EASTMAN

Eastman **EASTOFLEX**™

amorphous polyolefins

Wire and cable industry

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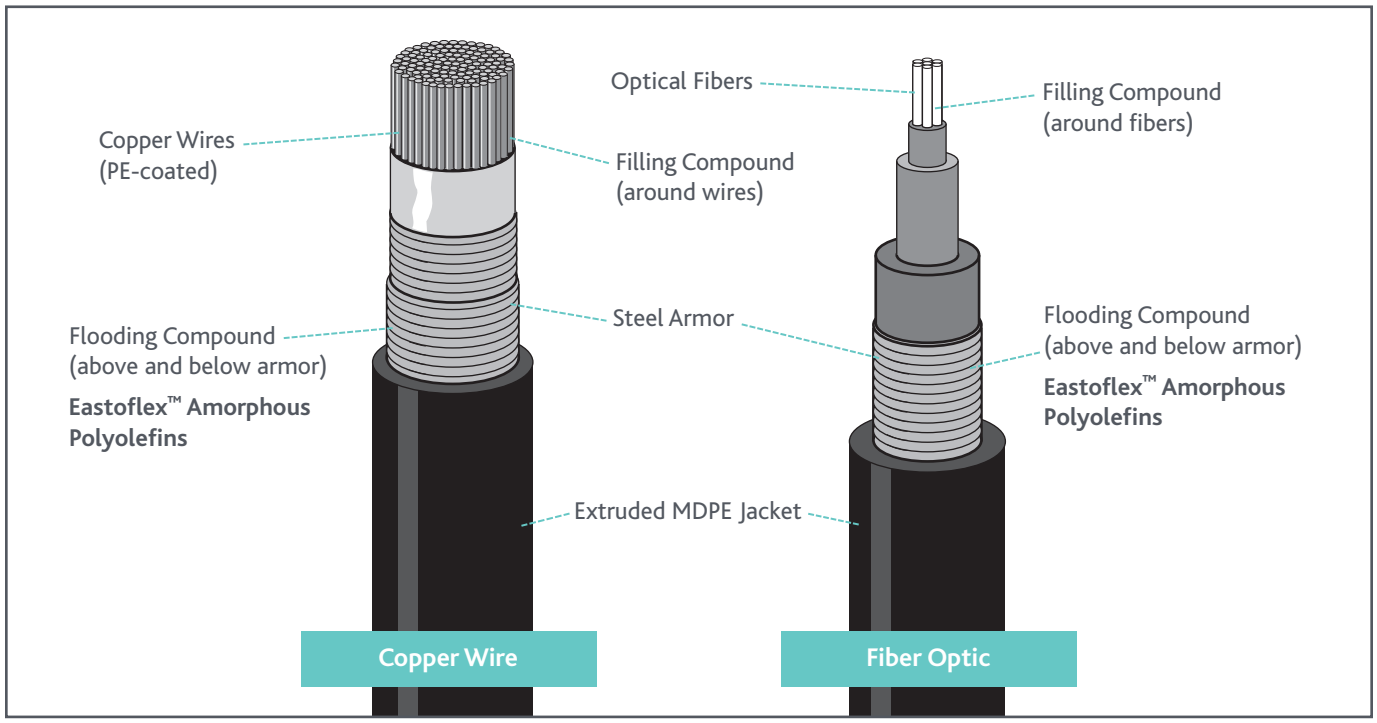
There are generally two types of telecommunications cables in use: copper wire and fiber optic (see Figure 1). Both types require materials that serve as filling compounds, which space the conductors, and flooding compounds, which flood the armor layers within the cable. These compounds, which also provide waterproofing for the interior components of the cable, are generally hydrophobic hydrocarbons that can be extruded or injected hot during cable manufacture. These materials must also remain flexible at low temperatures.

Eastoflex™ Amorphous Polyolefins (APOs) can be used as raw materials in the formulation of filling and flooding compounds.

Figure 1
Telecommunications Cables



Eastoflex™ APOs include:

- Excellent waterproofing.
- Aggressive tack.
- Prime quality—not a by-product.
- Low color.

In some cases, neat APOs may be used as flooding compounds; others are used in combination with hydrophobic materials (petrolatum, polyethylene, polybutene, polyisobutylene) to formulate both flooding and filling compounds.

Table 1

Eastoflex™ Amorphous Polyolefins Typical Properties

		Viscosity, @ 190°C, mPa·s	R&B Softening Pt, °C (°F)	Glass Transition Temperature, °C (°F)	Penetration Hardness, dmm
		ASTM Method			
Product Name	Form	D 3236	E 28	D 3418	D 5
Propylene Homopolymers					
P1010	Molten/Solid[a]	1,000	155 (311)	–10 (14)	18
P1010PL	Pellets	1,000	155 (311)[b]	–10 (14)	18
P1023	Molten/Solid[a]	2,300	155 (311)	–10 (14)	18
P1023PL	Pellets	2,300	155 (311)[b]	–10 (14)	18
Propylene-Ethylene Copolymers					
E1003	Molten/Solid[a]	300	120 (248)	–30 (–22)	100
E1005	Molten/Solid[a]	500	125 (257)	–28 (–18)	85
E1016	Molten/Solid[a]	1,600	135 (275)	–25 (–13)	50
E1016PL-1	Pellets	1,600	135 (275)	–25 (–13)	50
E2030	Molten/Solid[a]	3,000	135 (275)	–23 (–9)	50
E1045	Molten/Solid[a]	4,500	135 (275)	–22 (–8)	40
E1045PL	Pellets	4,500	140 (284)[b]	–22 (–8)	40
E1060	Molten/Solid[a]	6,000	135 (275)	–20 (–4)	40
E1060PL	Pellets	5,700	140 (284)[b]	–20 (–4)	35
E1060PL-1	Pellets	6,000	135 (275)	–20 (–4)	35
E1080	Molten/Solid[a]	8,000	135 (275)	–20 (–4)	40
E1200	Molten/Solid[a]	20,000	135 (275)	–22 (–8)	25
E1200PL	Pellets	17,000	143 (289)[b]	–22 (–8)	25
Polypropylene/Propylene-Ethylene Copolymer Mixtures					
M1010	Molten/Solid[a]	1,000	153 (307)	–15 (5)	30
M1018	Molten/Solid[a]	1,800	155 (311)	–15 (5)	25
M1018PL	Pellets	1,800	155 (311)[b]	–15 (5)	25
M1020	Molten/Solid[a]	2,000	150 (302)	–21 (–6)	35
M1020PL-1	Pellets	2,000	150 (302)	–21 (–6)	35
M1025	Molten/Solid[a]	2,500	155 (311)	–14 (7)	20
M1030	Molten/Solid[a]	3,000	155 (311)	–12 (10)	20
M1030PL	Pellets	3,000	155 (311)[b]	–12 (10)	20
M1030PL-1	Pellets	3,000	155 (311)	–12 (10)	20
M1058	Molten/Solid[a]	5,800	155 (311)	–15 (5)	20
M1058PL	Pellets	5,800	155 (311)[b]	–15 (5)	20
M2058	Molten/Solid[a]	5,800	153 (307)	–16 (3)	25
M2058PL	Pellets	5,800	155 (311)[b]	–16 (3)	25

[a]Molten available in tank trucks or railcars. Solid may be available in cylinders or drums.

[b]RBSP of pellet coating is 163°C. Pellet coating typically 1.5% to 2% by weight.

Properties reported in this publication are typical of average lots. Eastman makes no representation that the material in any particular shipment will conform to the listed values.

Parameters for the five Eastoflex™ APOs available for blending are illustrated in Figures 2 and 3, which show ranges for Thermosel™ viscosity at 190°C, ring and ball softening point, glass transition temperature, and needle penetration hardness.

There are minimum order requirements for the development of a custom APO blend. Note that only Eastoflex™ P1010, P1023, E1003, E1060, and E1200 are available for blending. If you have any questions about Eastman's capabilities for APO blending, contact your Eastman sales representative.

Eastman Eastoflex™ APO Blending Capabilities

Figure 2

Ring & Ball Softening Point vs. Thermosel™ Viscosity @ 190°C

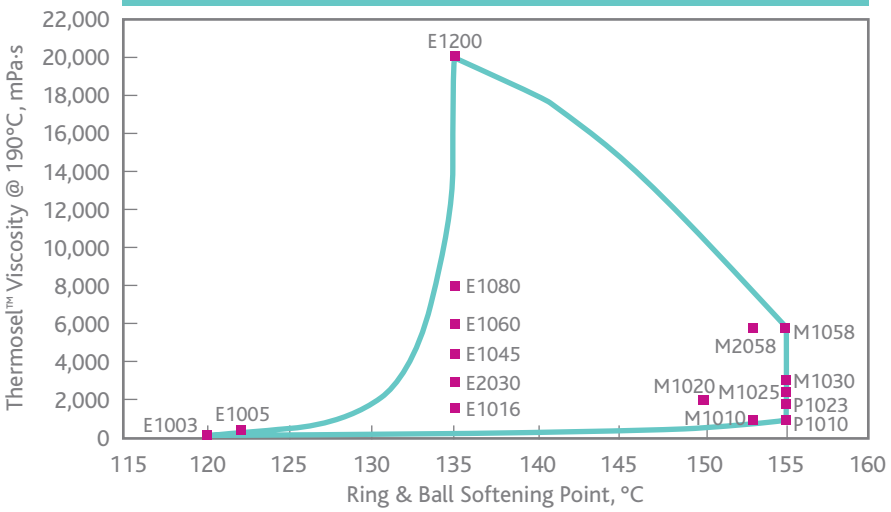
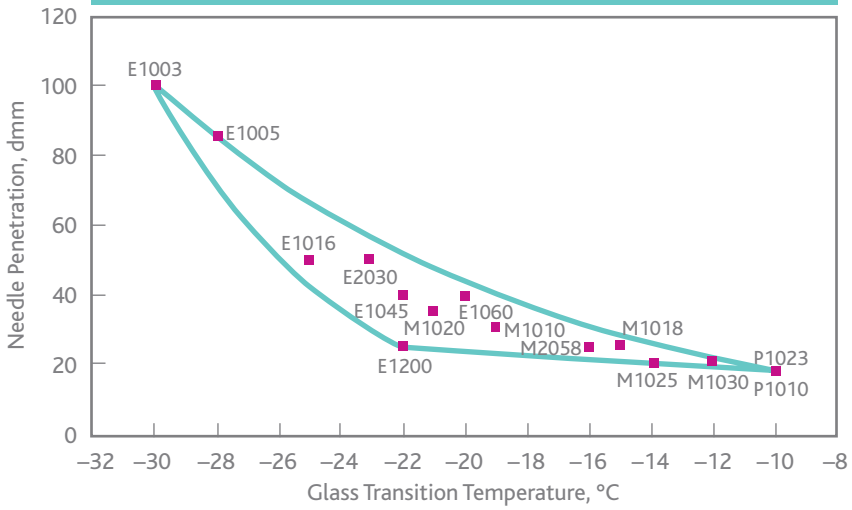


Figure 3

Glass Transition Temperature vs. Needle Penetration



Cable Flooding Compounds

Eastoflex™ APOs are hydrophobic products that can be used to formulate cable flooding compounds having excellent water barrier properties. Eastoflex™ APOs provide flexibility and improved adhesion to cable components such as the armor and jacketing. Cable flooding compounds, which prevent the intrusion of water into the cable, are applied above and below the armor within the cable, as indicated in Figure 1. The viscosity of cable flooding compounds is usually higher than that of filling compounds. Typical cable flooding formulations, along with test results, are given in Table 2. Formulations were prepared by heating the components with agitation to 125°–130°C and mixing until uniform. These formulations exhibit excellent adhesion to carbon steel, coated carbon steel, copper, coated copper, aluminum, coated aluminum, and polyester.

Table 2
Cable Flooding Compounds

Ingredients	Composition, % by Weight		
Eastoflex™ E1003 (Eastman)	99.8	75.8	29.8
Petrolatum 4576 (Penreco)	0.0	22.0	67.0
Epolene® N-21 (Westlake)	0.0	2.0	3.0
Irganox® 1035 (Ciba)	0.2	0.2	0.2
Test Results			
Thermosel™ viscosity @ 150°C, mPa•s	862.0	265.0	43.8
Thermosel™ viscosity @ 115°C, mPa•s	n/a	n/a	113.0
RBSP, °C	110.0	107.0	102.0
Slump test—2 h at 80°C	pass	pass	pass
Slump test—fail temperature, °C	95.0	105.0	95.0
Drip test—4 h at 80°C	pass	pass	pass
Drip test—fail temperature, °C	145.0	135.0	110.0
Lap shear, psi	7.0	4.8	1.5

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