Concrete Labor

This paper examines concrete construction, using the Lafayette 148 New York Shantou Building in China as a foil to discuss construction logic driven by labor. The paper seeks to identify different considerations of labor historically in concrete architecture and contemporaneously in practice. As such, the processes of building, in context to global architectural practice, is examined to ask where can design influence labor? What kind of labor is it? And who's labor are we referring to?

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Labor and architecture has gotten some bad press in the last few years, instigating the formation of such groups as *Gulf Labor Coalition and Who Builds Your Architecture?* (*WBYA?*) These coalitions of artist, architects, activists, scholars, and educators holds workshops, conferences, and exhibitions that expose the hidden labor of what it takes to 'build a building."[1] The later group WBYA? Even attempted to diagram and make visible the complex global networks that constitute contemporary building practices.[2] This diagram takes a fictional building project and maps the necessary steps in the design, construction, and implementation of a large-scale architectural project—involving the movement of building materials and people from around the world. (fig. 1) This diagram, exhibited at the Istanbul Design Biennale, literally represents, didactically, to a general public contemporary practice in global architecture—noting that global architectural practice is becoming ever more complicated and each moment marks a wider gap in direct involvement from the standpoint of an architect to influence the production of architecture. The recent interview from BBC's Today Programme, with Zaha Hadid in reference to Qatari Stadium laborers' deaths is case in point.[3]

The works of *Gulf Labor Coalition* and *WBYA?* is not the direct aims of this paper, though related and will address this very question of labor. The aim of this paper takes the approach of examining concrete construction as a point of departure, using the *Lafayette 148 New York* Shantou Building in China as a foil to discuss construction logic driven by labor. This paper seeks to identify different considerations of labor historically in concrete architecture and contemporaneously with the influence of fabrication technology. As such, the processes of building, in context to global architectural practice, is examined to ask where can design influence labor? What kind of labor is it? And who's labor are we referring to? Given the compartmentalization of expertise and responsibility at various stages of building, especially for large-scale international projects, what is the role of architects in balancing design with the building of that design? And finally, what opportunities in concrete forming, especially in relation to fabrication technologies can design recast the question of labor in architecture?

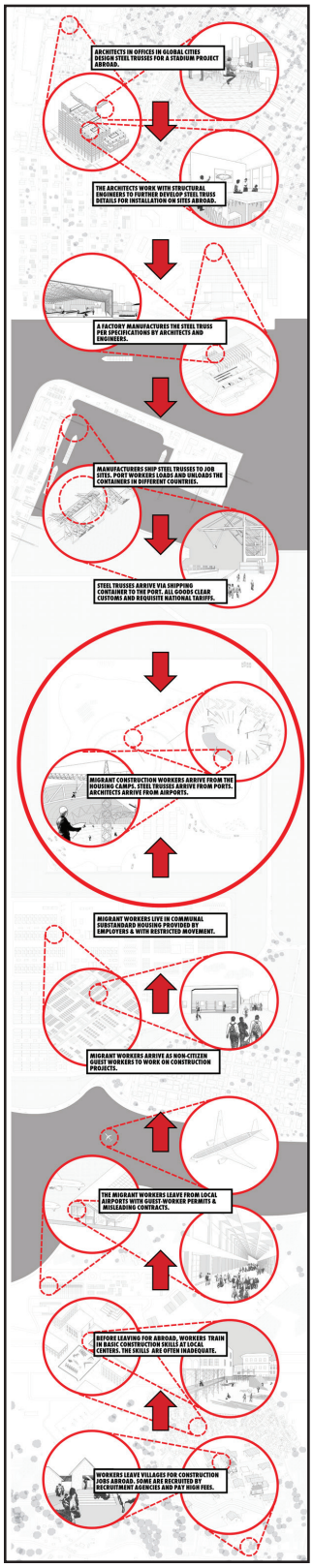

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Figure 1: Diagram produced by WBYA? mapping moments where laborers are present in the contemporary building process.

LAFAYETTE 148 NEW YORK BUILDING, SHANTOU CHINA

Completed in 2009 by Tsz Yan Ng and Mehrdad Hadighi of Studio for Architecture, the *Lafayette 148 New York* building in Shantou China houses the entire operation of the New York-based fashion label oversea. The eleven-story building, organized around the functions and logic of clothing manufacturing from conception to shipment, is made up of predominantly factory floors with showrooms on the ground level and office space at the top two floors. (fig. 2) The building, constructed with a post-tensioning system enable the north side of the building to become the vertical service slab with elevators, bathrooms, and fire stairs, and the factory floor, spanning 17 meters (56 feet) X 87 meters (285 feet) to be completely column-free. Carvings are introduced to the overall building volumes to bring light and air into the core of the building. These thru-level carvings create a chimney effect to promote natural ventilation. Further thru-floor (North–South) carvings enable cross ventilation. The double-layered skin of concrete brise-soleil and operable glazing maintains interior comfort level—even for the factory floors—up to 30°C (86° F) in Shantou's tropical climate without the use of air-conditioning. The combination of these passive cooling strategies not only reduces energy consumption for this building, but also creates interior courtyards with stunning views. Since occupying the building, the client have found their electric use to be 40% less compared to other factory buildings they've occupied in the region. Air conditioning is used predominantly to mitigate humidity.

CONCRETE TWISTS

More than a diagram of a vertical factory and measure of practicality for a manufacturing facility, the most striking aspect of the *Lafayette 148* building is perhaps the twisted concrete brise-soleil fins that wraps the east, south, and west side of the building. The fabric-like facades are composed of four twisted fins per level. The twist, flows fluidly across the surface from east to west. The south side (considered front of the building) reveals the twist to be more than a visual aesthetic effect for the surface. The twists correspond to the carvings inside the building block, opening up the façade to accommodate airflow and light, with operable windows as enclosure layer behind. The concrete fins are perforated with holes that lightened the weight of the panels, and provide a play of oblique ovals of light on adjacent surfaces. The perforations spells out the company name *Lafayette 148 New York* in Braille repeatedly.

Our initial impetus to use concrete for building came out of an examining of local building practices. Pour-in-place rigid reinforced concrete frames for buildings are prevalent in this region of China for both residential and commercial buildings. All the formworks are made manually because labor is cheap, and after the concrete is set, bricks infill for walls and then plastered over with cement or tiled. Our evaluation of local building processes directed us to 1-challenge the use of reinforced concrete as the primary building material (most cost-effective method of construction) and 2- to take advantage of the readily available and abundant labor force to building in a systematically customized fashion that is not possible to achieve anywhere else in the world.

Our goal as well as our client's for the factory levels was to make an open well-lit, well-ventilated workspace for the workers who work seven days a week, with a minimum of two days of overtime, expected not from the employer but from the employees because of overtime pay. To recast the association of clothing manufacturing facilities as 'sweatshops,' comfort, for EVERYONE was our primary concern. Laborers here, broadly speaking, refer to the users of this building who performs a range of low to high-skilled work for garment production. These were the individuals who we were primarily designing for. While our concern was to create the space for their labor, the challenge of forming twisting concrete fins speaks to labor on an architectural level, that of design, construction, and material experimentation.

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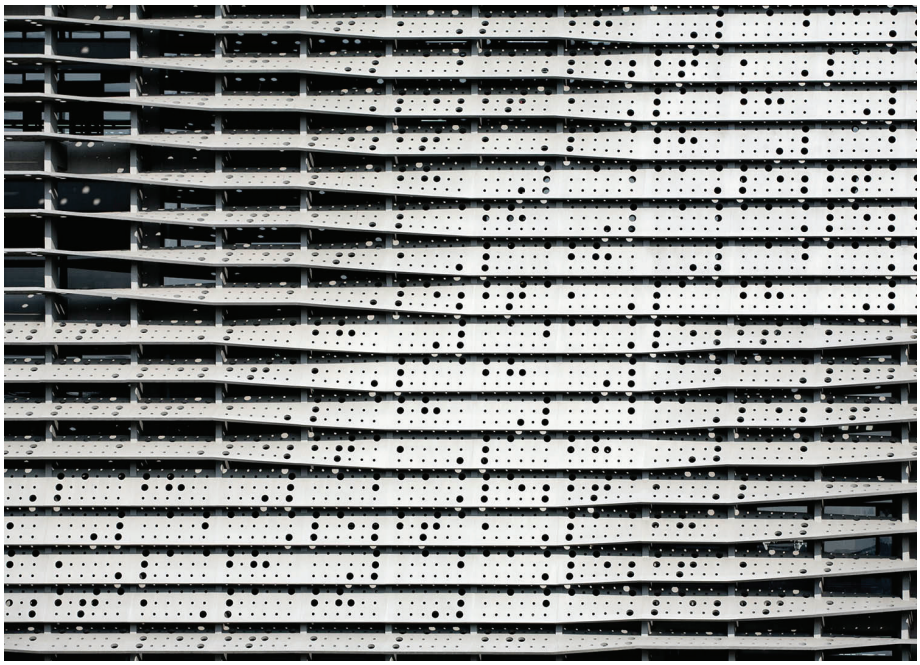
TWIST ON LABOR

Concrete historically has been developed with two separates sets of labor. The labor of casting in concrete as Adrian Forty elaborates in *Concrete and Culture, A Material History* (2012), has been split between unskilled labor, that of manual labor for making formwork on-site, and intellectual command, that which resides in specialized concrete engineering and highly crafted designs for formwork.[4] For concrete architecture, this split continues to today. Additionally, formwork for concrete shaping is one of the most labor-intensive processes for building, often covering a large portion of the project's overall cost. While prefabrication has made the use of concrete more cost effective and time efficient, for pour-in-place concrete formwork, the labor is still extensive.

In Shantou, China, all concrete formwork are done manually. Precasting processes does not exist for this region. As such, our reliance on manual labor of on-site casting was critical in considering our building processes. In fact, contrary to typical scenario of foreign architects who builds in other parts of the world (usually of large-scale civic building) where they inserts a design that requires the importation of materials and prefabricated parts, techniques, and labor force to build it, the design and construction of the *Lafayette 148* building was developed with and dependent upon local building traditions.

The twisted fins for the Lafayette 148 building was developed and conceived as an assembly system of family of parts. (fig. 3) Our final design utilizes a total of five different twist angles, 0°, 18°, 36°, 54°, and 72°, configured in combinations to create a smooth continuous twist appearance. The design development insists that there is not only a concern for balance of weight and structural stability but also that the non-rectilinear formwork is reusable. The challenge for concrete forming, in this case of non-rectilinear form, was intentional on two levels. It was for us not only a way to develop new techniques for formwork making to realize our conception of creating a textile like façade that shades the building volume, but was also to ensure that our partnering firm in China would come back to us to seek our expertise in the design. Many design teams from the US and Europe who go through schematic design, often hands off the project 'as a napkin sketch,' whereby the need for their service ends at the moment in which an image is created. By simply not knowing how to build it, it ensured that our labor (in this case intellectual) as designers is valued and that we could maintain a continuous working relationship for the duration of the project. (Note, to give our partnering firm in China due credit, they took a giant leap with us to develop this project.)

Figure 2: Overall view of *Lafayette 148 New York* Shantou building



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The twisted façade, conceived as a precast system, had no direct precedent that we could turn to to aid in our design. As such, we built wooden prototypes to test both processes of forming the concrete and to account for issues of crafting because of the skill level of the typical construction worker in Shantou. It is not to say that this region lacks the skills necessary for this work, because clearly, the project is built. It is a question of normative practices there where rough concrete forming is usually tiled to hide poor or quick craftsmanship. In this sense, in addition to figuring out how to form the concrete, we had to built-in a foolproof system for the making of the formwork.

Wooden formwork prototypes were built and part of the discovery of making it, we realized that the bi-lateral twist of the plywood needed to be perforated so that the material could twist properly. The perforations originally came out of this material demand. The final formworks used for casting were made with steel, reconfigurable and reusable. (fig. 4) The perforations on the fins at the end served multiple functions beyond the Braille text of the company name: 1-as mentioned, it lightened the overall weight of the panels; 2-during the construction process, chain pulleys could loop through the holds to transport the panels from one place to the next, 3-the chains enabled the panels to be lowered into place for installation, and 4-performatively, the small perforations as part of the overall building façade created a Venturi effect drawing air through holes by the differential pressure on one side of the façade surface. (fig. 5) As each level of the building was completed, the factory floor became the casting factory for the concrete fins for the floor below (so that the panels could be easily lowered into place). In that sense, the first thing that the building as a factory produced was in fact itself.

THE LABOR OF ARCHITECTURE AS A MANUFACTURING INDUSTRY

Labor in architecture is difficult to grasp. It is even harder to measure or demonstrate concretely the labor of all those who participated from conception to inhabitation. Against what metrics or form could labor be considered for contemporary architectural practice/ discourse? How could labor negotiate design with a building industry steeped with protocols and specialized roles?

Figure 3: Details of twisted concrete brise-soleil

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An interesting parallel could be drawn from *Lafayette 148 New York* in terms of it being part of the complex global network of clothing manufacturing. Both the garment and the building industry rely on cheap manual labor as the basis for its production. We see similar types of grievances for the treatment of workers in the last century for the garment industry and more recently for the building industry.[5] Imported migrant workers are essentially the backbone of both industries today. The obvious scale and pace of architectural production resists the extent by which change could be addressed easily—especially when most building projects today, participating in the global sense described by *WBTA?*, is complicated and steeped in tradition. In coming back to the diagram of *WBYA?* which exposes the various moments where laborers participate in the making of a building, I would like to point out that this diagram presents manual laborers in the trajectory of construction. It makes visible the laborers. While this is important for the general public to understand and even for architects to be reminded of architectural production as a manufacturing industry with social and ethical implications, what I would like to offer through the example of Lafayette 148, is where design could potentially and effectively work *with* labor—where the aesthetics and ethics of labor, through the building's construction logic and crafting, be the process of making and the formal expression of the design. This shifts the attention away from the need to represent the intrinsic act of labor as in *doing* the labor or laborers themselves (such as those of migrant workers), or some reliance on the necessity of the material to legibly *read* or embody labor.

CONCRETE LABOR

Concrete, one of the most pervasive building materials in architecture has diverse associations historically, culturally, politically, and socially in the modern period. As mentioned, labor in concrete production is split. Forty writes in reference to Hennebique's methods of concrete building from late 19th C. to the early part of 20th C,

> …reveal the extent to which it was possible, with concrete construction, to detach the skilled, mental work of building from the purely manual element. The opportunities that concrete provided for such a division of labour is what really distinguished concrete and make it uniquely different from all other construction processes in labour terms.[6]

While concrete labor is the subject at hand, two aspects are highlighted of contemporary

Figure 4: Steel formwork for twisted concrete fins on the factory floor

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architectural practice today that is not exclusive to building in concrete. The first is this separation of craft, between the intellectual (architect as designer) to that of the manual (labor of the builder). And the second, implicit in the reconsideration of crafting, proposes design innovation as a form of heuristic knowledge—what constitutes design research in academia and for the building industry as a model of collaboration between builder/specialists and designers.[7]

The crafting of the twisted fins for the *Lafayette 148* factory is an attempt to close the gap between the intellectual and manual labor. Here I turn to Kenneth Frampton's quote of Renzo Piano's definition of a craftsman.

> An architect must be a craftsman. Of course any tools will do. These days the tools might include a computer, an experimental model and mathematics. However, it is still craftsmanship-the work of someone who does not separate the work of the mind from the work of the hand. It involves a circular process that draws you form an idea to a drawing, from a drawing to an experiment, and from a construction back to an idea again. For me this cycle is fundamental to creative work.[8]

For us, the crafting of the twisted fins was not just a concept drawn or represented, handed to the builder. Our prototypes was informed through making and refined through testing. Our concrete formwork design was informed by crafting both intellectual and manual working with builders and specialists. The formwork design for the twisted fins is the site of labor, a product of creative exchanges. The design did not rely on predetermined existing systems, but rather sought to work with the labor available and capabilities of the local building trade. There were parameters to consider and limitations. What emerges, also as a form of intellectual labor through this process, was the challenge of not only producing the representation of what the design may look like or construction documents with specifications but also other types of invented diagrams for communicating design intentions and instructions for building (especially for those that does not understand the English language). This recursive process described, or more precisely as a methodology—of making, testing, drawing, and remaking,

Figure 5: Concrete panels during installation

etc.—is crafting, a form of heuristic knowledge or what constitute academically as design research.[9] In context to practice, it recalibrates the roles of each player, not only of responsibility but challenges each in terms of expertise. The Lafayette 148 project operated outside of normative practice, from experimentation to design to construction. Labor was central from conception to execution to inhabitation. This includes labor in terms of design (aesthetically), construction logic (techniques for building), and the people (those who built it and those who work in the factory).

The production of architecture, as a manufacturing industry, has followed trajectories guided by technology, material innovation, economic forces, and socio-political influences. Anyone involved in both academia and practice over the last fifteen years has likely not escaped the shift into digital production. Computer aided technologies have become an integral part of the means of production, and they have effectively reshaped architectural discourse in both production and outcome—retooling and reskilling the profession in the process. As such, the labor of architecture, in design and as a manufacturing industry, is recalibrated. Perhaps unexpected, and in fact, opportunistically, it might be the right set of circumstances to address inherent tensions that currently exists in the profession.

ENDNOTES

1. Gulf Labor Coalition was invited by Chief Curator Okwui Enwezor of the 56th International Venice Art Biennale to exhibit and hold panel discussions of building labor issues taking place on Saadiyat Island in Abu Dhabi, UAE. Major art institution such as the Louvre and Guggenheim, as well as educational outpost of New York University are all undertaking major building projects there that employs migrant laborers. The exploitative nature of these migrant workers have gone well below the minimum level of sound labor practices to be now considered violations of basic human rights. The group *Who Builds Your Architecture? (WBYA?),* founded in 2013 tackles similar issues with members coming from the discipline of architecture. Please see the websites: gulflabor.org and whobuildsorg/about/ for more information.

2. Published in *e-flux*, journal #66, October 2015, "*Who Builds Your Architecture*?: An Advocacy Report," by Kadambari Baxi, Jordan Carver, and Mabel Wlson.

3. *Huffington Post UK*, web "Zaha Hadid Interview on BBC's Today Programme Turns Awkward Over Qatari Stadium Deaths Question," by Jack sommers. September 24, 2015.

4. See Forty, Adrian. *Concrete and Culture, A Material History.* London: Reaktion Books Ltd, 2013, 14-22, 225-235, especially the chapter on concrete and labour.

5. I am only referring to modern history.

6. Forty, p.232.

7. For an extensive consideration of various forms of labor in relation to practice and technological shifts, see Peggy Deamer and Phillip G. Bernstein's *Building (in) the Future, Recasting Labor in Architecture.* New York: Princeton Architectural Press, 2010.

8. From Kenneth Frampton's essay "Intention, Craft, and Rationality," in Deamer and Bernstein, p. 34.

9. Frampton refers to the Greek term *techne* (according to Martin Heidegger), a mode of knowledge that is inseparable from creativity. Also, heuristic knowledge is built over time and emcompasses knowledge previously gained..