

REVERE. THE WORLD'S COPPER LEADER FOR OVER TWO HUNDRED YEARS.



Freedom Gray[®]

Z-T Alloy[™] Coated Copper

For durability, attractiveness
and environmental friendliness,
FreedomGray delivers.



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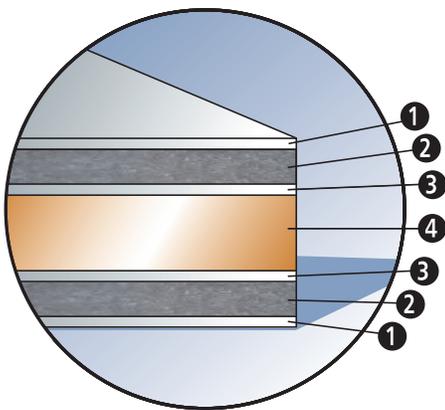
Specifications



Revere FreedomGray®: Durable, attractive and easy on the environment.

Revere FreedomGray® is standard architectural sheet copper coated both sides with a unique, patented Z-T Alloy™ (tin-zinc alloy). It offers all the advantages of copper in a naturally weathering earthtone gray color. FreedomGray is rugged, environmentally friendly and aesthetically appealing, for use in virtually all architectural metal applications.

The four layers of FreedomGray



- 1 Washcoat
- 2 Tin/zinc alloy
- 3 Intermetallic layer
- 4 Copper (99.5% pure)

The tin-zinc alloy is applied to both sides of FreedomGray sheets and coils, using the hot-dip process. This ensures complete coverage and eliminates voids.

A pre-weathered (painted) finish is factory-applied to FreedomGray, to reduce initial reflectiveness, provide a natural, weathered appearance and minimize the possibility of “white rust” corrosion during storage and transit.

The paint is applied in a “semi-uncontrolled” manner to assure that some of the surface is covered and some is not. This may create noticeable variations between panels – non-uniform patterns, textures, lines or shading. The uncovered tin/zinc alloy begins to darken immediately upon exposure, while covered areas undergo little or no color transformation until the paint is removed through weathering.

It is important to understand that the paint is a transitional phase only. It is NOT FreedomGray’s final color or aesthetics.

Over time, as weathering breaks down the paint and exposes the alloy, the initial differences fade away. Environmental conditions and severity of exposure dictate how long this will take. For roofs, most paint is usually removed within 12 to 18 months, while vertical wall panels may take longer.

As with plain and pre-patinated copper, there will always be differences in the shades and hues of FreedomGray’s natural patina. These are NOT an indication of defective material. In many respects it is the variations that give FreedomGray its unique life, vitality and aesthetics.

FreedomGray vs. zinc: A revealing comparison.

When a durable gray architectural metal roof is called for, FreedomGray offers numerous advantages over zinc. Like all architectural copper, FreedomGray is easier to form, simpler to install and more durable in most environmental conditions.

These are the facts:

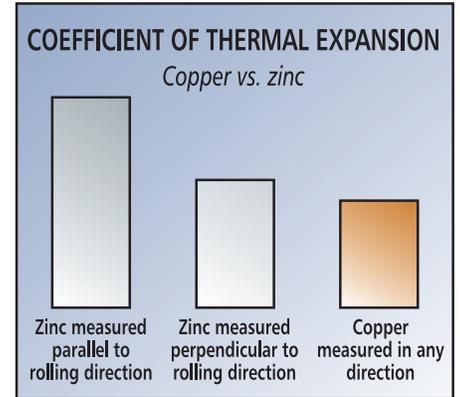
- **More versatile forming** – At temperatures below 45° F, zinc becomes brittle and may break or split when bent, formed or subjected to stress or loads. All coppers, including FreedomGray, can be formed, installed and subjected to sub-freezing temperatures with no adverse effects.

Sharp, zero-radius bends that are typical with all architectural metal work, can stress zinc to the point that it cracks or splits. Expansion movement caused by daily and seasonal temperature changes can aggravate minor splits and make them “run” or grow.

FreedomGray can be formed and installed with the same bends as plain copper.

- **Less restrictive installation** – Moisture on the reverse side of zinc can cause severe and rapid corrosion. In extreme conditions it can “rust through” in less than a year. To avoid this problem, the underside of zinc must be ventilated – installed above the roof deck. This difficult, costly installation is not necessary with copper, including FreedomGray, which can be applied directly over roof decks.

- **Greater durability** – Ice dams in valleys and along eaves are a common winter occurrence in much of the country. Water trapped behind these dams can (and does) penetrate locks and seams.



With zinc roofs, this can lead to “underside corrosion.” Moisture trapped on the underside of copper, on the other hand, has no negative effects, making FreedomGray the better choice for long-term durability.

- **Physical properties** – Properties of sheet zinc (coefficient of thermal expansion, tensile strength, creep rate, etc.) depend upon temperature and direction of rolling. The above chart compares the coefficient of thermal expansion for zinc and copper.

- **Soldering** – Zinc anneals at 212° F and melts at 784° F. Standard solder begins to flow at 420° F. As a result, soldering changes the grain size of zinc (anneals it) and weakens it at the seam. If too much heat is applied, a hole can easily be burned through zinc.

The melting point of architectural copper is 1,981° F. At 700° F, it takes almost an hour for copper to begin to anneal. As discussed later, FreedomGray is soldered similar to plain copper.



In any environment, FreedomGray fits.

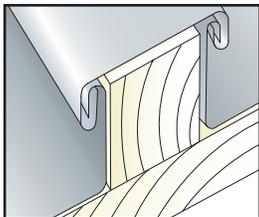
FreedomGray is appropriate for use in any application that would use copper or lead-coated copper. It may be used not only for roofs, but also to form most architectural accents, gutters, downspouts and other rainwater carriers.

Roofs and flashings using the patented tin-zinc alloy have been exposed to industrial, seacoast, urban and rural environments without failure. Salt spray, salt fog and other accelerated weathering tests have also had no adverse effects.

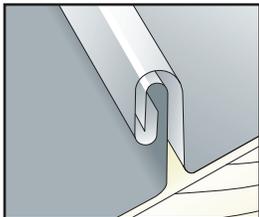
FreedomGray is a practical choice for today's environmentally conscious clients.

Installation Tips & Techniques

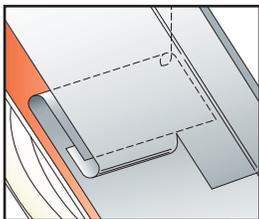
FreedomGray architectural copper is a premium product that requires little, if any, special handling.



Batten Seam Roofing



Standing Seam Roofing



Steep Pitch Transverse Seam

Forming

FreedomGray is installed using the same tools, machines and working techniques as with mill-finish copper.

Forming is done in the same manner. The tin-zinc alloy will not crack or flake off tight bends (180 degrees). Portable pan forming machines are used, and bending and seaming are performed without any

special considerations. Double lock-standing seams are closed by hand or with a seaming machine. Cross joints are formed in the same manner as plain copper.

Cutting

Cutting FreedomGray with snips or shears does not cause burrs – a common problem with stainless steel – provided the snips or shears are sharp.



GAP Clothing – Mashpee, MA

Soldering

FreedomGray is soldered in a similar manner as plain copper; however, we recommend you consult our Revere Architectural Services Department for the most up-to-date soldering techniques.

1. Cleaning: To ensure good, strong soldered seams, it is necessary that FreedomGray is clean, bright and free of all oxides, washcoats, etc. Lacquer thinner may be used to remove the washcoat; oxidized metal should be wire-brushed to a bright condition. *The tin-zinc alloy should not be removed.*

2. Form locks: For proper strength, locks must be at least 3/4-inch wide.

3. Flux seam: Apply a tin-bearing flux such as "Flux-N-Solder E127 with pure tin," by Johnson Manufacturing, Princeton, Iowa (563-289-5123), to all surfaces to receive solder. This will greatly aid in soldering FreedomGray.

4. Apply heat and solder: All soldering should be done with heavy soldering coppers only (do not solder with open flame on metal). Coppers should weigh 6 to 10 pounds per pair except when gas-heated soldering torch is used. *For best results, use either pure tin solder OR lead-free, high-tin solders such as Number 497 by Johnson Manufacturing.*

5. Clean soldered seam: Thoroughly rinse soldered seam to remove all residual flux. Normally, flux need not be neutralized if sufficient clean water is used to remove all residues.

Pre-tinning FreedomGray is usually not required.

However, if pre-tinning is desired or necessary to effect a completely sweated seam, use the same solder as will be used for the seam.

Drainage

A minimum positive drainage of 1/8" per foot should be provided for flat seam roofing to avoid water staining.

Handling Considerations

Compatibilities

FreedomGray's tin-zinc alloy is basically inert, allowing it to be used with most other architectural metals. When in doubt, contact Revere's Technical Advisory Service for answers about the nobility and electrochemical potential of certain metals.

In most environments and applications, FreedomGray will not stain other materials below it. However, drips and overhangs should still be designed to minimize water staining.

If desired, FreedomGray may be painted without altering its physical properties.

Inorganic acids, including hydrochloric acid, can damage FreedomGray. Care should be taken to protect against run-off from acid-leaching substances, overspray from masonry cleaners (muriatic acid), etc.

All commonly available underlayments may be used with FreedomGray. Before installing FreedomGray over fire-retardant treated lumber, consult with Revere and the lumber treater.

For safety, Revere always recommends the use of gloves and eye protection whenever handling any architectural metal.



Specifications

Architectural Guide Specifications

Revere FreedomGray™ is cut, bent, formed and installed using the same tools and techniques as with mill-finished copper. Complete details and specifications for the installation of architectural sheet copper are contained in the Revere manual Copper & Common Sense.

Materials:

Sheet Copper

All sheet copper shall be standard, ounce-weight copper conforming to ASTM specification B370.

Where FreedomGray coated copper is specified or noted on the drawings, copper shall be coated both sides with zinc/tin alloy approximately 0.5 mils thick. Composition of the alloy shall be approximately 50-percent zinc and 50-percent tin with trace elements controlled for durability, corrosion resistance and color.

The Z-T Alloy shall be applied by the hot-dip process. All Z-T Alloy coated copper shall have temporary, degradable pre-weathered coating to minimize water-stains during transit and storage and provide initial weathered appearance.

Solder

Where used on Z-T Alloy coated copper, solder shall conform to ASTM specification B32 and shall be pure tin OR lead-free, high-tin.

Workmanship:

Handling & Storage

Store FreedomGray coated copper sheets, coils and formed shapes off the ground, in an enclosed structure. Do NOT store in a manner or location so that the water or moisture may remain between sheets or shapes prior to installation. Do NOT store on bare ground under a tarp or in other manner that may cause condensation to form on or between sheets or shapes.

Handle sheets and shapes in a manner to reduce scratches, dents, etc.

COMMENTARY

In the absence of oxygen, standing water may cause water-stains. Water-stains and surface scratches should not affect the life or durability of FreedomGray; however, they can be aesthetically unattractive.

Soldering

Before soldering Z-T Alloy coated copper, the pre-weathered coating must be removed and surfaces to receive soldering chemically and/or mechanically cleaned to produce clean, bright alloy.

COMMENTARY

To ease soldering, a tin-bearing flux may be applied to all surfaces to receive solder.

Installation

Except as noted elsewhere, form and install FreedomGray as noted on the drawings and in the same manner as described for plain copper in Revere's sheet copper design manual Copper & Common Sense, latest edition.

Protection

FreedomGray shall be protected during installation and cleaning of masonry with tarps, polyethylene sheeting, or similar impervious materials. To prevent water stains due to condensation trapped on metal's surface, protection must be removed at the end of each workday.

Cleaning

Remove excessive dirt and construction debris by washing thoroughly with clear water. Grease, oils, etc., may be removed by washing with alkaline commercial cleaning agent in hot water. Do not otherwise chemically or mechanically clean FreedomGray.

Available Forms:

Types Sheets and coils

Weights 16-oz.; 0.0216" thick
20-oz.; 0.027" thick

Temper H00- cold rolled

Stock sizes 36"x120"x16oz. sheets
36"x120"x20oz. sheets
250 lin. ft. coils of 20"
and 24" wide, 16oz.

Note: Other sizes and corresponding lead times available on request

Ordering Information:

Price

FreedomGray is priced at a premium above Revere's **Classic Copper** finish. Contact your local Revere distributor for prices and lead times.

Minimum order quantity

One standard case or coil.

Availability

Through Revere sheet copper distributors throughout the United States, Canada and South America.

FreedomGray Warranty

Revere warrants that, for a period of 25 years after delivery, FreedomGray will comply with the written specifications accepted by Revere and will be free of defects in workmanship and materials. Call Revere for complete warranty details.

Technical Guidance

If you have questions or concerns about the use of FreedomGray on a particular project, please call (800) 448-1776, ext. 2474 or ext. 2707.

Do NOT use FreedomGray

- 1) Below plain or pre-patinated copper.
- 2) In areas subject to impingement (e.g., in areas where water falls off a higher roof onto FreedomGray)
- 3) In areas of concentrated or abrasive flow (such as in valleys on slate or tile roofs)
- 4) Below or next to fire retardant treated (FRT) lumber, including FRT cedar shingles and siding.

Cautionary Uses:

- 1) Interior applications where the pre-weather Paint may be objectionable and/or will not Break down and allow natural weathering of the Tin/zinc alloy.
- 2) Soffits and similar "protected" applications where weathering will be extremely slow (if at all)

Copper & Common Sense

Since 1945, Revere has published **Copper & Common Sense**, which is now the industry's most widely referenced sheet copper design manual. To learn how to obtain the latest edition, call, fax, or e-mail Revere at the address below.



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FreedomGray is a trademark of Revere Copper Products, Inc. Z-T Alloy is the registered trade name for Follansbee Steel's patented zinc/tin alloy and the method of applying it to architectural copper.