TEX-FAB, a regional organization that promotes the integration of advanced computing and fabrication in education and the AEC industry, organizes an annual competition around a conceptual theme that ultimately awards a building commission to the winner. This year, the SKIN competition sought innovative solutions to facade systems through the toolset of parametric design and digital fabrication. The contest coupled the best project with the material support and donated fabrication expertise of Zahner Metals and Rigidized Metals with the efforts led by TEX-FAB to develop the project as a substantial prototypical building envelope.

The competition proposed that the building envelope represents the most complex and fundamentally linguistic element of architecture today. Its formal development and performative capacity—what may be called the activated envelope—is foundational to its purpose and presents a dialogue the building has with itself and that of its context. We can understand this relationship in many ways, but ultimately it is one that mimics our own skin. Fundamental to this is an explicit or implicit adaptability found in its performance—how it functions and meets the needs of the building. The transformation from a static, heavy and obfuscating series of load bearing walls prior...
to modernism, to its current role of a communicative envelope, dynamical and exploratory, set the stage for this competition and, in what we believe, is the most important area of research in architecture. It is within this framework that the international digital fabrication competition SKIN asked designers and researchers to speculate on the role of the building envelope by exploring new methods to enable the performative and aesthetic qualities of a façade.

Project 3xLP, the winning submission to the TEX-FAB SKIN competition, is a continuation of design research on the structural properties of textured stainless steel sheeting, which typically is used for skinning and other non-structural purposes. The team conducted performative analyses of the material, and verified the results through full-scale prototyping. Structural studies relied on scale shifts that began with molecular composition and culminated with large-scale geometric systems. The work provides evidence of the adaptability, rigidity, and high performance of thin-gauge, textured metals; it establishes the groundwork for new structurally-based design possibilities using sheet steel. The current prototype is seen as a continuation of project 2xmT, which looked at the relationship between structure and appearance through a performative analysis of textured stainless steel. While project 2xmT was a proof-of-concept, our latest large-scale prototype, project 3xLP, builds in more direct visual porosity, a greater degree of geometric variation, and preliminary details toward incorporating glazing and enclosure. The addition of glazing, however, would potentially close the system, requiring a strategy for venting strong winds vertically and in some cases, horizontally through the structure. In both project 2xmT and 3xLP, subtle and strategic transitions between various gauges (thickness) of the sheet steel are organized so that the system may be able to accommodate a wide range of scales depending on the
relationship to the building mass. As the structure gets taller and/or wider, the amount of material required stays minimal due to the exponential increase in overall strength and rigidity found in material thicknesses amounting to 0.012” between gauges.

This ongoing research collaboration between the authors and the Rigidized Metals Corporation was coupled with material and fabrication support from Zahner Metals through the competition development process. The team continued to examine the performative potential of deep-textured metals, namely stainless steel, by reinforcing the relationship between structure and appearance. This relationship is made direct through the rigidizing process and the folded origami system developed by the designers and their collaborators. This third-generation prototype has ramped up our research practice and thus our ability to investigate light-weight and self-supporting building skins built entirely from ultrathin sheet steel without the use of structural frameworks.

The project was delivered as a kit-of-parts from Zahner’s Kansas City facility and assembled by the design team in the gallery at the University of Texas at Austin for the TEX-FAB 5 event. In September 2014, the exhibition will travel to the University of Houston, College of Architecture to be installed in the atrium of the building and continue on to UT Arlington later in the fall of 2014.
**Preliminary Glazing Options (scheme 1 of 3)**

Glazing Unit

- Material: PETG 1/8"
- Pattern: 6WL
- Finish: Glossy / Sandblasted
- Blank area: 0.943 sq ft
- Panel area: 0.556 sq ft

Panels:
- Material: 304 Stainless Steel
- Pattern: 3ND front, 4LB back
- Thickness: 20 Gauge
- Panel Type: B, D hybrid, G edit
- Unroll Dimensions: Upper and Lower Bounds: 14.84" x 6.86" - 26.06" x 18.05"

**Connection Type B**

**Connection Type C**

Christoph Romano is a Research Assistant Professor at the University at Buffalo, State University of New York and a researcher within the Material Culture Research Group. His research practice and teaching explores the relationship between design, construction and the contemporary culture of building by leveraging regional manufacturing, digital fabrication technology, and material processes to test the latent potential of materials at full-scale (1:1). Recent research and prototyping has focused on the use of folded metal to produce large-scale, self-structuring surfaces that examine the relationship between structure, appearance, and performance.

Nicholas Bruscia is a Clinical Assistant Professor in the Department of Architecture at the University at Buffalo, where he is also a researcher in the Center for Architecture and Situated Technologies (CAST). His work and research focuses on the computational design-to-fabrication process and the application of performative material parameters at various scales. Recent projects have explored augmenting manual making techniques with physical computing enabling a material response to the chemical characteristics of cast materials, and the digital workflows associated with the fabrication of large-scale sheet metal assemblies.

**IMAGE CREDITS**

Bruscia, Nicholas and Romano, Christopher (2014) project 3xLP. Buffalo, NY. Completed.