

Zircadyne® Corrosion Data





TELEDYNE

WAH CHANG ALBANY

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PROPERTIES DATA: The properties listed in this brochure are average values based on laboratory and field test data from a number of sources. They are indicative only of the results obtained in such tests and should not be considered as guaranteed maximums or minimums. Because the chemical composition of your media may differ from that tested, materials should be tested under actual service conditions to determine their suitability for a particular application.

Chemical Compositions of Zircadyne Alloys

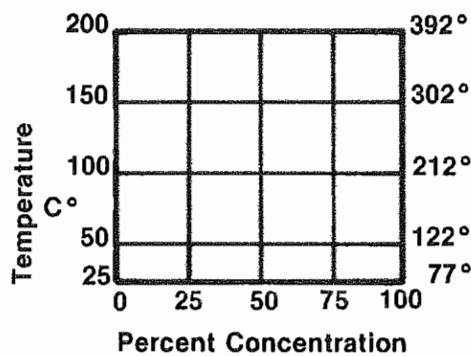
Grade (ASTM Designation)	Zircadyne 702 (R60702)	Zircadyne 704 (R60704)	Zircadyne 705 (R60705)	Zircadyne 706 (R60706)
Chemical Compositions, Percent				
Zr + Hf, min.	99.2	97.5	95.5	95.5
Hafnium, max.	4.5	4.5	4.5	4.5
Fe + Cr	0.2 max.	0.2-0.4	0.2 max.	0.2 max.
Tin	---	1.0-2.0	---	---
Hydrogen, max.	0.005	0.005	0.005	0.005
Nitrogen, max.	0.025	0.025	0.025	0.025
Carbon, max.	0.05	0.05	0.05	0.05
Niobium	---	---	2.0-3.0	2.0-3.0
Oxygen, max.	0.16	0.18	0.18	0.16

Minimum ASTM Requirements for the Mechanical Properties of Zirconium at Room Temperature (Cold Worked and Annealed)

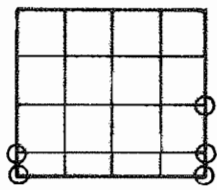
Zircadyne Grade (ASTM Designation)	Zircadyne 702 (R60702)	Zircadyne 704 (R60704)	Zircadyne 705 (R60705)	Zircadyne 706 (R60706)
Tensile Strength, Min. ksi (MPa)	55 (379)	60 (413)	80 (552)	74 (510)
Yield Strength, Min. ksi (MPa)	30 (207)	35 (241)	55 (379)	50 (345)
Elongation (0.2% offset) Min. Percent	16	14	16	20
Bend Test Radius*	5T	5T	3T	2.5T

*Bend tests are not applicable to material over 0.187 in. (4.75 mm) in thickness.
T equals the thickness of the bend test sample.

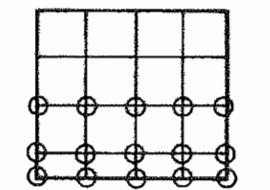
The Corrosion Resistance of Zircadyne® 702



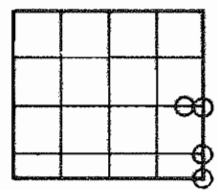
- < 2 mpy (.002" per yr.)
- < 20 mpy (.020" per yr.)
- < 50 mpy (.050" per yr.)
- > 50 mpy (.050" per yr.)
- ▽ Weight gain



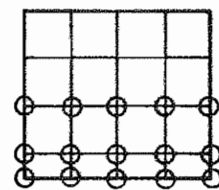
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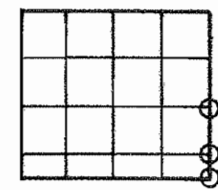
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(AERATED OR AIR-FREE)



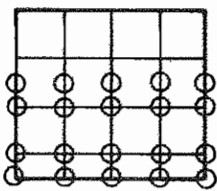
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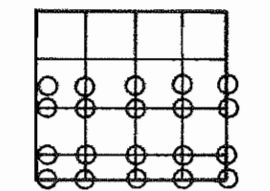
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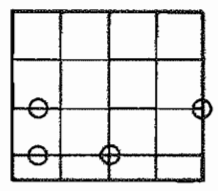
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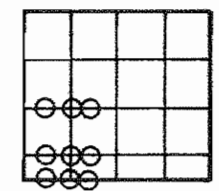
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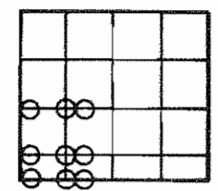
ALCOHOL (METHYL)



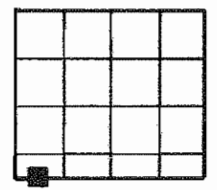
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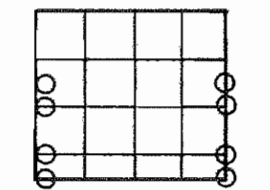
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CHLORIDE



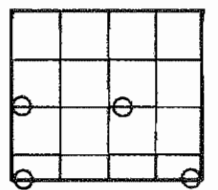
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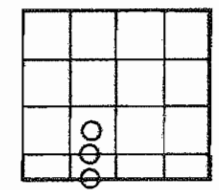
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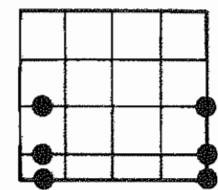
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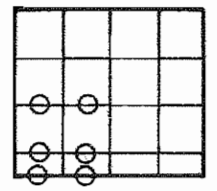
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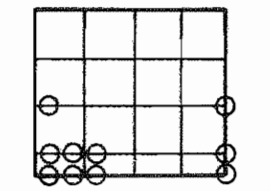
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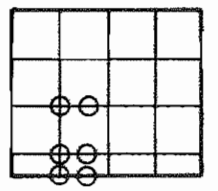
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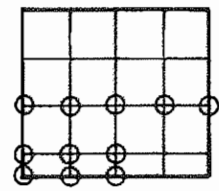
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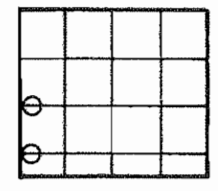
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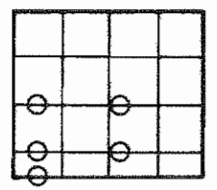
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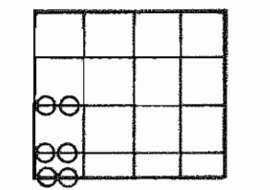
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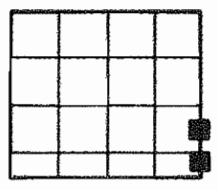
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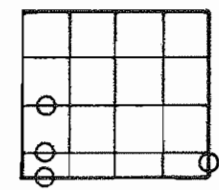
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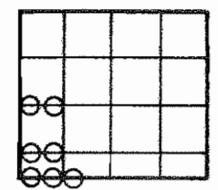
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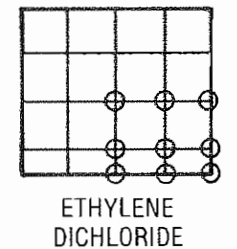
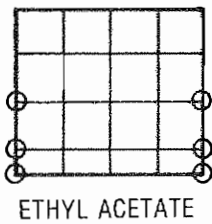
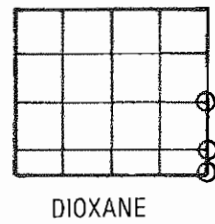
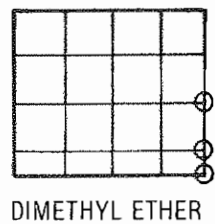
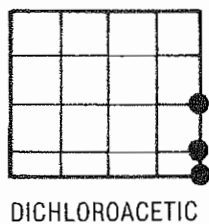
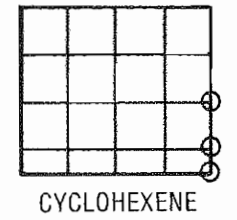
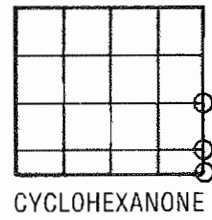
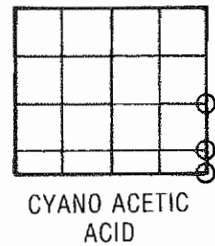
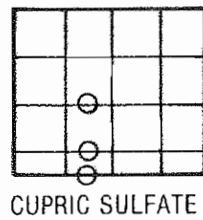
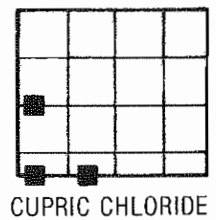
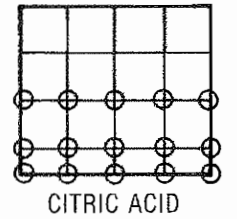
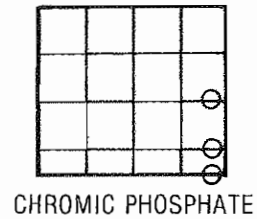
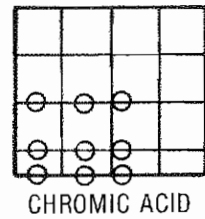
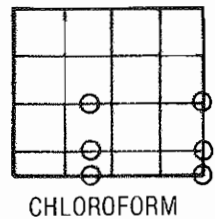
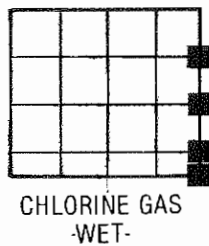
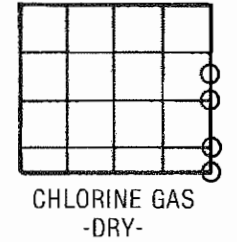
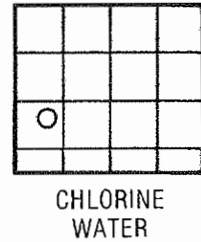
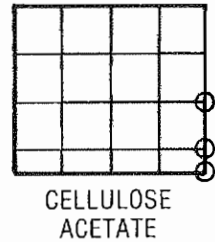
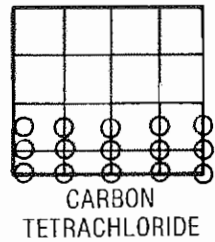
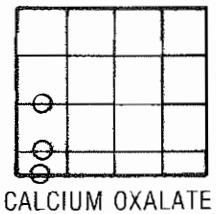
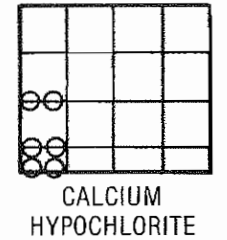
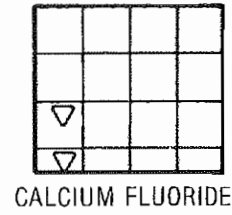
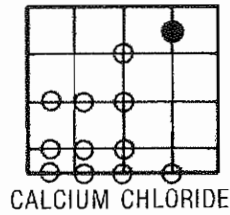
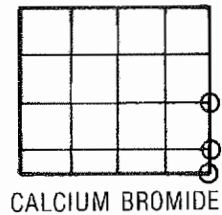
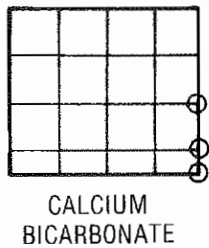
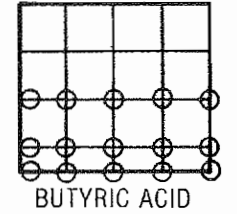
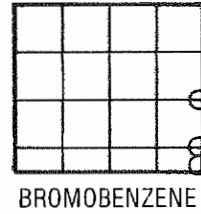
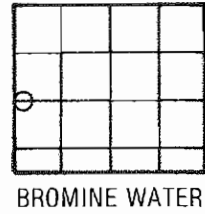
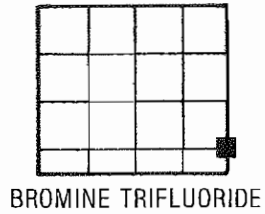
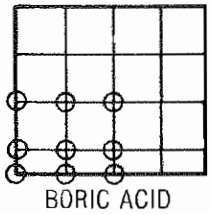
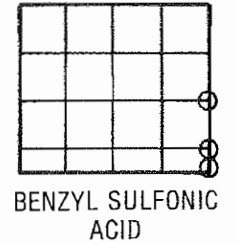
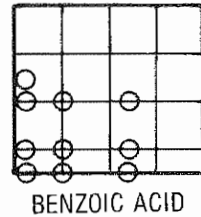
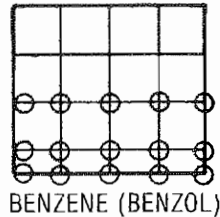
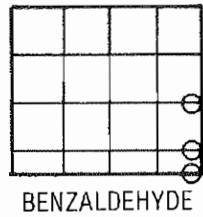
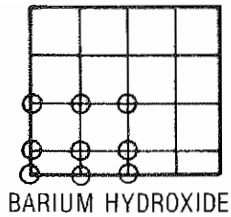
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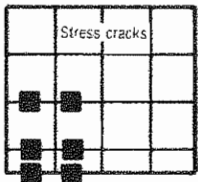


BARIUM CARBONATE

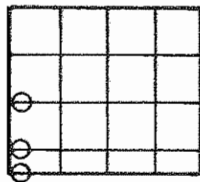


BARIUM CHLORIDE

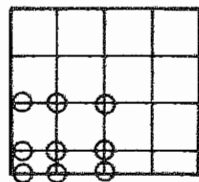




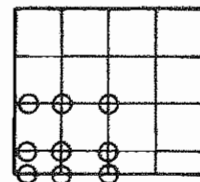
FERRIC CHLORIDE



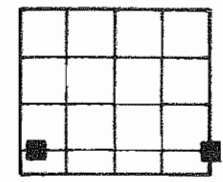
FERRIC SULFATE



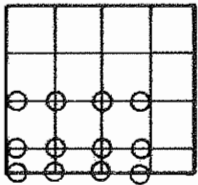
FERROUS CHLORIDE



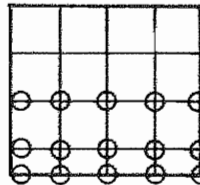
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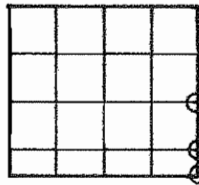
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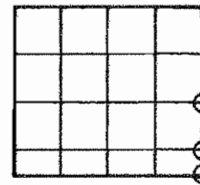
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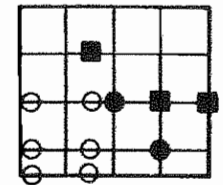
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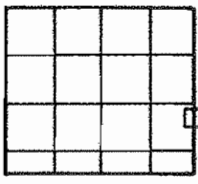
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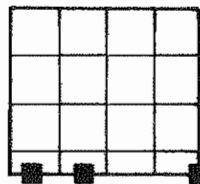
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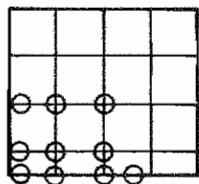
HYDROCHLORIC ACID
(Avoid Fe^{3+} and Cu^{2+} ions)



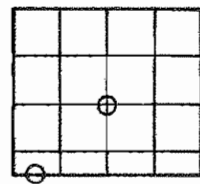
HYDROCHLORIC +
SULFURIC ACID



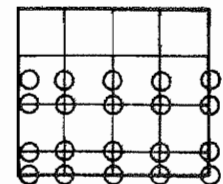
HYDROFLUORIC
ACID



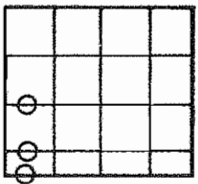
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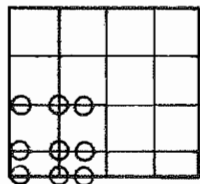
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(As KI)



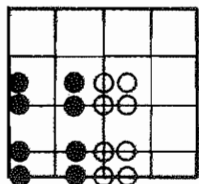
LACTIC ACID



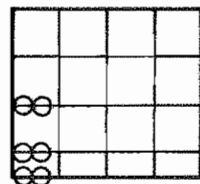
MAGNESIUM
CARBONATE



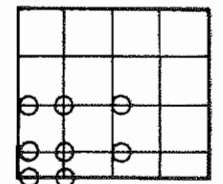
MAGNESIUM
CHLORIDE



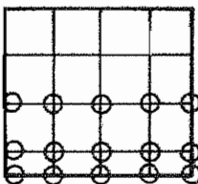
MAGNESIUM
SULFATE



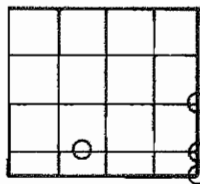
MANGANESE
CHLORIDE



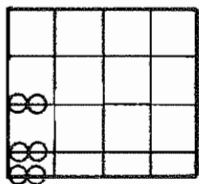
MERCURIC CHLORIDE



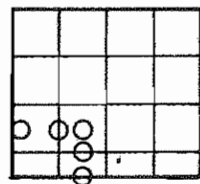
METHYL ETHYL
KEYTONE



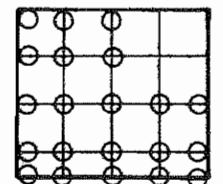
MONOCHLOROACETIC
ACID



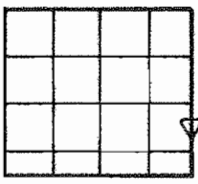
NICKEL CHLORIDE



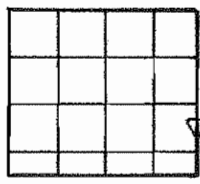
NICKEL SULFATE



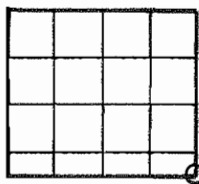
NITRIC ACID



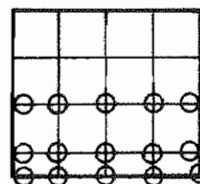
NITRIC ACID
(RED FUMING)



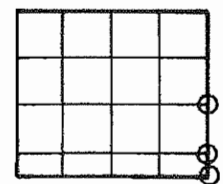
NITRIC ACID
(WHITE FUMING)



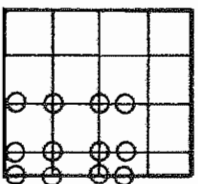
OLEIC ACID



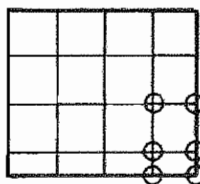
OXALIC ACID



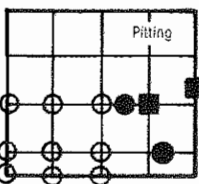
PENTANE



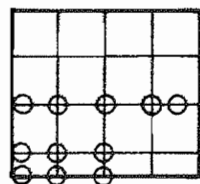
PERCHLORIC ACID



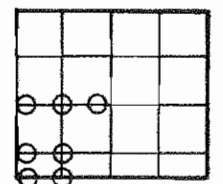
PHENOL



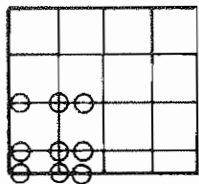
PHOSPHORIC
ACID



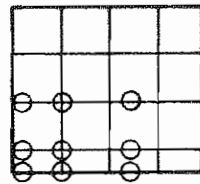
POTASSIUM BROMIDE



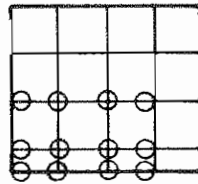
POTASSIUM
CHLORIDE



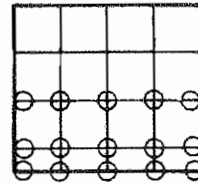
POTASSIUM DI-CHROMATE



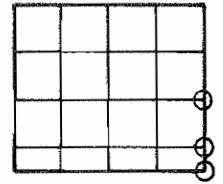
POTASSIUM HYDROXIDE



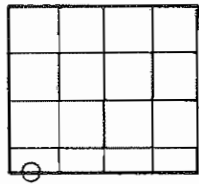
POTASSIUM IODIDE



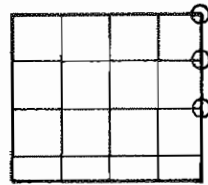
POTASSIUM NITRITE



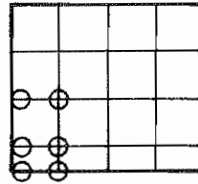
SEA WATER (SYNTHETIC)



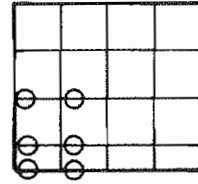
SILVER NITRATE



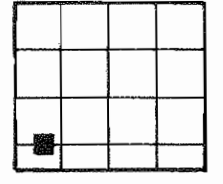
SODIUM



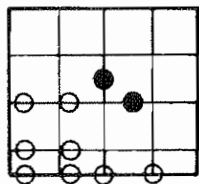
SODIUM BICARBONATE



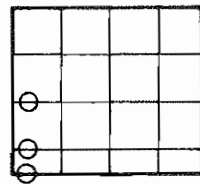
SODIUM CHLORIDE



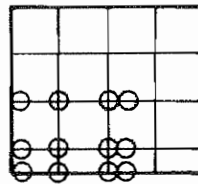
SODIUM FLUORIDE



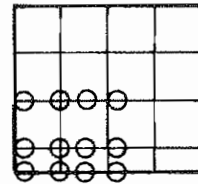
SODIUM HYDROXIDE



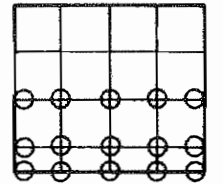
SODIUM HYPOCHLORITE



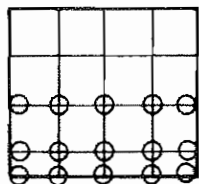
SODIUM IODIDE



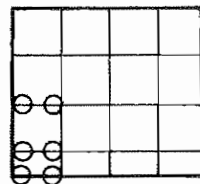
SODIUM NITRITE



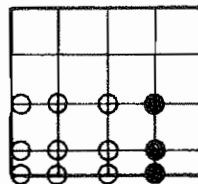
SODIUM PHOSPHATE



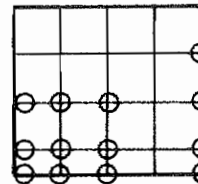
SODIUM SILICATE



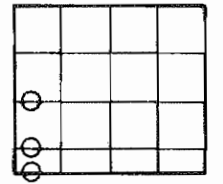
STANNIC CHLORIDE



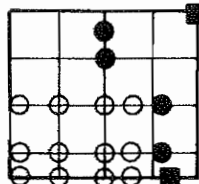
STANNOUS CHLORIDE



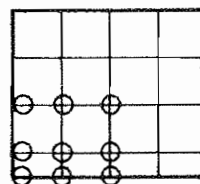
SUCCINIC ACID



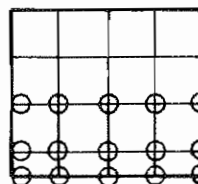
SULFUROUS ACID



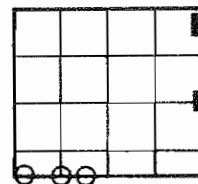
SULFURIC ACID (AERATED)



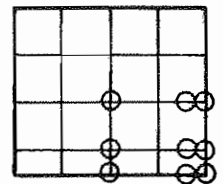
TANNIC ACID



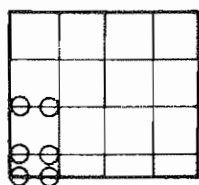
TARTARIC ACID



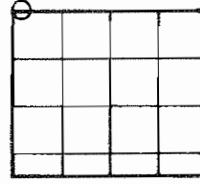
TRICHLOROACETIC ACID



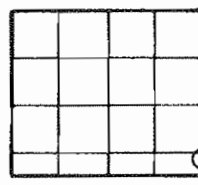
TRICHLOROETHYLENE



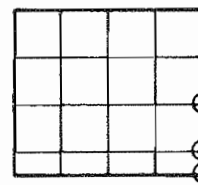
TRISODIUM PHOSPHATE



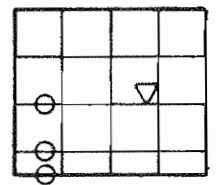
URANYL SULFATE



UREA



XYLENE



ZINC CHLORIDE

Zirconium Corrosion Data

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Acetaldehyde	100	Boiling	<2	—	—	
Acetic Acid	5-99.5	35-Boiling	<1	—	<1	
Acetic Acid (anhydride)	99	Room-Boiling	<1	—	<1	
Acetic Acid (glacial)	99.7	Boiling	<5	—	—	
Acetic Acid	100	160	<1	—	—	
Acetic Acid + 50 ppm I ⁻ (KI)	100	160,200	<1	—	—	
Acetic Acid + 1% I ⁻ (KI) + 100 ppm Fe ⁺³ (Fe ₂ (SO ₄) ₃)	99	200	<1	—	<1	
Acetic Acid + 2% HI	80	100	<1	—	<1	
Acetic Acid + 2% HI, 1000 ppm Fe (Fe powder)	80	100	<1	—	—	
Acetic Acid + 2% HI, 1% methanol, 500 ppm formic, 100 ppm Cu	80	150	<1	—	<1	
Acetic Acid + 2% HI, 1% methanol, 500 ppm formic, 100 ppm Fe	80	150	<1	—	<1	
Acetic Acid + 2% HI	98	150	<1	—	<1	
Acetic Acid + 2% HI + 200 ppm Cl ⁻ (Fe Cl ₃)	80	100	<1	—	<1	
Acetic Acid + 2% HI + 200 ppm Fe ⁺³ (Fe ₂ (SO ₄) ₃)	80	100	<1	—	<1	
Acetic Acid + 2% I ⁻ (KI)	98	150	<1	—	<1	
Acetic Acid + 2% HI + 1% CH ₃ OH + 500 ppm HCOOH	80	150	<1	—	<1	

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Acetic Acid + 2% HI + 200 ppm Cl ⁻ (NaCl)	80	100	<1	—	<1	
Acetic Acid + 50% Acetic Anhydride	50	Boiling	<1	—	<1	
Acetic Acid + 50% 48% HBr	50	115	<1	—	<1	
Acetic Acid + Saturated gaseous HCl and Cl ₂	100	Boiling	>200	—	>200	
Acetic Acid + Saturated gaseous HCl and Cl ₂	100	40	<1	—	—	
Acetic Acid + 10% CH ₃ OH	90	200	<1	—	—	
Aluminum Chlorate	30	100	<2	—	—	
Aluminum Chloride	5, 10, 25 25 40	35-100 Boiling 100	<1 <1 <2	— — —	— <1 —	
Aluminum Chloride (aerated)	5, 10	60	<2	—	—	
Aluminum Fluoride	20	Room	>50	—	—	pH = 3.2
Aluminum Potassium Sulfate	10	Boiling	nil	—	nil	pH = 3.2
Aluminum Sulfate	25 60	Boiling 100	nil <2	— —	nil —	
Ammonia (wet)	+ water	38	<5	—	—	
Ammonium Carbamate	—	193	<1	—	—	58.4% Urea, 16.8% Ammonia, 14.8% CO ₂ , 9.9% H ₂ O at 3,200-3,500 psi
Ammonium Chloride	1,10, saturated	35-100	<1	—	—	
Ammonium Hydroxide	28	Room-100	<1	—	—	
Ammonium Fluoride	20 20	28 98	>50 >50	— —	— —	pH = 8 pH = 8
Ammonium Oxalate	100	100	<2	—	—	
Ammonium Sulfate	5, 10	100	<5	—	—	
Aniline Hydrochloride	5, 20 5, 20	35-100 100	<1 <2	— —	— —	
Aqua Regia	3:1	Room	>50	—	—	3 parts HCl/1 part HNO ₃

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Barium Chloride	5, 20 25	35-100 Boiling	< 1 5-10	— —	— —	
Bromine	100-Liquid Vapor	20 20	<10 —	— —	20-50 >50	Pitting Pitting
Bromochloromethane	100	100	< 2	—	—	
Cadmium Chloride	100	Room	< 2	—	—	
Calcium Bromide	100	100	< 2	—	—	
Calcium Chloride	5, 10, 25 70 75 Mixture	35-100 Boiling Boiling 79	< 1 < 1 < 5 < 1	— — — —	— — — —	B.P. = 162°C 14% CaCl, 8% NaCl 0.2% Ca(OH) ₂
Calcium Fluoride	Saturated Saturated	28 90	nil nil	— —	— —	pH = 5 pH = 5
Calcium Hypochlorite	2, 6, 20	100	< 5	—	—	
Carbonic Acid	Saturated	100	< 5	—	—	
Carbon Tetrachloride	0-100	Room-100	< 2	—	—	
Chlorine (water saturated)	—	Room 75	>50 >50	— —	— —	
Chlorine Gas (more than 0.13% H ₂ O)	100	94	>50	—	—	
Chlorine Gas (dry)	100	Room	< 5	—	—	
Chlorinated Water	—	100	< 2	—	—	
Chloroacetic Acid	100	Boiling	< 1	—	—	
Chromic Acid	10-50	Boiling	< 1	—	—	
Citric Acid	10-50 10, 25, 50 50	35-100 100 Boiling	< 1 < 1 < 5	— — —	— — —	
Chrome Plating Solution	—	66	>50	—	>50	M + T Chemicals CR-100
Cupric Chloride	5, 10, 20 20, 40, 50	35-100 Boiling	>50 >50	>50 >50	>50 >50	

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Cupric Cyanide	Saturated	Room	>50	—	—	
Cupric Nitrate	40	Boiling	W.G.	—	W.G.	B.P. = 115°C
Dichloroacetic Acid	100	Boiling	<20	—	—	
Ethylene Dichloride	100	Boiling	< 5	—	—	
Ferric Chloride	0-50 0-50	Room-100 Boiling	>50 >50	>50 >50	>50 >50	
Ferric Sulfate	10	0-100	< 2	—	—	
Formaldehyde	6-37 0-70	Boiling Room-100	< 1 < 2	— —	< 1 —	
Fluoboric Acid	5-20	Elevated	>50	—	—	
Fluosilicic Acid	10	Room	>50	—	—	
Formic Acid	10-90	35-Boiling	< 5	—	—	
Formic Acid (aerated)	10-90	Room-100	< 5	—	—	
Hydrazine	Mixture Mixture	109 130	< 1 nil	-- —	— —	2% Hydrazine + saturated NaCl + 6% NaOH 2% Hydrazine + saturated NaCl + 6% NaOH
Hydrobromic Acid	48 Mixture	Boiling Boiling	< 5 < 1	— --	< 5 <1	B.P. = 125°C (shallow pits) 24% HBr + 50% Acetic Acid (glacial)
Hydrochloric Acid	2 5 10 20 32 32	225 Room 35 35 30 82	< 1 < 1 < 1 < 1 < 1 < 1	— — — — — —	< 1 — — — — —	
20% HCl + Cl ₂ gas	—	58	5-10*	—	—	*Pitting
37% HCl + Cl ₂ gas	—	58	< 5	—	—	
10% HCl + 100 ppm FeCl ₃	—	30	< 1	< 2	< 1	SCC observed
10% HCl + 100 ppm FeCl ₃	—	105	< 5	--	—	*Pitting Rate

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
20% HCl + 100 ppm FeCl ₃	—	105	< 5	—	—	
37% HCl + 100 ppm FeCl ₃	—	53	5-10	—	—	SCC Observed
Hydrochloric Acid	Mixture	Room	Dissolved	—	—	20% HCl + 20% HNO ₃
	Mixture	Room	Dissolved	—	—	10% HCl + 10% HNO ₃
Hydrofluoric Acid	0-100	Room	>50	—	—	
Hydrogen Peroxide	50	100	< 2	—	—	
Hydroxyacetic Acid	—	40	< 5	—	—	
Lactic Acid	10-100	148	< 1	—	—	
	10-85	35-Boiling	< 1	—	—	
Magnesium Chloride	5-40	Room-100	< 2	—	—	
	47	Boiling	nil	—	nil	
Manganese Chloride	5, 20	Room-100	< 1	—	—	
Mercuric Chloride	1-Saturated	35-100	< 1	—	—	
	Saturated	Boiling	< 1	—	< 1	
Nickel Chloride	5, 20	35-100	< 1	—	—	
	5-20	100	< 1	—	—	
	30	Boiling	nil	—	nil	
Nitric Acid	20	103	< 1	< 1	< 1	
	70	121	< 1	< 1	< 1	
	10-70	Room-260	< 1	—	—	
	70-98	Room-Boiling	< 1*	—	—	*SCC Observed
Nitric Acid + 1% Fe	65	120	< 1	—	—	
Nitric Acid + 1% Fe	65	204	< 1	—	—	
Nitric Acid + 1.45% 304 S.S.	65	204	nil	—	—	
Nitric Acid + 1% Cl ⁻ (as NaCl)	70	120	nil	—	—	
Nitric Acid + 1% Seawater	70	120	nil	—	—	
Nitric Acid + 1% FeCl ₃	70	120	nil	—	—	
Oxalic Acid	0-100	100	< 1	—	—	
Perchloric Acid	70	100	< 2	—	—	
Phenol	Saturated	Room	< 5	—	—	

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Phosphoric Acid	5-30	Room	< 5	—	—	B.P. = 108°C B.P. = 123-126°C B.P. = 156°C 88% H ₃ PO ₄ + 0.5% HNO ₃ 88% H ₃ PO ₄ + 5% HNO ₃ 85% H ₃ PO ₄ + 4% HNO ₃
	5-35	60	< 5	—	—	
	5-50	100	< 5	—	—	
	35-50	Room	< 5	—	—	
	45	Boiling	< 5	—	—	
	50	Boiling	< 5	5-10	10-15	
	65	100	5-10	—	<20	
	70	Boiling	>50	—	>50	
	85	38	5-20	—	—	
	85	80	20-50	—	20-50	
	85	Boiling	>50	—	>50	
	Mixture	Room	nil	—	—	
Mixture	Room	W.G.	—	—		
Mixture	89	>50	—	>50		
Potassium Chloride	Saturated	60	< 1	—	—	
	Saturated	Room	< 1	—	—	
Potassium Fluoride	20	28	nil	—	—	pH = 8.9
	20	90	>50	—	—	pH = 8.9
	0.3	Boiling	< 1	—	—	
Potassium Hydroxide	50	27	< 1	—	—	13% KOH, 13% KCl
	10	Boiling	< 1	—	—	
	25	Boiling	< 1	—	—	
	50	Boiling	< 5	—	—	
	50-anhydrous Mixture	241-377 29	>50 < 1	— —	— —	
Potassium Iodide	0-70	Room-100	< 2	—	—	
Potassium Nitrite	0-100	Room-100	< 2	—	—	
Silver Nitrate	50	Room	< 5	—	—	
Sodium Bi-Sulfate	40	Boiling	< 1	—	< 1	B.P. = 107°C
Sodium Chloride	3-Saturated	35-Boiling	< 1	—	< 1	Adjusted to pH = 1 Adjusted to pH = 0
	29	Boiling	< 1	—	—	
	Saturated	Room	< 1	—	—	
	Saturated	Boiling	< 1	—	< 1	
	Saturated	107	nil	—	—	
Sodium Chloride + Saturated SO ₂	3.5	80	nil	—	—	
Sodium Chloride + Saturated SO ₂	25	80	nil	—	—	
Sodium Chloride + Saturated SO ₂	Saturated	80	nil	—	—	

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Sodium Chloride	Mixture	215	nil	nil	nil	25% NaCl + 0.5% Acetic Acid + 1% S + saturated H ₂ S
Sodium Fluoride	Saturated	28	nil	--	--	
	Saturated	90	>50	--	--	
Sodium Formate	0-80	100	< 2	--	--	
Sodium Hydrogen Sulfite	40	Boiling	< 1	--	< 1	
Sodium Hydroxide	5-10	21	< 1	--	--	
	28	Room	< 1	--	--	
	10-25	Boiling	< 1	--	--	
	40	100	< 1	--	--	
	50	38-57	< 1	--	--	
	50-73	188	20-50	--	--	
	73	110-129	< 2	--	--	
	73 to anhydrous	212-538	20-50	--	--	
	Mixture	82	< 1	--	--	9-11% NaOH, 15% NaCl
	Mixture	10-32	< 1	--	--	10% NaOH, 10% NaCl & wet CoCl ₂
	Mixture	129	< 1	--	--	0.6% NaOH, 2% NaClO ₃ + trace of NH ₃
	Mixture	191	< 1	--	--	7% NaOH, 53% NaCl, 7% NaClO ₃ , 80-100 ppm NH ₃
	Mixture	138	< 5	--	--	52% NaOH + 16% NH ₃
Sodium Hydroxide (Suspended salt-violent boiling)	20	60	10-20	--	--	
Sodium Hydroxide + 750 ppm Free Cl ₂	50	38	< 1	--	--	
	50	38-57	< 1	--	--	
Sodium Hypochlorite	6	100	< 5	--	--	as received super chlor.
	6	50	nil	--	nil	
Sodium Iodide	0-60	100	< 2	--	--	
Sodium Peroxide	0-100	Room-100	< 2	--	--	
Sodium Silicate	0-100	Room-100	< 2	--	--	

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Sodium Sulfate	0-20	Room-100	<2	—	—	
Sodium Sulfide	33	Boiling	nil	—	nil	
Stannic Chloride	5	100	<1	—	—	
	24	Boiling	<1	—	—	
Succinic Acid	0-50	100	<2	—	—	
	100	150	<2	—	—	
Sulfuric Acid	0-75	20	<1	<1	<1	
	80	20	<5	>50	--	
	80	30	20-50	>50	>50	
	77.5	60	10-20	—	<10	
	75	50	<1	—	—	
	77	50	5-10	>50	—	
	80	50	>50	>50	>50	
	75	80	<5	—	<5	
	65	100	—	<1	<5	
	70	100	<2	—	<5	
	75	100	<5	—	<5	
	76	100	<10	—	—	
	77	100	<20	—	—	
	77.5	100	>50	>50	>50	
	60	130	—	—	<5	
	65	130	<1	—	—	
	70	140	<5	—	<10	
	58	Boiling	—	<1	<5	B.P. = 140°C
	62	Boiling	<5	—	10-20	B.P. = 146°C
	64	Boiling	<5	—	20-50	B.P. = 152°C
68	Boiling	<5	—	—	B.P. = 165°C	
69	Boiling	<5	—	—	B.P. = 167°C	
71	Boiling	<5	—	—	B.P. = 171°C	
72-74	Boiling	5-10	>50	—		
75	Boiling	10-20	>50	—	B.P. = 189°C	
Sulfuric Acid + 1000 ppm Fe ³⁺ + 10,000 ppm Fe ³⁺	60	Boiling	<1	—	—	B.P. = 138-142°C
	60	Boiling	<5	—	—	Added as Fe ₂ (SO ₄) ₃
Sulfuric Acid + 200-1000 ppm Fe ³⁺ + 10,000 ppm Fe ³⁺	65	Boiling	<5	—	—	B.P. = 152-155°C
	65	Boiling	5-10	—	—	Added as Fe ₂ (SO ₄) ₃
Sulfuric Acid + 14 ppm - 141 ppm Fe ³⁺ + 200 ppm + 1410 ppm-10,000 ppm Fe ³⁺	70	Boiling	5-10	—	—	B.P. = 167-171°C
	70	Boiling	10-20	—	—	Added as Fe ₂ (SO ₄) ₃
	70	Boiling	>50	—	—	
Sulfuric Acid + 1000 ppm FeCl ₃ + 10,000 ppm FeCl ₃ + 20,000 ppm FeCl ₃	60	Boiling	<5	<5	<20	B.P. = 138-142°C
	60	Boiling	<5	<20	20-50	
	60	Boiling	20-50	20-50	>50	

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Sulfuric Acid + 200 ppm FeCl ₃ + 1000 ppm FeCl ₃ + 10,000 ppm FeCl ₃	65 65 65	Boiling Boiling Boiling	< 5 < 5 < 5	< 5 < 5 < 5	<20 <20 <20	B.P. = 152-155°C
Sulfuric Acid + 10 ppm FeCl ₃ + 100 ppm FeCl ₃ + 200 ppm FeCl ₃ + 1000 ppm FeCl ₃ + 10,000 ppm FeCl ₃	70 70 70 70 70	Boiling Boiling Boiling Boiling Boiling	<20 <20 <20 <20 20-50	<20 <20 <20 <20 >50	>50 >50 >50 >50 >50	B.P. = 167-171°C
Sulfuric Acid + 200 ppm Cu ²⁺ + 1000-10,000 ppm Cu ²⁺	60 60	Boiling Boiling	< 5 < 1	— —	-- --	Added as CuSO ₄
Sulfuric Acid + 200-10,000 ppm Cu ²⁺	65	Boiling	< 5	--	--	Added as CuSO ₄
Sulfuric Acid + 3 ppm Cu ²⁺ + 27-226 ppm Cu ²⁺	70 70	Boiling Boiling	5-10 >50	— —	— —	Added as CuSO ₄
Sulfuric Acid + 1000-10,000 ppm NO ₃ ⁻ + 50,000 ppm NO ₃ ⁻	60 60	Boiling Boiling	< 5 >50	— —	— —	Added as NaNO ₃
Sulfuric Acid + 200-1000 ppm NO ₃ ⁻ + 10,000 ppm NO ₃ ⁻ + 50,000 ppm NO ₃ ⁻	65 65 65	Boiling Boiling Boiling	< 5 10-20 >50	— — —	— — —	Added as NaNO ₃
Sulfuric Acid + 200 ppm NO ₃ ⁻ + 6000 ppm NO ₃ ⁻	70 70	Boiling Boiling	5-10 20-50	— —	— —	Added as NaNO ₃
Sulfuric Acid + 1000 ppm NO ₃ ⁻ + 10,000 ppm NO ₃ ⁻ + 50,000 ppm NO ₃ ⁻	60 60 60	Boiling Boiling Boiling	< 5 10-20 >50	— — —	— — —	Added as HNO ₃
Sulfuric Acid + 1000 ppm NO ₃ ⁻ + 10,000-50,000 ppm NO ₃ ⁻	65 65	Boiling Boiling	< 5 >50	— —	— —	Added as HNO ₃
Sulfuric Acid	Mixture Mixture Mixture Mixture Mixture Mixture	Room-100 Room-100 Boiling 100 Room Boiling	< 1 nil < 1 >50 < 1 >50	— — — >50 — >50	— — — >50 — >50	1% H ₂ SO ₄ , 99% HNO ₃ 10% H ₂ SO ₄ , 90% HNO ₃ 14% H ₂ SO ₄ , 14% HNO ₃ 25% H ₂ SO ₄ , 75% HNO ₃ 50% H ₂ SO ₄ , 50% HNO ₃ 68% H ₂ SO ₄ , 5% HNO ₃

CORROSIVE MEDIA	CONCENTRATION %	TEMPERATURE °C	CORROSION RATE, mpy			REMARKS
			Zr 702	Zr 704	Zr 705	
Sulfuric Acid (Cont.)	Mixture	Boiling-135	10-20	10-20	>50	68% H ₂ SO ₄ , 1% HNO ₃
	Mixture	Room	>50	>50	>50	75% H ₂ SO ₄ , 25% HNO ₃
	Mixture	Boiling	< 1	—	—	7.5% H ₂ SO ₄ , 19% HCl
	Mixture	Boiling	< 1	—	—	34% H ₂ SO ₄ , 17% HCl
	Mixture	Boiling	< 1	—	—	40% H ₂ SO ₄ , 14% HCl
	Mixture	Boiling	1-5	—	—	56% H ₂ SO ₄ , 10% HCl
	Mixture	Boiling	< 1	—	—	60% H ₂ SO ₄ , 1.5% HCl
	Mixture	Boiling	< 5	—	—	69% H ₂ SO ₄ , 1.5% HCl
	Mixture	Boiling	10-20	—	—	69% H ₂ SO ₄ , 4% HCl
	Mixture	Boiling	<20	—	—	72% H ₂ SO ₄ , 1.5% HCl
	Mixture	Boiling	>50	—	>50	20% H ₂ SO ₄ , 7% HCl with 50 ppm F impurities
Sulfurous Acid	6 Saturated	Room 192	< 5 5-50	— —	— —	
Sulfamic Acid	10	Boiling	nil	—	nil	B.P. = 101°C
Tannic Acid	25	35-100	< 1	—	—	
Tartaric Acid	10-50	35-100	< 1	—	—	
Trichloroacetic Acid	10-40	Room	< 2	—	—	
	100	Boiling	>50	—	—	
	100	100	>50	—	—	B.P. = 195°C
Tetrachloroethane	100	Boiling	< 5	—	—	B.P. = 146°C symmetrical B.P. = 129°C unsymmetrical
Trichloroethylene	99	Boiling	< 5	—	—	B.P. = 87°C
Trisodium Phosphate	5-20	100	< 5	—	—	
Urea Reactor Mixture	Mixture	193	< 1	—	—	58 Urea 17 NH ₃ 15 CO ₂ 10 H ₂ O
Water - Sea (Pacific)	—	Boiling 200	nil nil	— —	nil —	pH = 7.6
Zinc Chloride	70	Boiling	nil	—	nil	
	5-20	35-Boiling	< 1	—	—	
	40	180	< 1	—	< 1	

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