

**LAMITEX®**



## THERMOSET LAMINATED TUBE AND SHAPES FOR INDUSTRY

ROUND ■ SQUARE ■ RECTANGULAR ■ ANGLES ■ CHANNELS ■ RODS



**FRANKLIN FIBRE-LAMITEX CORPORATION**

SERVING INDUSTRY SINCE 1921

# Committed to Providing The Highest Quality



Businesses worldwide have depended on Franklin Fibre-Lamitex Corporation since 1921 for the highest quality convolute wound round, square, rectangular tubes and molded rods, angles, channels and custom shapes. Our customers enjoy the economies of dealing

with a small business, while benefiting from relationships we have with our large corporate partners. Over the years, Franklin has earned a reputation for cost-effective solutions, the highest quality products, and on-time deliveries.

Our engineering staff can help meet your technical needs today and your development goals for tomorrow. At Franklin, we take the time to learn about our customers' unique applications and requirements. By confronting complex problems with innovative solutions, we design, engineer, and rigorously test our products through to market acceptance. From your initial contact to after the sale follow-up, Franklin is with you every step of the way.

## Grades and Types of Tubing Material

### LAMITEX® Laminates:

LAMITEX® laminated materials provide a unique range of design benefits. LAMITEX® composite laminates are engineering materials made from layers of fibrous reinforcement such as cotton cloth, paper or woven glass cloth, which are bonded together with high quality thermoset plastic resins. The layers are pressed together under high pressure and the resin is baked until it becomes solid, fusing the material into a tough, strong and dense material. Combinations of phenolic, epoxy, melamine or silicon resins saturated and cured in paper, cotton fabric, glass fabric or aramid fibre fabrics offers a range of laminate grades with properties designed for everyday use to the most demanding by today's technologies.



LAMITEX® laminates combine mechanical strength and electrical insulation with chemical and weather resistance. They are rigid, with a high strength to weight ratio, and most grades can be machined with standard machine tools to make finished components. Franklin offers a comprehensive range of grades for our customers' diverse applications.

LAMITEX® is a registered trademark of Franklin Fibre-Lamitex Corp.

## Lamitex Tubes Properties and Characteristics

Upper Figures Are For Molded Tubing / Lower Figures Are For Rolled Tubing

GRADE	Mechanical Properties											Dielectric Strength, V.P. M. (Short Time)				
	Filter	Resin	Colors Available	Specific Gravity	Compressive Strength Axial psi	Tensil Strength psi	Power Factor 106 Cycles	Dielectric Constant 106 Cycles	Water Absorption 24 Hrs. Percent Wall Thickness, Inches			Over 1/16 to 1/8, incl.	Over 1/8 to 1/4, incl.	Over 1/4 to 1/2, incl.		
X	Paper	Phenolic	Natural	1.25	18,000	12,000	—	—	6.0	4.5	4.0	3.6	270	180	100	
XX				& Black	1.10	10,000	8,500	—	—	8.0	5.0	4.3	4.0	325	200	145
			1.25		18,000	11,000	0.040	5.5	6.0	2.0	1.8	1.6	220	150	110	
			XXX	& Black	1.10	13,000	8,000	0.040	5.0	—	3.0	2.5	2.0	290	200	145
					1.22	20,000	9,000	0.040	5.5	—	1.4	1.2	1.1	220	150	110
			& Black	1.12	13,000	7,000	0.040	5.3	—	1.5	1.3	1.0	—	—	—	
	C	Phenolic		Natural	1.25	19,000	9,000	—	—	—	3.5	2.6	2.2	160	110	75
1.12			12,000		6,000	—	—	—	5.0	3.6	3.0	120	110	75		
CE			& Black	1.25	19,000	8,500	—	—	—	3.0	2.2	2.0	175	125	90	
				1.12	13,000	6,000	—	—	—	4.7	3.3	2.7	140	120	85	
CYB			Phenolic; Graphite Inclusion	Grayish Black	1.28	18,000	8,500	—	—	—	3.5	2.6	2.2	—	—	—
					L	Phenolic	Natural	1.25	18,000	9,000	—	—	6.5	3.5	2.2	1.8
1.12	13,000	6,000	—	—				8.0	5.0	3.3	2.8	120	110	75		
LE	& Black	1.25	19,000	8,500			—	—	4.5	2.2	1.8	1.5	175	125	90	
		1.12	13,000	7,000			—	—	7.5	5.0	3.0	2.5	140	120	85	
LEB	Bleached	Phenolic	Natural	1.25	19,000	8,500	—	—	6.0	3.0	1.7	1.4	170	120	85	
G3	Medium	Phenolic	Grayish	1.55	20,000	30,000	—	—	6.5	3.7	3.2	3.0	170	120	85	
			Brown	1.50	13,000	25,000	—	—	7.0	4.0	3.5	3.2	175	125	90	
G5	Weave	Melamine	White	1.80	20,000	30,000	—	—	5.0	3.9	3.7	3.0	155	105	75	
				1.70	13,000	25,000	0.012	7	5.0	3.9	3.7	3.0	160	110	85	
G7	Glass Fabric	Silicone	White	1.55	6,000	—	—	—	1.0	1.0	0.8	0.8	125	140	140	
G10 G11		Epoxy	Yellow/Green	1.55	25,000	15,000	0.005	7	1.0	0.6	0.4	0.3	300	250	200	
		G30	Polyimide	Dark Brown	1.84	70,000	40,000	—	—	—	—	—	—	—	—	

\* All values are average test results from typical production material. No warranty is implied or guaranteed and testing is recommended for each application.

Specific Heat (0.35 to 0.40 Grades X, XX, XXX, C, CE, CYB, L, LE, LEB)  
(0.26 Grades G5, G10)

Thermal Conductivity (0.0007 Grades X, XX, XXX, C, CE, CYB, L, LE, LEB)  
cal/sec/Cm /degC/Cm (0.0012 Grades G5, G10)

## Lamitex Tube Tolerances

Inside Diameter mm	Maximum Deviation mm
3 < ID ≤ 10	± 0.10
10 < ID ≤ 30	± 0.15
30 < ID ≤ 50	± 0.20
50 < ID ≤ 75	± 0.30
75 < ID ≤ 100	± 0.40
100 < ID ≤ 150	± 0.50
150 < ID ≤ 200	± 0.70
200 < ID ≤ 300	± 1.00
300 < ID ≤ 500	± 1.50
500 < ID ≤ 1250	± 2.00

Inside Diameter inches	Maximum Deviation inches
0.118 < ID ≤ 0.394	± 0.004
0.394 < ID ≤ 1.181	± 0.006
1.181 < ID ≤ 1.969	± 0.008
1.969 < ID ≤ 2.953	± 0.012
2.953 < ID ≤ 3.937	± 0.016
3.937 < ID ≤ 5.906	± 0.020
5.906 < ID ≤ 7.874	± 0.028
7.874 < ID ≤ 11.811	± 0.039
11.811 < ID ≤ 19.685	± 0.059
19.685 < ID ≤ 49.213	± 0.079

Tolerance charts continued on next page...



## Lamitex Tube Tolerances

Outside Diameter mm	Maximum Deviation mm
3 < OD ≤ 20	± 0.10
10 < OD ≤ 25	± 0.20
25 < OD ≤ 50	± 0.25
50 < OD ≤ 75	± 0.30
75 < OD ≤ 100	± 0.35
100 < OD ≤ 125	± 0.45
125 < OD ≤ 200	± 0.50
200 < OD ≤ 300	± 1.00
300 < OD ≤ 500	± 1.50
500 < OD ≤ 1270	± 2.00

Outside Diameter inches	Maximum Deviation inches
0.118 < OD ≤ 0.787	± 0.004
0.394 < OD ≤ 0.984	± 0.008
0.984 < OD ≤ 1.969	± 0.010
1.969 < OD ≤ 2.953	± 0.012
2.953 < OD ≤ 3.937	± 0.014
3.937 < OD ≤ 4.921	± 0.018
4.921 < OD ≤ 7.874	± 0.020
7.874 < OD ≤ 11.811	± 0.039
11.811 < OD ≤ 19.685	± 0.059
19.685 < OD ≤ 50.000	± 0.079

Wall Thickness mm	Maximum Deviation mm
0.8 < T ≤ 1.5	± 0.25
1.5 < T ≤ 3	± 0.40
3 < T ≤ 6	± 0.50
6 < T ≤ 12	± 0.80
12 < T ≤ 25	± 1.20
25 < T	± 1.60

Wall Thickness inches	Maximum Deviation inches
0.031 < T ≤ 0.059	± 0.010
0.059 < T ≤ 0.118	± 0.016
0.118 < T ≤ 0.236	± 0.020
0.236 < T ≤ 0.472	± 0.031
0.472 < T ≤ 0.984	± 0.047
0.984 < T	± 0.063

## Lamitex Tube Sizes

Tube Grades	Standard lengths for tubes				
	Inside Diameter (minimum inches)	Inside Diameter (maximum inches)	Manufacturing lengths (inches)		
PAPER PHENOLIC XX (NATURAL)	.118	.331	59.1		
	.335	.394	53.1		
	>.394	3.937	53.1	59.1	65
	>3.937	49.2	48	53.1	65
PAPER PHENOLIC XXX (NATURAL)	>.472	49.2	50	65	
BLACK PAPER PHENOLIC XXX	.118	.394	40.9		
	>.394	11.811	53.1		
CE CANVAS PHENOLIC	>.256	.591	53.1		
	>.591	49.2	57.1		
CYB CANVAS GRAPHITE PHENOLIC	>.256	49.2	57.1		
LE LINEN PHENOLIC	.118	.591	53.1		
	>.591	49.2	57.1		
LEB BLEACHED LINEN PHENOLIC	.118	49.2	47.2		
G10 GLASS EPOXY	.118	.591	48		
G10/FR GLASS EPOXY	>.591	49.2	48	65	
G11 GLASS EPOXY					
G7 GLASS SILICONE	.118	49.2	48		
G5/G9 GLASS MELAMINE					
G30 GLASS POLYIMIDE					
G3 GLASS PHENOLIC	>.315	49.2	48		

# Glass Epoxy Filament Wound Tubes



Filament wound tubes and shapes have exceptional interlaminar shear strength. Glass/epoxy resin ratios, winding tensions and pre-determined wind angles give directional strength as required for each application. Tubes weighing half as much and with equal strengths as similar size aluminum tubes may have 33% thinner walls. Glass/epoxy filament wound tubes can be machined to close tolerances.

Glass and epoxy materials offer excellent resistance to weather, ultraviolet radiation, temperature extremes and moisture. Halogen-free epoxies are suitable for salt water environments. Glass/epoxy composites are also excellent electrical insulators, are non magnetic and will not interfere with radar or radio frequency signals. With few exceptions, filament wound materials are more resistant to chemical corrosion than stainless steel, monel and titanium.

Various epoxy resin formulations are available with 135°C, 155°C, 180°C, 200°C and cryogenic continuous use ratings. Tubes can be made with flame retardant epoxy resins. The standard natural color is light green; however tubes can be made in custom colors.

Tubes can be made with an ID as small as .187" and as big as 48". Standard lengths are 90" to 96", depending on the ID size, and some sizes are available up to 16' long.

## Typical Properties

Thermal Conductivity	K = 2.5 Btu/in/hr/sq.ft/deg. F
Thermal Expansion	4-7 x 10-8 in/in/deg. F
Density	.07/. 076 lbs/in3
Perpendicular Electric Breakdown	350 V/mil
Axial Tensile Strength	10 x 103 psi
Axial Tensile Strength	15 x 103 psi
Hoop Strength	60 x 103 psi
Flexural Strength	20 x 103 psi
Flexural modulus	2.5 x 105 psi
Shear Modulus	.85 x 105 psi
Water Absorption	24 hrs 0.1%

\* All values are average test results from typical production material. No warranty is implied or guaranteed and testing is recommended for each application.

# Vulcanized Franklin Fibre™

Vulcanized Franklin Fibre™ is a very hard, dense homogeneous material, possessing a wide range of favorable properties. Franklin Fibre™ ranks high as an electrical insulator. It does not carbonize readily when subjected to arcing, and gives off a gas which tends to quench the arc. Vulcanized Franklin Fibre™ Tubing is moisture conditioned and then rolled under pressure to finished inside diameter and oversized outside diameter. The outside diameter is then finished, ground to size and buffed.

Vulcanized Franklin Fibre™ can easily be worked by practically all conventional machining methods, and responds readily to severe forming operations.

Vulcanized Franklin Fibre™ is available in sheet, rod, tubing and roll or coil stock. Standard colors are Red, Gray and Black.

## Vulcanized Franklin Fibre Sizes

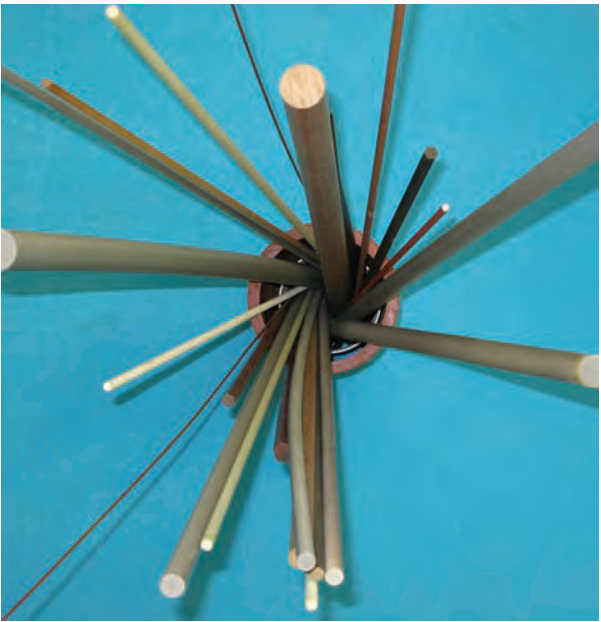
Mandrel Wound tubes, accurately ground to size are available in sizes from 3/8" ID to 1" OD in 1/16" increments and from 1" ID to 4" OD in 1/8" increments approximately 42" or 48" long. (Smaller diameter tubes may be available and may be shorter in length, please consult factory.)

Franklin Fibre™ is a trademark of Franklin Fibre-Lamitex Corp.

# Round Rods

Rods are supplied in two forms: wrapped and molded or ground from sheet stock. Specification of what product fits your needs is dependent upon your application. Please consult with technical sales for assistance in specifying the correct material. Molded rods are available in sizes from .250" to 4" in diameter in lengths 34"-40".

ROUND ROD		
Grade	Diameter Range Inches	
	min.	max.
Paper phenolic	0.062	2.000
Canvas phenolic	0.125	6.000
Linen phenolic	0.062	6.000
Linen epoxy	0.375	2.000
Glass epoxy	0.062	4.500
Glass melamine	0.062	4.000
Glass silicone	0.250	2.000
Glass polyester	0.125	1.500
Nominal lengths: 36" to 48"		



# Mold-Laminated



Laminations which are cut to shape to fit a mold are known as mold-laminated. This type of molding is preferred and economical when the quantities involved are sufficient to warrant the cost of a mold over that of extensive and intricate machining.

Tests indicate that mold-laminated mechanical and electrical properties are almost identical to parts machined from laminated sheet stock. Similar properties include tensile strength, moisture resistance, specific gravity and dielectric strength. There are however three distinct advantages of mold-laminated products over conventional machined parts: mold-laminated parts require less machining, are cosmetically more appealing and have specific higher mechanical strengths.

SQUARE & RECTANGULAR TUBE – MOLDED GRADES				
Grade	ID Range Inches		OD Range Inches	
	min.	max.	min.	max.
Paper phenolic	0.187	5.875	0.312	6.000
Canvas phenolic	0.187	5.875	0.312	6.000
Linen phenolic	0.187	5.875	0.312	6.000
Linen epoxy	0.187	5.875	0.312	6.000
Glass epoxy	0.187	5.875	0.312	6.000
Glass melamine	0.187	5.875	0.312	6.000
Glass silicone	0.187	5.875	0.312	6.000
Available in 36" to 48" lengths				
Wall thicknesses: dependent upon available tooling — check factory				

## Channel & Angle

Channel & Angle sections are molded to size and/or cut from square or rectangular tubes. Sizes can be determined by referring to the sections above. Deduct 1/8" to 1/4" from the relevant internal dimension(s) to allow for the cut.



# Experience and Modern Fabrication Facilities You Can Rely On

Franklin is equipped to handle any tube fabricating need you may have. We are continually improving our technical expertise and fabricating capabilities to keep ahead of the ever increasing demands of industry. Franklin fabricates thermoplastic materials, vulcanized fibre and all NEMA grade phenolics, epoxies, melamines and glass polyesters. We specialize in the fabrication of glass, Kevlar® and graphite-filled composite sheet and tube.

CNC lathes are used to hold tight tolerances where required for all turning work and can swing up to 25.5" diameter and 48" in length. Franklin is very experienced in turning all types of plastics and thermoset materials. By utilizing the latest technologies, Franklin continues to build experience in machining difficult materials. Vast inventories of tubing and rod stock are immediately accessible for the production of your specific needs. Large and small quantity orders for machined parts are processed routinely, and CNC lathes provide an economical solution for turning large tubes.



Multiple spindle CNC horizontal and vertical machining centers produce parts 1/4" wide to 10 feet long. CNC saws are able to cut blocks and strips with +/- .005" tolerances and material can be ground or sanded to +/- .0015" thickness tolerances.



- Multiple spindle machines for medium to high volume production.
- 6-Axis fabrication capability for our customers' most imaginative parts.
- Fabrication of parts from our large inventory of tubes and rods.
- Fabrication of parts from custom formulated Lamitex sheets.
- Reverse engineering of fabricated parts.
- Milling, shaping, beveling, molding, vacuum forming, extruding, laminating, turning, routing, punching, die cutting, welding, grinding, drilling, scoring, slitting, chamfering and shearing.
- Secondary operations: hot oil baking, oil soaking, deburring, sand blasting, polishing, coating, painting, silk screening, hot stamping, engraving, numbering, labeling and assembly.

## Value Added Fabricating Services

- CAD/CAM capability to receive CAD drawings on diskette for uploading to CAM system.
- Prepaid materials held in stock for future release.
- Blanket order processing.
- Just-In-Time Delivery performance.
- Kanban Inventory System Compatible.
- 24 Hour turnover on cut-to-size stock orders.
- Experienced in export sales.

Kevlar® is a registered trademark of the Dupont Company.

## Industries Served By Franklin

- |                      |                      |                           |
|----------------------|----------------------|---------------------------|
| ■ Electronics        | ■ Power Distribution | ■ Consumer Goods          |
| ■ Switch Gear        | ■ Power Generation   | ■ Plastic Distribution    |
| ■ Transformers       | ■ Switches           | ■ High Voltage Insulation |
| ■ Arc Furnaces       | ■ Utility            | ■ And many others         |
| ■ Ceramic Capacitors | ■ Defense            |                           |



FRANKLIN FIBRE-LAMITEX CORPORATION  
SERVING INDUSTRY SINCE 1921

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# Grades of Lamitex Tubing

Corresponding To Government Agencies Specifications

Lamitex/ NEMA Grade	Military Spec	Military Spec. Type	Navy 17-P-5 Type	Army 71-484 Type	ASTM (D-709) Type	MIL-I- 24768	Federal Spec. L-L-31 (Formerly HHP-254) Type	Grade	Grade Description
X	-	PMB	PBM	I	I	/12	I	X	Paper Filler-Hard Phenolic Resin
XP	-	PMB-P	PBP	-	I-1	/19	I	P	Paper Filler- Plasticized Phenolic Resin
XPC	-	PMB-PC	-	-	I	/20	I	PC	Paper Filler- Plasticized Phenolic Resin
XX	MIL-P-3115	PBG	PBG	I	I	/11	I	XX	Paper Filler-Hard Phenolic Resin
XXP	-	PBM-P	-	-	I-2	/21	I	XXP	Paper Filler- Plasticized Phenolic Resin-For Hot Punching
XXX	MIL-P-3115	PBE	PBE	I	I-4	/10	I	XXX	Paper Filler-Hard Phenolic Resin
FR2	-	PBE-PCF	-	-	-	/25	-	-	Paper Filler- Plasticized Phenolic
C	MIL-P-15035 MIL-P-55072*	FBM	FBM	II	II	/16	II	C	Medium Weight Cotton Fabric
CE	MIL-P-15035	FBG	FBG	II	II-5	/14	II	CE	Filler-Hard Phenolic Resin
CYB	MIL-P-5431	-	-	-	-	-	-	-	Medium Weight Cotton Fabric Filler-Hard Phenolic Resin With Graphite Inclusion
L	MIL-P-15035	FBI	FBI	II	II	/15	II	L	Fine Weave Cotton Fabric Filler
LE	MIL-P-15035	FBE	FBE	II	II-5	/13	II	LE	Hard Phenolic Resin
LYB	MIL-P-5431	-	-	-	-	-	-	-	Fine Weave Cotton Fabric Filler-Hard Phenolic Resin With Graphite Inclusion
G3	-	GPG	-	-	-	/18	IV	G-3	Glass Cloth Filler Phenolic Resin
G5	MIL-15037	GMG	GMG	-	IV	/8	IV	G-5	Continuous Filament Glass Cloth Filler-Melamine Resin
G7	MIL-P-997	GSG	GSG	-	IV	/17	IV	G-7	Continuous Filament Glass Cloth Filler-Silicone Resin
G9	MIL-P-15037	GME	-	-	IV	/1	IV	-	Glass Cloth Filler Melamine Resin
G10	MIL-P-18177	GEE	-	-	IV	/2	-	-	Continuous Filament Glass Cloth Filler-Epoxy Resin
G11	MIL-P-18177	GEB	-	-	IV	/3	-	-	Continuous Filament Glass Cloth Filler-Epoxy Resin
FR4	-	GEE-F	-	-	IV	/27	IV	-	Glass Cloth Filler Epoxy FR Resin
FR5	-	GEB-F	-	-	IV	/28	IV	-	Glass Cloth Filler Epoxy FR Resin
N1	MIL-P-15047	NPG	-	-	V	/9	V	N-1	Nylon Fabric Filler-Phenolic Resin

## Franklin's Process Controls Are Your Quality Assurance

At Franklin, Quality Assurance is not just a "buzzword". Designing, producing, and delivering first-class products and parts requires strict quality control in every phase of product inspection, development and production. We use the latest quality verification equipment to document every step of the manufacturing process in the production and delivery of first-class products and parts. This guarantees specified tolerances and parts are "free of any defect".

Our commitment is to provide our customers with the highest quality precision parts available in the market place. All parts undergo careful inspection before they leave our plant to assure that we deliver the finest quality parts to our customers the first time...every time.

1-800-233-9739

[www.franklinfibre.com](http://www.franklinfibre.com)

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