

Supporting presentation for lecturers of  
Architecture/Civil Engineering

## Chapter 08

# Stainless Steel Surfaces

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# 1 - Stainless steel finishes <sup>1,2</sup>

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- Electrolytically Coloured and Patterned Finishes
- Organic Coatings
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Many finishes are available

# Ex-mill cold rolled finishes <sup>1,3</sup>

EN 10088-2 cold rolled finishes from table 6 of the standard, with a guide to typical Ra values

Symbol	Finishing Process Route	Notes	Typical (Ra) $\mu\text{m}$
2B	Cold rolled, heat treated, pickled, skin passed	Most common 'cold rolled' finish available. Non-reflective, smooth finish, good flatness control. Thickness range limited by manufactures' skin passing rolling capacity.	0.1-0.5
2C	Cold rolled, heat treated, not descaled	Smooth with scale from heat treatment, suitable for parts to be machined or descaled in subsequent production or where the parts are for heat resisting applications.	-
2D	Cold rolled, heat treated, pickled	Thicker sheet size ranges. Smoothness not as good as 2B, but adequate for most purposes.	0.4-1.0
2E	Cold rolled, heat treated, mechanically descaled	Rough and dull. Usually applied to steels with a scale which is very resistant to pickling solutions	-
2H	Cold rolled, work hardened	"Temper" rolling on austenitic types improves mechanical strength. Smoothness similar to 2B	-
2R	Cold rolled, bright annealed	Highly reflective "mirror" finish, very smooth. Often supplied with plastic coatings for pressings. Manufactured items usually put into service without further finishing	.05-0.1
2Q	Cold rolled, hardened and tempered, scale free	Only available on martensitic types (e.g. 420). Scaling avoided by protective atmosphere heat treatment or descaling after heat treatment	-

More on Ra:

[http://www.worldstainless.org/Files/issf/non-image-files/PDF/Euro\\_Inox/RoughnessMeasurement\\_EN.pdf](http://www.worldstainless.org/Files/issf/non-image-files/PDF/Euro_Inox/RoughnessMeasurement_EN.pdf)

These are the most common ones

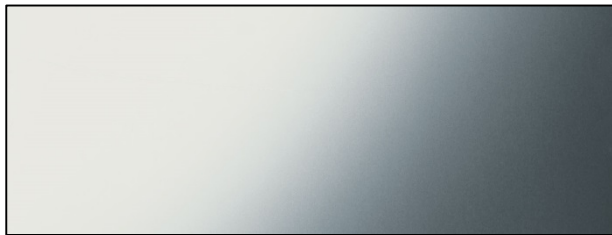
# Most common mill finishes



2B This is produced as 2D, but a final light rolling using highly polished rolls gives the surface a smooth, reflective, grey sheen. This is the most widely used surface finish in use today and forms the basis for most polished and brushed finishes.



2D This is achieved by cold rolling, heat treating and pickling. The low reflective matt surface appearance is suitable for industrial and engineering needs but, architecturally, is suitable for less critical aesthetic applications.



2R By bright annealing under Oxygen-free atmospheric conditions following cold rolling using polished rolls, a highly reflective finish, that will reflect clear images, is obtained. This ultra-smooth surface is less likely to harbour airborne contaminants or moisture than any other mill finish, and it is easy to clean.

# Special Finishes <sup>1,3</sup>

EN 10088-2 special finishes from Table 6 of the standard, with a guide to typical Ra

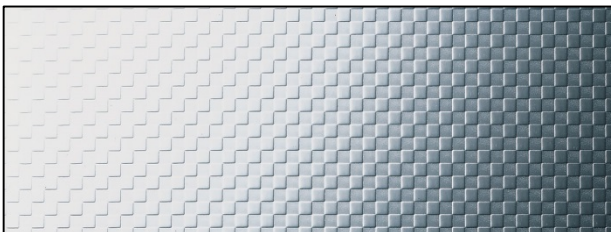
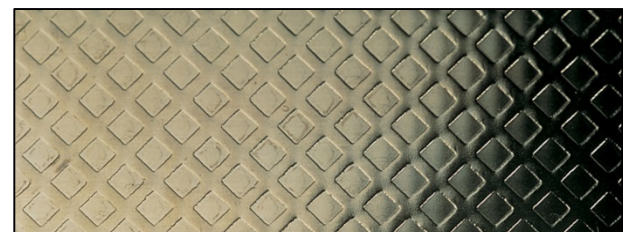
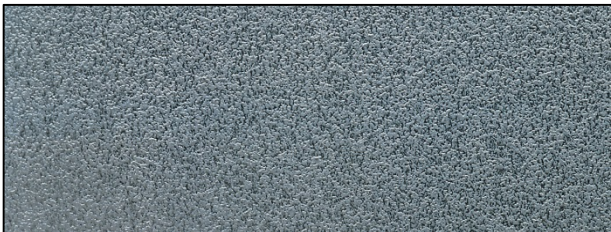
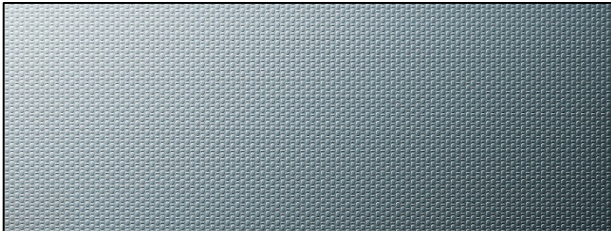
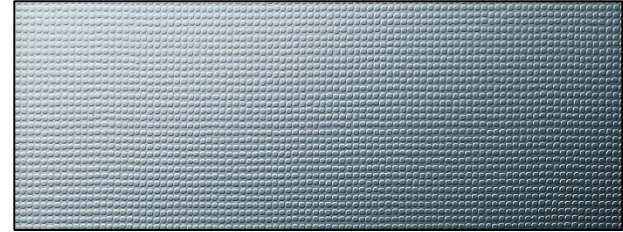
Symbol	Finishing Process Route	Notes	Typical (Ra) $\mu\text{m}$
1G or 2G	Ground	Can be based on either '1' or '2' ex-mill finishes*. A unidirectional texture, not very reflective	-
1J or 2J	Brushed or dull polished	Can be based on either '1' or '2' ex-mill finishes*. Smoother than "G" with a unidirectional texture, not very reflective	0.2-1.0
1K or 2K	Satin polished	Can be based on either '1' or '2' ex-mill finishes*. Smoothest of the special non-reflective finishes with corrosion resistance suitable for most external applications.	< 0.5
1P or 2P	Bright polished	Can be based on either '1' or '2' ex-mill finishes*. Mechanically polished reflective finish. Can be a mirror finish.	< 0.1
2F	Cold rolled, heat treated, skin passed on roughened rolls	Uniform non-reflective matt surface, can be based on either 2B or 2R mill finishes	-
1M or 2M	Patterned	Can be based on either '1' or '2' ex-mill finishes*. One side patterned only. Includes "chequer" plates ("1" ex-mill finish) & fine textures finishes ("2" ex-mill finish)	-
2W	Corrugated	Profile rolled (e.g. trapezoidal or sinusoidal shapes)	-
2L	Coloured	Applied to flat (2R, 2P or 2K type fishes) or patterned (2M) sheet base finishes in a range of colours	-
1S or 2S	Surface coated	Can be based on either '1' or '2' ex-mill finishes . Normally coated on one side only with a metallic coating, such as tin, aluminium or titanium	-

\* 1 finishes are for hot-rolled products, 2 finishes for cold rolled

There is a very wide choice of special finishes

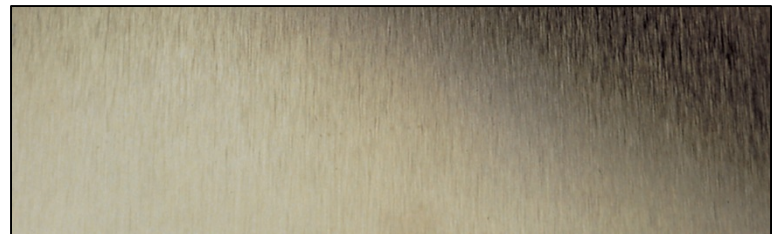
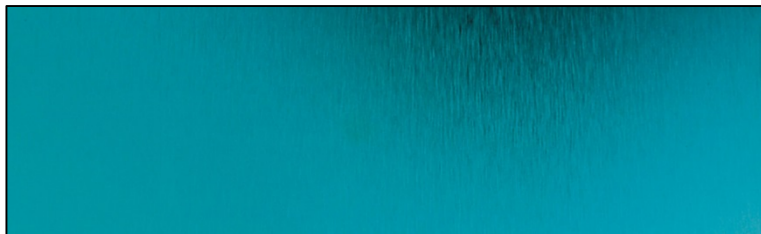
# Patterned Finishes <sup>4,5,7</sup>

These few examples illustrate the use of sheets patterned on one side only, classified as 2M. A wide variety of patterns are available



# Coloured finishes<sup>4, 5,7</sup>

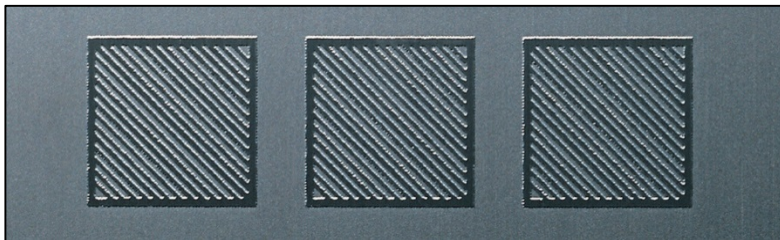
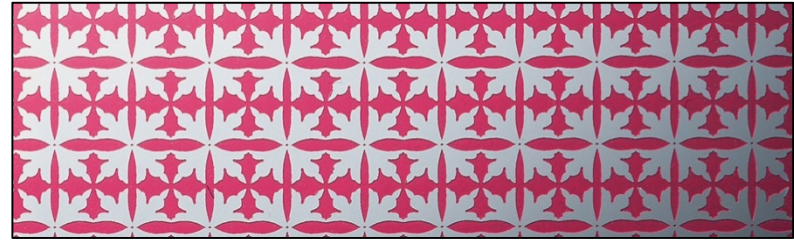
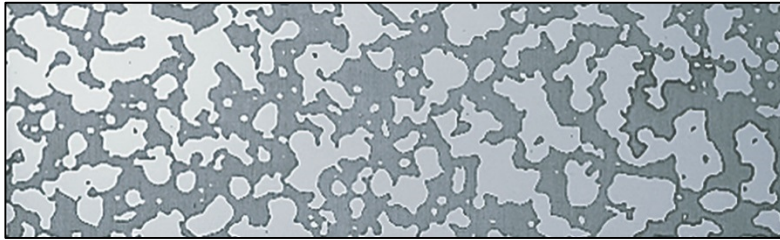
This is only a selection of the colour effects that can be produced by electrolytically colouring stainless steel





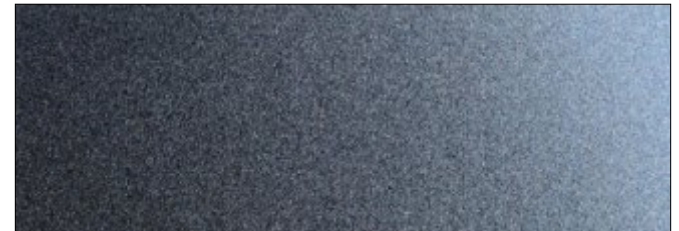
# Etched Patterns<sup>4,5,7</sup>

Silk screen and photoresist processes have been developed to transfer any pattern onto stainless steel, the surface of which is then acid etched to reveal the pattern. Acid etching is a process which removes a small amount of surface material. Etched surfaces have a dull and a slightly coarse appearance which contrast well with polished or satin finished un-etched surfaces. Electro-chemical colour can be given to etched surfaces before or after etching.



# Proprietary finishes<sup>4,5</sup>

Many specific & custom finishes are available from specialized companies  
Some examples are shown below



# Electropolishing<sup>6</sup>



Produces bright reflecting surfaces which feature

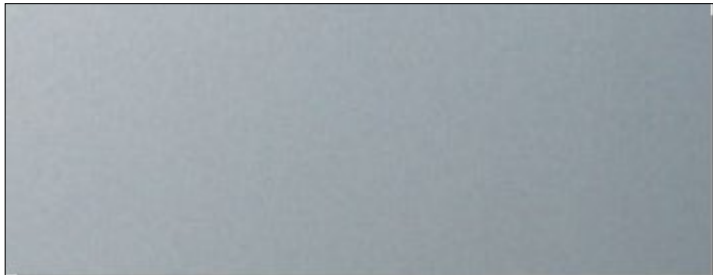
- Optimum corrosion resistance for any grade
- Easier disinfection and cleanability
- Easier removal of graffiti

However

- Irregular surfaces are more visible
- As well as damage from scratches and mechanical damage

# Bead Blasting <sup>8</sup>

The appearance can be altered by different blasting materials,  
e.g. glass bead (above) or shredded glass (below)



## Please note:

There are many different grades of stainless steel, which offer solutions to a wide range of design problems, from corrosion resistance in even the most aggressive environments, to high strength requirements; and from ease of formability to ease of welding. Similarly, stainless steels offer a wide range of surface finishes which can assist the architect in achieving the aesthetically pleasing appearance he is looking for. Surface finishes range from a plain matte through soft polishing through textured patterns and colours right up to highly polished mirror finishes. These provide the imaginative designer with a wide array of options.

**Care should be taken when using glossy surface finishes to ensure that they do not unwittingly create glare or heat reflectivity issues. Especially building fronts facing the sun and concave-shaped areas deserve special attention during the planning phase.**

Architects use everyday the palette of surface finishes available on stainless steels <sup>7</sup>

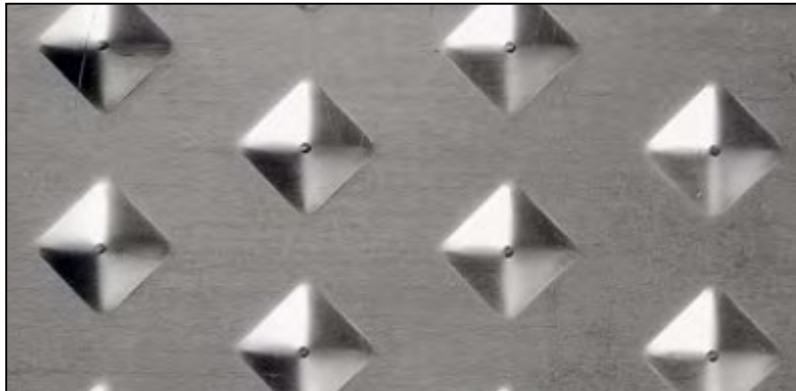
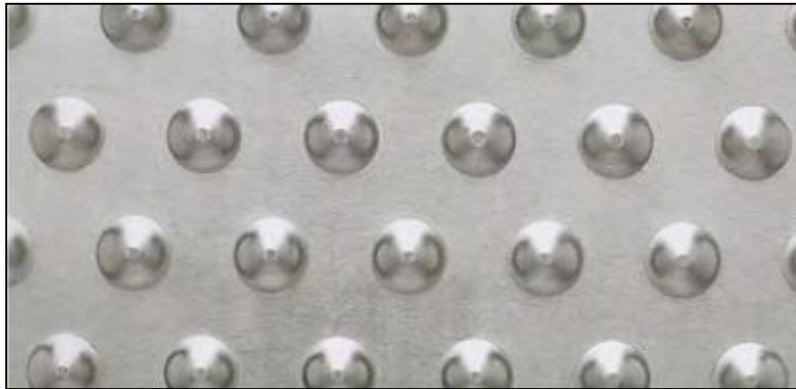
In Chapter 2 you will find some examples of buildings for which the surface finish is essential to the aesthetics

## 2 - Tridimensional Finishes <sup>9</sup>

i.e. deeper tridimensional features than patterns obtained by embossing, punching, cutting, profiling, ....

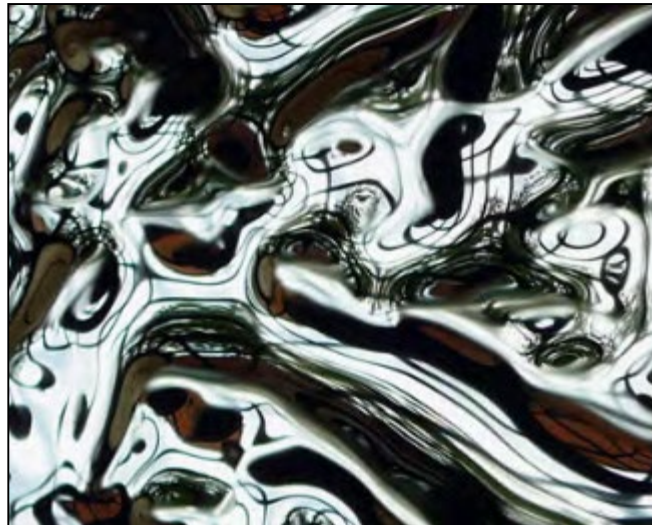
usually carried out on Computer-controlled machines

# Embossed patterns <sup>9</sup>

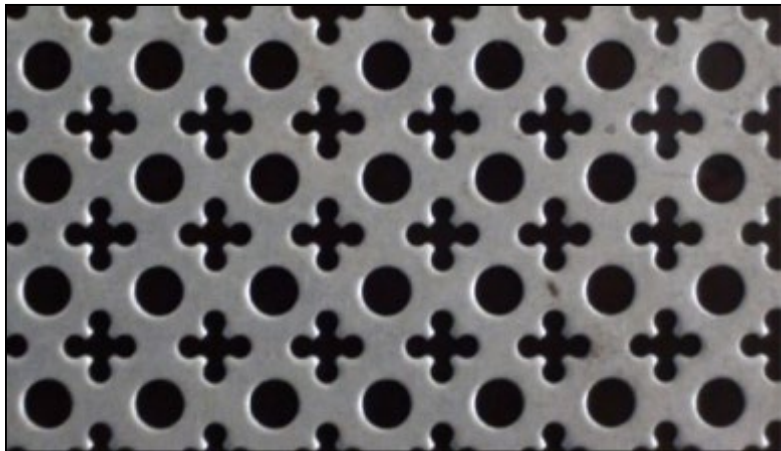
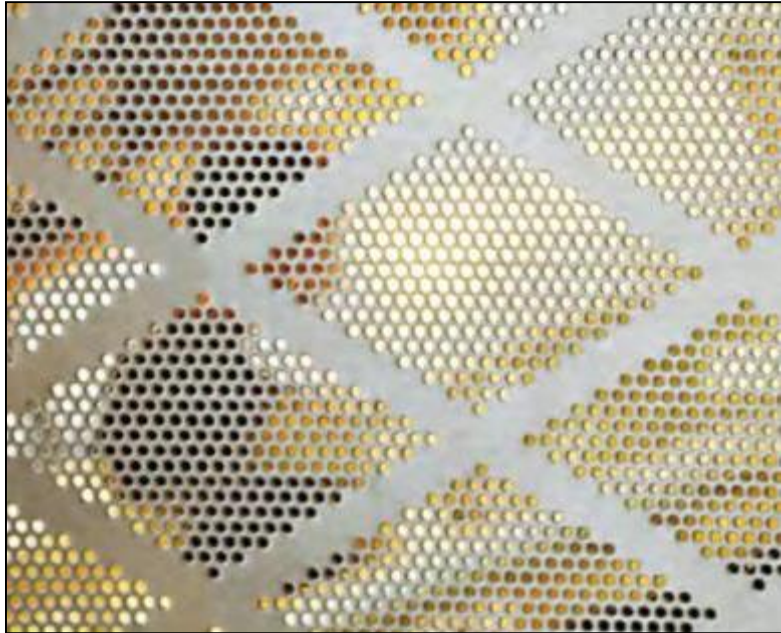




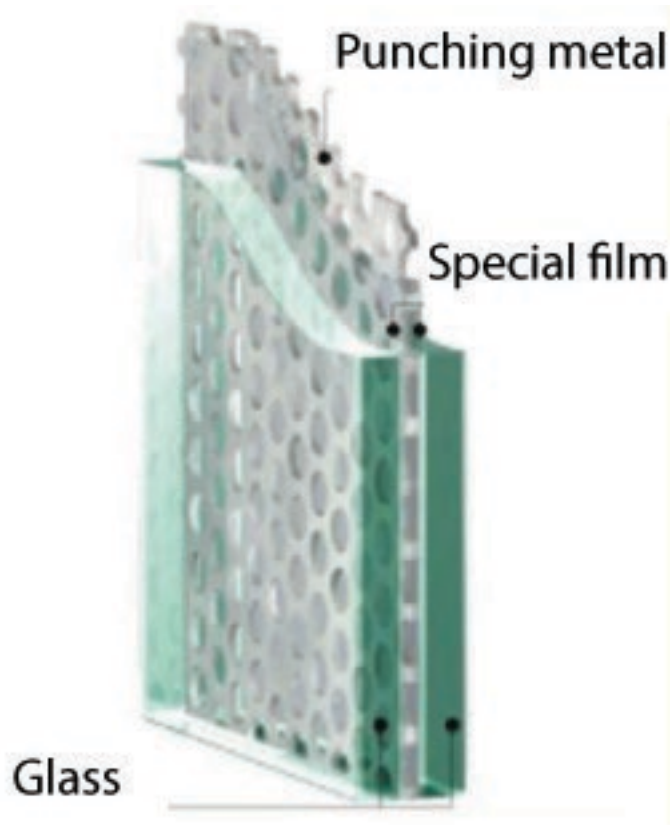
# Irregular shapes<sup>9</sup> (fluid forming)



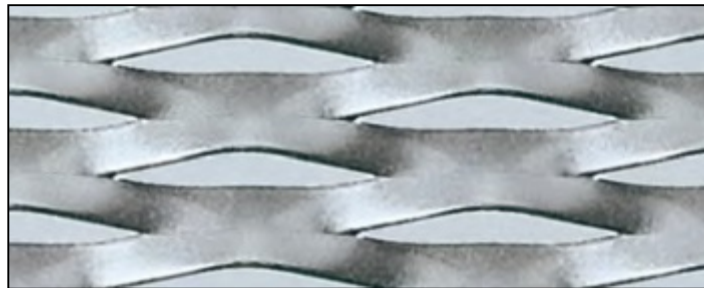
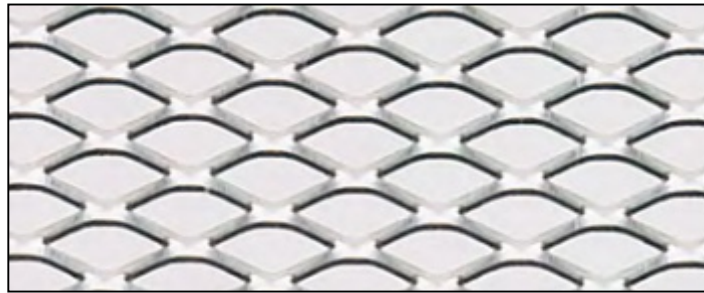
# Perforated sheet <sup>9</sup>



# Semi-transparent glass panels with perforated sheet <sup>10</sup>

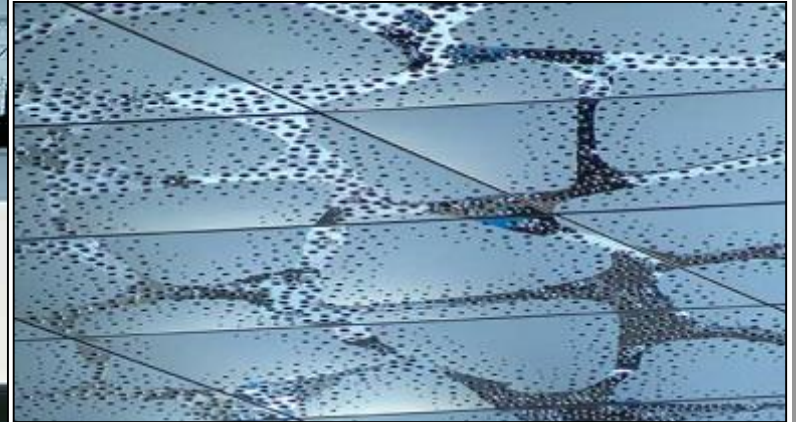


# Expanded Sheet



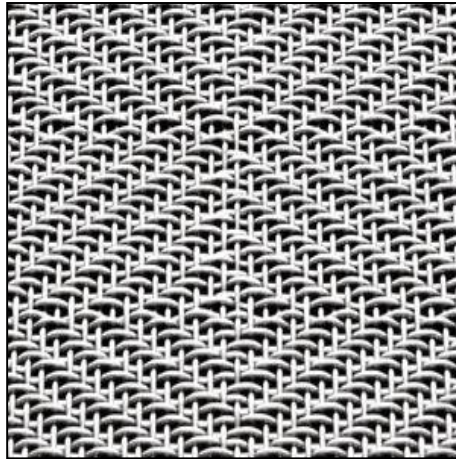
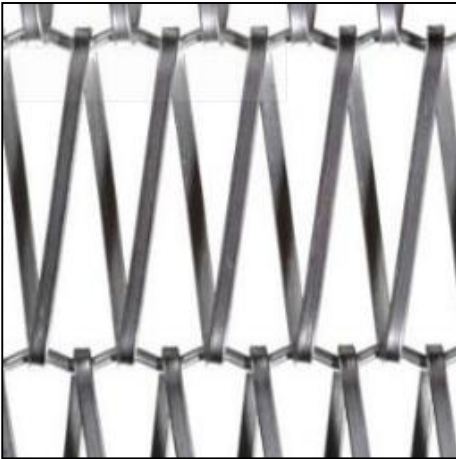
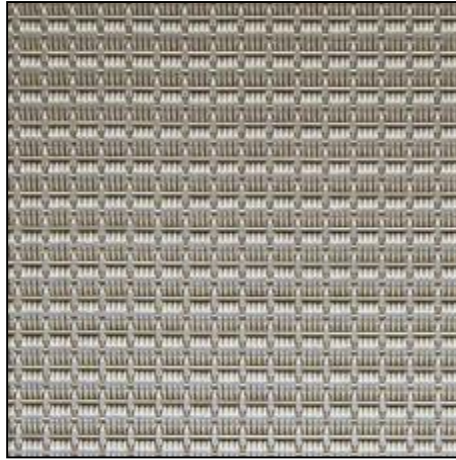
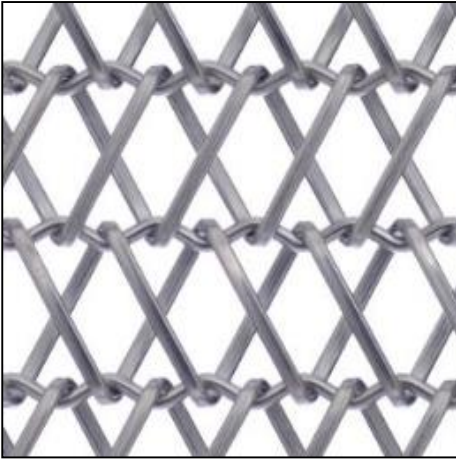
# Combination of techniques <sup>11</sup>

Stockholm Waterfront Building : Perforated and colored stainless steel ceiling that reproduces the image of the melting ice on the lower right



## 3 – Woven Mesh

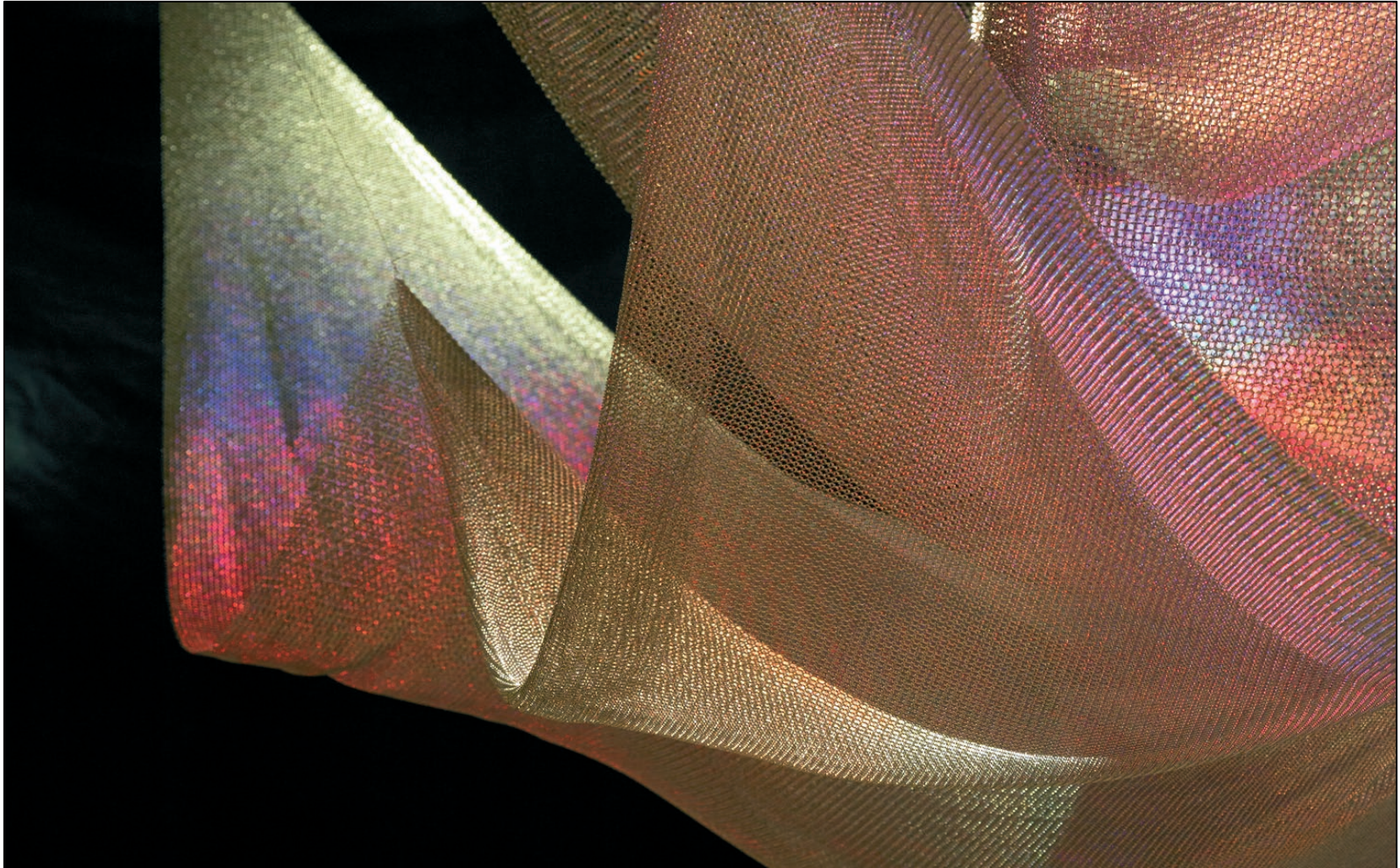
# Standard 12-14



A very wide set of woven shapes and patterns is available, with adjustable

- stiffness
- open area
- light diffusion
- acoustic transparency
- color
- etc...

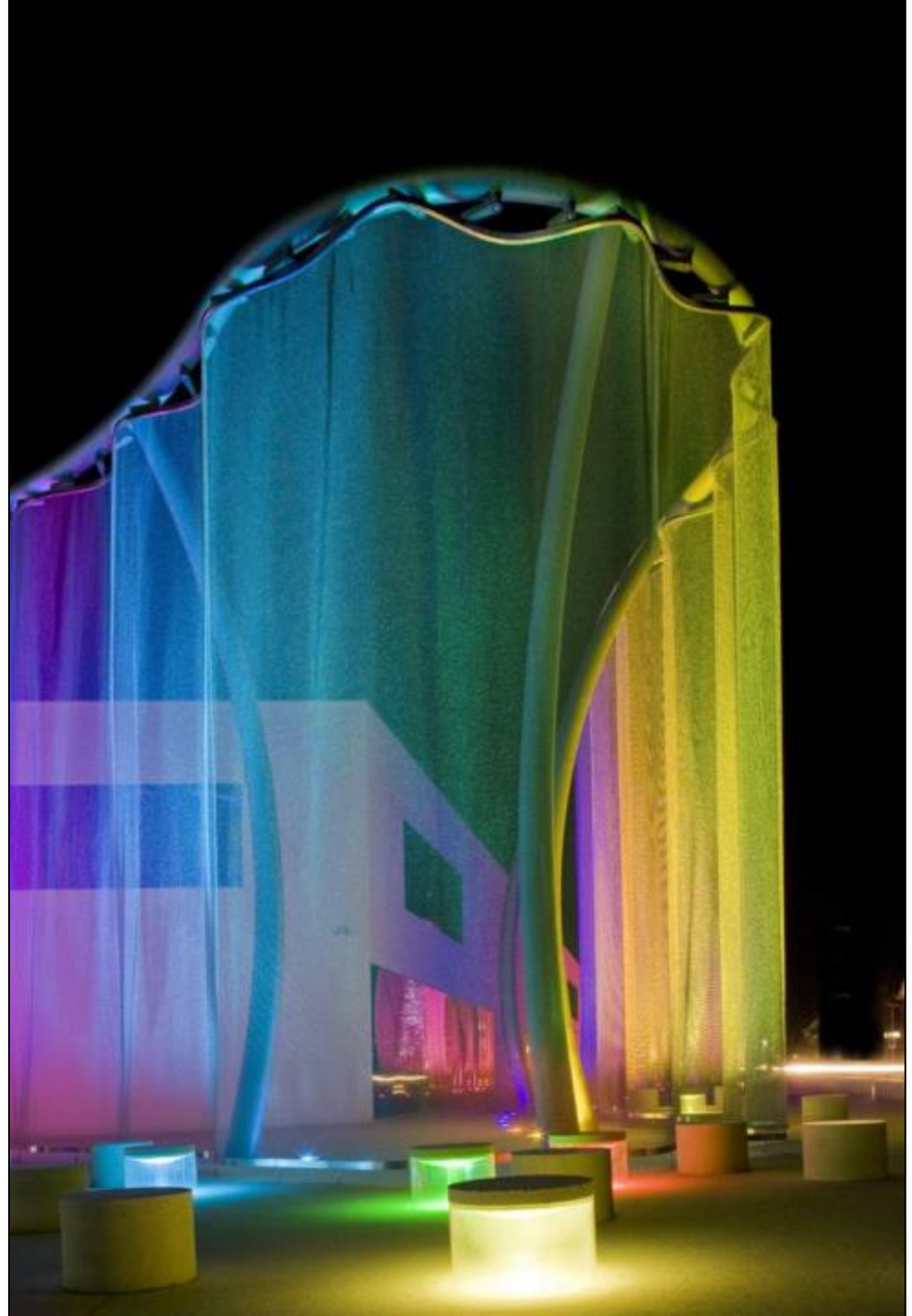
# Example of decoration with stainless steel mesh



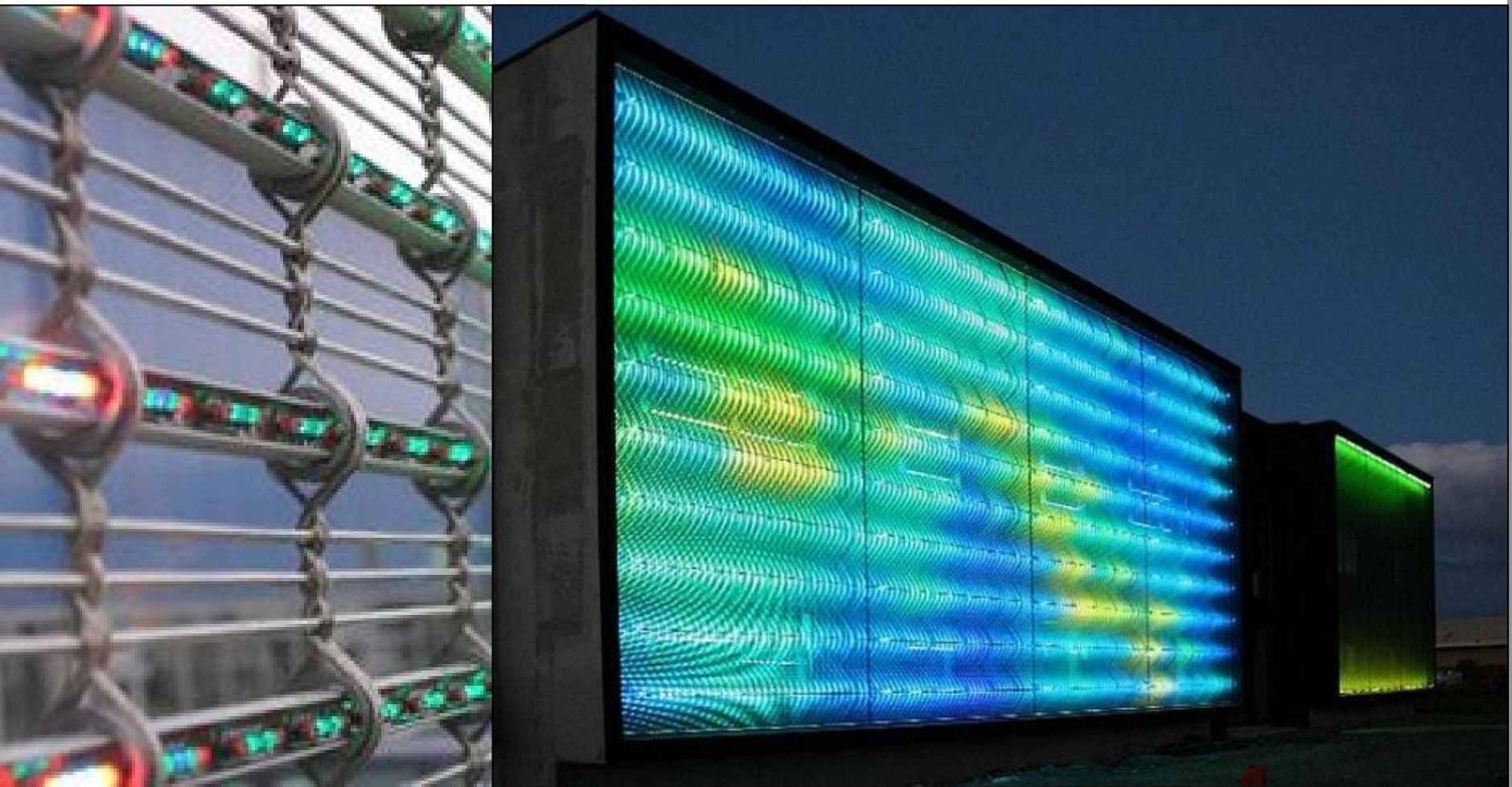


## Outside decoration with Stainless Wire mesh

Stainless wire mesh is widely used for decoration. It allows special effects such as lights (with LEDs) as shown (Swarovski Building headquarters)



# Woven stainless with LEDs <sup>13</sup>



# 4 - References and sources

1. [https://www.worldstainless.org/Files/issf/non-image-files/PDF/Euro Inox/Finishes02 EN.pdf](https://www.worldstainless.org/Files/issf/non-image-files/PDF/Euro%20Inox/Finishes02_EN.pdf)
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14. [https://www.worldstainless.org/Files/issf/non-image-files/PDF/Euro Inox/RoughnessMeasurement EN.pdf](https://www.worldstainless.org/Files/issf/non-image-files/PDF/Euro%20Inox/RoughnessMeasurement_EN.pdf)

# Thank you

Test your knowledge of stainless steel here:

<https://www.surveymonkey.com/r/3BVK2X6>