

Nylon

Grade

Zytel 101F

Value Plastics Material Code

-0 (natural) or -1, -2, -3, -4, -5, -06, -07, -8 (colors)

Manufacturer

DuPont Engineering Polymers

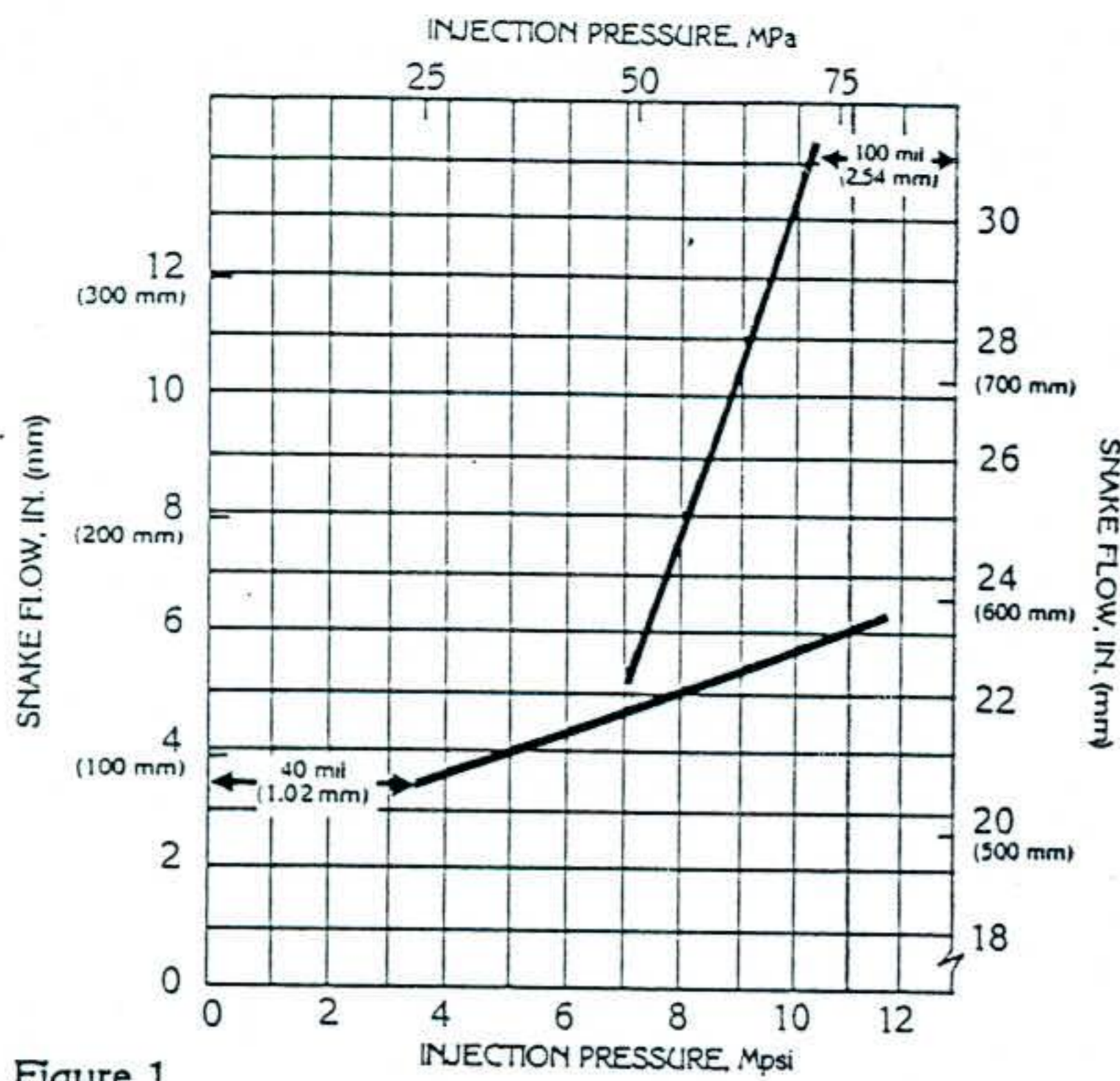
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Wilmington, DE 19898

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Nylon

Figure 1
 Injection Molding of ZYTEL 101F: Snake Flow vs. Injection Pressure
 Molding Conditions: Melt 555°F (291°C)
 Mold 150°F (64°C)

TYPICAL PHYSICAL PROPERTIES OF ZYTEL 101 F NC-10

Property ^{1, 2}	ASTM Method	Units	Value	
Tensile Strength	D 638	Mpsi	12	
		MPa	82.8	
Elongation at Break	D 638	%	52	
Izod Impact Strength	D 256	ft lb/in.	≥ 1.0	
		J/m	≥ 53	
Flexural Modulus	D 790	Mpsi	400	
		MPa	2760	
Heat Deflection Temp.	D 684	@ 264 psi	°F	194
		@ 1.8 MPa	°C	90
		@ 66 psi	°F	455
		@ 0.5 MPa	°C	235
Rockwell Hardness	D 785		R121	
Melting Point	D 789	°F	491	
		°C	255	
Specific Gravity	D 792		1.14	

¹ All properties are "dry-as-molded" at 73°F (23°C).
² These values are for this specific composition only. Colorants or additives of any kind may alter some or all of these properties. The data listed here fall within the normal range of product properties, but they should not be used to establish specification limits nor used alone as the basis of design.

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E. I. DUPONT DE NEMOURS & CO. (INC.)
 PLASTIC PRODUCTS AND RESINS DEPARTMENT
 WILMINGTON, DELAWARE 19898

PROPERTIES OF DU PONT ZYTEL[®] NYLON RESINS AND MINLON[®] ENGINEERING THERMOPLASTIC RESINS - S.I. UNITS (continued)

Property	ASTM Method	Units	Unreinforced										Toughened/Super Tough				
			Z 101 Z 101 L General Purpose		Z 105 BK-10A Weather Resistant		Z 133 L Nucleated Lubricated		Z 158 L		Z 211		Z 408 L Z 408 HS Impact Mod.		ST 801 ST 801 HS Super Tough		
			DAM	50%	DAM	50%	DAM	50%	DAM	50%	DAM	50%	DAM	50%	DAM	50%	
ELECTRICAL	Volume Resistivity	D 257	ohm-cm	10 ¹⁵	10 ¹³	10 ¹⁴	10 ¹²	10 ¹⁵	10 ¹³	10 ¹⁵	10 ¹³	10 ¹²	10 ⁹	10 ¹⁵	10 ¹³	10 ¹⁴	10 ¹³
	Dielectric Constant	D 150		100 Hz	4.0	8.0	4.0	8.0			4.0	6.0				3.2	5.5
				10 ³ Hz	3.9	7.0	3.9	7.0			4.0	5.3			3.2	4.5	
				10 ⁶ Hz	3.6	4.6	3.6	4.6			3.5	4.0			2.9	3.2	
	Dissipation Factor			100 Hz	0.01	0.20	0.02	0.18			0.02	0.15				0.01	0.20
10 ³ Hz				0.02	0.20	0.03	0.12			0.02	0.15			0.01	0.10		
10 ⁶ Hz				0.02	0.10	0.03	0.06			0.02	0.10			0.02	0.50		
Dielectric Strength Short Time	D 149		—	—	—	—	—	—	—	—	—	—	—	—	—	—	
MISCELLANEOUS	Specific Gravity	D 792		1.14		1.15		1.14		1.06		1.13		1.09		1.08	
	Water Absorption 24 Hour + 23°C	D 570	%	1.20		1.20		1.10		0.25		2.90		1.20		1.20	
	Water Absorption Sat. + 23°C	D 570	%	8.50		8.50		8.20		3.00		9.50		7.00		6.70	
	Harness Rockwell M Rockwell R	D 785		79		87		123		114	108	45	29	71	50	112	89
				121		121						104	87	115	102		
	Taber Abrasion CS-17 Wheel 1000g		mg/1000 Cvc.		7						6						
	Mold Shrinkage 1/8" Flow Transverse		%	1.50		1.50		0.60		1.10		1.20		1.50		1.50	
	Acid Resistance	Limited; attacked by strong acids; general order of resistance 612>66>6.															
	Base Resistance	Excellent at room temperature; attacked by strong bases at elevated temperatures.															
Solvent Resistance	Generally excellent; some absorption by such polar solvents as water alcohols and certain halogenated hydrocarbons causing plasticization and dimension changes.																
Oxygen Index ¹⁰	D 2863	% O ₂	78	31	25	31	27	—	25	28	21	23	19	20	18	19	
UL VALUES	UL Flammability ⁹	UL-94		V-2	—	V-2	—	V-2	—	HB	—	HB	—	HB	—	HB	
	Hot Wire Ignition	UL-746A	S	15								10		10		20	
	High Amp Arc Ignition	UL-746A	Arc S	186								200+		200+		200+	
	Temperature Index Electrical Mech. w/Impact Mech. w/o Impact	UL-746B	°C	125								65		65		65	
				75							65		65		65		
				85							65		65		65		
	High Voltage Tracking Rate	UL-746A	cm/min	0.51								0.00		0.00		0.762	
	Arc Resistance	D 495	S	—								127		125		131	
Comparative Tracking Index	UL-746A	V	—								600+		600+		600+		

Notes: 1. These values are for this composition only. Colorants or other additives of any kind may alter some or all of these properties. The data listed here fall within the normal range of product properties but they should not be used to establish specification limits or used alone as the basis for design.

2. Many modified 66 nylons are similar in most properties to the unmodified resins. These include the fluorovynyl resistant ZYTEL 122L, which has about 2-4 times the life in boiling water of the unstabilized resins. The heat stabilized ZYTEL 103 HS-L has mechanical properties similar to ZYTEL 101, except for slightly lower elongation. The internally lubricated ZYTEL 101 F and 101 F-HS offer optimum injection molding productivity. ZYTEL FR-10 has a UL flammability rating of 94 V-0.

3. ZYTEL 157 HS-L BK-10 is a heat stabilized 612 nylon, containing carbon black for superior outdoor weathering.

4. Properties are measured DAM (dry as molded, with about 0.2% water) or at 50% RH (i.e. equilibrated with the atmosphere at 50% relative humidity).

5. These values obtained by first annealing the test bars for 30 minutes in oil at 90°F (50°C) below melting point of resin.

6. Thermal conductivity measured by Conco-Fitch apparatus.

7. These are approximate values. The coefficient of expansion is highly dependent on both temperature and moisture content.

8. In tests conducted by our laboratories, two of the two hundred humans tested showed an allergic skin reaction to ZYTEL 211. Therefore, it is not recommended where a fabricated part, or extracted material therefrom, is in prolonged contact with human skin. Furthermore, ZYTEL 211 should not be used in contact with foodstuffs.

9. Based on specimens 1/8" (15.9 mm) thick.

10. This small scale test does not indicate combustion characteristics under actual fire conditions.

PROPERTIES OF DU PONT ZYTEL[®] NYLON RESINS
AND MINLON[®] ENGINEERING THERMOPLASTIC RESINS - S.I. UNITS

Property ^{1,4}	ASTM Method	Units	Unreinforced										Toughened/Super Tough					
			Z 101 Z 101 L General Purpose ²		Z 105 BK-10A Weather Resistant		Z 133 L Nucleated Lubricated		Z 158 L ³		Z 211 ⁶		Z 408L Z 408 HS Impact Mod.		ST 801 ST 801 HS Super Tough			
			DAM	50%	DAM	50%	DAM	50%	DAM	50%	DAM	50%	DAM	50%	DAM	50%		
MECHANICAL	Tensile Strength	D 638	MPa		113.8	110.3	129.0	117.2	136.5	118.6	93.8	93.1	110.3	90.3	104.1	90.3	80.0	69.0
	-40°C		82.7	77.2	90.3	62.1	97.9	70.3	60.7	60.7	64.8	60.0	62.1	51.7	51.7	41.4	—	
	-23°C		62.1	40.7	62.1	50.3	53.8	—	40.7	36.6	41.4	37.2	43.4	34.5	40.7	—	—	
	+77°C		42.7	37.9	47.6	42.1	49.0	—	—	—	33.1	30.3	31.7	27.6	34.5	—	—	
	-121°C																	
	Elongation at Break	D 638	%		15	20	10	15	10	10	15	30	25	35	—	20	20	10
	-40°C		60	≥300	30	200	25	100	150	≥300	270	285	80	270	60	210	210	
	-23°C		≥300	≥300	145	250	170	>300	≥300	≥300	250	270	210	≥300	220	170	—	
	+77°C		≥300	≥300	≥300	≥300	280	>300	—	—	250	250	≥300	≥300	275	—	—	
	-121°C																	
	Yield Strength	D 638	MPa		82.8	58.6	90.4	62.1	97.9	70.3	60.7	51.0	51.0	40.7	60.7	51.7	—	—
	-23°C																	
	Elongation at Yield	D 638	%		5	25	5	25	—	—	7	40	20	30	5	15	—	—
+23°C																		
Flexural Modulus	D 790	MPa		3241	3447	3516	—	3723	4068	2344	2758	—	—	2827	3309	1965	2344	
-40°C		2827	1207	2965	1310	3034	1241	2034	1241	1034	745	1965	1103	1689	862	862		
+23°C		689	565	724	586	724	—	414	379	414	414	552	414	476	393	393		
+77°C		538	414	552	—	490	—	331	303	345	345	345	345	345	345	324		
+121°C																		
Shear Strength	D 732	MPa		66.2	—	72.4	69.0	71.7	62.1	59.3	55.9	62.7	—	—	—	57.9	—	
+23°C																		
Deformation Under Load	D 621	%		1.4	—	1.2	—	—	—	1.6	—	2.2	—	1.4	—	—	—	
2000 psi																		
Compressive Stress—	D 695	MPa		33.8	—	—	—	42.1	15.2	16.6	—	—	—	—	—	—	—	
1% Deformation																		
Poisson's Ratio																		
Izod Impact	D 256	J/m		32	27	37	32	—	—	48	32	16	21	69	64	160	139	
-40°C		53	112	43	107	37	64	53	75	80	—	229	240	907	1068	1068		
+23°C																		
Tensile Impact—	D 1822	KJ/m ²		504	1470	—	—	231	756	611	945	525	—	550	1680	588	1155	
Long Specimen																		
-23°C																		
THERMAL	Melting Point (Fisher-Johns)	D 789	°C		255	255	255	255	256	256	212	212	213	213	255	255	255	255
	Heat Deflection Temp. ⁵	D 648	°C		235	—	240	—	243	—	180	—	177	—	232	—	219	—
	455 kPa		90	—	90	—	101	—	90	—	67	—	87	—	83	—	—	
	1820 kPa																	
	Coefficient of Linear Thermal Expansion ⁷	D 696	m/m/°C		8.1 × 10 ⁻⁵	—	—	—	8.1 × 10 ⁻⁵	—	9 × 10 ⁻⁵	—	8.1 × 10 ⁻⁵	—	8.1 × 10 ⁻⁵	—	43.7 × 10 ⁻⁵	—
	Specific Heat		W/m·K		0.4	—	0.4	—	—	—	0.4	—	0.4	—	—	—	—	—
	Thermal Conductivity ⁸		°C		0.25	—	0.25	—	0.28	—	0.22	—	—	—	—	—	—	—
Brittleness Temperature	D 746	°C		-80	-65	-52	-52	—	—	-126	-109	—	—	-104	-84	—	—	

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8. In tests conducted by our laboratories, two of the two hundred humans tested showed an allergic skin reaction to ZYTEL 211. Therefore, it is not recommended where a fabricated part, or extracted material therefrom, is in prolonged contact with human skin. Furthermore, ZYTEL 211 should not be used in contact with foodstuffs.
9. Based on specimens 1/16" (1.59 mm) thick.
10. This small scale test does not indicate combustion characteristics under actual fire conditions.



DuPont
 Chestnut Run Plaza
 P. O. Box 80713
 Wilmington, DE 19880-0713

April 2, 2001

Texas
 Fax: 972-226-5073

Gentlemen:

Thank you for your interest in DuPont Engineering Polymers Zytel® nylon resin. Specifically, you have requested survey information on possible animal content in Zytel® 101F NC010.

Zytel® 101F NC010 does contain minor amounts, <1%, of potentially animal-origin raw materials.

While some raw materials may be derived from vegetable sources, an alternate source would be tallow from bovine and porcine sources.

Countries of origin are predominantly US and Canada. Our suppliers have certified that as a minimum, their sources are not countries with animals infected with BSE.

Processing steps to convert from tallow to the raw material include temperatures in excess of 200 deg C, and pressures of 40 bar and above. Also the manufacture of Zytel® requires extrusion temperatures of approximately 250 deg C.

I trust this information meets your needs. If further support is desired, please do not hesitate to contact me.

Best Regards,

Irene V. Hebensee
 Regulatory Affairs Consultant
 302-999-4257

IVB:lad
 ANI 1B-05-01

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 Z-1000 Rev 11/00



ESTABLISHED 1802

E. I. DU PONT DE NEMOURS & COMPANY

INCORPORATED

WILMINGTON, DELAWARE 19898

POLYMER PRODUCTS DEPARTMENT

February 14, 1989

Ms. Marsha Rekow
Value Plastics, Inc.
350 Eastbrook Drive
Fort Collins, CO 80525

Dear Ms. Rekow:

In response to your request to our Engineering Polymers Enterprise, information is provided on the FDA status of natural color Zytel® 101F NC-10 nylon resin. It is my understanding that you are interested in the use of this polymer for fittings in beverage dispensing equipment.

Zytel® 101F NC-10 nylon resin is in full compliance with the FDA regulation 21 CFR 177.1500 (Nylon resins) for unrestricted use in contact with all types of food with no temperature limitations.

I trust this provides the assurance that you need.

Very truly yours,

J. B. Armitage
Regulatory Affairs

JBA:dlg

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DuPont Engineering Polymers

DuPont Engineering Polymers
Chestnut Run Plaza
P.O. Box 80713
Wilmington, DE 19880-0713

September 4, 1996

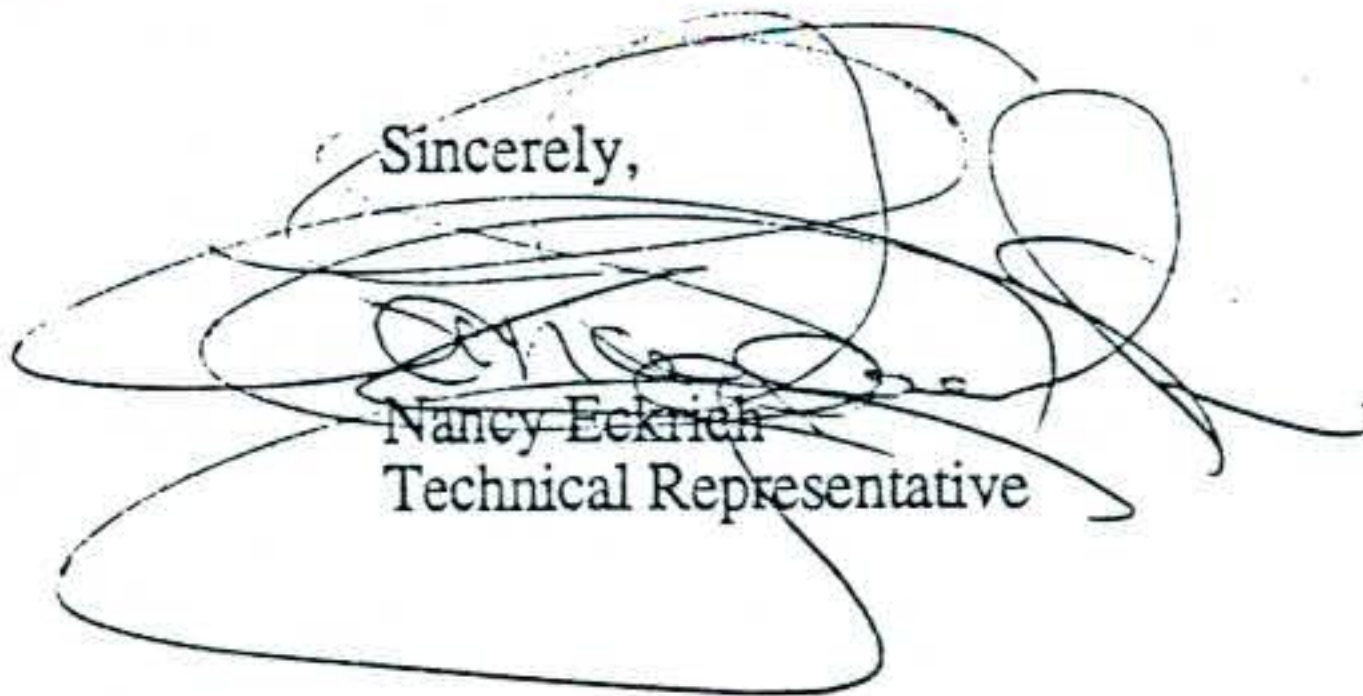
Mike Caulk
Value Plastics
3325 Timberline Rd.
Ft. Collins, CO 80525

Dear Mike:

Your customer, Audrey Daniels of Deroyal Tech., is asking for a letter about the amount of latex in Zytel® 101F. There is no latex in Zytel® 101F. I have enclosed an MSDS sheet with the list of ingredients in our nylons.

If you have further questions, please call.

Sincerely,



Nancy Eckrich
Technical Representative

NE:lad
Enclosure

ZYTEL® is DuPont's registered trademark for nylon resin

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