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Prepainted Sheet Steel: Taking on Canada's climate for two decades

Four key components constitute prefinished sheet steel

Prefinished sheet steel for construction consists of four major components: the sheet steel itself, a metallic (zinc or aluminum-zinc alloy) coating, chemical pre-treatment and primer, and a top coat. Each performs an important role in providing designers with a high quality, aesthetic, cost-competitive and corrosion-resistant material.

The backbone of the system is sheet steel, an ideal material for covering large surface areas because of its economy and high strength-to-weight ratio.

Protection against the demanding Canadian environment is provided by the metallic coating, one of the most effective methods of protecting bare steel from corrosion. Both zinc and aluminum-zinc alloy provide a tough, non-porous coating.

Besides acting as a protective barrier, zinc is able to "sacrifice" itself to protect the underlying sheet steel if both metals are exposed, for example at a cut edge. Sacrificial protection occurs when two dissimilar metals are in electrical contact and are coupled with water and oxygen. Under most conditions, zinc can protect gaps of bare steel or edges up to 2 mm (1/16 inch) in width.

The aluminum-zinc alloy coating also provides both sacrificial and barrier type protection to the base steel.

Zinc and aluminum-zinc alloy coated sheet steel is, of course, a viable construction material by itself. For maximum corrosion protection, however, a primer and top coat must be added to provide both colour and a highly effective barrier to the atmosphere. The primer and top coat inhibit water and oxygen from reaching the underlying metallic coated sheet steel, thus effectively arresting the corrosion process.

This, then, is prefinished sheet steel.

Prefinished sheet steel is a Canadian development, one that can back up all its claims and prove that it performs successfully in Canada's many different environments.

Manufacturing excellence

Manufacturing expertise and meticulous attention to detail lies behind prefinished sheet steel's success.

Prefinished sheet steel is a coil-coated product manufactured under stringent quality control in a modern coating factory. Coil coating is a precise, multi-step process that applies paint coatings to specially prepared sheet steel in a continuous operation. The process starts with a coil of metallic coated sheet steel. The steel strip enters a five-stage chemical treatment section where the steel surface is cleaned, rinsed, chemically treated to ensure optimum paint adhesion, rinsed again and finally chemically neutralized.

A primer containing corrosion inhibitors is now applied and the primed sheet cured in a gas oven at up to 230°C (450°F).

Next stage is another roller-coating unit that applies the top coat to one or both sides. Coating thickness is accurately controlled to a tolerance of $\pm 3 \mu\text{m}$ (± 0.1 mils). The strip now travels through another gas oven where consistent paint curing is assured by controlling line speed and oven temperature. After cooling and passing through an exit accumulator, the coated sheet is recoiled and removed from the line.

Throughout the manufacturing process, process control and product quality are strictly observed. Qualified technicians operate the coil-coating line, ensuring that all product performance criteria are met. Each batch of paint is analyzed; thickness is monitored as the paint is applied and immediately after curing; bend and impact tests on painted samples measure paint adhesion; colour is monitored using a MacBeth Daylight Booth; gloss is also measured.

In every sense of the word, prefinished sheet steel is a custom product. User criteria and field conditions should be known before the material is specified and produced.

Prefinished sheet steel is normally supplied with a full paint coat on the top side and a clear wash coat on the reverse side. This wash coat, which protects the top side during recoiling, is compatible with the top coat but is thinner. Prefinished sheet steel can also be produced with a full paint coat on both sides

of the sheet. An important note here: although different colours can be ordered on either side, the paint system must be the same type.

Layered protection

Prefinished sheet steel cladding has demonstrated exceptional durability right across Canada since the mid-1960's. The proven and outstanding performance is due to the efficient combination of different materials protecting the steel core. These are:

1. **Top coat:** an aesthetically pleasing protective barrier.
2. **Primer:** aids bonding of finish coat and contributes to corrosion resistance.
3. **Microcrystalline zinc phosphate pre-treatment:** works with primer, providing clean and uniformly passive surface, to ensure stable bonding.
4. **Metallic coating:** provides tough, non-porous corrosion protection for steel substrate.
5. **Steel substrate:** the steel core provides the physical and mechanical properties of the sheet.

The prefinished sheet steel family: meeting every need

There are different prefinished sheet steel systems for exterior use on buildings or other construction.

The 8000+ Series and Colorite™ HMP are 2-coat systems used in commercial, industrial, and agricultural applications.

The 10 000 Series is a 2-coat system based on the Kynar 500 resin system. 10 000 Series is used primarily in architectural and commercial applications of a more prestigious nature. It has superior colour retention and formability properties compared to the 8000+ Series or Colorite™ HMP.

Barrier Series is a 2-coat plastisol system available in 100, 200 and 300 µm (4, 8 or 12 mils) coating thickness, compared to about 25 µm (1 mil) for the 8000+ Series, 10 000 Series and Colorite™ HMP. Barrier Series is used in aggressive environments where corrosion resistance is the primary concern. It has good weathering characteristics and excellent protective properties, combined with excellent formability. The

300 µm (12 mils) thick Barrier Series is suited to particularly aggressive industrial environments and is available on request. The particular atmospheric conditions to be encountered should be evaluated before ordering Barrier Series. Aggressive environments may demand that the reverse side of the sheet be protected as well as the exposed side.

The Metallic/Elite Series are 4-coat systems used in prestigious applications: Metallic for flat architectural panels, and Elite for accent applications. They are available in a range of colours and metallic finishes offering very good weathering and protective properties.

Metallic coatings are relatively new and offer a brilliant metallic finish in a range of colours. These coatings have a minimum dry film thickness of 41 to 51 µm (1.6 to 2.0 mils) and are intended for prestigious use on commercial, institutional and light industrial buildings. Building panel surfaces should be inclined no more than 30° to the vertical.

Proven colours

Prefinished sheet steel is available in a variety of standard proven colours. (A "proven colour" is defined as one manufactured from pigments whose stability has been established under prescribed external exposure conditions.) For colour matching, an actual paint sample of the desired colour is required. The steel supplier will then supply samples of the closest possible colour match for approval. It is, however, technically impossible for different production lots of prefinished steel to have perfect colour match. There are, however, several ways to achieve satisfactory colour matching on a large project. For example, purchase the entire requirements for the project from one lot; clad each building elevation with material from the same lot; insert a new lot at an elevation change or break in the building structure to minimize the effect of any possible colour variation.

For More Information

For more information on sheet steel building products, or to order any CSSBI publications, contact the CSSBI at the address shown below or visit the web site at www.cssbi.ca

