

Cable Ties – Material Selection Ordering Guide

Introduction

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, therefore, 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 is clearly presented in tabular form. This will make it easy for you to determine the best material for your needs.

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

There are a number of factors to be considered when choosing the proper materials for a specific environment. It is extremely difficult to provide data on all the possible combinations or conditions that can occur and, therefore, it is recommended that this information be used as a guideline and that cable tie samples be tested in the intended application by the user to determine suitability.

How to use Table 1:

If your application is in an extremely cold environment, three materials will answer your need: Tefzel*, nylon 12 and stainless steel. If you also require high tensile strength, then stainless steel is your best choice. Where high strength is not required, nylon 12 might be your choice as it is the least costly.

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 vary testing should be conducted by the user in the intended environment.

Table 1 gives relative performance ratings of the different materials we offer. More detailed information is shown in Tables 2 and 3.

Table 1/Relative Performance Ratings of Materials

	Heat-Stabilized 6/6 Nylon as Used in TYH Series	Halar† as Used in TYV Series	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
Ultraviolet Resistant	1	5	4	1	4	1
Radiation Resistant	1	4	1	1	1	1
Low-Temperature Requirement	3	4	4	3	3	2
High-Temperature Requirement	4	4	2	3	3	3
Flammability Requirement	3	4	1	3	3	4
Relative Cost	Low	High	Med	Low	Low	Med
Chemical Resistance	See Table 3					

Table 1/Relative Performance Ratings of Materials – continued

	Weather-Resistant Nylon 12 as Used in TYC X Series	Polypropylene as Used in TYP Series	Weather-Resistant Polypropylene as Used in TYP X Series	Tefzel* as Used in TYZ Series	Stainless Steel as Used in TYS Series
Ultraviolet Resistant	4	1	4	5	5
Radiation Resistant	1	1	1	4	5
Low-Temperature Requirement	4	3	3	4	5
High-Temperature Requirement	2	2	2	4	5
Flammability Requirement	1	1	1	4	5
Relative Cost	Med	Low	Low	High	High
Chemical Resistance	See Table 3				

Ratings
5 = Most Suitable
1 = Least Suitable

* Trademark of DuPont

† Trademark of Allied Fiber and Plastic

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Table 2/Physical Properties of TY-RAP® Cable Tie Materials

	Heat-Stabilized 6/6 Nylon as Used in TYH	Halar† as Used in TYV	Weatherable Acetal as Used in TYD	Standard 6/6 Nylon as Used in TY	Weather-Resistant 6/6 Nylon as Used in TY	Fire-Retardant 6/6 Nylon as Used in TY	Weather-Resistant Nylon 12 as Used in TYC	Natural Polypropylene as Used in TYP	Weather-Resistant Polypropylene as Used in TYX	Tefzel* as Used in TYZ	Stainless Steel as Used in TYS
	Series	Series	Series	Series	X Series	FR Series	X Series	Series	X Series	Series	Series
Tensile Strength P.S.I. at 50% R.H., 73°F	(1) 8500 Yield	(1) 7000 Break	(1) 6500 Break	(1) 8500 Yield	(1) 9000 Yield	(1) 5500 Yield	(1) 5800 Yield	(1) 4600 Yield	(1) 4600 Yield	(1) 6500 Break	4000 Yield
Elongation at Break_% 50% R.H., 73°F	(1) 300	(1) 200	(1) 200	(1) 300	(1) 200	(1) 75	(1) 250	(1) 200 Min.	(1) 200 Min.	(1) 200	50 Min.
Notched Izod (2) Impact Strength 50% R.H., 73°F	2.1	No Break	17	2.1	2.0	1.7	1.4	0.45	0.40	No Break	—
Notched Izod (2) Impact Strength Low Temperatures	.5 at -40°F	2.3 at -40°F	—	.5 at -40°F	.6 at -40°F	—	1.3 at -40°F	—	—	20 Min. at -65°F	—
Flammability Rating—U.L.	94V-2	94V-0	94HB	94V-2	(3) 94V-2	94V-0	—	—	—	94V-0	—
Radiation Resistance Rads	1 x 10 ⁶	2 x 10 ⁸	—	1 x 10 ⁶	1 x 10 ⁶	—	—	1 x 10 ⁶	1 x 10 ⁶	2 x 10 ⁸	2 x 10 ⁸
Ultraviolet Light Resistance	Poor	Excellent	Very Good	Poor	Good	Poor	Good	Poor	Good	Excellent	Excellent
Water Absorption % (4)	8.5 Max.	<0.1%	Low	8.5 Max.	8.5 Max.	.9 24 Hrs.	1.5 Max.	.02 24 Hrs.	.02 24 Hrs.	.03 Max.	—
Max. Continuous Temp. °F	221	302	185	185	185	185	185	185	185	302	1000
°C	105	150	85	85	—	—	—	—	—	150	538
Min. Continuous Temp. °F	-40	-50	-40	-40	-40	-40	-40	-40	-40	-50	-112
°C	-40	-46	-40	-40	-40	-40	-40	-40	-40	-46	-62
Color	Green Tint	Maroon	Black	Milky White	Black	Off White	Black	Light Green	Black	Aqua	Stainless Steel
Tensile Strength (IN LOOP)	Consult Customer Service										

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† Trademark of Allied Fiber and Plastic

(1) Tested per ASTM D638

(2) Tested per ASTM D256

(3) Except for TY27MX, TY272MX, TY37MX, TY29MX

(4) Tested per ASTM D570

R.H. = Relative Humidity

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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 ½", 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.

Material classed 94V-0:

A material classed 94V-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 classes 94V-1:

A material classed 94V-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.
- 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 94V-2:

A material classed 94V-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.

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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-		Weatherable	Standard 6/6	6/6 Weather-	6/6 Fire-	Weather-	Polypropylene	Weather-	Stainless	
		Stabilized 6/6 Nylon as Used in TYH	Halar* as Used in TYV	Acetal as Used in TYD	Nylon as Used in TY	Resistant Nylon as Used in TY	Retardant Nylon as Used in TY	Resistant Nylon 12 as Used in TYC	as Used in TYP	Polypropylene as Used in TYP	Tefzel* as Used in TYZ	Steel as Used in TY5
		Series	Series	Series	Series	X Series	FR Series	X Series	Series	X Series	Series	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	E
Ammonium Sulfate	10%	—	E	—	—	—	—	S	S	S	S	S
Barium Carbonate	All	—	E	—	—	—	—	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 Chlorate	10%	—	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

* Trademark of DuPont

† Trademark of Allied Fiber and Plastic

Ratings

E = Excellent

S = Satisfactory

F = Fair

NR = Not Recommended

(**AQ** = Aqueous)

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Table 3 – continued

Reagents	Concentration	Heat-Stabilized 6/6 Nylon as Used in TYH	Halar* as Used in TYV	Weatherable Acetal as Used in TYD	Standard 6/6 Nylon as Used in TY	6/6 Weather-Resistant Nylon as Used in TY	6/6 Fire-Retardant Nylon as Used in TY	Weather-Resistant Nylon 12 as Used in TYC	Polypropylene as Used in TYP	Weather-Resistant Polypropylene as Used in TYP	Tefzel* as Used in TYZ	Stainless Steel as Used in TYS
		Series	Series	Series	Series	X Series	FR Series	X Series	Series	X Series	Series	Series
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	E
Magnesium Chloride	10%	F	—	—	F	F	F	F	F	F	F	F
Magnesium Nitrate	All	—	E	—	—	—	—	E	E	E	E	E
Malic Acid	AQ	—	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
Methyl Ethyl Ketone	100%	—	E	F	—	—	—	E	E	E	E	E
Naptha	100%	—	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
Oleic Acid	100%	—	E	S	—	—	—	—	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

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Table 3 – continued

Reagents	Concentration	Heat-Stabilized 6/6 Nylon as Used in TYH	Halar† as Used in TYV	Weatherable Acetal as Used in TYD	Standard 6/6 Nylon as Used in TY	6/6 Weather-Resistant Nylon as Used in TY	6/6 Fire-Retardant Nylon as Used in TY	Weather-Resistant Nylon 12 as Used in TYC	Polypropylene as Used in TYP	Weather-Resistant Polypropylene as Used in TYP	Tefzel* as Used in TYZ	Stainless Steel as Used in TYS
		Series	Series	Series	Series	X Series	FR Series	X Series	Series	X Series	Series	Series
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 Ferricyanide	25%	—	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
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
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
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	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

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