

# ATSM-2180: METALLIC COMPOSITE MATERIAL MCM

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## Cuyahoga Community College

**Viewing: ATSM-2180 : Metallic Composite Material MCM**

**Board of Trustees:**

January 2021

**Academic Term:**

Fall 2021

**Subject Code**

ATSM - Applied Ind Tech- Sheetmetal

**Course Number:**

2180

**Title:**

Metallic Composite Material MCM

**Catalog Description:**

Advanced course covering the applications of metallic composite materials (MCM) used as decorative and functional external and interior covering on commercial and residential structures. Included are proper handling and layout techniques, waterproofing of various substrates and installation procedures.

**Credit Hour(s):**

3

**Lecture Hour(s):**

3

## Requisites

**Prerequisite and Corequisite**

Departmental approval and a member of the Sheet Metal Workers' union.

## Outcomes

**Course Outcome(s):**

I. Discuss the various types of metallic composite materials (MCM), core materials and different applications used in the construction industry.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define the terms related to MCM.
2. Identify the different materials used as skin and core components.
3. Explain the use of fire-retardant materials used in panel cores.
4. Differentiate between wet and dry panel systems.
5. Explain the use of glazed panel systems.
6. List and describe the use of MCM panels in the building industry.
7. List the properties of MCM panels including flame spread, cost and grain patterns.

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**Course Outcome(s):**

II. Discuss proper handling and storage practices for MCM and panels, fabrication and layout techniques and safety procedures employed for cutting and routing the materials.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. Describe the proper handling and practices required for moving MCM panels.
  2. Explain the importance of protecting MCM panels during storage on job sites or in warehouses.
  3. Outline the processes employed in panel fabrication.
  4. Explain the importance of using carbide blades and router bits for cutting and routing operations.
  5. Identify specific safety procedures that followed for handling, cutting and routing of MCM panels.
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**Course Outcome(s):**

III. Identify the different measuring devices used to establish panel locations and starting points and explain the application of each.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List the various measuring tools and equipment used in MCM installations.
  2. Discuss uses of the spirit level and explain the technique used to determine accuracy of the tool.
  3. Identify different laser types and accessories and discuss calibration of the equipment.
  4. Describe the use of a laser measuring device used to determine building length, width and height measurement elevations, and discuss different applications of the tool.
  5. Explain how 3-D mapping determines field measurements and stores renderings and data.
  6. Explain how transit levels and lasers establish starting points for layout of MCM panels.
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**Course Outcome(s):**

IV. Discuss the purpose of waterproofing different building substrates, identify the types of applied materials and demonstrate the installation techniques.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. List and define the terms related to waterproofing.
  2. Explain the purpose of protecting building substrates using manual and mechanical applications.
  3. List the different types of substrate waterproofing.
  4. Explain how waterproofing flashing and sealants maintain a moisture free building envelope.
  5. Demonstrate the ability to properly install different waterproofing membranes including material layout, application in shingle fashion with correct lap in accordance with industry standards.
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**Course Outcome(s):**

V. Demonstrate the ability to install the wet system of MCM panels including starting point establishment, dimension verification, clip spacing and shimming and flashing provisions.

**Essential Learning Outcome Mapping:**

Critical/Creative Thinking: Analyze, evaluate, and synthesize information in order to consider problems/ideas and transform them in innovative or imaginative ways.

**Objective(s):**

1. Safely operate equipment and tools used for ACM installations in accordance with industry standards.
2. Interpret construction and specific shop drawings to verify panel placement and building dimensions.
3. Calculate MCM spacing dimensions to establish starting panel position and extrapolate placement of flashing height.
4. Address openings, windows and doors, and flashing placement using specific drawing details.
5. Demonstrate the ability to install the specified flashing according to manufacturer's specifications.

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**Methods of Evaluation:**

1. Quizzes
2. Tests
3. Class participation
4. Student must demonstrate proficiency in the tasks presented in this course.

**Course Content Outline:**

## Course Outline

1. MCM panels: types and properties
  - a. Terminology
    - i. Composite
    - ii. Core
    - iii. Polyethylene
    - iv. Polyurethane
    - v. Corrugated
    - vi. Thermal set phenolic resin
    - vii. Thermal brake
    - viii. Expansion
    - ix. Contraction
    - x. Sealed system
    - xi. Substrate
    - xii. Backer rod
    - xiii. Rain screen
    - xiv. Extrusion
    - xv. Spline
    - xvi. Vaproshield
    - xvii. Tyvek
    - xviii. Glazing system
    - xix. Building envelope
    - xx. Cladding
  - b. Materials
    - i. Skin
      1. Stainless steel
      2. Zinc
      3. Copper
      4. Aluminum
        - a. Painted
        - b. Anodized
    - ii. Core
      1. Polyethylene
      2. Polyurethane
      3. Thermoset phenolic resin
      4. Aluminum
      5. Corrugated
      6. Fire retardant
        - a. Mineral fiber
        - b. Polyethylene
  - c. Fire retardant core
    - i. Purpose
      1. Maintain core integrity
      2. Eliminate fuel source
    - ii. Code specific: 40-0 feet or higher
  - d. Wet versus dry panel system
    - i. Wet
      1. Sealed
      2. Direct fasten to substrate
      3. Shim for plumb/square

- 4. Clips
- 5. Substrate
  - a. Plywood
  - b. "c" channel
  - c. "Z" channel
  - d. Flat plate
  - e. Dens glass
- 6. Backer rod
  - a. Open cell
  - b. Closed cell
- 7. Silicone caulk
- 8. Gasket
- ii. Dry
  - 1. Rain screen
  - 2. Non- sealed
  - 3. Extruded panel frame
  - 4. Extruded track
  - 5. Spline reveal
  - 6. "U" channel
  - 7. Water proofing
    - a. Tyvek
    - b. Vaproshield
    - c. Spray on urethane
    - d. Door and window treatment
  - 8. Commonly used
  - 9. Efficient installation
  - 10. Weep holes
- e. Glazed panel system
  - i. Components
    - 1. Window systems
    - 2. Retainer
    - 3. Cap/cover screw treatment
    - 4. Panel
    - 5. Gaskets
  - ii. Use
    - 1. Floor line treatment
    - 2. Aesthetics
- f. MCM panel: use, applications
  - i. Building envelope
  - ii. Retrofit
  - iii. Residential
  - iv. Commercial
  - v. Industrial
  - vi. Interiors
  - vii. Column covers
  - viii. Soffits and canopies
  - ix. Signage
- g. Properties
  - i. Flame spread
  - ii. Cost
  - iii. Grain patterns
- 2. MCM: Handling and storage, Safety and Fabrication
  - a. Material handling
    - i. Unloading
    - ii. Equipment operation
    - iii. Positioning
    - iv. Panel protection
      - 1. Cutting/routing residue
      - 2. Correct panel marking

- b. Panel protection
  - i. Scratch protection
  - ii. Marking bleed thru
  - iii. Plastic shipping film
    - 1. Ultraviolet light protection
    - 2. Film removal
  - iv. Denting
  - v. Panel crimping
  - vi. Positioning
    - 1. Face to face
    - 2. Back to back
  - vii. Soft dunnage
- c. Panel fabrication
  - i. Tools
    - 1. Hand
      - a. Aviation snips
      - b. Tape measure
      - c. Scratch awl
      - d. Combination square
      - e. Mallet
      - f. straight edge
      - g. Pop rivet gun
      - h. Bender
    - 2. Power
      - a. Portable power saw
      - b. Jig saw
      - c. Router
      - d. Drill motors
      - e. Screw gun
      - f. Power pop rivet gun
    - 3. Equipment
      - a. Panel saw
      - b. Panel router
      - c. Vacuum
      - d. Work table
      - e. Compressor
      - f. Hand brake
      - g. Sheer
  - ii. Cutting tools
    - 1. Power saws and equipment
    - 2. Saws
      - a. Carbide cutting
      - b. Aluminum cutting
  - iii. Fabrication processes
    - 1. Layout
      - a. Two sided measurements
      - b. Maintain "square"
      - c. Allowances
    - 2. Cutout
      - a. Panel saw
      - b. Skill saw
      - c. Jig saw
      - d. Aviation snips
    - 3. Route
      - a. Panel saw/router attachment
      - b. Hand router: depth, purpose , overcut etc
      - c. Two sided measurement
    - 4. Form

- a. Brake
    - b. Bar folder
    - c. Slip roll
  - 5. Assemble
    - a. Corner clips°
    - b. Miter clip
    - c. Extrusions
  - d. Cutting and routing
    - i. Cutting
      - 1. Carbide tip
        - a. Aluminum
        - b. Extrusions
        - c. Demolition
      - 2. Sheer
        - a. Deformed edge
        - b. Imprint
        - c. Requires adjustment
    - ii. Routing
      - 1. Specialty bit
        - a. 96°bit standard fold
        - b. 120°bit extreme fold
      - 2. Modified cutter
        - a. Standard
        - b. Tip modification
      - 3. Flat surface
  - e. Specific safety procedures
    - i. General: PPE
    - ii. Cutting and routing
      - 1. Safety glasses
      - 2. Face shield
      - 3. Burr protection
    - iii. Drilling and fastening
      - 1. Chip and burr protection
      - 2. Stem/shank discharge
- 3. MCM: Devices, Panel Locations and Starting Points
  - a. Measuring tools and equipment
    - i. Ruler
    - ii. Tape
    - iii. Line
    - iv. Laser
    - v. Laser pointer
    - vi. Aerial lift
    - vii. Scissors
    - viii. Transit level
  - b. Spirit
    - i. Uses
      - 1. Establish level lines
      - 2. Establish plumb lines
      - 3. Straight edge
    - ii. Tool check
    - iii. Assumed level line
    - iv. Rotation of tool
  - c. Laser types
    - i. Tripod mounted
    - ii. Wall mounted
    - iii. Horizontal
    - iv. Combination
      - 1. Horizontal
      - 2. Vertical

- v. Self levelling
- vi. Accessories
  - 1. Receiver
  - 2. Story pole
  - 3. Ruler
  - 4. Lens
- vii. Calibration
  - 1. Plumb
  - 2. Level
  - 3. Alignment
- d. Laser measuring device
  - i. Building length
    - 1. Initial positioning
    - 2. Digital read
  - ii. Width
  - iii. Height
  - iv. Elevation verification
  - v. Opening verification
- e. 3 D Mapping
  - i. Uses
    - 1. Interior room dimensions
    - 2. Mechanical locations
    - 3. Exterior dimensions
    - 4. Plumbing operations
    - 5. Building deflection
    - 6. Shimming requirements
  - ii. Safer field operations
  - iii. Efficient
  - iv. Accuracy +/- 1/16"
- f. Transit level and laser
  - i. Starting point
    - 1. Establish base line
    - 2. Baseline transfer
    - 3. Window/door tops/highest point
    - 4. Drawing details
    - 5. Panel/window meeting point
    - 6. Panel bottom elevation
    - 7. Flashing elevation
  - ii. Corner
    - 1. Plumb
    - 2. Straight
  - iii. Window location
  - iv. Doors
- 4. Waterproofing and vapor barrier
  - a. Terminology
    - i. Waterproofing
    - ii. Substrate
    - iii. Vapor
    - iv. Densglass
    - v. Tyvek
    - vi. Vapro-shield
    - vii. Self- adhered
    - viii. Shingle fashion
      - ix. Penetrated
        - x. Membrane
        - xi. Synthetic
        - xii. Sealant
        - xiii. Duct Tape

- xiv. Vapro Bond
- xv. Urethane caulk
- b. Waterproofing: purpose
  - i. Substrate protection
    - 1. Water damage
    - 2. Insulation protection
  - ii. Vapor transmission
  - iii. Energy efficiency
  - iv. Indoor air quality
  - v. Sustainability
  - vi. Sheds water
- c. Waterproofing types
  - i. Synthetic
    - 1. Tyvek
    - 2. Vapor shield
    - 3. Gortex
  - ii. Denselment Barrier System
    - 1. Gypsum sheeting
    - 2. Air barrier
    - 3. Water barrier
  - iii. Spray-on
    - 1. Urethane
    - 2. Silicone
    - 3. Foam
- d. Moisture free envelop
  - i. Flashing
    - 1. Shed water
    - 2. Diversion channel
    - 3. Position
      - a. Windows
      - b. Doors
      - c. Penetrations
    - 4. Coping
      - a. Parapet wall
      - b. Roof edge
- e. Waterproofing
  - i. Material layout
    - 1. Starting location
    - 2. Proprietary methods/applications
      - a. Windows/doors
    - 3. Material quantities
      - a. Perimeter
      - b. Area
  - ii. Shingle fashion
    - 1. Bottom to top
    - 2. Lap
    - 3. Fastening techniques
      - a. Staple
      - b. Cap nail
      - c. Self-adhering
- f. MCM Installation
  - i. Tools
    - 1. Hand
      - a. Tape measure
      - b. Window bar
      - c. Caulking gun
      - d. Knife
      - e. Razor holder
      - f. Level
      - g. Chalk line



2. Power
  - a. Drill motor
  - b. Impact wrench
3. Equipment
  - a. Ladder
  - b. Scaffold
  - c. Aerial lift
- ii. Drawings
  1. Construction
    - a. Elevations
      - i. Building dimensions
      - ii. Heights
      - iii. Windows
      - iv. Doors
      - v. Openings
      - vi. Offsets
    - b. Sections
      - i. Joints
      - ii. Exterior mats
    - c. Reflected ceiling plan
      - i. Soffits
      - ii. Heights
  2. Shop drawings
    - a. Panel placement
    - b. Thickness
    - c. Dimension verification
    - d. Clip specification
    - e. Waterproofing detail
    - f. Flashing
      - i. Type
      - ii. Detail
- iii. Spacing dimension
  1. Starting point
  2. Calculations
    - a. Building length
    - b.  $\text{Actual} = \text{proposed dimension} / \text{panel nos.}$
    - c. Vertical calculation
    - d. Horizontal calculation
  3. Flashing height = overall height / #panels
- iv. Openings
  1. Flashing placement
  2. Verification measurements
  3. Details
    - a. Flashing
    - b. Set back(s)
  4. Panel placement
- g. Flashing installation
  - i. Drawing interpretation
    1. Details
    2. Architectural sheets
  - ii. Location/placement
  - iii. Type/design
    1. Flat
    2. 90 degree with brake
    3. Order of installation
    4. Caulking requirements

## Resources

International Training Institute for the Sheet Metal and Air Conditioning Industry. *Architectural Sheet Metal*. current. Alexandria, Virginia; International Training Institute, 2013.

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Sheet Metal and Air Conditioning Contractor's National Association. *Architectural Sheet Metal, Sixth Edition*. current. Chantilly, VA; Sheet Metal and Air Conditioning National Association, 2003.

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Sheet Metal Occupational Health Institute Trust. *Safety Handbook Revision 3*. current. Fairfax VA; Sheet Metal Occupational Health Institute Trust, 2016.

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## Resources Other

1. [www.alucobondusa.com](http://www.alucobondusa.com)
2. [www.sheetmetal-iti.org](http://www.sheetmetal-iti.org) (<http://www.sheetmetal-iti.org>)
3. [www.smacna.org](http://www.smacna.org) (<http://www.smacna.org>)
4. [www.reynobond.com](http://www.reynobond.com) (<http://www.reynobond.com>)

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