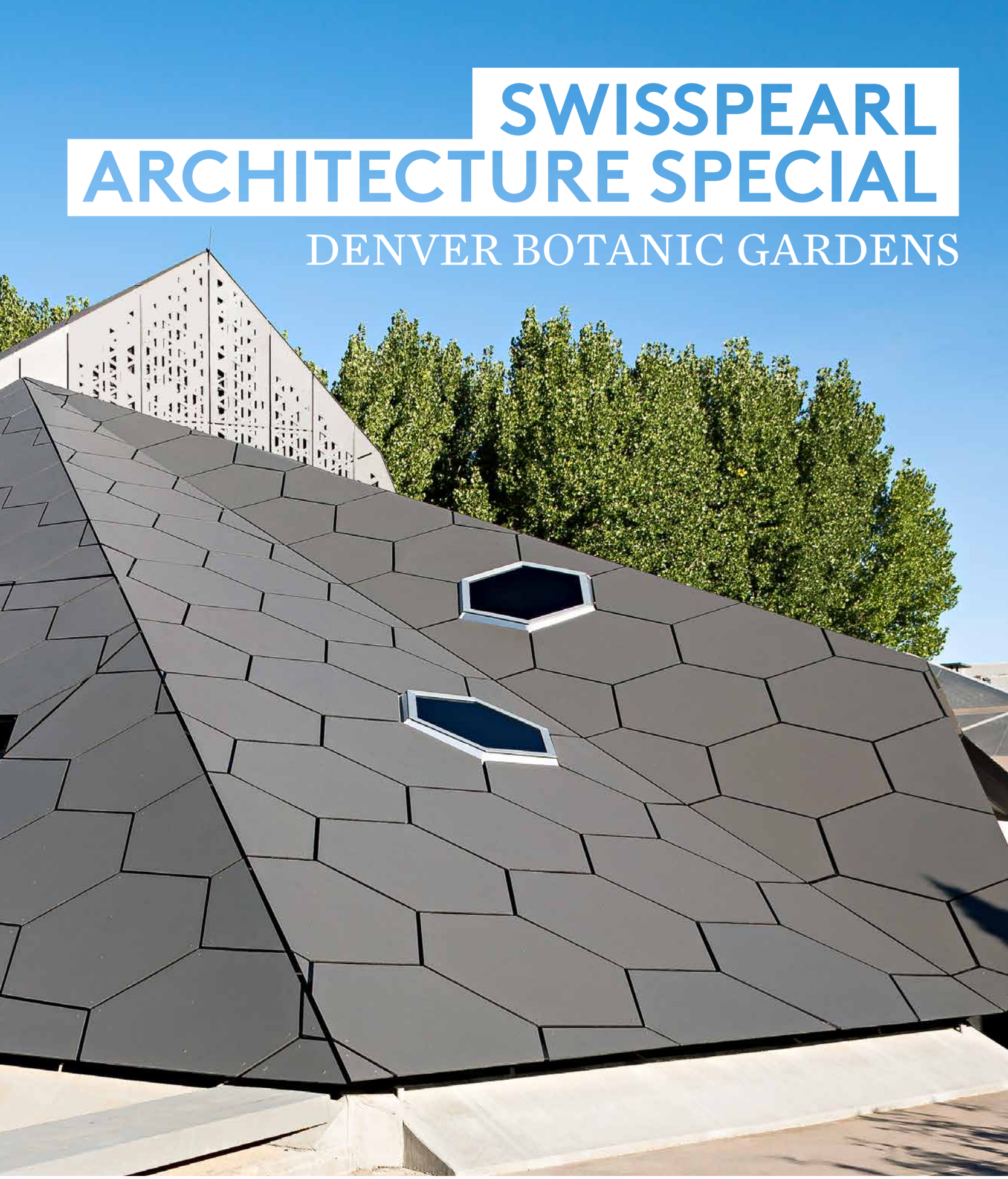
SWISSPEARL ARCHITECTURE SPECIAL

DENVER BOTANIC GARDENS



swiss pearl®

CUSTOM MADE

IMITATING NATURE

This new iconic structure raises awareness for Denver Botanic Gardens' important work in botanical and environmental research. Both form and skin of the building were inspired by natural phenomena—the former mimics the collision of two tectonic plates; the latter recalls the honeycomb pattern of a beehive composed of almost five hundred hexagonal Swisspearl panels.

PATRICK ZAMARIÀN In July 2013, Denver Botanic Gardens, an institution with a long tradition of commissioning cutting-edge architecture, invited selected architectural practices to submit proposals for a "Science Pyramid," prominently located next to a sunken amphitheater and partially surrounded by an existing pond. Complementing recent additions, the new structure was to provide an exhibition space for the institution's conservation and research efforts, thereby highlighting the Gardens' broader mission as a scientific research body.

Ben Niamthet, an associate principal with Denver-based Burkettdesign, used biomimicry as the conceptual driver of his winning competition entry. Faced with the task of designing a transparent pyramid, as specified in the competition brief, Niamthet drew his inspiration from the geological processes causing the ragged rock formations of the nearby mountain ridges. The volumetric configuration of the building is modeled on the collision of two tectonic plates, with the resulting twin-peaked, multi-faceted pyramid rising nearly thirty-four feet from an elevated platform.

The envelope of the structure was likewise informed by a biological metaphor and features almost 500 dark gray, hexagonal Swisspearl panels, arranged in a honeycomb pattern and interspersed with thirty photovoltaic collectors and multiple windows and skylights. The shell is bisected by a strip of electrochromic glass whose opacity adjusts according to the solar intensity, allowing a degree of transparency without affecting the video displays and touch-screen exhibits inside.

The architects' approach produced a geometrically complex pyramid comprising sixteen facets, each with a different degree of inclination, and a variety of ridges, valleys, and angular openings. To translate this ambitious scheme into reality, they teamed up with Studio NYL's Skins Group, whose structural engineers devised a steel frame consisting of digitally calculated and partially prefabricated painted steel tubes that are fully exposed in the interior of the building.

Creating a continuous honeycomb skin around this structural framework proved difficult, particularly as the architects wished the envelope to function as a high-performance rain screen containing a ventilation gap between its five-inch insulation layer and the façade panels in order to reduce thermal gain. While this technology is well established for vertical surfaces, it is only the second such application as a roof system worldwide, and the first in the United States. Unsurprisingly, the design team invested considerable time and effort into researching suitable cladding systems, ultimately arriving at the conclusion that Swisspearl was the only manufacturer prepared to warranty its product for sloping surfaces.

The success of the envelope depended on the invariable quality of the Swisspearl panels. The gaps between these were set at one inch, based on an evaluation of the airflow requirements of the rain screen system as well as the distance at which the joint pattern should be discernible. The desired uniform look of the honeycomb pattern necessitated more than 1,500 joints of consistent width, which, in turn, prohibited even minute variations in panel size and appearance.

Panel width needed to be consistent to ensure that adjoining panels would appear flush. To reduce the thickness of the panels, the architects opted for exposed, yet unobtrusive fasteners, which do not compromise the unified look of the cladding. Swisspearl

Science Pyramid,
Denver Botanic Gardens,
Denver (CO), USA

LOCATION
1007 York Street, Denver

CLIENT
Denver Botanic Gardens

ARCHITECTS
BURKETTDESIGN, Denver
Barton Harris, Project Architect
Rieko Ishiwata, Project Architect
N. Ben Niamthet, Project Designer

STRUCTURAL ENGINEER
Studio NYL, The Skins Group Boulder (CO)
Chris O'Hara

PHOTOS
JC Buck, Black Bike Productions, Denver

BUILDING PERIOD
2014

GENERAL CONTRACTOR
GH Phipps Construction Co., Greenwood Village (CO)

FAÇADE CONSTRUCTION
NDF Construction, Greenwood Village (CO)

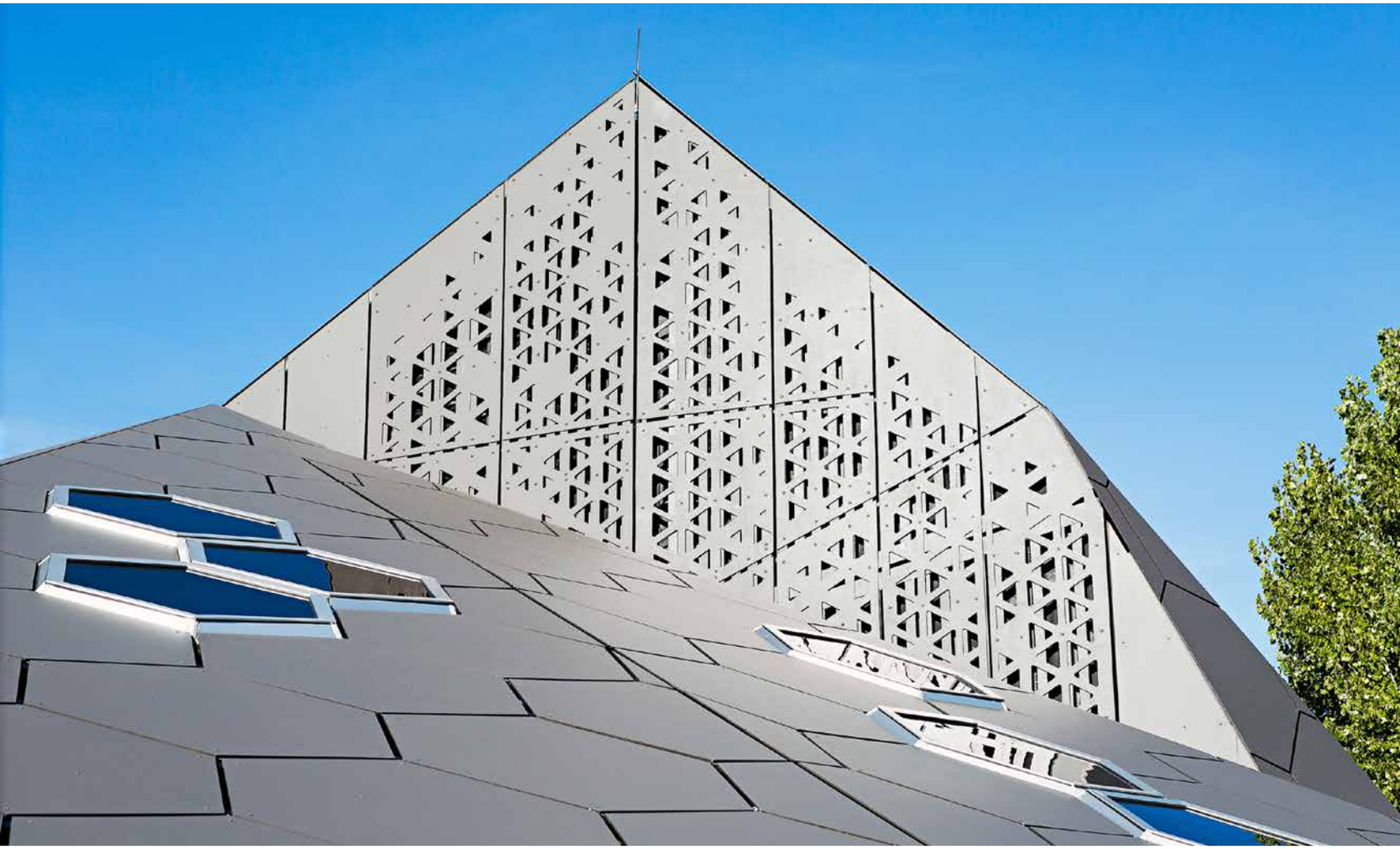
FAÇADE MATERIAL
Swisspearl® LARGO, CARAT Black Opal 7020 R

> "There are no visible color or surface variations from panel to panel—this is astounding given that the panels were neither supplied nor installed in batched packages."
>
> Barton Harris, principal-in-charge, Burkettdesign

offered an attachment solution for each of the myriad partial pieces, some of which were no larger than one inch by two inches, and its technicians used client-supplied CAD files to saw blade-cut full four-foot hexagonal shapes in factory conditions. More demanding were the numerous partial hexagons, which installers wearing mountain-climbing gear adjusted in the field to adapt to the building's wide range of architectural elements. The color integrity and material consistency of the panels guaranteed that the uniformity of the paneling could be maintained, regardless whether the individual elements were prefabricated or custom-cut on site.

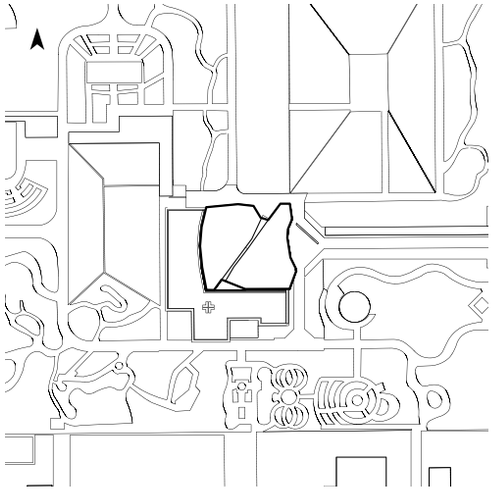
True to its purpose as a showcase project for an institution concerned with research on environmental issues, the new Science Pyramid incorporates a number of eco-friendly measures, key among which is it its innovative and technologically advanced ventilated façade composed of sustainable, durable, and low-maintenance Swisspearl panels. Aesthetically, too, the Science Pyramid achieves its objectives. Working closely with structural engineers and manufacturers, the architects managed to transpose their ambitious design scheme into an iconic structure whose fractured surface is wrapped in an astonishingly flawless honeycomb cladding made of almost 500 individual hexagonal panels. Most importantly, the $ 6 million landmark, which opened to the public in September 2014, appears to fully succeed in drawing visitors' attention to the scientific work of Denver Botanic Gardens—according to CEO Brian Vogt, "it's drawing people in droves."

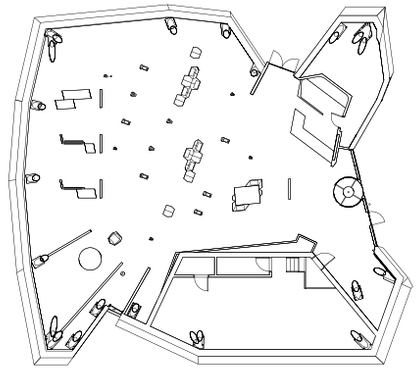
The volumetric configuration of the building mimics the collision of two tectonic plates. The shell is bisected by a strip of electrochromic glass whose opacity adjusts according to solar intensity.



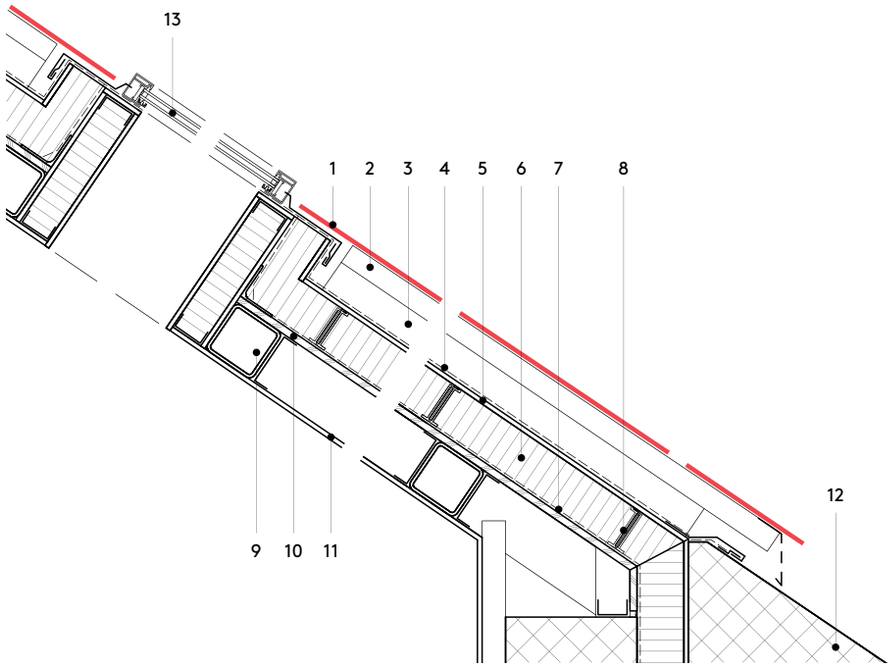
"As the architect, we were very concerned about the level variation between hexagonal cladding panels—the Swisspearl product made this concern vanish."

Barton Harris, principal-in-charge, Burkettdesign





First floor 1:500



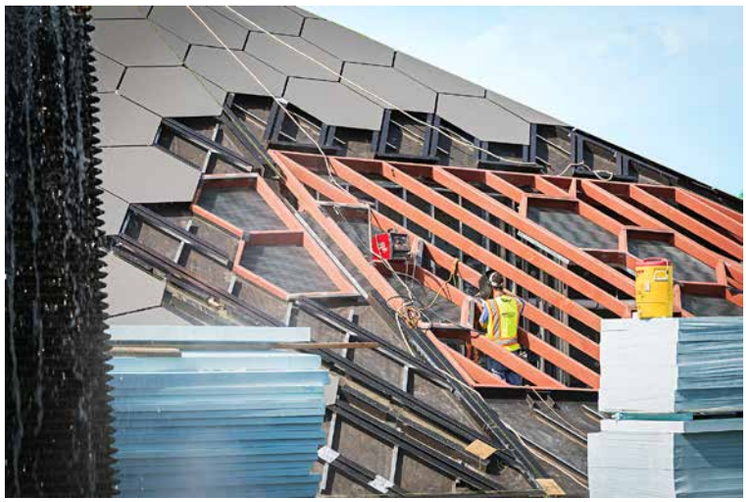
Vertical section 1:20

1 Swisspearl® LARGO panel 8 mm, R-coating
2 ventilation cavity, panel support profile
3 ventilation cavity, Z-girts
4 waterproofing
5 sheathing
6 thermal insulation
7 vapor barrier
8 fiberglass bracket
9 steel tube
10 plywood board
11 gypsum board
12 concrete
13 skylight

The panel edge is sealed by hand. Panels are lifted up by vacuum cups. Completed panels are packed up in stacks.

"Preciseness in panel size and the gap between panels were critical to visually communicate the concept of a honeycomb."

Studio NYL Structural Engineers, The Skins Group/Burkettdesign



Workers in mountain-climbing gear install the Swisspearl panels. Numerous on-site adjustments were necessary to meet the complex geometries of the cladding.

swiss pearl®