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APPROVED
[Signature] 12/27/65
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MATERIAL SPECIFICATION

SPECIFICATION NO.
EMS 2080

REV.	DATE	BY
A	12/22/65	Martin

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS CORPORATION
LA GRANGE, ILLINOIS

NAME-- POLYOLEFIN TUBING, HEAT REACTIVE

REQUIREMENTS:-

1. **Properties:** (Note: All tests shall be made on samples that have been shrunk by heating at $200 \pm 5^\circ\text{C}$. (392°F .) for not less than three minutes and then cooled to room temperature.

Tensile Strength (ASTM D412-62T), psi, min. -----	1400
Elongation (ASTM D412-62T), %, min. -----	100
Specific Gravity (ASTM D792-64T**), max. -----	1.30

Low Temperature Flexibility

Test: Condition three 18" specimens and steel mandrel at -55°C . (-67°F .) for four hours. Bend at this temperature three turns around a mandrel at rate of two seconds per turn --- No Cracking

Tubing Size, Expanded

Mandrel Dia.

3/64 to 1/4 Incl.
3/8 to 1/2 Incl.
3/4 to 2 Incl.
3 to 4 Incl.

5/16 Inches
3/8
7/16

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Heat Aging

Test: Three 6" specimens shall be placed in a $175 \pm 3^\circ\text{C}$. (350°F .) oven for 168 hours. After cooling to room temperature the specimens shall be bent 180° over mandrel (see sizes above). Any side cracking caused by flattening of specimens shall be disregarded. ----- No Cracking

Heat Shock

Test: Three 4" specimens shall be placed in a $250 \pm 5^\circ\text{C}$. (482°F .) oven for four hours. ----- No dripping, flowing, cracking

Dielectric Strength (ASTM D876-63**), VPM, min. ----- 400

Flammability

Test: Five 5" specimens shall be marked one inch from each end. Specimen to be held at 45° angle in a draft-free chamber by a clamp that completely closes upper end of tube. A one inch flame from a 3/8" diameter Bensen burner shall be applied to lower end. When specimen has burned to lower mark, the flame shall be removed. Failure of more than one specimen to extinguish within three inches shall be cause for rejection. ----- Self-extinguishing within 3"

Fungus Resistance (MIL-I-7444) ----- Must not support fungus growth

Water Absorption (ASTM D570-63**, 24 Hr.), %, max. ----- 0.5

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(CONTINUED)

2. Dimensions & Tolerances: I.D. and Wall Thickness - (Note: All measurements made in accordance with ASTM D876-63**).

Size Inches	Expanded - As-Received	Recovered Dimensions ¹ - After Heating		
	Inside Dia., Inches, Min.	Inside Diameter (Inches) Maximum	Wall Thickness Minimum	(Inches) Maximum
3/64	0.046	0.023	0.013	0.019
1/16	.063	.031	.014	.020
3/32	.093	.046	.017	.023
1/8	.125	.062	.017	.023
3/16	.187	.093	.017	.023
1/4	.250	.125	.022	.028
3/8	.375	.187	.022	.028
1/2	.500	.250	.022	.028
3/4	.750	.375	.027	.033
1	1.000	.500	.030	.040
1-1/2	1.500	.750	.034	.046
2	2.000	1.000	.038	.052
3	3.000	1.500	.042	.058
4	4.000	2.000	.046	.064

¹Longitudinal shrinkage to be 5%, maximum.

3. Color: Black, unless otherwise specified on the engineering drawing.

NOTE: An Engineering Approval of Source is required for the purchase of this material.

****NOTE:** Wherever the specification or test of any society is referred to herein with its date or revision letter stated, no other dated or more recent revisions are acceptable except by revision of this Electro-Motive Specification.

GENERAL INFORMATION:-(Not Mandatory Vendor Requirements)

EMS 2080 is a flexible, irradiated, polyolefin electrical insulating tubing whose diameter will reduce to a predetermined size upon application of heat in excess of 250°F. (121°C.)

The first use of this material at EMD was on cable splices on GP35 traction motors.

DRAFTING INFORMATION:-

Where use of this material is specified, it shall be designated as:

MATERIAL: EMS 2080 PLASTIC TUBING

NOTE: These specifications were developed without considering whether patents may or may not be involved. In all cases, therefore, the supplier shall be required to assume patent liability.

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