NIPPON STEEL

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TINFREE STEEL
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NIPPON STEEL

TINFREE STEEL

Steel Sheet

NET ZERO
NIPPON STEEL
Green Transformation
initiative

NIPPON STEEL CORPORATION

Introduction

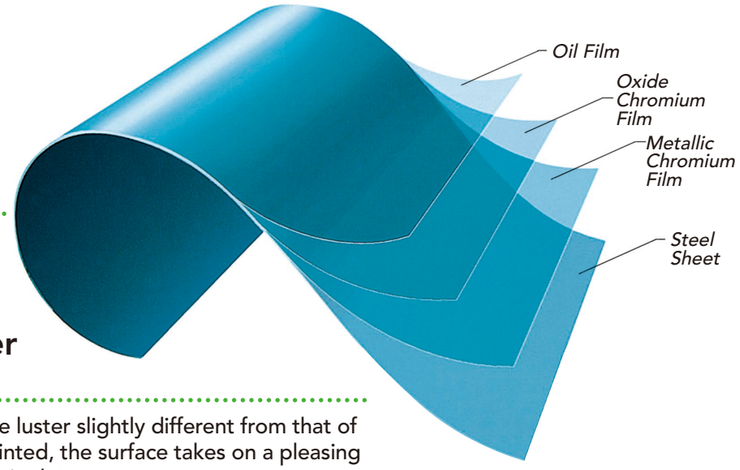
NIPPON STEEL's Tinfree Steel is chromium plated steel sheet. Developed by NIPPON STEEL as a highly economical, high quality replacement for tinplate, it is now the world's most widely used tinfree steel.

Tinfree Steel offers outstanding corro-sion resistance, workability, lacquerability, lacquer adherence as well as printability. That's why more and more manufacturers are using it in various types of containers, electric applianc-es and other household articles.

This catalogue gives detailed information on Tinfree Steel — its properties and applica-tions.

Contents

Features



1 Attractive Appearance

Tinfree Steel has a beautiful, lustrous metallic finish on both sides.

2 Pleasing Lacquer and Print Finish

Tinfree Steel has a surface luster slightly different from that of tinplate. Lacquered or printed, the surface takes on a pleasing tone not obtainable with tinplate.

3 High Workability After Lacquering

Lacquer adheres to Tinfree Steel so tightly that the lacquered sheet can take considerable fabri-cation. The tough surface film has outstanding resistance to flaking and scratching. Further-more, because of its excellent non-aging properties Tinfree Steel retains its high after-lacquering work-ability for long periods.

	Tinfree Steel	Tinplate
Results of citric acid bolling tests (epoxyphenolic)		
Caustic soda boiling tests (oleoresinous)		
Results of undercut film corrosion tests		

4 Superior Corrosion and Chemical Resistance, Even After Fabrication

Tinfree Steel offers superb chemical and corrosion resistance. Lacquer-ing and printing enhance these properties, protecting the steel even at the most severely fabricated points.

5 Outstanding Sulphide Resistance

Food cans made of Tinfree Steel are not sus-ceptible to sulphur staining or blackening. This is because the metallic chromium coating provides outstanding sulphide resistance.

6 Superior Heat Resistance

Tinfree Steel can undergo high-temperature lacquer baking for short periods with no change in its corrosion resistance.

7 Abrasion Resistance

Tinfree Steel is practically abrasion-proof. Thus it is far easier to handle and transport than tinplate.

Applications

Excellent lacquer adherence, workability, corrosion resistance and other features make Tinfree Steel ideal for the following applications. Lacquering is recommended for optimum performance.

1. Food & Beverage Containers

For beverage cans, ends, oval cans, rectangular cans, etc., Tinfree Steel can be used in the same manner as tinplate.

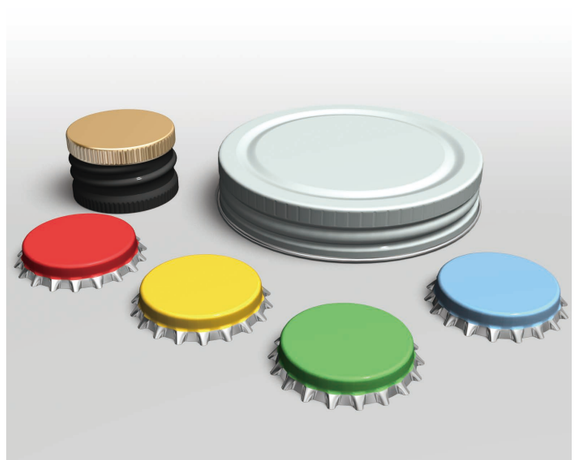
Excellent sulphide resistance, lacquer adherence and other properties make it a highly versatile food-can material.

2. Decorative Cans and Containers

Owing to its superior lacquer adherence, workability, scratch and chemical corrosion resistance, Tinfree Steel is eminently suitable for general cans designed to hold candies, coffee or tea, paints, detergents, chemicals, and for dry cells, film cartridges, etc.

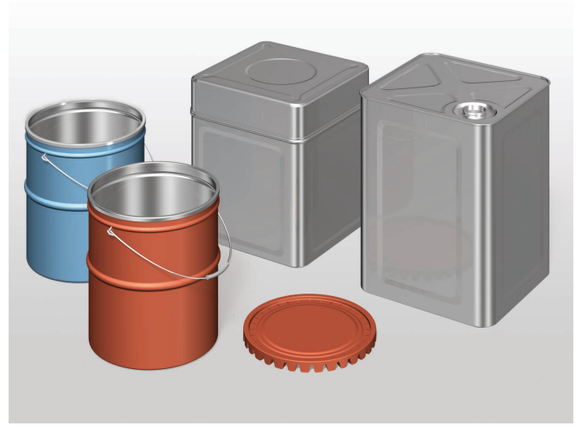
3. Screw and Crown Caps

Having high scratch resistance, lacquer adherence, drawability and lining adhesion, Tinfree Steel is ideal for use in crown caps for beer, juice and other beverage bottles, as well as in screw caps for coffee, tomato ketchup, jam and other bottles.



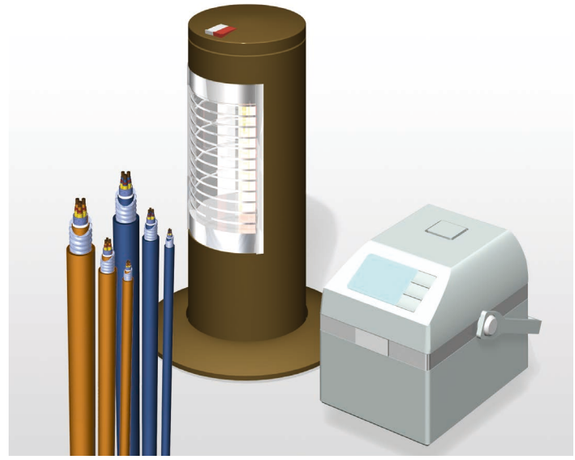
4. Oil Cans and Pails

Lacquer adherence, workability, weldability, ease of seaming and chemical corrosion resistance make Tinfree Steel highly suitable for use in cans for motor oils, edible oils, paints and lacquers, chemicals, mineral oils, etc.



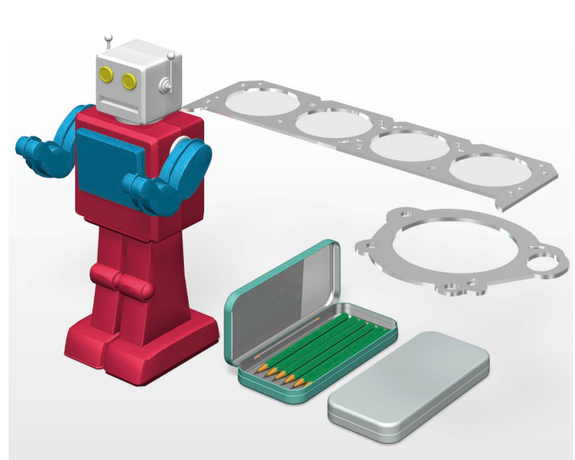
5. Household Articles and Electric Appliances

Because of its lacquerability, printability, workability, corrosion and heat resistance, Tinfree Steel is widely used for fixtures, bodies for vacuum cleaners, pots, coasters, stove parts, trays, etc.

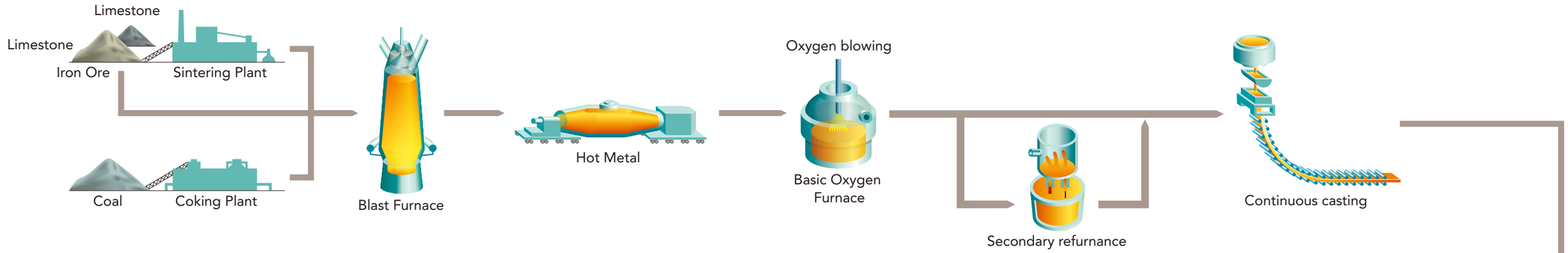


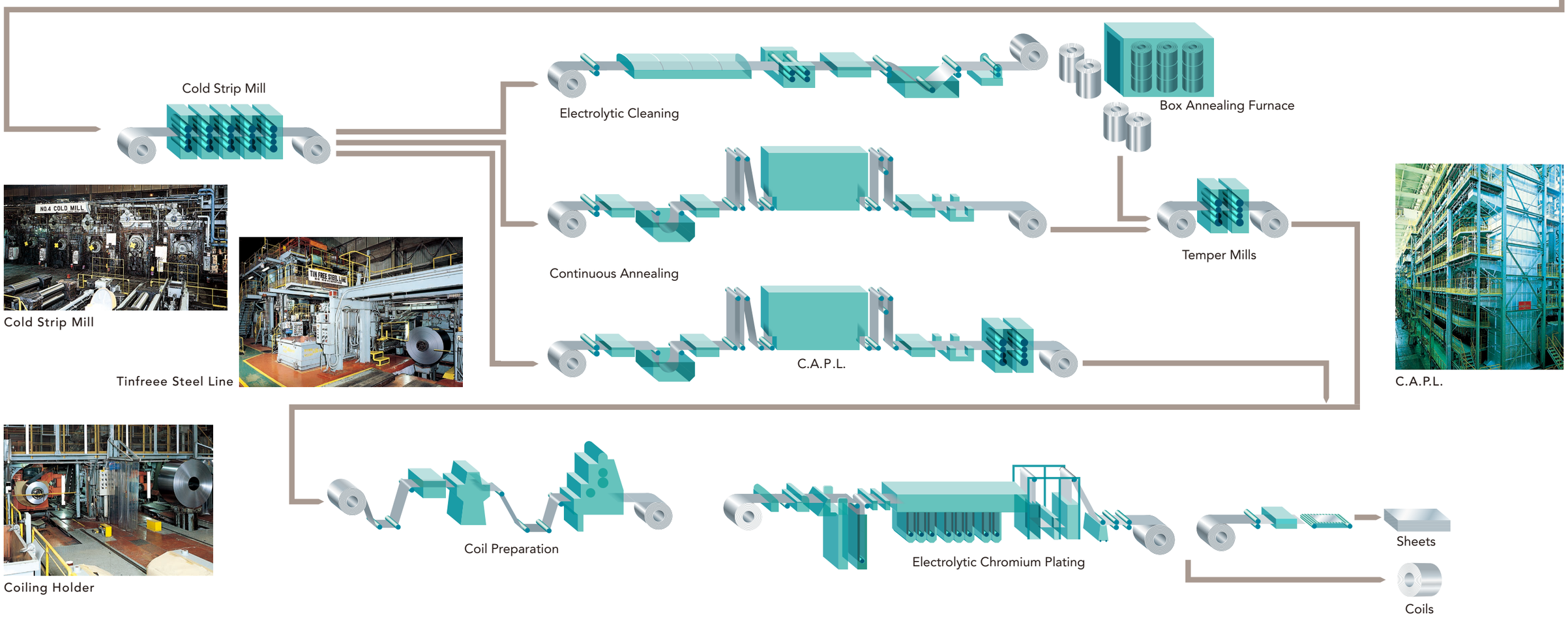
6. Others

Toys, pencil cases, gaskets, etc.



Manufacturing Process





Cold Strip Mill

Tinfreee Steel Line

C.A.P.L.

Coiling Holder

Grades and Sizes

Tinfree Steel comes in a wide range of grades, finishes and sizes, allowing the customer to select the most suitable steel for his application.

Tinfree Steel is produced to NIPPON STEEL Standard or Japanese Industrial Standard (JIS G 3315).

1. Temper

Base sheet strength and workability depend on grade, the olling method used, and, particularly, the degree of temper rolling.

Tinfree Steel is produced in the same tempers as tinplate.

	Designation	Nominal rockwell hardness (HR30TSm)	Applications
SR	T-1	49	Extra deep drawn cans which require high ductility.
	T-2	53	Printed cans and average deep drawn cans which require ductility and surface hardness.
	T2-1/2	55	General uses which require a fair degree of ductility, including cans, bodies and caps.
	T-3	57	General uses which require a fair degree of hardness, including cans, bodies and caps.
	T-3.5	59	General cans which require a fair degree of hardness and high degree of toughness.
	T-4	61	General cans which require a comparatively high degree of toughness.
	T-4.5	63	General cans which require a high degree of toughness.
	T-5	65	Large cans which require high buckling resistance. Caps and bodies of pressure vessels.
DR	DR- 7.5	71	Bodies for beer cans, carbonated beverage cans, DrD cans, etc.
	DR- 8	72	
	DR- 8.5	73	
	DR- 9	75	Tops and bottoms for beer cans, carbonated beverage cans, bodies for DrD cans, etc.
	DR- 9M	76	
	DR- 10	79	

Notes:
1. Annealing is by batch annealing or continuous annealing. Even though the hardness values expressed in HR 30T obtained from these processes are equal, mechanical properties other than hardness are not always consistent. Therefore, you may specity the annealing process by agreement with us. Where the continuous annealing process is selected, CA shall be suffixed to the temper designation specified in Table (Example: T -4 CA).
2. Rockwell Hardness Values are based on the use of a diamond anvil.

2. Surface Finish

Tinfree Steel comes in the following surface finishes, each with a different luster. Each finish can be lacquered or printed to display a unique tone.

Bright Finish

This finish, natural with Tinfree Steel has the characteristic sheen of metallic chromium.

Dull (Matte) Finish

This finish, produced by coating dull finished steel base with metallic chromium, has a silvery white luster. Offering superior ink adherence, it is widely used for printed cans and crown caps.

Rough (Stone) Finish

This finish is produced by coating rough finished base steel with metallic chromium for a unique light matte effect.

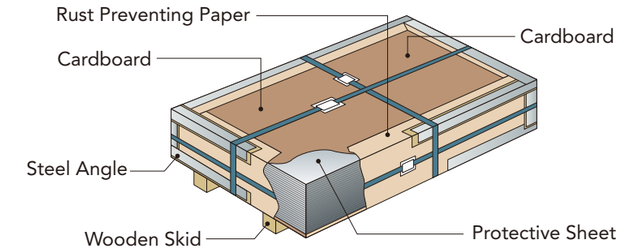
3. Available Sizes

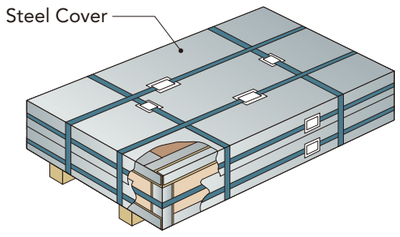
	Single-reduced size				Double-reduced size			
	Sheets		Coils		Sheets		Coils	
	Negotiable Range	Normal Range	Negotiable Range	Normal Range	Negotiable Range	Normal Range	Negotiable Range	Normal Range
Thickness mm (lbs)	0.12-0.81 (44-290)	0.20-0.40 (72-143)	0.12-0.81 (44-290)	0.20-0.40 (72-143)	0.10-0.49 (40-175)	0.15-0.36 (54-128)	0.10-0.49 (40-175)	0.15-0.36 (54-128)
Width mm (in)	508-1080 (20-42.5)	680-950 (26.8-37.4)	508-1,240 (20-48.8)	680-950 (26.8-37.4)	508-1040 (20-40.9)	680-950 (26.8-37.4)	508-1,240 (20-48.8)	680-950 (26.8-37.4)
Length mm (in)	457-1,083.9 (18-42.6)	500.1-1063 (19.7-41.8)	—	—	457-1,083.9 (18-42.6)	500.1-1,063 (19.7-41.8)	—	—
Coil Mass metric tons (lbs)	—	—	2-14 (4,410-30,860)	5-14 (11,030-30,860)	—	—	2-14 (4,410-30,860)	5-14 (11,030-30,860)
Coil Inside Diameter mm (in)	—	—	406, 419, 508 (16, 16.5, 20)	419, 508 (16.5, 20)	—	—	406, 419, 508 (16, 16.5, 20)	419, 508 (16.5, 20)
Coil Outside Diameter mm (in)	—	—	1,880 Max. (74 Max.)	1,880 Max. (74 Max.)	—	—	1,880 Max. (74 Max.)	1,880 Max. (74 Max.)

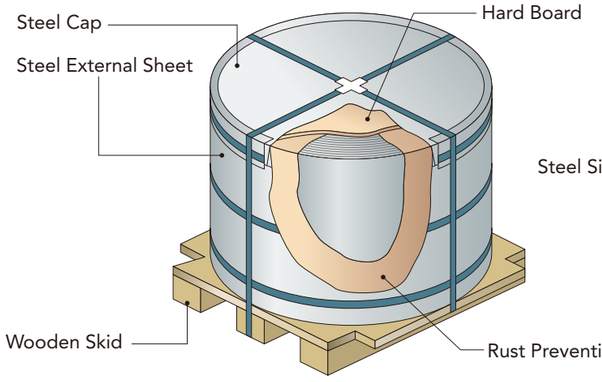
Note: Other sizes are available on special order.

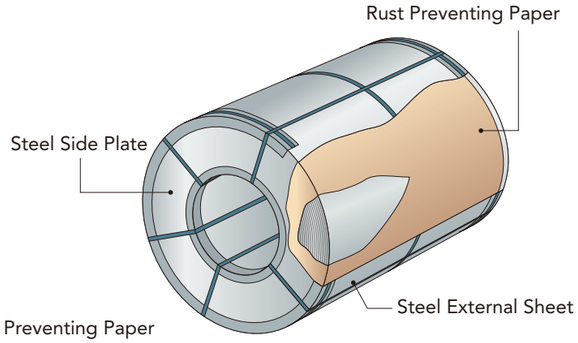
Packaging and Marking

1. Packaging









2. Marking

Each package is marked on the exterior with gauge number, degree of temper, surface finish, size, weight, production number, package number, package date, etc. An inspection card inside the package gives the same information.

Recommended Practices in Using Tinfree Steel

Tinfree Steel has several unique properties, and offers a wide range of advantages, particularly if it is used printed or lacquered. These recommendations should be followed for the best results.

Handling

Care must be taken with Tinfree Steel, as with tinplate, that the sheets are not scratched and that they are not stained with fingerprints, sweat or other foreign matter.

Fabrication

Tinfree Steel can undergo press drawing, seaming and other similar processes with satisfactory results, if they are applied in the proper manner with consideration given to the thickness of the sheet.

Degreasing

Oil and grease (such as the lubricants used during drawing operations) must be removed. This can be done easily with various types of organic solvents, emulsion cleaners or light alkaline cleaners. Strong alkaline solvents and elec-trolytic cleaning should be avoided.

Lacquering and Printing

Tinfree Steel may be lacquered or printed with excellent results by any of the conventional methods: roller coating, spray coating or dip coating.

1. Coating materials suitable for Tinfree Steel include baking or heat-hardening lacquers and printing inks commonly used on tinplate. When air-drying paints are used, size coating is recommended.
2. The exterior of Tinfree Steel can should be covered with lacquer.
3. The interior of Tinfree Steel can should also be covered with lacquer, except for use as motor oil cans.
4. It is very important not to scratch the lacquered surface of Tinfree Steel during canmaking.

Bonding

Tinfree Steel lends itself superbly to joining either with adhesives or by welding. Any of the following methods is suitable. As with aluminum, however, it is difficult to solder Tinfree Steel.

- Bonding with organic adhesives, such as seam cement
- Bonding by seam welding or spot welding

In order to apply welding, the metallic and oxide chromium of both sides should be cleaned off because of its high electric resistance.

Storage

After unpacking, Tinfree Steel must be kept in as clean and dry a place as passible. Do not store it outdoors.

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