

LandArtgenerator Copenhagen

DG83BW47

"POLYPODART ENERGY RAPTOR"

A- Concept:

The aim of proposed structure is to enrich the landscape formed by existing around the site naval industry environment and bring a new meaning to the development of Nordhavnen area nearby site. The frequent winds and presence of sea waters around the project site will animate this creature generating energy all the year. It could be enhanced by the created octopus-like forms, producing for us electrical energy, and home some sport and divertissement facilities. This energy based on natural resources (sun, wave power and wind) is as necessary for our every day life as is the water. The natural forms of proposed "PolypodArt Energy Raptor" are shaped on image of an imaginary multi-pod creature which is composed of several levels of optic fiber web fabric forming external skin. It should appear in the existing landscape as an ephemeral structure softening the hard and artificial image of the existing fixtures. Purposely we extend our composition to the water edge in aim to benefit from the waves movement energy. Its sprawling arms plunge into the sea waters which permanent motion will produce still more and more energy.

B - Structure:

The structure can be divided into three main structural elements:

1. The skin
2. the platform
3. the columns supporting the skin and the platforms

The skin due to the large spans of the skin and due to the fact that the skin is not designed as a 'perfect' shell it will require a significant amount of material to support it. It is therefore suggested to continue the columns supporting the skin base and the platform to the skin roof to reduce the spans within the skin. It is also suggested not to use the rather heavy steel structure but a lighter structure where is possible to reduce the weight of the building. Additionally this would also reduce the carbon footprint of the building. The platforms are typically supported by the columns. The span of the platforms between two columns should be limited to a maximum of 12m. It is suggested to construct the platforms as a composite structure. The columns support the skin as well as the platform. To reduce the additional thrust force produced by the inclination of the columns it is suggested to arrange the columns in a way such that the thrust forces cancel each other out.

C- Components:

C.1 - External skin will be created by a textile made of optic fiber PV mesh. The optic fabric web mesh is composed of 3 layers:

- 1- the optic fiber core
- 2- covered by a single walled carbon nanotubes. (<http://www.alternative-energy-news.info/more-efficient-solar-cells-with-carbon-nanotubes/>)
- 3- Protected by the external layer of optic fiber material.

C.2 - On the dominant winds north-west to south, the external elevation fabric will be equipped with the wind micro-dynamics for to enhance the electric power production and bring the necessary refreshing air to the interior.

C.3 - The south-eastern side of the external skin will be used partially by the solar protecting PV shells and north-western side will be equipped with the memory metal made springs, which will regulate their open-close position depending on external temperature. (http://en.wikipedia.org/wiki/Shape_memory_alloy) This device will regulate the natural cooling and ventilation system without the need of external energy. (See scheme). These shells will be made of self cleaning translucent material.

C.4 - Internal breathing textile envelop will serve as an isolated translucent zone inside the skin, forming inner spaces.

C.5 - Integrated external skin is equipped with illumination led system.

D - Sustainability:

D.1- Planting vegetation between the site and "PolypodArt Energy Raptor" will allow oxygenation of the site air before dominant winds carry the air through the installation. This will provide a fresh feeling to the space and can provide a natural air filter thereby extending the lifetime of the internal fabric filters. Irrigation of this green filter will be done via wind- and PV-driven pumps.

D.2- It is proposed that natural ventilation and its associated passive heating/cooling will be designed into the structure with appropriately positioned and sized openings. With the openings activating in tune with the ambient conditions (see Memory Metals section - http://en.wikipedia.org/wiki/Shape_memory_alloy), this massively reduces the energy consumption for driving fans and actuators. During summer season, the solar gains can be used to create a lateral buoyancy effect that will cause hot air to expel from one side of the building thus driving cooler air into the building through the opposite side.

D.3- However, where there is a need for mechanical fans - and other electrical devices and lighting - the electricity to drive these fans will be generated from various natural and passive sources, including:

- CPV-optic fiber skin;
- wind-turbines;
- Human walking movement energy through piezoelectric platforms (<http://www.inhabitat.com/2008/07/16/green-a-go-go-at-londons-first-eco-disco/> and <http://www.inhabitat.com/2009/10/28/energy-generating-pavement/>) and ticket gates (http://www.treehugger.com/files/2006/08/japan_ticket_gates.php);

D.4- With the high-rate of commuters, there may be excess electricity generated that will then be stored in the ultra capacitor devices through the use of a one-atom thick structure called "graphene" as a new carbon-based material. These batteries are located under the walking platforms level. (<http://www.sciencedaily.com/releases/2008/09/080916143910.htm>).

D.5- High-performance façade systems are proposed throughout the "PolypodArt Energy Raptor", manufactured to reduce direct solar heat gains yet provide sufficient daylight into the interior spaces.

D.6- In times of extreme hot weather, a reserve-cycle heat pump system is proposed that could use the adjacent waters as a heat-sink. A water-based cooling system can be integrated into the structure for distribution. Condensate forming on the exterior surface and rain waters can be collected and used as the heat transfer medium or used for irrigation of the green filter. The use of mechanical cooling can be reduced by introducing thermal mass into the structure. Whilst the general light-weight scheme does not such the use of concrete, the material can still be patchily located in prime areas of high heat gains and platforms. The energy from the cooler night-time air will be stored and then released during the day.