

Introduction

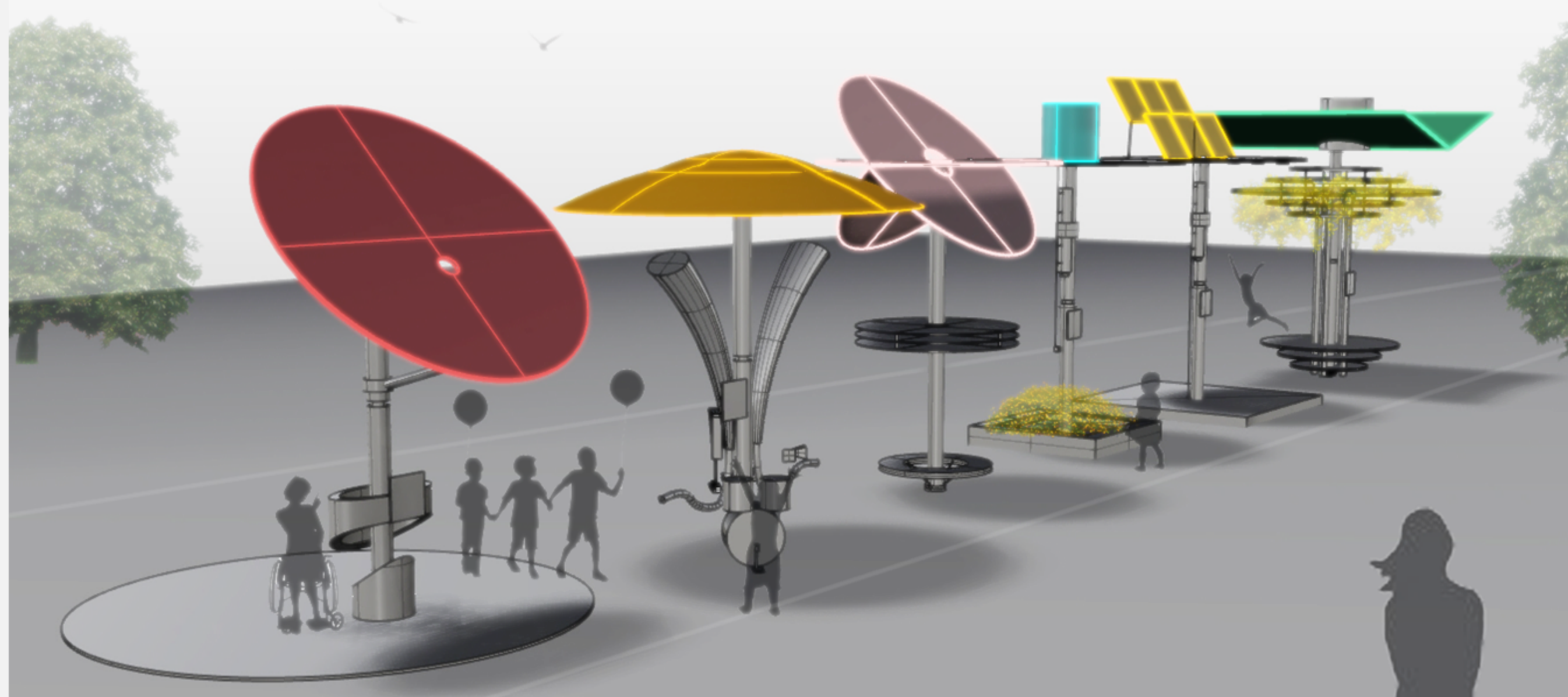
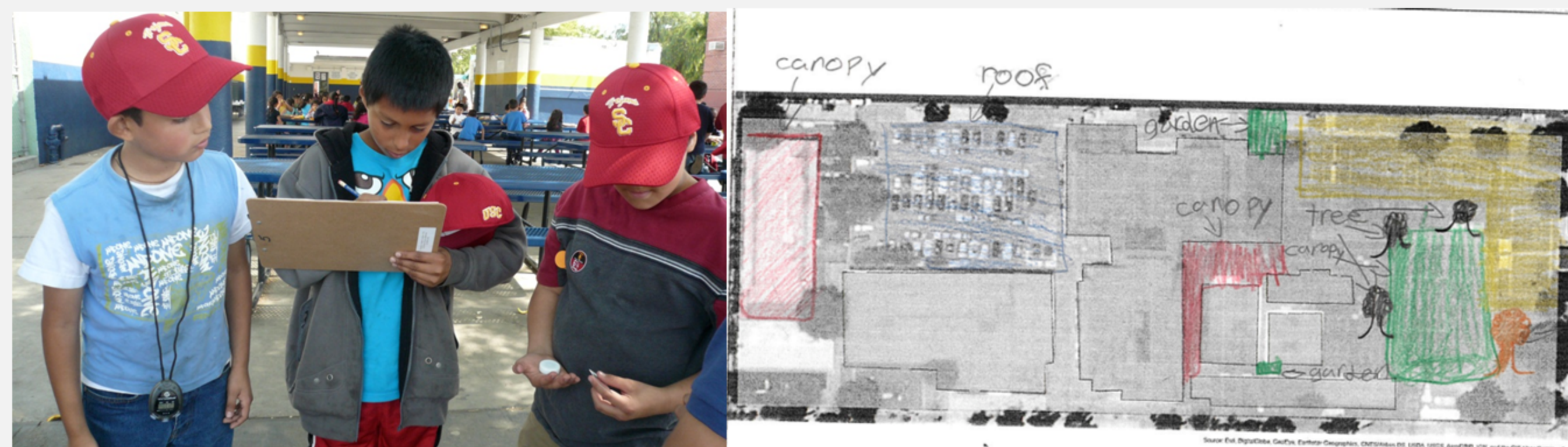
“SunSmart” is a skin cancer intervention program initiated by faculty in the USC Keck School of Medicine in collaboration with the USC Spatial Sciences Institute. The current interdisciplinary efforts aim to reduce sun exposure in the playgrounds of local Los Angeles (LA) elementary schools through educational outreach and design solutions.

Phase 1 of this project, completed in the 2016-2017 academic year, used field collection of solar radiation (UV) data, subsequent spatial analysis, and input from the primary stakeholders, 4th grade students who participated in a GeoDesign workshop to determine locations most in need of shade structures at Bright Elementary School in LA.

Phase 2 of this project, conducted during the 2017-2018 academic year, used the initial analysis and stakeholder input to innovate adaptable, flexible, community-based designs for shade structures that also provide opportunities for children to experience the sciences, technology, engineering, arts and math (S.T.E.A.M.). Geospatial technologies are being used to analyze the potential impact of proposed shade structure locations on solar radiation exposure.

Objectives

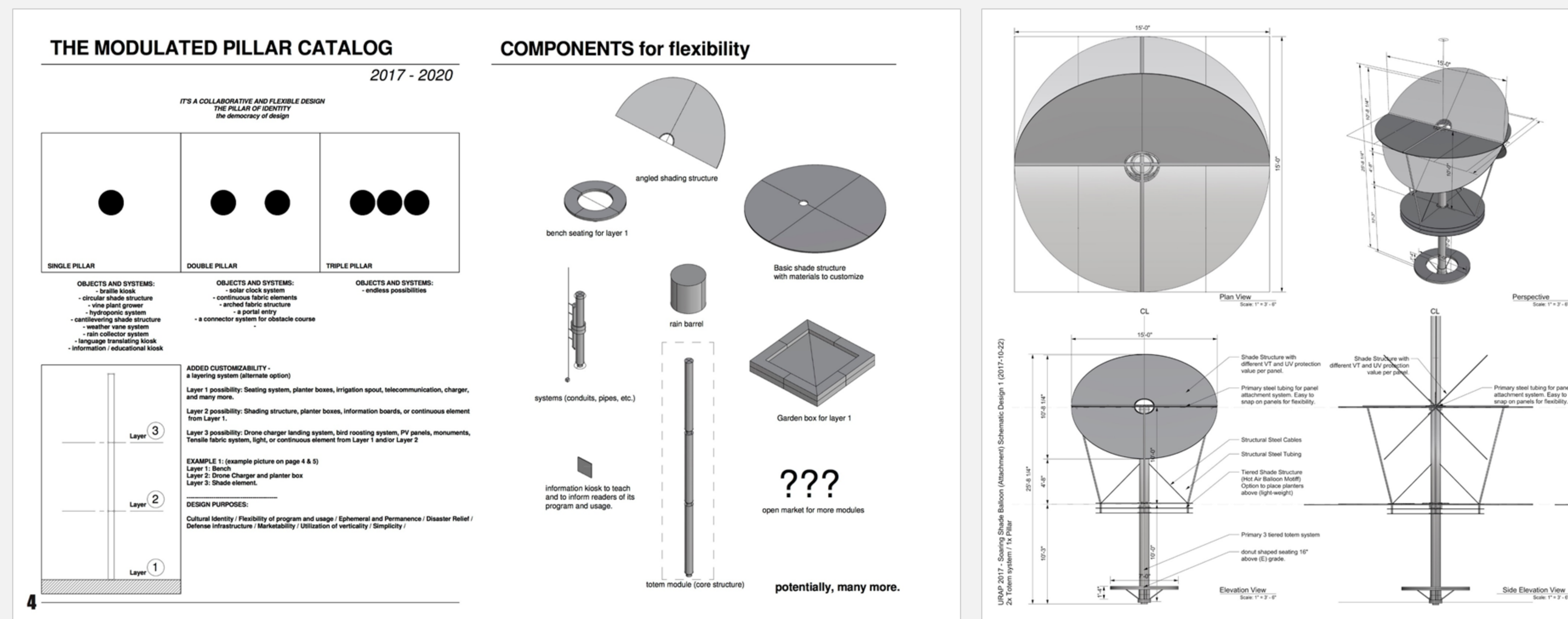
- Educate elementary school children on the importance of safe sun exposure behaviors to reduce the risk of skin cancer, and S.T.E.A.M.
- Develop a community-based, data informed landscape that can reduce UV exposure on the playgrounds of elementary schools
- Enhance the arts and humanities studies through design solutions



Top left: Students at Bright Elementary School near USC sketch out design ideas for sun shades in their school's playground. Top Right: a student's design idea. Stakeholder input is vital to the GeoDesign process in order to arrive at community-based solutions. In this case, elementary students were the most important, primary stakeholder used for the design. Their input was incorporated into the design process. Bottom: The five main modulations of the sun shade design: **braille clock shade**, **music-making "sound station"**, **rain catchment shade**, **balloon shade**, **photovoltaic (solar panel) shade**, and **garden bed shade**. These shades address not only skin cancer prevention but provide children with access to **STEAM** (science, technology, engineering, arts, math).

Design Thesis

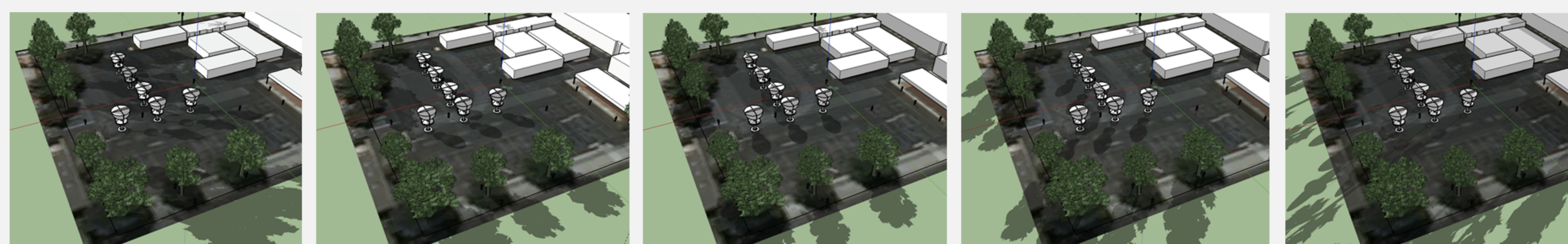
The innovative shade designs consist of a modulated network of multi-use “totem” posts that can be reconfigured at will. The structures include opportunity for additions (solar panels, water catchment system, vegetated planter boxes, play equipment, etc.) that can adapt to meet each individual school's needs, providing both physical and economic flexibility. These designs are combined into a “catalog” of options that can be selected on a case-by-case basis.



Schematic design diagrams showing the componentry of the sun shades and the modular catalog. Clients will be able to select from a catalog of optional components in order to create a complete shade design that best fits their particular site.

Analyzing the Design in Context

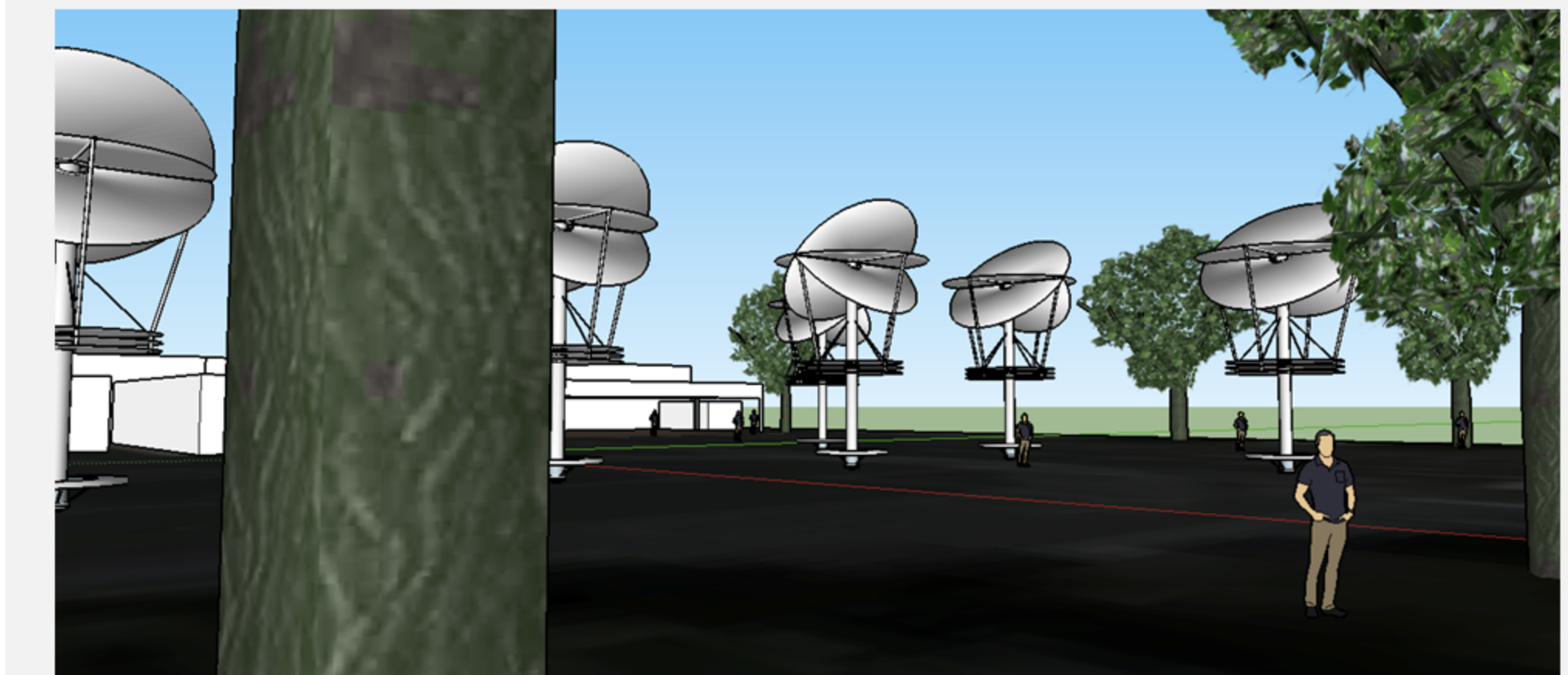
This project used a variety of digital modeling programs, including Esri ArcMap, ArcGIS Pro, GeoPlanner, SketchUp, and Rhino, to model the sun shades in site context. The group then performed Spatial Interpolation of UV and 3D shade analysis in ArcGIS Pro in order to evaluate how the additions of their sun shade designs could improve shade cover. The diagrams below show how shade may be impacted throughout the day with the addition of shade structures.



8:00 AM 10:00 AM 12:00 PM 2:00 PM 4:00 PM

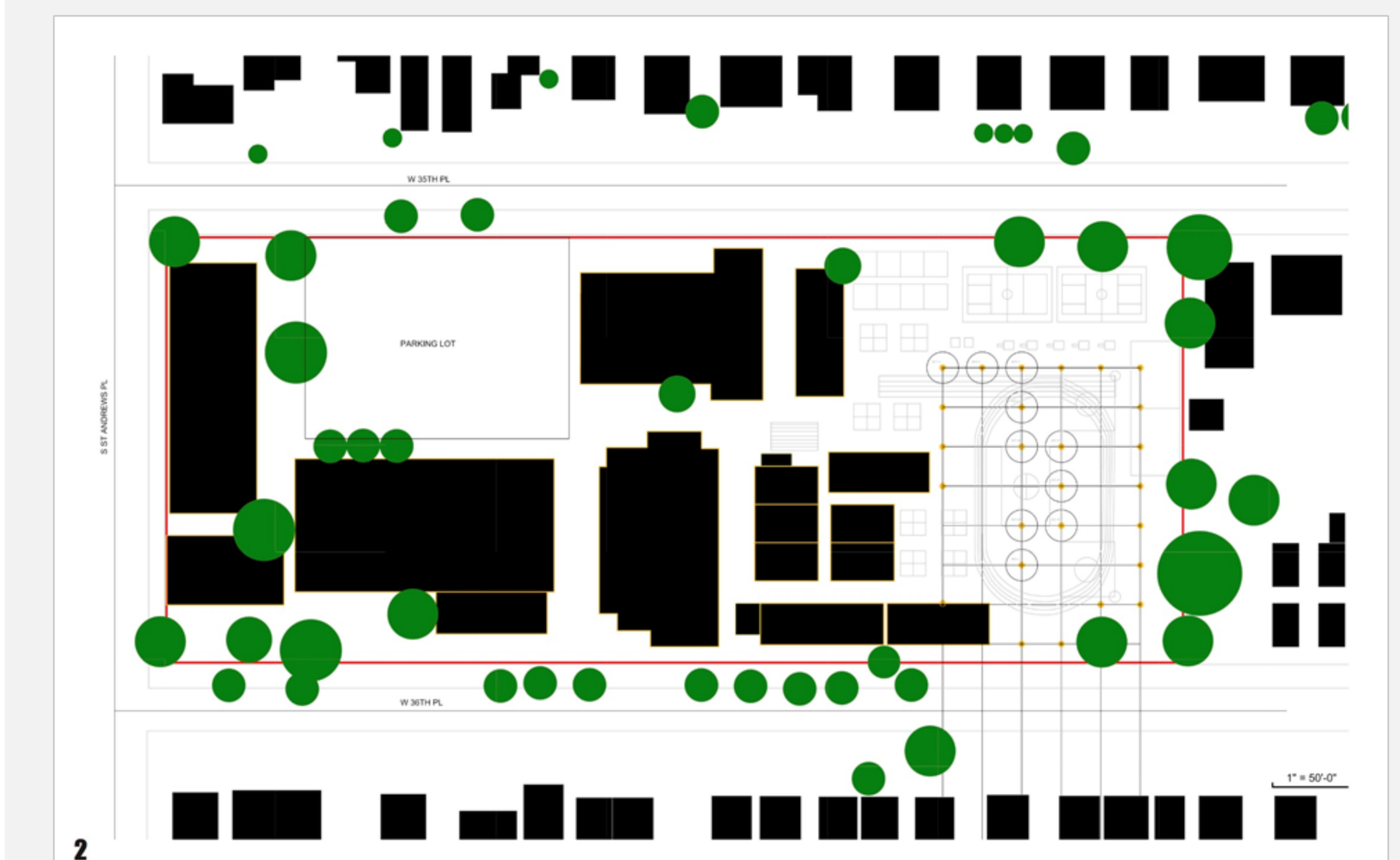
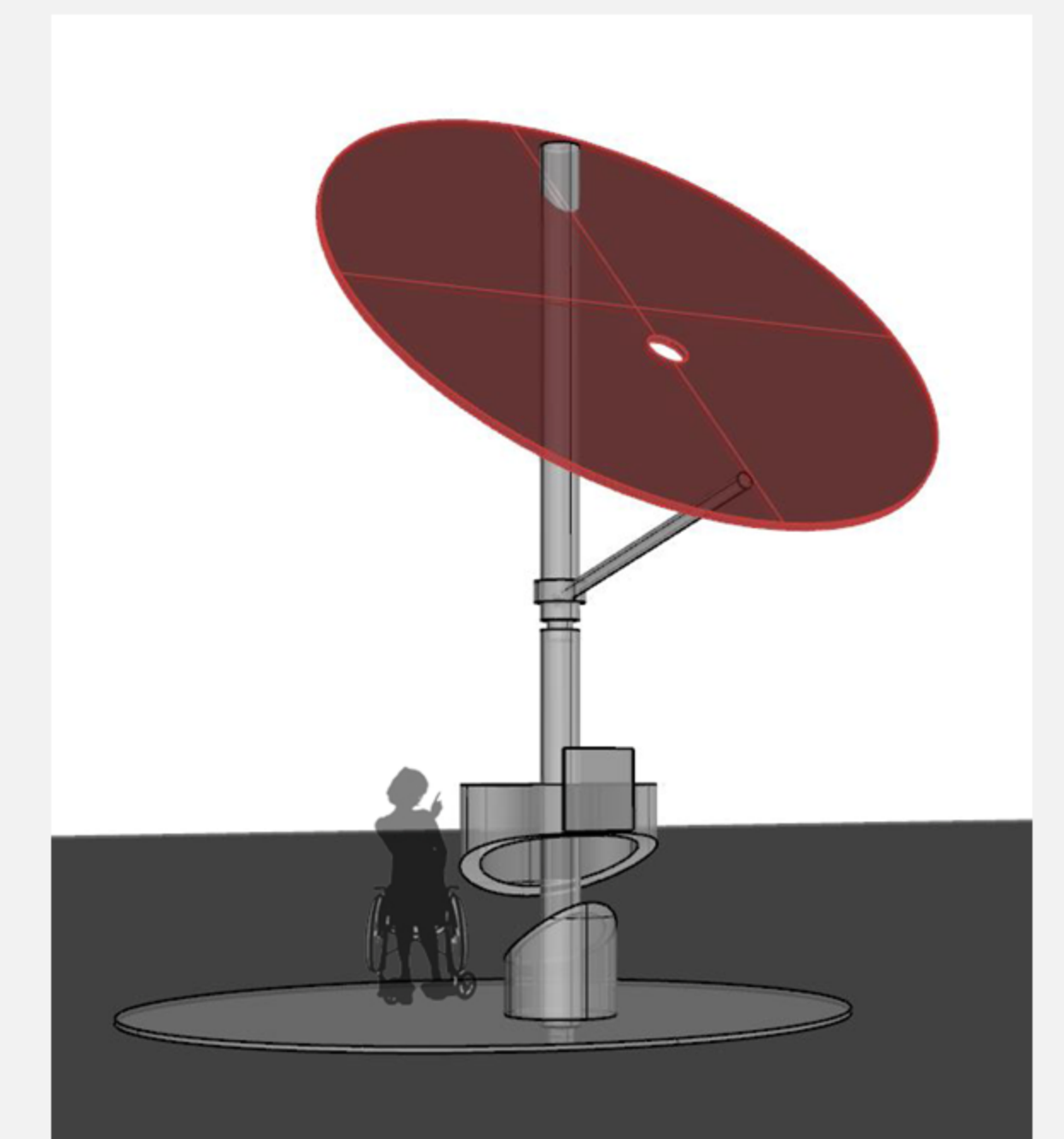


Top: 3D shade analysis of shade cover at Bright Elementary throughout the day with the addition of the proposed shade structures. These models were compared to shade analysis of the site prior to the addition of the shade structures, in order to demonstrate the impact of the structures on shade cover in the playground. There is a significant increase in shade cover when the structures are added. Bottom: Detailed 2D and 3D site models of proposed shade structures, with blacktop designs and building footprints for context.



Next Steps and In Progress

- Phase 2 has initiated discussions with the LAUSD (Los Angeles Unified School District) about a timeline for implementation in schools which includes design review and approval
- Envisioning building a full scale sun shade prototype to speed up the LAUSD approval process, to expedite the construction process to minimize skin cancer risk for students
- Working with the USC Stevens Institute to consider patent procedures related to the design of the bases of the shade structures
- Present playground design alternatives to local elementary schools to gain stakeholder input



Top: 3D rendering of shade structures in hypothetical context. Middle: 3D rendering of braille clock shade structure. Solar-heated tubes tell time base on touch. Bottom: site plan of proposed sun shade network layout at Bright Elementary School in LA.

Acknowledgements

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