Busada extrudes formula 576, 10% plasticizer and odor mask and UVI.

Tenite™ cellulose acetate butyrate—Selector chart

Formulas 264, 285, 485, 530, 550, 565, 575, 576

Arrow points to formula 576

Property[a]		Unit	ASTM method								
Plasticizer		%	—	3	5	8	10	13	16	20	23
Flow designation			D569	H3	H2	H	MH	M	MS	S	S2
Flow temperature		°C	D569	165	160	155	150	145	140	135	130
		°F		329	120	311	302	293	284	275	266
Specific gravity			D792	1.21	1.20	1.20	1.19	1.18	1.17	1.17	1.16
Mechanical											
Tensile stress @ yield 50 mm/min (2 in./min)		MPa	D638	45.5	40.7	37.2	33.1	29.0	25.5	21.4	17.2
		psi		6,600	5,900	5,400	4,800	4,200	3,700	3,100	2,500
Tensile stress @ break 50 mm/min (2 in./min)		MPa	D638	53.8	51.0	47.6	43.4	39.3	33.8	27.6	20.0
		psi		7,800	7,400	6,900	6,300	5,700	4,900	4,000	2,900
Elongation @ break 50 mm/min (2 in./min)		%	D638	55	55	50	50	50	50	50	50
Flexural modulus 1.27 mm/min (0.05 in./min)		MPa	D790	1,862	1,724	1,586	1,379	1,241	1,103	965	827
		10^5 psi		2.70	2.50	2.30	2.00	1.80	1.60	1.40	1.20
Flexural yield strength 1.27 mm/min (0.05 in./min)		MPa	D790	63.4	57.2	51.0	45.5	39.3	33.1	27.6	21.4
		psi		9,200	8,300	7,400	6,600	5,700	4,800	4,000	3,100
Rockwell hardness		R scale	D785	102	94	88	78	59	40	12	—
Izod impact strength, notched	23°C	J/m	D256	139	165	198	240	283	331	384	448
	73°F	ft•lbf/in.		2.6	3.1	3.7	4.5	5.3	6.2	7.2	8.4
	–40°C	J/m		80	85	91	96	101	107	112	123
	–40°F	ft•lbf/in.		1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.3
Thermal											
Deflection temperature (Conditioned 4h @ 70°C [158°F])	1.82 MPa	°C	D648	86	83	79	74	69	64	58	52
	264 psi	°F		187	181	174	165	156	147	136	126
	0.455 MPa	°C		96	93	89	85	81	77	72	68
	66 psi	°F		205	199	192	185	178	171	162	154
Vicat softening temperature (Conditioned 4h @ 70°C [158°F])		°C	D1525	121	115	109	104	100	96	92	88
		°F		250	239	228	219	212	205	198	190
Permanence											
Water absorption (24h immersion)		%	D570	1.8	1.6	1.5	1.4	1.4	1.3	1.2	1.2
Soluble matter loss		%		0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Weight loss on heating (72h @ 80°C [176°F])		%	D707	0.15	0.25	0.3	0.5	0.6	0.8	1.0	1.2

[a]*Unless noted otherwise, all tests are run @ 23°C (73°F) and 50% relative humidity.*

Formula 264—base.

Formulas 285, 530, 550, 565—odor mask.

Formula 485—odor mask; UVI.

Formula 575—odor mask; standard inventory; available in 10% plasticizer only.

Formula 576—odor mask; UVI; standard inventory; available in 10% plasticizer only.

Tenite™ cellulose acetate butyrate—Selector chart

Formulas 264, 285, 485, 530, 550, 565, 575, 576

Miscellaneous butyrate properties	
Refractive index (ASTM D542)	1.46–1.49
Light transmission (1.52-mm [0.06-in.] thickness) (ASTM E308)	>90%
UV light screening (>99% absorbed) (ASTM E308)	Formulations available on request
Haze (1.52-mm [0.06-in.] thickness) (ASTM D1003)	<8.5%
Specific heat @ 23°C (73°F) (DSC)	1.26–1.67 kJ/kg•K (0.301–0.399 Btu/lb•°F)
Thermal conductivity (ASTM C177)	0.17–0.33 W/m•K (1.2–2.3 Btu•in./h•ft^2•°F)
Coefficient of linear thermal expansion (ASTM D696)	11–17 x 10^{-5} mm/mm•°C (6–9 x 10^{-5} in./in.•°F)
Mold shrinkage (ASTM D955)	0.2%–0.6%
Dielectric strength (ASTM D149)	11.8–18.7 kV/mm (300–475 V/mil)
Dielectric constant @ 1 MHz (ASTM D150)	3.3–3.8
Dissipation factor @ 1 MHz (ASTM D150)	0.01–0.15
Volume resistivity (ASTM D257)	10^{13}–10^{15} ohm•cm

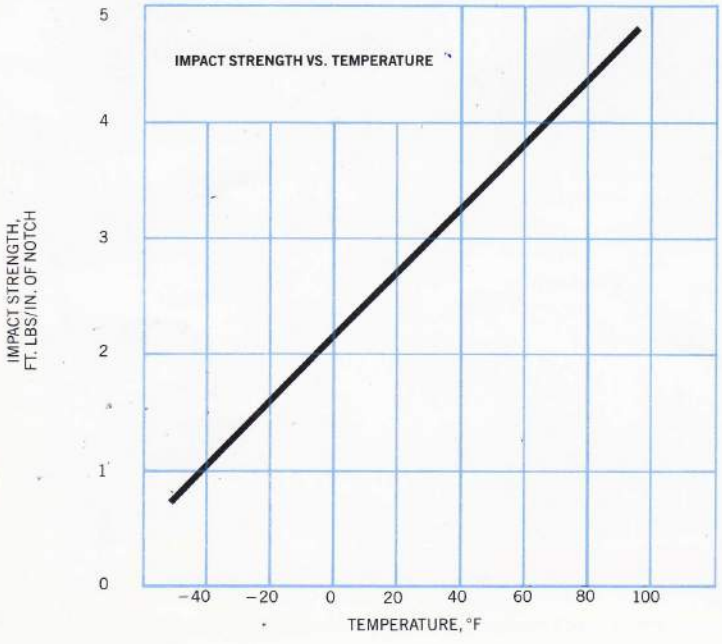
Properties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

Conversions of metric/U.S. customary values may have been rounded off and therefore may not be exact.

TYPICAL MATERIAL PROPERTIES

	ASTM Test Method	Test Temp.	Value
Specific Gravity	D792	73°F	1.2
Hardness, Rockwell R Scale	D785	73°F	79
Tensile Strength (Yield), psi	D638	73°F	4,300
Tensile Strength (Fracture), psi	D638	73°F	5,550
	D638	158°F	2,800
Flexural Strength (Yield), psi	D790	73°F	6,200
Flexural Modulus, 10^5 psi	D790	73°F	2.0
Impact Strength (Izod), ft lbs/in. of notch	D256	73°F	4.2
	D256	−40°F	1.0
Water Absorption, % (24 hour immersion)	D570	73°F	1.6
Compressive Strength (Yield), psi	D695	73°F	4,200*
Deflection Temperature, °F at 66 psi fiber stress	D648		176*
264 psi fiber stress	D648		152*
Dielectric Constant at 1kHz	D150		3.93
1MHz	D150		3.64
Dissipation Factor at 1kHz	D150		.013
1MHz	D150		.025
Dielectric Strength, v/mil (⅛ in. thick, short time)	D149		365
Volume Resistivity, ohm cm 10^{15}	D257		1.4
Thermal Conductivity, 10^{-4} cal/sec/sq cm/°C/cm	C177		8.0

*Values for compression molded specimens (½ in. thick). All other values for injection molded specimens (⅛ in. thick).



FABRICATION

Important to the user considering Busada 200 tubing for an application are the variety of machining, finishing, decorating, and assembly techniques applicable to the product.

Machining—In general, most tools used for machining wood or metal may be used with Busada 200 tubing. Tool speeds should be such that the material does not overheat and soften. Best results are obtained using the highest speed at which overheating does not occur. Cutting edges should be kept sharp and hard, wear resistant tools with greater cutting clearances than are used for cutting metal are recommended. Busada 200 tubing may be drilled, tapped, threaded, turned, milled, and sawed with relative ease. Other important fabrication techniques are heat forming operations such as blow molding.

Surface Finishing—Tool marks may be erased and a variety of surface finishes may be produced on Busada 200 tubing ranging from mirror-like to satin. As with machining, it is important that overheating be avoided and that light pressures be employed. Operations suitable for use on Busada 200 tubing are sanding, wheel polishing and buffing, ashing, rubbing, solvent polishing, and sandblasting.

Decorating—A significant advantage to the design engineer and the industrial designer are the many ways in which Busada 200 tubing may be decorated for functional use or esthetics. Most permanent markings are achieved with hot stamping where, for greater visibility, the stamping may be filled with lacquer or filling paste. Colored foils may also be hot stamped and pressure fused into the plastics surface. In addition, decorating may be readily accomplished by printing, silk screening, engraving, etching, through the use of decals, metal coating, and lacquering.

Assembly—Joints may be made permanent by the use of solvents or cement. Mechanical assembly techniques employing threaded inserts, keyed designs, screws, and swedging with heated tools may also be used.

Busada Manufacturing Corporation has been manufacturing plastics tubing for more than twenty five years. Experience acquired in many different applications is available to help solve particular problems. Busada has gained a reputation for service and quality that is the envy of the industry. Not only does Busada have the technical expertise to assist you but you can count on your order being handled promptly, with care.

Products produced by Busada Manufacturing Corp. are:

Busada 200—Clear Butyrate Tubing

Busada 500—Clear Polycarbonate Tubing

Busada 600—Clear Acrylic Tubing

Busada 200 tubing is a clear, transparent, thermoplastic tubing extruded from a cellulose acetate butyrate compound (Tenite* butyrate) especially formulated for improved resistance to aging and weathering. Tubing is manufactured under rigidly controlled conditions to insure consistently high quality. Used in a wide variety of O.E.M. products and in pneumatic conveying applications, Busada 200 tubing features transparency, toughness, weatherability, machinability, consistency, and is shock and shatter resistant.

AVAILABLE SIZES, THICKNESSES AND SHAPES

Busada 200 tubing is available in a wide variety of stock and standard sizes ranging from ½ in. O.D. to 8 in. O.D. with wall thicknesses ranging from 1/16 in. to ¼ in. depending on diameter. Connecting sleeves and bends of 30, 45 and 90 degrees are available for selected tubing sizes.

TABLE OF STANDARD and STOCKED SIZES of BUSADA 200 TUBING

Standard Length: 20 ft. (X indicates standard sizes; O indicates stock sizes)

Outside Diameter (inches)	Wall Thickness (inches)			
	1/16	1/8	3/16	¼
0.500	X	X		
0.625	X	X		
0.750	X	X		
0.875	X	X		
1.000	X	X		
1.250	X	O		
1.500	O	X		
1.625	X	X		
1.750	X	X		
1.875	X	X	X	
2.000	O	X		
2.125	X	X	X	
2.250	X	X	O	
2.375		X	O	
2.500		X		
2.625		X	O	
2.750	X	X	X	
2.875		O	O	
3.000	X	X	O	
3.125		X	O	
3.250		X	O	
3.375	X	X	O	
3.500		O	O	X
3.625		X	O	
3.750		X	O	
3.875		X	O	
4.000		X	O	
4.125		X	O	
4.250		X	O	
4.313		X	O	
4.375		X	O	
4.500		X	X	X
4.625			O	
4.750		X	X	
4.875		X	O	
5.000		X	O	
5.125			O	
5.250		X	O	
5.500		X	O	X
5.875			X	
6.000		X	X	
6.375		X	X	
6.500		X	X	
6.625			X	
7.000			X	
7.500		X	X	
8.000		X	X	

Bends of 30, 45, and 90 degrees as well as connecting sleeves are available for selected sizes. Thus, complete tubing assemblies of straight lengths, bends, and slip-fit external sleeves may be constructed for conveying systems.

Bends of 5° to 180° and radii from 4.5" to 80" available depending on outer diameter.

QUALITY CONTROL

Busada 200 transparent plastics tubing is manufactured under rigidly controlled processing conditions. Manufacturing tolerances of +0.010, −0.015 inch are maintained on O.D.'s at any point on the circumference and wall thicknesses are controlled to ±0.005 inch. In addition, clarity with minimum distortion is assured as Busada 200 tubing is produced without inclusions, discontinuities or other imperfections

SERVICE

Busada's over two decades of experience in manufacturing consistently high quality tubing under rigidly controlled processing conditions, assisting in a multitude of different applications, and an unexcelled reputation for quality and service, are available to assist the engineer in solving particular design or manufacturing problems.

AGING AND WEATHERING

Of importance to the design engineer contemplating the use of Busada 200 tubing is its aging and weathering characteristics. Busada 200 tubing is produced from the most weather resistant butyrate formulation. Inhibitors provide resistance to ultraviolet degradation for extended service life in outdoor applications.

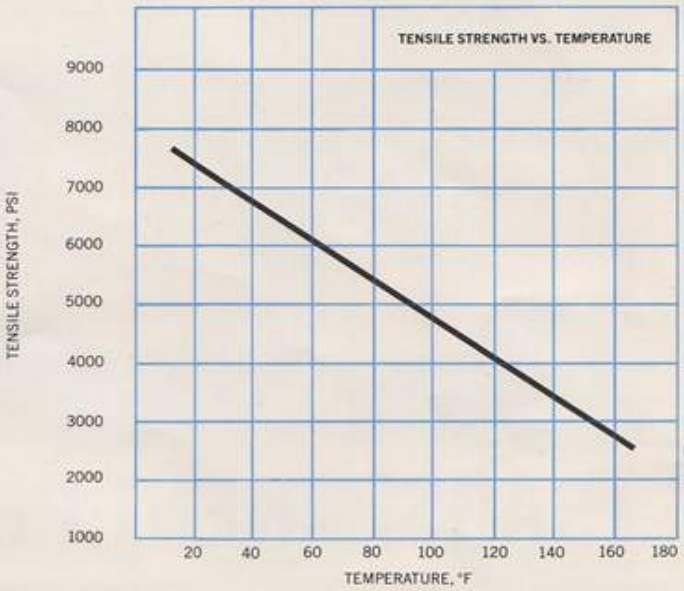
CHEMICAL RESISTANCE

Laboratory tests have shown that Busada 200 plastics tubing has resistance to a large number of chemicals and reagents including:

10% Citric Acid	1% Sodium Hydroxide	2.5% Calcium Chloride
Oleic Acid	Di-2-Ethylhexyl Adipate	Calcium Phosphate
10% Sulfuric Acid	Heptane	10% Potassium Chloride
	10% Ammonium Sulfate	10% Potassium Sulfate
Ethylene Glycol	3% Hydrogen Peroxide	10% Sodium Carbonate
Glycerin	10% Sodium Chloride	10% Sodium Nitrate

Note: This data should be used as a guide only and users should conduct their own tests under representative service conditions. Specific data involving literally hundreds of chemicals is available on request.

*Registered trademark of Eastman Kodak Co.



	Basic Formula	Basic Plus Odor Mask	Basic Plus UVI	Basic Plus Odor Mask and UVI
TENITE Acetate (Specific gravity approximately 1.28)	**036** 105 ■110			
	130 131 132			
	☆180			
TENITE Butyrate (Specific gravity approximately 1.18)	**264**	285 530 **550**		485 ■576 ☆581
		565 ■575 ☆580		
	525	438 ●562	460	461 462
				465 ●513
			563	
	568			
TENITE Propionate (Specific gravity approximately 1.18)	358 ☆380		307 ☆381	
	350			
	363			
			353	
	364 ▲**369**		365	
	360 ▲**371** ■375		372 ■376	
	■**377** ☆**382** ▲☆**383**		☆384	

Bold Numbers = Meets FDA requirements when supplied in FDA color numbers (For Propionate 350, only flows of H2 or harder meet FDA requirements.)

● = Contains lubricant for extrusion
▲ = Contains mold release
■ = Standard inventory clears
☆ = HT Series formula

Table 2 Typical Properties

Property	Units	ASTM Method	Acetate 105-MS	Butyrate 264-MH	Propionate 360-H2
Specific Gravity		D 792	1.26	1.19	1.20
Tensile Strength at Yield (50 mm/min [2 in./min])	MPa	D 638	22.8	33.1	31.7
	psi		3000	4800	4600
Elongation at Break (50 mm/min [2 in./min])	%	D 638	30	50	45
Modulus of Elasticity in Bending (127 mm/min [0.05 in./min])	MPa	D 790	1310	1379	1448
	10^5 psi		1.9	2.00	2.10
Flexural Strength (1.27 mm/min [0.05 in./min])	MPa	D 790	33.1	45.5	41.4
	psi		4800	6600	6000
Izod Impact Strength at 23°C (−40°C) (3.2 mm x 12.7 mm [⅛ in. x ½ in.] specimen)	J/m	D 256	235 (59)	240 (96)	416 (107)
	ft-lbf/in.		4.4 (1.1)	4.5 (1.8)	7.8 (2.0)
Deflection Temperature (conditioned 4 h @ 70°C)					
at 1.82 MPa (264 psi)	°C (°F)	D 648	57 (135)	74 (165)	75 (167)
at 0.455 MPa (66 psi)	°C (°F)		70 (158)	85 (185)	83 (181)
Light Transmission (1.52 mm [0.060 in.] thickness	%	E 308	>90	>90	>90
UV Light Screening (>99% Absorbed)	%	E 308	— Formulations Available Upon Request —		
Haze (1.52 mm [0.060 in.] thickness)	%	D 1003	<8.5	<8.5	<8.5
Coefficient of Linear Thermal Expansion	$°C^{-1}$	D 696	12×10^{-5}	12×10^{-5}	11×10^{-5}
	$°F^{-1}$		7×10^{-5}	7×10^{-5}	6×10^{-5}
Dielectric Strength	kV/mm	D 149	14.5	16.6	15.9
	V/mil		368	422	404
Dielectric Constant	@ 10^6 Hz	D 150	3.5	3.3	3.3
Dissipation Factor	@ 10^6 Hz	D 150	0.05	0.02	0.03
Volume Resistivity	ohm•cm	D 257	1.6×10^{13}	1.6×10^{15}	2.6×10^{15}
Surface Resistivity	ohm/sq	D 257	6.8×10^{14}	1.4×10^{16}	3.9×10^{16}

EASTMAN

Product Data Sheet

Tenite™ Butyrate 576E3720010 Clear, Trsp

Application/Uses

- Furniture/Furniture trim
- Recreational

Product Description

Tenite™ cellulosic plastics are noted for their excellent balance of properties - toughness, hardness, strength, surface gloss, clarity, and a warm feel. The mechanical properties of Tenite™ cellulosic plastics differ with plasticizer levels. Lower plasticizer content yields a harder surface, higher heat resistance, greater rigidity, higher tensile strength, and better dimensional stability. Higher plasticizer content increases impact strength. Color concentrates are available in let-down ratios from 10:1 to 40:1. Tenite™ Cellulose Acetate Butyrate 576-10 contains an odor mask and an ultra-violet inhibitor(UVI). It has a plasticizer level of 10%.

Typical Properties

Property[a]	Test[b] Method	Typical Value, Units[c]
Plasticizer		10%
Specific Gravity	D 792	1.19
Mechanical Properties		
Tensile Stress @ Yield	D 638	33.1 MPa (4800 psi)
Tensile Stress @ Break	D 638	43.4 MPa (6300 psi)
Elongation @ Break	D 638	50%
Flexural Modulus	D 790	1379 MPa (2.00 x 10^5 psi)
Flexural Yield Strength	D 790	45.5 MPa (6600 psi)
Rockwell Hardness, R Scale	D 785	78
Izod Impact Strength, Notched		
@ 23°C (73°F)	D 256	240 J/m (4.5 ft·lbf/in.)
@ -40°C (-40°F)	D 256	96 J/m (1.8 ft·lbf/in.)
Thermal Properties		
Deflection Temperature [d]		
@ 1.82 MPa (264 psi)	D 648	74°C (165°F)
@ 0.455 MPa (66 psi)	D 648	85°C (185°F)
Vicat Softening Temperature [d]	D 1525	104°C (219°F)

Permanence Properties		
Water Absorption, 24 h immersion	D 570	1.4%
Soluble Matter Loss	D 570	0.1%
Weight Loss on Heating [72 hours @ 80°C (176°F)]	D 707	0.5%

Miscellaneous Butyrate Properties		
Refractive Index, n_D	D 542	1.46-1.49
Light Transmission [e]	E 308	>90%
Haze [e]	D 1003	<8.5%
Specific Heat @ 23°C (73°F)	DSC	1.26-1.67 kJ/kg·K (0.301-0.399 Btu/lb·°F)
Thermal Conductivity	C 177	0.17-0.33 W/m·K (1.2-2.3 Btu·in./h·ft^2·°F)
Coefficient of Linear Thermal Expansion	D 696	11-17 x 10^{-5} /°C (mm/mm·°C) (6-9 x 10^{-5} /°F (in./in.·°F))
Mold Shrinkage	D 955	0.2-0.6%
Dielectric Strength	D 149	11.8-18.7 kV/mm (300-475 V/mil)
Dielectric Constant 1 MHz	D 150	3.3-3.8
Dissipation Factor 1 MHz	D 150	0.01-0.15
Volume Resistivity	D 257	10^{13}-10^{15} ohm·cm

[a] *Unless noted otherwise, all tests are run at 23°C (73°F) and 50% relative humidity.*

[b] *Unless noted otherwise, the test method is ASTM.*

[c] *Units are in SI or US customary units.*

[d] *Conditioned 4 hours @ 70°C (158°F)*

[e] *1.52-mm (0.06-in.) thickness*

Characteristics

Formula 576 - odor mask; UVI; standard inventory. Available in 10% plasticizer only.

Comments

Properties reported here are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform exactly to the values given.

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