Etymologically the word architect is derived from the Greek word arkhitekton meaning “chief builder” (arkhi-, chief + tekton, builder). Originally, architects were primarily builders or artisans. Since that time architects have moved increasingly further away from the act of building. However, recent technological advances in such fields as digital fabrication, custom prototyping, and materials science are drawing architects back to the craft of making. This issue of TECHNE focuses on the relevance of building, making, and fabricating in architectural pedagogy and practice, and presents essays, conceptual proposals, and projects that address this topic. We consider why it is important to provide students with opportunities to engage in building and making and reflect on what students gain from these experiences. What are the lessons learned from student projects that have embraced a design-build approach? How can we provide more of these opportunities to students?

This issue features the extraordinary work of our students and faculty on the Solar Decathlon. The project exemplifies the epitome of a hands-on experiential learning opportunity in designing to build. It is through projects like this that students are afforded the opportunity to learn soft skills, such as communicating, collaborating, scheduling, and managing, together with hard skills such as drawing construction details and using tools on a job site. Both students and faculty discover that, unlike in a traditional classroom, each learn more than they could have expected.

We also discuss the impact new digital fabrication tools have on the way we conceive, practice, and, most importantly, teach architecture. With the onset of these tools, architecture is being conceived differently both in its conceptual approach and its multitude of possible job descriptions. These tools have enabled students and practitioners to engage more directly with the act of expeditiously making and have inspired projects that are seemingly less constrained by the confines of a traditional architecture practice. These explorations and inspirations expand the field of architecture, and what it makes, and exponentially increases the number of potential trajectories that we can embark upon. Are these tools and processes redefining the role of an architect? Should we use what we learn from these contemporary processes to inform traditional practices and pedagogies or are they something entirely new?
An unexpected effect of advanced digital tools in the department is the strengthening of social networks and cross disciplinary communication. Fabrication and data visualization are building blocks for a twenty-first century barn-raising. Heated discussions of material science, environmental analytics and joinery methods engage students in a dynamic design process that invites an expansive array of inputs. Their sophisticated modeling tools link them to scholars like archaeologists, climatologists and sociologists. Digital computation and simulations enable access to concise visions of futurists and astrophysicists. Consider the efforts of Hyperloop One, subverting earthly distance and time, in contrast to the Illustris simulation of cosmic evolution. Math and science are common denominators when studying or visualizing phenomena affecting building design. The architectural technologist is growing into bloom of non-traditional career paths. Our eighth floor FabLab thrums with additive and subtractive processing. Physical and digital models are borne of computational precision, kindling the spirit of experimentation and collaboration. DURAtome and the Iris Pavilion exemplify the fusion of digital and digits. The post fabrication bond between students has far reaching consequences for a department eager to elude its spatial confines. We propose that our students’ reach should exceed their grasp, or what’s an education for?

Sanjive Vaidya, Architect
Department Chair
"...OUR TEAM DEVELOPED THE FORM AS AN ARCHITECTURAL INVESTIGATION INTO THRESHOLDS OF HAPTIC AND VISUAL PERCEPTION."

Mentor: Professor Joseph Vidich

Assitants: Michael DiCarlo & Anner More

Students:
Shadeen Dixon
Allon Morgan
Heraldi Sadmojo
Mimu Sakuma
Claudia Tupayachi

The Iris Pavilion was part of the new International Fabrication Festival hosted by the Faculty of Architecture and the Built Environment and the Fabrication Laboratory at the University of Westminster. The festival featured over 50 innovative cardboard pavilions designed and built by students from Westminster as well as by guest teams from across the UK and around the world. The New York City College of Technology was invited to participate and assembled a team of five students from the Department of Architectural Technology lead by Adjunct Lecturer Joseph Vidich.

The constraints of the festival rules limited each group to a three-meter square cube area and required each team to use cardboard as their primary building material. Conceptually our team developed the form as an architectural investigation into thresholds of haptic and visual perception. Sight lines and forced perspectives were strategically created in order to lead the viewer around, into, and through the pavilion, at once allowing them to observe and be observed themselves. Each aperture or puncture defined a specific set of vantage points encouraging the viewer to circumnavigate the boundaries of the pavilion before eventually discovering the entrance.

The internal chamber of the Iris Pavilion, a cavity through which all the lines of sight are focused, housed three virtual reality headsets pre-programmed with immersive 3-dimensional landscapes of iconic New York City landmarks. The chamber, itself designed to barely accommodate three adults, forced the users to negotiate the physical space surrounding them while simultaneously navigating the alternate 3-dimensional virtual realities of the headsets. The resultant effect was the conflation of the haptic awareness of the body with the disconnected visual perception of the mind as occupied by a new virtual world.

The team received the Kraft Prize for Best Architectural Pavilion.
"...[STUDENTS] INVESTIGATED DESIGN DISCIPLINES OUTSIDE OF ARCHITECTURE AS A MEANS OF CREATING A BODY OF RESEARCH WHICH SPECULATED ON ITS POTENTIAL APPLICATION IN FABRICATION.”

Professor Hart Marlow
Spring 2016

In the fall semester of 2016 students in ARCH 4890: Computation and Fabrication - Performative Architecture investigated design disciplines outside of architecture as a means of creating a body of research which speculated on its potential application in fabrication. The work focused on materializing this research through the representation and digital craft of additive and subtractive manufacturing.

Research began with studying and estranging the process of tailoring and the making of garments as a means to develop material patterns. Material, as it relates to the pattern, was developed as a quasi-textile with architectural properties. The two-dimensional pattern set up the basis for the material application. The pattern inherently had an internal set of geometries which controlled how a garment is fitted to an anatomy and an external set of geometries that informed the figure.

The project was evaluated based on the students’ ability to incorporate multiple performance and aesthetic properties in the discovery of new associations.
OPPOSITE: CLAUDIA TUPAYACHI, CNC MODEL, FABRICATION FALL 2016

ABOVE: CLAUDIA TUPAYACHI, DIGITAL MODELS, FABRICATION FALL 2016
GLASS FIBER

YARN

HDF PARALLEL FINISH
PAINT + RESIN

OPPOSITE: MIMU SAKUMA, DIGITAL MODELS, FABRICATION FALL 2016
ABOVE: MIMU SAKUMA, CNC MODEL, FABRICATION FALL 2016
Smocking is a technique that manipulates fabric by using hand stitching to create areas of tension and release in the fabric. This results in very sculptural effects that can sometimes appear far more complex than they actually are. Before elastic, smocking was commonly used to make cuffs, bodices, and necklines in garments where buttons were undesirable.

Smocking was practical to use in the making of garments so that they were both form-fitting and flexible, hence its name was derived from a "smock," a farmer's work-shirt.
Smocking Shape & Types

- Lattice Smocking
- Lattice Smocking
- Lattice Smocking
- Floweretted Smocking
- Arrow Smocking
- Cribbly Smocking
- Box Smocking
- Fish Scale Smocking
- Barley Smocking
- Cross Stitch Smocking
- Box Smocking
CAST

FINAL MOLD

FINAL TEST
Student Reflection: Marco Dwyer

In the third computational fabrication course offered in the Department of Architectural Technology we explored different ways of looking at common materials in order to discover previously unknown characteristics. One of the methods we explored was material compositing. The studied material was applied formally through the application of 2D patterning, used in the fashion industry, as a means to unfold fabrics that hold 3D forms. This allowed for a two-step process. The first was to develop a functional textile and the second part was to understand how a two-dimensional pattern could develop into a three-dimensional form.

Process

First, the ¼" plexi was laser cut. This plexi represents the formwork, to be laser cut then layered. Layer one of the plexi is an etched cut base. This base along with its etch cut holds the outline for the following layer to be placed on top of it. The layer placed on top is a ¼" piece of plexi that is cut through. This is where the aluminium wire is placed carefully. The wires are joined together at each node to insure all around stiffness in the form. At this point the formwork is ready to be casted in. The low viscosity silicone allows for the mixture to get all large and small spaces, it also allows for the silicone to reach in the etching of the base layer of the plexi formwork in the framework and is then left for a day to cure.

Materials used:

Silicone - Smooth-On Dragon Skin 10 NV
(low viscosity, high performance platinum cure silicone rubber that is easy to use and versatile)

Plexi - ¼" thickness
(thick enough to having a decent thickened skin)

Aluminium wire - 1/32" diameter
(Strong enough to create a form while fitting in the formwork)

Food coloring
“THIS TECHNIQUE CAN BE APPLIED TO ANY TERRAIN DATA WITH ENDLESS POSSIBILITIES.”

Henry Aguilar
“DURA IS A PRODUCT OF THE VIBRANT ETHNIC DIVERSITY OF NEW YORK CITY.”

Solar Decathlon Team

The Solar Decathlon is an international competition that brings together a diverse group of engineering and architecture students. Each team works within this competitive environment and works hard to overcome numerous challenges that require teamwork and problem solving skills. These skills, along with the technical skills gained from the experience of designing and building a functional off the grid house, are invaluable. The opportunity to gain these skills through this intensive experience is unique and rare. The training it provides architecture students significantly enhances their education, providing a live pressure filled environment for the application of creative problem solving skills, requiring an open minded, versatile, and even improvisational approach. This environment for research and active learning is an authentic, cutting edge, real world experience where engagement and dedication to learning are pre-requisites. The Solar Decathlon is at its core Experiential Learning, one that is particularly relevant and efficacious for CUNY students. Design to build projects are a natural component of the curriculum for architectural education. All students should be provided with this type of opportunity. The DURA project for the Solar Decathlon allowed City Tech students to research the latest technology and apply it to a real project. As technology continues to evolve, future students will need similar opportunities to actively learn through direct experience.

The name DURA stands for Diverse, Urban, Resilient and Adaptable:

DIVERSE DURA is a product of the vibrant ethnic diversity of New York City. In each of the last ten years, US News and World Report has listed City Tech as among the most ethnically diverse colleges of its type in the U.S.

URBAN DURA is suitable for construction at the heart of the urban environment. DURA challenges conventional methods of a post-industrial society to meet the evolving nature of urban living.

RESILIENT DURA is designed to respond to an environment rife with climatic change and aims to mitigate disaster damage. Proximity to the floodplain and the rising sea levels of the Atlantic Ocean increases the need for a proactive resilient design.

ADAPTABLE DURA is adaptable in usage and location. Its modularity is designed for aggregation, stackability, and an ability to transform to accommodate various lots throughout the urban environment.
DURAhome is an urban approach to resilient, energy-efficient housing that adapts to the needs of diverse city and its people.

DURAhome is une approche urbaine de résilience, écoifficiante de l'habitation qui se adapte à une ville diversifie et sa gente.

DURAhome это архитектурно-экологическое решение, адаптирующееся к потребностям города и его жителей.
DURA is suitable for construction at the heart of the URBAN environment. DURA challenges conventional methods of a post-industrial society to meet the evolving path of urban living.

DURA is adaptable in usage and location. Its modularity is designed for aggregation, stack-ability, and an ability to transform to accommodate various lots throughout the urban environment.
DURA is designed to respond to an environment rife with climatic change and aims to mitigate disaster damage. Proximity to the floodplain and the rising sea levels of the Atlantic Ocean increases the need for a proactive resilient design.
VIEWS OF KITCHEN

VIEWS OF LIVING & DINING ROOMS
VIEW OF EXTERIOR RAMP

VIEW OF EXTERIOR

TECHNZ

SOLAR DECATHLON
This document reflects on the sequence in which the DURA home was assembled to give a clear summary of the modular construction process.

The foundation footings must be uniquely constructed based on the topography of the location of assembly (in this case, multiple locations) and leveled to a synchronized flat plane. The footings should be organized by an alphabetical and numerical grid system perpendicular in relation i.e: (column A1, A2, D1, D2). Footings located on module lines (split points) need to be accessible for the installation of two hurricane ties that bolt down on each side of the footing to resist differential movement of the modules. Once the structural grid has been laid out the ground should be marked with place keepers. To ensure the structural integrity of the foundation, each footing must be secured into the ground with four steel reinforcement bars. These bars, approximately 6 feet in length, need to be jack hammered through holes in the corners of each foundation footing. This will stabilize the footings and help eliminate any eccentricities.

Once the footings have been placed, the structural framing process can begin. Each module consists of a wood frame with 16” spans between wall studs and the floor and ceiling joists. Each module requires pick points which allow the module to be hoisted during relocation. These points must be coordinated carefully with the structure of each module to ensure stability during the hoisting and placing stage. The same points facilitate the structural joining of the modules into a stable whole. All construction joints between the modules need to be carefully considered due to the fact that this home will be assembled, taking apart, and reassembled multiple times. Specially designed thresholds run throughout the home where two modules meet each other. When the body is positioned in place it needs to be bolted together in a specific sequence from bottom to top. First the floor joists that meet at module lines are bolted, then the columns. Only after these are secure can the roof modules be bolted together. The roof modules are bolted down through the triple layer wind beams that run along the perimeter of the house. Each phase of assembly is a detail oriented process and requires careful attention and multiple rounds of review as the integrity of the bolts is critical to the stability of the house. Additional elements can be connected once the primary modules are secure, including the exterior decking, ramps, and green wall.

At this point, once the structure and envelope are effectively secured and sealed, it is safe to shift to the interior installation of the electrical, mechanical, and plumbing systems. Electrical wiring must be installed and checked by the team electrician or electrical engineer. Plumbing, mechanical, and electrical system sources are consolidated into the mechanical room between the bathroom and kitchen. The installation of these systems requires specialized skills and should be tended to only by those with the proper qualifications and experience. The mechanical system consists of ERV & AC units that should be commissioned to ensure functionality. In this house a fire suppression system is required due to New York City regulations. This system needs to be tested for leaks and functionality as well. Once the systems are tested and operational, interior finishes are installed.

At this stage the energy production system can be installed. A custom steel bracket is fabricated to provide an optimum angle for the solar panels. Once the bracket system is installed, the solar panels with individual inverters are slid into place along rails running between the brackets. The solar panel system also generates hot water for the house, with hot water coils running behind one of the panels. This requires a hook up to the piping system.

Volunteering my time and energy as a member of the team DURA and the Solar Decathlon was one of the best decisions I could have made as an individual pursuing a career in the field of architecture. It has expanded my knowledge on the effectiveness and value of sustainable technologies and improved my skill of effectively working in teams. Most importantly, it has given me a real world experience that classroom learning alone cannot provide.
“No other experience from this school can compare to what I did here [Solar Decathlon].” Jonathan states confidently, a Bachelor Degree student from the Architectural Technology Department. The Solar Decathlon was an invaluable experience for students. They designed a house from scratch, working in teams and collaborating to bring it to life. The experience taught them through first-hand experience, giving the participating students not just a view of the scope of their perspective fields, but also an insight of how to mold themselves into the future. The students were profoundly impacted by the responsibility of creating a house through their own creativity and craftsmanship. While other schools employed professional builders to aid in the construction of their project, the City Tech DURA team executed all the work themselves.

The City Tech students were exposed to different strategies for organizing teams and managing projects. The students had to learn to be versatile as many of the participants of the DURA team never had a specific set job or role in the design and construction. Continuously alternating and changing position, each member worked on almost all components of the project. While this diversity of experience had its benefits, many problems did arise from the lack of consistency and rigorous organization. This turned out to be a significant learning opportunity. While the construction would have been smoother if students were able to focus on practicing one particular skill set, the importance of project management and construction technique became readily apparent to the students. Only a live project could reveal these insights. The students came away with an understanding of the flaws of the process, as well as their individual shortcomings, conscious that they must work on these issues as they progress in their degree and their professional careers.

Design to build projects provide students with a depth of self-awareness and cause for metacognition and reflection that classroom education rarely achieves. One team member reflected: “I had first-hand experience working with people from different trades (something that we don’t necessarily get in classrooms.) I came into the working field already knowing how to talk to clients, engineers, teammates and many other consultants.” Another student noted: “I learned that I need a lot of self-improvement and that I need to grow and develop my mind and body if I want to truly be successful. I need to help others when I see that they are in need of assistance and point them in the right direction.”

The Solar Decathlon was a true team effort, where all participants were challenged throughout the process but shared together in the sense of accomplishment. While researching and applying the latest technology in sustainable and resilient design, the students learned, most importantly, about themselves as learners, as young professionals, and as members of a community needing leadership in sustainability and resilience. City Tech provided this to the participating students of the DURA project, and they in turn hope City Tech will find a way to continue providing it in the future through design to build projects.
<table>
<thead>
<tr>
<th>Contest</th>
<th>Rank</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Architecture</td>
<td>7</td>
<td>74.000</td>
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<tr>
<td>Market Appeal</td>
<td>12</td>
<td>52.000</td>
</tr>
<tr>
<td>Engineering</td>
<td>T5</td>
<td>85.000</td>
</tr>
<tr>
<td>Communications</td>
<td>13</td>
<td>62.000</td>
</tr>
<tr>
<td>Affordability</td>
<td>10</td>
<td>92.014</td>
</tr>
<tr>
<td>Comfort Zone</td>
<td>11</td>
<td>53.240</td>
</tr>
<tr>
<td>Appliances</td>
<td>14</td>
<td>56.526</td>
</tr>
<tr>
<td>Home Life</td>
<td>14</td>
<td>58.594</td>
</tr>
<tr>
<td>Commuting</td>
<td>3</td>
<td>72.250</td>
</tr>
<tr>
<td>Energy Balance</td>
<td>5</td>
<td>88.196</td>
</tr>
</tbody>
</table>

100 points possible per contest

Last updated: Oct. 17, 2015, at 11:21 a.m. PDT

This project ultimately involved the collaboration of over 400 students and 60 faculty members.
This study reports the energy simulation for the Solar Decathlon project by the City University of New York, New York City College of Technology, Architectural Technology Department. Beginning with climate analysis, three types of energy simulation are conducted: daylight, airflow, and thermal analysis. For weather inputs, the New York City is used as a basis.

The report is intended to provide more information about the conducted simulations and analysis, including input climate, building geometry, internal and external loads, and systems. Simulations have helped the project team to estimate the impact of certain alternatives in the design and operation of the building. The results of simulations provided the understanding of where the energy is used and where there are opportunities to improve during the design process, as well as verify the as designed building performance of the final project.

The figure below is the floor plan of the building. The living spaces are arranged along the east-west axis to promote solar exposure. The array of PV panels are located on south to maximize solar radiation gain as illustrated below. The PV panel arrangement is designed to produce energy while also providing shading for the building. Terraces are located on the southwest and northeast corner. Both terraces are covered by the roof which is 12' 6" above the floor.

**TEMPERATURE AND HUMIDITY**

The monthly temperature and humidity data of the New York City are shown. This weather data is recorded in Central Park in Typical Meteorological Year format that has been developed by the U.S. Department of Energy. The daily average temperatures are analyzed for maximum, minimum and average in each month to provide a climate overview. General comfortable temperature ranges are indicated by colored shades: blue for summer (73–80 °F) and orange for winter (68–75 °F), both of which are extracted from ASHRAE 55:2013. Monthly average humidity is also shown.

The temperature in the summer months (June, July, and August) are generally agreeable. However, the high relative humidity near 70% may cause discomfort in July and August especially with the temperature over 75 °F. Temperature ranges in the colder months, October to March, fall below the winter comfortable ranges. In particular, average temperature from December to February drops below 40 °F, which may cause thermal discomfort. Humidity levels stay above 60% due to the New York City’s geographical proximity to the bodies of water, such as the Hudson River and the east River.
The outdoor condition of the project location has comfortable hours in 10.7% of the entire hours of a year. This can be improved by climate specific design strategies for a region. An expert system is chosen for analyzing the annual 8760 hour climate data [1]. This system creates the recommended list of the passive strategies which are proper to the given climate condition from the master list. Note that the recommendations are general for a climate zone, not specific to the proposed design.

As a result of analyzing the climate data, a total of 3297 hours of comfortable temperature can be gained by using passive strategies for a total of 46% comfortable hours. These passive strategies require no additional energy for HVAC systems.

A. INTERNAL HEAT GAIN 21%
Heat transmitted from lamps and appliances, direct solar gain through glazing, transmission due to solar gain on exterior surfaces, and latent heat from people in a well-insulated home contribute to provide internal heat.

B. PASSIVE SOLAR DIRECT GAIN (LOW MASS) 9.6%
It is desirable for a floorplan to be organized so that the low winter sun can fully penetrate the dwelling during the daytime. In New York City, this space should face south.

C. SUN SHADING OF WINDOWS 8.4%
Shading outdoor spaces such as a porch or patio that is oriented to the prevailing winds can further provide thermal comfort by the following functions; storing heat in the winter, further protection of cold winter winds from directly hitting dwelling surfaces, and protection from direct sunlight in the summer.

D. WIND PROTECTION OF OUTDOOR SPACES 5.3%
Sunny outdoor areas provided with external wind protection can extend the interior living areas. Examples include sun rooms, enclosed patios, courtyards, verandas.

E. THERMAL MASS 1.3%
High mass interior surfaces absorb heat from the sun during the day and disperse it throughout the night.
SOLAR SHADING

Solar shading is one of the passive strategies to prevent overheating in the summer and to heat the space in the winter. By using the Sun Shading Chart in the Climate Consultant, weather data is analyzed with the comfortable temperature range (68~80°F). Each hour in the weather data (total 8769 hours) is color coded to indicate the temperature: red for warm/hot, yellow for comfortable, and blue for cool/cold. The window shading can be also visualized to approximate the number of hours that are affected in either exposed or shaded conditions.

Using the sun shading chart, a parametric study was conducted to find an optimal angle for solar shading. While increasing the altitude angle for the south wall, the shaded hours in the warm hours and the exposed hours in the cold hours are observed for the entire year. The tested range of altitude angles is at every 5° from the highest solar angle (73°). The lowest tested angle is 50° where the trend became evident, compared to the higher ones. Based on this study, 65~70° is the appropriate altitude angle, predominantly for passive heating. With these angles, environmental condition of the space may reduce thermal loads for HVAC system.

SEASONAL WIND

The following diagram shows the prevailing wind conditions for seasons in New York City. Prevailing wind is determined by the monthly average speed and the dominant direction. For winter months when low temperature is associated, wind progresses from the north and west. This warrants that the building may use passive design strategies such as wind shading or highly insulated wall toward the wind. In spring and summer, wind comes from either the north, northeast or south. For natural ventilation, the building may locate openings in the north-south orientation and the narrow building shape may maximize natural ventilation. To utilize this strategy properly, however, it is desirable to further consider the microclimate that determines the wind direction and speed in urban areas.

DAYLIGHT ANALYSIS

Daylight analysis of the proposed design was conducted. The analysis period is at every hour between 7AM and 6PM October 1st, which is one of the days when the building will be open to the public. This allows visitors to understand the daylight condition for the building when located in New York City. Three criteria include indoor light level (illuminance), perceived light condition (rendering), and glare level.
An indoor light level is measured at a table height 30” above the ground. The light level is visualized at a 750 max lux scale where the color red represents any instance the occupant experiences illumination above 750 lux. To evaluate the simulation result, the recommended light level is summarized in the table below for residential [2].

Perceived light condition is simulated by a radiance rendered image of a selected view at a given date and time. This helps to observe how a space is day lit, especially how daylight penetrates the dining and living room and affect the quality of these spaces.

For glare level, Evalglare v1.0 is used in DIVA plug in for Rhino. This is a radiance based tool derived from analysis of glare. The metric Daylight Glare Probability (DGP) chosen for average human discomfort [3]. DGP considers overall brightness of the view, position of ‘glare’ sources and visual contrast. Contrast based glare sources will be seen highlighted in color.

### SIMULATION RESULT

The dining room receives enough daylight over 200 lux, in the typical meal times: 8am, 12pm, and 5pm. The full height glazed wall on the south contributed to this by allowing diffused radiation. For the same hours in the day, the kitchen is under lit with less than 200 lux such that it can be difficult to focus on cooking activities. Even if the kitchen is connected to the dining room, the daylight level is decreased as the total volume of space is further away from the glazed wall on the south. This warrants allocating task lights to enhance local viabilities. For all tested hours, no glare was found perceptible.

The living room generally meets the recommended light level, with diffuse light throughout the day. This light level and quality is good for watching TV, music listening, and playing board games. Reading and writing can be better accommodated with task lights.

The adaptable room that is connected to the living room on the south can be regarded as a home office that can be used for other multiple purpose. The light level through the day mostly falls below 100 lux, much less than the recommended level. This is due to room location on the northern part of the building, and the window is shaded by the exterior overhang. This may require additional ambient or task light to serve the designed purpose. Once the proper light level is achieved by electric lighting, the space will have more stable light conditions, without glares on the working plane and monitors.

The light level of the bedroom is above the recommended level. In the morning, from 7am to 9am hot spots were shown over 750 lux. These are due to the direct solar radiation through the easterly located window. However, after 4pm the room becomes dark with lower than 40 lux, which warrants the provision of an ambient light system.

In summary, the daylight level in most rooms serves their activities satisfactorily. However, strategic allocation of task lights may provide better visual comfort and safety for the activities that require high visual concentration, such as cooking and book reading. Ambient light can be added for the walls and ceilings that were visualized in the perceived light result. They may improve visible appearances even if they do not directly relate to certain activities.

### Table: Recommended Light Level for Residential (lux)

<table>
<thead>
<tr>
<th>Residential space</th>
<th>Light level</th>
<th>Residential space</th>
<th>Light level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Living Room</td>
<td>32</td>
<td>Dining</td>
<td>54-215</td>
</tr>
<tr>
<td>Bedroom</td>
<td>54</td>
<td>Home office</td>
<td>215</td>
</tr>
<tr>
<td>Bathroom</td>
<td>54-323</td>
<td>Kitchen</td>
<td>215-538</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DGP Tolerance</th>
<th>DGP Tolerance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.00 - 0.33</td>
<td>Imperceptible</td>
</tr>
<tr>
<td>0.33 - 0.40</td>
<td>Perceptible</td>
</tr>
<tr>
<td>0.45 or more</td>
<td>Intolerable</td>
</tr>
</tbody>
</table>

**Daylight Analysis, New York City, 7 AM-12 PM October 1st**

**Table: Daylight Glare Probability (DGP)**

<table>
<thead>
<tr>
<th>Session</th>
<th>Lux (lx)</th>
<th>Light Source</th>
<th>Glare (GDP %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7am</td>
<td>200</td>
<td>Natural</td>
<td>10%</td>
</tr>
<tr>
<td>9am</td>
<td>150</td>
<td>Natural</td>
<td>5%</td>
</tr>
<tr>
<td>11am</td>
<td>100</td>
<td>Natural</td>
<td>2%</td>
</tr>
<tr>
<td>1pm</td>
<td>50</td>
<td>Natural</td>
<td>1%</td>
</tr>
<tr>
<td>3pm</td>
<td>15</td>
<td>Natural</td>
<td>0.5%</td>
</tr>
</tbody>
</table>

**Daylight Analysis, New York City, 7 AM-12 PM October 1st**

**Figure:** Perceived Light Condition From Dining to Living Room, Glare (GDP %) In a Fisheye View From Kitchen.
The main purpose of the airflow analysis is to provide natural ventilation strategies. The analysis involves the prevailing wind and its impact on indoor airflow for each season at the New York City site. The airflow is further investigated with possible design scenarios, with the windows and doors of the project. The result would provide an understanding of how to control the airflow for ventilation and comfort.

3D geometry tool, Rhinoceros 5.0, is used to create building geometry. The geometry is then used in ANSYS Meshing to generate the computational grid. The boundary conditions are defined in ANSYS Fluent with regional weather data, including wind speed and direction. K epsilon model is used for turbulence. To assess simulation results, indoor and outdoor air speed are adopted.

Wind intake direction and its initial velocity is the key to this simulation, with regional weather data from a local weather station loaded and calculated down to a more realistic velocity with the NSF urban wind speed equation.

In spring, prevailing wind is traveling to New York City from northeast according to the seasonal wind study within the climate analysis (Section 1). The openings on the east and west sides provide cross ventilation and allow air to smoothly flow thru the house. CASE B shows that by having door closed, DURA home will significantly avoid high velocity wind, yet maintain indoor airflow as light air conditioning.
In summer, the primary wind is traveling to New York City from the south. A light air breeze can help an occupant feel a few degrees cooler in summer. The large sliding door located on the south facade will invite a fresh breeze to the interior space and increase the air exchange rate to carry the hot air out of the house. CASE A shows that by leaving this door open, the DURA home's living room will have a few light breeze spots, which can be pleasant in a humid hot summer.

In autumn, the primary wind is traveling to New York City from the northwest. The DURA home's north wall helps prevent chilly wind flowing directly thru the house. Both CASE A and B show that wind speed velocity is significantly lower indoors as compared to outdoors.

In winter, the primary wind is traveling to New York City from the north. Winter wind is not pleasant at all. The DURA home’s highly insulated north wall with no openings protects the house interiors from cold winter wind. CASE A and B show even with the window and door open during summer, cold winter wind’s impact on building is significantly reduced.

VENTILATION STRATEGIES

Proper level of air movement expands summer comfort level; occupants feel comfortable with breeze in a higher temperature condition. Natural ventilation provides the opportunity to reduce air conditioning during summer, reducing cooling energy consumption. However, it is difficult for occupants to predict and control airflow with the multiple windows and doors. The current section proposes a simulation supported method to control airflow indoor.

To understand the openings in the proposed design and its influence on indoor airflow, more scenarios are created and assessed. Sixteen (16) test cases vary with how windows and doors are operated: open, closed, and half open. Wind direction and speed are fixed among tests. The resultant airflow speeds are measured at 50 locations in each room.
The simulation result is analyzed to identify which scenarios promote airflow. Average speeds of all cases are within the indoor comfortable ranges. The acceptable air speed for indoor spaces is generally below 2 m/s [4]. The current study includes an expanded range for other types of residential activities, such as accelerating heat and indoor toxin removal. Hence, 2–4 m/s, wind speed for outdoor gentle breeze, is adopted from the extended Beaufort Scale [5].

Scenario #12 and #15 have the highest average speeds that may be used in the summer to enhance ventilation and passive cooling. These two show the importance of opening B, combined with opening F. Note that even if scenario #8 has both B and F fully open, the average speed is lower than #12 and #15, against intuitive assessment by the team members. The lowest average speed is found in scenario #1, which can be suitable for when minimum ventilation is required. Given the major openings (B and F) are in the same condition as in #8, the role of other openings is revealed, reinforcing the premise of the simulation supported control method.

Detailed energy modeling has been conducted to analyze the annual energy consumption and thermal comfort of the design for the project building. Building energy simulation was performed by using the DesignBuilder software package with EnergyPlus engine. The model started with a three-dimensional representation of the building geometry based on the as-designed floor plans, elevations and other reference information. Envelope constructions were defined in order to simulate heat transfer and solar gains. Internal loads and schedules were developed to emulate how people, equipment and lighting impact heating, cooling and direct utility loads. HVAC systems were created to maintain space or other conditions. Wind speed in m/s based on calculated loads, and all of these were used in an hourly simulation spanning a typical year of use.

MATERIAL AND METHOD

4.1.1 Energy simulation engine
EnergyPlus is the energy simulation engine with the DesignBuilder user interface. EnergyPlus is a whole building energy simulation program, developed by the U.S. Department of Energy. EnergyPlus models heating, cooling, lighting, ventilation, other energy flows, and water use. EnergyPlus has been validated under the comparative Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs BESTEST/ASHARE STD 140.

4.1.2 Key construction properties
- Walls: R 41
- Windows: R 8.4, SHGC 0.61
- Roof: R 52 – R 76
- Floors: R 46

4.1.3 Benchmark for annual energy use
Simulation results of the new building are compared with the existing benchmark data from the EnergyStar, which uses Energy Use Intensity (kBTU/ft²/year) with more than 100,000 buildings. In the residential category, multifamily housing, residence hall/Dormitory, and other lodging/residential are considered. The annual source energy will be used following EPA recommendations. Source energy considers raw energy delivered to the site. It incorporates all transmission, delivery, and production losses. Therefore, the simulation results for the benchmark building are desired to be in the range of 114.9 to 155.5 for source EUI.

SIMULATION RESULT

Simulation results are analyzed for annual energy use intensity with monthly breakdown energy use for heating, cooling and lighting. An MVPDAE are also analyzed to understand the energy use in conjunction with the proposed building design. Finally, indoor comfort is assessed for occupants’ thermal sensation.

ANNUAL ENERGY USE INTENSITY

For source energy, energy use intensity of the project building is 73.15 kBtu/ft²/year. This is roughly 45% more efficient than the EnergyStar benchmark data for residential buildings.

MONTHLY ENERGY USE BREAKDOWN

Total energy use is broken down to each month. Cooling consumption occurs from April to November, with its peak demand by 480.72 kBTU in July. Heating consumption occurs from November to April, with its peak demand by 2355.56 kBTU in January. Lighting consumes energy more evenly through each month, ranging between 186.87 and 269.73 kBTU. Due to seasonal fluctuation of daylight availability, lighting requires more energy in the winter than in the summer.
Much higher range of solar heat is gained than the bedroom, indoor daylight availability for a summer day and winter day. Monthly heat balance of the dining room is shown as well as heating system. Low heat gains in the winter months are supplemented by the infiltration shows its effect for heat removal in the summer. The cooling system. The internal natural ventilation and external heat gains in the summer months are mainly offset by the changes, high in the summer and low in the winter. The high gain.

The heat balance of the bedroom is shown. Main gains are with zone sensible cooling, shows the heat loss that offsets this result (Section 5.3.3), especially to the bedroom. Another contributor is heat loss by internal natural ventilation, which is due to the open floor plan. Since there is no obstruction to the adjacent dining room, conditioned air can be freely exchanged. This open floor plan also contributes to the zone sensible cooling. The zone sensible cooling for living is up to 1780.419 kBtu/ft², which is more similar to the dining room (2184.456 kBtu/ft²), than to the bedroom (1085.872 kBtu/ft²).

THERMAL COMFORT

To assess thermal comfort of the building, hourly indoor temperature is analyzed with ASHRAE 65 thermal sensation. Fanger’s Predicted Mean Vote (PMV) model is used for thermal sensation scale. PMV accounts for air temperature, radiant temperature, clothing, activity level, humidity, and air speed[6]. Indoor temperatures are shown for 48 hours from June 21, with the recommended comfort range 68~75 °F in blue colored shades. For the same period, thermal sensations by occupants are between neutral or slightly cool in the building. This is reasonable since outdoor temperature is mostly agreeable most of the time, and the heat gain in the summer was relatively small, based on the heat balance analysis at the Section 5.3.3.

For 48 hours around December 21, thermal sensation of the occupants is cool in the building. Low heat gain in the winter contributed to this result (Section 5.3.3), especially with low outdoor temperature of an average of 40.65 °F. The recommended comfort temperature is shown in the orange colored shade. However, thermal comfort in the winter may be improved by added clothing, lower air speed, and increased activities.

DESIGN EXPANDABILITY FOR HOME OFFICE

2.6% of the U.S. employee workforce (3.3 million people, not including the self-employed or unpaid volunteers) considers home their primary place of work, according to the latest American Community Survey data [7]. This is a significant increase of 80% from 2005. Since working at home is an increasing trend, the DURA home can be further adapted to facilitate this condition.

The Adaptable space on the north side can be configured as a home office. An office space includes higher internal loads than a residential space. It requires higher level of lighting and more equipment such as computers, monitors, and printers. ASHRAE 90.1 2010 baseline LPD for enclosed office space is 1.11 w/sf, and one work station composed of a laptop computer, 17” monitor, and a laser printer has equipment load of around 370 watts [8]. The significant characteristic of the home office scenario is operation schedule where the space is utilized normally from 8am to 6pm a day.

The additional devices with later operation hours increase the electricity consumption, but decrease the heating load. With an assumption that the DURA home is located in New York, heating driven climate, the increase in internal heat gain helps reduce heating energy consumption. It is significant in the as designed case that the home office is on the north side of the building with less solar heat gain, the as designed case that the home office is on the north side of the building with less solar heat gain.
REFERENCE


* Acknowledgement. The study is conducted and documented by Prof. Jihun Kim, MuJun Chen, Noemi Rovirosa (the New York City College of Technology), and Chanyang Shin (the Syska Hennessy Group, Inc.)
“THE PROJECT WAS INSPIRED BY ABSTRACT, GEOMETRIC REPRESENTATIONS OF NATURAL PHENOMENON.”

Anner More & Franklin Rojas

Student Team:
Mimu Sakuma
Allon Morgan
Heraldi Sadmojo
Anastasiia Shaiukova

StratusQuo, designed for Brooklyn Boulders, a rock climbing gym, explores a tessellated geometry inspired by rock formations and mountain climbing. The intent of the project was to encourage people to visit the facility by installing a prominent design feature visible from the street. The project was inspired by abstract, geometric representations of natural phenomenon. Computational geometry and digital fabrication were used to derive the final forms.

The installation was located near the entrance to in order to mediate between the exterior and interior of the facility. The concept was to create a tessellated cloud that reminds climbers of being high in the mountains. The tessellated cloud is made up of repetitive modules. The rhombic dodecahedron was chosen to be the basic module because of its many unique attributes. The rhombus has equal lengths along all of its edges which gives the form an ease of constructibility. The 3-dimensional shape also equally distributes forces to make it structurally stable.

The installation has received positive feedback from the community and has enticed more people to visit the facility. The final installation was made possible by Brooklyn Boulders and Voodoo Manufacturing.
The rhombic dodecahedron was chosen for many of its unique attributes. One being that in order to create the 3D shape ones uses the same geometry throughout the whole composition of the shape which is a rhombus with equal edge lengths. This gives the form an ease of constructibility and because of its equal edge lengths the 3D geometry has an equilibrational force distribution making it structurally stable.

2D panels with added pattern.
An organic pattern was chosen because of its ability to control the porosity of light falling on the object.
The openings were controlled to allow enough material on the edges to be left in order to connect them to the form.

Single panel with pattern for mounting
A single cell.

A single cell with a triangular division of units for ease of fabrication.

Typical connection of fabrication units.

Wooden dowels and custom 3D printed connections were used to create the form.
3D printed connection detail. The 3D print is symmetrical on all sides which gives one the ability to create the units at any starting point.

Exploded axon showing connections.

Final cell configuration with panelized faces.
Tessellation of cell units throughout the space.

Student Reflection: Atmeer More

This project was made possible by Brooklyn Boulders and their artist residency program. Without their support this project would never have come to life. The opportunity to participate in this project came in an unexpected way. Franklin and I were at a store and met a future Brooklyn Boulders’ artist resident named Mandy Mei. We start talking about traveling, adventure, and art, and as it turned out she attends City Tech as well! She invited us to go to Brooklyn Boulders and introduced us to the artist residency program. I was really excited at the idea of having the opportunity to participate in the program and to possibly create something other than paper models. I submitted a proposal for the project and weeks later I received a call notifying me that the project was selected. Shortly afterwards I called Franklin and the rest is history. Without the support, enthusiasm, participation, and knowledge of digital fabrication from many City Tech students and alumni the project wouldn’t have been such a success.
“THE SYSTEM EMPLOYS PARAMETRIC AND SOLID MODELING METHODS WITH PRODUCTION BY STREAMLINING COMPUTER NUMERICALLY CONTROLLED (CNC) MANUFACTURING THROUGH NOVEL DETAILING AND PRODUCTION TECHNIQUES...”

Faculty Mentor: Professor Philip Anzalone

Emerging Scholar Students:
- Starky Acevedo
- Adel Yaseen
- Asli Oney
- Andres Espinal
- Alyssa Ayow
- Cyntia Persaud

The Adaptive and Autonomous Tensegrity System (AATS) is a project for incorporating a computationally driven design-to-installation workflow into building components. It involves the deployment of a geometrically-active structure that is efficient and automated, with potential uses as part of an active façade system. The system combines parametric- and solid-modeling methods with production workflow by streamlining computer numerically controlled (CNC) manufacturing by means of novel detailing and production techniques that assure efficient manufacturing and assembly. The AATS system focuses on computationally-produced full-scale performative building systems and the ways in which they can be applied to innovative uses in the building and construction industry.
INTRODUCTION

The basis for the structure of the AATS is the use of tensegrity, an advanced structural concept that looks to the future as an innovative system where a continuous network of efficient axially-loaded high-tension cables are configured with isolated structural compression members in such a way as to delineate the system spatially to provide a highly efficient, dynamic, and exciting form. As a structural concept, tensegrity is a relatively new invention, developed only fifty years ago by Buckminster Fuller and Kenneth Snelson. Its potentials are now being realized through the computational capability of advanced hardware and software.

COMPONENT

Image A displays one component in its expanded state, and image B displays the same component in its contracted state. Due to the flexibility properties of the tensegrity structure, the component will be able to expand and contract as stresses are applied to the cables. When used as a shading device, it can adjust its shape according to the position of the sun. The frame alone is extremely light and stable, balanced according to the principles of tension and compression.
CONCLUSION

The structure self-tunes through geometric transformation as it seeks a state of equilibrium. It counters vibration and dampens movement by dispersing the forces in its naturally-resilient tensegrity system. The lightness of the structure alleviates the need for extensive support from external structures, providing an economical and less invasive attachment condition to new and existing buildings.
"The work in this fabrication studio is based on design process rather than on design concept."

Anastasiia Shaiukova

The work in this fabrication studio is based on design process rather than on design concept. The main objective of this project is to develop a landscape and architectural intervention through a series of manipulations of the given initial curves and surfaces. This design started off by experimenting with different combinations of curves to create an organic flowing surface to represent the landscape. Next, surface torus curves were extracted to develop an initial architectural intervention. A cutting pattern was developed based on the shape of its surface, and later applied to the initial architectural form. Experimenting with the density of the pattern and the nature of the materials, application of forces dictated the shapes of folding planes. The final folding plane was thus generated and placed on the landscape as the final architectural intervention.
LIKE IN ANY PROPHECY, PROJECTING ARCHITECTURE IS PORTRAYED BY A BRIEF YET INTENSE MOMENT INHERENT IN THE OVERALL PROCESS.

Building Technology IV  
Professor Severino Alfonso  
Fall 2016

Students:  
Espinoza Edinboro  
Leitch Chaudhury

INTRODUCTION

The following text explores the digital technologies impact on the architecture discipline both in the academic and in the professional realms. With the term Projecting in mind, the essay involves the architect as a visionary and a holistic figure that rightfully determines how buildings and cities should be. Following this idealistic proposition, the text identifies two actual figures that have come forth as a result of architecture’s digital integration: the digital manager and the digital craftsman. This paper is concerned with an inflection point subverting normative design processes, a point that would explain the abundance of conceptual arguments driving the discipline today and would also play an important role in the disappearance of contemporary global manifestos in architecture.

PROJECTING ARCHITECTURE

Architecture agglomerates a surplus of sub-disciplinary approaches. Many architecture movements of the present, echo some of the radical architecture projects of the 1960s and 1970s. These were founded in the belief that technology and the humanities would merge into a holistic project and intended to bring the arts and the social studies together to encourage social interaction and human participation in the design. Cybernetics, information technologies or game theory are among the emerging sciences that shaped the focus of avant-garde architects of that period who implemented them both as a design tool and as a theoretical discourse. These technological advancements can be distilled into two: the computer and the internet. The former brought computational algorithms in the form of informational technologies and the latter enabled instantaneous interchange of information among the digital craftsman. This paper is concerned with an inflection point subverting normative design processes, a point that theory identifies two actual figures that have come forth as a result of architecture’s digital integration: the digital manager and the digital craftsman. This paper is concerned with an inflection point subverting normative design processes, a point that
rendering image that exacts an uncontrollable premonition. A mental depiction that fancies on an everlasting aesthetic image, hyper-realistic materials and a gleaming identity. These come together in conforming a virtual architecture that is currently defined in a computer laboratory, a digital realm that includes algorithm protocols, computational operations, and data archives, all collaborating in the making-process of an in-vito architecture byproduct. These computer laboratories have taken advantage of a high level of flexibility and a uniform-time management during their production cycle.

The coordination time for the development of an architecture project has shrunk exponentially thanks to the digital technologies. The first commercial computer-aided design and drafting software application running on a microcomputer was 1982's AutoCAD. Since then, architecture has increased its production speed and efficiency due primarily to the installment of CAD-based software in the office. In recent years, the architecture office has faithfully accepted the new building information modeling interphase (BIM) without ample questioning of its indirect implications. These softwares are specific to the construction field and are strongly based on the parametric control of architecture types and families. Under this scenario, Projecting assumes a digitally managed organization and control that leaves no room for inaccuracy, weakness or imperfection in the creation of architecture. The discipline is taking a clear path towards securing and safeguarding the design process by increasingly repelling accidents, misunderstandings, or difficulties thus becoming less organic, intuitive, or spontaneous. Architects should invest more on their intuition capacities, but instead they have privileged their rational capabilities even through their ration d’être is based on their foreseeing capacities. Intuition has been lost from the architecture conception having prioritized optimism and selecting processes over questioning and examining the project’s sequential evolution. A successful design process today is one where all inconveniences have been accurately planned in anticipation to the actual construction phase. This is an honest and transparent proposal throughout, yet it forbids any hidden agenda and it advocates for an architecture and shape by a digital manager rather than by a thinker or a maker of spatial environments.

Projecting still has every bit to do with the envisioning of a future, but today is consumed within the managerial boundaries of the digital information. Its actions emerge from multiple forecasting protocols that consolidate instantaneous into series of script-controlled, semi-expected outcomes. As an example, material research is conceived both in academia and in the office space as a heavily parametric based research process that bifurcates and expands with no clear manifesto supporting it. In time, academia shifted its attention towards form finding protocols and the creation of conceptual narratives for the construction of apparently new architecture territories. On the other hand, the office has veered towards modularity and replication as an opportunity to “dress” the building with new aesthetic standards and to reduce costs and implementation time during the construction phase.

THE DIGITAL MANAGER

On his first book of De Architectura, “On the Training of Architects”, Vitruvius wrote the following in regard to technology and architecture:

“The science of the architect depends upon many disciplines and various apprenticeships which are carried out in other arts. His personal service consists in craftsmanship and technology. Craftsmanship is continued and familiar practice, which is carried out by the hands in such material as is necessary for the purpose of a design. Technology sets forth and explains things wrought in accordance with technical skill and method so architects who without culture, aim at manual skill cannot gain a prestige corresponding to their labors, while those who trust to theory and literature obviously follow a shadow and not a reality. But those who have mastered both, like men equipped in full armor, soon acquire influence and attain their purpose.”

Vitruvius hints first to the idea of architecture as a science which depends on a wide variety of disciplines and apprenticeships. Second, he advises against the separation of theory and skill thus attaining an architecture concept where both are mastered. The two notions of disciplinary dependency and the alignment between skill and theory have prompted a new arrangement. The architect as a manager and the architect as a craftsman emerge from Vitruvius’ text, yet they have had different connotations depending on the historical period. A distinction that reassembles the arguments behind the architect as a specialist or a generalist but concentrates on the working relationships that have mutated given each technological imposition. Behind this conflicting pair, the coordination of the architect’s capacity to assume or delegate control of the design process is found.

The internet has infused the architect with vast resources in the form of digital archives, and has made it easy to share digital files between the disciplines involved in an architecture project. While the internet helped architects increase their production speed, it also facilitated large companies’ tendency to outsource subsidiary tasks. In that regard, architecture has rediscovered its foundation by expanding its boundaries outwards and in multiple directions away from its orthodox center. Following again Vitruvius’ writings, contemporary architecture has shatter away from the needed cohesion that should exist between his Three Principles of Good Architecture: Firmitas (Durability), Utilitas (Utility), and Venustatis (Beauty). Present design processes have focused on each of these principles with effective independence, but when it came to correlating them, the processes have relied fundamentally on managing and controlling multiple layers of information that overlap but do not necessarily interfere with each other. Projecting in this case, has fragmented it not explored architecture’s functional organs into distinct parts as if they belonged to different bodies. The building’s facade for example, has been separated from its core, the structure from its landscape organization, the mechanical system from its missing study, and so on and so forth. The bond existing under the intrinsic architecture definitions has been lost, thus has taken place within each isolated components’ systems of organization in the form of irreparable grading, etc. The digital manager today perpetuates this disintegration process by first separating and cataloging the different building organs and then by restructuring them according to alternative
principles that are utterly unrelated to architecture itself. During the last thirty to forty years, the architecture corporate office has successfully operated under this preference and has improved its overall production tactics close to a point of business perfection.

THE DIGITAL CRAFTSMAN

The digital craftsman operates thanks to the high level of fragmentation in the architecture production line and has been supplying the digital manager with conceptual and material sub-systems. The architect as a digital craftsman underlines a simple disciplinary principle: to understand architecture as a framework of parts that come together into a final product. Projecting is directed here along iterative testing processes that investigate on a series of independent details and their interrelationships. The digital craftsman is in charge of producing a unit that belongs to a bigger organization. He operates with manufacturing logic on the efficiency, adjacency and technical resolution of each component and does it with leading knowledge of the digital fabrication and parametric design tools at the time. His focus is not concerned with architecture’s core definitions, and it therefore eludes any theoretical entitlement to it. The digital craftsman stimulates numerous conceptual formalizations, but only with much difficulty will he instigate an architecture manifesto of interest unless he takes action in searching for a holistic identity in the overall project.

APPENDIX

Architecture production today is a puzzle-like dilemma. As in every puzzle, the instructions are straightforward, and the final outcome is premeditated. The puzzle is organized in multiple small packages, each of them filled with distinct pieces that are recognized and put together by each of the many players involved. None of these players can nor will engage with the overall output, except one player, the manager. She controls and dictates the place, time and rules of the game. Even though she does not arrange the pieces from the original packages, the manager has the key to empower the rest of the players’ reason to play. In appearance, the game follows a surreal opportunity to outsmart every player’s individual excellence, but instead it turns into a game ruled by dullness and with no catholic aim.
15 levels of precast concrete floors

West Curtain Wall System
with Aluminum Mullions,
Terra Cotta and Stucco Sand
Finish Coarse Panels

This side of the facade has two emergency exits and a loading dock area

North Curtain Wall System with Aluminum Mullions and Glaze windows, Terra Cotta and Stucco Sand Finish Coarse Panels

This side of the facade has one emergency exit and a secondary entry

East Curtain Wall Systems Facing Jay Street. These systems are made up of Aluminum Mullions and Glaze windows, Terra Cotta and Stucco Sand Finish Coarse Panels

This side of the facade has one emergency exit and a secondary entry

South Curtain Wall Systems Facing Tillary Street. These systems are made up of Aluminum Mullions and Glaze windows, Terra Cotta and Stucco Sand Finish Coarse Panels

The lower side facade will be connected to an atrium. This facade has a secondary entry

This structural frame work is made of column and beam
Two Way-Slab Structural System

Section 14 Rebar Detail

Level 14 Rebar Detail Axon

Level 14 Column Rebar Detail

Partial Structural Axon
“CONSTRUCTION IS COMPLEX AND FAILURES HAPPEN. SOMETIMES THINGS SIMPLY DON’T GO WELL. YOU HAVE TO BE WILLING TO EXPECT THIS FACT.”

Professor Mars Podvorica

Mars Podvorica, adjunct professor known for a challenging Design III course offers his insight and shares practical experiences from his own design build projects. In an on-one interview we discuss the architect-client relationship and how some clients are more willing to experiment than others, the limitation of an architects’ ‘paper’ designs and some contractors are capable and willing to produce prototypes and mockups. While most projects are a success, others do not have the expected results. We review a few of Mars’s noteworthy projects and then elaborate on the implementation of a unique design build strategy.

Q: Mars, please tell me a little bit about your background. Where did you study architecture?

A: After initially studying in Prishtina, the capital of Kosovo, I came to New York and completed my degree at Pratt Institute in Brooklyn.

Q: Why did you decide to work in the New York / Tri-State Area?

A: The urban context, living and working in the city provides me with the opportunity to lead the lifestyle I enjoy while also running a successful practice. City life provides unique experiences, for example, being able to walk to get a cup of coffee in the morning, an experience that is less common in suburban or rural life. I made a lot of connections in the [architectural] industry during my time at Pratt and it made good business sense to stay in New York City. If you plan to work for yourself, it is important to make long lasting relationships with trade professionals and customers.

Q: You currently have your own architectural design firm, MAP’D Studio. When/Why did you decide to start your own company?

A: Right out of school I worked for an architectural design firm, and after years of hard work I eventually became a junior partner there. As time passed I eventually reached a point when I wanted to start my own company. It is never easy but when you see the opportunity you must take the leap. It is important to keep good relations with your former employer.

Q: With respect to Design-Build, has it always been a part of your work floor?

A: No it has not. To be clear not every project is a design-build project. About 3 years ago there was a complex project; the problems were eventually solved by taking control and arranging the trades myself. When the project allows for it, involving the entire team can solve things.

Q: The Architect and Client relationship is always important, but in the case of a design-build project it is particularly significant. When you are working through a concept with the client, is there a ‘typical’ process or procedure you follow since no two clients are the same?

A: The hardest part is educating the client; doing your best to guide them to what you consider to be the ideal or right solution. For every client, we [MAP’D Studio] try our best to make a great project out of every project. Often times we, the architects, may not think that things are ideal. Whether it’s the budget, schedule, client, site or the existing configuration, we routinely feel as though the situation is less than ideal. It is important not to make judgments that prevent us from being creative. Work with what the project provides you and make an interesting project out of every project. Work closely with the client.

Q: How do you navigate the relationship with a client who (does/doesn’t) want to do something exciting, or is an otherwise (easy/difficult) client?

A: It is not about the ego; we attempt to offer solutions. In a creative way, you must make your case to the client to consider your ideas. Try the hardest you can, do everything in your power. If you feel as though you did everything you could, and they still don’t want to do what you think is exciting, remember the project still needs to be completed. Early in my career I would bend to the will of the client more frequently, but my business has grown and now I am more selective with my clients.
Q: Architects’ ideas exist on paper and in various digital forms. At what point, do you start to generate mock-ups and prototypes to present to the client?

A: Mock-ups are not just for the client. First, the design team must come to some agreement; sometimes implementing models as the first attempt at solving problems. We then use 3D renderings to further our understanding of the solution and present these to the client. Once we have the client on board with the concept, we proceed to physical models in order to help us crystallize our ideas.

Q: The ability to produce a physical representation of the concept requires, among other things, materials, machinery and expertise. Tell us how you integrate the contractors in this phase of the design process. What does the contractor have to offer?

A: Consultants assist us with tasks that we consider outside of ordinary or typical architectural services. We like to engage them as early as possible; especially with regards to cost control. The sooner we have our tradesmen guiding us, the quicker we can make a decision. The specialized trades offer unique perspectives on efficiency and routinely offer multiple solutions that we have not considered. It is then our responsibility to select the best solution to the client.

Q: Do you have contractors that you prefer to work with? How did you arrive at the point of a successful working relationship with these contractors?

A: Over time you carefully select the consultants you work well with. Some contractors are provided to you by the client, others are referred to you by colleagues and others you just find along the way. If you see the work of a tradesman you like, it does not hurt to ask, “Who did this, can I get in touch with them?” Making connections is such an integral part of what we do as architects, we must always be on the lookout for a new contact. Slowly but surely, you will pull together a team of trustworthy consultants.

Q: When a team member lets you down, you bear the brunt of the blame. Can you speak about a time when a teammate didn’t do what was asked of them?

A: Construction is complex and failures happen. Sometimes things simply don’t go well. You have to be willing to accept this fact. Subs and consultants, we were depending on them just disappeared, never to be seen or heard from again. You need to have perseverance in the toughest of times and work hard to get through the difficult situations. It is painstaking work to gather a team of consultants you can count on.

Q: More often than not your design-build endeavors are successful. Tell me about your most noteworthy projects and why they were successful.

A: The following projects are worth mentioning and I am proud to say that City Tech Students were involved in the design process of all of them.

Bethlehem Restaurant: Line work from original blue prints of Bethlehem’s historic Hill to Hill Bridge were used to create perforated panels that were incorporated into the load bearing wall that divides the dining room with the bar.

Calabria Pizza: 200 crates populate the ceiling to represent the fresh food coming from the crates of local markets while fresh vegetables rotate on the crates in the counter. 700 spoons, as a synonym of healthy food, create the mural that also incorporates a map of Italy highlighting the region of Calabria.

Libra, UWS apartment: To provide natural light into the area used as a library and work space by the client who is a writer. The kitchen backsplash was eliminated and the overhead cabinets were raised which impacted the bookshelves on the other side of the wall.

KST House: The geometry of the facade comes from the traditional carpets of the area where the client is from. Three carpet elements were borrowed, rearranged and recomposed to create panels that wrap a portion of the house.

The following projects are worth mentioning and I am proud to say that City Tech Students were involved in the design process of all of them.

Bethlehem Restaurant: Line work from original blue prints of Bethlehem’s historic Hill to Hill Bridge were used to create perforated panels that were incorporated into the load bearing wall that divides the dining room with the bar.

Calabria Pizza: 200 crates populate the ceiling to represent the fresh food coming from the crates of local markets while fresh vegetables rotate on the crates in the counter. 700 spoons, as a synonym of healthy food, create the mural that also incorporates a map of Italy highlighting the region of Calabria.

Libra, UWS apartment: To provide natural light into the area used as a library and work space by the client who is a writer. The kitchen backsplash was eliminated and the overhead cabinets were raised which impacted the bookshelves on the other side of the wall.