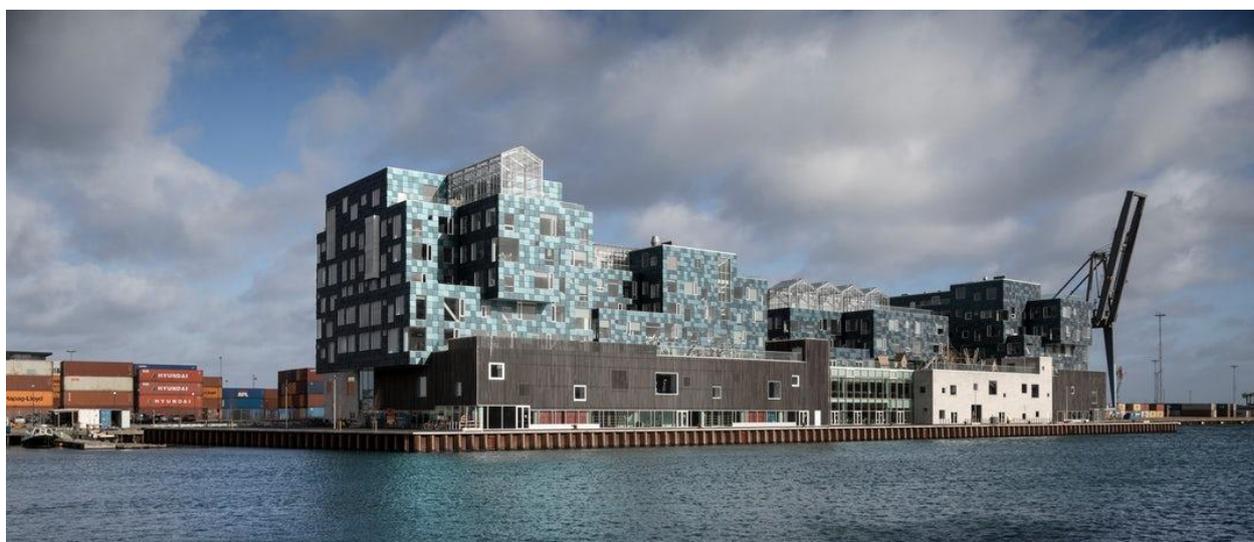


Case GB 17.
Denmark → Copenhagen:
Building with Integrated Solar Panels



Problem to resolve: Global Warming and wide-spread use of non-renewable energy,



Means: Active and passive building construction,

Strategy: Place Branding,

Location: Denmark --> Copenhagen.

CIS Nordhavn is a new school building for Copenhagen International School, which is located on a prominent site in Copenhagen's new Nordhavn district. The school is designed to link the school premises with the public sphere in the urban environment, and give the school an open ambience. The promenade outside the school will become an urban port-side space providing opportunities for relaxation and various activities. The main school building is subdivided into four smaller towers, each specially adapted to meet the needs of children at different stages of development. For example, the classrooms for the youngest pupils are particularly large: A full range of functions will take place in and around the classroom, each of which has designated green spaces and areas with drama/performance facilities, PE, etc. The towers have from five to seven storeys. The subdivision of the school into four units also creates identity and makes it easier for people to find their way. The common areas will be open for school and local community events. The base includes a shared roof terrace which will function as a school playground for the whole school – and as a secure environment for the youngest pupils in particular. ¹

Appraisal

The Copenhagen International School represents “*the architecture of willingness and foresight.*” With a façade encased in over 12,000 solar tiles, this project pushes well beyond carbon-neutrality while proving that a building can reject the dreary aesthetic that architects often associate with building-integrated photovoltaics. With deep pedagogical meaning, this school is not only a site of learning for the students within, but an indispensable resource for the wider world. *The Lead Architect explained: “What we wanted to do was to expose ourselves as a leader in sustainable design, but also create a truly sustainable project, not just for the sake of greenwashing. We thought that the architecture of the school should communicate many of the climate-based concerns that people are thinking about these days, all over the world.”*

Very little is being communicated about possible other eco construction principles which could compensate the fact that the dominating glasse panel façade does not offer more than 50% of the building’s total energy demand.



The design for the Copenhagen International School encourages students to observe and interact with the solar tiles and their associated energy production on a daily basis.

The Solar Façade

The Copenhagen International School's unique façade features 12,000 identical sea-green solar tiles that cover a total area of 6,048 square meters, supplying more than half of the school's annual electricity demand. This result was only possible through the collaboration of three distinct actors:

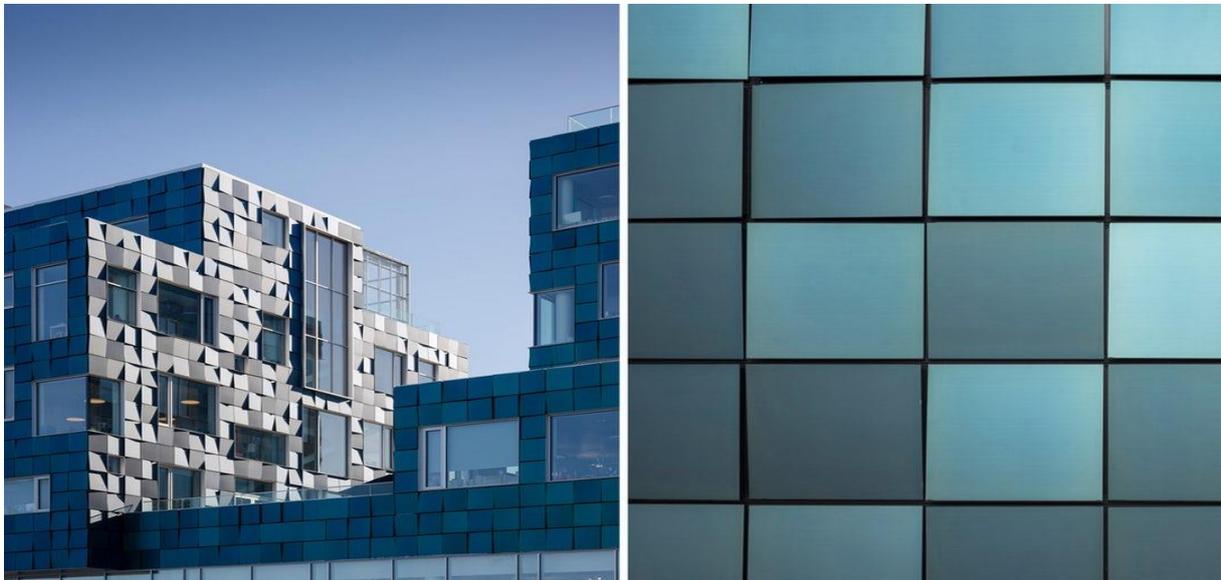
- a willing client that saw a holistic vision beyond his immediate needs,
- architects equipped to create something drastic, and finally,
- an international community of manufacturers.

The solar façade resulted from a truly international effort: The development of the glass happened in Switzerland, the manufacturing of the glass happened in Dubai, the intelligence behind the “back contact” — the part that harvests the electricity — happened in Taiwan, the gluing together of all those parts was done in Croatia. And, finally, the testing of the panels was commissioned to a climate lab in Spain. The school continues to use this story to educate the students on how manufacturing occurs in this century.”



Colored solar glass panels created by the Ecole Polytechnique Federale in Lausanne; image via Lifegate

All solar glass panels were manufactured by Swissinso (from Switzerland) and developed in cooperation with the Ecole Polytechnique Federale in Lausanne (EPFL). A special glass filter allows the solar panel to take on one single color. The filter determines which wavelengths of light will be reflected as a visible color," The rest of the sunlight is absorbed by the solar panel and converted into energy. Today, these panels are produced in brick red, royal blue, golden yellow and sea green, as seen on the Copenhagen International School.



Left: while all 12,000 tiles are identical, they are angled at four different orientations to create a sequin-like effect; Right: detail image of the sea-green solar tiles

While the building looks like it is encased in three or four different hues, all of the panels, measuring 70-centimeters by 70-centimeters, are in fact the exact same color. It just depends on the way the panel is angled, and how the sun hits its individual surface, To create the building's stunning sequin-like effect, each panel was tilted at a 5-degree angle with one of four different orientations. Throughout the day, the moiré of colors shifts from blue to green, reflecting the water and crashing waves of the harbor. The design "has an ability to communicate the landscape, and plays with the idea of creating architecture that sets a scene.



Diagram of the Copenhagen International School's façade.

Ever since its completion, the school has been incredibly well-received by the students, as it allows for unique and exciting learning environment that completely alters the status quo. It is a model that could be replicated, time and time again. Not only will these architectural components reduce the building's energy consumption, but it will also serve a larger purpose of educating a new generation.

"The school is used as a visual dashboard of real-time energy usage," said the architect. "The building's daily performance numbers show up on LCD screens throughout the interior of the school. These numbers are used in the children's math classes, which allows even the youngest students to participate in a discussion on environmental issues. It has a pedagogical impact. It shows how we can really change the future if we are able to use solar cells as an integrated part of both buildings and education."

Credentials

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Source and credits:

¹ Copenhagen, Denmark: Building with Integrated Solar Panels.in: *Architizer*. 31 October 2017.

https://architizer.com/blog/cf-moller-solar-tiles/?utm_medium=email&utm_source=eloqua&utm_campaign=newsletter-week-ly&elqTrackId=2175ECBF65147584CC1F9E6DE2806355&elq=ab4dfa557fa74243835b2dbf60e6f212&elqaid=863&elqat=1&elqCampaignId=649

<https://www.cfmoller.com/p/Copenhagen-International-School-Nordhavn-i2956.html>

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