



# Metal Roof & Wall Systems

**SPECIFYING FOR AESTHETICS, DURABILITY,  
AND ENERGY EFFICIENCY**



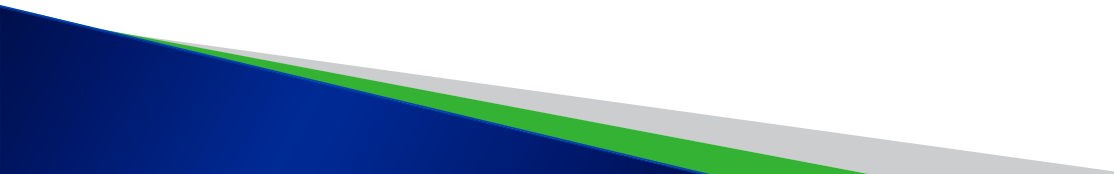
**DURO-LAST**  
THE WORLD'S BEST ROOF®

**EXCEPTIONAL**  
*Metals*

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# Learning Objectives

By the time you have completed this educational unit, you will be able to:

- Understand the **basics** of standing seam metal roof and wall systems.
  - Identify **grade vs. gauge** and their importance for standing seam metal roofs and walls.
  - Discuss **oil canning** and why it is prevalent with some metals but not others.
  - Describe how to achieve greatest **energy efficiency** with metal roofs and walls.
  - **Describe storage, handling, onsite vs. controlled environment** manufacturing, and how to obtain the right **warranty** for the product and application.
- 



INTRODUCTION

# **SECTION 1**



# Long, Proven History of Use



# Metal Roofing Increasing in Market Share



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For Immediate Release August 3, 2015

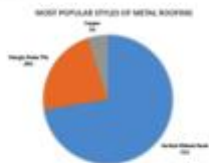
## New Study: Residential Metal Roofing Market Share Jumps to 11% in U.S.

(St. Louis, MO)—The demand for sustainable, eco-friendly and energy efficient home improvement materials continues to grow in North America. According to a new study conducted by Dodge Data & Analytics, the residential metal roofing industry saw a big jump in market share last year, moving from approximately 8% in 2014 to 11% in 2015. The independent survey shows that between 2014 and 2015, the total demand for metal roofing increased from 11.7 million squares to 17.7 million squares. This is the second time residential metal roofing has achieved double-digit market share in the re-roofing segment. Metal roofing is second only to asphalt shingle roofing in the remodeling market. Asphalt market share dropped 2 points overall, and is now 78% of the U.S. market.

"When the Metal Roofing Alliance ([www.MetalRoofing.com](http://www.MetalRoofing.com)) began our national consumer awareness campaign in 1998, metal only made up 3.7% of the re-roofing market. Our consistent effort to educate consumers about investment grade metal roofing has helped to build this market, and we believe even more growth is possible," said Dick Bus, President of the nonprofit Metal Roofing Alliance (MRA). "Based on this data, combined with what we know about the remodeling market in general, we can estimate that over 750,000 U.S. homeowners chose a metal roof to protect their families in 2015."

### Survey Data

Dodge Data & Analytics conducts an annual repair and remodeling survey which measures the percent of homeowners who purchased building products in a given year. Questions pertaining to metal roofing types were included in the online survey which revealed the roofing choices for those households. The study reviewed metal roofing activity across nine U.S. Census regions using a representative sample that can be used to provide accurate data.



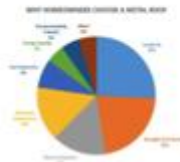
Metal roofing in the remodeling market is showing strong growth overall, and several regions are much higher than the national average. For example, in the East South Central region (which includes Alabama, Kentucky, Mississippi and Tennessee), metal roofing reached 22%, a gain of 8 points in a year. Other big gains occurred in the South Atlantic region (which includes Delaware, Florida, Georgia, Maryland, North Carolina, South Carolina, Virginia and West Virginia), where metal now boasts 12% market share. Overall, metal roofing gained an average of 3 to 5 percentage points in each region.

### Consumer Insights

The top reasons homeowners provided in the study for why they chose a metal roof include: longevity (26%), strength/protection (22%), attractiveness (15%) and good investment/adds value (15%).

The most popular style of metal roofing is vertical ribbed panel with 71%, followed by metal shingle/shake/tiles with 22%. Copper roofing now holds a 5% market share.

Painted metal roofs are the most popular, with 53% of homeowners installing painted panels followed by bare metal at 32% and stone coated metal roofs are at 14%, up from 8% from last year.



"The Metal Roofing Alliance was formed as a market-building organization, and that's exactly what we've done consistently for the past 18 years," states MRA Executive Director, Bill Hippard. "We've been able to more than triple metal roofing's residential market share by offering a quality, investment grade product that provides decades of protection for homes. The MRA will continue to educate homeowners and develop educational tools like the Find-A-Contractor feature and the Roofing Visualizer tool on our website to further build our market share."

The Metal Roofing Alliance is a nonprofit association dedicated to educating consumers and roofing contractors to the many benefits of residential metal roofing. For more information, please visit [www.metalroofing.com](http://www.metalroofing.com)

For More **MEMA** information, contact:  
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# Standing Seam Metal Roofing: What Drives Demand?

Longevity

Durability

Fire Safe

Energy Efficient

Sustainability

Aesthetically Superior



# Standing Seam Panels: Long Lasting

Metal roofs can last  
for 60 years or more



# Standing Seam Panels: Durable

- Some metal roofs can sustain wind gusts up to 140 miles per hour
- Look for Underwriters Laboratories ratings for wind uplift



# Standing Seam Panels: Fire Safe

- Some metal roof systems carry UL ratings for Fire Resistance
- This is especially important in areas threatened by wildfires



# Standing Seam Panels: Energy Saving

- Most metal roofing panels that use PVDF finishes reflect solar radiant heat. This can reduce cooling costs by 10% to 25%
- When calculated into the building's energy needs, this can lead to a smaller sized HVAC unit



# Standing Seam Panels: Environmentally Friendly

- Steel is the #1 recycled material in the world
- Most metal roofs contain as much as 10%-35% recycled content
- Recyclable at the end of their useful life
- EPA ENERGY STAR® Roof Products





# Standing Seam Panels: Aesthetics

- The aesthetics of standing seam roofing is a major driver of demand
- Standing seam metal evokes both the past and the present





# STANDING SEAM BASICS

## **SECTION 2**

# Standing Seam Panels

- Panels identified by adjacent panel edges which are formed at a 90° vertical
- Seam can stand anywhere from  $\frac{3}{4}$ " to 3" above the roof surface
- Panels can be snap lock or mechanically seamed



# Vertical Legs

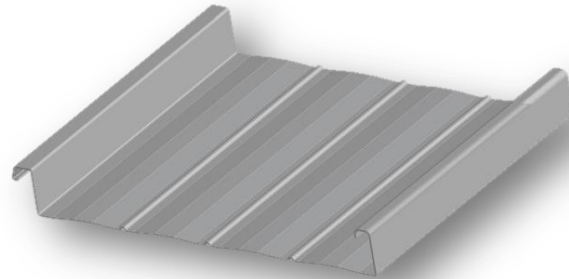
- Vertical legs can range from  $\frac{3}{4}$ " height upwards of 2" height
- Occasionally 3" for special applications



PANEL PROFILE  
BEFORE SEAMING

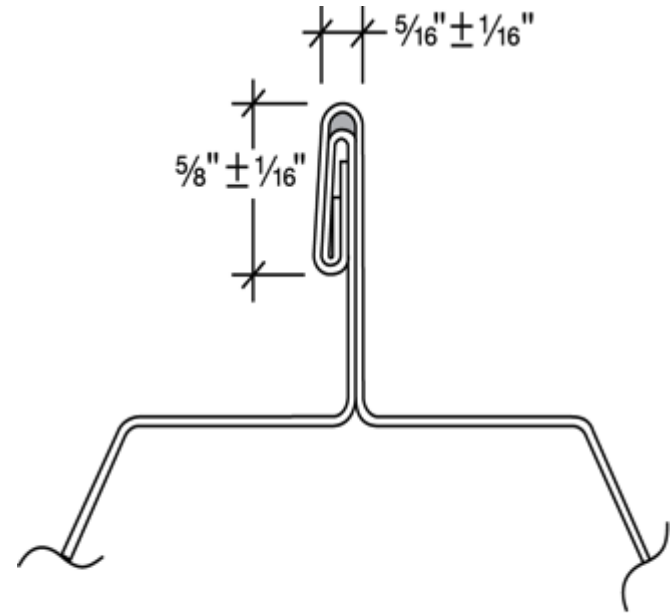


PANEL PROFILE  
AFTER SEAMING



# Trapezoidal Legs

- This panel is usually used for very low slope (1/4" on 12" slope)
- A trapezoidal panel handles snow loads and downpours of rain
- Not recommended on building designs where hip/valley conditions exist



**Cross Section of Finished Seam  
(Actual Size)**



# Hydrostatic Roof Panels

- Trapezoidal panels designed to handle large volumes of water
- Allows for water to stay on the roof without penetrating panel seam or endlap
- Installs involve more sealants, gaskets, and fasteners than other roof types
- For 2:12 slope or less

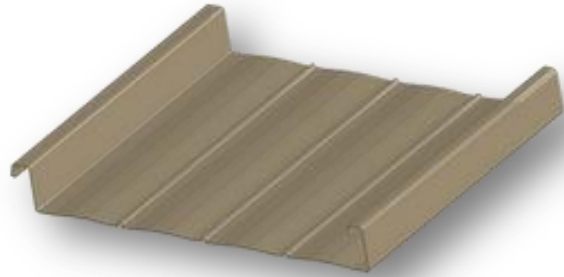


# Hydrokinetic Roof Panels

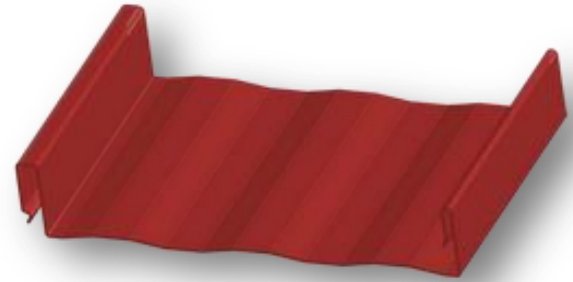
- Perform best in steep roof applications
- May require a solid substrate
- Typically 3:12 and greater slope



# Types of Standing Seam Roof Panels



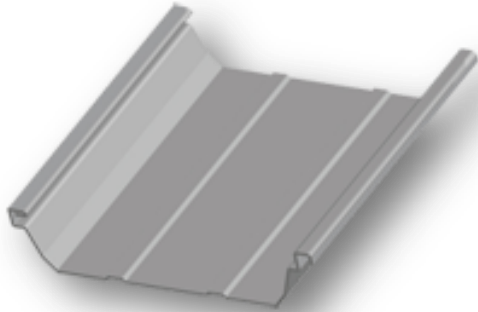
Mechanically field-seamed, high strength structural



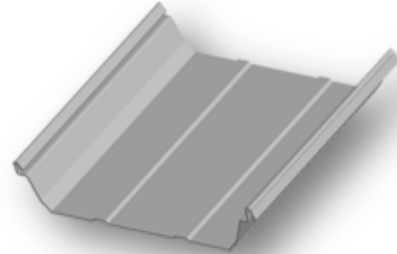
1 3/4" Tall Vertical Rib



# Types of Trapezoidal Roof Panels



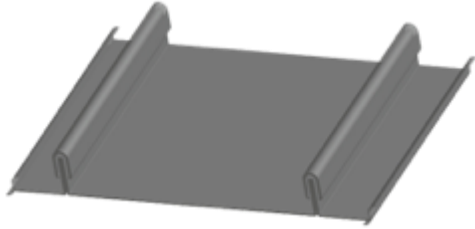
Double locking trapezoidal leg



A snap-together, trapezoidal leg standing seam roof system may have air leakage and water penetration testing approvals.



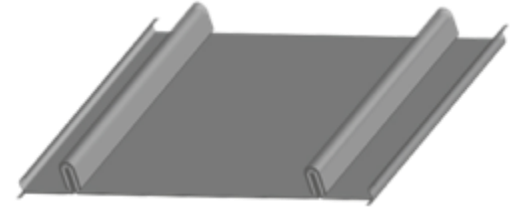
# Types of Concealed Fastening Roof Panels



High Batten



Large Batten

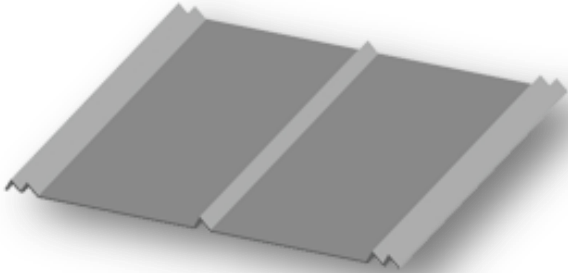


Small Batten





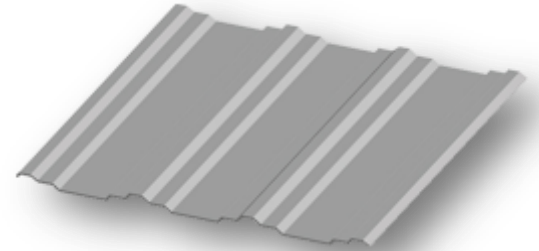
# Types of Exposed Fastening Roof Panels



Old-time, residential appearance with rib height  $\frac{1}{2}$ " – 1"



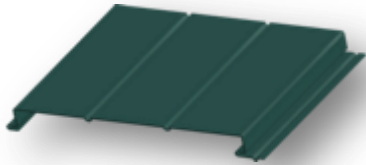
A structural panel and an exposed fastener panel



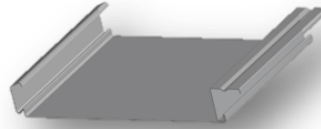
Good for retrofits, can be applied directly over existing panels



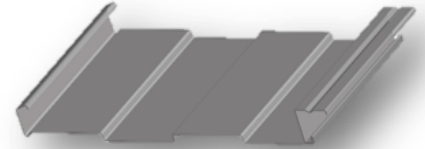
# Type of Concealed Fastening Wall Systems



Heavy Gauge



Flat panel



Fluted Panel



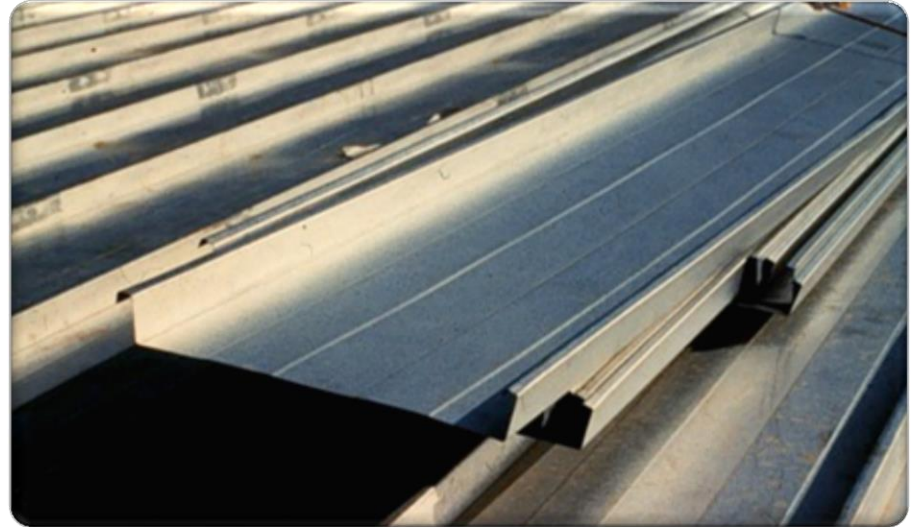


# GAUGE AND GRADE

## **SECTION 3**

# Gauge and Grade Not the Same

- 26-gauge steel could be stronger than 22 or 24 gauge
- Important to understand both gauge/grade when designing and specifying



# How Gauge and Grade Are Specified

Gauge is typically specified as 22, 24 or 26

- Grades are measured in ksi (kilopounds per square inch), or 1,000 pounds per square inch
- Grade measures tensile strength
- The amount of stress a material can undergo before breaking



# Grade for Steel Roofing Panels

- Typical range: 30 to 80 ksi
- $> 50$  = insufficient structural value
- $< 80$  = too strong to make bend

Typical Range:  
30 to 80 ksi

# Grade for Steel Roofing Panels

Preferred Product for Standing Seam Metal Roofing:

**50 grade, 24 gauge, Galvalume coating**

# How to Specify Top Grade



## IAS AC 472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, Part B

frames that are primary structural steel members, secondary members that are cold-formed steel and steel joists, and roof and wall cladding components, specifically designed to support and transfer loads and provide a

**3.23 Structural Weldments:** Structural framing involving welding, coping, cutting, and drilling of built-up I-shaped sections, rolled shapes, or cold-formed sections.

**3.24 Substructure:** An individual component or

**ACCREDITATION CRITERIA FOR INSPECTION PROGRAMS FOR MANUFACTURERS OF METAL BUILDING SYSTEMS**

International Accreditation Service, Inc.  
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Brea, CA 92603 USA  
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**ACCREDITATION CRITERIA FOR INSPECTION PROGRAMS FOR MANUFACTURERS OF METAL BUILDING SYSTEMS**

**AC472**

August 2012  
(Effective September 1, 2012)  
(Editorially revised September 4, 2013)  
(Editorially revised February 9, 2016)

(Previously issued April 2008, September 2006, May 2010, and April 2011)

**PREFACE**

The attached accreditation criteria has been issued to provide all interested parties with guidelines on implementing performance features of the applicable standards referenced herein. The criteria was developed and adopted following public hearings conducted by the International Accreditation Service, Inc. (IAS), Accreditation Committee and is effective on the date shown above. All accreditations issued or reissued on or after the effective date must comply with this criteria. If the criteria is an updated version from a previous edition, solid vertical lines (|) in the outer margin within the criteria indicate a technical change or addition from the previous edition. Deletion indicators (-) are provided in the outer margins where a paragraph or item has been deleted if the deletion resulted from a technical change. This criteria may be further revised as the need dictates.

IAS may consider alternate criteria provided the proponent submits substantiating data demonstrating that the alternate criteria are at least equivalent to the attached criteria and otherwise meet applicable accreditation requirements.

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IASB004  
Revised January 1, 2016

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IASB004  
Revised January 1, 2016



# OIL CANNING: CAUSES AND CURES

## **SECTION 4**

# What Is Oil Canning?

- Wavy, physical distortions in the “flatness” of the metal
- Not a performance issue
- An aesthetic issue
- Cause is residual stresses





# Causes of Oil Canning

- Alignment
- Engagement
- Fasteners
- Expansion longitudinally
- Lesser grade steel
- Handling of panels



# Methods to Control Oil Canning

- Order panels with:
  - Striations
  - Stiffener ribs
  - Thicker gauges
  - Narrower panel widths



# Visual Impact of Striations

- When ribbed or striated panels are installed at the roof level, the striations are not readily visible or noticeable from the ground level
- Result is a stronger assembly and a reduction of oil canning, which can be seen from ground level



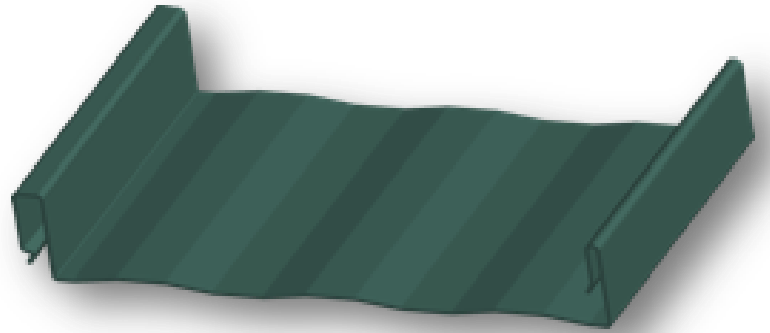


COATINGS AND FINISHES

# **SECTION 5**

# 4 Major Steel Paint Finishes

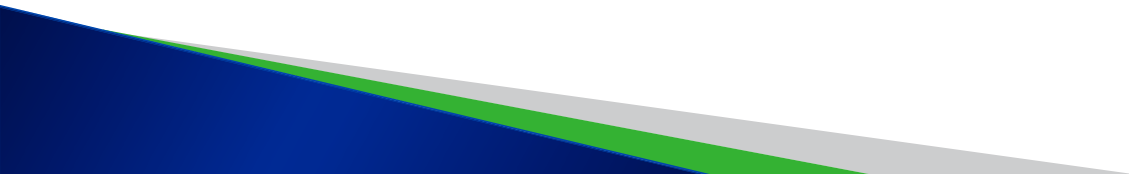
- Galvalume Plus®
- Siliconized Polyester
- Kynar® or Polyvinylidene Fluoride (PVDF)
- Metallics





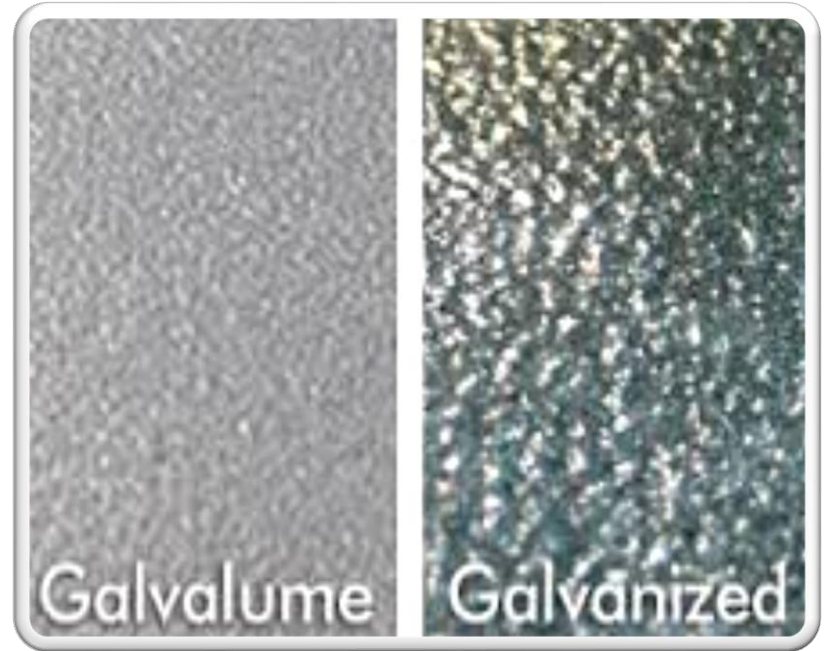
# White Rust on Galvanized Steel

- Moisture combined with lack of air movement will cause this to occur. It is also known as oxidization.
- Water and no air movement will cause premature aging and a wearing away of the zinc coating added to the galvanized steel.



# Galvalume Plus<sup>®</sup>

- An aluminum-zinc alloy coating
- 55% aluminum and 45% zinc by weight
- Provides corrosion protection with a barrier of aluminum and a layer of sacrificial zinc
- Includes a thin, clear acrylic coating



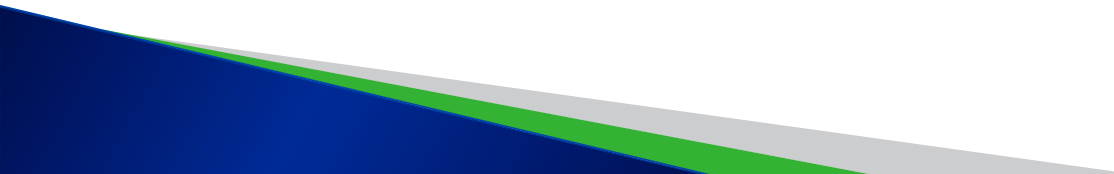
# Galvalume Plus

Two coating weights:

- AZ50 = 0.50 ounces per square foot (.8 mil coating)
  - Commonly used for painted panels
- AZ55 = 0.55 (.9 mil coating)
  - Commonly used for unpainted or clear coat panels



# Weathering

- **Weathering** of paint is gradual degrading of the pigment, the resin or both
  - **Chalking** is the breakdown of resin, which creates a powdery residue
  - **Fading** is the breakdown of the pigment resulting in color change, with a gradual changing of the color towards white
  - **There is no paint that does not fade or chalk over its life span**
- 

# Siliconized Polyester (SP)

- An organic polymer resin modified with silicone
- Economically priced
- Provides good durability, fade and chalk resistance
- Works well for muted, earth-tone colors used in the metal building industry





# Polyvinylidene Fluoride (PVDF) or Kynar 500

- The best available performance against weathering
- Offers superior resistance to chalking and fading
- Needed for brighter colors that are used on architectural projects
- Also available in metallic finishes
- Best known by the trade names Kynar 500® or Hylar 5000®
- The specification should be for PVDF 70%, or polyvinylidene fluoride





CORROSION & COMPATIBILITY

# **SECTION 6**

# Corrosion, Excess Water, Trapped Moisture

- Corrosion happens when a solid degrades and changes by a chemical reaction
- Excess water and trapped moisture are the cause of white rust
  - Can be prevented with proper storage allowing for proper airflow
  - “White rust” is a phenomenon on galvanized material that is caused by improper storage of material



# Galvanic Reaction



Lead



Copper

# Galvanic Reaction

A grease marker or similar marker is the preferred method of writing on a panel



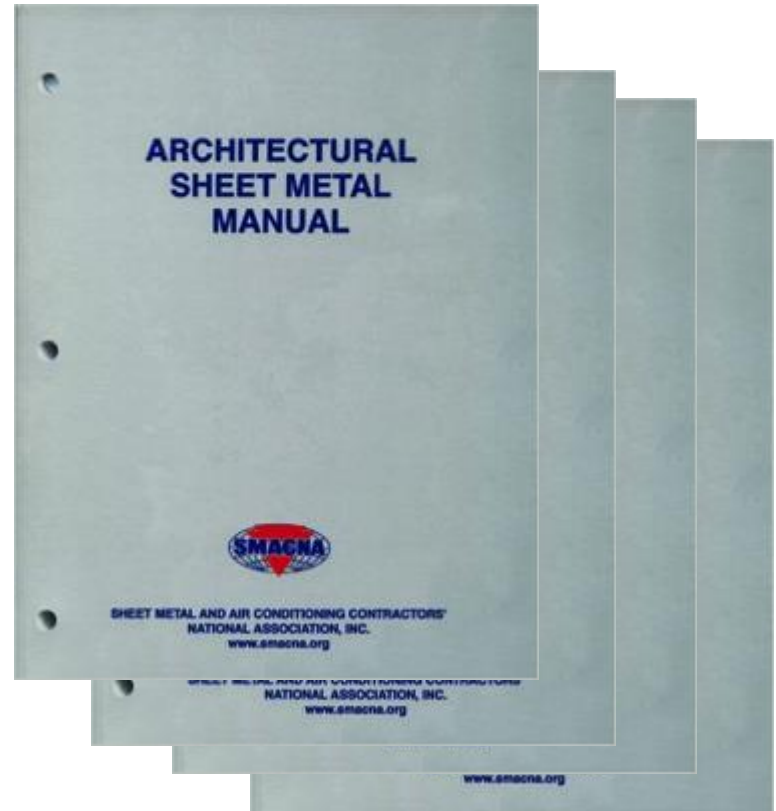
Treated lumber often has high concentrations of copper, salts and other corrosive elements



# Further Details on Compatibility

## Architectural Sheet Metal Manual

By the Sheet Metal & Air  
Conditioning Contractors'  
National Association



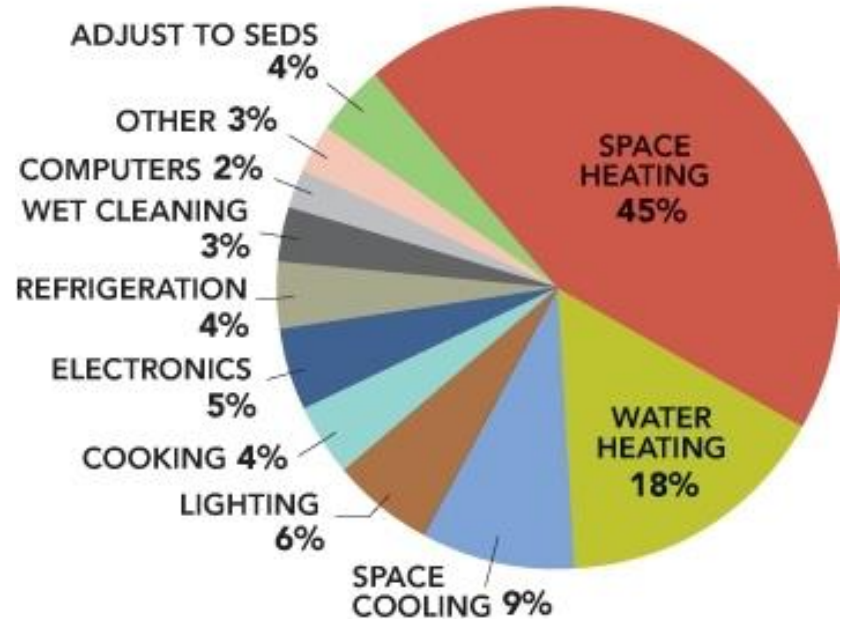


ENERGY EFFICIENCY

# SECTION 7

# Energy Efficiency and Standing Seam Metal Roofing

- Americans spend about \$40 billion annually to air condition buildings
- 1/6 of all electricity generated
- Standing seam metal roofing can help reduce that amount from 10 to 40 percent



# Cool Roofing

- A standing seam metal roof becomes a cool roof with the addition of a coating that has known radiative properties
- Reflects the heat of the sun
- Keeps the roof surface temperature lower during peak sun times



# Product Ratings

- SR = the measure of solar reflectance
  - Must be 29 or higher to be CRRC approved
  - Measurements made initially, and after 3 years, of aging
- TE = thermal emittance
  - Must be 78 or higher to be CRRC approved
  - Measurements are made initially, and after 3 years of aging







TESTING AND CERTIFICATIONS

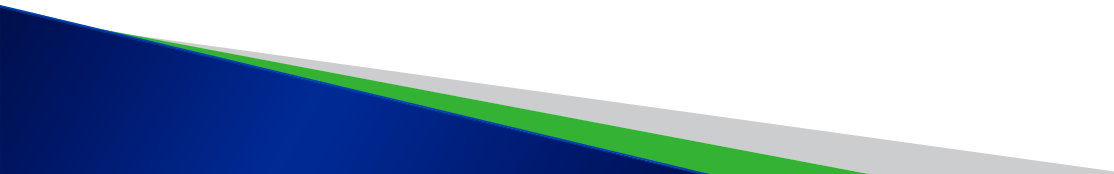
# **SECTION 8**

# Stringent Testing and Accreditation Procedures

Some of the testing criteria include:

- American Architectural Manufacturer's Association (AAMA): [www.aamanet.org](http://www.aamanet.org):
- AAMA 621 - Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) & Zinc-Aluminum Coated Steel Substrates.
- AAMA 809.2 - Voluntary Specification Non-Drying Sealants.
- American Society of Civil Engineers (ASCE): [www.asce.org/codes-standards](http://www.asce.org/codes-standards): ASCE 7 - Minimum Design Loads for Buildings and Other Structures.
- ASTM International (ASTM): [www.astm.org](http://www.astm.org):
- ASTM A 653 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- ASTM A 755 - Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Pre-Painted by the Coil-Coating Process for Exterior Exposed Building Products.
- ASTM A 792/A 792M - Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- ASTM A 980 - Standard Specification for Steel, Sheet, Carbon, Ultra High Strength Cold Rolled.
- ASTM C 645 - Specification for Nonstructural Steel Framing Members.
- ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- ASTM D 1003 - Standard Test Method for Haze and Luminous Transmittance of Transparent Plastics.
- ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
- ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.
- ASTM E 1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
- ASTM E 1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
- ASTM E 1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.
- ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

# More Testing and Accreditation Resources

- Cool Roof Rating Council (CRRC®): CRRC-1-2008 - CRRC Product Rating Program
  - International Accreditation Service (IAS): IAS AC 472 - Accreditation Criteria for Inspection Programs for Manufacturers of Metal Building Systems, Part B
  - Underwriters Laboratories, Inc. (UL): UL 580 - Tests for Uplift Resistance of Roof Assemblies
  - US Environmental Protection Agency: ENERGY STAR® Reflective Roof Products
  - US Green Building Council (USGBC): Leadership in Energy and Environmental Design (LEED®) Green Building Rating Systems
- 



ONSITE VS. CONTROLLED ENVIRONMENT

# **SECTION 9**

# Onsite Coiled Metal Forming

- Drawbacks to onsite forming
  - Forming machine is pulled by a truck along the highway
  - Can pick up dirt, dust, and debris on its hardened chrome (chromium) rollers
  - Machine must be recalibrated each time it is moved





# Factory-Controlled Environment

- Factory-controlled environment
- Highly trained personnel
- A clean and stable atmosphere





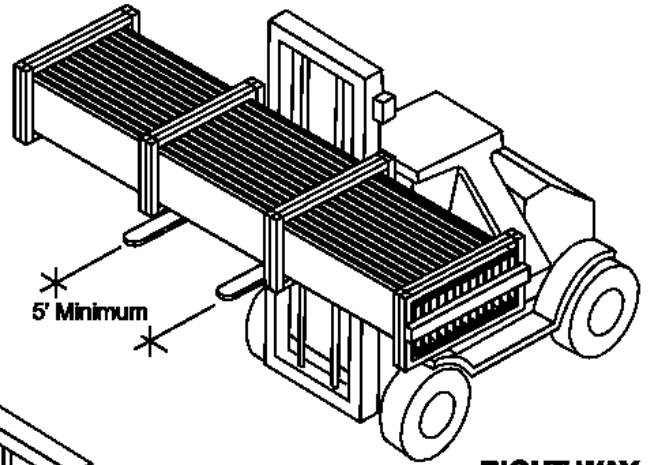


DELIVERY, STORAGE, AND HANDLING

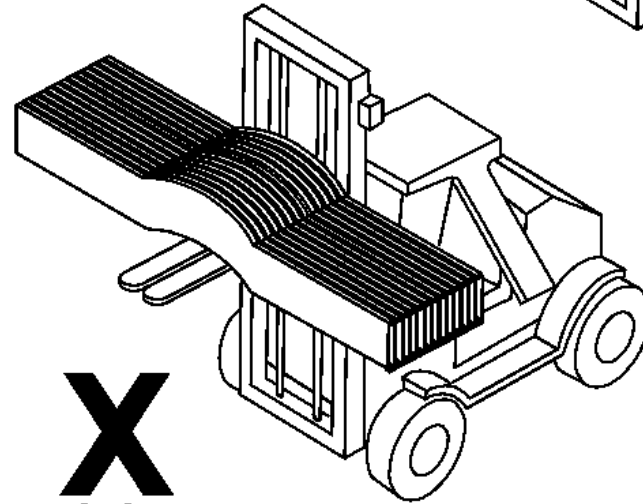
# **SECTION 10**

# DELIVERY

- Bundles 25 feet or under of factory formed panels may be handled by forklift
- Bundles longer than 25 feet should be lifted using a spreader bar and nylon straps



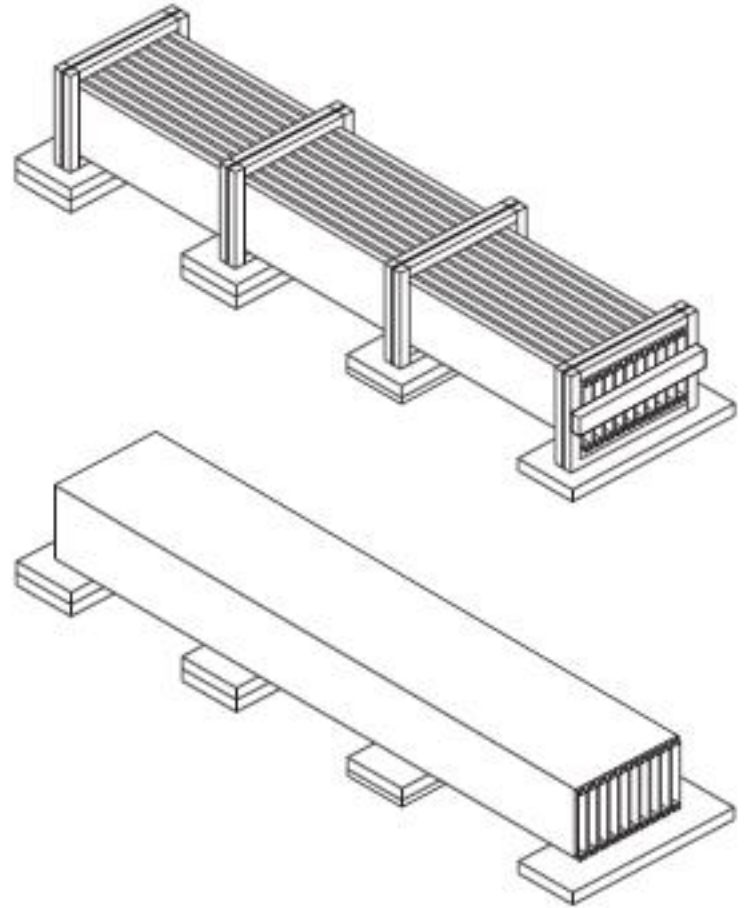
**RIGHT WAY**



**X**  
**WRONG WAY**

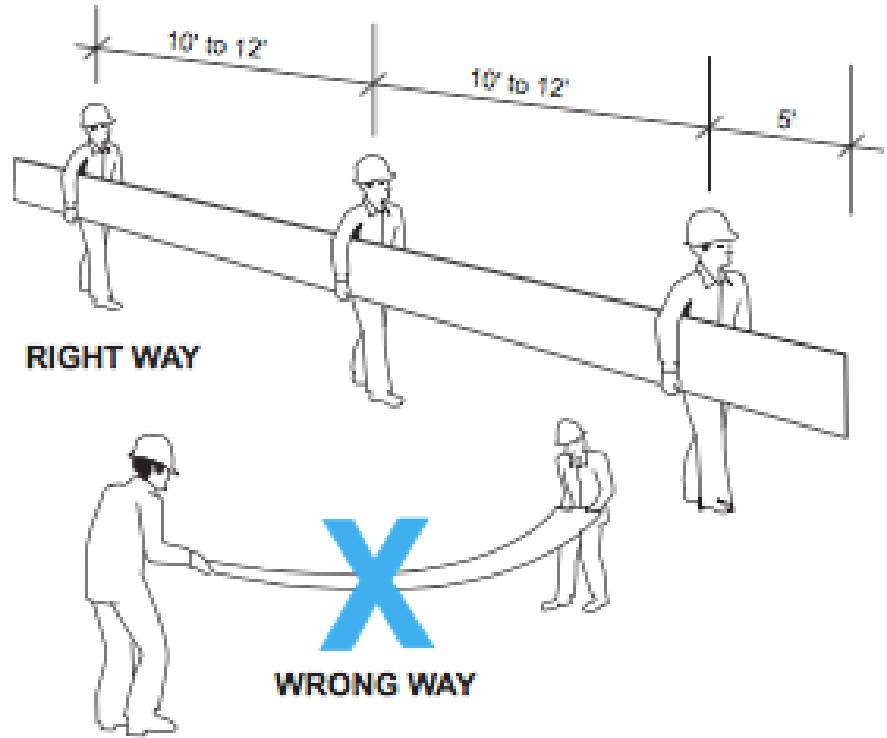
# Storage

- Prolonged storage of panels in a bundle is not recommended
- Bundles should be approximately 1 foot off ground
- Elevate bundles at one end to allow water to run off



# Handling

- Individual panels are somewhat fragile and may be awkward to handle
- Therefore two or three workers should handle the panels
- Lift, move and place panels instead of sliding them





WARRANTY

# **SECTION 11**

# What Does the Warranty Cover? Questions to Ask

- What about extra costs?
- Can the warranty be transferred with ownership?
- What are the other exclusions?





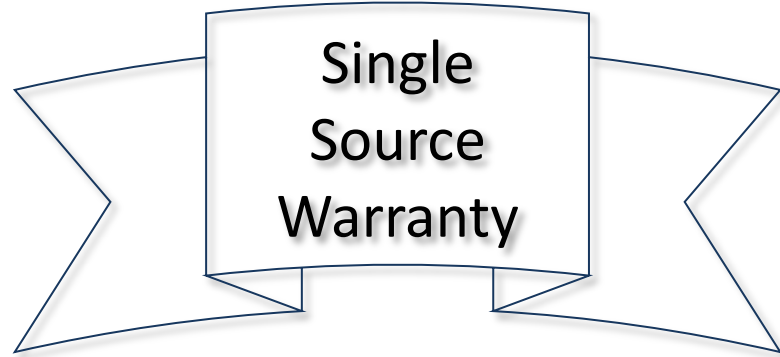
# What Does the Warranty Cover?

- Is the length of time for the warranty realistic?
- If the company has only been in business for a few years, is a warranty of several decades a red flag?
- What are the manufacturer's care and maintenance guidelines?

Be sure to request a sample copy of the warranty and review it before making a purchase because some manufacturers require extensive care and maintenance for their warranties to remain valid.

# Single-source Warranty

- Greatest protection is a “single-source warranty”
- One company is responsible for the warranty
- Eliminates finger pointing



# Manufacturer Warranty Requirements

Many require a minimum  
3 roof inspections:

1. 10% of the roof installed
2. 50% of roof installed
3. 95% to 100% of the roofing or wall complete

**Paint Finish Warranty Issuance Form**

Warranty # (MBCI Use Only): \_\_\_\_\_

Project Name:  Building End Use:

Physical Address:  City:  State:  Zip:

Owners Name:  Phone Number:

Physical Address:  City:  State:  Zip:

**MBCI Customer Information**

Company Name: Duro-Last Roofing Contact Name: Mike Gwizdala

Physical Address: 525 Morley Dr. City: Saginaw State: MI Zip: 48601

**Roofing Installer Information (if different from customer)**

Company Name:  Contact Name:

Physical Address:  City:  State:  Zip:

Phone #:  Fax#:

Customer/Installer: \_\_\_\_\_ Signature: \_\_\_\_\_

Title: \_\_\_\_\_ Date: \_\_\_\_\_

**Weather-tightness Warranty Issuance Form**

Warranty # (MBCI Use Only): \_\_\_\_\_

Project Name:  Building End Use:

Physical Address:  City:  State:  Zip:

Owners Name:  Phone Number:

Physical Address:  City:  State:  Zip:

**MBCI Customer Information**

Company Name: Duro-Last Roofing Contact Name: Mike Gwizdala

Physical Address: 525 Morley Dr. City: Saginaw State: MI Zip: 48601

**Roofing Installer Information (if different from customer)**

Company Name:  Contact Name:

Physical Address:  City:  State:  Zip:

Phone #:  Fax#:

The work performed has been reviewed and we hereby certify the roof has been installed in a workmanlike manner in accordance with MBCI approved drawings, specifications and erection guidelines and that it is substantially complete. The date of Substantial Completion of this portion of the work designated above is hereby established as        which is also the date of commencement of applicable warranties required by the Contract Documents, except as stated below:

The date of Substantial Completion of the designated portion of Work is the Date certified by the Architect when construction is sufficiently complete whereby, the Owners Agent can utilize the designated portion of the Work for the use for which it is intended, as expressed in the Project Contract Documents.

\*\* Once the date of Substantial Completion has been given and the warranty has been issued with the above date, there will be a \$100.00 change fee to issue a new warranty with a different date of Substantial Completion.

Customer/Installer: \_\_\_\_\_ Signature: \_\_\_\_\_

Title: \_\_\_\_\_ Date: \_\_\_\_\_

# Services for the Architect or Contractor

- What services does the manufacturer or supplier offer the architect or contractor?
- Does the manufacturer work with the designers to provide the best solution for each roofing need?
- Does the manufacturer help with code information?
- Does the manufacturer help with drawings?
- Does the manufacturer help with documentation?



# Certified Installers

- Manufacturer certified installers
- Trained in proper installation practices
- Likely required to show proof of general liability
- Likely required to show proof of workers comp insurance






**CONCLUSION**

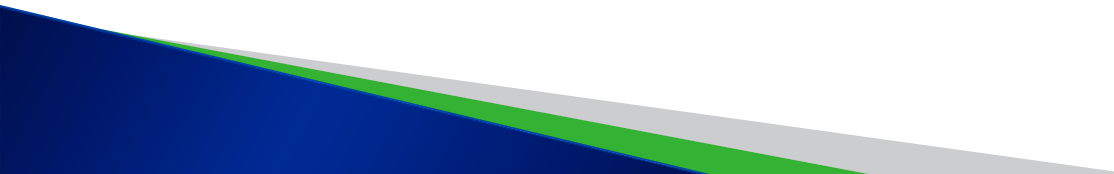


# Conclusion

- Metal roofing manufacturers offer a variety of colors and profiles
  - Metal roofing offers many different panels for various types of installations
  - A savvy specifier will understand both, what the panels are made of and how and where they are made
  - Attention should be given to delivery, storage and installation
  - The warranty will provide least exposure and most assurance for an effective, long-lasting, and aesthetically striking project
- 

# Review Learning Objectives

Now that you have completed this educational unit, you are able to:

- Understand the **basics** of standing seam metal roof and wall systems
  - Identify **grade vs. gauge** and their importance for standing seam metal roofs and walls
  - Discuss **oil canning** and why it is prevalent with some metals but not others
  - Identify the importance of **galvanized vs. Galvalume**, and other coatings for durability and compatibility
  - Describe how to achieve greatest **energy efficiency** with metal roofs and walls
  - **Describe storage, handling, onsite vs. controlled environment** manufacturing, and how to obtain the right **warranty** for the product and application
- 

# Thank You



**Thank you for your time.**

This concludes the AIA Continuing Education System Program.

## Questions?

