NICKEL

THE MAGAZINE DEVOTED TO NICKEL AND ITS APPLICATIONS

Nickel in automobiles: more than ever before

Nickel in space: the power to operate

Rethinking plating: solution for a cleaner, more efficient industry

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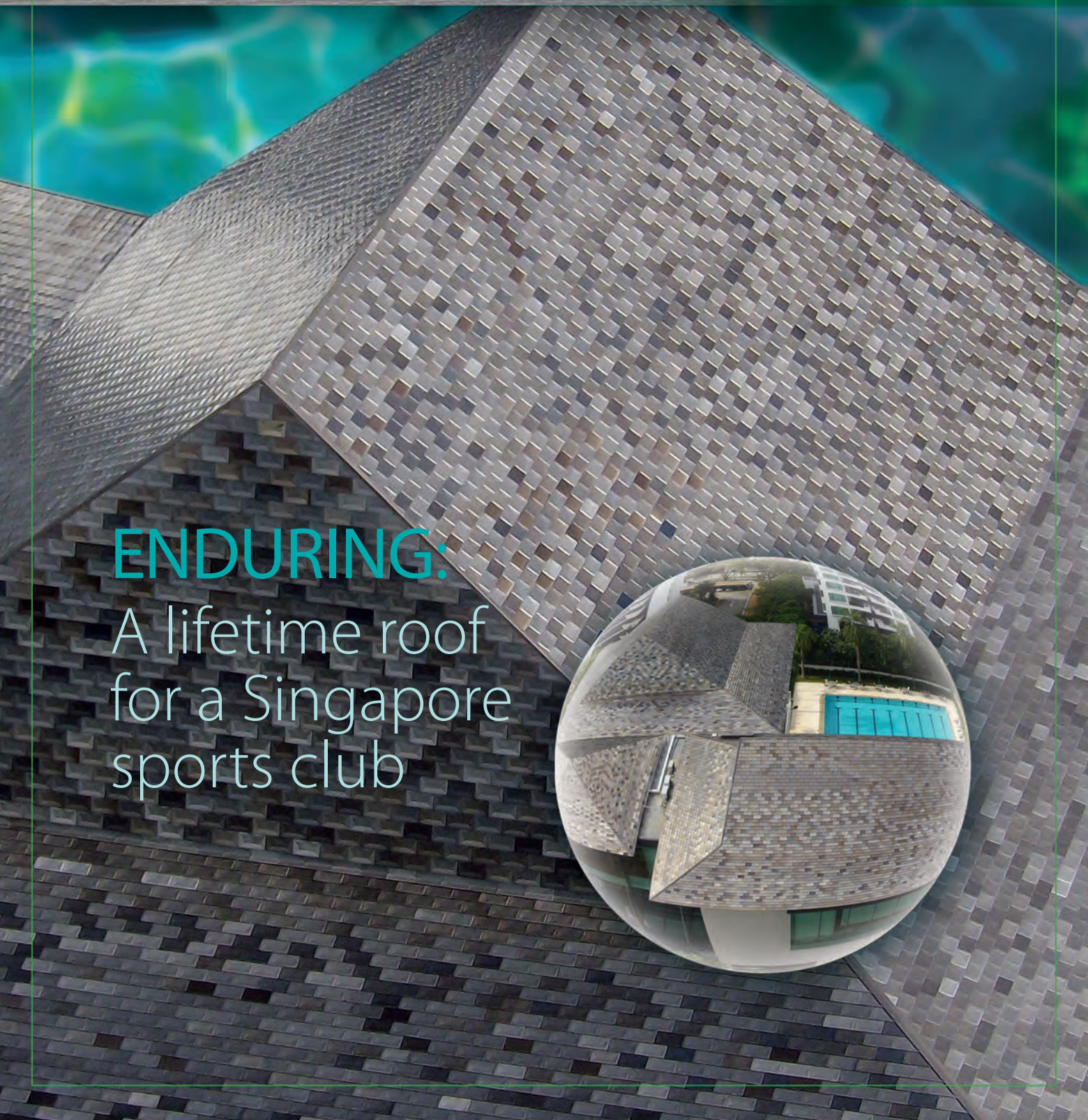


ENDURING:
A lifetime roof for a Singapore sports club

POOL BACKGROUND: ISTOCK PHOTO © UYEN LE

PHOTOS: MILLENNIUM TILES

△ *Top: Aerial view of the complex.*

▷ *Right: In addition to the strength, durability and corrosion resistance, the Type 304 stainless steel tiles add visual variety and attractiveness compatible with the residential nature of the community.*

FIRST CLASS COVER

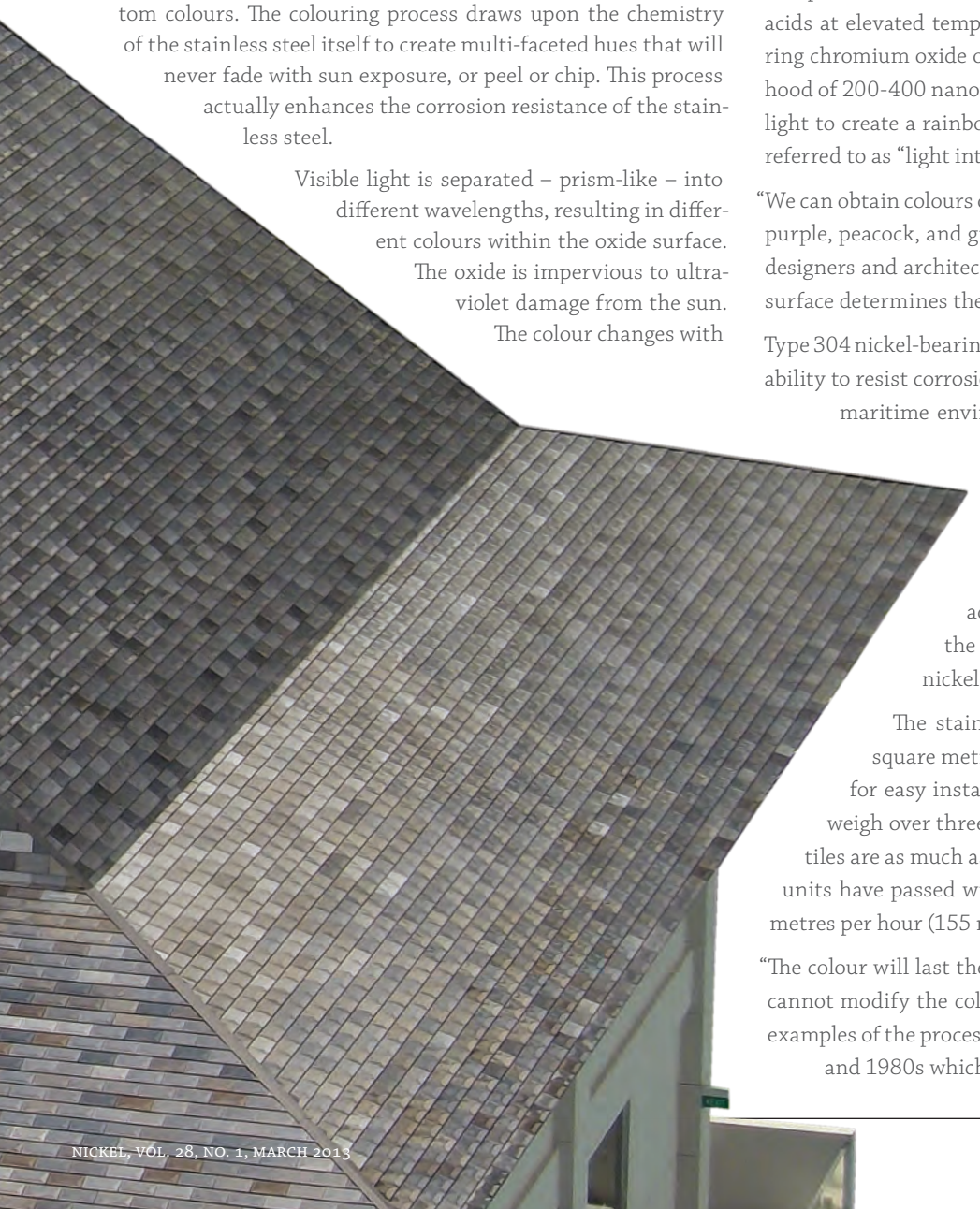
Situated on Singapore's idyllic East Coast, the Chinese Swimming Club has a 90-year history of excellence in sports – not just swimming but water polo, basketball, tennis, squash and badminton as well.

Now the club has something else to boast about: a dazzling roof consisting entirely of electrochemically coloured tiles made from nickel-containing stainless steel.

Millennium Tiles of Elkhorn, Wisconsin, U.S.A., designed the mosaic-like roof. Singapore receives considerable rainfall (2,340 mm per year on average), so the company chose Type 304 (UNS S30400) stainless steel which performs well in boldly exposed applications.

The tiles are available in a full range of high-performance custom colours. The colouring process draws upon the chemistry of the stainless steel itself to create multi-faceted hues that will never fade with sun exposure, or peel or chip. This process actually enhances the corrosion resistance of the stainless steel.

Visible light is separated – prism-like – into different wavelengths, resulting in different colours within the oxide surface. The oxide is impervious to ultraviolet damage from the sun. The colour changes with



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light conditions as they occur throughout the day, reflecting the natural environment. There are slight colour variations in the tiles, similar to those found in organic products. As Walter Hauk founder and president of Millennium Tiles, explains: "These variations give the tiles a natural appearance as well as remarkable aesthetic beauty."

The process is electrochemical in nature and uses oxidizing acids at elevated temperatures, enhancing the naturally occurring chromium oxide of stainless steel which is in the neighborhood of 200-400 nanometers thick. The oxide reflects incoming light to create a rainbow effect, with no pigment added, and is referred to as "light interference colour".

"We can obtain colours of wheat, bronze, and slate, as well as blue, purple, peacock, and green, all of which are highly appealing to designers and architects. The underlying finish of the stainless surface determines the appearance."

Type 304 nickel-bearing stainless steel was chosen, chiefly for its ability to resist corrosion, an especially important aspect in the maritime environment of Singapore. The high amount of rain there prevents the chlorides from building up on the metal surface, reducing the risk of pitting. Ferritic grades cannot compete with 304 unless they have molybdenum added, but even then, ferritic grades lack the superior forming characteristics of the nickel-alloyed grades.

The stainless tiles weigh only 4.5 kilograms per square metre (0.9 pounds per square-foot), allowing for easy installation. By comparison, asphalt shingles weigh over three times as much, and ceramic or concrete tiles are as much as 16 times heavier. The Millennium Tiles units have passed wind tests using speeds of up to 250 kilometres per hour (155 mph).

"The colour will last the life of the stainless steel since UV light cannot modify the colour," says Hauk, adding that the earliest examples of the process application are facades in the late 1970s and 1980s which show no deterioration to this day. Ni