# Milwaukee Composites

*Designed For Life*

MANUFACTURER OF ADVANCED PHENOLIC COMPOSITE PANELS FOR THE MASS TRANSIT INDUSTRY


# WHO ARE WE?

**We are an engineering focused company who is committed to providing innovative products**

# WHERE ARE WE LOCATED?

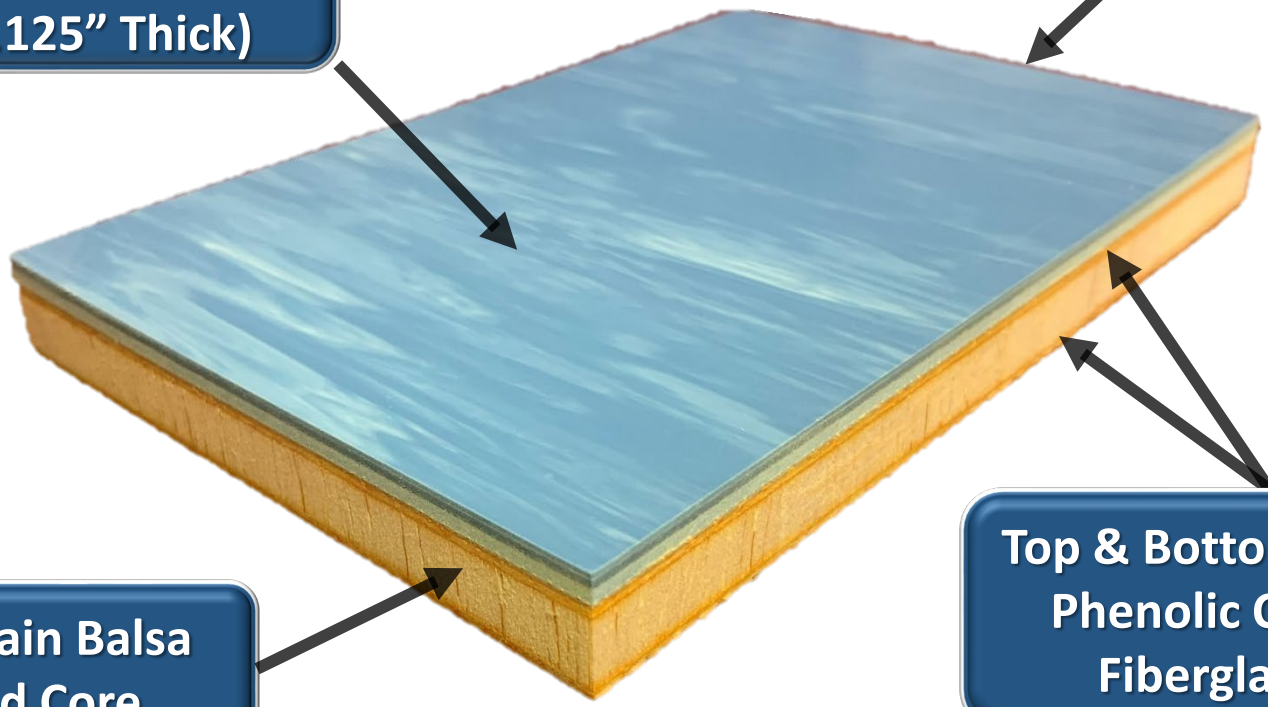
**Headquarters:**

* Cudahy, WI
* 140,000 ft² (13,000 m²) Facility
* (95) Employees
* ISO 9001: 2015


**Representation:**

- India: Ashok Joshi
- Japan: GSI Creos
- China: James Chen
- Europe: Ian Duffy
- S. Korea: Choi Byung Cheon

# CURRENT PHENOLIC COMPOSITE PANEL CONSTRUCTION



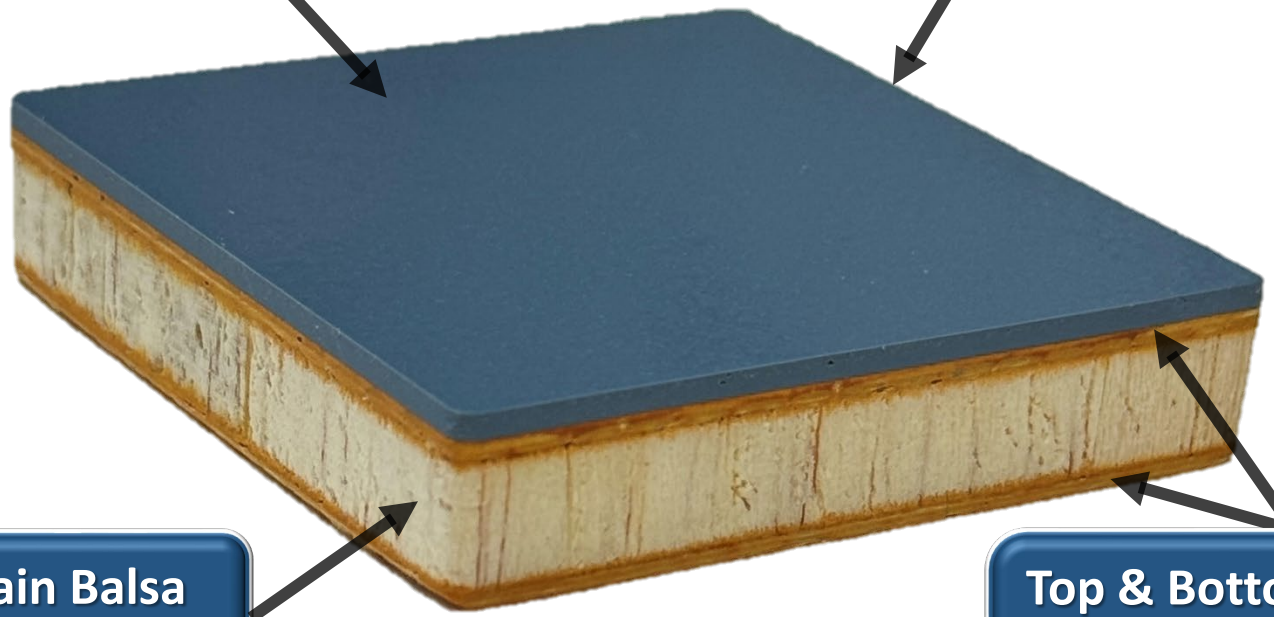
Lonseal Lonmat Marbleized Blue (0.125” Thick)

0.560” THICK FALSE DECK

End-Grain Balsa Wood Core

Top & Bottom Structural Phenolic Composite Fiberglass Skins

# PROPOSED PHENOLIC COMPOSITE PANEL CONSTRUCTION



MCI Tough Coat MC-1
(0.060” Thick)

0.560” THICK
FALSE DECK

End-Grain Balsa
Wood Core

Top & Bottom Structural
Phenolic Composite
Fiberglass Skins

# FALSE DECK COMPARISON

## Current Lonmat:

* Total Deck Thickness: 0.560”
* Phenolic Panel Thickness: 0.400”
  - Skin Thickness: 0.050”
  - Balsa Thickness: 0.300”
* Lonmat Thickness: 0.130”
* Adhesive Thickness: 0.030”
* Process: Compression Molding
* Areal Weight 2: 2.44 lb/ft$^2$
* Lonmat Lead-time: 12-14 weeks
  - Produced in Japan

## Proposed Tough Coat:

* Total Deck Thickness: 0.560”
* Phenolic Panel Thickness: 0.500”
  - Skin Thickness: 0.050”
  - Balsa Thickness: 0.400”
* MCI Coating Thickness: 0.060”
  - Includes 0.005” Primer
* Process: Compression Molding
* Areal Weight 1: < 1.84 lb/ft$^2$
* Coating Lead-time: 2-3 weeks
  - US Materials / Processed by MCI

# APPLICATION OF NEW COATING

**Manufacture of Test Coupons and Serial Production:**

* Panel production: The composite panels will be produced using the same compression molding process.

* Mixing of materials: During the trials, MCI found it necessary to invest in a custom variable ratio meter mix system in order to accurately mix and dispense the liquid components (resin/iso).

# APPLICATION OF NEW COATING

**Manufacture of Test Coupons and Serial Production:**

* Application of Materials: MCI originally planned to use a "screeding" process for applying the material. Although it worked well for small coupons, it was determined to not be consistent for larger panels. MCI switched to an injection process that is extremely reliable and repetitive. MCI invested in tooling (18" x 50" and 27" x 50") for production of the test coupons for the NSRP. Upon approval of the coating, MCI will invest in larger tooling (50" x 102") for serial production.

# PROJECT GOALS & OBJECTIVES

* Cost Reduction:  the cost of the new materials and processing could offer a cost reduction

* Weight Reduction:  the reduced thickness of the coating (vs Lonmat) will allow MCI to meet the requirements for Areal Weight 1

* Decreased Lead-Time and US Production

*  Repairability:  the new coating can be repaired easily by sanding the damaged area and re-applying the coating without removing the panel

# OVERVIEW OF TESTING

MCI's phenolic false deck with MCI Tough coat will conform to MIL-PRF-32664 with the following testing:

| # | Test | Test Standard | Test Results |
|---|---|---|---|
| 1 | Dielectric | MIL-DTL-15562G, paragraph 4.6.11 | Pass |
| 2 | Voltage | MIL-DTL-15562G, paragraph 4.6.10 | Need to test (Dielectric test more severe) |
| 3 | Flame | ASTM E162 | Fail; Modified formula to be tested |
| 4 | Smoke (Optical Density) | ASTM E662 | Pass |
| | Toxicity (Flame and Non) | ASTM E800 (flaming and non-flaming) | Pass |
| 5 | Moisture Absorption | ASTM D570 | Passed In-House Testing |
| 6 | Resistance to Cleaning Agents | MIL-PRF-32170 | Need to test |
| 7 | Heat and Light Resistance | ASTM F1514 and ASTM F1515 | Need to test |
| 8 | Light Reflectance | ASTM D523 | Need to test |
| 9 | Wear Resistance | ASTM D4060 | Fail; Currently reviewing fillers |
| 10 | Impact Resistance | ASTM D7766, Procedure C | Passed In-House Testing |
| 11 | Slip Resistance: 1. Leather Shoe, Dry<br>2. Rubber Shoe, Wet & Dry | ASTM D2047 | 1. Equivalent to Lonmat<br>2. Pass |
| 12 | Rolling Load Resistance | CISCA - recommended test procedure for access floors | To be tested after FST (flame, smoke, toxicity), Dielectric, Friction and Wear Resistance.<br>Note: a thicker base panel will provide better mechanical performance than existing panel. |
| 13 | Short Beam Shear Strength | ASTM C393, Three Point Bend | |
| 14 | Long Beam Flexure | ASTM D7249, Four Point , 1/4 span | |
| 15 | Sandwich Compression Strength | ASTM C365 | |
| 16 | Edgewise Compression Strength | ASTM C364 | |
| 17 | Flatwise Tensile Strength | ASTM C297 | |
| 18 | Maximum Panel Deflection Form 1 | per MIL-PRF | |
| 19 | Maximum Panel Deflection Form 2 | per MIL-PRF | |
| 20 | Shock Testing (current and proposed panel) | per MIL-PRF | Need to test |

# STRENGTHS / BENEFITS

- 27 years supplying the global transit industry
- Passionate about innovation
- Maintenance-free Products
- Lightweight
- No corrosion or delamination
- Highest level of fire safety