LEAD INDUSTRIES ASSOCIATION, INC.
292 MADISON AVENUE
NEW YORK, N. Y. 10017
TELEPHONE – AREA CODE 212
OR 9-0080

April 29, 1966

SUBJECT: REPRINT OF ARTICLE ON SEAMLESS TERNE ROOFING

To: Members of the Lead Industries Association, Inc.

The enclosed reprint, "Roofing With Seamless Terne", has just been obtained by L.I.A. It will be sent with literature on terne in reply to mail and trade show inquiries.

This article originally appeared in the February, 1966, "Metals in Architecture" issue of Architectural and Engineering News. As a result of the article a number of requests have been received for additional information. It is, therefore, being added as a useful part of our architectural information service.

Since the quantity is limited, additional copies in quantities up to twenty-five will be available free of charge while they last.

Very truly yours,

E. D. Martin

Edwin D. Martin, A.I.A.
Manager, Architectural Services

EDM:df
Enclosure

Look Ahead with Lead

N 3479

ROOFING WITH SEAMLESS TERNE

This material has experienced a recent revival because it can be laid in longer sheets than formerly, because its good painting qualities can be used to express dramatic roof conformations and because of price. Modern terne is known as 'seamless' because the frequency of cross seams is now determined by expansion characteristics of the metal rather than by limitations of manufacture. This article is based on material supplied by the Follansbee Steel Corporation.

Terne metal is a copper-bearing, steel sheet coated on both sides with a tin and lead alloy. It is available in cut length sheets and in 50 ft. rolls, in widths of 14 in. through 28 in., and in 30 ga. (IC), 28 ga. (IX) and 26 ga. (XX).

Terne coatings of 40 lbs., 20 lbs. and 8 lbs. per 435 sq. ft. are commercially sold through major distributors. The alloy coating consists of approximately 80 per cent lead and 20 per cent tin.

Let us examine terne from the viewpoints of: economy, paint adherence, heat-reflection, permanence, workability, low co-efficient of expansion, and weight.

Terne is an economical material because of its relatively moderate initial costs, 50 cents to $1.25 a sq. ft. applied, depending on locality and design. Because of its light weight, architects can frequently eliminate or reduce the need for load-bearing substructures (*see table 1*). Terne can also reduce the costs of fire insurance on the structure, depending on local regulations.

Painting terne

Terne is unusual among architectural metals because of its ability to hold

LEAD INDUSTRIES ASSOCIATION
292 Madison Avenue
New York, New York 10017

ROOFING WITH SEAMLESS TERNE

paint. The material may be ordered plain, one side shop coated, or both sides shop coated. The shop coated side is sufficient covering for the underside of metal. The exposed side of the metal, however, must be given two coats of paint even if there is a mill-coat already applied.

Painting should be completed after installation. If the underside is lacking a shop coat, a slow-drying, iron oxide-linseed oil paint should be used. On the exterior surface, the first coat should be a slow drying, red iron oxide paint, ground and mixed with linseed oil. The second coat should be any good quality long oil, exterior paint. This will allow the architect to specify any color he wants on the roof of the building. By painting terne in this recommended manner with the proper colors, one can achieve the effects of a more costly copper roof.

An independent series of exposure tests by a lead company at Perth Amboy, N. J., and at a marina in Sayville, Long Island, N. Y. demonstrated the durability of painted terne as follows:

At Perth Amboy, the exposed painted specimens had a rating of 9 (virtually perfect) on a scale of 10, after the test was conducted for 7 years, 9 months. Under the more severe conditions at the Sayville marina, the specimens rated a perfect 10 after 83 months of exposure to the corrosive sea air.

Tests have also shown that the combination of white or light colored paint on a terne roof reflects solar heat efficiently.

Historic uses cited

The durability of terne is measured in decades rather than years. Terne, which was developed in Wales about 1720, has been used on many American buildings that are more than a century old. Octagon House, the Washington, D.C. AIA headquarters, has terne that is more than a century old. Andrew Jackson's 'Hermitage' in Tennessee and Thomas Jefferson's 'Monticello' in Virginia still have their original terne roofs.

Terne is a highly workable material that needs no pre-treatment for soldering. Installation time is less than that of other roofing materials.

As shown in *table 2*, terne also offers the advantage of having the lowest co-efficient of expansion of roofing metals.

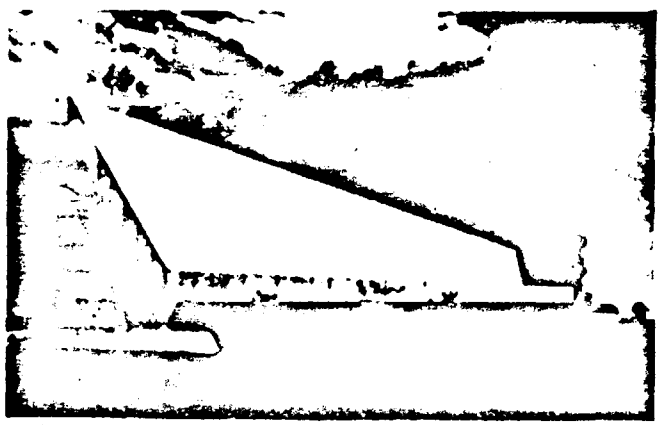
Four types of terne seams

There are four different types of seams to choose from when specifying terne roofing: *standing seams*, *batten seams*, *Bermuda seams* (which create dramatic horizontal effects), and *flat locked seams* (for flat or low-pitched roofs, wherever drainage can be provided).

General specifications for using terne are as follows:

Architects should specify IC (30 ga.) for a 20 in. width and under. IX (28 ga.) or 2X (26 ga.) may be used in any width with a 40 lb. coating for maximum longevity. (26 and 28 ga., 40 lb. are available on request in 20 in., 24 in., and 28 in. widths, rolls and cut lengths.

When the pitch of the roof is 2½ in. or less to the foot, the seam should be flat lock. Cleats should be 1½ in. wide and carefully hooked over ½ in. edge and nailed to sheathing with two 7/8 in. roofing nails or stapled with 7/8 in. diversion point staples to each cleat. Seams should be thoroughly and smoothly hammered down with a wooden mallet and carefully soldered with large coppers. Where the pitch is 6 in. per foot or more, a 3/4 in. minimum cross seam should be used and left unsoldered. Unexposed portions of the cross seams should, however, be painted with iron oxide-linseed oil



WHITE PAINTED TERNE roof of Congregation Shaarey Zedek, Southfield, Mich., is accented by batten seam lines. Albert Kahn Associated Architects and Engineers

paint before they are applied.

When there is sufficient pitch (2½ in. or more per foot), the roof should be laid with standing seams, batten seams or Bermuda seams.

For applications which require maximum flatness, the specification should state that terne sheets be cut to length and roller-leveled at the mill. Also, the roofing contractor should be instructed to form flanges on press brake equipment.

All valleys and gutters [whether IX (28 ga.) or IC (30 ga.)] should be applied flat lock, of sufficient pitch to prevent standing water.

1. Standing seam

For standing seam specifications in applications with 2½ in. per foot minimum pitch, the architect should use seamless terne roofing specifying gauge and coating weight. Ridge treatment should be specified as either flat seam, standing seam, or batten seam and cap.

Cross seams should be staggered to avoid extra thickness in pressed standing seam, and they should be single locked soldered joints, except for expansion joints which must be placed above the high water line of gutters, valleys, walls, etc.

Cross seams should be made according to the flow, that is, the higher strips must always overlap the lower adjoining strips.

2. Batten seam

For batten seam, architects should use seamless terne roofing in applications of 2½ in. per foot minimum pitch seamless terne roofing. The contractor should be instructed that before beginning the first course, he should attend carefully to proper application at drip edges, or side walls, ridges, gutters, valleys, etc.

All cross seams should be flat locked and soldered. Construction of batten seams at ridge and hip and end of battens should follow manufacturer's instructions carefully. Nails should not be driven through strips. Cleats should be used, spaced at intervals of 8 in., and staggered along the battens. Flat lock soldered seams should also be staggered to avoid extra thickness.

Continued

1. TERNE MANSARD ROOFS (top) were specified for unusual configuration of townhouses at Center Village, Philadelphia, by architect Frank Wells. Both standing and flat seams were used.

2. STANDING SEAM construction was used for mansard roofs of 660 South Torrence Street houses, Chicago (above). Terne was painted brown. Architects are Pyatok Associates.

3. BERMUDA SEAM emphasizes horizontal lines of terne hip roof of Fairmont Clinic, Fairmont, W. Va. (below), designed by E. Todd Wheeler and The Perkins and Will Partnership.

LIA14046

ROOFING WITH SEAMLESS TERNE
Continued

3. Bermuda seam

With a horizontal seam Bermuda roof with a 2½ in. per foot minimum pitch, seamless terne should be used; ridge treatment can be either flat seam or standing seam. The contractor should be told to form Bermuda seams by making vertical bends along the longer dimension of the sheets or rolls ½ in. higher than the batten. The first course should be placed in position with painted side down. Do not nail through the strips.

Cleats should be made of the same material, and nailed every 8 in. along the face of the batten. Again, cross seams should be staggered to avoid extra thickness in malleting against the battens.

Cross seams should be single locked soldered joints except for expansion joints, which must be placed above the high water line of gutters, valleys, walls, etc. As with standing seams, cross seams should be made according to flow, that is, the higher strips must always overlap the lower adjoining strips.

4. Flat locked seams

For flat locked seams for applications of less than 2½ in. per foot pitch, architects should use terne sheets. The flat locked seam can be used for roofing or at end walls, side walls, gutters, drip edges, valleys, flashings, etc. For flat locked seam applications, terne is available in 14 x 20 in. and 20 x 28 in. sheets. Special sheet sizes can be made on request, but a sheet size greater than 20 x 60 in. is not recommended.

One side should be painted and well oiled before applying to roof with painted side down. The shop applied coat is sufficient for the under side. One should not nail through the strips. Strips should be attached to the roof with cleats made of the same material. Cleats should be placed at 8 in. intervals.

Before beginning the first course, the contractor should be instructed to attend to proper application at ridges, drip edge, end or side wall, gutters, valleys, etc.

Strips should, as before, be laid according to the flow: i.e., by placing the strip higher on the roof over the upper edge of the lower adjoining strip. Sufficient pitch must be provided for proper drainage, to preclude standing water.

Joints should be staggered, and seams malleted down to form a flat overlapping surface. Careful malleting of the seams will avoid buckling. Seams should be well soaked with half and half solder, using resin as a flux, never acid flux. Excess resin should be removed before painting.

Table 1. Weight

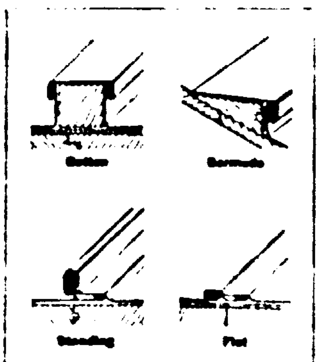
The approximate weights of various roofing materials per square (100 sq. ft.) are:

Material	Wt. per square
Terne roofing IC	62 lbs.
Terne roofing IX	70 lbs.
Copper 16 oz. standing seam	125 lbs.
Built up, 4 ply, no gravel	175 lbs.
Wood shingles	200 lbs.
Galvanized 20 ga., corr.	275 lbs.
Asbestos shingles	300 lbs.
Hard lead sheets	300 lbs.
Plates	450 lbs.
Built up—surfaced by gravel	600 lbs.
Asbestos shingles—heavy	650 lbs.
Slate	700 lbs.
Tile, Spanish	850 lbs.
Lead	1000 lbs.
Tile, plain	1800 lbs.

Table 2. Expansion

Material	Lineal expansion per 100 ft. per 100° F.
Wood	.331 in.
Slate	.696 in.
Terne roofing	.875 in.
Copper	1.064 in.
Zinc	2.076 in.
Lead	1.900 in.
Aluminum	1.536 in.

Expansion seams must be provided for terne on runs exceeding 30 ft. where both ends are free to move (15 ft. maximum where ends are securely fastened).



FOUR TYPES of seams for terne roofing are illustrated here.

> More detailed specification data on the four categories of terne roofing may be obtained from: Lead Industries Association, 292 Madison Avenue, New York, N. Y. 10017.

reprinted from
Architectural & Engineering

LEAD INDUSTRIES ASSOCIATION
292 Madison Avenue
New York, New York 10017