2017-2018 Collaborative Practice

CULTURAL CONSTRUCTION
32332

The CULTURAL CONSTRUCTION Studio leverages the specialized assets of a diverse ensemble of actors to restore the childhood home of world-renowned playwright August Wilson located in Pittsburgh's Hill District. In jeopardy of being lost due to decades of neglect, this culturally significant structure is the focus of a community driven effort to establish a new cultural hub providing programming and education in the arts for youth and adults.

Efforts to restore the childhood home of August Wilson have been on-going for over 10 years. Restoration to-date has been led by a small group of professionals and community leaders and has primarily focused on stabilization of the structure to prevent collapse. Now that the building is stable, the university-affiliated non-profit design-build studio was asked to help with the design and construction of the next phase of work: the restoration of building's Bedford Avenue facade, the principal public interface to the Hill District and global communities.

While culturally significant, the building is not architecturally significant. It is a modestly sized, utilitarian, mixed- use structure that represents a larger contextual backdrop. It is one of many buildings like it in a disinvested neighborhood – one where authenticity of place is threatened by progressive decay and demolition. The effort to restore a single building of great cultural relevance offered the opportunity to explore strategies that are transferable in preserving modest structures throughout a landscape where authenticity of place is at risk. Reality Computing, digital fabrication, and traditional craft methods developed and employed by the studio hold promise for enhancing efficacy and achieving affordability in the broad scale preservation of vernacular, context-forming structures that maintain the cultural identity of our communities.

Programmatically, the studio utilized three modes of practice: 1) RECONNAISSANCE including historical research and analysis of existing conditions with advanced capture technology; 2) VIRTUAL RECONSTRUCTION using enhanced digital workflows and physical prototyping to resolve project design and construction documents; and 3) PREFABRICATION of full-scale, integrated construction that represents value to society. Victorian elements of the facade designed/restored by the design build studio included: 1) Upper Cornice and Box Gutter, 2) Upper Brackets, 3) Window Hoods, 4) Storefront Cornice and Signboard, 5) Storefront, 6) Pilasters. Spiritually, the studio aspired to manifest the spirit of Wilson's "Pittsburgh Cycle" series of ten plays through development of storytelling tools and engagement practices that link technical dimensions to pride in place, prospect for

home, and the aspiration of scaffolding socio-economic mobility.

The vertically-integrated 18-unit studio and 9-unit co-requisite course featured collaboration between students, community leaders, educators, professionals, a regulatory body, fabricators, and material suppliers who each brought a unique skill-set to the table. Through a variety of experiences and challenges, students developed skill sets in communication, research, technology, technical delineation, fabrication, storytelling, and project delivery. Of greater significance was the development of sensibilities in empathy, knowledge of place, and humility.

CULTURAL CONSTRUCTION

The CULTURAL CONSTRUCTION Studio leverages the specialized assets of a diverse ensemble of actors to restore the childhood home of world-renowned playwright August Wilson located in Pittsburgh's Hill District. In jeopardy of being lost due to decades of neglect, this culturally significant structure is the focus of a community driven effort to establish a new cultural hub providing programming and education in the arts for youth and adults.

Efforts to restore the childhood home of August Wilson have been on-going for over 10 years. Restoration to-date has been led by a small group of professionals and community leaders and has primarily focused on stabilization of the structure to prevent collapse. Now that the building is stable, the university-affiliated non-profit design-build studio was asked to help with the design and construction of the next phase of work: the restoration of building's Bedford Avenue facade, the principal public interface to the Hill District and global communities.

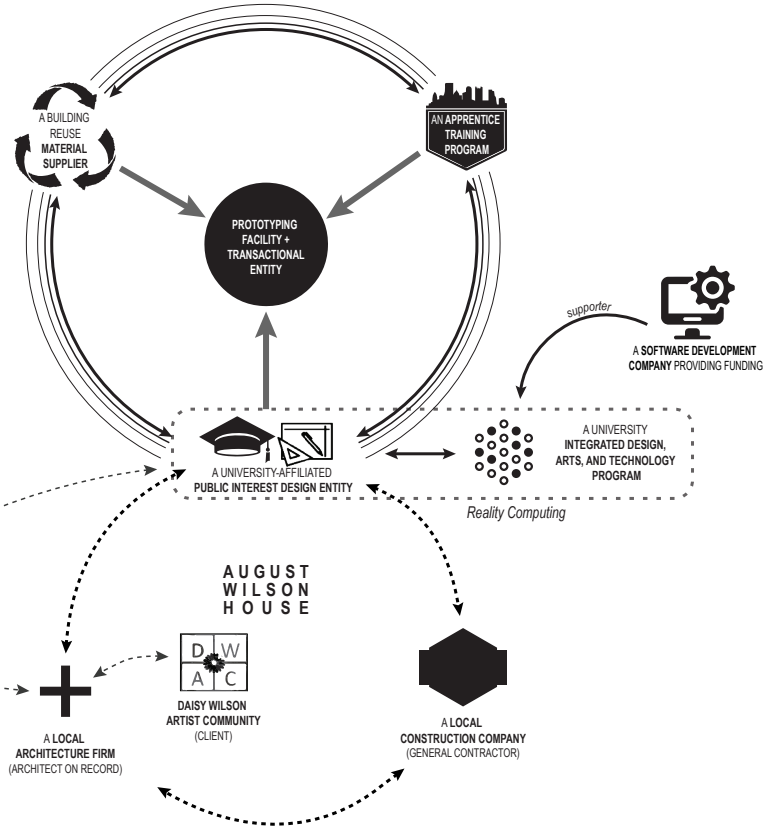
While culturally significant, the building is not architecturally significant. It is a modestly sized, utilitarian, mixed- use structure that represents a larger contextual backdrop. It is one of many buildings like it in a disinvested neighborhood – one where authenticity of place is threatened by progressive decay and demolition. The effort to restore a single building of great cultural relevance offered the opportunity to explore strategies that are transferable in preserving modest structures throughout a landscape where authenticity of place is at risk. Reality Computing, digital fabrication, and traditional craft methods developed and employed by the studio hold promise for enhancing efficacy and achieving affordability in the broad scale preservation of vernacular, context-forming structures that maintain the cultural identity of our communities.

Programmatically, the studio utilized three modes of practice: 1) RECONNAISSANCE including historical research and analysis of existing conditions with advanced capture technology; 2) VIRTUAL RECONSTRUCTION using enhanced digital workflows and physical prototyping to resolve project design and construction documents; and 3) PREFABRICATION of full-scale, integrated construction that represents value to society. Victorian elements of the facade designed/restored by the design build studio included: 1) Upper Cornice and Box Gutter, 2) Upper Brackets, 3) Window Hoods, 4) Storefront Cornice and Signboard, 5) Storefront, 6) Pilasters. Spiritually, the studio aspired to manifest the spirit of Wilson's "Pittsburgh Cycle" series of ten plays through development of storytelling tools and engagement practices that link technical dimensions to pride in place, prospect for home, and the aspiration of scaffolding socio-economic mobility.

The vertically-integrated 18-unit studio and 9-unit co-requisite course featured collaboration between students, community leaders, educators, professionals, a regulatory body, fabricators, and material suppliers who each brought a unique skill-set to the table. Through a variety of experiences and challenges, students developed skill sets in communication, research, technology, technical delineation, fabrication, storytelling, and project delivery. Of greater significance was the development of sensibilities in empathy, knowledge of place, and humility.

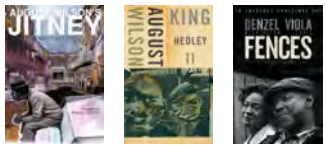
Photograph during construction taken just underneath the August Wilson House's upper cornice. Small paired upper brackets and window hoods are installed. In the background, a member of the general contractor team fastens a mounting block to the masonry facade in preparation for installation of the large upper brackets.

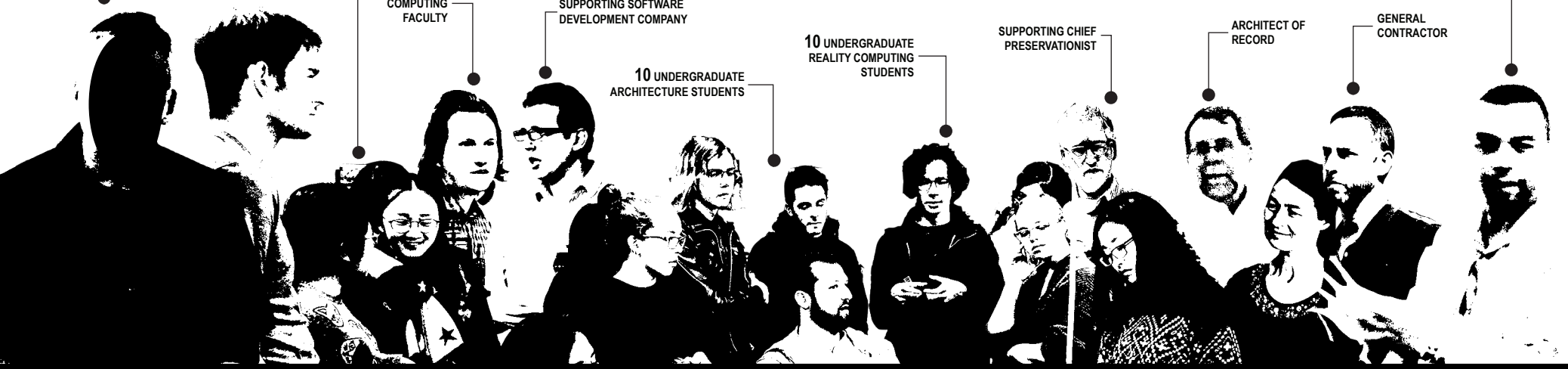
A NETWORK OF ACTORS



AUGUST WILSON

August Wilson is regarded by many critics as one of the leading American playwrights of the late-twentieth century. His plays, which explore themes of personal identity, racial injustice, the struggle for power, and spiritual growth in African-American communities, have been recognized with numerous awards, including seven New York Drama Critics Circle Awards, two Tony Awards and two Pulitzer Prizes between the years of 1980 and 2005. Most recently, his work is known for the Academy Award-winning 2016 film *Fences* directed by Denzel Washington and based on Wilson's Pulitzer Prize-winning play of the same name.





1000's OF CULTURALLY SIGNIFICANT BUILDINGS AT RISK OF DEMOLITION

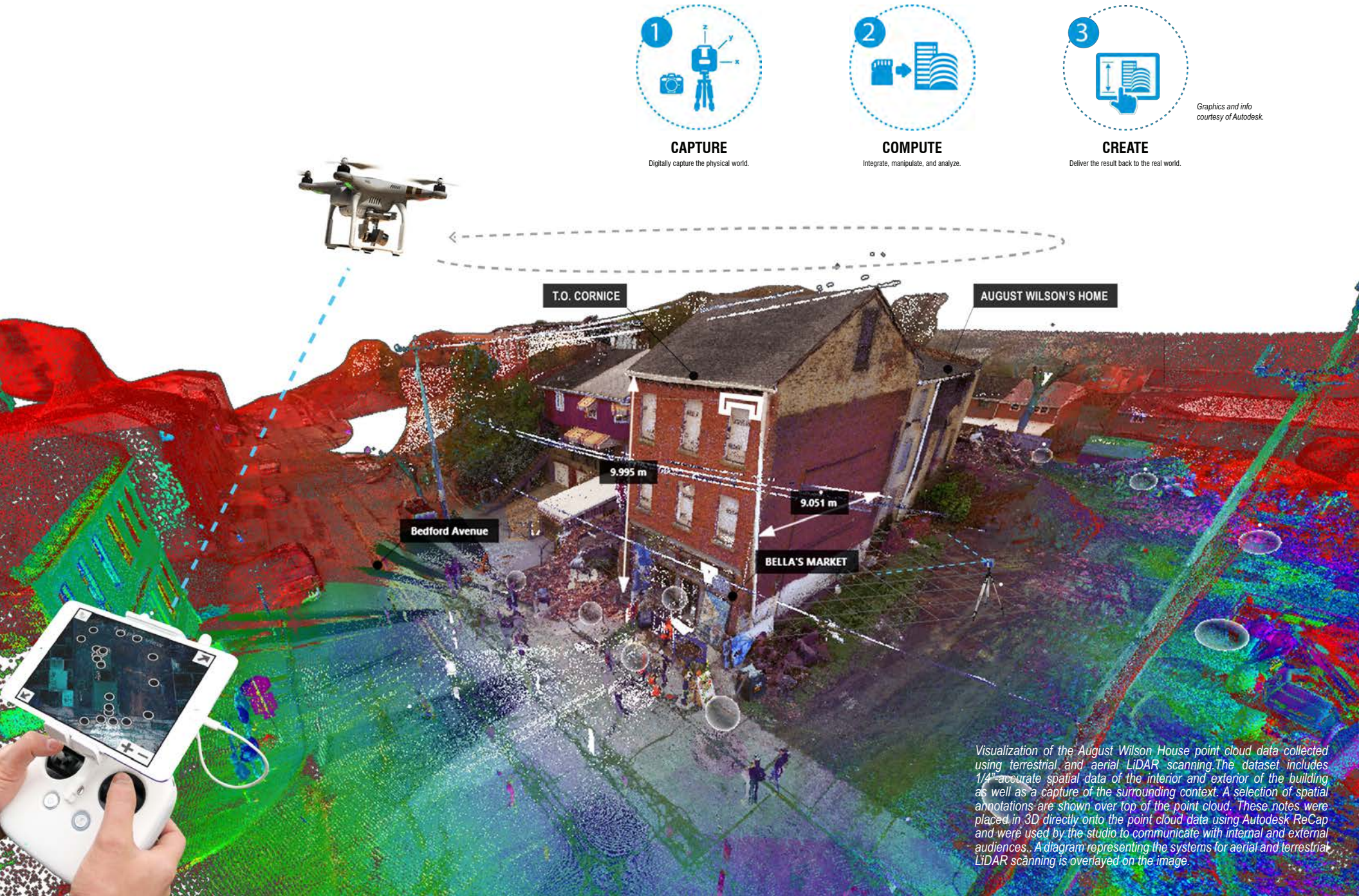
Aerial imagery looking east over the Hill District. Identified are older building stock which provide critical cultural value and sense of heritage yet are at risk of demolition due to low investment.

A BROADER ISSUE

In Pittsburgh and throughout the country, hundreds of architecturally modest buildings of cultural significance are **at risk of ruin**; yet, these buildings receive **little municipal investment** because they lack the architectural sophistication to justify such efforts. **Reality Computing technologies** have the potential to revolutionize Historical Preservation practices, **reducing time and cost** investment while **increasing quality** of final product and ultimately increasing the potential for preservation for vast numbers of important buildings suffering from disinvestment.

REALITY COMPUTING

Reality Computing is an emerging field of technology concerned with the **translation of information between physical and digital environments**. Using capture technologies such as **photogrammetry** or **terrestrial/aerial LiDAR scanning**, objects in the physical world can be brought into digital workflows for manipulation/analysis via computational and/or modeling softwares. Experiential technologies including **virtual/augmented reality** and digital fabrication methods such as **3D-printing** and **CNC-milling** can then be used to deliver results back to the physical world. The CULTURAL CONSTRUCTION Studio utilized the August Wilson House as a test-case for developing **innovative applications of Reality Computing technologies for enhancing the efficacy field of Historic Preservation**.



Visualization of the August Wilson House point cloud data collected using terrestrial and aerial LiDAR scanning.The dataset includes 1/4"-accurate spatial data of the interior and exterior of the building as well as a capture of the surrounding context. A selection of spatial annotations are shown over top of the point cloud. These notes were placed in 3D directly onto the point cloud data using Autodesk ReCap and were used by the studio to communicate with internal and external audiences.. A diagram representing the systems for aerial and terrestrial LiDAR scanning is overlayed on the image.

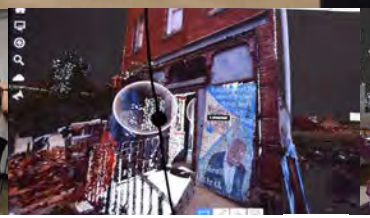
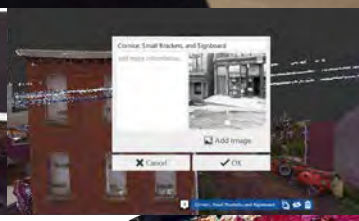
Undergraduate architecture student uses an HTC Vive headset to test out a virtual reality experience created by the Reality Computing students. The tool, developed as part of an early learning unit of the course focusing on VR tools, allows one to visualize and explore the point cloud data of the building and surrounding context collected using LiDAR scanning. The view inside the headset can be seen displayed on the monitor in the lower left. This tool has potential application in future programming at the August Wilson House and could be used to educate the public about the legacy of August Wilson as well as expose under-represented populations to advanced technology and the arts.

REALITY COMPUTING COLLABORATION

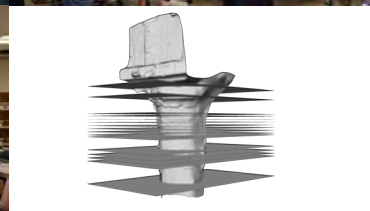
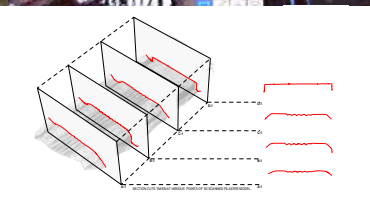
Leveraging the university's assets as a research institution, the studio collaborated with students in a **Reality Computing course** offered by the university, as well as with professional experts from a **partnering software development company**. Software development representatives provided students with knowledge of emerging Reality Computing technologies through immersive excercises and demonstrations. The various student cohorts then worked together to apply that knowledge to the development of advanced digital design and preservation workflows.








ARCHITECT/CHIEF PRESERVATIONIST COLLABORATION

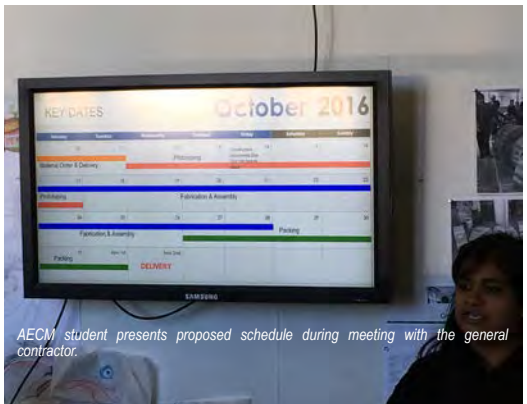
During RECONNAISSANCE and RECONSTRUCTION, bi-weekly coordination meetings were held between the studio and the collaborating architect of record and chief preservationist to evaluate the studio's research findings and design proposals. The preservationist's expert knowledge helped students learn how to locate appropriate sources of evidence and draw conclusions about the history of the facade. Through this process, the students learned to uncover the history of the building, rather than *design* it. This experience was valuable for the students' development as young professionals and helped them to develop humility for their work.

Undergraduate architecture student and graduate AECM student work together to conduct quantity take-offs, working side-by-side to ensure design decisions are maintained through the management of project logistics.

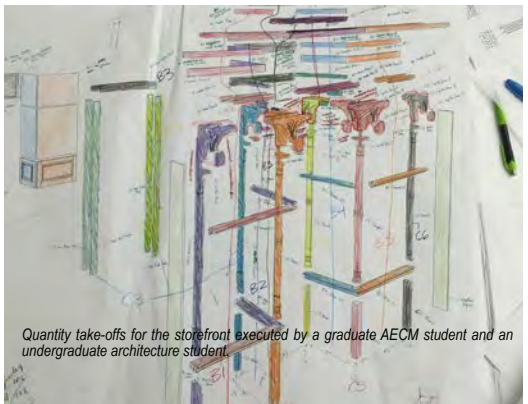
AECM COLLABORATION

Internally, undergraduate architecture students worked side-by-side with graduate Architecture Engineering Construction Management (AECM) students to coordinate design work with real project delivery parameters related to schedule, budget, material procurement, and logistics. At each stage of development, design work and construction management work recursively informed one another, forcing students to learn to communicate and coordinate effectively between the different student cohorts. For many of the students, this was the first time delivering a real project with real cost and time constraints. Noticable development in maturity, humility, decision-making, and problem solving were evident over the course of the studio as a result of these experiences.

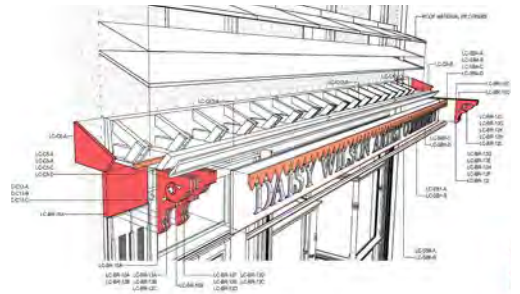
Coordination meeting between undergraduate architecture students and graduate AECM students.



AECM student presents proposed schedule during meeting with the general contractor.



Quantity take-offs for the storefront executed by a graduate AECM student and an undergraduate architecture student.

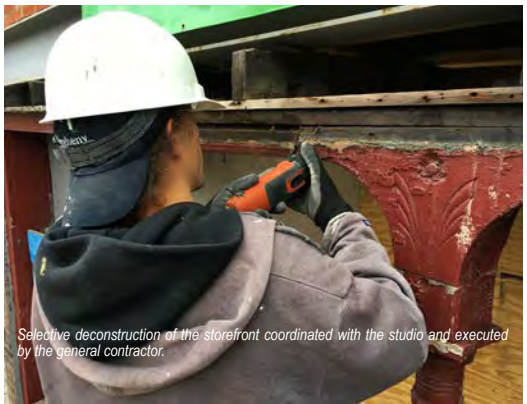


Exploded drawing differentiating parts according to material source and pre-fabrication processes generated in collaboration between undergraduate architecture students and graduate construction management students.

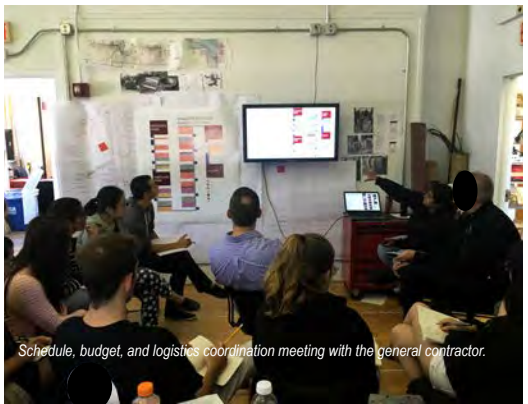
GENERAL CONTRACTOR COORDINATION

The studio worked directly with the general contractor throughout the semester to coordinate project delivery and logistics related to construction. After design and pre-fabrication by the studio, the contractor used its expertise in navigating built conditions to facilitate on-site construction and installation of the missing facade components. While not directly involved in on-site construction, students gained knowledge of construction practices and procedures through observation of the process and seeing their work come to fruition.

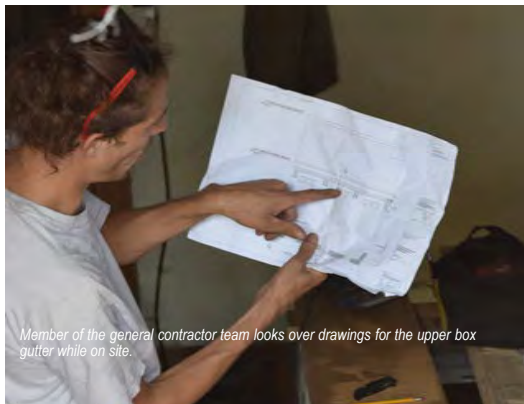
General contractor speaks to the studio about construction parameters relating to the existing building during the first site visit.



Selective deconstruction of the storefront coordinated with the studio and executed by the general contractor.



Schedule, budget, and logistics coordination meeting with the general contractor.



Member of the general contractor team looks over drawings for the upper box gutter while on site.

Upper Cornice/ Upper Brackets

a. Existing rafters where the **cornice and box gutter** would be attached. The box gutter would have sloped to the right and drained through a downspout. **b.The upper brackets** would have had a large end bracket at either side and four smaller ones in the center.

a. upper cornice and box gutter

Without the original gutter or molding, students used old photographs as well as precedent from moulding on the back to make decisions regarding the cornice design. **Autodesk ReCap** was also used in measureing roof pitch to correctly size the gutter

b. upper brackets

Since the brackets were no longer existing, the design wasdrawn from neighborhood precedents of the same period as well as pattern books used regionally in the period. The ornament design was selected to relate to the existing ornaments on the storefront.

Storefront Cornice / Signboard

An **d. existing steel lintel** replaced the original timber lintel in order to support the newly renovated brick veneer. Historically, the lintel would have been covered by the **e. cornice and signboard**.

e. cornice and signboard

Using old images of the facade as well as patternbook and historic photos as precedent, students developed the design of the storefront cornice to match historic precedent and replicate what was there in the time of August Wilson's childhood.

Pilasters

h. Wood Nailers replace bricks every few courses indicating the location of where the pilasters ran up the side of the storefront. Existing pieces of pilasters were found inside the building when it was deconstructed at an earlier time and show much decay.

h. wood nailers and pilasters

pieces of the original pilasters were still present and students used **Autodesk ReMake** and digital tools to recreate the identical profile of the fluting.

Graphic summarizing research findings and evidence collected by the studio pertaining to each of the missing/damaged components of the building's Bedford Avenue facade. These findings would be used recreate a historically accurate vision for the facade in Mode 2: VIRTUAL RECONSTRUCTION.

Window Hoods

The existing brick veneer was created with window cut outs. The existing window sills were re-installed, but **c. no existing window hoods remained.** In the recreation of the facade, it was found that the upper windows were **built one course too high.**

window hoods c.

Similar to the process for the brackets, pattern and design was drawing inspiration from existing elements on the facade as well as local precedent.

Storefront

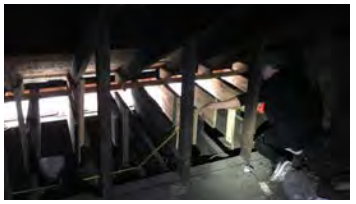
The storefront has many parts. At the site the **windows and doors** are boarded up with plywood.The storefront has **f. six existing colonettes** that are believed to be original. The storefront itself shows evidence that it has been modified. The locations where the **g. bulkhead panels** are have been boarded up.

colonettes f.

Given that the colonettes were present but in poor condition, students used **Autodesk ReCap** and **ReMake** to replicate the pattern and detailing into a digital model that could then be made using digital fabrication methods.

bulkhead panels and moulding g.

Due to the degree of degradation of the moulding and panels, selective deconstruction and digital capture were used to identify moulding profiles for fabrication.



Students collect measurements of existing roof framing.

Students observe and discuss the storefront construction logic.

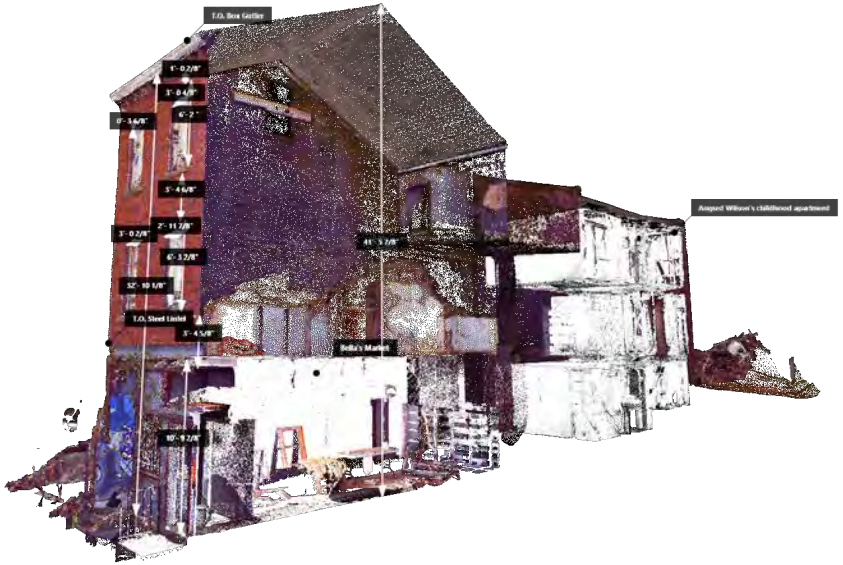
Member of the General Contractor team selectively deconstructs the colonnette capital from the storefront in preparation for 3D scanning.

Chief preservationist works with students over photos and drawings collected/generated during RECONNAISSANCE.

One of a series of analog constructions done by a student to study historical window hood ornament options.

MODE 1: RECONNAISSANCE

Beginning with **RECONNAISSANCE**, the studio used a variety of research methods, including **analysis of digital capture data**, **on-site observation**, analysis of **historic photographs** and **pattern books**, and investigation of **neighborhood precedents** to make evidence-based determinations about the appearance of the building during the years that August Wilson lived there, from 1945 to 1956.



Perspective view of a sectional cut through the 3D point cloud data collected from the aerial and terrestrial LiDAR scans. With approximately 1/4" accuracy, the point cloud model was used for off-site dimensioning and well as storytelling through annotative information directly on the data.

A view of the point cloud data inside the very room that August Wilson grew up. As mentioned on page 6, this data has potential use in future Virtual Reality experiences to be implemented as part of programming at the new August Wilson House, educating users about the history of the building as well as exposing under-represented communities to advanced technology.

MODE 2: VIRTUAL RECONSTRUCTION

Based on knowledge acquired in RECONNAISSANCE, the studio RECONSTRUCTED a historically-accurate vision of the facade. Students learned to coordinate with each other and hold one another accountable in order to ensure a unified scheme that reflected the realities of what could be built.

HISTORIC COMMISSION PROPOSAL REVIEW

After four weeks, the studio presented its proposal for the facade RECONSTRUCTION to the **Pennsylvania Historical and Museum Commission** in a detailed **280-page book**. The document included technical drawings and renderings delineating the proposed scheme and images of all evidence/research used to inform the proposal. In order to gain traction from the regulating body in support of innovative Reality Computing restoration strategies, the document also included diagrams explaining the proposed digital workflows and the technologies to be used.

PROPOSAL

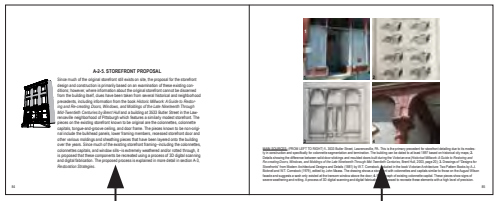
explaining the proposed design for the South facade restoration, supported by evidence and research, for each of the six components on the facade in question: Upper Cornice + Box Gutter, Upper Brackets, Window Hoods, Storefront Cornice and Signboard, Storefront, and Pilasters.

RESTORATION STRATEGIES

explaining through diagrams the proposed methods for restoration involving Reality Computing and digital fabrication technologies.

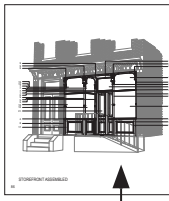
COLOR + FINISH ANALYSIS

depicting various color palette options explored for the new facade. Schemes were predicated on historical research of Victorian paint palettes as well as an investigation of the layers of paint on existing building pieces.

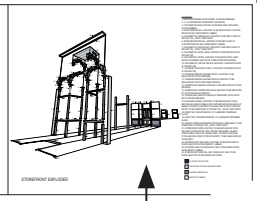


A *Overview of the unique conditions surrounding the proposal for each specific component, such as existing pieces and primary sources.*

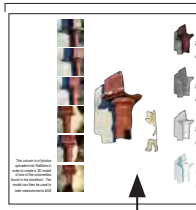
B *Primary evidence for proposal including pattern book research and images of existing elements.*



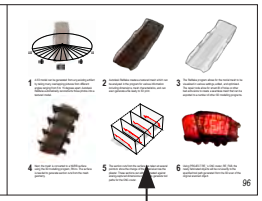
C *Technical drawings of proposal for each element, assembled*



D *Technical drawings of proposal for each element, exploded*



E *How the photogrammetry works to capture the geometry of existing pieces*



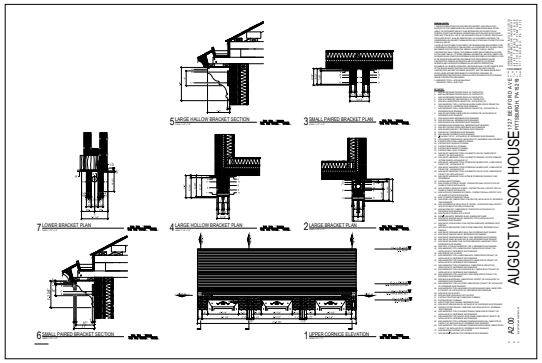
F *How the capture is translated into a digitally fabricated component*

G *Neighborhood precedent of color scheme and historic color palette*

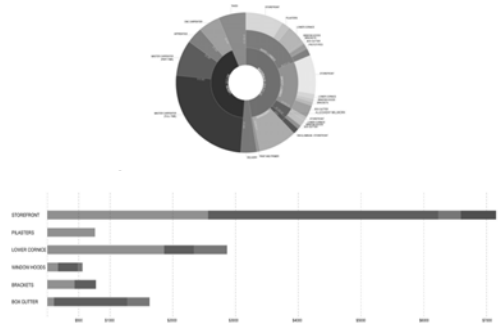
H *Color scheme applied to building facade*

The collaborating Chief Preservationist making comments to the studio about the proposed scheme and corresponding historical evidence prior to submitting the proposal to the Pennsylvania Historical and Museum Commission (PHMC).

Photograph taken during conference call with Pennsylvania Historical and Museum Commission (PHMC) liason. The call was used to reconcile questions regarding historical integrity and methodologies for the proposal and ultimately gain approval for the next phases of work.



Sample sheet from the 30-page construction document set generated by the studio.

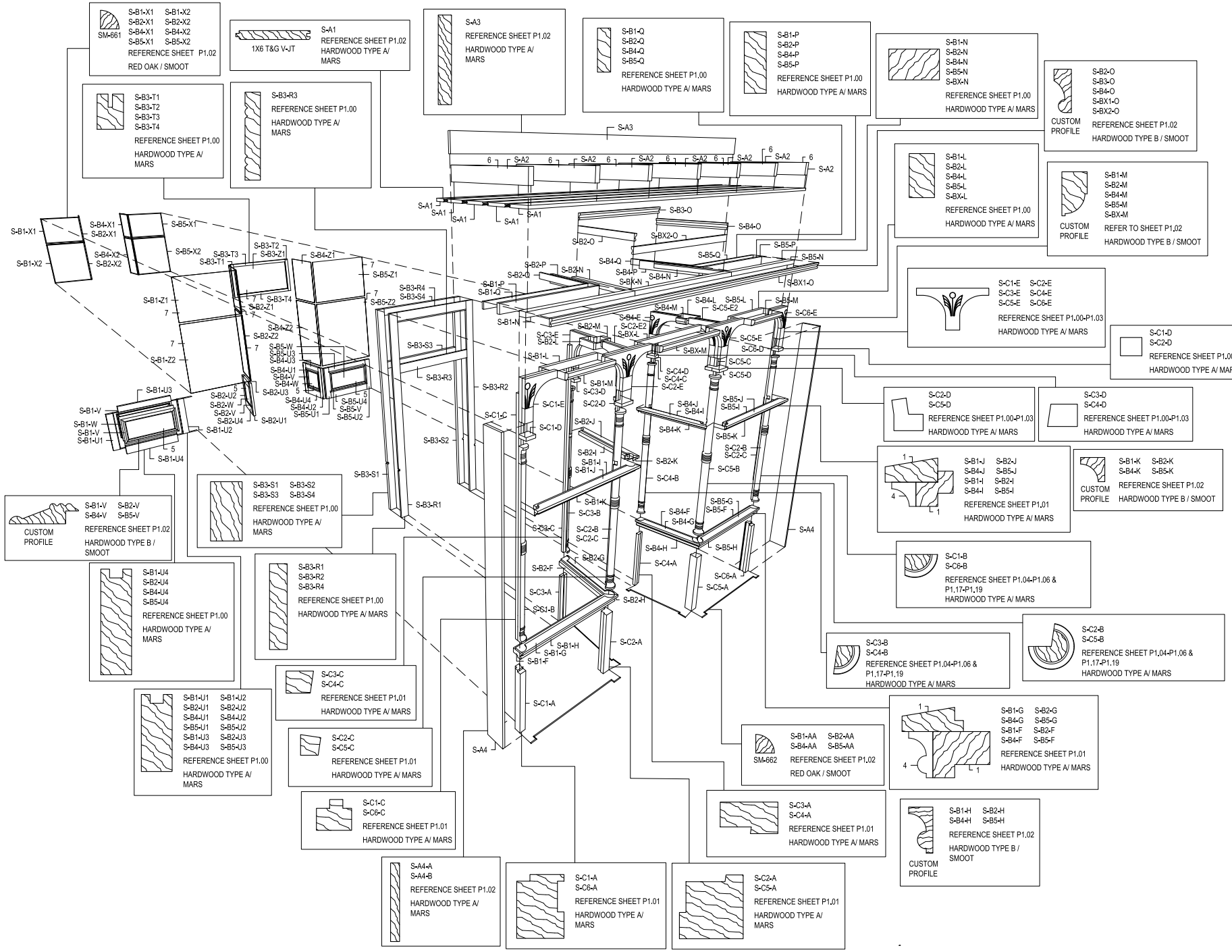


Budget allocation diagrams. Data/information generated by graduate construction managmeent students; graphics generated by undergraduate architecture students.

Photograph of the studio director working with the undergraduate architecture students and graduate construction managmenet students to resolve design detailing, material procurement logistics, and scheduling.

CONSTRUCTION DOCUMENTS, SHOP DRAWINGS, AND IMPLEMENTATION MANUAL

Following historic commission approval, the studio developed a **construction document set**, **shop drawing set** and **construction implementation manual**. The drawing sets include **complete code analysis**; **pictorial assembly drawings**; **schedule**, **budget**, and **logistical diagrams**; and **all productive detailing/delineation** to serve implementation. These documents were utilized for **permitting**, **public review**, **procurement**, **pre-fabrication**, and **construction**.



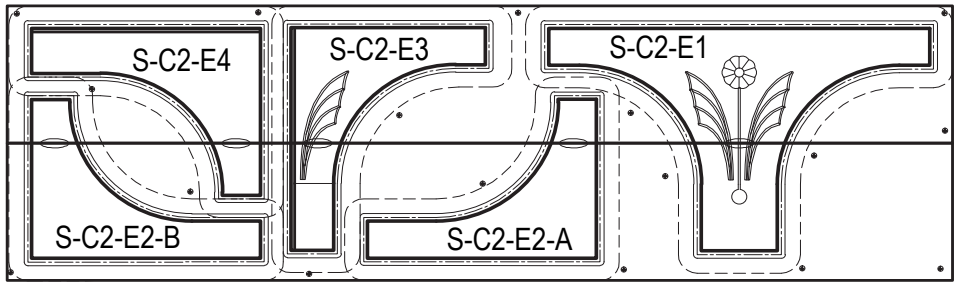
Exploded assembly drawing of the August Wilson House storefront generated by studio to communicate with the collaborating architect, general contractor, fabricator, material suppliers, and Pennsylvania Historical and Museum Commission. The storefront design was reconstructed by studying existing pieces, making assumptions based on construction logics, and using precedent/pattern book research to fill in the blanks where original pieces no longer remained. The complex assembly is composed of over 35 unique profiles.

MODE 3: PRE-FABRICATION

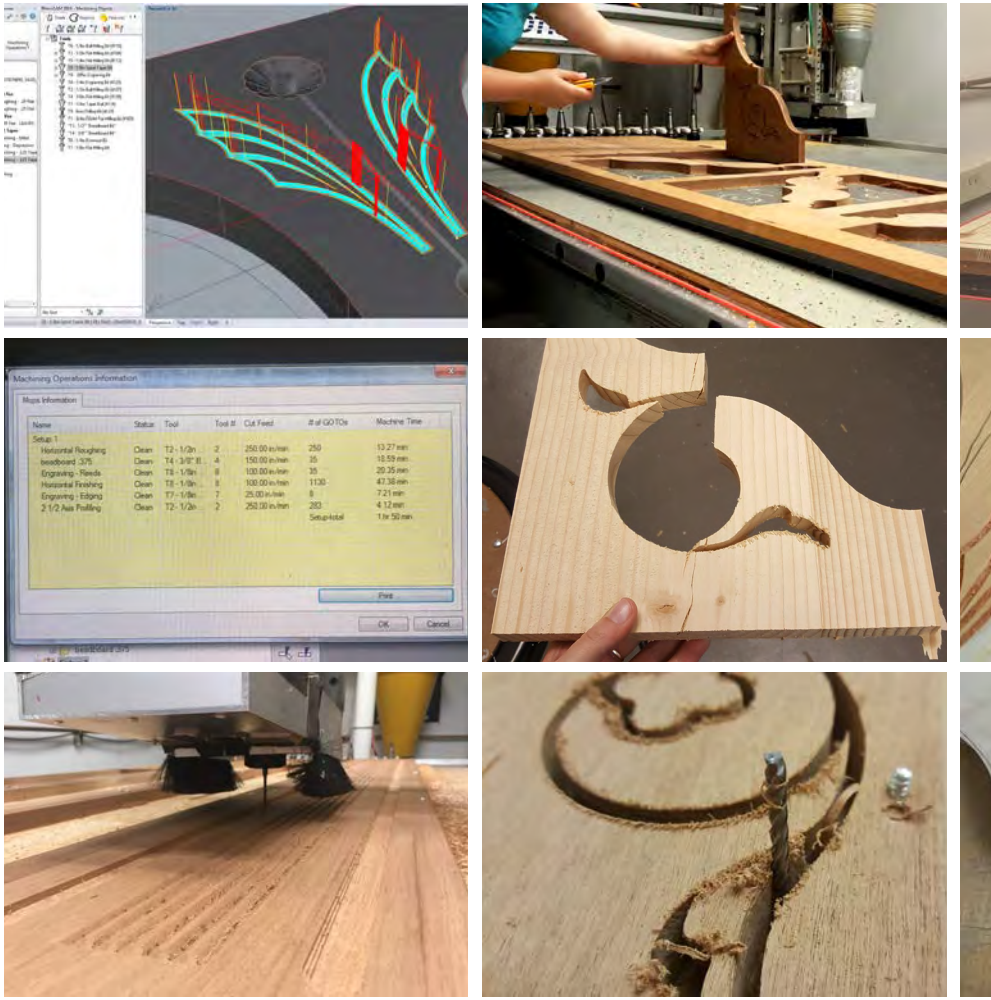
CREATE

The studio developed and executed CNC-milling processes predicated on a **high level of precision** in order to accurately **recreate the ornamental Victorian detailing originally crafted by hand**. Through many attempts, students learned about the limitations of digital fabrication technology and developed strategies for optimizing output based on the tool's capabilities in preparation for final fabrication.

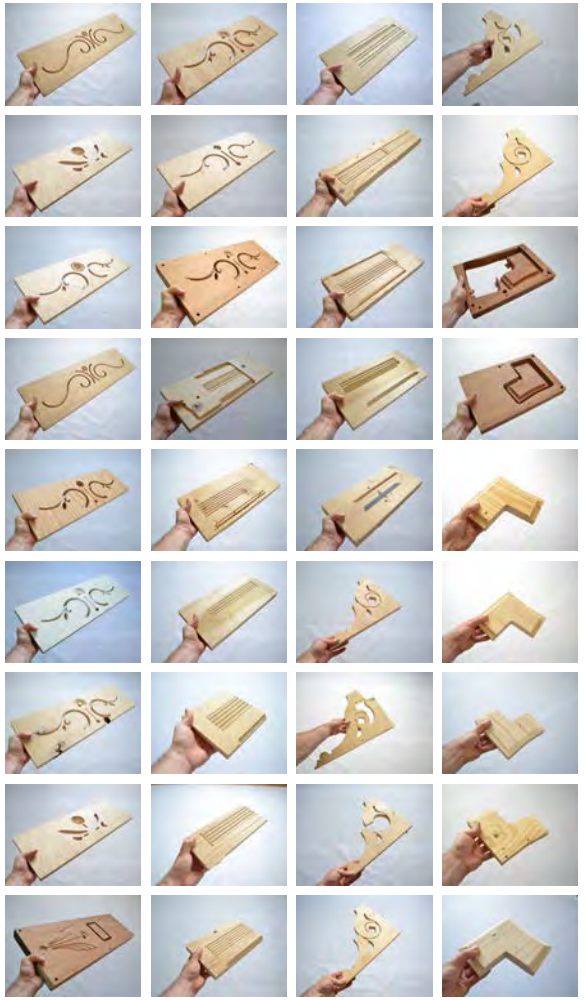
Through studying the desired geometry and observing outcomes, the studio narrowed tooling down to six unique bits. Each one serves a unique purpose in recreating the various ornamental geometries originally crafted using chisels, gouges, and a scroll saw.



Part layout drawing generated to coordinate toolpaths with mounting screw and biscuit locations. These drawings were used by the collaborating master carpenter and apprentice to laminate and prepare larger pieces of stock that would accommodate the milling processes.



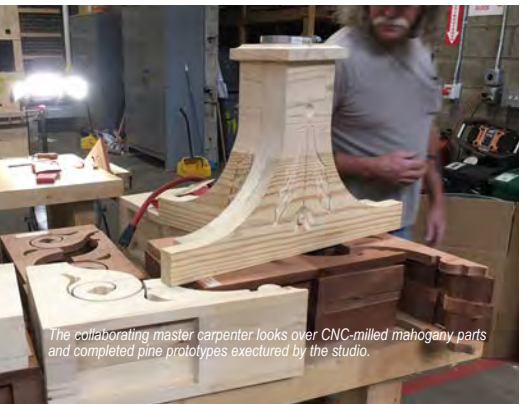
Snapshots from the iterative prototyping and refinement process.



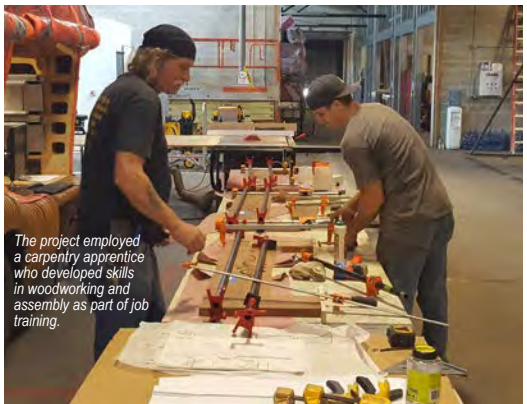
Samples from the many CNC-mill prototypes used to refine toolpaths. Starting from the top left and moving vertically: window hoods; pilasters; brackets; colonnette capital base.

CARPENTRY COLLABORATION

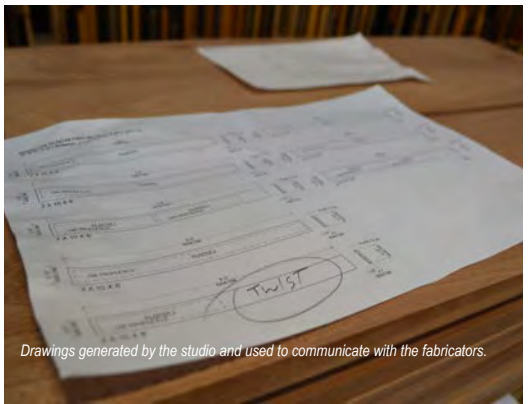
While students executed work involving skill sets in design, delineation, and high-tech fabrication, a master carpenter and carpentry apprentice in training were employed to execute post-processing and assembly of prefabricated components. Working off of drawings generated by the studio, the carpenters utilized their skill sets in traditional woodworking to assemble the CNC-milled parts into the final building components with a high level of craft. The components were then delivered to site and installed by the the general contractor.



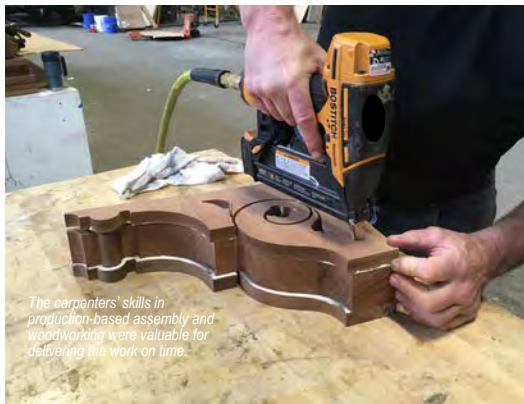
The collaborating master carpenter looks over CNC-milled mahogany parts and completed pine prototypes exectured by the studio.



The project employed a carpentry apprentice who developed skills in woodworking and assembly as part of job training.



Drawings generated by the studio and used to communicate with the fabricators.



The carpenters' skills in production-based assembly and woodworking were valuable for delivering the work on time.

Detail of lower end of final mahogany large upper bracket. The bracket is composed of two outer ornamental plates, two inner solid plates, and a central solid plate matching the profile of the outer plates.

Detail of final mahogany large upper bracket.

Elevational view of one of the six final mahogany window hoods.

Final mahogany large upper bracket, a composite of five profiled plates of varying thickness.

Elevational detail of one of the six final mahogany window hoods. Numerous studies were done during prototyping to achieve the desired shadow effect.

Detail photograph of the CNC-milled ornament on one of the six final mahogany window hoods. This photograph reveals the level of precision, craft, and detail that can be achieved at scale through application of Reality Computing technologies.

View of the August Wilson House looking up Roberts Street. At the time of the photograph, the sideyard was being used for an event by a local art museum honoring the legacy of August Wilson as a pilot for future programming.

EDUCATION, HERITAGE, AND HOPE

The restoration of the August Wilson House has served as an educational experience for aspiring architects and allied professionals, a research platform for advancing the field of Historic Preservation, and as a tangible effort in Public Interest Design seeking to benefit populations in one of Pittsburgh's under-represented communities. When restoration is complete, the home will be an **authentic venue for staging plays**, will serve as a **cultural heritage center**, and, through diverse programming in the arts, aspires to play a role in **catalyzing socio-economic mobility** within the Hill District.

Through the collaborative efforts of this **interdisciplinary team**, a culturally significant building is being reborn, the heritage of a community is being restored, and the legacy of an important cultural figure is being retold.

View of the August Wilson House from the sideyard taken during an evening arts and culture event held by a local museum. African American artist Bradford Young, whose work is heavily influenced by that of August Wilson, is seen speaking to an audience while his work is projected onto the east wall of the home.