

Fiber Reinforced Molded Lumber (MF) Specifications

Section 06 50 00

Part 1: General

1.1 SECTION INCLUDES

- A. Composite HDPE structural plastic shapes including the following:
 - a. General lumber shapes for structures
 - b. Decking
 - c. Columns, posts and railings
 - d. Beams, joists and bracing
 - e. Stair treads, risers and stringers
 - f. Sleepers and ledger boards
 - g. Retaining wall posts and lagging
 - h. Marine piles, wales, bull rails, rub rails
 - i. Fence posts, rails, vineyard and orchard posts
 - j. Refer to website www.tangentmaterials.com for other applications.

1.2 RELATED SECTIONS

- A. Section 06 10 00 - Rough Carpentry
- B. Section 06 20 00 - Finish Carpentry
- C. Section 06 - 1100 - Wood Framing

1.3 REFERENCES

- A. ASTM D6109 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastic Lumber and Related Products.
- B. ASTM D638 - Standard Test Method for Tensile Properties of Plastics
- C. ASTM D2344 - Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates.

- D. ASTM D6341 – Standard Test Method for Determination of the Linear Coefficient of Thermal Expansion of Plastic Lumber and Plastic Lumber Shapes Between -30 and 140°F (-34.4 and 60°C)
- E. ASTM D792 – Standard Test Method for Density and Specific Gravity (Relative Density) of Plastics by Displacement.
- F. ASTM D570 – Standard Test Method for Water Absorption of Plastics.
- G. ASTM D256 – Standard Test Method for Determining the Izod Pendulum Impact Resistance of Plastics.
- H. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
- I. ASTM D543 – Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.
- J. ASTM D4329 – Standard Practice for Fluorescent Ultraviolet (UV) Lamp Apparatus Exposure of Plastics.
- K. ASTM D4060 – Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
- L. ASTM D2394 – Standard Test Methods for Simulated Service Testing of Wood and Wood-Based Finish flooring.
- M. ASTM D6117 - Standard Test Methods for Mechanical Fasteners in Plastic Lumber and Shapes.
- N. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

- A. Structural Performance – **Decking or Weak Axis Orientation**
 - a. Maximum deck board spans from 60 – 200 pounds per square foot live loads for temperatures from 78°F to 122°F
- B. Structural Performance – **Joist or Strong Axis Orientation**
 - a. Maximum joist spans from 60 – 200 pounds per square foot live loads at 120°F for on-center spacings of 12”, 16” and 24”.
- C. Decking and Joist Span Data may be found at: <https://tangentmaterials.com/wp-content/uploads/2023/05/SMA002-230206-Tech-Manual-MF-Fiber-Reinforced-Molded-Lumber.pdf>
- D. Surface Burning and Smoke Developed Data per ASTM E84.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01 30 00 – Administrative Requirements
- B. Product data to include:
 - a. Shop drawings for all applicable shapes including standard tolerances and all secondary operation details
 - b. Product brochure
 - c. Product user’s field and installation guide
 - d. Test results against ASTM Standards upon request
 - e. Samples representing actual product color and finish upon request

1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.
- B. Manufacturer’s Qualifications: Minimum 10 years experience manufacturing similar products.
- C. Installers Qualifications: Minimum 2 years experience installing similar products

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store Tangent products in dunnage provided by manufacturer. If provided, keep bundles covered in wraps shipped with product.
- B. Store all products on a flat and level surface.
- C. Comply with manufacturers recommendations. Handle materials to avoid damage.

1.8 WARRANTY

- A. Provide manufacturer’s limited warranty against structural damage due to termites or fungal decay and splitting or splintering for a period of 50 years beginning on the original date of purchase of the product.
- B. Specific terms for MF product warranty can be found at: <https://tangentmaterials.com/wp-content/uploads/2021/01/TTD001-221223-Tangent-Limited-Product-Warranty.pdf>

Part 2: Products




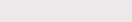
2.1 MANUFACTURERS








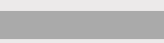



- A. Contract documents are based upon products manufactured and supplied by Tangent Technologies LLC, 1001 Sullivan Rd., Aurora, IL 60506.
- B. Substitutions: Not permitted under Section 01.








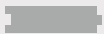






2.2 APPLICATIONS / SCOPE


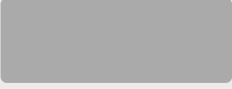

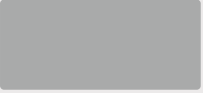






- A. Plastic/fiberglass composite lumber
 - a. Material description: Composite lumber consisting of recycled, high-density polyethylene (HDPE) and fiberglass strands. The product is molded into shapes and sizes as depicted in the table below.
 - b. Maximum lengths range from 16' to 40' depending upon shape. Consult a Tangent sales representative for available lengths.
 - c. Color to be specified from Tangent's standard list of colors.






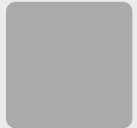

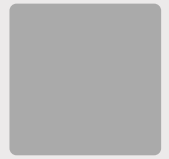

FIBER REINFORCED MOLDED LUMBER PROFILE LIST









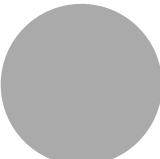
| Shape | Nominal Profile | Actual Dimensions (in x in) | Longest Length (ft) | Approx. Weight (lb/ft) | Actual Dimensions (cm x cm) | Longest Length (m) | Approx. Weight (kg/m) |
|---|-----------------|--------------------------------|------------------------|---------------------------|--------------------------------|-----------------------|--------------------------|
|  | 5/4 x 2 7/8 | 1.10 x 2.88 | 7.5 | 1.4 | 2.8 x 7.3 | 2.3 | 2.1 |
|  | 5/4 x 4 | 1.10 x 3.54 | 8 | 1.5 | 2.8 x 9.0 | 2.4 | 2.3 |
|  | 5/4 x 6 | 1.10 x 5.52 | 12 | 2.3 | 2.8 x 14.0 | 3.7 | 3.4 |
|  | 5/4 x 8 | 1.10 x 7.40 | 12 | 3.1 | 2.8 x 18.8 | 3.7 | 4.6 |







| Shape | Nominal Profile | Actual Dimensions (in x in) | Longest Length (ft) | Approx. Weight (lb/ft) | Actual Dimensions (cm x cm) | Longest Length (m) | Approx. Weight (kg/m) |
|---|------------------|--------------------------------|------------------------|---------------------------|--------------------------------|-----------------------|--------------------------|
|  | 2 x 2 | 1.60 x 1.60 | 7.5 | 1.0 | 4.1 x 4.1 | 2.3 | 1.5 |
|  | 2 x 3 | 1.60 x 2.60 | 7.5 | 1.6 | 4.1 x 6.6 | 2.3 | 2.4 |
|  | 2 x 4 | 1.45 x 3.43 | 16 | 2.2 | 3.7 x 8.7 | 4.9 | 3.3 |
|  | 2 x 4 BN | 1.45 x 3.50 | 12 | 2.2 | 3.7 x 8.9 | 3.7 | 3.3 |
|  | 2 x 6 | 1.46 x 5.44 | 16 | 3.5 | 3.7 x 13.8 | 4.9 | 5.2 |
|  | 2 x 6 Sq. Corner | 1.46 x 5.44 | 20 | 3.5 | 3.7 x 13.8 | 6.1 | 5.2 |
|  | 2 x 8 | 1.50 x 7.40 | 18 | 4.2 | 3.8 x 18.8 | 5.5 | 6.3 |
|  | 2 x 10 | 1.46 x 9.26 | 16 | 5.4 | 3.7 x 23.5 | 4.9 | 8.0 |
|  | 2 x 12 | 1.46 x 11.25 | 16 | 6.5 | 3.7 x 28.6 | 4.9 | 9.7 |
|  | 2 x 5 1/2 True | 1.99 x 5.49 | 16 | 4.8 | 5.1 x 13.9 | 4.9 | 7.1 |
|  | 2 x 7 True | 1.98 x 6.95 | 16 | 6.1 | 5.1 x 17.7 | 4.9 | 9.0 |

| Shape | Nominal Profile | Actual Dimensions (in x in) | Longest Length (ft) | Approx. Weight (lb/ft) | Actual Dimensions (cm x cm) | Longest Length (m) | Approx. Weight (kg/m) |
|---|-----------------|-----------------------------|---------------------|------------------------|-----------------------------|--------------------|-----------------------|
|  | 2 x 24 | 1.95 x 23.98 | 10 | 20.6 | 5.0 x 60.9 | 3.1 | 30.8 |
|  | 3 x 4 | 2.40 x 3.38 | 16 | 3.4 | 6.1 x 8.6 | 4.9 | 5.0 |
|  | 3 x 4 BN | 2.40 x 3.40 | 16 | 3.4 | 6.1 x 8.6 | 4.9 | 5.0 |
|  | 3 x 6 | 2.38 x 5.42 | 16 | 5.1 | 6.0 x 13.8 | 4.9 | 7.6 |
|  | 3 x 8 | 2.45 x 7.38 | 16 | 7.0 | 6.2 x 18.7 | 4.9 | 10.4 |
|  | 3 x 8 BN | 2.40 x 7.30 | 16 | 7.0 | 6.1 x 18.5 | 4.9 | 10.4 |
|  | 3 x 10 | 2.40 x 9.30 | 16 | 8.9 | 6.1 x 23.6 | 4.9 | 13.3 |
|  | 3 x 10 T&G | 2.44 x 9.10 | 20 | 8.9 | 6.2 x 23.1 | 6.1 | 13.3 |
|  | 3 x 12 | 2.40 x 11.30 | 16 | 10.8 | 6.2 x 28.7 | 4.9 | 16.0 |
|  | 3 x 3 3/4 True | 2.91 x 3.64 | 16 | 4.7 | 7.4 x 9.2 | 4.9 | 7.0 |
|  | 3 x 24 True | 2.95 x 23.92 | 10 | 31.1 | 7.5 x 60.8 | 3.1 | 46.6 |
|  | 4 x 4 | 3.45 x 3.45 | 16 | 4.8 | 8.8 x 8.8 | 4.9 | 7.0 |
|  | 4 x 6 | 3.38 x 5.38 | 20 | 7.2 | 8.6 x 13.7 | 6.1 | 10.7 |
|  | 4 x 8 | 3.38 x 7.38 | 20 | 9.8 | 8.6 x 18.7 | 6.1 | 14.6 |

| Shape | Nominal Profile | Actual Dimensions (in x in) | Longest Length (ft) | Approx. Weight (lb/ft) | Actual Dimensions (cm x cm) | Longest Length (m) | Approx. Weight (kg/m) |
|---|-----------------|--------------------------------|------------------------|---------------------------|--------------------------------|-----------------------|--------------------------|
|  | 4 x 10 | 3.44 x 9.50 | 20 | 14.4 | 8.8 x 24.1 | 6.1 | 21.5 |
|  | 4 x 12 | 3.44 x 11.25 | 20 | 15.0 | 8.8 x 28.6 | 6.1 | 22.4 |
|  | 4 x 4 True | 3.94 x 3.94 | 16 | 5.9 | 10.0 x 10.0 | 4.9 | 8.8 |
|  | 4 1/2 x 10 True | 4.48 x 9.95 | 16 | 19.6 | 11.4 x 25.3 | 4.9 | 29.3 |
|  | 5 x 5 | 4.37 x 4.37 | 20 | 7.6 | 11.1 x 11.1 | 6.1 | 11.3 |
|  | 6 x 6 | 5.38 x 5.38 | 16 | 11.5 | 13.7 x 13.7 | 4.9 | 17.2 |
|  | 6 x 8 | 5.40 x 7.38 | 32 | 16.0 | 13.7 x 18.7 | 9.7 | 24.0 |
|  | 6 x 10 | 5.40 x 9.38 | 20 | 22.3 | 13.7 x 23.8 | 6.1 | 33.4 |
|  | 6 x 12 | 5.37 x 11.25 | 16 | 25.0 | 13.6 x 28.6 | 4.9 | 37.4 |
|  | 6 x 6 True | 5.88 x 5.88 | 16 | 15.2 | 14.9 x 14.9 | 4.9 | 22.7 |

| Shape | Nominal Profile | Actual Dimensions (in x in) | Longest Length (ft) | Approx. Weight (lb/ft) | Actual Dimensions (cm x cm) | Longest Length (m) | Approx. Weight (kg/m) |
|---|-----------------|-----------------------------|---------------------|------------------------|-----------------------------|--------------------|-----------------------|
|  | 6 x 16 True | 5.88 x 15.56 | 24 | 40.3 | 14.9 x 39.5 | 7.3 | 60.4 |
|  | 7 x 10 True | 6.96 x 9.95 | 17 | 30.5 | 17.7 x 25.3 | 5.2 | 45.7 |
|  | 8 x 8 | 7.40 x 7.40 | 24 | 22.0 | 18.8 x 18.8 | 7.3 | 33.0 |
|  | 8 x 10 | 7.40 x 9.38 | 17 | 28.0 | 18.8 x 23.8 | 5.2 | 42.0 |
|  | 8 x 12 | 7.40 x 11.38 | 24 | 33.0 | 18.8 x 28.9 | 7.3 | 49.4 |
|  | 10 x 10 | 9.75 x 9.75 | 41 | 40.0 | 24.7 x 24.7 | 12.5 | 60.0 |
|  | 10 x 12 | 9.75 x 11.75 | 25 | 48.0 | 24.7 x 29.8 | 7.6 | 72.0 |
|  | 12 x 12 | 11.75 x 11.75 | 41 | 56.0 | 29.8 x 29.8 | 12.5 | 84.0 |
|  | 12 x 16 | 11.75 x 15.75 | 25 | 77.0 | 29.8 x 40.0 | 7.6 | 115.4 |

| Shape | Nominal Profile | Actual Dimensions (in x in) | Longest Length (ft) | Approx. Weight (lb/ft) | Actual Dimensions (cm x cm) | Longest Length (m) | Approx. Weight (kg/m) |
|---|-----------------|--------------------------------|------------------------|---------------------------|--------------------------------|-----------------------|--------------------------|
|  | 1 3/8" Round | 1.34 diameter | 8 | 0.6 | 3.4 diameter | 2.4 | 0.9 |
|  | 2 1/2" Round | 2.30 diameter | 10 | 1.8 | 5.8 diameter | 3.1 | 2.6 |
|  | 3 1/2" Round | 3.48 diameter | 16 | 4.2 | 8.8 diameter | 4.9 | 6.2 |
|  | 4" Round | 3.88 diameter | 16 | 4.8 | 9.8 diameter | 4.9 | 7.1 |
|  | 5" Round | 4.85 diameter | 16 | 8.1 | 12.3 diameter | 4.9 | 12.1 |
|  | 6" Round | 5.81 diameter | 16 | 11.7 | 14.7 diameter | 4.9 | 17.5 |
|  | 8" Round | 7.51 diameter | 34 | 19.5 | 19.1 diameter | 10.4 | 29.2 |
|  | 8 1/2" Round | 8.30 diameter | 20 | 23.9 | 21.1 diameter | 6.1 | 35.8 |
|  | 10" Round | 9.83 diameter | 24 | 28.3 | 25.0 diameter | 7.3 | 42.4 |

| Shape | Nominal Profile | Actual Dimensions (in x in) | Longest Length (ft) | Approx. Weight (lb/ft) | Actual Dimensions (cm x cm) | Longest Length (m) | Approx. Weight (kg/m) |
|---|-------------------|--------------------------------|------------------------|---------------------------|--------------------------------|-----------------------|--------------------------|
|  | HD Parking Curb | 4.48 x 6.40 | 8 | 12.6 | 11.4 x 16.2 | 2.4 | 18.8 |
|  | LD Parking Curb | 4.0 x 5.88 | 8 | 10.4 | 10.2 x 14.9 | 2.4 | 15.5 |
|  | SM Parking Curb | 3.19 x 4.38 | 8 | 6.2 | 8.1 x 11.1 | 2.4 | 9.2 |
|  | Speed Bump | 2.0 tall x 9.8 | 8 | 8.6 | 5.1 tall x 24.9 | 2.4 | 12.8 |
|  | 2.5 x 3.5 Stadium | 2.50 x 3.50 | 16 | 3.9 | 6.3 x 8.9 | 4.9 | 5.8 |
|  | Octagon 5.5 | 5.32 | 17 | 9.8 | 13.5 | 5.2 | 14.6 |

2.3 MATERIAL AND STRUCTURAL PROPERTIES

- A. Coefficient of thermal expansion for Fiber Reinforced Molded Lumber is 0.000033 in/in/°F. Allow for expansion and contraction at butt-joints. Provide gaps between butted deck boards per the following chart:

| Board temperature at time of installation (heat soaked) (°F) | Board Length (ft) | Ideal Gap between butt end boards (in) |
|--|-------------------|--|
| 110 | 4 | 0 |
| 110 | 8 | 1/16 |
| 110 | 10 | 1/16 |
| 110 | 12 | 1/16 |
| 110 | 16 | 1/8 |
| 90 | 4 | 1/16 |
| 90 | 8 | 1/8 |
| 90 | 10 | 1/8 |
| 90 | 12 | 3/16 |
| 90 | 16 | 1/4 |
| 70 | 4 | 1/16 |
| 70 | 8 | 3/16 |
| 70 | 10 | 3/16 |
| 70 | 12 | 1/4 |
| 70 | 16 | 3/8 |
| 50 | 4 | 1/8 |
| 50 | 8 | 1/4 |
| 50 | 10 | 5/16 |
| 50 | 12 | 3/8 |
| 50 | 16 | 1/2 |

B. Material and structural properties¹ are as follows.

| Test | ASTM Test | Value (US) | Value (Metric) |
|--|-----------|--|--------------------------|
| Flexural Strength | D6109 | 2750 psi | 193 kg/cm ² |
| Flexural Modulus Secant @ 1% Strain | D6109 | 306080 psi | 21520 kg/cm ² |
| Compression Strength Parallel to Grain | D6108 | 2842 psi | 200 kg/cm ² |
| Compression Strength Perpendicular to Grain | D6108 | 1482 psi | 104 kg/cm ² |
| Compression Modulus Strength Parallel to Grain - Secant @ 1% Strain | D6108 | 159576 psi | 11219 kg/cm ² |
| Compression Modulus Strength Perpendicular to Grain - Secant @ 1% Strain | D6108 | 54119 psi | 3804 kg/cm ² |
| Specific Gravity | D6111 | 0.93 g/cc | 0.93 g/cc |
| Flash Point | | 644°F | 340°C |
| Moisture Absorption | | 0.06% by Weight | 0.06% by Weight |
| Thermal Expansion | D6341-98 | 0.000033 in/in/°F | |
| Average Screw Pull Out | D6117 | 646 lbs | 293 kg |
| Static Coefficient of Friction - Dry | D2394 | .53 | |
| Static Coefficient of Friction - Wet | D2394 | .51 | |
| Sliding Coefficient of Friction - Dry | D2394 | .23 | |
| Sliding Coefficient of Friction - Wet | D2394 | .51 | |
| Flame Spread | E84 | 62 | |
| Flame Spread Classification | E84 | 60 | |
| Smoke Developed | E84 | 230 | |
| Smoke Developed Classification | E84 | 250 | |
| Spontaneous Ignition | D1929 | 824°F | 440°C |
| Tensile Test (skin) | D638 | 3623 psi | 254 kg/cm ² |
| Shear Strength | D2344 | 800 psi | 56 kg/cm ² |
| Notched Impact Resistance Method A | D256 | 2.77 ft x lb / in | |
| Abrasion Resistance | D4060 | <0.02 oz - with 2.2 lb sample | |
| Ultraviolet (skin) | D4329 | <10% change in Type D durometer at 500 hours | |

¹ Structural properties are ultimate values. Load and resistance factors (LRFD) or safety factors (ASD) should be applied as deemed necessary by a licensed, qualified design professional

2.4 ACCESSORIES

- A. Fasteners
 - a. Use corrosion-resistant through-bolts, locking nuts and oversize flat washers for connections as recommended by fastener manufacturer.
 - b. Pre-bore holes for lag/deck screws for fastening decking as recommended by manufacturer.
 - c. Nails are not recommended for use with Fiber Reinforced Molded Lumber.

Part 3: Execution

3.1 INSTALLATION

- A. Install according to Tangent's MF installation guidelines: <https://tangentmaterials.com/wp-content/uploads/2023/05/SMA003-230310-Field-Installation-Guide-ML-MF-MB.pdf>
- B. Cut, drill, and rout using carbine-tipped bits and blades.

3.2 CLEANING

- A. Pressure-wash to remove general dirt and grime. Keep pressure washer nozzle an adequate distance from material to be cleaned to avoid damage from spray.

DISCLAIMER:

Tangent Technologies, LLC guide specifications have been written as an aid to the professionally-qualified specifier and design professional. The use of this guideline specification requires the sole professional judgement and expertise of the qualified specifier and design professional to adapt the information to the specific needs for the building owner and the project, to coordinate with their construction document process, and to meet all applicable building codes, regulations and statues or laws.