## BESPOKE STAIRS DESIGN FOR LANE( GRAPHIC DESIGN AGENCY)



stail.

the grass.

Although the perforated metal plate looks very light, it is actually very strong, at the same time perforated metal plates increase permeability and provide privacy in the public living space. With gleamingly light, the perforated metal plate improves the level of the building and brings the artistic feeling.





### - Safety First

Prevent painful falls and injuries that could result from getting a foot caught between stairs

Slip-resistant surface helps prevent accidents, even when moisture is present on the tread

High load-bearing capacity offers increased structural integrity

#### -Cleanliness and Durability

sunlight flow and proper drainage are features of perforated stair treads — features that yield sanitary benefits for a stairway. Rust-free, non-corrosive materials and finishes ensure that the metal treads and risers are long lasting.

Strength and resistance to corrosion give both interior and exterior metal stair treads a long lifespan. Over the long term, this translates into cost savings due to fewer repairs and replacements.

#### -Aesthetically Pleasing

They give a clean, contemporary design to stairways, and can be customized to complement the aesthetics of any building or environment.

Because of the numerous perforation patterns available, the possibilities for classy perforated metal stairs are endless.



I was trying to design a creative workspace atmosphere with a sense of nature, modern in order to increase the work efficiency, comfort and to stimulate staffs' creativity in addition to being relaxed and energetic.

Therefor I placed many plants and natural materials in all corners of the workspace, including under each staircase.

I tried to use a transparent materials so that people could see the plant when they went up and down the stairs, just like walking on

### **BESPOKE STAIRS – MATERIAL RESEARCH**

### What Is Perforated Metal?

Perforated metal is a form of sheet metal which has been punched or stamped with a machine to create a pattern of holes. It is also known as perforated sheet, perforated plate, or perforated screen and is commonly made from stainless steel, cold rolled steel, aluminum and more.

Perforated metal was first developed around 150 years ago for the mining industry as a means of filtering coal. Initially, the perforation process was inefficient; involving laborers manually punching individual holes into a metal sheet. Over time, the process has improved through the use of machinery utilizing punching needles arranged in specific patterns.

#### How Is Perforated Metal Made?

The manufacturing process for perforating metal starts with sheet metal. Sheet metal is thin and flat, and can be cut and bent into different shapes.

1. The most common method of perforating metal uses a rotary pinned perforation roller. This is a large cylinder with sharp, pointed needles on the outside to punch holes into the metal. As the sheet metal is run across the perforation roller, it rotates, continuously punching holes in the passing sheet. The needles on the roller, which can produce a wide variety of hole sizes, are sometimes heated to simultaneously melt the metal which forms a reinforced ring around the perforation.

2.Another common method is "die and punch" perforating. During this process, a sheet with needles is repeatedly pressed onto the passing metal which punches holes into the sheet. The pieces remaining from the punching are then sheared off and the surface is smoothed. The die and punch method is very efficient and can perforate a large surface of sheet very quickly.



3. The most advanced method available is laser perforation. This process is very sophisticated and precise, but also the most expensive. Laser perforation produces results similar to rotary pinned perforation with hot needles, but maintains a higher level of consistency and control over the hole sizes and pattern.

#### Materials Type



Perforated aluminum sheet metal complements any structure and adds a visually stunning element to interiors and exteriors alike. Aluminum mesh sheet is an excellent option for designs of all types. Perforated aluminum sheet metal is a popular option, both for functional and aesthetic reasons, and the uses for perforated aluminum panels are virtually unlimited.

choice for the **b**espoke stairs. Characteristics of Aluminum Sheet With Holes lengths up to 6m perforated by special request.



Perforated Metal Mesh Panels are made high quality metal plates: Aluminium plate, copper plate, mild steel plate, stainless steel plate and so

Copper is one of the oldest building materials, and it is among the most trusted. Perforated copper sheet metal is visually stunning and has countless practical uses in structures, furnishings and more. At Accurate Perforating, we are leaders in perfectly crafted perforated copper products, from simple perforated sheets and plates to complex perforated copper corrugated or formed panels.

Quality perforated stainless steel can be used in several applications because it is strong, resistant to corrosion and visually attractive. At Accurate Perforating, our mission is to adhere to the highest standards of perforated metal of all kinds.

Perforated steel is an incredibly versatile material with properties ideal for both indoor and outdoor applications. As an industry leader among perforated steel sheet suppliers, Accurate Perforating is your best source for perforated steel sheet metal and other product options.

#### PERFORATED ALUMINUM PLATE

I decided to choose the perforated aluminum as the material after comparison with other metal by Cost, Corrosion Resistance, Strength & Malleability and Weight Differences. Perforated Aluminium Sheets are easily manufactured and can be cut, rolled and folded with ease, perforated aluminum adds a visually stunning element to interior, therefore I think the aluminum will be the best

- Very versatile. Naturally lightweight and easy to work with. Highly resistant to corrosion
- Cost-efficient material. Durable and long-lasting. Environmentally Friendly
- Perforation size: 1mm-154mm (additional Perforation sizes are available on request)
- Sheet Thickness: Popular thickness: 0.75mm 12mm. Graepels can perforate up to 25mm thick on special request.
- Sheet sizes: Standard sizes include 2mx1m, 2.5mx1.25m and 3mx1.5m. Sheets 4mx2m are perforated on larger machines. Longer
- Percentage open area: All open areas are physically possible but standard tooling tends to be between 20% and 60

The shape, size and pattern of the holes can be standardized or customdesigned. Standard perforation holes are typically circular and can range in size from 1 millimeter upward. However, the bigger the hole, the thicker the metal sheet needs to be. In order to echo my modular hexagon concept, I will use a hexagon pattern perforated aluminum to create a unique light and shadow effect.

### **BESPOKE STAIRS – SUSPENDED CONSTRUCTION**





In order to make the structure more stable and strong, I added the angle bracket on both sides of the perforated aluminum.



Ð G Figure 21 MUJI HOUSE, the architectural entity of Japanese design brand Muji/ 2014 Figure 23 Biscay Curtain Mesh System





I'm continuing to do some research, trying to find the safest and most reliable structure to hang

the aluminum plate. I find it difficult to find the vertical hanging structure of the ceiling, most of them are invisible structures hiding in the wall. So I found some precendent of vertical panel structures mounted in the floor. I think they can be used interchangeably.





## BESPOKE STAIRS – SUSPENDED CONSTRUCTION











I think a whole piece of aluminum is too big, I am not sure if the suspension structure can bear its weight, so I decided to divide it into three pieces, so that the stress on the ceiling can be dispersed and it will be safer.

Then I started searching how to join aluminum plate without welding. In order to cater to the theme of modularity and flexibility in the office design, I decided to use hardware because it can be disassembled, it will not be permanently like welding, it is easy to repair and the price is reasonable.







Folding or dimpling perforated metal provides a stiffening effect so that the components are not weakened by the removal of material.





Front View

Top View

# BESPOKE STAIRS – DETAILS

i'm continue research on how to join two piece metal without welding of the suspended aluminum plate and stair tread. I'd like to continue with the hardware, but at the same time I want the stairs to look modern and spmplicity.



I found that if look closely on this precendent, although the inside looks very clean, as if all are welded, there are screws on the back of the stairs to fix the stairs and panels.

So I tried to make the same effect. After research, I think that the riveting is the most suitable hardware.

Joining two metal pieces together by riveting involves a rivet, which is a metal fastener that has a cylindrical post with a head, that is placed in a drilled or punched hole. The end of the cylindrical post is then upset by forming / expanding which holds the two pieces of metal in place by the rivet. The benefit to riveting is that it's more permanent than regular hardware assembly, it allows flexibility in the metal for changes in temperature, safe and stable without affecting aesthetics.





I have watch some instructions video of different hardware, and I found that rivets are easy to operate.



The tread will be folded into a cuboid, to increase the hardness, which makes the installation difficult, because it's hard to touch the inside of the tread, but the rivet can access to the backside of workpiece where is not possible by other hardware.



video source :https://www.youtube.com/watch?v=yuJqCtSrad0

