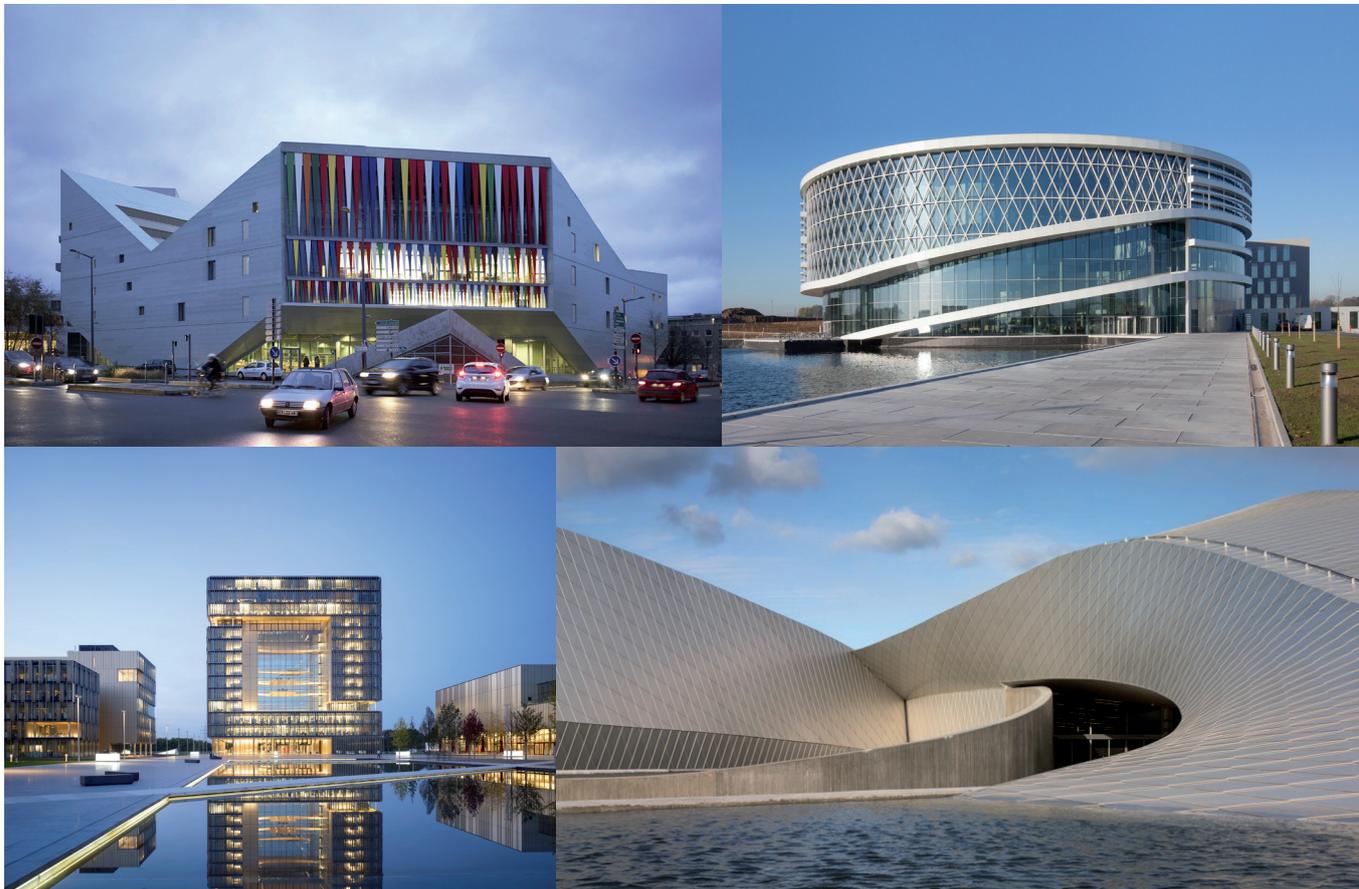




Recommendations for long-lasting prepainted metals in buildings



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0 - Introduction

New buildings are designed and erected all over the world, every day, with a variety of shapes, appearances and uses that our imagination can hardly encompass.

Among all the materials architects can decide to use in such projects, coil-coated metal is an ideal compromise between the overall cost, the flexibility in design, the range of different colours and aspects and the durability.

However, prescribers sometimes consider that pre-painted metal is only a second choice, mainly because of the wrong image they have of what pre-painted metal actually is.

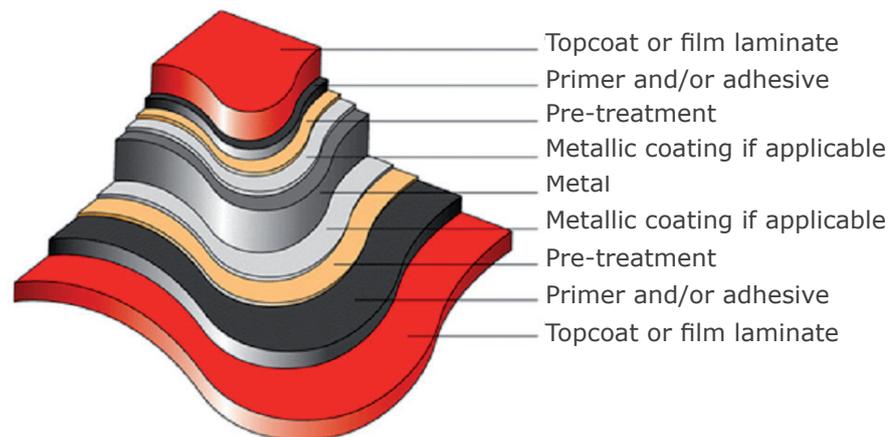


1 - What is prepainted metal?

Prepainted metal looks a simple material but it actually is far more sophisticated than most people could think a priori. A coil-coating line is a modern industrial tool where top quality flat metallic substrate is coated with the most advanced paints. Different coatings can be used based on the environment the finished product will be installed in and some coatings have excellent resistance to weathering elements in harsh environments. Coil-coating is the best way to have a perfectly painted surface, id est a surface where surface treatment and paint are evenly applied and cured. Painting flat surfaces with a roller-coater makes it far easier to get a homogeneously distributed layer than any post-painting technology that would generally not allow 25µm evenly painted over large surfaces with a perfect finish appearance. The optimal homogeneity of the coating appearance but also of its physical or chemical properties is generally easier to get with prepainted metal than with alternative post-painted techniques.

To be processable on a coil-coating line, metal coils need to be perfect. The coil-coating process is very demanding. The primer coating is generally only a few micrometres and applying such a thin layer is only possible if the thickness of the coil is very constant and if there are no surface defects. The used paints need to be curable in a few seconds. With its incredibly large range of aspects, high durability, mechanical properties that combine flexibility and hardness ... coil-coated metal is actually a high-tech product.

As such, it deserves special attention and care!



Typical composition of a prepainted metal

2 - Life starts before birth!

Per definition, prepainted metal is painted before being used. When a new building is commissioned, the organic coated material has then already been living for a while and its life in the early stage is not really peaceful: once painted, the flat metal coil needs to be cut, shaped, foamed, transported, handled, joined, ...

Compared with most other materials which are erected with their raw appearance and finished after erection, prepainted metal surface gets its final appearance even before being shaped.

The coating also plays a role in the overall resistance of the material (especially against corrosion) and preserving the integrity of the paint layer is not only important for the appearance of the material but also for its sustainability. It is then of prior importance to correctly choose the prepainted metal and to handle it with care all along the steps between coil-coating and building erection.

2.1 - Selection of the appropriate combination metal/paint is crucial

- Choose the correct metal substrate

Prepainted metal is generally steel or aluminium. In the case of aluminium, the nature of the alloy is important. In the case of steel, the metallic coating should also be considered, most coil coaters propose a range of hot-dip galvanized material in which the ideal one for your building needs to be chosen. The nature of the substrate (and of the metallic coating layer) and its thickness, will have direct consequences on the mechanical properties (drawability, stiffness) and on the corrosion behaviour.

- Choose the correct paint system

Depending on the way architects design their buildings, the expected properties can significantly differ. Some paint systems are known to be particularly flexible, for example, and should then be selected in the case where the prepainted flat metal later undergoes severe strains. Or some paint systems are known to be particularly resistant to UV degradation, they will of course be the best election for buildings where sunlight can be aggressive.



*UV resistance can be critical:
the Ferrari Center in Abu
Dhabi, with a red coil-coated
roof*

Coil-coaters can help in the selection of the appropriate system. Generally speaking, it is important to check the compatibility between the metal/paint system and

- The design of the building
 - Drawability versus stiffness?
 - Exposure to sun light (and even distribution of sun light)?
 - Exposure to rain or harsh weather conditions (and even distribution of precipitations)?
- The location of the building
 - Close to the sea?
 - Industrial area?
 - Very sunny?
- The nature of the building
 - Residential
 - Industrial
 - Offices
 - Agricultural
- The expected lifetime
 - Associated with the expected maintenance!

2.2 - Care is needed all along the supply chain

Small defects can turn as corrosion sites and these defects can result from any misuse in one of the processing steps after the coil-coating line.

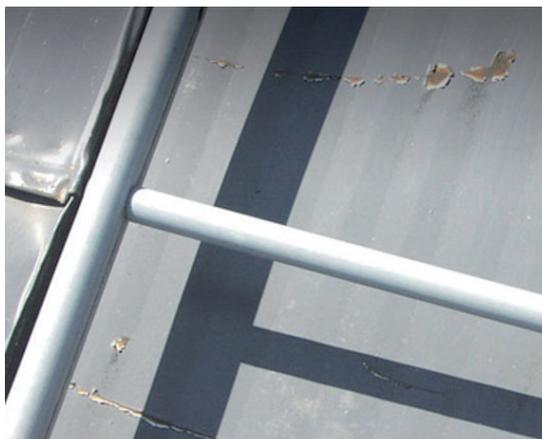
Prepainted metal is necessarily handled and stored several times before the elements for cladding, roofs, doors, are finally erected. A few simple rules for storage and handling are generally enough for preserving the quality of the prepainted metal:

- On reception, check whether there are signs of damage to the packaging or metal and also check whether there are any signs of water/condensation.
- Avoid fluctuations in temperature. Optimum storing conditions:
 - Storage temperature: 15-30 °C (below 15°C, condensation can occur)
 - Leave the material in its original package until the material has reached the temperature of the surroundings (min 24 - 48h)
- If the prepainted metal is kept on the floor, the floor must be clean and a resilient pad, such as carpet, felt or rubber should be used.
- When lifting coils or packs of sheets, care should be taken with lifting belts or hooks, in order to ensure that the coating surface is not damaged or the flatness of the sheet is not altered.

- A system of FIFO (First In First Out) should be used, as some coatings might harden and lose flexibility over a period of time.

Main risks for prepainted metal occur in the erection step, when workers need to handle panels on site, with a probability of bumps or scratches, stains with oil or grease or concrete, ...

The use of a temporary protective film, which is stripped off when the surface is not supposed to face any further risk of handling damage, may help not only to avoid damages to the surface but also dirt pick-up during forming and installation. Such a film, with arrows to avoid any visible direction mismatch on the building, should systematically be used with special colours (metallics, for example).



Consequences of scratches during the erection of the building

It is generally necessary to cut panels on site and to adapt the way panels are fixed in some special cases. An incorrectly executed work can result in unprotected edges or even in holes. Experienced people using appropriate tools will generally minimise burrs. Whenever possible, the down burr edge should be bottom side of the down slope edge of the roof pitch.

2.3 - Your role as a customer is fundamental

When commissioning the building, a thorough inspection is important because it will ensure a correct start-up for the building and lower the risks of premature ageing. The most important points that should be checked are:

- **Construction debris**

Metallic debris, such as swarfs, rivet stems, or other debris that may remain after construction or modification to the building will be vulnerable to corrosion, leading to an unsightly staining of the cladding. Debris of this nature should simply be removed at as early stage as possible, carefully so as not to damage the underlying coating.

Always test the cleaning solution on an unexposed area before applying on larger surfaces



Visible spot corrosion can happen when a coil-coated panel is drilled on-site if the metallic debris are not removed

Staining caused by the corrosion of construction debris can be removed using a 5% hydrochloric acid solution. Specialist cleaning products may be required for particularly stubborn marks.

Concrete and cement and plaster can be removed with a 5% phosphoric acid solution. When hydrochloric acid or phosphoric acid is used, this should be **followed by thorough washing and rinsing.**

- **Fasteners**

If inappropriate fasteners (or caps) are used, or if their use is incorrect, these fasteners can be the location of anticipated corrosion.

Check and replace with correct material if necessary.

- **Strippable film**

Temporary protection films must be removed as soon as they are not useful anymore because the longer they are left in place, the more difficult it is to remove them. Their tack increases over time, especially if exposed to sunlight.

To remove film in the difficult cases of excessive adhesion, white spirit can be used. It is then necessary **to thoroughly wash and rinse the surface.**

Always test the cleaning solution on an unexposed area before applying on larger surfaces



Protection film was only stripped off after significant on site ageing. Glue residues are difficult to remove from the coil-coated surface

- **Unprotected edges**

If the metal substrate is exposed in the zones where a panel has been cut, there is an obvious risk of premature corrosion. A specific attention should be given to penetrations, such as pipe-work and roof lights where on-site cuts cannot be avoided.



Panels were unnecessarily cut on site and cut edges were not properly treated

If some edges are unprotected, or even damaged, they should be protected again. For example:

- Cut and remove, or abrade, any loose organic coating back to solid metal.
- Abrade to bright, solid metal, ensuring that the surface is not polished. Thoroughly clean and dry these surfaces before applying the specified materials, which must be applied as recommended by the paint system manufacturer.
- Coat the prepared areas with the appropriate anti-corrosive primer recommended by the materials supplier.
- When the first primer coat has dried, apply a second primer coat in a neat band to the prepared area so that the primer extends beyond the prepared area, covering the original surface.
- Apply a top coat to the dry, primed area.

Always check with your supplier

3 - Life is longer if you take care

3.1 - General recommendations: inspection and cleaning

Prepainted metal, if correctly chosen and erected, is normally designed for a long-lasting life with a minimum care. But « minimum care » does not mean no care at all!

Normal ageing of paints is the consequence of long-term chemical changes mainly initiated by the sunlight exposure (photodegradation of the polymers or of the pigments yield to chalking or discolouring). In the case of prepainted metal, the timescale for such phenomena is long enough for considering that they do not limit their use in construction.

There are two major causes of anticipated ageing that a simple but regular preventive maintenance can easily eradicate:

- If any pollution piles up somewhere, this pollution is likely to have detrimental effects on the prepainted metal. Hopefully, most parts of a building are generally exposed to rain and the pollution is efficiently removed by the beneficial washing action of rainwater. Where surface deposits are not washed away by rainfall for any reason, there may be detrimental consequences of the contact with (corrosive) compounds that may compromise the appearance of the product or even shorten its life. If a very large quantity of debris builds up, ponding of water is also possible, which may also lead to corrosion.

- If the paint layer is damaged (abraded or indented), there is a risk of corrosion of the underlying metallic substrate because the protective (barrier) effect of the paint layer is turning less effective.

Most paint suppliers, coil-coaters and some retailers recommend a preventive maintenance which is mainly based on a periodic inspection of the status of the prepainted walls and roofs and on a cleaning of the parts where pollution has accumulated since the previous cleaning.

In the periodic inspection, the first objective should be to look for areas where rainwater doesn't succeed in cleaning the prepainted surface, especially the zones sheltered from rain. Build-up of dirt and debris can also be particularly profound at any irregularity such as at corners, penetrations and gutters. In urban areas, birds dropping can significantly alter roofs appearance. In the places where birds use to gather, it is important to inspect roofs more frequently.



Cleaning of a façade during periodic maintenance

When cleaning the prepainted metal, the products and equipment used should, of course, be selected in such a way that they won't damage the surface. The recommendations are:

- Ordinary detergent can be used (for example, one cup of household ammonia dissolved into 20l of water). If an industrial detergent is used, it should be dosed according to the manufacturers' recommendation. The detergent should not contain more than 0.5% phosphate dissolved into 7l of warm water. Stronger solutions than those recommended may damage the paint.
- Avoid organic solvents or abrasive cleaning products (like scouring powder for example). Oil can be removed by wiping the area with white spirit before cleaning and rinsing.
- Work from the bottom to the top of the metal panels, with well soaked cloth, sponge or very soft-bristled brush. A low-pressure spray washer can also be used.
- Rinse thoroughly from top to bottom, so that all detergent residues are removed.
- Excessive washing may do more harm than good!

3.2 - Cleaning in some special cases

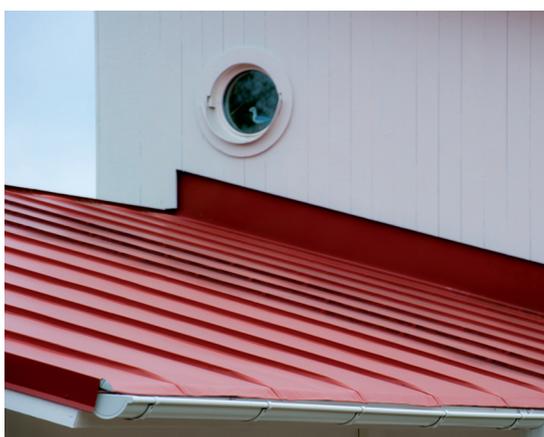
- **Graffiti**

It is now very uncommon for wide surfaces to keep free of graffiti in the urban environments. The sooner graffiti are removed, the easier it is to get rid of them and the lower the alteration of the prepainted surface. Some cleaning products have been developed specifically for removing graffiti, they are usually efficient (for instance, 3M Graffiti Remover GR2 (code CSS0561) or BIOkleen Graffiti Remover). Practically speaking, apply a recommended amount of the graffiti remover by spray, paint brush, roller or rag to fully saturate the substance to be removed. A paint brush or roller should be used for small areas. Larger areas will require a hand pump, weed sprayer or conventional spray equipment. The dwell time required to remove or soften graffiti, depends on the type of paint, number of layers of paint and temperature of the substrate. Follow the soften time recommended by the supplier of the graffiti removal agent. If the job has not been completed, wipe off the softened graffiti with a cotton cloth and re-apply the remover. For small areas, removal of residue can be completed by wiping with a dry cloth, followed by a warm or soapy water rinse. For larger surfaces, removal can be accomplished by pressure washing at approximately 60 - 100 bar with fresh water at a distance of minimum 50 cm.

In the areas where graffiti are a recurrent problem, waxy sacrificial treatment can be applied. When graffiti appear, these treatments can easily be removed and the surface treated again. Some permanent protective coatings can also be used, the graffiti is then easier to remove with a normal cleaning of the surface.

- **Mould**

Mould only appears and grows in certain conditions. Fungi first need moisture and won't develop if the surface is dry enough. Fungi also needs nutrients, which in most situations do not come from the surface itself but from the build-up of dirt which gives the fungi spores a good substrate to settle.



Mould development in the zones with high humidity – low sunlight exposure

- Getting rid of mould starts with a normal cleaning, then the surface needs to be treated with a solution of

Household detergent or proprietary cleaner	0.5%
Trisodium phosphate	3%
5% sodium hypochlorite solution	25%
Fresh water	71.5%

- The treatment should be applied with the use of a low-pressure spray or of a soft brush.
- It is also important to rinse the surface after treatment to remove the basic solution. Failure to remove all residues from these cleaning steps may damage the film.

3.3 - Repairing small defects

The periodic inspection generally gives the opportunity to detect some new scratches, bumps, stains. In the most severe cases, it can be useful to envisage touching up for recovering the initial appearance and restoring the corrosion resistance.



Repainting is easy but some simple rules need to be followed. This is the aspect of a roof which has been poorly repainted

Suppliers of automotive cellulose or acrylic coatings can provide a colour matching service for small cans of repair paint. The surface to be repaired should first be washed with a mild detergent solution in water, then thoroughly rinsed and dried. The touch-up paint should then be applied to the damaged area using a fine or medium soft-bristled brush. Changes in colour may appear during the process of natural weathering. This is normal and will generally not affect the overall aesthetics of the building.

If the zone to touch up has already been attacked by corrosion, any traces of corrosion should be removed as described for unprotected edges in section 2.3.

3.4 - Example of a maintenance program

Check	Action
Condition of the paint, signs of chalking, discoloration or surface cracking, particularly where rainwater cannot keep the surface clean	Evaluate the condition and assess whether washing, cleaning, treatment of edge corrosion, touching up or repainting is necessary
Dirt in the gutters. Blocked gutters increase the risk of corrosion and consequent water leakage into the building	Remove the waste from the gutters, since this binds moisture and corrosive substances
Accumulations of waste on the sheet increase the risk of corrosion, since the surface under the waste is kept continually humid	Remove the waste so that the sheet surfaces can dry out
Damage to the paint coat increases the risk of corrosion. Check whether the paint coat is damaged, even if the building is new	Consider whether touching up, repainting or changing of individual sheets is necessary, depending on the extent and type of damage
Loose fasteners, pop-rivet stems, drilling swarf or other metal objects resting directly on the roof could cause corrosion	Remove the swarf and/or metal objects
Wrong or incorrectly fitted fasteners could cause both leakage and corrosion	Replace the incorrect fasteners. If the thread is stripped, change to the next larger size
Edge corrosion at cut edge of overlapping sheets and sheet ends. The corrosion can spread unless treated in good time	Clean thoroughly the corroded edge and repaint as described earlier

For more information:

- * Contact your supplier
- * info@prepaintedmetal.eu

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About ECCA

Since its establishment in 1967, the European Coil Coating Association (ECCA) is the voice of the coil coating industry (prepainted metals) in Europe.

ECCA represents more than 100 members which include producers of prepainted aluminium, prepainted steel, and their suppliers.

ECCA is dedicated to promoting the use of coil- and sheet-coated metal. These materials provide an environmentally sound, cost effective, and high quality method of finishing.

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