PLACEMAKING ADELAIDE

The built form of the SAHMRI acknowledges its sense of place within the green belt of the Adelaide parklands, seamlessly interacting with its surroundings, including Adelaide’s public transport, cycling and walking networks. The building is oriented to engage this green belt and riverfront, as well as downtown Adelaide. The architecture is lifted, creating an open ground plane in an integrated landscape, opening the building to the public as well as users, allowing for greater activation and porosity through the site.

Derived from its unique site geometry and need to create a forecourt entry adjacent the new hospital to the west, the diamond-shape plan grows from the ground plane to become a “folie” in the park. Visible through the transparent facade, the west atrium expresses the entry and bridge links between the laboratories, while the east atrium expresses the active workplace environment inside. Together with the expression of the associated laboratory flues outside the west facade, the function of the building is clearly identified and aims to promote the importance of the research within.
The building form is further expressed by its unique triangulated dia-grid facade inspired by the skin of a pine cone. The triangulated structure and articulated sunshade allow for a singular skin to the building to create a sculptured object.

**INNOVATION IN SUSTAINABLE DESIGN**

As part of an innovative sustainability program, the project is the first laboratory building in Australia to achieve a LEED Gold rating. The design team worked collaboratively to conduct extensive tests, adjusting the building form to achieve its best solar orientation through the passive design of floor plates that respond to the internal program and provide maximum daylight where needed.

**GEOMETRIC DEVELOPMENT**

The original “sketch” geometry was developed using a collection of flat and blended NURBS surfaces in Rhino 3D. This enabled a sculptural feel to the form development process but also presented the team with challenges in its realization into a cost-effective and fabricatable form. At the same time, early development of production drawings had begun, and thus the suggestion to continue geometric development within Revit 2010 was actioned. The limitations of Revit’s geometry manipulation actually served as a beneficial aspect of the geometric rationalization process – these limitations became fabrication “controls,” resulting in the form migrating into a cleaner, arc-based collection of shapes.
After settling on a handful of options, a more thorough deployment of the paneling scheme and shading device concept was actioned using Rhino Grasshopper. Recognizing that early testing on a simpler surface would not be representative of the full range of local design conditions, use of Grasshopper allowed the team to test the schemes across the form’s many complex shapes and patches and to focus on fine-tuning and the resolution of anomalies.

Once the overall approach was developed, localized design-driven changes were explored in order to integrate environmental, programmatic and formal requirements. Across two of the flatter surfaces, significant shading fin depth was required to mitigate solar exposure. However, the transition from these deep-fin areas to areas that did not require any shading mitigation was abrupt. A gradient control mechanism was developed in Grasshopper, enabling the exploration of a range of potential blended solutions across various interior spaces. Ultimately, a simpler blended rectangle was used.

All data eventually made its way into Revit, resulting in a federated Building Information Model that coordinated architecture, structure and services. The final delivery of the facade model, including setout geometry and surfaces, was augmented by a thorough object-naming scheme to assist in fabrication. As noted before, development of the project corresponded with...
Early development of Grasshopper, and thus the ability to implement custom object-naming schemes was limited. Custom naming routines were developed using Rhinoscript Monkey, allowing each object’s name to take on a range of meta-data tags. Monkey also enabled the analysis of unique panel counts and overall panel simplification at early stages of design.

**FABRICATION AND ASSEMBLY**

Facade development was led by Australian-based design-build facade specialist 4DFS. Bringing in the original surface geometry from Rhino to Autodesk Inventor, minor tolerance issues were highlighted at the intersections of the mesh panels. This was resolved using nearest-neighbor algorithms/vertex averaging. A parametric model was developed to explore structural framing and glass connection details, with significant complexity required to address a required gap between panel edges, considerate of site tolerance, across both convex and concave conditions. The surface was then subdivided into a collection of larger panels to be fabricated off-site.

Fabrication occurred in China using manual welding processes, augmented by laser point-scanning for verification of fabrication accuracy. Assembled panels were shipped to the site, hoisted into place, checked again using laser scanning and welded in place.

**IMAGES CREDITS**

Images 2-3, 7-13, Woods Bagot.
Images 1,4,5, Peter Clarke.
Image 6, David Sievers.
Image 14, 4DFS

**SHANE BURGER** is an internationally recognized leader in the advanced use of design technology for the built environment through BIM & Computation. At Woods Bagot, he directs the global vision and team dedicated to a progressive digital design agenda. As a director of the design computation and education nonprofit Smartgeometry, he is actively engaged in the intersection of art and technology.