

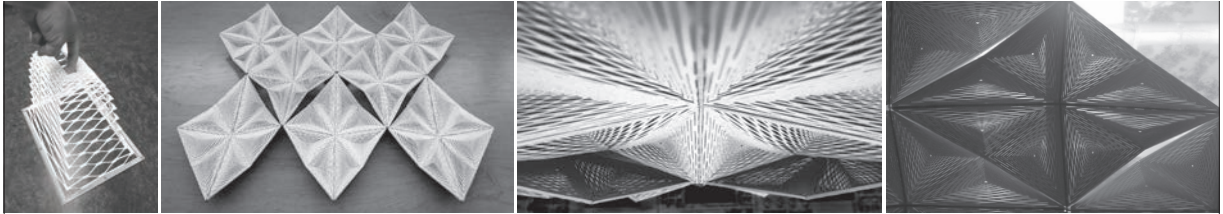
# Expanded Atmosphere: A High-Performance, Low-Waste Aluminum Envelope

**Jeff Ponitz**

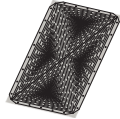
California Polytechnic State University

This proposal for a performative aluminum building envelope transforms weak sheet material into a rigid yet ephemeral spatial skin. This is achieved using a process inspired by expanded metal manufacturing; a sequence of operations employs strategic geometry and force to permanently deform thin-gauge aluminum into a permeable enclosure for light, heat, and wind. The only material removed during this process is due to the kerf of the cutting tool. Because the implied surface area of the sheet actually increases during expansion, the system results in well over 100% material efficiency while creating enough rigidity to greatly reduce secondary structural systems.

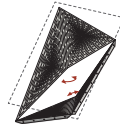
Expanded Atmosphere introduces opportunities for formal and performative variation at each stage of the design/fabrication/installation sequence. This is alternately driven by computational and analog processes: mass-customization may occur through variable cut patterns, or by applying variable force when expanding multiple identical panels, or by changing the orientation of a given panel. A combination of digital and analog parametric systems are used to create a skin that is both performative and experiential.



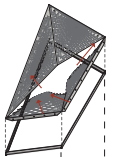
paper studies



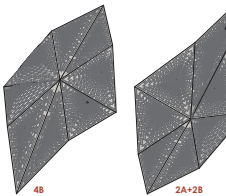
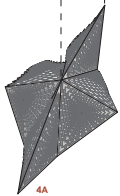
**1) CUT** (Waterjet or Metal Stamp)  
Six pattern informs the profile and openness of expanded volume. Nearly 100% of aluminum sheet is used.



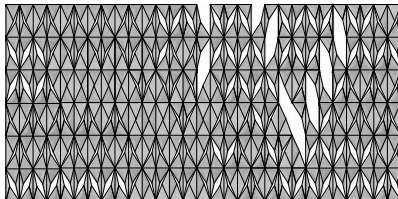
**2) FOLD** (CNC Brake)  
Fold angle controls the macro-scale form and depth of the system. This may be consistent within a given facade, but would vary based on climate.



**3) EXPAND** (Pneumatic Winch)  
Folded flanges are used to secure the panel to a light steel frame. Winch force modulates the volume of expansion, creating panels that range from subtle to expressive.



2A+2B



## Expanded Atmosphere

A High-Performance, Low-Waste Aluminum Envelope

Jeff Panitz, Cal Poly San Luis Obispo

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**4) SUB-TESSellate** (On-Site)  
Sheet expansion frames remain on the panels as the only secondary structural system. Panels are combined into sub-assemblies; different panel combinations yield varying degrees of concavity and convexity corresponding to performative and experiential qualities.

**5) SUPER-TESSellate**  
Groupings of assemblies respond to climate, program, context, and aesthetic desire. Pairings of adjacent assemblies create moments of self-shading, light-gathering, veiling, revealing, interior, and exterior.

