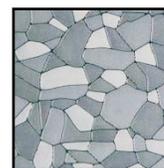


DECORATIVE SHEET METAL FINISHES



Starlight 7J



Austenite 55



InvariMatte®



InvariLux™



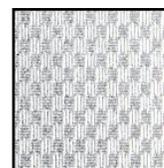
InvariGlass™



InvariWeave™



Seeds



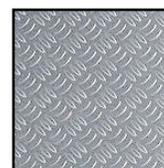
Origara



InvariBrush™



Hairline Blue



Microchecker



InvariMatte® Black

ROLLED-IN FINISHES

Akin to embossing, rolled-in finishes involves rolling coiled sheet metal through a set of work rolls to impart a texture.

Advantages

Since temper mills run at several hundred feet per minute, large quantities can be processed quickly at a reasonable cost. Repeatability of the surface pattern is excellent. Provided the producer executes proper process controls on the incoming material, as well as during the rolling process, uniformity from batch to batch can be achieved.

Disadvantages

Small quantities are not practical on production-oriented rolling equipment.

Contrarian Metal Resources, an industry leader in the manufacture of rolled-in metal finishes for architecture, offers several products of this type. We support small quantities by maintaining an inventory of popular sizes and adding small custom orders to large runs. More about the following rolled-in finishes can be learned in the PRODUCTS section of our website at metalresources.net.

ROLLED-IN STAINLESS STEEL FINISHES

- InvariGrain™
- InvariLux™
- InvariMatte™
- InvariTone™

ROLLED-IN TITANIUM FINISH

- InvariSand™

This section provides general information about various techniques used in the creation of decorative sheet metal finishes. We include comments about the advantages and disadvantages of specifying these finishing methods for architectural metal applications. With respect to any of the techniques employed, Contrarian Metal Resources endeavors to provide products that are best in class, having the highest degree of uniformity possible.

ABRASIVE POLISHED STAINLESS STEEL

This is undoubtedly the most widely used technique for finishing stainless steel. Industry standard finishes include #3, #4, and #6 POLISH, HAIRLINE, and VIBRATION.

Abrasive finishes have microscopic fissures created by the tearing action of the rotary abrasive belts. These voids allow contaminants like chlorides (salt molecules) to take hold, which can promote pitting corrosion. They are not the best choice in severe environments.

Shape distortion, caused by heat generated in the polishing process, is often an issue with abrasive polished finishes, particularly 20 gauge and lighter material. However, InvariBrush™ has a shape correction step that alleviates this problem.

- **#3 POLISH STAINLESS STEEL: Linear grit pattern, typically produced with a 100 grit abrasive belt.**
- **#4 POLISH STAINLESS STEEL: Linear grit pattern, smoother than #3.**

Advantages

These are economical abrasive finishes, available from a variety of sources. Weld areas can be readily repaired with the use of hand-held abrasive equipment.

Disadvantages

The vast majority of producers do not follow sufficiently restrictive process standards to guarantee finish uniformity from batch to batch. Further, common belt replacement practices do not guarantee consistency within a coil. Therefore, visual consistency from panel to panel cannot be assured. However, our InvariBrush™ finish (see *PRODUCTS – STAINLESS STEEL PRODUCTS – InvariBrush™*), which conforms to a #4 Polish designation, is designed to exhibit excellent uniformity from one process run to the next, which results in visually consistent panels.

- **#6 POLISH STAINLESS STEEL: An additional brushing operation (traditionally with Tampico brushes) is applied to #4 to create a smoother, somewhat less reflective finish. Contrarian's Invari6™ finish replicates this effect with modern technology, creating a less reflective linear grain finish that is easier to clean.**
- **HAIRLINE STAINLESS STEEL: Similar to a #6, having elongated grit lines. This finish is quite popular in Japan.**

Advantages

It is easier to blend this type of finish after weld repairs are made, particularly the Hairline version. The smoother surface aspect and the more linear appearance of Hairline are often desirable design elements.

Disadvantages

These stainless steel finishes are incrementally more expensive than the more popular #3 or #4 alternatives. Similar issues exist with respect to microscopic corrosion sites, however smoother is better. With the exception of Invari6™ flatness is also problematic with these finishes. Invari6™ employs shape correction to provide flatness to within five I-units (see *TECHNICAL INFORMATION – FLATNESS OF SHEET METAL*).

- **VIBRATION STAINLESS STEEL: (Sometimes referred to as Angel Hair or Non-Directive Satin) Multidirectional abrasive stainless steel finish with random grit lines.**

Advantages

Incidental scratches that occur over the life of the panel tend to blend into the random scratch pattern.

Disadvantages

This finishing technique is rather expensive, since processing is slow and often labor intensive. Fine texture versions of Vibration finishes usually require a more costly, bright annealed stainless steel substrate.

Fabrication shops, as well as many suppliers produce this finish by hand, resulting in a high degree of surface variability. Our InvariWisp™ finish (see *PRODUCTS – STAINLESS STEEL PRODUCTS – InvariWisp™*), however, is applied by a numerically-controlled head that delivers excellent uniformity.

CHEMICALLY-ETCHED STAINLESS STEEL

This process involves the use of chemical solutions to change the surface aspect of the material. Unlike electropolishing (see below), which results in a smooth surface, chemical etching is done without involving electric current and results in a dull, textured surface.

Advantages

Numerous patterns or designs can be achieved by masking off certain areas of a sheet with relatively high reflectivity and etching the exposed areas to reduce reflectivity.

Disadvantages

The process can be rather costly.

COLORIZED STAINLESS STEEL, TITANIUM & ALUMINUM

Stainless steel and titanium, as well as aluminum can be readily colorized through a variety of processes, which are outlined below:

- **ANODIZING:** Typically performed on aluminum to improve corrosion resistance, this process can also add color to aluminum, stainless steel and titanium. Anodizing relies upon the combination of chemicals and electric current to produce a hardened surface coating that is integral to the base metal. Colorizing stainless steel in this fashion is customarily done with a patented process developed by Inco®.

Advantages

Corrosion resistance is improved. In the case of aluminum, the coating will resist the appearance of a chalky oxide for a number of years. Colors are UV resistant and therefore long lasting.

Disadvantages

The anodizing process is quite expensive.

In the case of aluminum, the anodized layer is not immune to atmospheric corrosion. Combining initial costs with the probability of replacement in 30 years or so may well create an unfavorable life cycle cost for this option (see *TECHNICAL INFORMATION – LIFE CYCLE COSTING*). Colors choices are limited and have a translucent quality.

- **PAINTED METALS:** Paint can add years to the lives of less noble metals like galvanized steel and aluminum. It is an inexpensive way to introduce color to a building system. However, even the best of paint systems will deteriorate over time, suggesting maintenance or replacement shortly after the 20-year mark.

Our philosophy is to design with high performance metals that will last the useful life of a building with little or no maintenance. Uncoated stainless steel and titanium are in keeping with this philosophy. There are exceptions, however.

If the panel system must be a color (other than the range of silvers and grays that natural high performance metals provide), the budget will not allow a more robust colorizing process and the environment puts galvanized and aluminum at a high risk of failure in fewer than 30 years (see *TECHNICAL INFORMATION – METALLIC CORROSION*), consideration should be given to painted stainless steel. It can be readily painted on a coil coating line with special process steps that are required to achieve proper coating adhesion. Contrarian Metal Resources offers a 20-year paint system warranty on stainless steel, which in turn carries a 30-year limited warranty for corrosion. Please contact us for details.

Advantages

A wide array of color choices can be economically achieved. The functional life of less noble metals like galvanized steel and aluminum is extended when a coat of paint is added.

Disadvantages

Paint systems are subject to deterioration.

- **POWDER COATED METALS:** This technique involves spraying pigmented material onto the metal surface, followed by a baking operation to harden and set the coating. Some powder coating is done on sheet metal coils in a coil coating line.

The powder coat formulations for coil coating are formable enough to make architectural panels. While this is a less costly alternative to powder coating finished panels, the latter allows formulations that produce very hard durable coatings. We can refer you to a qualified powder coating company.

Advantages

A hard durable coating is possible (when coating pre-formed panels) that can last 50% longer than a high quality paint job. Graffiti-resistant properties are also possible (paint, ink and mild abrasion).

Disadvantages

The most durable of powder coatings are not readily formed. The cost of coating pre-formed panels can be significant. While the better powder coating systems will outlast the best paint systems, they are still not permanent.

COLORIZED STAINLESS STEEL, TITANIUM & ALUMINUM (CONTINUED)

■ VAPOR DEPOSITION COLORIZED STAINLESS STEEL:

Often referred to as sputtering, this process involves coating stainless steel and titanium (in a vacuum) with inorganic material, such as titanium nitrides and other ceramics. Contrarian Metal Resources offers stainless steel and titanium that are colorized using this method.

Advantages

Harder, more abrasion resistant layers can be achieved compared to those achieved by anodizing. These finishes are very resistant to ultraviolet light and can substantially outlast anodized, paint and powder coat systems. Decorative metal sheets that have a vapor deposition layer applied are often used for elevators and column covers where pedestrian traffic can be expected.

Disadvantages

This process is rather costly. Crazeing of the surface during severe forming can occur. Color matching is not perfect, but substantially better than that of anodized surfaces. Color choices are limited and have a translucent quality.

EMBOSSSED STAINLESS STEEL

Embossing involves imparting a texture into the sheet metal surface through the use of work rolls under pressure. Only one side of the sheet is subjected to a textured roll in some cases. However in some cases, the work rolls are a male and female set that impart a texture or pattern to both sides of the material.

Advantages

Deeply defined, uniform patterns are possible. Material hardness is often increased, adding a degree of abrasion resistance.

Disadvantages

Severe forming can be difficult with material that has been substantially hardened. Deeply textured surfaces can provide sites for retention of dirt and corrosives, like salt residue.

MICRO-EMBOSSSED STAINLESS STEEL

Micro-embossing involves imparting a hydrophobic texture into the sheet metal surface through the use of work rolls under pressure. Finishes from low glare to very bright can be achieved through this process. InvariMatte®, InvariLux®, InvariTone™ and invariSand™ are examples of these finishes in stainless steel and titanium.

Advantages

Maximum uniformity, flatness and dirt resistance are to be expected. The self-cleaning nature of these finishes preserves 100% of the solar reflectance (which can be as high as 94%) over time.

Disadvantages

These finishes are moderately more expensive than standard mill finished materials.

ELECTROPLATED & ELECTROPOLISHED METALS

These processes differ in that electroplating adds metal to and electropolishing removes metal from the surface of the material. We group them together as their application is limited in architecture and where their use is practical, the end result is similar. Most operations of these types are done on modest-sized parts for industrial applications. Electroplating involves depositing a thin film of metal onto the material surface through the use of electric current in a metal-rich solution. Electropolishing is a process whereby a thin layer of metal is removed, resulting in a very smooth, mirror-like surface.

Advantages

With electroplating, the process of coating metal with a different metal is less costly than using bi-metal (produced by two metal coils that are rolled together under pressure, creating a two-ply material). The visual appearance of a part can be significantly changed, depending upon what plating metal is used. Electropolishing creates a highly reflective surface that is quite uniform.

Disadvantages

The application of these processes is generally limited to small parts. To the extent sheets that can be fabricated into panels can be electroplated or electropolished, there are often better alternatives. Vapor deposition colorizing offers more visual options at about the same cost as electroplating. Buffing is less costly than either process, so long as a silver mirror is the objective.

METAL DIPPED PRODUCTS

Often referred to as hot dipping, the most popular application of this technique is galvanizing. Carbon steel coils are unwound and passed through a bath of molten zinc to make galvanized steel. This is an economical way to extend the life of carbon steel with the anodic protection provided by the zinc. Stainless steel can also be coated with zinc to create a spangled, weathered appearance without the frailty of carbon steel. More commonly in this country, stainless steel is coated with a mixture of tin and zinc to create a dull weathered appearance.

Advantages

An aged, variable, dull appearance is achieved.

Disadvantages

Dipped products can exhibit surface finish variability. Another less costly alternative is low-gloss, matte textured stainless steel (see *PRODUCTS-STAINLESS STEEL PRODUCTS - InvariMatte®*). Further, lead-bearing versions carry the risk of environmental contamination.

PERFORATED METAL SHEETS

Metals can be perforated, allowing for the exchange of air and light. This process involves feeding sheet material, usually in coil, through a large stamping press that punches a hole pattern in the material.

Advantages

Perforated panels can be an economical alternative to louvers, provided drainage behind the panels can occur, as in a rain screen concept. Sun screens can be made out of high performance metal as opposed to degradable materials.

Disadvantages

Light scratching can be expected from slugs that are stamped out and ride on the surface of the metal during the process. While it is often possible to finish sheets after perforating, the hole dimensions and shapes can be slightly altered. If cupping of the punched holes and bun cannot be tolerated, perforations can be cut by means of laser or water jet cutting. Contrarian Metal Resources can supply a variety of perforated patterns in a number of finishes in stainless steel, titanium and zinc.

PRE-WEATHERED SHEET METAL FINISHES

This process involves the chemical treatment of reactive metals like zinc and copper to approximate the effect of atmospheric weathering.

Advantages

A mature appearance is possible. Corrosion resistance is improved somewhat. In the case of zinc that has been pre-weathered, a patina layer is quickly formed that erodes more slowly than zinc oxide. An even more durable surface occurs on zinc when exposed to the atmosphere and gradually draws carbon dioxide, converting the oxide layer to zinc carbonate over time. This carbonate layer is more resistant to corrosion than zinc oxide. A similar effect occurs in red metals. However, a substantial increase in the longevity of panels that have been pre-weathered should not be expected. The untreated metals will catch up to the same level of corrosion resistance in due time.

Disadvantages

The pre-weathering process costs money. If the building owner is patient, the same visual appearance will be realized in time. Zinc will patina more rapidly than copper, resulting in a mature appearance in just a few years in moderate climates.

BUFFED OR MIRROR FINISHED STAINLESS STEEL

- **#8 FINISH STAINLESS STEEL: The industry standard for a highly reflective, mirror-like, directional finish produced by buffing wheels with abrasive compounds.**

Advantages

Shatter-proof mirror panels can be achieved. Corrosion resistance is improved since the surface is quite smooth, limiting the opportunity for contaminants to react with the material.

Disadvantages

Typical processing leaves a degree of visible buff lines in the surface. If superb image clarity is required, we recommend InvariGlass™ (see *PRODUCTS – STAINLESS STEEL PRODUCTS – InvariGlass™*), which has additional buffing that results in a surface free of visible buff lines.

THERMALLY-SPRAYED METALS

This process involves spraying molten metallics or ceramics onto the surface of metal. While this is traditionally done to improve wear resistance on machinery parts, certain cosmetic aspects can be achieved.

Advantages

Deep textures can be realized. Caution should be exercised in the application of deep textured metals in corrosive environments like seacoasts and in areas in close proximity to deicing salt use. Abrasion resistance can be improved in the case of ceramics.

Disadvantages

The process is quite costly.

In the case of metallics, particularly stainless steel sprayed onto a stainless substrate, there is a significant reduction in corrosion resistance (caused by carbide precipitation that occurs as the metal cools). Passivating (acid etching) the work piece will correct this problem, but cosmetics will be affected.

Visual variability is to be expected within a panel as well as from one panel to the next.

This process is best suited on heavier gauges (greater than 1/8" thick) in order to counter shape distortion. Since the coatings can often be brittle, this process generally lends itself to pre-formed panels.

If deep textures are desired, our recommendation is to specify embossed or media blasted finishes. Contrarian Metal Resources can provide samples of media blasted finishes as required.

MEDIA BLASTED METALS

A variety of tones and textures can be achieved through media blasting with air pressure. This is often done in the fabrication shop on finished panels. Glass bead-blasted stainless steel is among the most popular architectural metal finishes.

Advantages

Numerous finish aspects can be created for a custom appearance. Areas can be masked off, creating two different textures in the same panel.

Disadvantages

Shape distortion usually occurs on panels that are media blasted (the higher the air pressure and mass of the medium, the greater the potential for distortion). This is also true of flat sheets that are blasted prior to fabrication. However, if the sheets are properly flattened after blasting, the fabricator has every opportunity to produce a distortion-free panel.

Media blasting presents a certain degree of surface variability. The best opportunity to achieve visual uniformity is in pre-blasting sheets prior to fabrication. It is easier to limit the variables in a sheet finishing environment as opposed to blasting the various surfaces of finished panels. While it is true that post fabrication blasting affords an easy way to dress over weld repairs, the issue of shape distortion makes this unadvisable. We believe it is better to address weld repairs through chemical means or use mechanical joinery in visually sensitive areas.

Finishing metals in this method can be rather costly, given the labor component and consumption of media. Contrarian Metal Resources can supply pre-blasted sheets in a variety of textures, including a peen-hardened surface that is extraordinarily abrasion resistant. All of our media blasted finishes are shape-corrected, allowing for ease of fabrication and distortion-free panels.



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