


> Gardens of stainless steel



Located outside the Chinese city of Nanjing, the Jiangsu Garden Expo recreates famous classical gardens from across Jiangsu province. The 3.5 km² park is an outstanding example of regenerating a degraded environment into a living museum furnished with hotels, restaurants, and entertainment. Stainless steel features prominently throughout the Expo.

A hilly area in eastern Nanjing once hosted a cluster of stone and sand quarries and cement factories; they supplied building materials for a booming local construction industry that has since declined. The abandoned mines, equipment, and factory infrastructure left a legacy of severe environmental damage: kilometers of scarred mountain slopes, hills of debris, polluted water, and all but extinct plants and animals. A team of prominent personalities in urban planning, landscaping, and sustainable infrastructure headed by Chinese “starchitect”, Cui Kai, has now developed the damaged site into a tourist destination that celebrates the region’s rich history of garden design. Contrast and rebirth are key themes guiding the project. There are replicas of 13 existing classical gardens from across Jiangsu Province, including several UNESCO World Heritage sites, spanning over 1200 years of history.

Throughout the park, industrial remains are repurposed as massive planters for trees, living roofs, and other innovative green spaces. The timeless ancient gardens contrast with defunct factory equipment reclaimed by vegetation. These installations and others reflect the design team’s mission: to create a space embracing harmonious coexistence between humans and Planet Earth; appealing beauty coupled with efficient pragmatism and to make all this sustainable in the long term. Or, in Cui Kai’s own words, the Garden Expo “respects the environment, protects industrial heritage, and unearths the potential of space. (The Expo) juxtaposes old and new, heaviness and lightness, and with novel construction techniques, materials, and technologies, it creates a new space, a new landscape, a new experience”. Stainless steel plays an important role in the realization of this vision. Its varied surface finishes throughout the Expo help visually express both contrast and integration between humanity and nature. Thanks to its 2% molybdenum content,

Type 316 stainless steel has improved corrosion resistance, contributing to sustainability and durability. A few examples of stainless steel at the Expo are detailed below.

The Future Garden

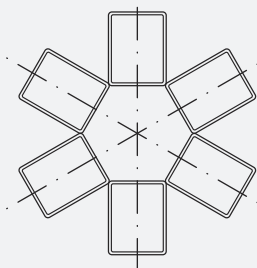
Nanjing’s high humidity, abundant year-round rainfall, and vast seasonal temperature swings challenged the designers to find a solution different from the traditional greenhouse; something that would provide cover to both plants and visitors while maintaining natural airflow. The result is a forest of giant “umbrella trees”; open on all sides allowing for good ventilation, shade, and protection. The Future Garden sprawls across 16,000 m² and boasts almost 1,000 species of plants. Over 1,000 tonnes of Type 316L stainless steel tubes with a mirror-polished surface are used in the installation due to the material’s resistance to corrosion, and its ease of maintenance and cleaning.

42 umbrella-like stainless steel trees structurally support the whole installation. Each is covered by a 12-sided transparent acrylic sheet spanning 21 m across. This sheet allows the structures to function as any umbrella should: a thin layer of gently flowing water continuously washes over them. It produces ripples, reflections, and all sorts of visual effects that can be observed from above and below – that’s why the area is also called the “Underwater Botanical Gardens”. Because of the difference in the coefficient of thermal expansion between the acrylic and stainless steel, a special connection allows both rotation and displacement between the vertical stainless steel tubes that connect the branches to the acrylic sheet.

Design and construction of the “trees”

The umbrella trees vary in height from 5 m to nearly 21 m. The “trunks” are each made up from six interconnected stainless steel cold-rolled tubes. The wall thicknesses of the rectangular hollow sections (RHS 250 x 200 mm) range from 8 to 12 mm, depending on height and load requirements. The tubes forming the two tallest trees are

filled with concrete for added strength. The trunk divides into six main branches (RHS 300 x 200 x 8–12 mm), which then branch out into smaller, stainless steel elliptical hollow sections that connect to the acrylic canopy. The whole structure is welded and finished with a polished surface.



“Trunk” section



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Commercial Complex

On its northern side, the Future Garden is bordered by the Expo's main Commercial Complex, characterized by its accordion-like façade made of perforated and polished stainless steel panels. These panels produce a spectacular distorted mirror effect that reflects the colors and lights of the garden, the water ponds, the cliffs, and the sunlight. The need for an easily installable solution with long service life, beautiful aesthetics, and minimal maintenance made Type 316L stainless steel an ideal choice for the panels. Thanks to the reflective panel façade, the Commercial Complex integrates seamlessly with the surroundings, merging with the Future Garden into a single, open, luminous space.



- ▶ Perforations and alternating angles in the Commercial Complex's façade reflect a watercolor-like version of the Future Garden's trees.

Cloud Pond Stage

On the eastern end of the Future Garden lies Cloud Pond, a suspended water pool reminiscent of a flooded, decommissioned quarry. Cloud Pond is flanked on its southern side by a cliff, whose huge rocky surface serves as the background and projection screen of a light show or other performances that interact with the pond's water



surface. Spectators can watch the show from a vantage point on the northern side of the pond, where the slope is arranged into platforms and steps. Stainless steel is widely used in this location for several applications, but it features most notably in two places: complex-structured stone cages, used for slope protection and as wall façade decoration, and the rippling, water-like stainless steel ceiling panels.

Stone cages are often used in landscaping due to their good price-to-performance ratio and the natural feeling they emanate, thanks to the use of coarse stone. The designers of the Jiangsu Garden Expo applied this popular building

- ▶ Stainless steel cages allow for a unique stone façade that contrasts with the watery-metal ceiling panels above (left). The panels line a spectacular overhanging wall that visually balances the adjacent cliff face (right).



technique in many locations, but with a twist: for the cage structure withholding the stones, Type 316L stainless steel was selected to attain maximum life duration and aesthetics.

The water-ripple stainless steel panels can be found on all ceilings and overhangs within the Cloud Pond Stage precinct. The Type 316L panels are installed at different angles, and they produce stunning blurred reflections of lights and colors from the surroundings: the natural stone of the walls, the rocks of the quarry cliffs, the pond water, and all the other elements. The effect is further enhanced through the light and sound show at night.

Mirror Plaza

The last main site where a large amount of Type 316L stainless steel is used is the Mirror Plaza, serving as an access lobby to the Main Expo Hall. This is a canopy structure offering shelter from heat and rain, with a ceiling made of mirror-polished stainless steel panels. Some of the panels bear perforated patterns, allowing for a continuous

dance of light underneath, even in poor weather. The panels are installed at various inclination angles, reflecting each other as well as the surroundings to a stunning distorted mirror effect.

The role of Type 316L stainless steel

The design team preferred locally sourced and natural materials that would easily blend in with the environment. Alternatively, “unnatural” materials, namely stainless steel, create interaction with nature through reflecting and re-rendering the colors, lights, and hues of the landscape. At the same time, materials for the Expo needed to be readily available, easy to handle and install, and provide a long service life with minimal cleaning and maintenance needs. This combination of requirements made the more corrosion resistant, molybdenum-containing Type 316L stainless steel an obvious choice, and one that reflects the spirit of innovation in the designers. (Fabio Ries)

➤ The Mirror Plaza Hall uses a blend of perforated and mirror-polished surface finishes to create a miraculous natural light show.

