

with the

Praiseworthy Competition → ^ ← Past:

Design-through-Production: from Analysis to Formulation

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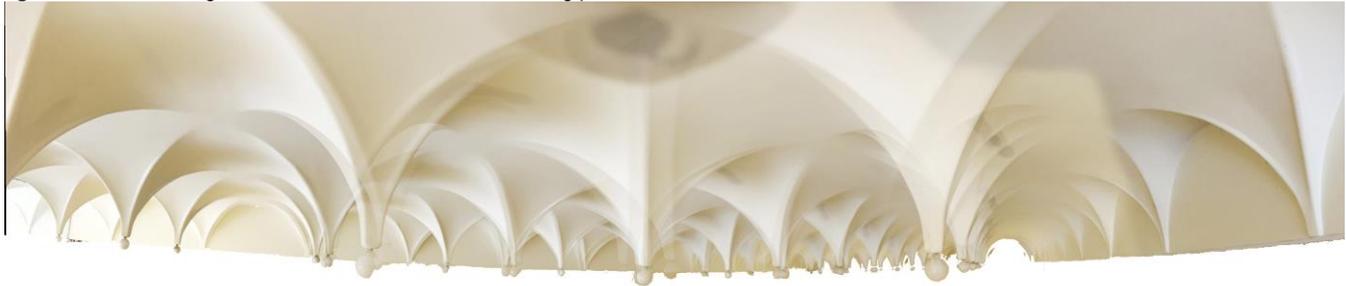
**Note team collaborators/contributors ant end.*

Abstract

Parameters within a highly collaborative design-through-production process range from a very broad set of influences. To address the conundrum of selecting operational logics, we begin searching for form genesis with an examination and reproduction of the past in order to both restore and formulate a contemporary response to an existing ceiling within an iconic space, designed in 1964 by Alexander Girard in the atmosphere of significant architectural design influences radiating from Columbus, Indiana. Methods learned from analysis of original production are used, and synthesized as guiding principles in the design-through-production process of contemporary work.

Keywords: Design-through-production; Digital fabrication, Columbus, Indiana, Design principles

figure 1: 432 Washington Street, Columbus, Indiana, Ceiling pattern of Alexander Girard.



Localizing → Columbus, Indiana

Columbus, Indiana is *the* small Midwestern city, where an investment in architecture and design has made a major difference—emerging designers who became significant architects over the course of their careers innovated a new expression for architecture in Columbus, while elevating public awareness towards the need for good design. This city remains positioned at the crossroads of advanced manufacturing and Modern architectural heritage, and is well positioned to continue its influence as a model for good design in partnership with the community well into the future.

← Radiating Architecture →

The atmosphere of architecture is dispersing; the layers of the discipline have been affected by the relations of computational technology, and fundamental changes in architecture from design-through-production are inserting new parameters and methods into the discourse about

crafting a useful and dynamic physical future for building in a multidisciplinary world. The order of information technology has influenced the order and logistics of our constructed world, much as the industrial model in the postwar era solidly situated mechanized arrangements across the globe. The question of formulating a new *Zeitgeist* for the discipline of architecture looms large as a response to the atmospheric pressures of adapting new technological methods. Resisting the desires to place an “umbrella over a ‘new’ design movement or style,” Mark Burry exercises caution against framing for the “current generation,” an “action plan... to deducting some kind of ‘Quo Vadis,’ or *where are we now*, rather suggesting that “innovative scripting designers do not want to be locked into a single defining culture.” (Burry, 2011, pp. 10, 11). Nonetheless, he asserts that “something is going on, and we need to get behind it.” (Burry, 2011) Similarly, in relation to temporal parameters becoming more prevalent in architecture, Branko Kolarevic and Vera Perlac advise us to exercise prudence, as well in regards to *Architecture of Change*: “As we probe and embed adaptability, interactivity, and responsiveness into the buildings and spaces, we must

not unconditionally and blindly chase the latest technological advancements.” (Kolarevic, Perlac, 2015). Indeed, something is going on, and in order to situate the real potential for a promising future, we must enable it, not solely from an architecture and design point of view, but from a collaborative, global, business, organizational, operational, and strategy point of view that admits that good design matters. If encouraged as such, investment in good and relevant design will effectively refashion our world, as it has done in Columbus, Indiana. Partnering design with innovative technology, in service to the current needs of real people, is the great new formula for this magnificent new age. Or is that an old idea?

Pablo Herrera points out that the significant conundrum exists that “users are unable to define what constitutes a meaningful choice before they start, in many cases, with an ill-defined problem.” (Herrera, 2013). Nonetheless, there are leaders who are finding true potentials enabling rigorous design solutions using new technological means. New technology is changing both the discipline of architecture and the potentials of the construction site. Gramazio and Kohler have framed the robotic discourse in architecture, globally, with their pioneering work with robotic fabrication. They maintain that “building with the robot takes architecture far beyond the creation of static forms to the design of formative material processes. Data and material, programming and construction are thereby interwoven so that the algorithmic logic of the computer is directly connected with the material reality of built architecture. It becomes possible, then, to intervene directly in the materialization process and to *formulate it according to architectural design criteria*. With this change in perspective we open up entirely new ways of *reflecting on the physis* of architecture, its design and materialization.” (Gramazio Kohler, 2015, p 15) The operative word here is “physis,” or inherent nature. Herein, the implication is that architecture is on a trajectory of evolution, constantly informed by the techniques we deploy to realize and inform form. The critical hinge lies in the way we formulate the “materialization process” according to architectural design criteria, for this implies a collective understanding of architectural design criteria. While it is not certain, as Herrera points out, if there are collectively understood principles governing decision making during the design-through-production feedback loop, it is clear that, irrespective of algorithms and techniques, humans are making the choice to privilege particular criteria from which to inform form. “Thus, it is critical to look beyond the operative conditions and ask what the ethical responsibilities for architecture are in relation to natural systems, human behavior, social conditions, etc.” (Klinger, 2008, p.28). Similarly put by Elieel Saarinen: “just as any living organism can be healthy only when that organism is a product of nature’s art in accordance with the basic principles of nature’s architecture, exactly for the same reason town or city can be healthy—physically, spiritually, and culturally—only when it is developed into a product of [hu]man’s art in accordance with the basic principles of [hu]man’s architecture.” (Saarinen, 1943). Principles of architecture are still intact. These have not changed, much, and perhaps are more aligned to our human frame of reference, and not from deploying our technological devices for their own sake. Urban theorist, Lewis Mumford cautioned us that “progress, in an

organic sense, should be cumulative, and though a certain amount of rubbish-clearing is always necessary we lose a part of the gain offered by a new invention if we automatically discard all the still valuable inventions that preceded it.” (Mumford, 1964). While it has been argued, that algorithmically derived processes impart their own order and logic on our realized work, the responsibility is still that of the designer to plumb these methods for innovative solutions that find a depth of architectural expression engrained with the rich lineage of architectural principle.

Interconnections with global knowledge must reveal linkages that translate into local benefit, in reverence to the durable values of architectural principles, and adhering to the enduring ethos that connects our social longevity. The relations between technological advancements in both industry and design must endorse cultural progression. “whereas the ‘local’ might be all that was known in not so distant times, today we know the local of any situation better because we have many views of the world in which to locate it. And now that we understand the local in terms of the global, with the gift of the internet like minds can gravitate towards each other with sufficient critical mass to eschew automatic adherence to unnecessary global movements.” (Burry, 2011, p. 19).

Praiseworthy with the Competition → ^ ← Past:

This intensive design-through-production studio and seminar project will be realized with enlightened curators and in local conversations with industry partners—leading plastics and composites fabricators, as well as a local tube laser cutting manufacturers. Following the lines that “the challenge for those who exercise personal fabrication is not to produce more options, but to make choosing relevant...” (Herrera, 2013), the aim of this project is to develop relevancy by outlining principles to guide decision-making—looking backwards to aim forward, not just for this case, but for other projects to follow. Further, and as is the case with many design-through-production projects today, this project aims to add another case to the collective.

← Alexander Girard’s Lesser- Known Architectural Gem

432 Washington Street represents a forgotten story in the architectural legacy of the Columbus, Indiana narrative. This mid-sized mid-western city has long been considered an international center for industry and with the influence of the Architecture Program, developed by the Cummins Foundation under the initial leadership of J. Irwin Miller, Columbus is recognized for its rich cultural and physical heritage rooted in good design. Washington Street, like a typical “mainstreet USA,” is the primary commercial artery of downtown Columbus, and has endured as a quiet but sound component of this heritage, remaining an important place of business and entertainment into the present day. The resistance to the urban sprawl, which diminished the downtowns of so many mid-sized cities, in favor of the 19th century Victorian buildings along Washington Street, is partially due to the willful presence of J. Irwin Miller’s location

of the “temporary” Cummins headquarters along Washington Street (Lange, 2016, p. 233). Further contribution to the protection of downtown Columbus was due to the impact of the design thinking of Alexander Girard, which demonstrated an innovative, design-focused way to “clean up” the façades in the storefront renovation project in the 1960s. “He treated the whole town as a composition to be organized (Lange, 2016, p. 281).” Girard’s vision was to create a prototype for the un-cluttered and pedestrian-friendly American downtown, where both old and new co-exist harmoniously with careful consideration of the greater community.

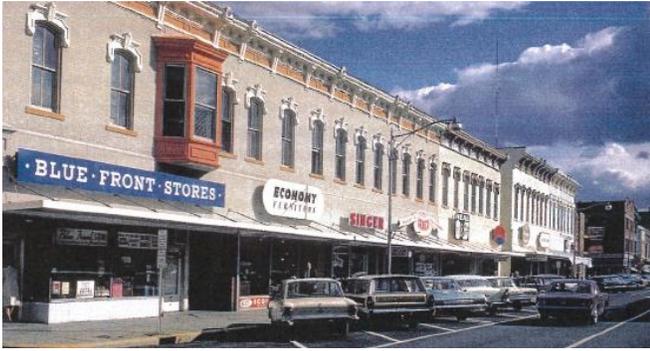


Figure 2: Washington Street, Columbus, Indiana. Alexander Girard redesign circa 1960s.

Girard created a “model block” in which many of the store fronts were painted in a limited range of dynamic colors and other storefront improvements such as signage rules and a common awing were developed to unify each block.

In advance of the forthcoming major international exhibition in Germany at the Vitra Design Museum entitled: Alexander Girard. A Designer’s Universe, running December 2016 – January of 2017, Girard’s remarkable body of work has already begun to recover a greater awareness within the design community. Sadly, there exist few surviving examples Alexander Girard’s built work. Columbus, Indiana “is one of the few locations where several interrelated and intact projects can still be visited, and as such is key to understanding Girard’s work as a system stretching from the selection of china to reconstruction of historic façades.” (Lange, 2016, p. 283). 432 Washington Street is an unsung member in the chorus of the arrangement of Washington Street, but remains a surviving marvelous demonstration of a Girard redesigned interior condition in Columbus. Girard’s wonderful “gift to the public” illustrates a great example of how good design can both serve corporate identity and culture, and simultaneously function as an integral component of the urban fabric.

Today, where the recessed entrance once enabled roughly one third of the lobby space to be opened directly for public access, the interior space is now hidden behind reflective glass and key-swipe access for employees of Cummins/Westport. The current façade was added years after Girard’s design, and currently admits none of the public to view of the beautiful presence of the space beyond.



figure 3: 432 Washington Street today hidden behind glass.

432 Washington was designed to be temporary executive offices for Cummins Inc. in advance of an extensive renovation of the Miller family’s historic building at 301 Washington. However, architects and designers saw the opportunity to create a lasting presence and display of the art in architecture, even in what was intended to be a transitional main floor lobby space on the way to work spaces on the above floors. The main space gestured inward from the public street edge as the entryway was set back, and the beginning of the spatial volume served as a recessed, publicly accessible, portico. This design move drew the attention of passersby, and gifted the qualitative design space of the interior of the lobby towards the public realm.

The primary elements within the lobby were minimal gestures, unadorned walls and flooring served as a platform to give greater attention to the “stalactite” patterned field condition of the ceiling and the lights which hung from the tip of each stalactite.

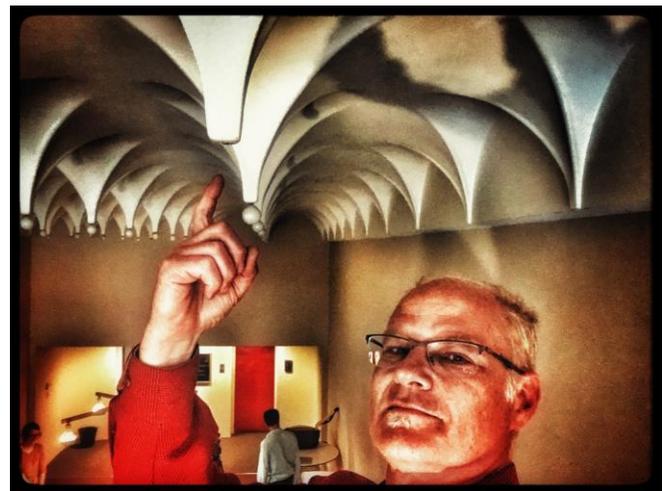


figure 4: Serial stalactite ceiling node

Furniture, also designed by Girard in partnership with Herman Miller, floated within the space above the ground plane, thus keeping the floor platform clean for viewing the dominant

expressive form ceiling, and the resulting “sparkle” from the bank of exposed light bulbs.



figure 5: Alexander Girard designed vacuum formed ceiling

Once inside currently, it is likely that Girard would be disappointed to see the room has lost its “sparkle,” the original design intent, as described by Harold Hatter, who worked closely with Girard and Miller to accomplish the original design, fabrication, and coordination of the elements within the space. The “sparkle” in the space was accomplished by the distributed bank of low wattage lights dangling from tips of each articulated ceiling node. The lights no longer function, leaving the deep interior space dark and uncomfortable to inhabit, and further, the natural light from the east-facing façade penetrates only slightly into the space. Where once there was a human stationed, just beyond the glass revolving doors one third of the way into the space, at a custom-tailored Herman Miller produced welcome desk situated in the middle of the interior space to monitor access to the offices beyond. Today, the human centered security presence has been replaced by an information centered card swipe access at the limit of the interior space. The “stalactites” have been physically and visually separated from the public through the introduction of the new glass façade on the building’s exterior, which reflects the viewer’s gaze out away from the space within and sets the interior further from the street and the public.

Revitalizing Design “Sparkle” →

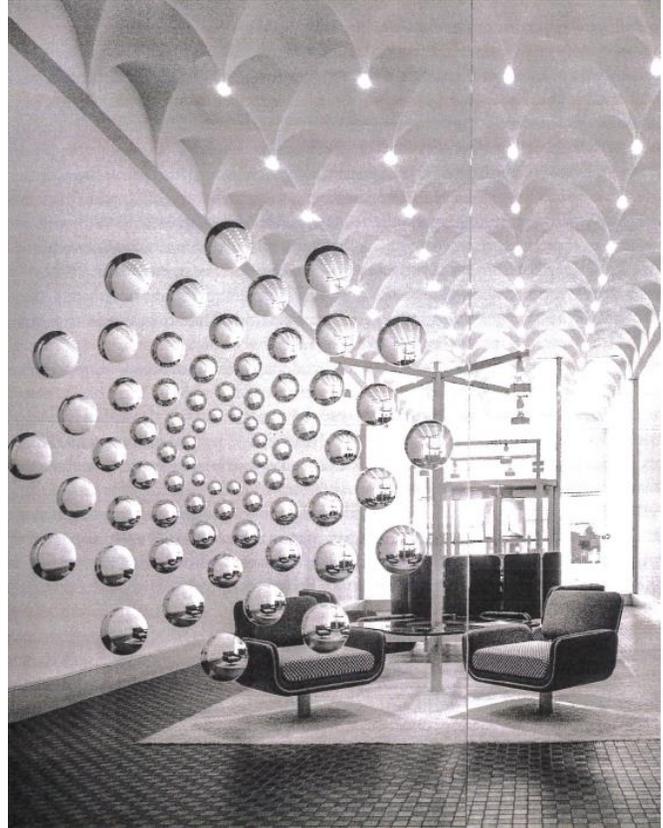


Figure 6: 432 Washington Street. 1964 Alexander Girard designed interior fittings

How does one return the sparkle and presence of Girard’s legacy to the general public, just short of removing the façade and restoring the original Girard design composition? The aims of this Ball State University led project are to trigger a renewed interest, through an informed contemporary installation acknowledging Girard’s work, albeit in praiseworthy competition with the work itself. We believe that this is an effective strategy, which will eventually lead to a total restoration and further situating of Girard’s legacy.

When restored, the vestibule and lobby space at 432 Washington Street will present an interesting opportunity for inclusion on the famous architectural tours offered by the Columbus Area Visitors Center as “one of the lesser-known Alexander Girard designs.” With improvements and restorations to the interior spaces, Girard’s design could once again contribute to the public sphere, becoming another source of pride for an already design-proud community. Investment in the restoration and re-imagining and reopening of this space will also serve to create a productive workplace at the Cummins/Westport offices, as better lighting within in the lobby space, increased daily activity and functionality within the space, and greater public awareness of the space itself will enable concepts such “eyes on the street,” “mixed primary uses,” and “social capital,” as articulated by the great urban theorist, Jane Jacobs. Moreover, restoring the lobby to a condition in line with its original design intent will create an atmosphere of inspiration and engagement at the Cummins/Westport offices, and an alignment with the

historical investment in better design and civic pride cultivated by Cummins Inc. and Columbus, Indiana.

The timing of this upgrade to Girard's work for Cummins/Westport is important, as Columbus is poised to be on the radar of the international discipline of architecture and art in a significant way. The inaugural symposium in fall of 2016 entitled "*Foundations and Futures*," will herald the establishment of "*Exhibit Columbus*," and the "*J. Irwin Miller and Xenia S. Miller Prize Competition*" in 2017. This biennial is an exploration of architecture, art, design, and community, with a significant focus on Columbus as a platform for enabling globally inspired design ideas locally. The initial biennial program will be followed by another symposium and exhibition in 2018 and 2019, creating a new, ambitious cycle of events, and a constant presence of Columbus in the architectural discourse. Additionally, Cummins will celebrate a 100 year anniversary in 2019, which no doubt, will frame the historical significance of the investment of Cummins on the cultural relevance of Columbus, Indiana.

Interrogating Girard →

This project was initially enabled by funding from within Ball State University, specifically our College of Architecture and Planning Immersive Learning Mini-Grants, intended to provide support funds for developing or enhancing "high-impact learning activities that result in real-world solutions." With inaugural funding in place, we began the exercise by encoding existing conditions and educating ourselves about the role of Alexander Girard, both in Columbus, and in his greater legacy in the global design contexts of 1960s. Clearly his relationship with J. Irwin Miller and Eero Saarinen was a significant one. Together, Miller and Saarinen, along with Charles Eames and others crafted a stimulus for encouraging better design as a tool to foster greater community and public awareness that design matters. Girard radiated in this sphere of influence, and was selected to participate in multitude of projects for them. Girard's flair for organization and pattern were as rigorous and advanced as any designer of the time, and we was a natural fit for adding attention to detail to each of the architectural commissions, including the residential houses designed by Saarinen for the Miller family.

The serial patterned ceiling of 432 Washington Street was born of an innovative industrial process using vacuum forming around a mold (or pattern), individually forming each stalactite node. We conducted a formal interview with Harold Hatter, who was primary responsible as J. Irwin Miller's right hand man for helping to realize many of the design intentions throughout Columbus, Indiana.



Figures 7,8: Student Jeremy Margis' video historical archive. Harold Hatter interview with Richard McCoy.

Hatter's insight was invaluable, as he revealed many stories about the development of the space, the selection of the art, the logistics of installation, as well as the fact that the vacuum forming was too strong, which led to the happy accident of articulating the metal ribs of the pattern along the ridges of the plastic nodes—a forming opportunity, which will reveal itself further in our final installation. Since each of the individual molds were standardized, we chose to scan the geometry with a hand-held 3d scanner.

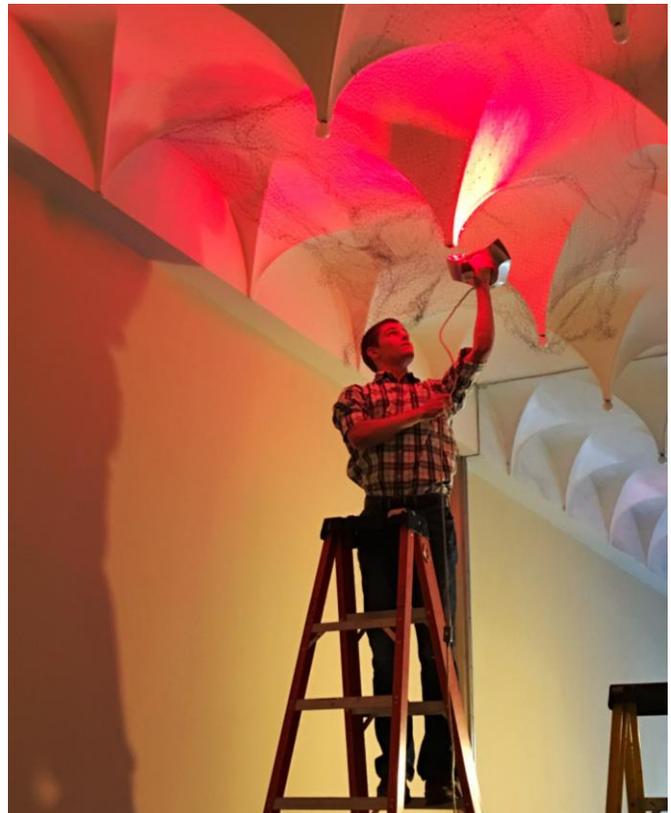


figure 9: 3d Scanning of individual stalactite nodes.

Placing a mesh with spatial location dots attached within helped situate the surface geometry, so that we could gain a precise 3d model from which to work, and data to send directly to our 3d printer for a physical model.



figures 10, 11: mesh installing the location mesh

Taking careful measure of exact dimensions of the remainder of the space using a laser distance measurer enabled further accuracies of the existing interior condition. While much of the original furniture elements and the sculptural piece selected by the Miller family at the end of the space (screening the elevator) have been removed (see the foreground acrylic screen in figure 6). The revolving door has been removed, however, the door housing and glass entry façade remain intact within the space, serving only as a historical threshold for workers who have already gained access to the space from the current exterior façade.

Once the interior measure was established as an accurate model, we developed schematic ideas for consultation with our partners. The first intent was to develop strategies for returning the “Sparkle” to the ceiling by activating the lights. We examined fiber optics for daylighting the individual bulbs within the space, however, although a sound concept, the distance from the ceiling to the roof above the third story was too great to be efficient, and the costs of these kind of systems were extremely cost prohibitive. Our second approach was to develop a scheme, which replaced the bulbs with LED strips that would be encoded with pattern designs from Alexander Girard’s extensive library of remarkable patterns for which he was responsible.



figure 12: LED patterned strips scheme A.

We decided that the strips might upstage the ceiling, and scrapped this approach, however, LEDs remained an important component of the work. Embedded within the plastic and tube steel, the final schematic direction was to approach the design as an installation which would replace the visual episode of the removed acrylic sculptural work at the end of the space, however, we moved it to the front of the space in order to more effectively penetrate the reflective façade barrier to serve as an illuminated LED signal to the passersby that there indeed is some interest behind the austere barrier, and trigger their interest to peek through the reflective glass.

To do proper justice to the space, the façade should be removed, at which point the installation could be repositioned.



figure 13: Schematic design for plastics and composites installation.



figure 13: Schematic design with LED “sparkle” and material reflectivity .

At the conclusion of the one month first summer session design studio, we had established a schematic direction to develop a plastics and composites free standing unit embedded with its own LED internal “sparkle”, mimicking, not matching, the curvilinear geometry of the existing ceiling. Additional functional capacity would be embedded in the freestanding twisted ribbon-like forms deeper within the space. The intention also proposes the restoration of all existing furniture elements from Girard’s original design. As such, the space makes better sense to include on the Columbus Indiana Architectural heritage tour.

Design →|← Production

Phase 2 began at the onset of the fall semester 2016 with the design-through-production oriented seminar, we commenced with the work of developing fabrication realities for the schematic design intent. Necessarily inherent in this process formulation of final form, we are examining industry production realities in order to better align design intent with the fabrication realities. the design is being modified in order to best accommodate these production realities. An armature of steel akin to the armature used to vacuum form the original ceiling is being developed, only in this solution, as a surface condition, while the plastics and composites reverse roles and form a structural base pushing up from the floor. Moreover, and more critical, the steel gestures outward from the existing ceiling in order to signify and reveal the relationship with the role of the pattern in forming the original ceiling node. From the node to the floor, the steel begins to follow its own structural logic and deviate from the ceiling in order to connect with the other conditions of the space, namely, the floor, the wall, and the pedestrian glass façade. Each intersection of the elements provides an opportunity at

the moment of negotiation between the existing and the armature. Each one of these transitions are embedded with different functional intentions for serving the current conditions of the space and the occupancy.

To best inform this steel armature material strategy, we established a factory visit with Tru-Form Steel and Wire, Inc, in Hartford City, Indiana in order to understand the production realities of tube cutting lasers, specifically, the Trumpf TruLaser Tube 7000. The pioneering tube laser work of Barkow-Leibinger, who pioneered architectural research with Trumpf machine tools for the campus of the machine tool company in Stuttgart serves as solid inspiration. It is from this lineage we proceed with the careful informing of form with design-through-production feedback from industry technique. (Barkow, 2008).

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