surfaced. the formation of twisted structures

the work of **SYSTEMarchitects**

text by Jeremy Edmiston

contributions by

Chee Pearlman Carolina Miranda Paul Chatterton

edited by Oscar Riera Ojeda Architectural structures describe the environment in which they are situated, while at the same time creating that environment. Complex forms, such as the twist, offer the architect a tool to shape an environment with a precision that elicits a highly nuanced space. This book charts the journey of SystemArchitects from the folded geometries of the seminal BURST house exhibited at MoMA's renowned 2008 show to the curves, tucks and twisted spaces that followed. It follows five years of experimentation with pre-fabricated and iterative techniques, low cost materials and algorithmic design all in service of projects made for everyday use.



www.oropublishers.com www.oscarrieraojeda.com



surt faced. the formation 9 twisted structures

_

suraced

OSCAR RIERA OJEDA PUBLISHERS

ormation iwsted structures

the work of SYSTEMarchitects



the work of SYSTEMarchitects









the work of SYSTEMarchitects

contributions by Chee Pearlman Carolina Miranda Paul Chatterton

edited by Oscar Riera Ojeda



OSCAR RIERA OJEDA PUBLISHERS

contents

- 010 Acknowledgements
- 013 **Preface**

- 014 **Answering the right question** A conversation with Chee Pearlman
- 018 **Form isn't the only parameter** An interview with Carolina Miranda
- 022 A hierarchy of surfaces A conversation with Paul Chatterton

028 **1. Form + Use**

030 1.1 BURST*003
056 1.2 wellFLEET
060 1.3 USS (Urban Space Station)
064 1.4 bulkhead 2E
076 1.5 terminal pop-UP

084 **2. Structure + Connection**

- 086 2.1 KOKODAschool
- 106 2.2 boats 2E + 2N
- 118 2.3 BURST*008
- 126 2.4 fulcrumSTAIR

132 **3. Perforation + Pattern**

- 134 3.1 aA SHELTER
- 154 3.2 cMcF
- 158 3.3 lattice 3N

180 **4. Material + Depth**

- 182 4.1 UNhistoric townHOUSE
- 206 4.2 ballast 2N
- 216 4.3 Pied-å-Terre

226 Appendix

- 228 SYSTEMarchitects profile228 Awards /Exhibitions230 Glossary
- 232 Project Credits
- 233 Photo Credits



Things were pretty much at a fever pitch in the last few weeks before the opening of the Home Delivery Exhibition at New York City's Museum of Modern Art (MoMA). Douglas Gauthier and I hadn't slept much and neither had the dedicated students and workers who were putting together BURST*008, a full scale home built in MoMA's parking lot, and our contribution to this groundbreaking exhibition. Right at one particularly stressful point (there were many, as can be imagined when building a house in one of the prime tourist destinations of midtown Manhattan), Max Risselada a European curator helping out at MoMA came up to us and said he found it remarkable how the project looked beautiful in all its phases of construction. We'd been so busy that we hadn't really noticed, but his kind remark stopped me. It made me realise that not only were we constructing a building we'd designed, but it was being built using a method of construction we had designed as well. Design and construction are not a linear process; the design of the construction method has an influence on the design of the project. Many of the details of a project come from an idea for how to construct something, and many of the ideas about how to construct come from the intentions of a project. I wanted to articulate this in a book, and we

preface.

Design and construction are not a linear process; the design of the construction method has an influence on the design of the project. Many of the details of a project come from an idea for how to construct something, and many of the ideas about how to construct come from the intentions of a project. I wanted to articulate this in a book, and we thought it would be helpful if we organised the projects by the kinds of drawings and models we make to work through the ideas of a project. This book looks at a number of works that have come through the studio in the past six years as well as two important precedents from when I was working with a former partner, Douglas Gauthier: a guest house at Wellfleet, Massachusetts, and the BURST* projects in North Haven, Australia, and at MoMA.

Answering the right question. A conversation with **Chee Pearlman**

What was the problem you were asked to solve with the aA SHELTER?

This space is in the bottom of a church, and the church occupies one of the buildings that was originally a parish house. And someone came to me and said, 'which colour linoleum should we choose when we redo the floor?' I didn't want to be involved in linoleum choosing but they kept pursuing me. So I offered them a deal that we would donate our time for something bigger, but we wouldn't go to meetings and they would have to build whatever we came up with if it came under budget. And I thought they wouldn't take that deal, but they did.

So in other words you were asked the wrong question about the linoleum, but you gave the right answer: 'we'll make something that you maybe didn't realise you would really benefit from?'

Because I felt that we could talk to the folk who used the space, who used the shelter, used the church.

When you were presented with this, how familiar with the end-user were you, and what did you learn about them?

I knew of the activities that happened in the space because I'd helped out with the meals that were served to the homeless every week. I knew that they slept in the space at least one night a week, sometimes more. I knew that there were medical services, psychiatric services, social services that were run out of that space.

But I didn't really know the people who were using it at the time. So we started talking and interviewing, and watching what was going on. The space has been kind of a multi-purpose space. All sorts of groups use it.

So you had to make sure everyone could use it; it has multiple programmes.

It does. And the church members who are paying for it have a view of what the space is, which is guite different from how it's used perhaps in the evening or during the meals.

But what we felt was that you can't really design a multi-purpose space unless you have something quite specific that you want to achieve. We felt that the shelter aspect of the space was the most fundamental, and that it tied the building to kind of a network of homeless services in the city. The church's other activities are more insular.

There's a regular constituency that shows up there for meals, for a place to sleep. I would imagine that design wasn't their top priority in terms of what they needed to receive. How did you feel design could help them?

In my experience working with the meals, and serving them, what's really striking to me is that, like all people, they don't only have physical needs, they have preferences, they have opinions. I'm not sure architecture is about meeting physical needs. It's perhaps best meeting the needs of the mind, of imagination, of hope. We'd done some work earlier in the practice with emergency housing. You know, it struck me that architects as a whole are probably terrible at providing emergency housing; there are engineers and builders that do that stuff really fast, and well.

Architecture is doing something else. It's offering a culture to that solution, to that issue of emergency housing after a natural crisis. It's thinking about the terrain in that country that is still intact, it's thinking about the whole landscape and what it might contribute to the environment in the long term.

And to have some insight into the cultural needs and the traditions of the people who might be in that condition. A need for emergency housing can happen to anyone, but you don't just necessarily throw all into the same generic kind of situation.

Right. I think needs can also be emotional, and cultural, and of the mind. It's not just a bench to sit on. And engaging those ideas is more specific to a place, a moment, an action, perhaps even a material.

This client came and said, 'should we have pink or blue linoleum,' and you said, 'I think we want to take this a lot further. But you have to let me solve this problem the way I want to'. Typically that's where designers and architects can end up doing their best work-with the constraints being defined only by the end-user.

Right. I enjoyed the very direct relationship with the end-user. And taking that idea back into the studio, and thinking about it in that way. I asked for a budget and we took the budget quite seriously. We'd just finished the MoMA show, and what I noticed about that process was that those who donate their time or material or money are really invested in the project. You're not just paying them for something, they're giving it. So they take a lot more care, and they pay a lot more attention. And that's really helpful when you're trying to do something quite particular. A lot of people helped out, a lot of the homeless community came and helped us on the construction as well as regular people from the church.

In a way this really was a design-build community project. It sounds like you went far beyond being the architect here, you were also the driver of the vision, and of making it viable. They didn't just hand you a blank check.

What does that mean?

The space is three-dimensional and you have to make interventions into this space for it to work, so those interventions have a structure, they have coordinates, they have measurements. For this project, the measuring system wanted to be other than a grid or a vertical measurement or a horizontal measurement or an 'x-y-z'. So it became this system of lines, and the lines track through the floor and up the wall that we have to put in, and on to the ceiling. And these lines start at 90 degrees to the wall and parallel with each other at the entrance, and that's the last time they ever are.

Chee Pearlman is the director of the editorial and design consultancy Chee Company, the curator of the Curry Stone Design Prize and the former editor in chief of I.D. Magazine.

I think all designers do that extra. If anything is to be produced, then somebody has to fill all of those roles.

What is the concept here, what's the over-arching design and aesthetic?

Broadly, the idea is that there's a flow to the way we observe the homeless navigate the city. They find the leftover spaces, they find alternate routes through the city, they aren't as wedded to the avenues and streets as we, the non-homeless, may be. We have a catalogue of known addresses that we navigate the city by. There's the addresses for the kids' schools, there's home, there's the office, university. These are coordinates that we schedule our lives around, a matrix that we build our lives on. And it seems that the homeless have a more fluid matrix. We wanted to express that in the space. So you couldn't use the grid. Instead, the idea became a continuous flowing threedimensional ordering system.

1



form + use

form + use



In the studio at SYSTEM, form is never really talked about directly. Each project requires a multiplicity of actions as the project grows and is influenced by a deeper understanding of the programme, the site conditions, the owner stipulations, the needs of the user, and the many agencies that have jurisdiction over the project. What everyone wants to know, however, is what the project looks like, and try as we might to explain that one needs to understand how the project came to be in order to 'read' how it looks, very few folks ever really grasp the relationship between how the building works and how it appears. Nevertheless, everyone has a connection to the visual. It's a necessary function of architecture to show ideas for building in the environment through form. The built work documents a moment when ideas for space made a coherent argument in a form in a place.

The relationship between form and use is more complex than it initially appears. Obviously, the uses of a project fit within the shape of the project and its appendages, and in cities or highly built environs, once this is achieved there is often little extra space around to 'add' additional formal gestures. The form in this instance is very tightly connected to the use. But while working through this tightly woven connection, architects might discover there are often loopholes within the ordinances of a place. For example, in New York City, architectural elements may project from the building into the space of the street, balconies may also project into the street, setbacks might enable a building to be taller, or the thickness of a wall might affect the permissible height of a building. We used a combination of these in making the form for the UNhistoric townHOUSE project (see p. 182) shown in a later chapter.

The usefulness of a project may be thought of not only in terms of the layout of rooms and closets and corridors, but also as the creation of an interior environment, and as the creation of the relationship that environment has with the outside. This suggests not only a social arrangement of spaces and elements, but also how the users feel inside. The view, the light, the movement of air around a space influences the way a place is used, and these play out in the form of a project.

For form to be an agent of communication within the environment, it must have a provisional character—a sense that change is a part of the terrain in which it operates. From the outside, this change may best be characterised by movement, as in a form that is moving around the corner or moving across the horizon. This form is not interested in bringing the eye to rest, but quite the opposite, in carrying the eye across or around an object and out into the environment in which it sits. This positions the object as just one of many elements within the environment, playing its role within the ecology of that place. From the inside, this change may be described as transition. A space that is defined as much by its connection or transition to another as by the elements that contain the space. For example, a room may be made of pieces or elements that continue into other places within the interior.

In the projects that follow, form is developed at a number of scales. There is the form that responds to a zoning diagram, to the flow of a room, to the constraints of a site and the necessities of a programme and then there is the scale of a human moment within the project—leaning against a wall, having a place to put your keys, sitting and reading a book in a slice of sunlight. All these moments are suggestions within the manipulation of the form. In this chapter, five projects will illustrate the relationships that come into focus during the making of a project.





















- VIEW under croft looking towards entrance stair
 VIEW from exterior entrance stair
 VIEW entrance cowling
 VIEW looking across deck
 VIEW living room + exterior stair
 VIEW dining room + entrance stair



VIEW southeast undercroft
 VIEW nighttime from the garden



2

structure + connection









1-2 CONSTRUCTION 2N skin
3 boat 2N
4-7 ASSEMBLY sequence for ribs a + b + c

















ASSEMBLY floor clip
 VIEW rounted SIPS panel
 ASSEMNLY rib + clip

- 4 VIEW bleacher structure
- 5-6 ASSEMBLY on site7 PROCESS CNC routers SIPS panel























 VIEW BURST* profile
 CONSTRUCTION of façade
 CONSTRUCTION BURST* window
 VIEW BURST* details 5 VIEW BURST* window6 VIEW exhibition site

perforation + pattern



3

perforation + pattern



The measure of form is usefulness. The measure of structure is its strength. How then do we measure pattern? It is measured in the response it elicits, how much feeling it creates, how much it moves its beholders. Without feeling, it becomes difficult, if not impossible, to really occupy a place.

Just as form and structure are symbiotic, so enmeshed that it's hard to tell which is the cause and which is the result of any design decision, pattern is both the author and the product of its environment. Pattern is not applied, but integral to the other inter-relationships in the project. It's not just about material and it's not just about form; it's a whole other expression of the space.

As SYSTEM developed its iterative method of design, form-making, and construction, it followed a similar path for the creation of surfaces of patterns and perforations. The technology that allows us to implement rules of form, geometry, structure and construction in generating a surface also allows us to generate patterns using a combination of scripted code and complex geometries. The formation of these surfaces is a catalyst for creating patterns that eventually take on the contours of these surfaces and become three-dimensional.

In metropolitan apartments, light is often the currency for habitability. The idea that a pattern is able to respond to the micro-conditions of the natural and artificial lighting led to SYSTEM's experimentation with allowing the surface to reveal more subtle changes within a space. In Lattice 3N (page 158), steel is perforated in an arrangement that's both a result of the conditions in the apartment and also changes those conditions. The perforations become larger and the lattice more lacy at the edge of the screen that is closer to the window. On the other edge, close to the front door of the apartment, the holes are sparser and smaller. This has the effect of movement, of carrying anyone entering the apartment into the room as their eye is drawn from dark and solid to light and open.

Movement—imagined or implied—has been one of SYSTEM's guides to pattern creation. It seemed to us that if a pattern was a way to 'read' hidden forces within a place, then these forces were kinetic; they did not desire static resolution in the structure of form, but were rather seeking an expression of change. Patterns were therefore about moments of density, or compression, moments that were gradually opening up or suddenly tightening.

The software that we were using for these patterns is based on a grid geometry. We were forming and reforming and deforming grids, but trying to create a surface that spoke about constant and unexpected change. We were tied to a structure that was fully deterministic.

We discovered one way of loosening the grip of the grid in the aA SHELTER in Manhattan. In the shelter, the pattern on the floor is not only that of the material, but also a design of lines and markings that are milled into the material. These lines allow a large empty space to seem dynamic and occupied, so that users, who might initially be wary of entering a space where they might not intrinsically feel welcome, are drawn in. The pattern gives the impression that something is already going on and they will not be alone. The lines extend up the contoured wall, which does actually move and the pattern reinforces the geometry of the wall almost as if it were marking out the contours on a map.

Sometimes patterns can cause the opposite of movement. At the shelter,, the markings on the floor often cause people to pause to wonder at their meaning. A wide variety of users have told us of the narratives they have invented about the pattern, evidence perhaps that pattern gives the surface depth.







1 VIEW shelter meal 2-3 VIEW wall panels with perforated lighting screen

3.2 cMcF

The lobby of a penthouse apartment in a new high-rise residential building in New York City presented an interesting challenge. The space had a utility and it met all the many regulations of the building's co-operative board, but it needed character. We were only permitted to use paint, so we decided to work with qualities of paint that enhance surface. The pattern we devised envelops the floor, walls, and ceiling in an arrangement of matte, low sheen, and high gloss finishes. The effect was transformative but the subtleties of the articulation almost defy documentation. Photographer Albert Vecerka painstakingly adjusted the lighting to pick up the surface changes and compiled an image from more than 20 different exposures to reveal the interactions between the light and paint.

The pattern continued on the terraces as perforated outdoor furniture, designed to articulate the way the space would be used.

VIEW interior wall patterning
 VIEW patterning detail









1-3 PERFORATION CNC mill details4-5 PATTERN detail













material + depth

4.1 UNhistoric townHOUSE

With Robert Baker

The Landmark Preservation Commission (LPC) was established in New York to preserve historic buildings after the McKim, Mead, and White-designed Penn Station was pulled down. The Commission has jurisdiction over the site of a townhouse that SYSTEM was commissioned to renovate and enlarge in 2010. An odd leftover, the lot is only 25-feet deep and has buildings on three sides, but has almost 40 feet of street frontage. The current house does not meet the basic standards of cross ventilation, light and open green space that are required for residential habitation, yet is in a very desirable Manhattan neighbourhood. Tribeca was originally built for manufacturing, trade and warehousing when that part of the Hudson River was a thriving shipping port. The 10-storey building across the narrow street is now used for offices and movie production. Our site had little or no privacy or sense of domesticity, particularly as the building is only one room deep.

The argument we made successfully to the LPC was that our building was to be made from materials characteristic of the historic neighbourhood—brick, steel, glass, and cast iron—but used in a revolutionary fashion.

The windows are carefully angled to increase the views up and down the street while decreasing the view into the house from the commercial building across the way. This has the effect of turning the brick façade into a continuous twisting surface as the windows face any direction except straight on to the street. The bricks become like drapery, corbelling from their cast iron base up to the overhanging cornice.

After construction experiments with robotic bricklayers and backup walls made of plywood or honeycombed plastic, we decided to build with brick hand-laid onsite against a permanent foam template that is CNC cut to form every brick course and position every brick. The foam insulates, helps with the waterproofing and prevents damage from condensation between the walls. The interior of the façade is also brick, creating a four wythe wall, in which one of the interior wythes is foam. This enhances insulation and eliminates street noise.

Balconies extend beyond the façade and provide small outdoor spaces nestled in and jutting out from the brick wall. They're conceived as a second fabric swelling out from the brick surface, extending the habitable space through the wall, their balustrades screening the interior even further.

In the interior, the twisting geometry of the façade brings an intimate domestic scale to the interior spaces. The curves and kinks create alcoves, cubbies, and nooks that can be personalised. One might be a window seat, another a place for a plant, another a spot to talk on the phone or look out the window. Thus an otherwise commercial and impersonal environment can be made more intimate and domestic without the necessity of drawn shades.

































VIEW wall contour + perforated ceiling pattern
 VIEW ceiling detail

