



**IRATA International code of practice  
for industrial rope access**

**Part 3: Informative annexes**

**Annex J: Resistance to chemicals and other  
properties of some of the man-made fibres used in  
the manufacture of rope access equipment**

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## **Annex J (informative)**

### **Resistance to chemicals and other properties of some of the man-made fibres used in the manufacture of rope access equipment**

#### **Introduction**

Annex J gives advice and other information that could be relevant to users of rope access methods and is one of a number of informative annexes in Part 3 of this code of practice. This informative annex should be read in conjunction with other parts of this code of practice, should not be used in isolation and is not intended to be exhaustive. For further advice, readers should refer to relevant specialist publications.

#### **J.1 General**

**J.1.1** The resistance to chemicals of some of the man-made fibres used in the manufacture of rope access equipment is given in **Table J.1** and other properties are given in **Table J.2**. This information has been compiled from manufacturers' data. It should be noted that several variants of most of these fibres exist and new variants are continually being developed.

**J.1.2** The information in this annex may be used in the risk assessment process, prior to work commencing, to ensure the performance of equipment will not be adversely affected by chemicals to a point where the safety of the user is compromised.

**J.1.3** Some contaminants found on the worksite may be a complex mixture of several of the chemicals listed. This should be taken into account when planning the work. More specific information about the chemicals may be required, e.g. the effect of variations in temperature and concentration.

**J.1.4** It is strongly recommended that before working in an area where chemical contaminants are suspected, the manufacturer of the equipment or his authorised representative is consulted with regard to the properties of the safety-critical materials used in the equipment's manufacture, bearing in mind that more than one type of man-made fibre could have been utilised, e.g. polyamide and polyester.

**Table J.1 — Resistance to chemicals of some of the man-made fibres used in the manufacture of rope access equipment (page 1 of 6)**

Chemical	Aramid			Polyamide <sup>a</sup> (PA)		Polyester <sup>a</sup> (PET)		High performance polyethylene (HPPE)	Polypropylene <sup>b</sup> (PP)		High tenacity polypropylene (HTPP)
	21 °C <sup>c</sup>	60 °C	20 °C 6 months	6 months <sup>d</sup>	60 °C	20 °C	60 °C	6 months <sup>d</sup>	4 days 20 °C	21 h 70 °C	6 months <sup>d</sup>
Acetic acid 10 %	OK	!	OK	OK	!	OK	OK	OK	OK	!	OK
50 %	! (1 000h)	!	OK	OK	☠	OK	OK	OK	OK	!	OK
80 %	OK	☠	OK	OK	☠	OK	OK	OK	OK	!	OK
100 %	OK (24h)	☠	!	OK	☠	!	☠	OK	!	!	OK
Acetic acid (glacial)	?	?	?	OK	?	?	?	OK	?	?	OK
Acetone	OK	OK	!	OK	OK	!	☠	OK	OK	!	OK
Ammonia gas	?	?	!	OK	?	!	☠	OK	OK	OK	OK
Ammonia solution 10 %	OK	!	☠	OK	!	☠	☠	OK	OK	OK	OK
25 %	OK	☠	☠	OK	☠	☠		OK	OK	OK	OK
100%	OK	☠	☠	OK	☠	☠	☠	OK	OK	OK	OK
Aniline	?	!	?	OK	!	?	?	OK	OK	OK	OK
Aqua regia	?	☠	☠	☠	☠	☠	☠	☠	☠	☠	☠
Aviation fuel (115/145 octane)	OK	OK	OK	OK	OK	OK	OK	OK	!	☠	OK
Aviation fuel (turbine fuel)	OK	OK	OK	OK	OK	OK	OK	OK	!	☠	OK
Benzene	OK	OK	OK	OK	OK	OK	!	OK	?	☠	OK
Brine (saturated)	!	OK	OK	OK	!	OK	!	OK	OK	OK	OK

**Key**

**OK** Negligible effect; **!** Limited effect (Caution!); **☠** Considerable effect (Danger!); **?** No information available.

<sup>a</sup> Test duration not known.

<sup>b</sup> Except for high tenacity polypropylene.

<sup>c</sup> Values in parentheses are test durations. The test duration for other chemicals is not known.

<sup>d</sup> Test temperature not known (probably 20 °C).

**Table J.1 — Resistance to chemicals of some of the man-made fibres used in the manufacture of rope access equipment (page 2 of 6)**

Chemical	Aramid			Polyamide <sup>a</sup> (PA)		Polyester <sup>a</sup> (PET)		High performance polyethylene (HPPE)	Polypropylene <sup>b</sup> (PP)		High tenacity polypropylene (HTPP)
	21 °C <sup>c</sup>	60 °C	20 °C 6 months	6 months <sup>d</sup>	60 °C	20 °C	60 °C	6 months <sup>d</sup>	4 days 20 °C	21 h 70 °C	6 months <sup>d</sup>
Bromine gas	?	?	!	!	?	!	☠	!	☠	☠	!
Calcium hypochlorite 20 %	?	?	?	☠	☠	!	!	!	!	!	!
Carbon dioxide gas	?	?	?	!	!	OK	OK	OK	OK	OK	OK
Carbon tetrachloride	OK	OK	?	OK	OK	OK	OK	OK	☠	☠	OK
Castor oil	?	?	?	OK	OK	OK	!	OK	OK	OK	OK
Chlorine gas	?	?	?	☠	☠	?	?	☠	☠	☠	☠
Chlorine water	?	?	?	OK	!	OK	OK	☠	OK	!	☠
Chloroform	!	☠	?	!	!	!	!	OK	☠	☠	OK
Chromic acid 1 %	?	?	?	☠	☠	!	☠	☠	!	!	☠
10 %	☠	?	?	?	?	?	?	?	?	!	?
50 %	?	?	?	☠	☠	☠	☠	☠	!	!	☠
80 %	?	?	?	☠	☠	☠	☠	☠	?	?	☠
Dibutyl phthalate	?	?	?	OK	?	OK	?	OK	OK	!	OK
Diethyl ether	?	?	?	OK	?	OK	?	OK	!	?	OK
Ethylene glycol	?	?	?	OK	?	OK	?	OK	OK	OK	OK
Freon	OK	OK 500h	?	OK	?	OK	?	OK	OK	?	OK
Formic acid 40 %	!	?	?	?	?	?	?	?	?	?	?
75 %	OK 10 000 h	?	?	?	?	OK	!	OK	?	?	OK

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<sup>a</sup> Test duration not known.

<sup>b</sup> Except for high tenacity polypropylene.

<sup>c</sup> Values in parentheses are test durations. The test duration for other chemicals is not known.

<sup>d</sup> Test temperature not known (probably 20 °C).

**Table J.1 — Resistance to chemicals of some of the man-made fibres used in the manufacture of rope access equipment (page 3 of 6)**

Chemical	Aramid			Polyamide <sup>a</sup> (PA)		Polyester <sup>a</sup> (PET)		High performance polyethylene (HPPE)	Polypropylene <sup>b</sup> (PP)		High tenacity polypropylene (HTPP)
	21 °C <sup>c</sup>	60 °C	20 °C 6 months	6 months <sup>d</sup>	60 °C	20 °C	60 °C	6 months <sup>d</sup>	4 days 20 °C	21 h 70 °C	6 months <sup>d</sup>
Glycerine	?	?	?	OK	OK	OK	OK	OK	OK	OK	OK
Hydrochloric acid 2 %	!	☠	☠	!	☠	!	!	OK	OK	OK	OK
Hydrochloric acid 10 %	☠ (100h)	☠	?	☠	☠	!	!	OK	OK	OK	OK
30 %	☠	☠	?	☠	☠	!	☠	OK	OK	OK	OK
38 % (concentrated)	☠	☠	?	☠	☠	☠	☠	OK	OK	!	OK
Hydrofluoric acid 2 %	OK	!	?	☠	☠	OK	!	!	OK	OK	!
10 %	OK (100 h)	☠	?	☠	☠	☠	☠	OK	OK	OK	OK
20 %	☠	☠	?	☠	☠	☠	☠	OK	OK	OK	OK
Hydrogen peroxide 1 %	?	?	?	☠	☠	OK	OK	!	OK	OK	!
3 %	?	?	?	☠	☠	!	☠	!	OK	!	!
10 %	?	?	?	☠	☠	!	☠	?	OK	!	?
30 %	?	?	?	☠	☠	!	☠	?	OK	☠	?
12 part	?	?	?	?	?	?	?	?	?	?	?
Hydrogen sulphide	?	?	?	OK	!	!	!	?	OK	OK	?
Kerosene	OK	OK (500 h)	OK	?	?	?	?	OK	!	☠	OK
Lactic acid 20 %	?	?	?	!	☠	OK	OK	OK	OK	OK	OK
Lanolin	?	?	?	OK	OK	OK	OK	OK	OK	OK	OK
Lubricating oil	?	?	?	OK	OK	OK	OK	OK	OK	!	OK

**Key**

**OK** Negligible effect; **!** Limited effect (Caution!); **☠** Considerable effect (Danger!); **?** No information available.

<sup>a</sup> Test duration not known.

<sup>b</sup> Except for high tenacity polypropylene.

<sup>c</sup> Values in parentheses are test durations. The test duration for other chemicals is not known.

<sup>d</sup> Test temperature not known (probably 20 °C).

**Table J.1 — Resistance to chemicals of some of the man-made fibres used in the manufacture of rope access equipment (page 4 of 6)**

Chemical	Aramid			Polyamide <sup>a</sup> (PA)		Polyester <sup>a</sup> (PET)		High performance polyethylene (HPPE)	Polypropylene <sup>b</sup> (PP)		High tenacity polypropylene (HTPP)
	21 °C <sup>c</sup>	60 °C	20 °C 6 months	6 months <sup>d</sup>	60 °C	20 °C	60 °C	6 months <sup>d</sup>	4 days 20 °C	21 h 70 °C	6 months <sup>d</sup>
Meat juices	?	?	?	OK	OK	OK	OK	OK	OK	OK	OK
Methanol	!	!	?	OK	!	OK	OK	OK	OK	OK	OK
Methyl ethyl ketone	OK	OK	?	OK	?	OK	?	OK	OK	☠	OK
Motor oil	OK	OK (10 h)	?	OK	OK	OK	OK	OK	!	☠	OK
Naphthalene	OK	OK	?	OK	?	OK	!	OK	OK	OK	OK
Nitric acid 10 %	☠ (100 h)	☠	☠	☠	☠	OK	!	OK	OK	!	OK
50 %	☠	☠	?	☠	☠	!	☠	OK	☠	☠	OK
70 %	☠ (24 h)	☠	?	☠	☠	☠	☠	☠	?	☠	☠
fuming	?	?	?	☠	☠	☠	☠	☠	☠	☠	☠
Nitrobenzene	?	?	?	☠	☠	☠	☠	OK	!	?	OK
Petrol	?	?	OK	?	?	?	?	OK	?	?	OK
Perchloroethylene	OK	OK (10 h)	OK	OK	OK	OK	OK	OK	?	?	OK
Phosphoric acid 25 %	OK	OK	?	☠	☠	!	☠	OK	OK	?	OK
50 %	!	!	?	☠	☠	☠	☠	OK	OK	?	OK
Phenol 5 %	OK	?	?	☠	☠	!	☠	?	☠	?	?
Phenol based disinfectant	?	?	?	?	?	?	?	?	OK	!	?

**Key**

**OK** Negligible effect; **!** Limited effect (Caution!); **☠** Considerable effect (Danger!); **?** No information available.

<sup>a</sup> Test duration not known.

<sup>b</sup> Except for high tenacity polypropylene.

<sup>c</sup> Values in parentheses are test durations. The test duration for other chemicals is not known.

<sup>d</sup> Test temperature not known (probably 20 °C).

**Table J.1 — Resistance to chemicals of some of the man-made fibres used in the manufacture of rope access equipment (page 5 of 6)**

Chemical	Aramid			Polyamide <sup>a</sup> (PA)		Polyester <sup>a</sup> (PET)		High performance polyethylene (HPPE)	Polypropylene <sup>b</sup> (PP)		High tenacity polypropylene (HTPP)
	21 °C <sup>c</sup>	60 °C	20 °C 6 months	6 months <sup>d</sup>	60 °C	20 °C	60 °C	6 months <sup>d</sup>	4 days 20 °C	21 h 70 °C	6 months <sup>d</sup>
Potassium hydrate 40 %	?	?	?	?	?	?	?	?	?	?	?
Sea water	?	?	OK	?	?	?	?	OK	?	?	OK
Silicone oil	?	?	?	OK	OK	OK	OK	OK	OK	OK	OK
Sodium hydrate 40 %	?	?	?	?	?	?	?	?	?	?	?
Sodium hydroxide 10 %	!	☠	☠	OK	OK	!	☠	!	OK	OK	!
50 %	?	?	?	!	☠	☠	☠	?	OK	OK	?
Sodium hypochlorite (0.25 % Cl)	?	?	?	?	?	OK	OK	!	?	?	!
(5 % Cl)	☠ (1 000 h)	?	?	?	?	OK	OK	?	?	?	?
Sulphuric acid 2 %	OK (1 000 h)	!	?	!	!	!	☠	OK	OK	OK	OK
10 %	! (1 000 h)	☠	?	☠	☠	!	☠	OK	OK	OK	OK
50 %	☠	☠	?	☠	☠	!	☠	!	OK	!	!
90 %	☠	☠	?	☠	☠	☠	☠	☠	OK	?	☠
Sulphur dioxide	?	?	?	☠	☠	!	☠	?	OK	OK	?
Tallow	?	?	?	OK	OK	OK	OK	?	OK	OK	?
Toluene	OK	OK	!	OK	OK	OK	OK	OK	?	☠	OK

**Key**

**OK** Negligible effect; **!** Limited effect (Caution!); **☠** Considerable effect (Danger!); **?** No information available.

<sup>a</sup> Test duration not known.

<sup>b</sup> Except for high tenacity polypropylene.

<sup>c</sup> Values in parentheses are test durations. The test duration for other chemicals is not known.

<sup>d</sup> Test temperature not known (probably 20 °C).



**Table J.1 —Resistance to chemicals of some of the man-made fibres used in the manufacture of rope access equipment (page 6 of 6)**

Chemical	Aramid			Polyamide <sup>a</sup>		Polyester <sup>a</sup>		High performance polyethylene (HPPE)	Polypropylene <sup>b</sup> (PP)		High tenacity polypropylene (HTPP)
	21 °C <sup>c</sup>	60 °C	20 °C 6 mth	6 months <sup>d</sup>	60 °C	20 °C	60 °C		6 months <sup>d</sup>	4 days 20 °C	
Transformer oil	OK	OK	?	OK	OK	OK	OK	OK	OK	☠	OK
Trichloroethylene	OK	OK	?	OK	OK	OK	OK	OK	?	☠	OK
Turpentine	?	?	?	OK	OK	OK	OK	OK	☠	☠	OK
Urine	?	?	?	OK	!	OK	OK	?	OK	OK	?
White spirit	OK	!	?	OK	OK	OK	OK	OK	☠	☠	OK
Xylene	?	?	?	OK	OK	OK	OK	OK	☠	☠	?

**Key**

OK Negligible effect; ! Limited effect (Caution!); ☠ Considerable effect (Danger!); ? No data: effects not known.

<sup>a</sup> Test duration not known.

<sup>b</sup> Except for high tenacity polypropylene.

<sup>c</sup> Values in parentheses are test durations. The test duration for other chemicals is not known.

<sup>d</sup> Test temperature not known (probably 20 °C).

**Table J.2 — Other properties of some of the man-made fibres used in the manufacture of rope access equipment**

Property	Aramid	Polyamide (PA)		Polyester (PET)	High performance polyethylene (HPPE)	High tenacity polypropylene (HTPP)
		Type 6	Type 66			
Melting point (°C)	Chars at 350 <sup>a</sup>	195 to 230	235 to 260	230 to 260	145 to 155	165 to 170
Effect of low temperature (-40 °C)	Nil	Nil	Nil	Nil	Nil	Nil
Abrasion resistance	Poor	Very good	Very good	Very good	Good	Fair
Flexion durability	Very poor	Very good	Very good	Very good	Good	Good
Moisture regain (%) <sup>c</sup>	4 to 8	4.5	4.5	0.4	<0.05	0.05
Loss of strength when wet (%)	Nil	10 to 20	10 to 20	Nil	?	Nil
Resistance to UV	Poor	Poor	Good	Good	Good	Good <sup>b</sup>
Density (g/cm <sup>3</sup> )	1.44	1.12	1.14	1.38	0.97	0.91
Tensile strength (GPa)	3.4	?	0.9	1.1	2.7	0.6
Tenacity (N/tex)	1.9	0.7	0.8	0.8	2.65	0.6 - 0.7
Tenacity (g/den)	23	8	9	9	30	7.0 - 7.5
Elongation at break (%)	2.4 to 3.6	20	20	13	3.5	18
Comments	Fire resistant	—	—	—	Floats on water	Floats on water

**Key**

? No information available.

— No comment

<sup>a</sup> Aramids do not melt but decompose at 427 °C to 482 °C.

<sup>b</sup> Good with inhibitor but poor without.

<sup>c</sup> The mass of the fibres increases through absorption of moisture; in this case, ambient atmospheric moisture.