

## Cable Ties — Material Selection Ordering Guide

### Select the cable ties you need for special environments!

Thomas & Betts offers Ty-Rap® cable ties and accessories in a wide variety of materials, each suited for specific environments. The purpose of this document is to assist you in choosing the best material for your particular application. The effects of weathering, flame, chemicals, extreme temperatures, and radiation on the different materials are clearly presented in the following tables to simplify this process. Once you have determined the most suitable material, you can choose from the wide variety of Ty-Rap® cable ties, identification ties, mounting bases, lashing ties, etc., offered by Thomas & Betts.

#### General — How to use Table 1:

Table 1 simplifies the material selection process by giving the relative performance ratings of the materials offered by Thomas & Betts. For example, if your application is in an extremely cold environment, four materials will answer your need: 1. Radiation resistant fluoropolymer, 2. Low smoke fluoropolymer, 3. Nylon 12, 4. Stainless steel. Then, cost may be your next most important criteria, so out of those four options, nylon 12 would be the most cost effective. However, if tensile strength is important, then stainless steel would be the better choice.

Refer to Tables 2 and 3 for more detailed information regarding physical properties of the materials and chemical resistance of the materials respectively.

It is extremely difficult to provide data on all the possible combinations or conditions that can occur. This information is based on data provided by the manufacturers of the specific materials listed and is provided only as a general guide. No specific recommendation is intended. As each application may differ, cable tie samples should be tested in the intended application by the user to determine suitability.

**Table 1 — Available Materials 5 = Most Suitable 1 = Least Suitable**

	EXTRA HIGH TEMP 4.6 NYLON	NATURAL 6.6 NYLON	WEATHER- RESISTANT 6.6 NYLON	HEAT- STABILIZED U.V. 6.6 NYLON	HEAT- STABILIZED NATURAL 6.6 NYLON	FLAME- RETARDANT 6.6 NYLON	WEATHER RESISTANT NYLON 12	WEATHER- RESISTANT POLY- PROPYLENE	RADIATION RESISTANT FLUORO- POLYMER	LOW- SMOKE FLUORO- POLYMER	STAIN- LESS STEEL	DELTEC® WEATHERABLE ACETAL
Ultraviolet Resistance	1	1	4	4	1	1	4	4	5	5	5	4
Radiation Resistance	1	1	1	1	1	1	1	1	4	4	5	1
Low Temperature	3	3	3	4	3	2	4	3	4	4	5	4
High Temperature	4	3	3	3	4	3	2	2	4	4	5	2
Flammability	3	3	3	3	3	4	1	1	4	4	5	1
Tensile Strength	3	3	3	3	3	3	2	1	3	3	5	2
Relative Cost	Med	Low	Low	Low	Low	Med	Med	Low	High	High	High	High
Chemical Resistance	See Table 3 (Page D-12)											

#### Flammability ratings for selecting Ty-Rap® cable ties

**NOTE:** Flammability ratings of Ty-Rap® cable tie materials are shown in Table 2. These tests for flammability of plastic material are intended to serve as a preliminary indication of acceptability with respect to flammability for particular applications.

#### UL 94 vertical burn test procedures

Test specimens of the material, with dimensions 5" x 1/2", with the thickness intended for use in the end product, are tested in both the manufactured condition and in the aged state. The test requires that the specimen be supported in a vertical fixture and a precisely controlled flame applied for a

10-second period. The flame is removed and the duration of flaming is noted. If the flame extinguishes, a second exposure to flame for 10 seconds is applied and duration of flaming is again noted. It is observed and recorded whether or not test specimens drip flaming particles that ignite a cotton swatch.

**Table 2 — Physical Properties of Ty-Rap® Cable Tie Materials**

	NATURAL 6.6 NYLON	WEATHER- RESISTANT 6.6 NYLON	EXTRA HIGH TEMP 4.6 NYLON	HEAT- STABILIZED U.V. 6.6 NYLON	HEAT- STABILIZED NATURAL 6.6 NYLON	FLAME- RETARDANT 6.6 NYLON	WEATHER- RESISTANT NYLON 12	WEATHER- RESISTANT POLY- PROPYLENE	FLUORO- POLYMER RADIATION RESISTANCE	LOW- SMOKE DENSITY	STAIN- LESS STEEL	DELTEC® WEATHERABLE ACETAL
Tensile Strength (Yield) @ 73° F (Dry-As-Molded)* [psi]	12,000	12,000	14,500	11,500	12,000	11,000	7,500	4,600	6,700	6,600	90,000	10,000
Flammability Rating	UL94V-2	UL94V-2	UL94V-2	UL94V-2	UL94V-2	UL94V-0	—	—	UL94V-0	UL94V-0	—	UL94HB
Radiation Resistance [rads]	1 x 10 <sup>5</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>5</sup>	1 x 10 <sup>5</sup>	2 x 10 <sup>8</sup>	2 x 10 <sup>6</sup>	2 x 10 <sup>8</sup>	1 x 10 <sup>6</sup>
Ultraviolet Light Resistance	Poor	Good	Poor	Good	Poor	Poor	Good	Good	Excellent	Excellent	Excellent	Very Good
Water Absorption (24 hrs.) [%]	1.3	1.2	2.3	.25	1.4	1.4	0.25	0.1	<.01	<.01	None	0.25
Oxygen Index	28	28	27	26	31	34	—	—	30	52	—	21
Max. Continuous Use Temperature [F/C]	185/85	185/85	302/150	221/105	221/105	185/85	176/80	194/90	302/150	284/140	1000 / 537	194/90
Min. Continuous Use Temperature [F/C]88	-40/-40	-40/-40	-40/-40	-40/-40	-40/-40	-40/-40	-40/-40	-65/-65	-50/-46	-50/-46	-112 /-80	-85/-65
Color	Natural	Black	Light Green	Black	Green Tint	White	Black	Black	Aqua	Maroon	Stainless	Black

\* ASTM D638-878 except stainless steel, which is ASTM E8

Ty-Rap® Cable Fastening Systems

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### Materials classed UL 94V-0:

A material classed V-0 shall:

- A. Not have any specimens that burn with flaming combustion for more than 10 seconds after either application of the test flame.
- B. Not have a total flaming combustion time exceeding 50 seconds for the 10 flame applications for each set of five specimens.

C. Not have any specimens that burn with flaming or glowing combustion up to the holding fixture.

D. Not have any specimens that drip flaming particles that ignite the dry absorbent surgical cotton located 12" below the test specimen.

E. Not have any specimens with glowing combustion that persists for more than 30 seconds after the second removal of the test flame.

### Materials classed UL94V-1:

A material classed V-1 shall:

- A. Not have any specimens that burn with flaming combustion for more than 30 seconds after either application of the test flame.
- B. Not have a total flaming combustion time exceeding 250 seconds for the 10 flame applications for each set of five specimens.

## Chemical Resistance

Table 3 shows the resistance of Ty-Rap® cable tie materials to various chemicals. The table is designed to help you determine the cable tie material best suited for a particular chemical environment.

**Table 3 — Resistance of Available Materials to Various Chemicals Temp 70° F**

REAGENTS	CONCENTRATION	HEAT-STABILIZED	FLUOROPOLYMER	DELTEC®	STANDARD	6.6 WEATHER-	6.6 FIRE-	WEATHER-	POLY-	WEATHER-	FLUOROPOLYMER	STAINLESS
		6.6 NYLON	LOW-SMOKE	WEATHERABLE		6.6 NYLON	RETARDANT	RESISTANT		RADIATION-	NYLON 12	
		AS USED IN	HALAR	ACETAL	AS USED IN	NYLON	NYLON	NYLON 12	AS USED IN	PROPYLENE	RADIATION-	AS USED IN
		TYH SERIES	TYV SERIES	TYD SERIES	TY SERIES	TY X SERIES	TY FR SERIES	TYC X SERIES	TYP X SERIES	TYZ SERIES	TYZ SERIES	TYZ SERIES
Arsenic Acid	40%	—	—	—	—	—	—	—	E	E	—	E
Acetaldehyde	50%	S	—	—	S	S	S	—	—	—	—	—
Acetone	100%	E	E	F	E	E	E	E	E	E	E	E
Aluminum Hydroxide	AQ	—	E	—	—	—	—	—	E	E	E	E
Ammonia	All	—	E	—	—	—	—	—	E	E	E	E
Ammonium Carbonate	5%	S	E	—	S	S	S	E	E	E	E	E
Ammonium Hydroxide	10%	E	E	F	E	E	E	—	E	E	E	E
Ammonium Nitrate	—	—	E	—	—	—	—	—	E	E	E	E
Ammonium Sulfate	10%	—	E	—	—	—	—	S	S	S	S	S
Barium Carbonate	All	—	E	—	—	—	—	—	E	E	E	E
Barium Chloride	5%	NR	—	—	NR	NR	NR	E	E	E	E	E
Barium Sulfate	10%	E	—	—	E	E	E	E	E	E	E	E
Barium Sulfide	10%	S	—	—	S	S	S	E	E	E	E	E
Benzene	100%	E	E	F	E	E	E	E	S	S	E	E
Benzoic Acid	100%	NR	E	—	NR	NR	NR	E	E	E	E	E
Butyric Acid	50%	NR	E	—	NR	NR	NR	—	E	E	E	E
Calcium Carbonate	AQ	—	E	—	—	—	—	—	E	E	E	E
Calcium Hydroxide	20%	—	F	E	—	—	—	—	E	E	E	E
Calcium Hydrochlorite	2	NR	—	—	NR	NR	NR	—	F	F	F	F
Calcium Sulfate	2%	—	E	—	—	—	—	—	E	E	E	E
Carbon Tetrachloride	100%	E	E	E	E	E	E	E	F	F	E	E
Chlorine (WET)	—	NR	—	—	NR	NR	NR	—	F	F	F	F
Chlorine (DRY)	—	NR	—	—	NR	NR	NR	—	NR	NR	F	F
Chloroacetic Acid	30%	NR	—	—	NR	NR	NR	—	—	—	F	F
Chloroform	100%	—	E	—	—	—	—	F	F	F	E	E
Chromic Acid	50%	NR	S	—	NR	NR	NR	—	F	F	F	F
Citric Acid	50%	S	E	E	S	S	S	E	E	E	E	E
Copper Cyanide	10%	—	E	—	—	—	—	—	E	E	E	E
Copper Nitrate	50%	—	E	—	—	—	—	—	E	E	E	E
Cider	—	—	E	—	—	—	—	—	E	E	E	E
Dichloroethane	100%	—	E	—	—	—	—	—	—	—	E	E
Diethyl Ether	100%	—	E	S	—	—	—	E	E	E	E	E
Ethyl Alcohol	100%	S	E	—	S	S	S	E	E	E	E	E
Ethyl Chloride	100%	—	S	E	—	—	—	F	F	F	E	E
Ethylene Glycol	100%	E	E	S	E	E	E	—	E	E	E	E
Ferric Hydroxide	All	—	E	—	—	—	—	—	E	E	E	E
Ferric Nitrate	10%	—	E	—	—	—	—	—	E	E	E	E
Ferrous Sulfate	10%	—	E	—	—	—	—	—	E	E	E	E
Fuel Oil	100%	—	E	—	—	—	—	E	—	—	E	E
Furfural	100%	—	E	—	—	—	—	—	F	F	E	E
Gallic Acid	AQ	—	E	—	—	—	—	—	—	—	E	E
Gasoline	100%	E	E	—	E	E	E	—	S	S	E	E
Glycerine	100%	—	E	—	—	—	—	E	E	E	—	E
Hydrocyanic Acid	All	—	E	—	—	—	—	—	E	E	E	E
Hydrogen Peroxide	30%	NR	E	F	NR	NR	NR	S	E	E	E	E
Hydrogen Sulfide	Dry	NR	E	—	NR	NR	NR	E	E	E	E	E
Iodoform	100%	—	E	—	—	—	—	—	—	—	E	E
Isopropyl Alcohol	100%	S	E	—	S	S	S	E	E	E	E	E
Jet Fuel	100%	E	E	—	E	E	E	—	S	S	E	E
Lactic Acid	10%	E	E	—	E	E	E	S	E	E	E	E
Lanolin	10%	E	E	—	E	E	E	E	E	E	E	E
Lead Acetate	5%	—	E	—	—	—	—	—	E	E	E	E
Linseed Oil	10%	E	E	E	E	E	E	E	E	E	E	E
Magnesium Carbonate	All	—	E	—	—	—	—	—	E	E	E	E
Magnesium Chloride	10%	F	—	—	F	F	F	F	F	F	F	F

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- C. Not have any specimens that burn with flaming or glowing combustion up to the holding fixture.
- D. Not have any specimens that drip flaming particles that ignite the dry absorbent surgical cotton located 12" below the test specimen.
- E. Not have any specimens with glowing combustion that persists for more than 60 seconds after the second removal of the test flame.

**Materials classed UL94V-2:**

A material classed V-2 shall:

- A. Not have any specimens that burn with flaming combustion for more than 30 seconds after either application of the test flame.
- B. Not have a total flaming combustion time exceeding 250 seconds for the 10 flame applications for each set of five specimens.

- C. Not have any specimens that burn with flaming or glowing combustion up to the holding fixture.
- D. Be permitted to have specimens that drip flaming particles that burn only briefly, some of which ignite the dry absorbent surgical cotton placed 12" below the test specimen.
- E. Not have any specimens with glowing combustion that persists for more than 60 seconds after the second removal of the test flame.

Table 3 (continued)

REAGENTS	CONCENTRATION	HEAT-STABILIZED 6.6 NYLON AS USED IN TYH SERIES	LOW-SMOKE FLUOROPOLYMER AS USED IN TYV SERIES	DELTEC® WEATHERABLE ACETAL AS USED IN TYD SERIES	STANDARD 6.6 NYLON AS USED IN TY SERIES	6.6 WEATHER- RESISTANT NYLON AS USED IN TY X SERIES	6.6 FIRE- RETARDANT NYLON AS USED IN TY FR SERIES	WEATHER- RESISTANT NYLON 12 AS USED IN TYC X SERIES	POLY- PROPYLENE AS USED IN TYP SERIES	WEATHER- RESISTANT POLY- PROPYLENE AS USED IN TYP X SERIES	RADIATION- RESISTANT FLUOROPOLYMER AS USED IN TYZ SERIES	STAINLESS STEEL AS USED IN TYS SERIES
Magnesium Nitrate	All	—	E	—	—	—	—	E	E	E	E	E
Malic Acid	AQ	—	E	—	—	—	—	E	E	E	E	E
Mercury	100%	—	E	—	—	—	—	E	E	E	E	E
Methyl Alcohol	100%	S	E	—	S	S	S	E	E	E	E	E
Methyl Chloride	100%	—	S	—	—	—	—	S	S	E	E	E
Methyl Ethyl Ketone	100%	—	E	F	—	—	—	E	E	E	E	E
Naptha	100%	—	E	—	—	—	—	E	E	E	E	E
Nitric Acid	30%	NR	E	NR	NR	NR	NR	—	E	E	E	E
Nitric Acid	30—70%	NR	S	NR	NR	NR	NR	—	F	F	S	E
Nitrous Acid	5%	—	E	—	—	—	—	F	F	E	E	E
Oleic Acid	100%	—	E	S	—	—	—	E	E	E	E	E
Oxalic Acid	10%	—	E	—	—	—	—	S	E	E	E	E
Paraffin	100%	E	E	—	E	E	E	E	E	E	E	E
Petroleum Ether	100%	—	E	—	—	—	—	E	F	F	E	E
Phenol	90%	NR	E	NR	NR	NR	NR	—	E	E	E	E
Phosphoric Acid	10%	NR	E	—	NR	NR	NR	—	E	E	E	E
Picric Acid	1%	—	E	—	—	—	—	—	E	E	E	E
Potassium Bromide	AQ	—	—	—	—	—	—	S	S	S	S	S
Potassium Carbonate 1%	—	E	—	—	—	—	E	E	E	E	E	E
Potassium Chlorate	AQ	—	E	—	—	—	—	S	E	E	E	E
Potassium Dichromate	40%	NR	E	—	NR	NR	NR	F	E	E	E	E
Potassium Ferrocyanide	25%	—	E	—	—	—	—	E	E	E	E	E
Potassium Hydroxide	5%	S	E	—	S	S	S	—	E	E	E	E
Potassium Iodide	All	—	E	—	—	—	—	E	E	E	E	E
Potassium Nitrate	50%	F	E	—	F	F	F	E	E	E	E	E
Potassium Permanganate	5%	NR	E	S	NR	NR	NR	NR	E	E	E	E
Potassium Sulfate	5%	—	E	—	—	—	—	E	E	E	E	E
Potassium Sulfide	AQ	—	E	—	—	—	—	E	E	E	E	E
Propyl Alcohol	100%	E	E	—	E	E	E	—	E	E	E	E
Silver Nitrate	10%	—	E	—	—	—	—	E	E	E	E	E
Sodium Acetate	60%	E	E	—	E	E	E	—	E	E	E	E
Sodium Bicarbonate	All	E	E	—	E	E	E	E	E	E	E	E
Sodium Bisulfate	10%	—	E	E	—	—	—	E	E	E	E	E
Sodium Borate	All	—	E	—	—	—	—	—	E	E	E	E
Sodium Carbonate	5%	E	E	S	E	E	E	E	E	E	E	E
Sodium Chlorate	25%	—	E	E	—	—	—	S	E	E	E	E
Sodium Chloride	2%	E	E	S	E	E	E	E	E	E	E	E
Sodium Fluoride	5%	—	—	—	—	—	—	F	F	F	F	F
Sodium Hydroxide	10%	E	E	S	E	E	E	E	E	E	E	E
Sodium Hyposulfite	AQ	—	E	—	—	—	—	—	—	—	E	E
Sodium Nitrate	5%	E	E	—	E	E	E	E	E	E	E	E
Sodium Nitrite	AQ	—	E	—	—	—	—	S	E	E	E	E
Sodium Perchlorate	10%	—	E	—	—	—	—	—	—	E	E	E
Sodium Phosphate	5%	—	E	—	—	—	—	E	E	E	E	E
Sodium Sulfate	5%	S	E	—	S	E	E	E	E	E	E	E
Sodium Thiosulfate	5%	—	—	S	—	—	—	S	S	S	S	S
Stearic Acid	100%	—	E	—	—	—	—	F	E	E	E	E
Sulfur	100%	—	E	—	—	—	—	E	E	E	E	E
Sulfur Dioxide	All	NR	E	—	NR	NR	NR	E	E	E	E	E
Sulfuric Acid	Conc.	NR	E	NR	NR	NR	NR	—	S	S	E	E
Sulfuric Acid	5%	NR	F	F	NR	NR	NR	F	F	F	F	F
Tannic Acid	10%	—	E	—	—	—	—	—	E	E	E	E
Tartaric Acid	50%	—	E	E	—	—	—	E	E	E	E	E
Tetrahydrofuran	100%	—	F	E	—	—	—	S	F	F	E	E
Toluene	100%	E	E	F	E	E	E	E	F	F	E	F
Xylene	100%	E	E	—	E	E	E	E	F	F	E	E
Zinc Chloride	70%	F	E	NR	F	F	F	E	E	E	E	E
Zinc Nitrate	AQ	—	E	—	—	—	—	E	E	E	E	E
Zinc Sulfate	AQ	—	E	—	—	—	—	E	E	E	E	E

Ratings: E=Excellent S=Satisfactory F=Fair NR=Not Recommended (AQ=Aqueous)