

LEAD INDUSTRIES ASSOCIATION, INC.

192 MADISON AVENUE

NEW YORK, N. Y. 10017

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SUBJECT: TERNE PLATE

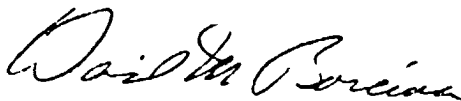
To Members of the Lead Industries Association, Inc.:

Please find attached a reprint of an article entitled "New Uses for Terne Coated Steel" that appeared in the February, 1965 issue of MATERIALS IN DESIGN ENGINEERING, also, a booklet on terne just issued by U. S. Steel. Extra copies of each of these are available upon request as long as our supply lasts.

Distribution of the reprint will be made at our exhibit at the Design Engineers Show and to answer inquiries.

The booklet issued by U. S. Steel was prepared by them after we had passed along the large number of inquiries we had received from our terne plate promotion in the trade press and at exhibits.

Very truly yours,

David M. Borcina
SecretaryDMB:so
Enc:

Look Ahead with Lead

New Uses for Terne Coated Steel

by David M. Sorcina,
Lead Industries Association, Inc.

Distributed by
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New Uses for Terne Coated Steel

*Lead-tin coating makes fabrication easier,
raises resistance to impact and corrosion.*

by David M. Bortone, Lead Industries Assn.

FOR MANY years the major uses for terne coated steel have been automotive gasoline tanks and roofing. However, because of the material's relatively low cost, toughness and corrosion resistance, users are beginning to realize that it can be applied successfully in many other applications. Terne coated steel is now being used for electronic chassis, gaskets, air ventilators and heating equipment, outdoor home accessories and laboratory

equipment. And, although these applications presently account for only a small portion of terne production, improved materials that are now available are expected to lead to wider use.

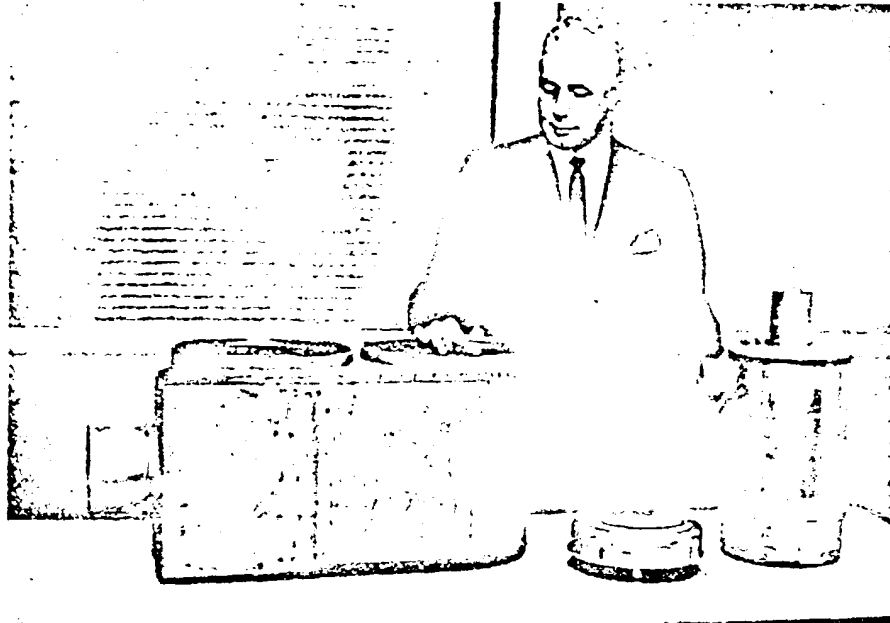
Grades determine properties

Terne coatings are applied by hot dipping in a molten bath containing 80 to 85% lead and 15 to 20% tin. The tin is added to assure good wetting of the steel sheet by

the lead.

Coated steel sheets are classified as either "long terne" or "short terne." Short terne steel sheets are produced in widths of 12 to 32 in. and in thicknesses of 29 gage and lighter. They are generally used for roofing purposes. The long terne sheets, however, are limited in size only by mill equipment, and are more suitable for forming into products. They are classified by the weight of the terne coating as

Air cleaning devices utilize terne coated steel because of its corrosion resistance and ductility. Shown left to right are a dual element type, low air cleaner, an air stack and a standard oil bath air cleaner.



follows: 0.25 oz per sq ft (this is a nominal weight and generally not a guaranteed weight), and 0.35, 0.45 and 0.55 oz per sq ft.

In addition to weight, long terne is also graded by quality as follows:

Commercial quality. Sheet of this quality is suitable for bending and moderate forming. It can withstand bending flat on itself in any direction at room temperature without fracture of the base metal.

Drawing quality. Rim steels are used as the base metal for this grade. Drawing quality steels can withstand more severe forming than the commercial quality grade and, if roller leveled prior to use, are free of stretcher strains.

Drawing quality, special killed steel. This steel is more resistant to stretcher strains and maintains its mechanical properties longer than does drawing quality terne plate.

Typical mechanical properties of the three grades are shown in the accompanying table.

Materials are easily worked

Among the most important characteristics of the above grades are their formability and high ductility. During severe drawing the terne coating acts as a lubricant. These properties, plus the exceptional impact rupture resistance and corrosion resistance of the materials, are responsible for their widespread use for fuel tanks and similar products with a complex contour.

The materials can be designed with bumps and hollows to follow restricted contours where space is limited. Separate pieces, such as tank parts, are readily joined by crimping and seam welding. Also, additional assemblies, such as filler pipes and fuel lines, can be soldered to their surfaces. The lead content of the coating facilitates soldering with noncorrosive fluxes

objects or rear end collisions. Over the years, no other material has proved to be an acceptable replacement for this application.

The corrosion resistance of regular weight terne coated steel is sufficient for many products. Where higher corrosion resistance is needed, thicker coatings are available, provided that the extra weight can be tolerated. Furthermore, the sheets are easy to paint, and usually require no primer or pretreatment.

Recent improvements in production techniques are now providing terne coatings with fewer pinholes, and thus better corrosion resistance. Pinholing is also reduced as coating thickness increases. However, even the most heavily coated terne plate should be well painted for maximum protection.

Applications are growing

Because of the above advantages, terne coated steel can be specified for:

TV and radio chassis. Terne coated steel is now being used as a replacement for cadmium plated steel because it is easier and quicker to solder and form.

Gaskets, washers, spacers. The soft temper of terne coated steel makes it an excellent gasket material (see photo), and reduces wear and tool maintenance. Both plain ring gaskets and corrugated metal valve gaskets are now being made from terne sheets. Similarly, ash-stuffed terne gaskets look promising for petroleum and chemical processing equipment.

Air handling and heating equipment. Terne coated steel is now being used for air filters (see photo), heater core assemblies, space heaters, engine cooling radiators and air conditioners. In these applications, the material is specified because it does not require



Gasket, typical of those used in petroleum refineries and chemical plants, are cold spun and corrugated pieces of terne coated steel. The lead coated sheet is easy to form in complex shapes.

painting on inside surfaces and resists moisture laden air.

Laboratory equipment and furniture. Although painted steel is frequently specified for these applications, terne coated steel is easier to paint and outlasts steel when attacked by acids, alkalis and solvents.

Outdoor home products. Terne coated steel can be used for many outdoor products, such as lanterns, screen housings, gutters and downspouts. The material provides long life when uncoated and, if required, can be painted easily without any special pretreatment or primers. ■ ■

ACKNOWLEDGMENTS

The author is grateful for additional data supplied by:
Armco Steel Corp.
United States Steel Corp.

TYPICAL PROPERTIES OF LONG TERNE SHEET

Grade *	Commercial Quality	Drawing Quality	Drawing Quality, Special Killed
Hardness, Rockwell B	40-60	38-50	38-45
Yield Point, 1000 psi	25-35	23-29	20-27
Ten Str, 1000 psi	38-46	40-44	41-45
Elong. % in 2 in.	35-42	38-43	40-45

Resist rupture and corrosion

Although it is easily dented, terne coated steel is difficult to rupture. This characteristic is responsible for the material's continuing popularity for fuel tanks, which seldom rupture from the impact of flying

Design / Development / Availability of Items / Fabrication / Physical Quantities / Applications



Long Ternes

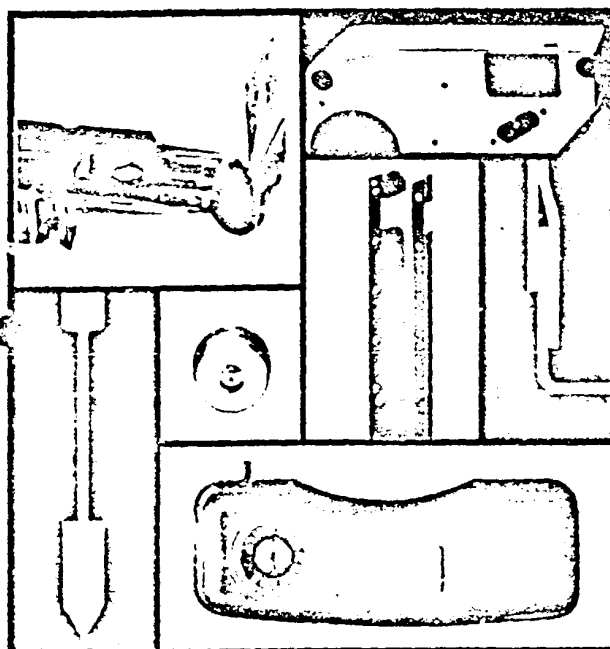


Table of Contents

Foreword	1
What are Long Term?	2
Availability	3
Fabricating & Physical Qualities	4
Applications	6
Suggested Uses	9

The largest coils
or cut lengths in the
industry.

Widths up to 54".

Coil weight to
60,000 lbs.



Long Terne Steel Sheets

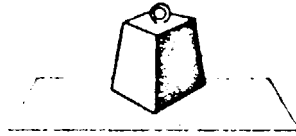
If you need a sheet product with excellent solderability, welding and a special kind of corrosion resistance, please read on.

USS Long Terne Sheets combine strong, durable steel sheets with a coating of lead and tin. This alloy coating adds corrosion resistance, drawing ability and a smooth, continuous surface to an already outstanding product.

Originally developed because of a need for a low cost, corrosion resistant roofing sheet with excellent solderability, USS Long Terne Steel Sheets have now found a wide range of uses from television chassis to gasoline tanks for automobiles, outboard motors and portable gasoline powered machinery and equipment. They are ideally suited for applications requiring severe drawing or forming.

With such unique properties, USS Long Terne Steel Sheets are being considered for many new and varied applications daily.

Steel offers strength



Lead and Tin for Corrosion Resistance



Tin for a smooth surface

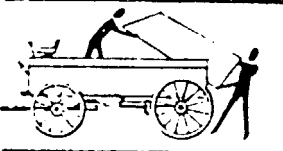


What are Long Ternes?

Since the nature of the coating on Long Terme Sheets is a mystery to many people, let's reveal the facts.

USS Long Ternes start as coils of cold rolled steel with excellent ductility. The cleaned sheet is immersed thru a molten bath of terme metal (80-85% lead and 15-20% tin). These coated sheets are duller in appearance than conventional tin coated sheets, hence the name "terne" from the French, which means "dull" or "tarnished."

The development of "terne plate" closely parallels that of tin plate. It was first made in the same Welsh mills that made tin plate during the 18th century. Someone decided to coat steel sheets with lead to act as a corrosive retardant, but soon discovered that lead alone does not alloy with steel. When tin is added to the coating, a tight intermetallic bond is formed.



Availability of USS Long Ternes

Table 1
Availability of Sizes*

Thickness		Width in Inches	Length in Inches	Max Coil Weight
Gage	Decimal			
16	0635 0548	6 to 48	18 to 144	25,000
17	0547 0509	6 to 48	18 to 144	25,000
18	0508 0443	3 to 64	18 to 144	50,000
19	0448 0389	3 to 64	18 to 144	50,000
20	0388 0344	3 to 64	18 to 144	50,000
21	0343 0314	3 to 64	18 to 144	50,000
22	0313 0284	3 to 64	18 to 144	50,000
23	0283 0255	3 to 48	18 to 144	50,000
24	0254 0225	3 to 48	18 to 144	50,000
25	0224 0195	3 to 36	18 to 144	50,000
26	0194 0172	3 to 36	18 to 144	50,000
27	0171 0157	3 to 36	18 to 144	50,000
28	0154 0142	3 to 36	18 to 144	50,000
29	0141 0128	3 to 36	18 to 144	50,000
30	0127 0113	3 to 36	18 to 144	50,000

* D 10" & 24" for gages 18 to 30
 D 72" max. for gages 18 to 30
 D 60" max. for gages 16, 17

Coating Weights: Comm. 0.25 and 0.45 oz/ft² in all gages

USS Long Ternes may be specified to decimal thickness or to gage number. When specified in coils, they are produced to decimal thickness only, while cut lengths may be specified by either means. Both coils and cut lengths are available in the sizes shown in Table 1.

USS Long Ternes can be specified by several coating classes as listed in Table 2.

Standard cold rolled sheet tolerances apply to USS Long Terme Sheets in all forms and coating classes.

USS Long Ternes are available in commercial, drawing and physical qualities.

Table 2
Weights per Square Foot for
Long Terme Sheets of Various
Coating Classes

Long Terme Gage No.	Weights in Ounces and Pounds per Square Foot for 16 Gages and Coating Classes Given					
	Commercial Coating		0.35 Ounce Coating Class		0.45 Ounce Coating Class	
	Oz per sq ft	Lb per sq ft	Oz per sq ft	Lb per sq ft	Oz per sq ft	Lb per sq ft
16	40.25	2.516	41.31	2.582	42.37	2.648
17	36.25	2.266	37.31	2.332	38.37	2.398
18	32.25	2.016	33.31	2.082	34.37	2.148
19	28.25	1.766	29.31	1.832	30.37	1.908
20	24.25	1.516	25.31	1.582	26.37	1.648
21	22.25	1.391	23.31	1.457	24.37	1.523
22	20.25	1.266	21.31	1.332	22.37	1.398
23	18.25	1.141	19.31	1.207	20.37	1.273
24	16.25	1.016	17.31	1.082	18.37	1.148
25	14.25	0.891	15.31	0.957	16.37	1.023
26	12.25	0.766	13.31	0.832	14.37	0.898
27	11.25	0.713	12.31	0.779	13.37	0.845
28	10.25	0.641	11.31	0.707	12.37	0.773
29	9.25	0.578	10.31	0.644	11.37	0.710
30	8.25	0.516	9.31	0.582	10.37	0.648

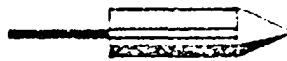
Fabricating and Physical Qualities

Drawing and Forming



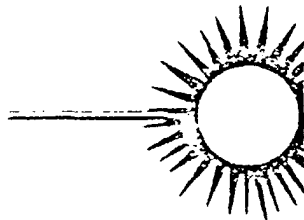
USS Long Terns are well suited for products requiring severe drawing or forming characteristics with excellent solderability and welding properties. The terne coating acts as a lubricant and facilitates drawability. The strong bond of the terne metal allows it to be formed with the base metal.

Solderability



USS Long Terns can be readily soldered with non-corrosive fluxes using normal procedures since the sheets are already "presoldered". This makes USS Long Terns a good choice for most applications, including radio or television chassis where ease of solderability and ease of forming are important factors.

Weldability



USS Long Terns can be readily welded by either roller seam or spot welding. Both methods are used in the manufacture of gas tanks.

of USS Long Ternes



Corrosion



USS Long Ternes offer excellent resistance to corrosion by water, gasoline and air in such applications as gasoline tanks, air filters, oil pans, etc.

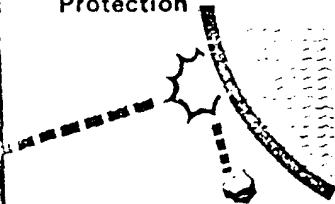
Paintability



The excellent paint adherence of some coating allows USS Long Ternes to be painted using conventional systems. No special surface treatment or primer is necessary prior to painting except for the removal of dirt, oil and grease.



Impact Rupture Protection



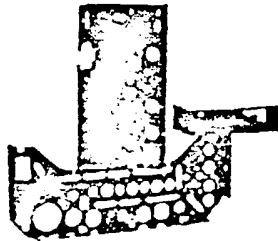
This special protection of USS Long Ternes can be observed by looking at any automotive gas tank. In most cases, it is so situated as to be subject to attack from flying stones or corrosion. USS Long Ternes may give and dent readily but seldom rupture, eliminating tendency to leak. Even the most "beet-up heap" in the junk yard usually has a gas tank in working shape.

Common Applications for

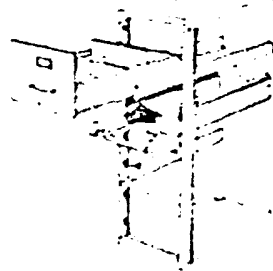


Long Ternes

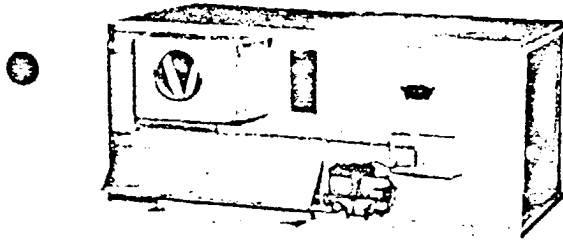
Some of the wide variety
of uses for
USS Long Ternes
are displayed on the
following pages.



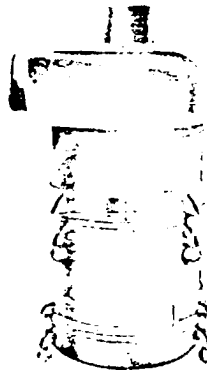
For electronics chassis, whether radio, television, or tape recorders, you can't beat USS Long Terme Sheets. The terme coating makes soldering a cinch.



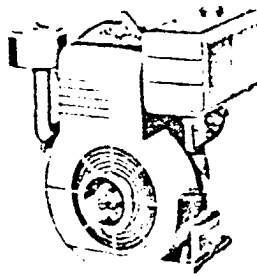
File drawers slide easily on tracks made of USS Long Ternes, thanks to the lubricating properties of the terme coating.



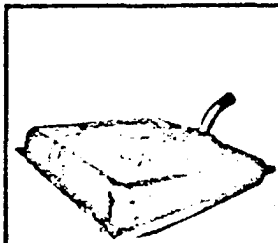
Many key heater and furnace parts are now being produced from USS Long Terns. They are easy to work with and supply good corrosion properties.



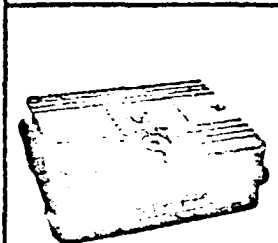
USS Long Terns are a natural for air filters. Easy fabrication and good corrosion resistance are the reasons many producers use terns for air filters and other engine parts.



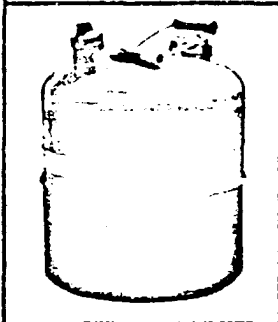
USS Long Terns can be ideally used in most gas tanks, no matter what the size. They can be easily formed or bent into the shape needed to fit a cramped or unusual space.



USS Long Ternes have found their greatest use in automotive gas tanks. The excellent solderability, welding and special corrosion resistance makes the product ideal for this use.



USS Long Ternes can be used for small gasoline tanks, such as for outboards, lawnmowers and similar applications. The tern coating holds up well and will give long life. Don't forget solderability, weldability, formability and paintability.



Even spare gas tanks are ideally suited to USS Long Ternes. The tern coating will not dissolve on the inside even after long use, and the outside can be attractively painted for aesthetic appeal.



LIA23343

1. Name (Last, First, Middle Initial) _____

2. Date of Birth (Month/Day/Year) _____

3. Social Security Number (Last Four Digits) _____

4. Address (Street, City, State, Zip) _____

5. Telephone Number (Area Code, Number) _____

6. Occupation (Job Title) _____

7. Signature _____

8. Date (Month/Day/Year) _____



Long Ternes

are attracting lively interest among designers in many fields. Their unusual properties have been adapted to a multitude of end uses and are under consideration for many more. Wouldn't some of the virtues of USS Long Ternes make your products better?

Here are some applications for which USS Long Tern Steel Sheets are well-suited:

Automotive

- Air conditioners
- Air filters
- Cylinder head covers
- Distributor tubes
- Gas tanks
- Laboratory cabinets
- Oil Filters
- Oil pans
- Radiator parts (where excellent solderability is required)
- Valve rocker arm covers

Caskets

Electronic Chassis and Parts

- Radios
- Tape recorders
- Television sets

File Drawer Tracks

Fire Doors and Frames

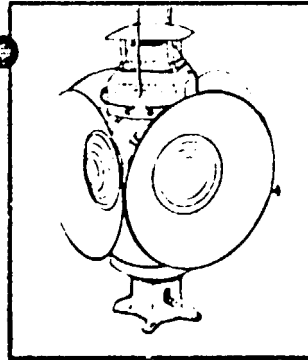
Furnace and Heating Equipment Parts

Railroad Switch Lamps

Small Fuel Tanks

- Lawn mowers
- Power saws
- Tractors
- Outboards

Railroad switch lamps stand a lot of bad weather. For protection from rust on the inside and to make sure all joints and seams are sealed, USS Long Ternes can be used very effectively. The ease of painting facilitates securing optimum service life on the exterior surfaces.



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for technical assistance,
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