WASTE-TO-ENERGY PLANT WITH RECREATIONAL QUALITIES

AMAGER RESOURCE CENTER – ARC

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Visualizations: BIG Architects

The Amager Resource Center, ARC, will be a role model in many ways. The new landmark will merge the industrial area on the island of Amager with the urban structure and society of the neighbouring city. Copenhagen's state of the art waste-to-energy plant will not only be one of the best performing European plants in terms of energy production, waste treatment capacity and environmental efficiency, but also in terms of visuality and local acceptance.

View of from East and West. © BIG Architects

It combines innovative technology, recreational activity and integration to society by creative architecture, and is consequently a great example of how a power plant can be welcome to people's backyards. Thus, the architects of the Bjarke Ingels Group (BIG) succeed in creating a new class of power plant.

For the first time, a waste-to-energy plant has been designed as an attraction: The extensive roof area of approximately 32,000 square meters (38,000 sq yd) is designed as a winding, inclined surface, serving as a ski slope with several levels of difficulty. The new building is situated in an area which has long been utilized by extreme sports athletes for their recreational activities. Now its role as popular destination of the Copenhagen population is to be established and expanded.

The new facility with state-of-the-art, eco-friendly disposal technology is built right next to the obsolete 45-year old plant which will be closed after the ARC has been commissioned.

OPEN SPACE PROVIDED BY USING DELTABEAM®

The design by the architects required long spans of the slabs for a column-free interior design. In addition, increased snow loads for the planned ski slope on the roof of the building had to be considered. DELTABEAM® Composite Beams meet all these requirements perfectly.

Oliver Beckmann, R&D Manager for Composite Structures at Peikko Germany, was responsible for the design of approximately 160 DELTABEAM® Composite Beams with a combined total length of nearly 1 kilometer (0.6 miles) in the ceilings and about 80 beams with roughly 400 meters (1,300 ft) in the roof area for this extraordinary project.

Both in terms of production quality and monitoring as well as with respect to corrosion protection, high demands were made, which were accomplished in close cooperation with the participating companies. In addition to DELTABEAM®, further concrete connection products of Peikko were utilized in the project as well.

THE CONCRETE–STEEL CONNECTION

Peikko's PCs Corbels provide the connection between the DELTABEAM® and precast concrete columns and walls. The hidden corbel substitutes concrete corbels. Its practical handling in the

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DELTABEAM® Composite Beams were used in the slabs for long spans with slim structures

precast plant and on the construction site ensures neat connections with a pleasing appearance after completion of the building. Specially modified PCs Corbels enable the DELTABEAM® to be positioned particularly close to the upper edge of the precast elements.

Several connections and bearings of DELTABEAM® Composite Beams on beams and precast walls were executed using modified Fastening Plates. Peikko's customer engineering developed the necessary connection details. The highly stressed, partly rigid end plate connections were designed at Peikko by FEM-calculations.

The specifications of execution class EXC3, execution of quality class Z and ultrasonic tests on the steel plates as well as the high requirements placed on surface preparation and corrosion protection placed high demands on Peikko's production facilities.

CONNECTIONS BETWEEN PRECAST AND IN-SITU CONCRETE STRUCTURES

Peikko's MODIX® Rebar Couplers were installed by the precast plant in filigree walls. This means that on the building site a connection is available for the reinforcement of the adjacent in-situ concrete structures. By inserting the MODIX® Couplers the rebars are "extended" and in-situ concrete walls may be cast in place in their formwork on site.

In the joints between precast concrete units and the in situ concrete a stirrup reinforcement is used. Since the reinforcement of the connection cannot be screwed, the MODIX® Couplers allow connection of straight or bent rebars, if neither of the two bars can be rotated.

The MODIX® Rebar Coupling System is designed to be the most safe and flexible rebar splicing system. The assembly team and the site supervisors are conviced: "MODIX® is much faster to install compared to similar products where you need to use a torque wrench to check if they are tighten with enough moment."

The connections between the precast and in-situ concrete walls are made with the MODIX® Rebar Coupling System.

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The roof area of the building will be used as ski slopes with different levels of difficulty.

VISIBLE ENERGY EFFICIENCY

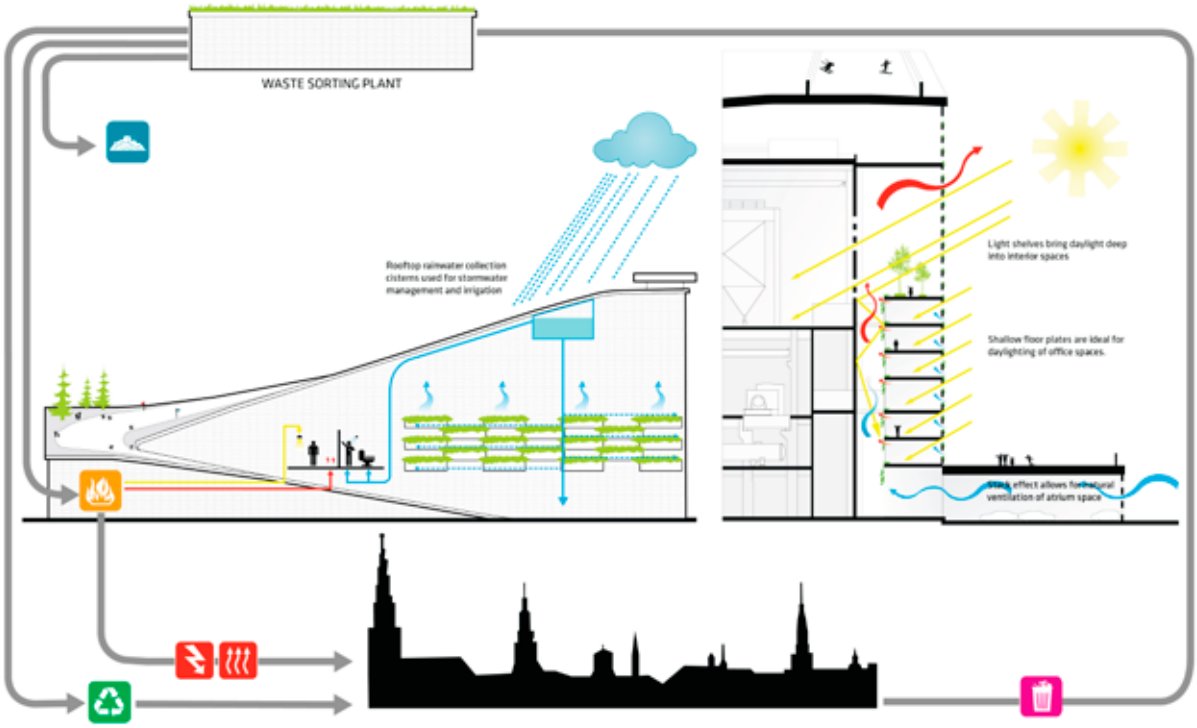
After commissioning in 2017, the ARC will provide heating to 160,000 households and electricity for about 62,500 residential buildings. The owners, five Danish municipalities, expect the plant to burns 2 x 35 tons (40 US Tons) of waste per hour.

From a 124-meter-high (407 ft) stack steam rings with a diameter of 25 meters (82 ft) are ejected. BIG explains: "Does anyone know what a ton of CO_2 looks like? We propose to modify the chimney so that a steam ring is released when one tonne of CO_2 has accumulated. These serve as a visible reminder of the impact of energy consumption." ■

ARC IN A NUTSHELL

Developer:	Amagerforbraending, Copenhagen
Architect:	BIG Architects, Copenhagen
Structural Engineering:	AKT, MOE
Constructor:	NCC Construction A/S Ed. Züblin AG, Hosena
Floor Space:	approx. 95,000 m² (114,000 sq yd)
Landscape Area:	approx. 90,000 m² (108,000 sq yd)
Roof and Ski Slope:	approx. 32,000 m² (38,000 sq yd)
Construction Period:	2015–2016

The new waste-to-energy plant pursues a consistent strategy of sustainability, ranging from the selection of construction methods and systems to its role as a communication platform in the urban and social environment.



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