Intersections Between the Academy and Practice

COLLABORATION: TECHNOLOGY, RESEARCH, PRACTICE

PAPERS FROM THE 2017 AIA/ACSA INTERSECTIONS SYMPOSIUM

SYMPOSIUM CO-CHAIRS:
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ABOUT THE SYMPOSIUM

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The American Institute of Architects (AIA) and the Association of Collegiate Schools of Architecture (ACSA) are pleased to partner on this 3rd annual symposium, dedicated to the integration of education, research and practice of technologies at the 2017 AIA National Conference in Orlando. This symposium focuses on COLLABORATION. New technology and ways of working are helping to break down barriers between the different players in the construction process. Industry leaders already do a great deal to encourage collaboration among their teams, providing vision, collaboration-conducive work environments, collaboration technology, and by removing obstacles. Collaboration also happens outside the traditional AEC industry, between architects and cognitive scientists, between architects and community organizers, etc.

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By Proxy:
Design Problems and Collaborative Inquiry

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Running parallel with the increase in partnered research initiatives in the fields of technology, medicine, and engineering, collaborations between private sector commercial or research organizations and academia are on the rise in architecture. There has been a recognition particularly in the last ten years of the value of incorporating design thinking into problem solving across scales and industries. From focused material investigations to long-term strategic planning, those outside of academia are looking to architects and spatial designers to leverage their approaches and processes to address real-world issues faced by communities, organizations, and businesses. Universities use these partnerships to fund research, offset capital expenses, and expand their influence. But these partnered research initiatives do not come without costs. The responsibility for companies and organizations is to see a return on their investment. Consequently, for universities, the academic freedom and maintaining of a clear pedagogy can be met with pushback. In addition, project goals and values do not always align, and expectations between partners can vary.

This paper examines a number of strategies that address the inherent tension in partnered research-design projects by reconfiguring stated problems into proxy inquiries. Proxies, as stand-ins for another - a person, an organization, an action or a process - allow for existing problems to be reconstructed into pedagogical ones - they allow for scales to be shifted and they generate holistic outcomes in the truncated duration of a semester, rather than offer piecemeal results. Proxies offer a methodology for accepting the constraints of partnered research as a way of expanding design inquiry, while remaining grounded in problems fundamental to architecture and design. More than just a substitute, proxies transmit agency.

Outlined in the paper are findings from the Proxy Series, which began in 2007 as a set of research-based academic inquiries focused on the exploration of emerging technologies and their reshaping of 1) design theory, 2) design process, and 3) design production. Conducted through studios, seminars, and independent research, each inquiry investigated a discrete set of issues spanning these three areas. While each is constructed to address a specific design problem within a pedagogical framework, the imposition of extra-academic considerations allowed for the pursuit of production techniques, materials research, and software experimentation, while working with partners and collaborators outside of the design discipline. As such, proxies offered an alternative formulation of the design life-cycle - one that emerged and evolved beyond conventional forms of practice or current problem-solving approaches, while mirroring the aspirations of the partnered research model itself.

THE REAL & THE SIMULATED

Design education takes many approaches toward the design of the *design problem*. For architectural education, the vast majority of these didactic problems work in the mode of approximation, in which the design problem is constructed as simplified versions of *actual* architectural projects. This happens either by truncating the scope of the project or by reducing the number of variables one may expect to encounter in the process of designing a building or structure. In both cases, the set of information considered is limited and their role in the design process constrained. This effort recognizes the need to make the studio problem manageable for students within the span of a single semester, and calibrated to match the knowledge and experience level of the students involved.

However, the studio problem is not just a simplified architectural project, but one which is supplemented as well. By augmenting projects with specific practical or theoretical considerations, these projects shift their focus to align with a particular pedagogical stance. This supplemental content is often directed toward expanding a

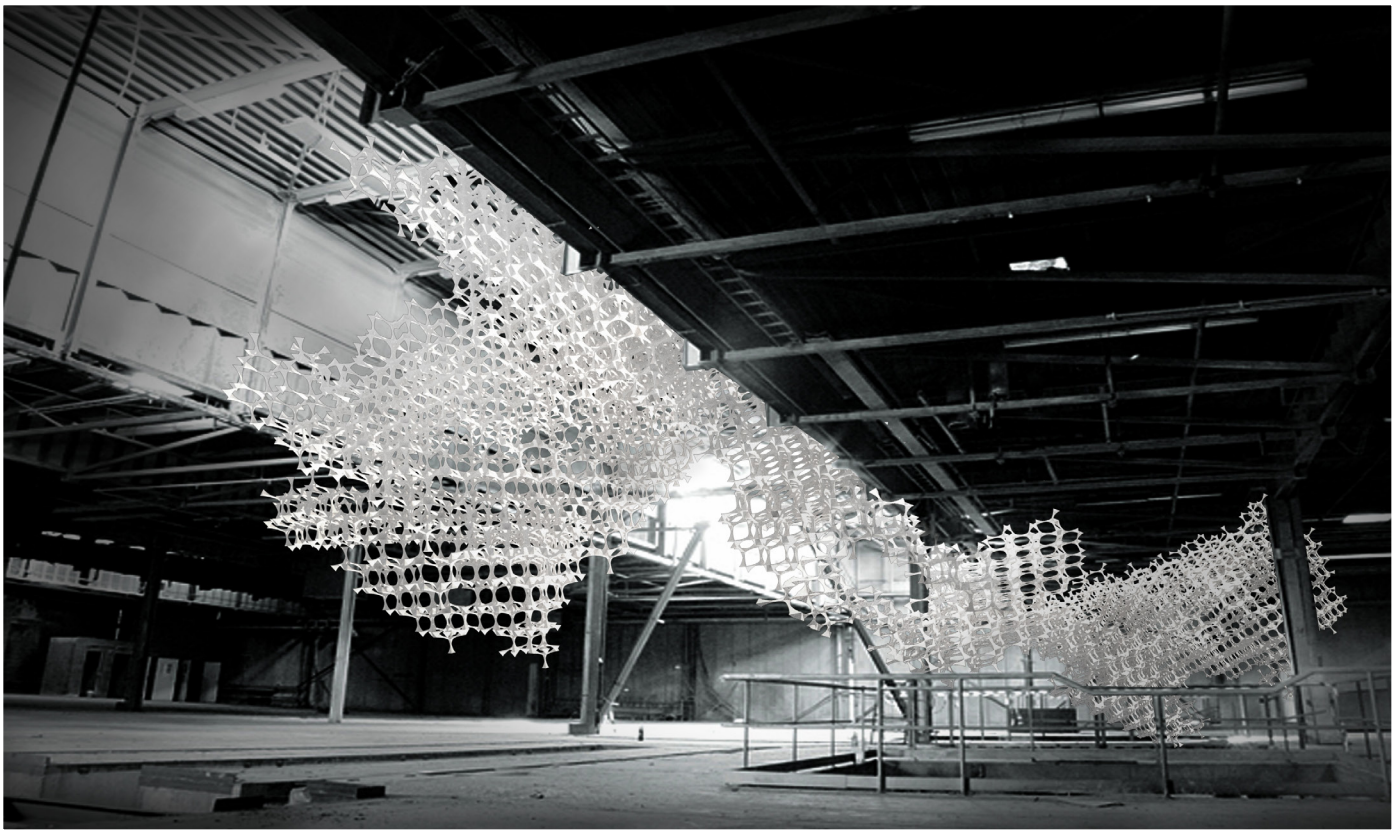

Figure 01: Proxy No. 06 (Zersetzung Wolke) | Installation Proposal

student's capacity to address the design problem with criticality. In effect, supplementation adds another domain of information onto the simplified problem - one that simulates many of the theoretical propositions that operate within architecture as a discipline. These are often implemented in an explicit and programmed manner, skewing the embedded nature of these issues in the practice of architectural design.

The simplified and supplemented problematization approach combines two domains of information, *the real* and *the simulated*. This combination is effective in that it both grounds the design problem in a shared and familiar context, while introducing complications or considerations that encourage students to engage the design process in a more expansive, projective manner. This approach ties theory with practice to develop critical design solutions that move beyond the everyday.

There is also an inherent flexibility in this approach, by foregrounding certain considerations while allowing others to recede. Within this general outline for the architectural design problem, a wide variety of pedagogical stances can be taken that retain the advantages mentioned above. And, while this approach may work well in the academy, and particularly in design studios, the design problem is being increasingly shaped by those who are not fully embedded in academia. This is a product of a number of trends, the most salient being the changing makeup of faculty and a move toward academic and commercial partnerships.

The makeup of university faculty has steadily moved away from full-time academics.[1] This is especially the case in the design disciplines, where research funding is comparatively low and curricula often incorporate professional development courses. This translates to architecture schools relying on an average of 66% adjunct faculty.[2] These instructors are often practitioners, operating in adjacent fields or as instructors at multiple institutions. Contingent faculty can bring a more transgressive view of education which exploits the gaps between practice and education - being situated in both domains generates a perspective that can offer alternative pedagogical approaches. However, the unpredictability in course assignments, schedules, and resources make developing pedagogical approaches that take advantage of these gaps difficult to achieve consistency.

Commercial, governmental, and institutional partnerships, a staple in many of the STEM and medical disciplines, have expanded within the architecture and design disciplines. This trend has fostered collaborations with non-academic entities on partnered design problems. A survey of partnered research projects at the Rhode Island School of Design for the 2015/16 academic year included collaborations with Lego, Nike, NASA, Samsung, and Textron Aviation, among others.

Partnered studios and design projects challenge the effectiveness of a simplified and supplemented approach to crafting the design problem. The difficulty in establishing shared goals and simultaneously creating a learning environment within this project context, places pressure on the formation of design problems that retain academic integrity. They

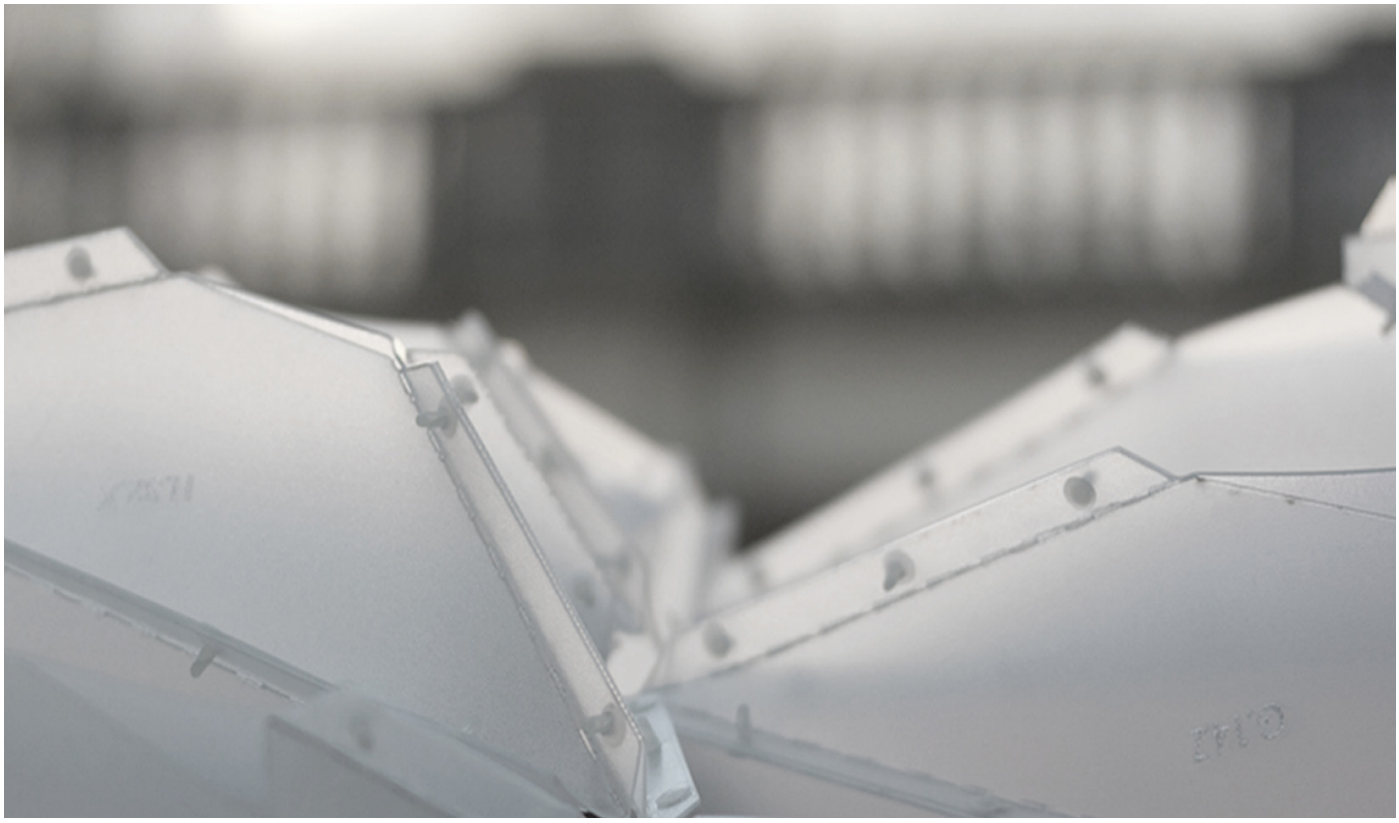

Figure 02: Proxy No. 13 (4111 Montrose) | University of Texas, Austin + Beta-field + Montrose Galleries | Course: Compu-tectonics

also complicate the way in which information is valued, mobilized, and utilized between domains.

PROXIES

A traditional progression of studio design problems may also be understood through a gradient from the didactic towards the real-world and open-ended. In other words, students earlier on in their academic careers are more likely to be given highly structured and abstract design problems that operate within a limited set of conditions in order to build fundamental techniques and skills, while also reinforcing design principles - the arguments for what is or is not fundamental and what should or should not be design principles notwithstanding. In real-world design problems, there is an effort, or at the very least, a perception that these design problems address the major problems one may face in professional design practice. This includes many of the cultural, regulatory, and physical considerations that are taken into account when designing projects are intended to be built.

This progression is challenged through partnered projects and non-traditional faculty make-up, where the mixture of agendas and actors involved creates a folded, rather than blended collection of information sets. The correlation between the real and the simulated is inconsistent and at times ill-fitting. While these descriptions may be generalistic and reductive, they match the insights of many of my colleagues and my own experiences as an educator. And it is from these insights and experiences that the Proxy Series of design problems originated.

Initiated in 2007, the Proxy Series is a set of partnered explorations that occupy territories of both academia and practice. Proxies are stand-ins for another - a person, an organization, an action, or a process. Proxies are not simulations, they do not require simplification or supplementations. They are holistic projects defined by the constraints shared by both pedagogical and practical concerns. More than just a substitute, proxies transmit agency. The goal of the Proxy projects is to set forth a series-based exploration of spatial artifacts that complete the design-to-fabrication life-cycle.3 They simultaneously examine the challenges and considerations that arise as one addresses deeply pedagogical and experiential design problems with those that are material and physical.

The first project, Proxy No. 01 Hooke's Continuous Structure started as a way of learning how to create an autodidactic design problem. That design problem quickly lead to an expanded set of projects, Proxies No.02 - 06, which positioned this initial question into a collaborative investigation through full-scale implementation (fig. 01).

In each case, a few underlying questions were quickly established that were key to all projects in the series. Each consideration is built from a more fundamental question of how collaborative/partnered projects span the divide from initial research to full-scale implementation. One of the issues in spanning that breadth of inquiry lies in how information is incorporated, utilized, and manifested spatially. Though that question could be understood as encompassing multiple aspects of

Figure 03: Proxy No. 08 (Serpentibus Modularis) | University of Virginia & Beta-field | Course: Computational & Material Practices

design, the Proxy Series instrumentalized this question within three information operations - workflows, continuities, and residues - which spanned both academia and professional practice and which could be addressed in multiple avenues of inquiry, whether collaborative or not.

Workflows

The first consideration built into the Proxy Series is that of information transfer. Transference in design is the active directing of information from one medium to another. A more common way of understanding this is through the term workflow. Workflows are already embedded into all forms of design practice, though they are not always explicit considerations within the design process. The term today refers more to digital design methodologies and practices, but when thought of more broadly as transference the idea permeates through multiple cultural, disciplinary, and technical contexts.

In transference, an understanding of how and what information is manipulated is crucial. Workflows, like all other constructed systems can be crafted to perform in certain ways. Workflows are chains of information transfer, which can be structured in either linear, networked, or recursive ways; and often times, in combinations of structures. Workflow structures are procedural in nature as such they too are embedded in any design problem. These procedural concerns have implications on all aspects of the design and manufacturing process. They impact where and how a designer might intervene within that process. Workflow, in many ways, is the superstructure for any design and manufacturing process. While disparate agendas across project partners may be practically or philosophically irreconcilable, procedures are not. The goal of any protocol is in fact to navigate the various systems in an assemblage. Protocols are only effective when they create a way for bridging systems - protocols that cannot be shared are not protocols by definition.

For the Proxy Series, workflow does not end at representations or prototypes, but at full-scale implementations. The Proxy Series is concerned with the crafting of procedures that take on the transfer of information across systems and materials as integral to any design problem (fig. 02). This approach creates an instructional environment, where creating reciprocity between a variety of platforms of exploration, development, and production are essential. Implicit in the concept of transference in technology is that of the "technical ensemble".4 The technical ensemble, as defined by Leroi-Gourhan and contextualized in digital media by Felix Guattari, encompasses the systems through which technical objects are defined; and, it is within this concept of design production as the technological, that the Proxy Series operates.

Proxy No. 08 was the first in a series that took this approach with students (fig. 03). This project was conducted with students from the University of Virginia through a research partnership with Beta-field. The project began by assessing the overlaps in how each entity had developed practices for transference, which were found to be common for material production in the AEC industry and architectural education.

These overlaps fell into three categories. The first was transference through technique. These, for example, included a limited set of manufacturing techniques that corresponded with the university's available equipment and the set of material compositions and typologies which could be used with those techniques. The second was transference through platform. This examined what technologies could be used as a host platform for the project. Additionally, we examined what support and skill base the students and practitioners involved shared. In this case, we settled on the use of Rhinoceros as our modeling platform, incorporating plug-ins and scripted components to generate, analyze and test proposals; and rationalize, organize, and prepare models for manufacture. The third was transference through material. This for example included the physical limitations of the facilities and its participants, and how they related to the scale of the project, the material

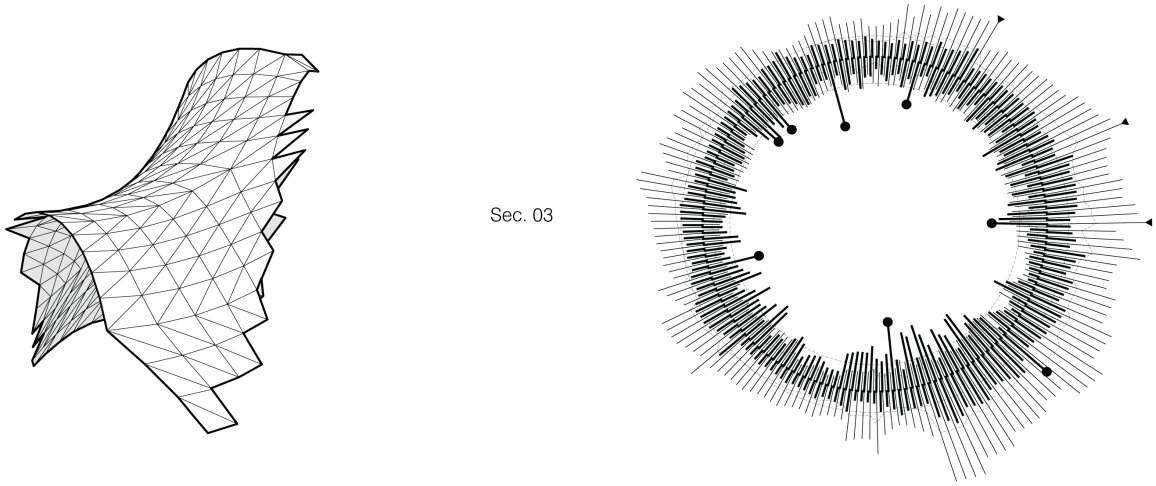

Figure 04: Proxy No. 10 (12% Pavilion) | University of Virginia + Beta-field + AIA National Headquarters | Research Partnership

characteristics, and the assembly process - all within the question of information transfer.

All three considerations shaped the design of the project work-flow, and they were not all a priori conditions. Rather, we started by slowly building the design process, incorporating new constraints as questions of what we should and could do, emerged. This limited bottom-up approach proved to be very useful in instructing students how they might construct their own design process. It also allowed room for each student's strengths to be revealed and leveraged.

CONTINUITIES

The academic design problem, in particular those developed for studio environments, translate information through representation. Translation is the substitution of one set of media specific data with another set, in an effort to traverse media. The advantages of a primarily representational model of design inquiry are clear. *Scale:* representational systems allow for changes in the size and complexity of production, where smaller, reductive artifacts can stand-in for full-scale built environments. *Conventions:* representational conventions off-load the responsibility of back-end translation onto the construction and manufacturing industry. And, *Fragmentation*: representations by definition that generate partial descriptions of spatial objects. A clearer, fuller understanding of a spatial object is achieved through an accumulation of representations. Representations offer a logic for division. For practiced designers, the ability to traverse the discontinuity between representations and actual spaces becomes second nature, creating a tight correlation between these two mediums

However, for students who have not had enough experience with conventional modes of design representation, the immediacy that educators and practitioners enjoy is replaced by uncertainty. The Proxy Series employs a non-representational or "information continuity" approach to the design problem.[5] Here, information translation becomes incorporated into the process of information transference. This creates variations on the representation to manufacturing relationship, where representation is used to access information, but not necessarily to translate it. Another way of thinking of this is that the role of representation to convey information on a technical level is abolished. The "file-to-fabrication" model of translation is expanded to cover all aspects of the design process life-cycle.[6] This is increasingly the case as regulatory and legislative limitations on information-rich documentation, such as Building Information Modeling (BIM) are beginning to catch-up with decades old technological advances. The same can be said for complex geometries, responsive materials, computer-aided manufacturing and assembly, and the preformative challenges presented by sustainability

Design-build is one avenue that challenges the predominance of representation; however, financial constraints and academic schedules make widespread adoption rare. They are difficult to complete in an academic semester and they must be funded at relatively high levels for design schools. The Proxy Series circumvents many of these considerations. By limiting the size, functions, and locations of these projects, where many of the regulatory and preformative considerations building must adhere to are irrelevant. As these considerations are allowed to fall away, others such as structure, material effects, formal and spatial composition, and other environmental performances can be retained and even highlighted; and the role of representation is allowed to take on new significance. This is the case in Proxy No. 10, a partnered project with the American Institute of Architects, where representations were used to communicate much of the data typically relegated to Building Information Modeling files (fig. 04).

RESIDUES:

Bruno Latour's assertion that all translations of information require transformation is one that is prophetic for the architecture and design

disciplines.[7] Advancements in digital production do not change this fact, they only bring its existence to the forefront of inquiry. Working in a representational mode affords an understanding of one's own work inasmuch the ways one understands how representations are translated and transformed into physical/material space. The discrepancies inherent in any representational system are mitigated by the conventions of practice. For architecture that means regulatory, manufacturing, construction, and engineering industries. This forms a threshold between architectural representation and architectural production, which often defines the boundaries for the academic design problem. It also establishes the terms under which solutions to that problem are evaluated - its representational coherence, legibility, and correlation to a potential built environment.

But, as Lev Manovich describes, "information processes often leaves material residues."[8] Those discrepancies or opportunities to design transformation are left out of the design problem, but their residues as they manifest in the built environment is not. This is particularly clear when working with projects partners outside of academia. When building full-scale, the discrepancies between representation and spatial manifestation are brought into the design problem. This opens new ways to explore information translation and its effect on material formation.

The Proxy Series, along with other design-to-manufacture academic research, uses transformations in information through media as a core design issue in the post-digital age. Exploring material computations, which combine embedded and applied computation through full-scale constructions is one such approach. Proxy No. 16 is an example where the digital approximation of a design solution only describes half of the information required to complete the project (fig. 05). Here, formal geometries are produced as continuous curvatures formed through the physical properties of the materials in use, under loads, and at scale.

Material computations - and other like-minded investigations - are only possible through projects that engage in full-scale design problems. They, in and of themselves, can reveal alternative organizations for inquiry such as the investigation of multiple domains of information simultaneously or the reversal of the representation to construction relationship. In each case, key insights come from confronting the entire process of information translation through all phases and scales of the project's design life-cycle.

CONCLUSIONS:

As with the increase in partnered research initiatives in the fields of technology, medicine, and engineering, collaborations between private sector commercial or research organizations and academia are on the rise in architecture as well as other design disciplines. There has been a recognition, particularly in the last ten years,, of the value of incorporating design thinking into problem solving across scales. From focused material investigations to long-term strategic planning, those outside of academia are looking to architects and spatial designers to leverage their approaches and processes to address real-world issues faced by communities, organizations, and businesses alike.

Universities use these partnerships to fund research, offset capital expenses and expand their influence. But these partnered research initiatives do not come without costs. The responsibility for companies and organizations is to see a return on their investment. For universities, academic freedom and maintaining a clear pedagogy can be met with pushback. Project goals and values do not always align, and expectations between partners can vary.

As such, their incorporation into any curricula is meet with questions. What advantages do partnered projects lead by contingent faculty produce? How does design education incorporate more progressive pedagogical agendas? How do we produce solutions that have a more immediate and meaningful impact on the built environment?

The Proxy Series was designed to operate within, parallel to, and outside of academia, but retain its core experimental and instructional value. As both a framework for exploration and collaboration, the Proxy Series is meant to reconsider the design problem in a way that recognizes changes in an academic environment. While the Proxy Series does not claim to answer these questions, those questions have shaped its development. More importantly those questions are becoming crucial to design education, both in terms of outside pressures and disciplinary relevance. They are questions that are influencing not only this series of collaborative projects, but ones throughout a diverse set of institutions and organizations globally.

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Figure 05: Proxy No. 16 (Surface Assemblies) | Rhode Island School of Design + Beta-field | Partnered Research