



## PROJECT SUMMARY

### Organization:

AA Emergent Technologies and Design MSc/MArch Programme  
Architectural Association  
London

### Solution:

Building

### Location:

London, UK

### Project Objective:

Design, engineer, and construct a permanent canopy structure for the AA terrace

### Products Used:

GenerativeComponents®

# AA Component Membrane Canopy for the Architectural Association in London

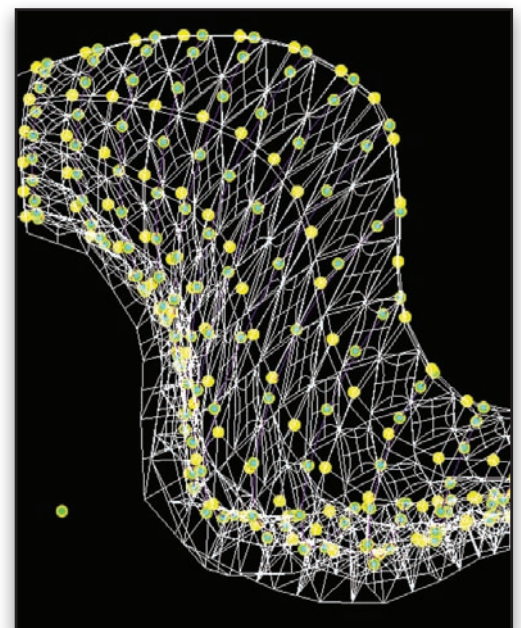
AA Component Membrane is a Canopy Design for the Projects Review of the Architectural Association (AA) – One of the World's most Influential Institutes in Architectural Education and Research.

The AA Projects Review is widely viewed within the architectural community as a showcase of excellence and innovative work. It takes place at the end of each academic year and attracts as many as 3,000 visitors. The canopy was inaugurated during the Projects Review, but will remain within the AA for several years as a highly visible design element. The canopy was designed by the Emergent Technologies and Design MSc / MArch Programme in collaboration with Buro Happold, one of London's leading engineering firms.

The AA Component Membrane was designed using the rich parametric logic enabled by GenerativeComponents®. The software, which was integral to the process from the beginning of the component-based design approach, gave the Emergent Technologies team a high level of control over a relatively complicated structure. A hierarchy of parametric relationships in tandem with certain control mechanisms allowed swift adjustment of the design in response to engineering, environmental, and design input. This immediate response to changing design and engineering decisions was facilitated by the use of parametric software, which addresses as the basis of its operation the interrelation between elements rather than simply fixed measurements – as is the case with traditional software approaches. As a result, a change in one parameter can be adjusted and incorporated within the system as a whole.

This capability allowed the Emergent Technologies team to adjust the angles of the membranes in the structure and, as a result, the sun shading provided

and the structure's morphology. Since the project was conducted within a very tight time frame and an academic context, this instant flexibility was crucial to its success. It ensured that the team could complete the project on schedule and increased the project's value as a research experiment. The final digital model was translated into manufacturing plans and lists, allowing the membranes to be laser-cut to size. This integration of digital modeling and manufacturing enables relatively complex and varied geometries to be realized while controlling the costs and time of manufacture.



*GenerativeComponents enabled a high level of control over a relatively complicated structure*

## FAST FACTS

- Interactive parametric model based on associative geometry in GenerativeComponents
- Data exchange protocols with engineering analysis software of the consulting engineers
- Data exchange protocols and feedback with environmental analysis software
- Automated data extraction for the manufacture of 600 different steel elements
- Automated data extraction for the manufacture of 150 different membrane patches
- Due to this integrated software approach the canopy could be designed, engineered, and constructed in only seven weeks

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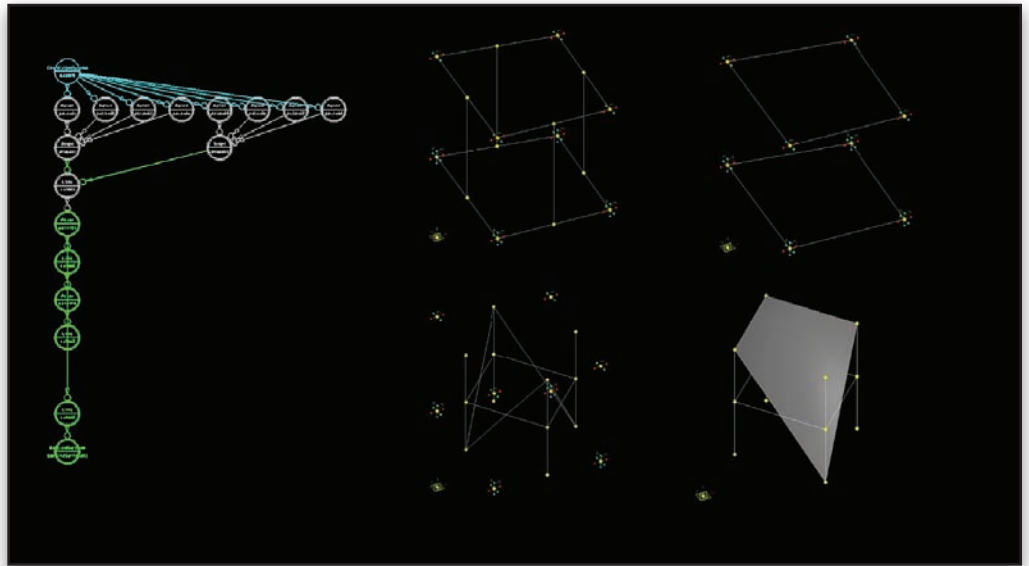
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*GenerativeComponents was integral to the process from the beginning of the component based design approach*

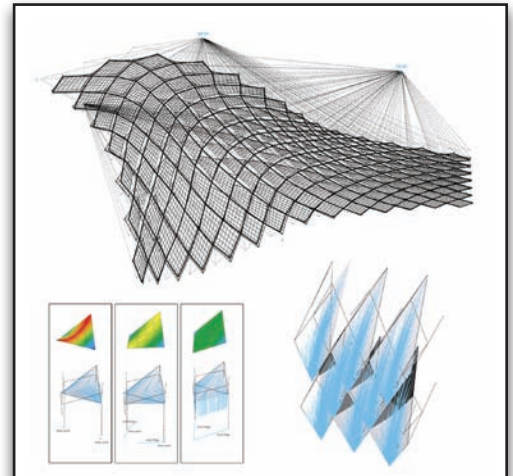
The design uses a component-based membrane system. The membranes work as structural elements, taking on tensile loads, whereas steel members are used to deal with compressive forces. The system consists of 150 components in total. These have been grouped into larger assemblies, and only certain elements are stiffened strategically.

This grouping logic also helped make the construction process relatively easy. Several components could be assembled into colonies in the workshop and then joined with the others in the final stage on site.

The component-based logic of the system facilitates spatial and environmental variations across the canopy, allowing the degrees of sun shading, rain protection, and airflow provided to be adjusted. These effects were tested using specific simulation software. On a much smaller scale, the component membrane introduces a shingling system that allows airflow, while letting rainwater run off the membrane without penetrating to the terrace.

The overlapping membrane articulation that results protects from rain while remaining porous enough to avoid excessive wind pressure. Moreover, it maintains the appealing views across London's roofscape. In addition, the membranes contribute significantly to the stiffness of the overall structure, which acts as a cantilever resting on just three points.

GenerativeComponents enabled this project team to direct their creativity to deliver an inspired design, using innovative materials and assemblies, and to achieve results that matched their imagination.



*Component based logic of the system allows for spatial and environmental variations of the canopy*



*These membranes contribute considerably to the stiffness of the overall structure*