PCI FOUNDATION
RHODE ISLAND SCHOOL OF DESIGN ARCHITECTURE DEPARTMENT

SPONSORED STUDIO
2014-2015

RISD ARCHITECTURE

PRECAST CONCRETE SPONSORED STUDIO

REPORT 2014-15

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1 / PROGRESS REPORT

SYNOPSIS_

The following are taken from our summer 2013 proposal to the PCI Foundation regarding the goals and objectives of the sponsored studio.

"The broad objective of this PCI Foundation funded studio is to test opportunities for serious engagement with Industry as a strategy for learning about construction technology and the construction industry as a whole. RISD's Department of Architecture is committed to exposing students to the design and fabrication of full-sized components of architecture. The PCI studio will provide comprehensive exposure to the pre-cast industry. It will also serve as a case study for regular design studios in which full- size materials investigation can be made available to RISD Architecture students as a normal part of the educational experience, not simply a "one-off" opportunity."

"A four-year commitment on the part of PCI and RISD would allow clarification of pedagogic objectives, project types and industry relations in order to assure continuance of a "Materials Investigations" studio each year."

"RISD as an institution is currently embarking upon a serious investment in "critical making" resources across the College. However, this emerging "workshop-laboratory" concept is not expected to engage in the scale needed by Architecture students. The Department of Architecture does have a history of serious work in materials' investigation, but much of it has been at a very small scale or through simulation. The PCI Grant provides an opportunity to demonstrate a commitment to full-scale fabrication for Architecture students and will inspire more creative work in materials beyond precast concrete. The faculty of the Department aspires to create opportunities whereby all students will be provided with at least one opportunity to create projects using construction materials at full scale or "one-to-one" and engage with the local construction industry. Fundamentally, the PCI grant will allow a full exploration of how the rich technical and fabrication resources available in Southeast New England can engage the creative energy of highly motivated design students in a mutually beneficial experience."

We are currently in year three of four of our grant for RISD and this report is a summary of status and documentation of activities for year two (2014-15).

STATUS_

The academic year 2014-15 included the second iteration of the Precast Concrete 1:1 as one of the Advanced Studio electives in the Spring semester. The studio included 11 students: 5 graduate and 6 undergraduate. The general framing of the studio was very similar to the first year: both academic and experimental model research followed by an in depth design project of each student's definition intended to culminate in the fabrication of precast concrete elements as close to full scale (1:1) as possible. Following the experience of the first year, the methods to make and type of final element were more restricted in this iteration: we acquired materials to cast a form of GFRC in order to free ourselves from the limitations of either pure compression elements or the more difficult use of traditional reinforcement. In addition, the students were encouraged to limit their components to a form of panel. These more closely defined constraints resulted in more focused projects in comparison to the first year.

In addition, the following activities occurred with some support from the grant:

- Attendance at 2014 PCI Convention in Washington DC by Prof Brett Schneider, Prof James Barnes, Rami Hammour (GR), and Brandon Wang (UG). Presentation of RISD year one and exhibition boards of student work.

- Exhibition by New York based architects SO-IL in the fall of 2014. This exhibition at the Bayard Ewing Building included the production of models by RISD students exploring novel methods of casting related to an ongoing project in precast concrete by the firm.

- Lecture by Mark West formally of the University of Manitoba. Mark West founded the CAST laboratory for the study of methods of casting concrete – primarily using fabric forms. He presented his work in an evening lecture and participated in an afternoon of critiques for the students in the studio in the Spring of 2015.

- Class field trip for both the studio and the RISD Concrete Structures (required technical sequence course in Architecture with 55 students) to Blakeslee Prestress in Branford CT to provide introduction to design, detailing, and fabrication of precast concrete.

- Class field trip for the studio to Coreslab Structures in Thomaston CT to see their facilities for the production of architectural precast including UHPC components.

Future plans include the more comprehensive engagement with newer concrete technology – fiber reinforcement and possibly UHPC; improving our ability to fabricate full scale components through the development of dedicated exterior space for form making and casting adjacent to the Bayard Ewing Building; and, given that the PCI Convention will next occur in the middle of the Spring 2016 semester, we are interested in exploring the possibility of beginning the third iteration of the studio with a large scale fabrication by the entire studio as a team in collaboration with one of our fabricator partners to exhibit at the convention.

2 / SYLLABUS

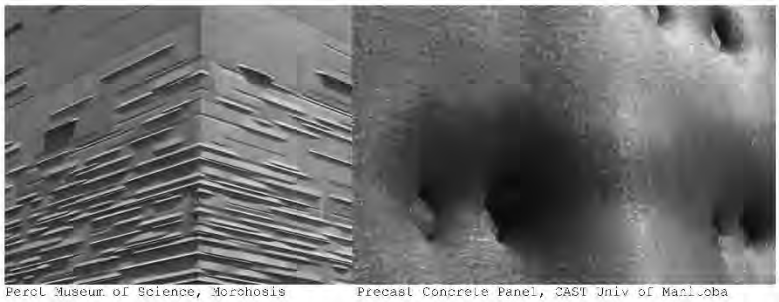
The following is a reproduction of the course syllabus describing intentions, deliverables, process, calendar, policies, and accrediting requirements fulfilled.

Division of Architectural Studies
Rhode Island School of Design

1:1 Precast Concrete
Arch 21ST Advanced Studio — Spring 2015

Monday and Thursday 1:10-6:10pm TBD

Brett H Schneider
Office: BSB 113
Office Hours: M/Th 10am-noon or by appointment
<bschneid@risd.edu>



Perot Museum of Science, Morphosis — Precast Concrete Panel, CAST Univ of Manitoba

Course Description:

The studio will focus on the design and execution of 1:1 architectural objects using the material of precast concrete. The students will progress from research on the technical methods of fabrication, to castings in scale models typically in plaster, and full size castings with concrete.

Through the support of the Precast Concrete Institute and nearby member fabricators, the studio includes multiple trips to nearby precast facilities to provide background on conventional methods of executing precast concrete elements and later as a location for pouring of the full scale components comprising the students' design projects.

Additional technical workshops with students working as group will also be included to introduce general methods working with concrete and formwork hands on.

Selected Bibliography:

Architectural Precast Concrete 3rd ed, Precast Concrete Institute, Chicago IL 2007.
PCI Design Handbook 7th ed, Precast Concrete Institute, Chicago IL 2010.
Cohen and Moeller editors, *Liquid Stone: New Architecture in Concrete*, Princeton Architectural Press, New York NY 2006.
Bell and Buckley editors, *Solid States: Concrete in Transition*, Princeton Architectural Press, New York NY 2010.
Detail: Review of Architecture and Construction Details (Eng Edition), periodical, Institut für Internationale Architektur-Dokumentation, Munich, 2005-current.
Phillips and Yamashita, *Detail in Contemporary Concrete Architecture*, Lawrence King, London UK 2012.
Nervi, Aesthetics and Technology in Building, Harvard University Press, Cambridge MA 1965.
Kepes editor, *Structure in Art and in Science*, George Braziller, New York NY 1965.
Forty, *Concrete and Culture*, Reaktion Books, London UK 2012.

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Arch 21ST Spring 2015

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Rhode Island School of Design

Studio Content:

Design exploration in the studio will be driven by three prompts to be related by the students: methods of producing precast concrete, critical response to properties of concrete, and simple program. It is intended that these prompts will provide a starting point for the conceptual and technical aspects of the projects to be developed by the students and will be continually re-visited, questioned, re-evaluated, and evolved as the semester continues following an iterative and serial process.

Prompt 1 - Methods of Production
The studio will begin with research into the various technical methods related to the production of precast concrete. Through research of technical documents and other sources, the students will each produce part of a lexicon of methods to be shared with their fellow students and used as reference in the later design work.

Prompt 2 - Material Criticality
While the use of the material of concrete is a given in this studio, it's character and the assumptions of how it is used will be confronted with a critical stance. In this case, if we typically think of concrete as hard material what does it mean to be appear hard or soft and how do we express/explore that through the design of an object in concrete and its formwork?

Prompt 3 - Program
The program for the project is loosely defined as an architectural surface of interface with a more specific interpretation and application to be defined by the student. To begin this process we can define an interface as a point where two systems, subjects, organizations, etc., meet and interact. In general, these surfaces can be thought of as two dimensional panels with degree of curvature, complexity of form, and depth (or thickness) to be determined by the student.

Studio Process:

The studio will progress through three steps with supporting workshops and fabricator visits added throughout the semester.

1 Research
Research of technical documents for an assigned topic related to the production of precast concrete. Parallel experimentation in physical models inspired by technical research.

2 Scale Model Castings
Part one of main design problem - develop castings at scale in plaster responding to three design prompts (see above). Completed at Midterm review.

3 Workshops
Group projects in department shop to introduce concrete mixing, simple form making and casting, and advanced form making using CNC milling of foam and wood. Throughout semester.

4 Fabricator Field Trips
Field trips to fabricator facilities for introduction to industry practices and conventions for both typical and custom products. Throughout semester.

5 Full Scale Castings
Translate scale models to full or half size castings in concrete. Completed at Final review.

Advanced Studio
Arch 21ST Spring 2015

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Division of Architectural Studies
Rhode Island School of Design

Semester Calendar:

February		
12	Thursday	Introduction
16	Monday	Problem 1 - Research and Exploratory Models Research of different methods related to precast concrete for presentation to the studio group through collection of documentation and production of representative/experimental model. The goal of this initial exercise is to develop a catalog of methods with an understanding of their potential and limits/constraints.
19	Thursday	Problem 1 - Pinup and Group Discussion
23	Monday	Workshop/Fabricator Trip #1 Mixing concrete, pouring test cylinders, making simple forms, simple casting. (at Oldcastle in Rehoboth TBC)
26	Thursday	Problem 1 Review
March		
2	Monday	Problem 2 - Working in Model Design of an architectural object through serial experiments both at small scale of full object in plaster. Students will choose a method from the catalog from Problem 1 and define a specific function for their architectural object to explore/address.
5	Thursday	
9	Monday	Workshop #1 Introduction to concrete mixes and form making
12	Thursday	
13	Friday	Fabricator Trip #1 Blakeslee Prestress Branford CT (with Concrete Structures class)
16	Monday	Workshop #2 Introduction of CNC milling of foam and wood.
19	Thursday	Problem 2 Interim Pinup
	Spring Break	
30	Monday	
April		
2	Thursday	Midterm Review
6	Monday	Problem 3 - Working Full Scale Continued design of architectural object transitioning to working solely at full scale and addressing related issues of forming and casting. Sub-problem will explore methods of drawing and documenting both object form and resulting object to capture the design of process and not just the final object as well as address development of appropriate representation of the design object in sited location as necessary.
9	Thursday	Fabricator Trip #2 Coreslab Structures Thomaston CT
13	Monday	Problem 3 Interim Pinup
16	Thursday	
20	Monday	
23	Thursday	
27	Monday	Problem 3 - Interim Pinup
31	Thursday	
May		
4	Monday	Fabricator Trip #3 Coreslab Structures Thomaston CT
7	Thursday	Problem 3 - Fabrication
11	Monday	Problem 3 - Fabrication

Final Reviews - Week of May 19-23

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Policies:

Evaluation is based upon satisfactory completion of requirements of each project and progress in the attainment of the pedagogic objectives of the course. Attendance and timely completion of work are required. Unexcused absences and frequent tardiness can constitute grounds for removal from the course. Incomplete (I) is assigned for temporary deferment of a final letter grade and may be granted by the instructor only under unavoidable and legitimate extenuating circumstances. Midterm evaluation of performance (Mid-Semester Report) in the course is noted as satisfactory or unsatisfactory (S or U;) unsatisfactory is explained by written comments. Student work of the entire term is evaluated--process as well as final conclusions--for each project.

NAAB Criteria Covered in this Class:

It is an objective of this course to cover the following skills sited by the National Architectural Accrediting Board as criteria in establishing educational quality assurance standards to enhance the value, relevance, and effectiveness of the architectural profession.

Design Thinking Skills: Ability to raise clear and precise questions, use abstract ideas to interpret information, consider diverse points of view, reach well-reasoned conclusions, and test alternative outcomes against relevant criteria and standards.

Applied Research: Understanding the role of applied research in determining function, form, and systems and their impact on human conditions and behavior.

Visual Communication Skills: Ability to use appropriate representational media, such as traditional graphic and digital technology skills, to convey essential formal elements at each stage of the programming and design process.

Technical Documentation: Ability to make technically clear drawings, write outline specifications, and prepare models illustrating and identifying the assembly of materials, systems, and components appropriate for a building design.

Investigative Skills: Ability to gather, assess, record, apply, and comparatively evaluate relevant information within architectural coursework and design processes.

Structural Systems: Understanding of the basic principles of structural behavior in withstanding gravity and lateral forces and the evolution, range, and appropriate application of contemporary structural systems.

Building Materials and Assemblies: Understanding of the basic principles utilized in the appropriate selection of construction materials, products, components, and assemblies, based on their inherent characteristics and performance, including their environmental impact and reuse.

Academic Integrity, Policies and Procedures:

Please refer to the following documents for information regarding academic integrity, policy and procedures:

Department of Architecture, Studio Culture Policy:
https://sites.google.com/a/risd.edu/bcb-office/home/policies-procedures/studio-culture

BEB Rules and Regulations:
https://sites.google.com/a/risd.edu/arch-student/home/rules-regulations

RISD Student Code of Conduct:
http://www.risd.edu/Students/Policies/

3 / STUDENT DATA

The following is a table of data of the students enrolled in the studio during the Spring 2015 semester. This data includes photographs, name, course of study, undergraduate or graduate, academic background, and expected graduation date.

	FIRST NAME	LAST NAME	COURSE OF STUDY	GRADUATION DATE
Mr.	Ali	Al Abbad	M.ARCH	2016
Ms.	Hyunbae	Chang	B.ARCH	2017
Ms.	Ginas	Farkas	M.ARCH	2016
Mr.	Dexter	Foster	B.ARCH	2017
Ms.	Yulia	Gusarova	B.ARCh	2017
Mr.	Cameron	Hastings	B.ARCH	2017
Ms.	Chereth	Hines-Channer	M.ARCH 2 YR	2016
Mr.	Ronak	Hingarh	M.ARCH 2 YR	2016
Mr.	Daejeong	Kim	M.ARCH	2016
Mr.	Jeffrey	Xu	B.ARCH	2017
Ms.	Sahar	Yaqoob	B.ARCH	2017

4 / STUDENT WORK

The following pages include detailed documentation of work by selected students listed on this page with a brief description of their respective research and design project.

Ali Al Abbad (GR) – Research on methods of applying fabric formwork with related inspired model experiments. Final project reconfiguring a plaza near the BEB to be composed of perimeter matched panels cast on fabric forms.

Gina Farkas (GR) – Research on methods of spray casting with related inspired model experiments. Final project focused on the development of five sided hollow sections to catch and focus light in an alley near the BEB.

Cameron Hastings (UG) – Research on embedments in concrete castings with related inspired model experiments. Final project spanning custom and varying precast beams between existing piers in the Providence River – each with a shape derived from the beam moment diagram and cast using configurable fabric forms.

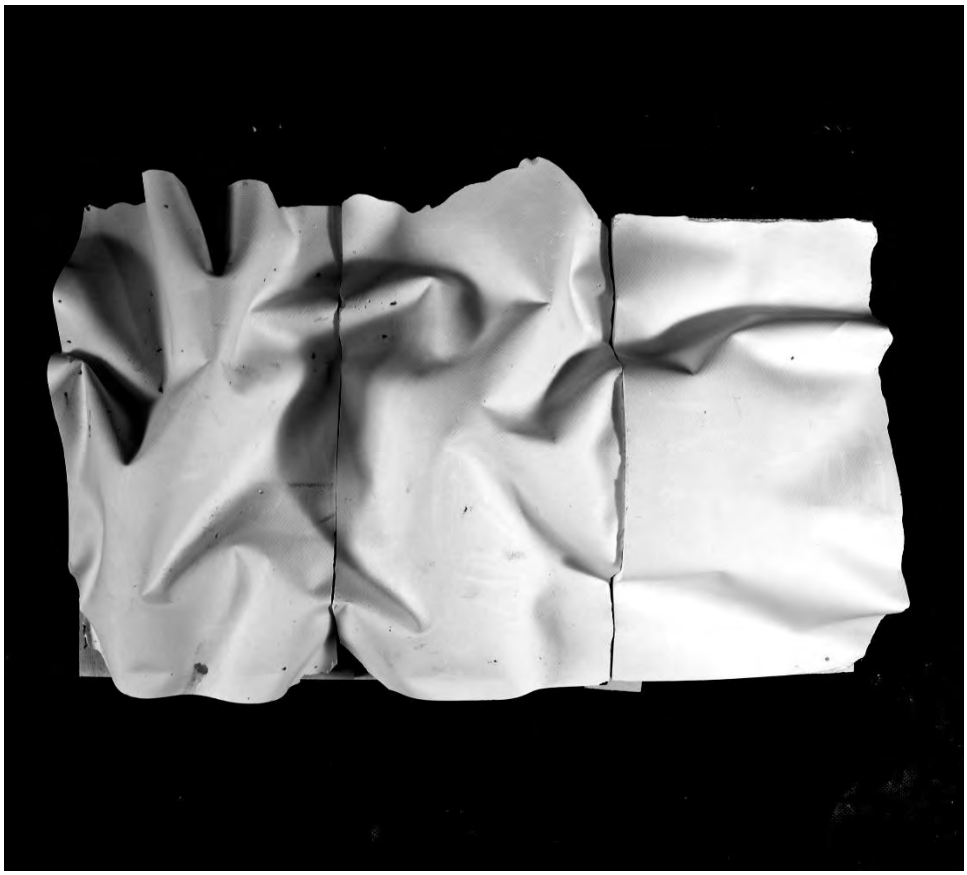
Ronak Hingarh (GR) – Research on embedments in concrete castings with related inspired model experiments. Final project populating a covered plaza adjacent to the RISD Museum with custom hollow sections composed of 4 flat and thin concrete faces with varying length.

Daejong Kim (GR) – Research on fiber reinforcement in concrete with related inspired model experiments. Final project investigating the replacement of a glazed corner of the RISD Museum building with panels of precast concrete developed out of the imperfection of the existing corner. The final panel elements were cast using a "rocking" form to go around the corner in a single pour without the use of a vertical form.

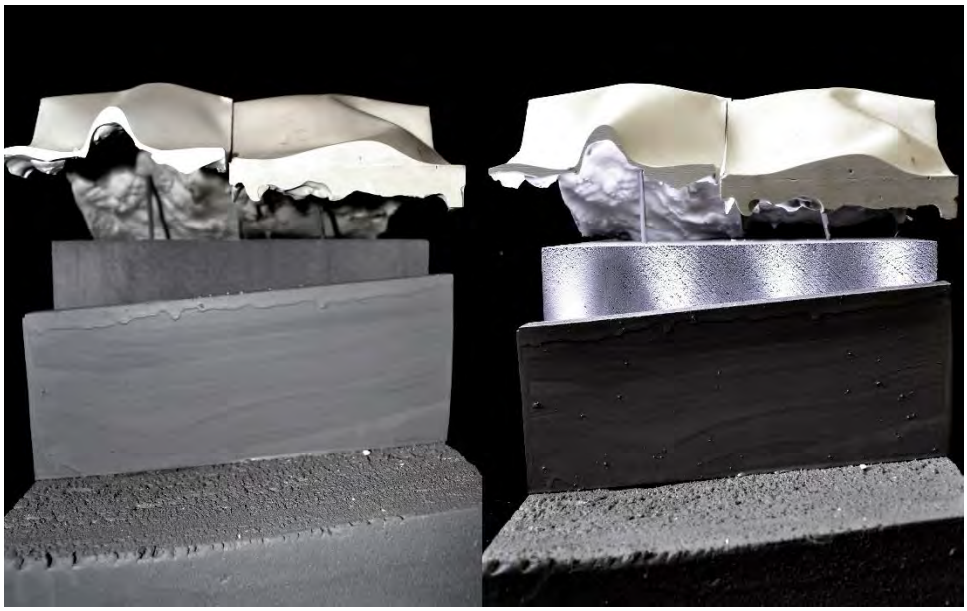
The following work by the students includes their initial experiments and final projects. Each case concludes with the summary board produced by the students.

In addition, the students participated in a group workshop early in the semester to familiarize themselves with the complications of missing and casting even a simple panel element in concrete.

4 / STUDENT WORK_ALI AL ABBAD

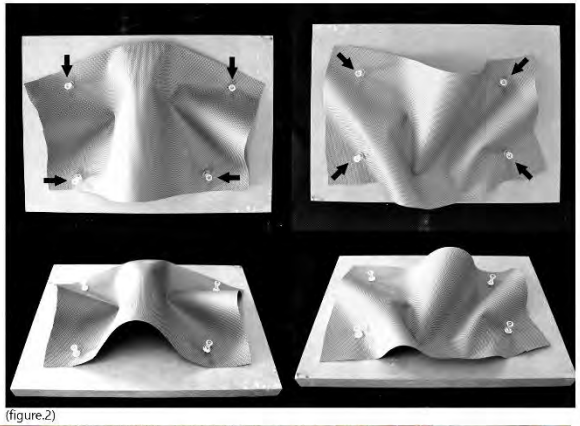




Rhode Island School of Design
PreCast Concrete Studio
Inst. Brett Schneider
Stu. Ali Al Abbad

I started this studio with an initial study about fabric as a casting form for concrete. Then, studies and experiments were focused on compression or buckling as a fabric form generator.(figure.1) Further studies were looking at controler of fabric form generation(figure.2) , Fabric and concrete panels edge condition and connection between panels(figure.3) . The language developed was used to express the historic value of market square as a form of landscape installations (figure.4). Two half scale concrete panals were executed to explore formwork and concrete cast methods (figure.5).


(figure.2)


(figure.3)


(figure.1)


(figure.5)


(figure.4)

4 / STUDENT WORK_GINA FARKAS

SPRAY CAST METHOD STUDIES: DUALITY IN SURFACES AND FORMWORK

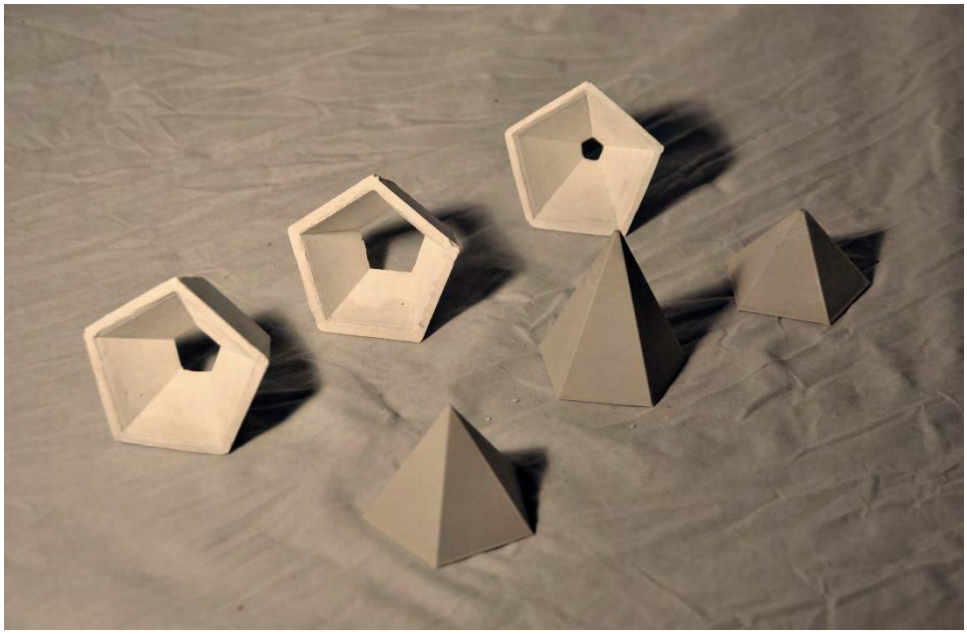
Gina Farkas
Experiments in Concrete Methods
Spring'15

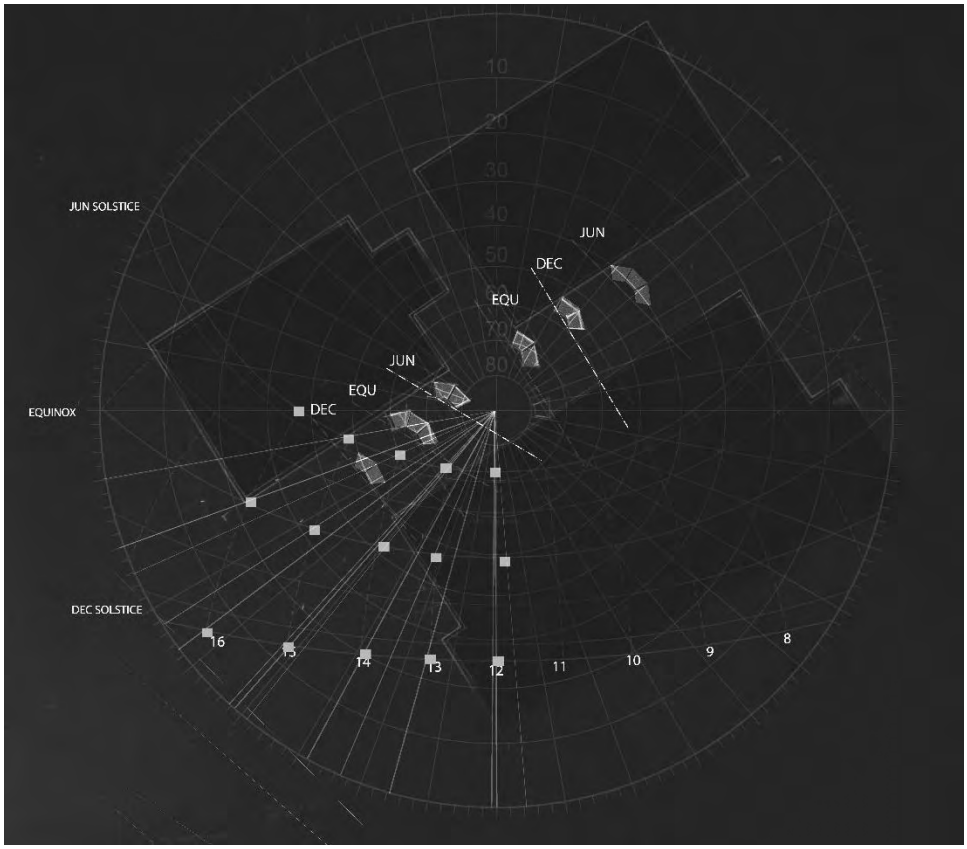
Parameters:
-Dimensions and sides
-Mold and form making
-Shape of adjacent and relative forms

THREE-SIDED
EMBEDDED SURFACE
TWO FORMS
Two surfaces impressed against one another. What kind of duality and interstitial space is created with two surfaces put together, facing one another?
A wire mesh embedded in a wood template that bounds the poured plaster. These two surfaces combined result in three surface faces: the interface and the adjacent apposing sides.

TWO-SIDED
PRESSED AND FORMED CAST
TWO FORMS
Different form for mold, same dimensions for shape.
Opposing shapes: external shell only relates to internal form as a contain-er/ boundary. The box acted as a bounding force and shell around the balloon as well as a box and surface to which the balloon was later applied.

REINFORCED SINGLE SIDED
CAST SPHERE SURFACE-PATTERN
ONE FORM
Two sides, captured in one layer.
What role does one sided formwork with no intentional releasing moment play in the forming of a skin or shell on the exterior form work?

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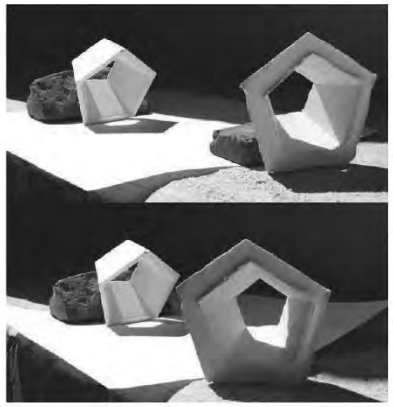
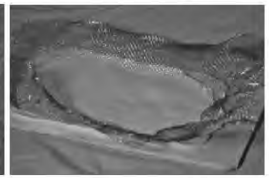
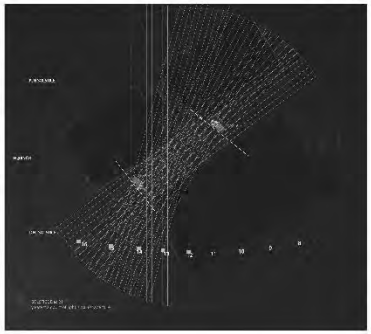
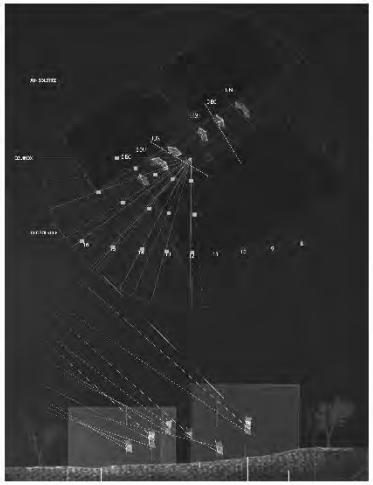
Aperture Pathway: Concrete as Interface between Light and Ground

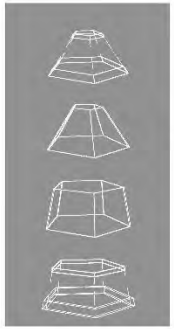
Adv. Studio Concrete Fabrication Spring 2015_Gina Farkas M.Arch'16

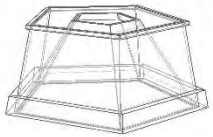


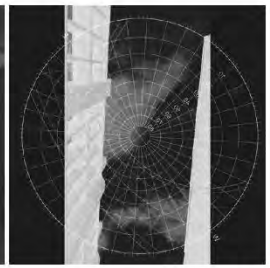








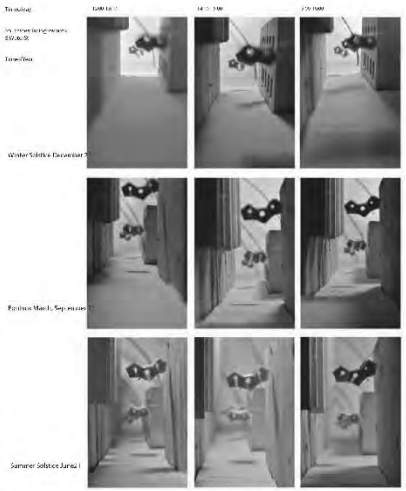




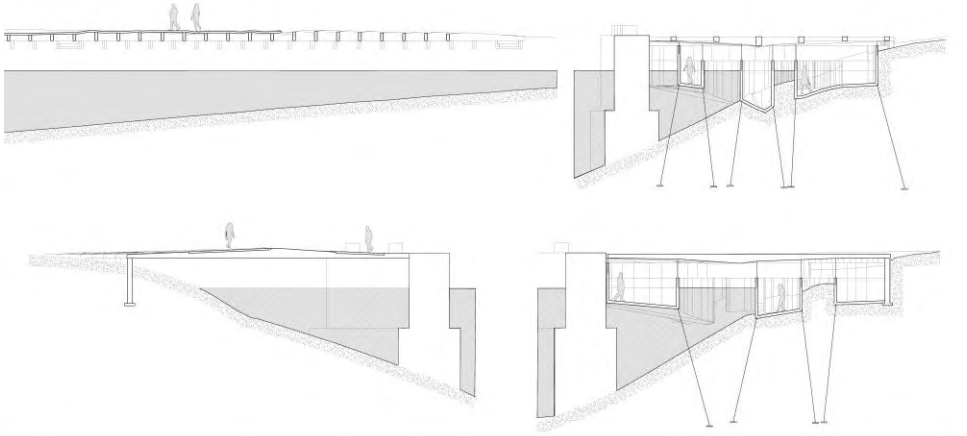
The initial experiments in drawing, casting, and printing interpreted the possibilities of concrete as 'hard and/or soft', as 'interface', and as a 'method/process'. These remained fundamental elements in the design for the final project, Aperture Pathway.

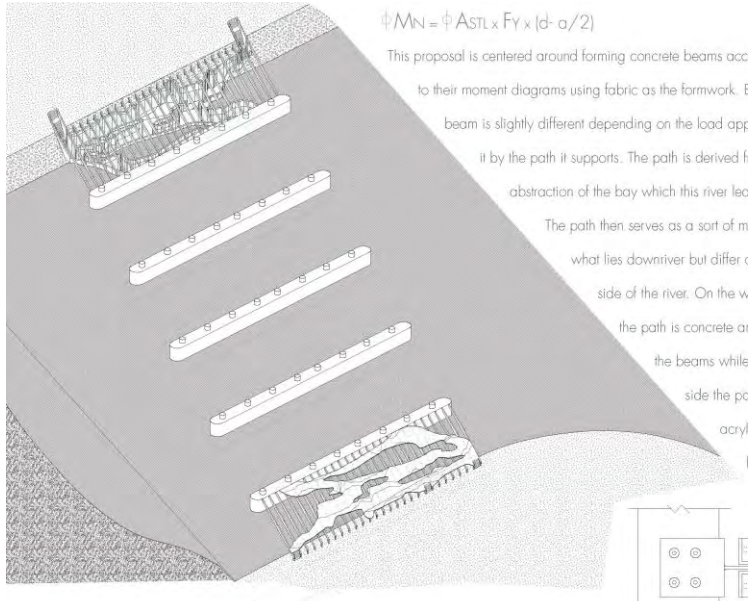
These early studies of concrete posited a set of observations to be included in the site analysis. Sun light can be treated as a soft element in contrast to the depth and rigity of concrete in multi-tonal forms. Concrete can act as an interface between the Sun and the Earth to bring attention to a forgotten place, like the alley way chosen for ste analysis. The method of choice here for concrete fabrication utilized two-sided formwork with little or no edge 'condition'.

The final pieces are modular 'apertures' that draw attention to certain times of day as the sun's path traces light across the inner angle. An attention was given specifically to the economics of variability in each piece's aperture.



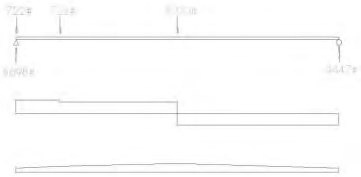
4 / STUDENT WORK_CAMERON HASTINGS

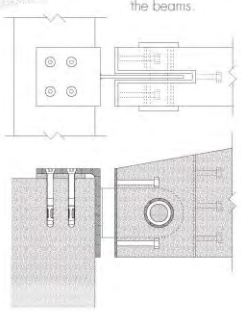


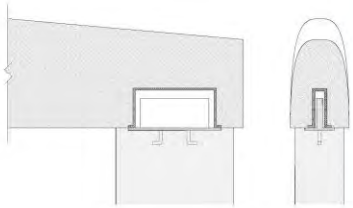


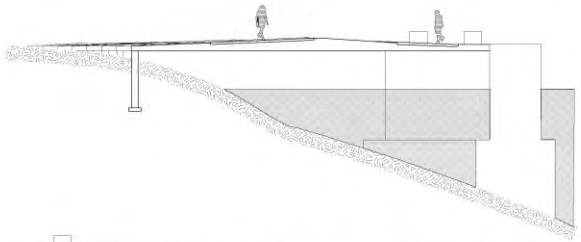
$\phi M_N = \phi A_{STL} \times F_Y \times (d - a/2)$

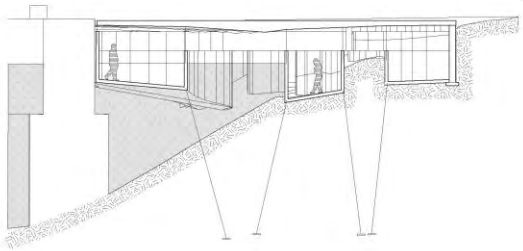
This proposal is centered around forming concrete beams according to their moment diagrams using fabric as the formwork. Every beam is slightly different depending on the load applied to it by the path it supports. The path is derived from an abstraction of the bay which this river leads into. The path then serves as a sort of map of what lies downriver but differ on each side of the river. On the west side, the path is concrete and sits atop the beams while on the east side the path is cast acrylic and is hung from the beams.



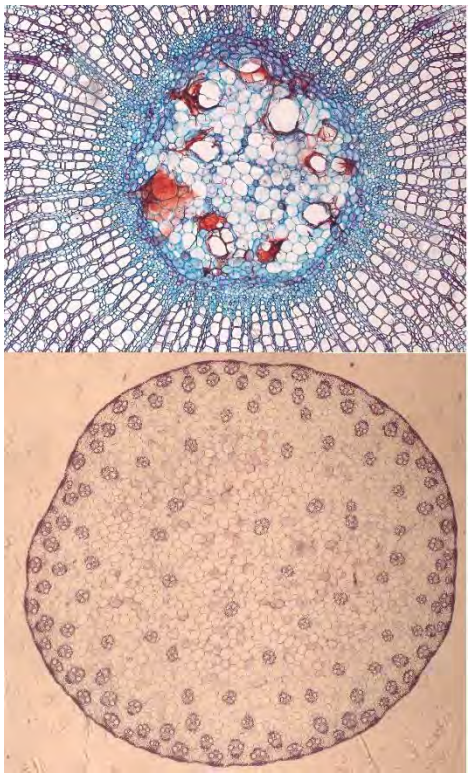


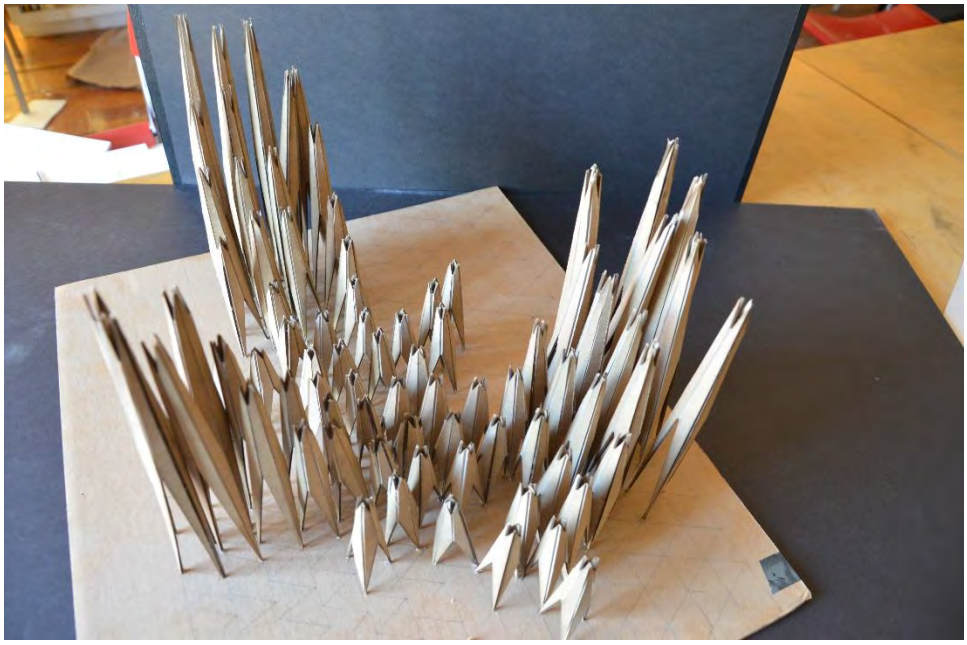


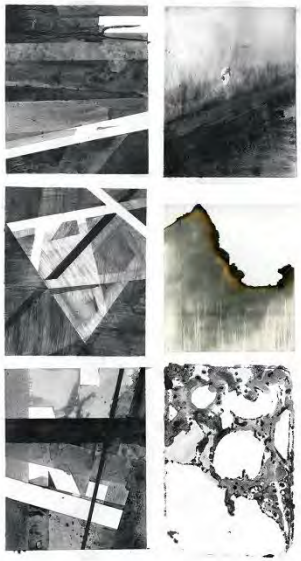


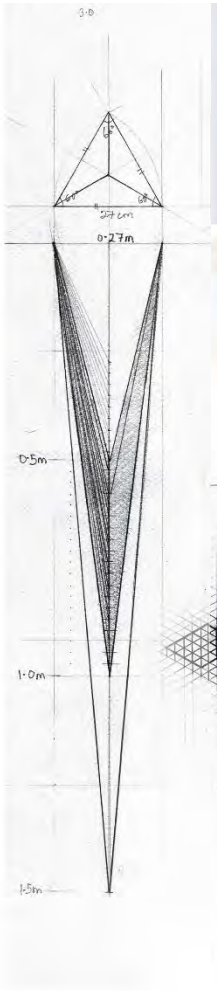


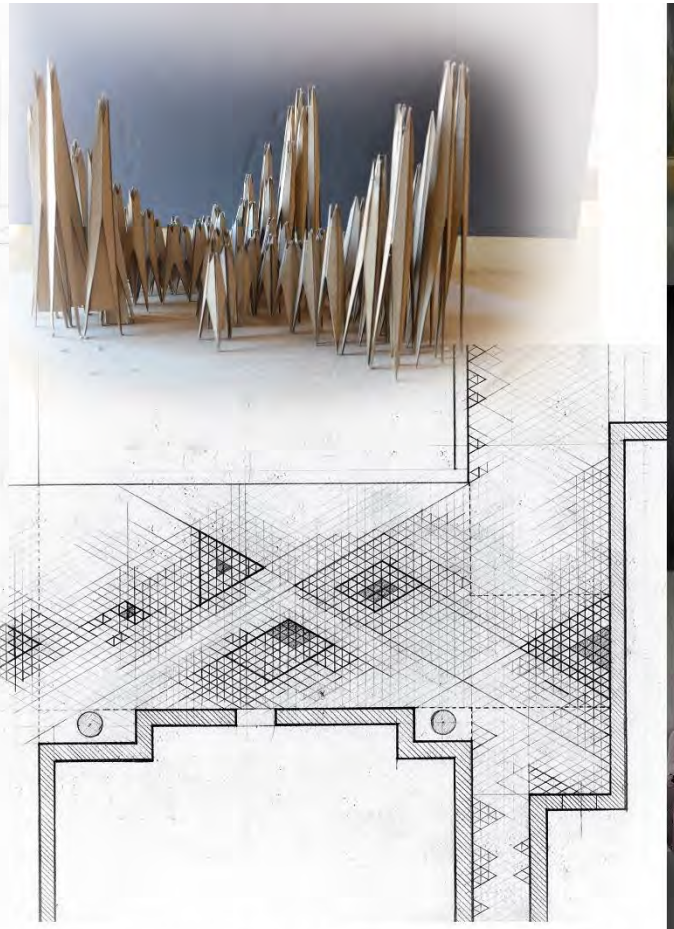
4 / STUDENT WORK_RONAK HINGARH

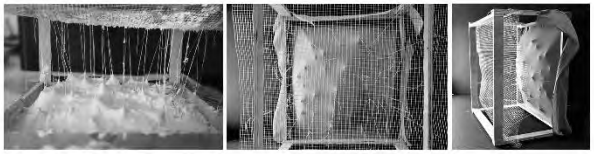












Concrete Studio// Stalactite-Stalagmite//
Rhode Island School of Design (M'Arch),
Advanced Studio, 2015

Proposed Location// RISD Museum Entrance

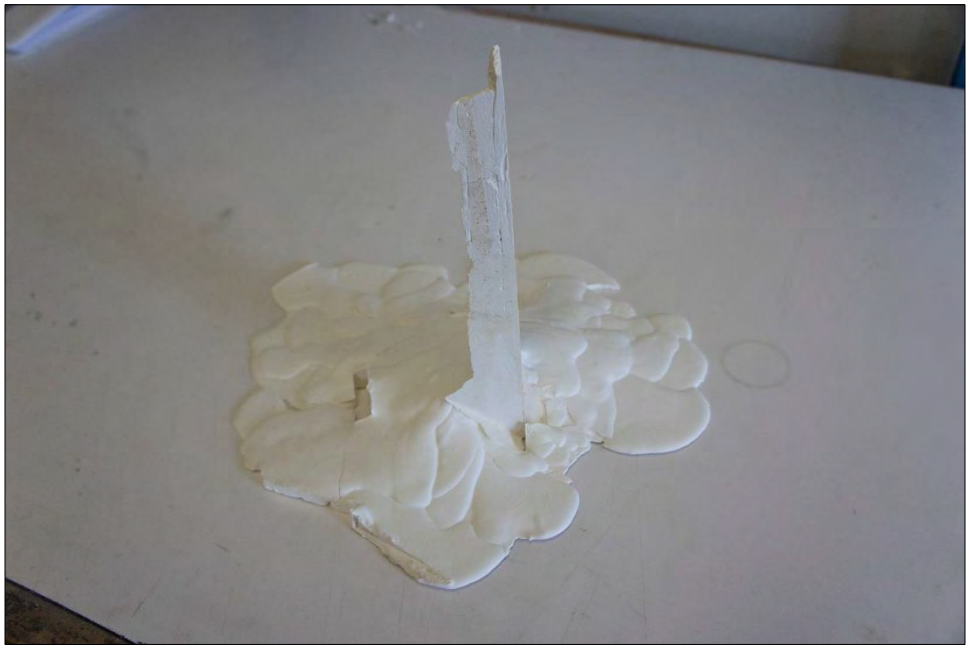
Individual and Academic Project

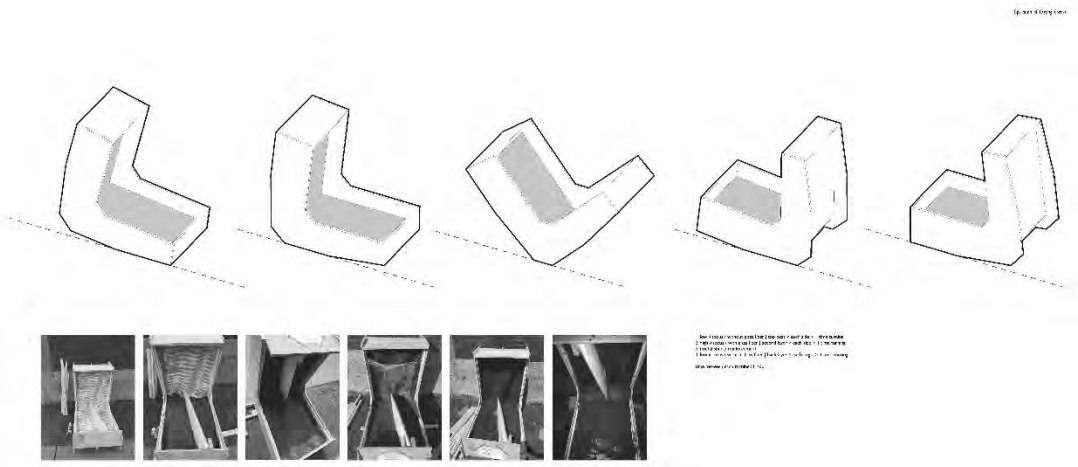
Design Guide/ Mentor// Brett Schneider
Contact: bschneid@risd.edu

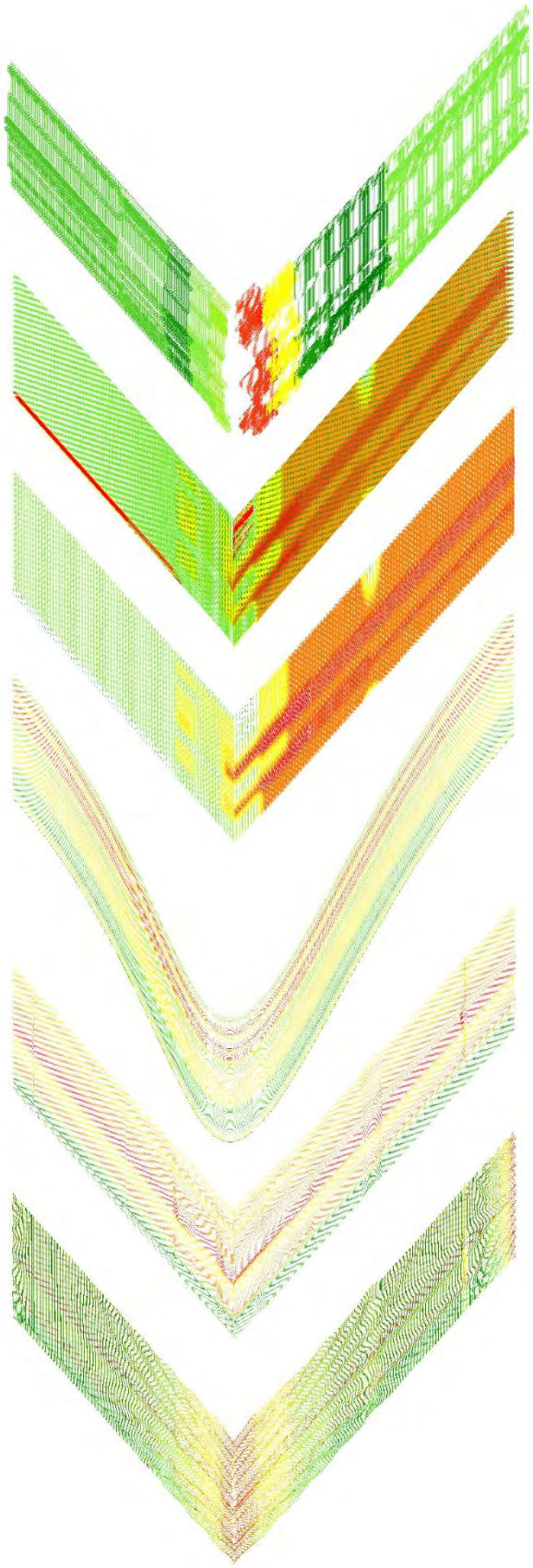
Design Concept and Methodology:
Exploration of fields and networks gave rise to a pattern of cluster based modulation of the surface. When stretched strategically the grid behaves as space formers.

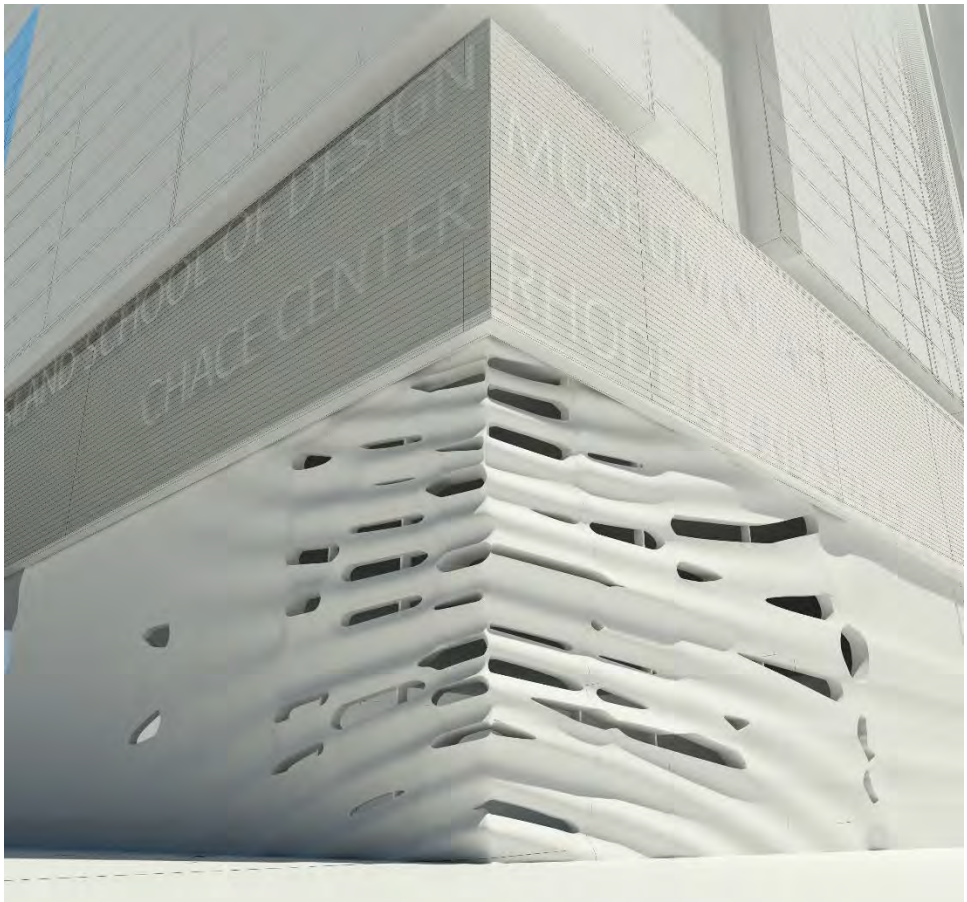
Indivudual panels were casted on flat wooden form work and assembled together.

4 / STUDENT WORK_DAEJONG KIM








CHACE CENTER

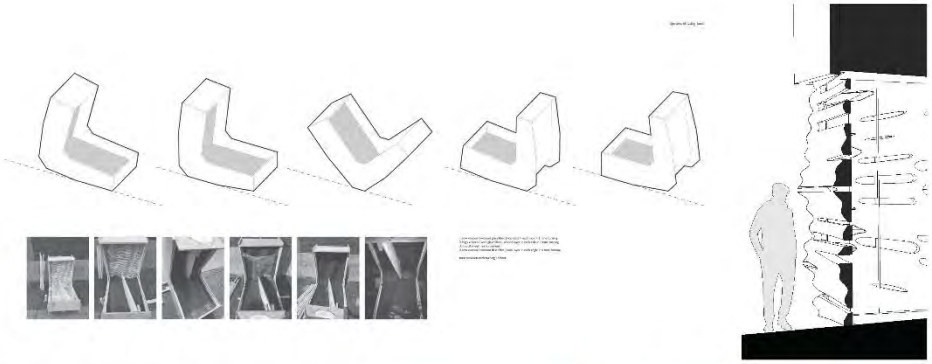
Daejeong Kim

1:1 Precast Concrete Studio. 2015 spring

//Brett Schneider

Corner. What does a corner mean to architects? This question defines the outer parameter of my project for the studio. To be more specific, the question was about imperfection of the corner. Every architect does consider a corner to be precise and perfect as he or she designs the architecture. Corner defines the architecture. Corner signify the architecture. Then why the corner of an architecture is not perfect at all? The implementation of creating the corner was neglected while it had been designed. Imperfection is an inevitable nature of a corner because of the implementation depends on handcraftman-ship, nature of producing the corner piece(s), and/or nature of the material. Imperfection can actually be a factor to create the corner. Maybe it should be. Then what if the design of a corner is emerged from the nature of that imperfection? Then it defines each surfaces on both sides. Ultimately, the corner is defined back from the surface the corner itself created. So it landed on the decision that the making of corner should be somehow coherent with the implementation of physical action of making the corner. The paradox revealed by this phenomenon is that the corner is the most significant element or field for architects in physically and metaphorically while it defies the architects by never being perfect. Gradual turning with several layers of concrete poured controls one side of corner while the other remained open. The paradox came to the play that one side of surface is controlled but not to be perfect, whereas the other side is not controlled with form-work but more seems to be more perfect as leveled by nature.

The tension played between architects and a corner is quite intensive, and one can never conquer the other utterly. Exploring through analog experimentations phase, digital analysis, digital design, and then back to intensive analog way of implementation -- styrofoam(pink foam) sectional profiles for mold, sending down, construction of wood backer shape, sealing, and intensive action of turning the form-work gradually all by hand, the project overarching a fundamental questions of architectural thinking.



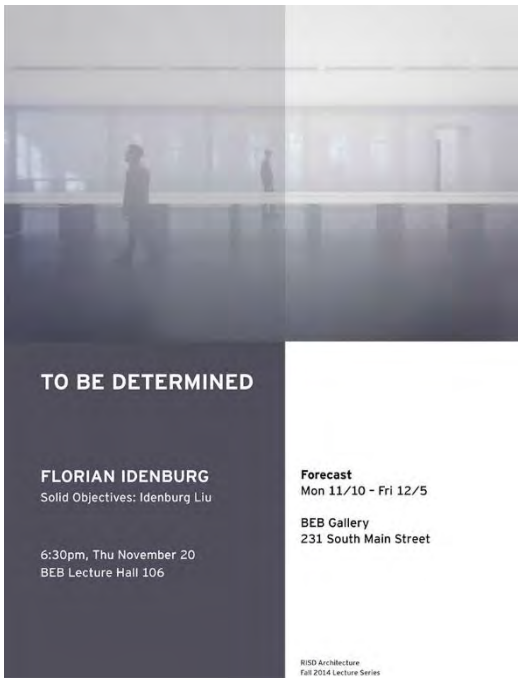
4 / STUDENT WORK_CASTING WORKSHOP

5 / RELATED EVENTS

The following is a list and description of various events including: trip to 2014 PCI Convention; Fabricator Partner Facility Visits; Departmental Lectures; and Departmental Exhibitions related to the sponsored studio.

Attendance at 2014 PCI Convention in Washington DC by Prof Brett Schneider, Prof James Barnes, Rami Hammour (GR), and Brandon Wang (UG). Presentation of RISD year one and exhibition boards of student work.

Exhibition by New York based architects SO-IL in the fall of 2014. This exhibition at the Bayard Ewing Building included the production of models by RISD students exploring novel methods of castings related to an ongoing project in precast concrete be the firm.



Lecture by Mark West formally of the University of Manitoba. Mark West founded the CAST laboratory for the study of methods of casting concrete – primarily using fabric forms. He presented his work in an evening lecture and participated in an afternoon of critiques for the students in the studio in the Spring of 2015.

Class field trip for both the studio and the RISD Concrete Structures (required technical sequence course in architecture with 55 students) to Blakeslee Prestress in Branford CT to provide introduction to design, detailing, and fabrication of precast concrete.

Class field trip for the studio to Coreslab Structures in Thomaston CT to see their facilities for the production of architectural precast including UHPC components.

6 / ACKNOWLEDGEMENTS

We would like to thank the following individuals and the companies and institutions that they represent for their contributions of time and effort to make this studio a more rewarding experience. In addition to coordinating and participating in field trips, Rita Seraderian and Robert Del Vento served as critics on design juries for the students and add valuable insight from a perspective outside the school.

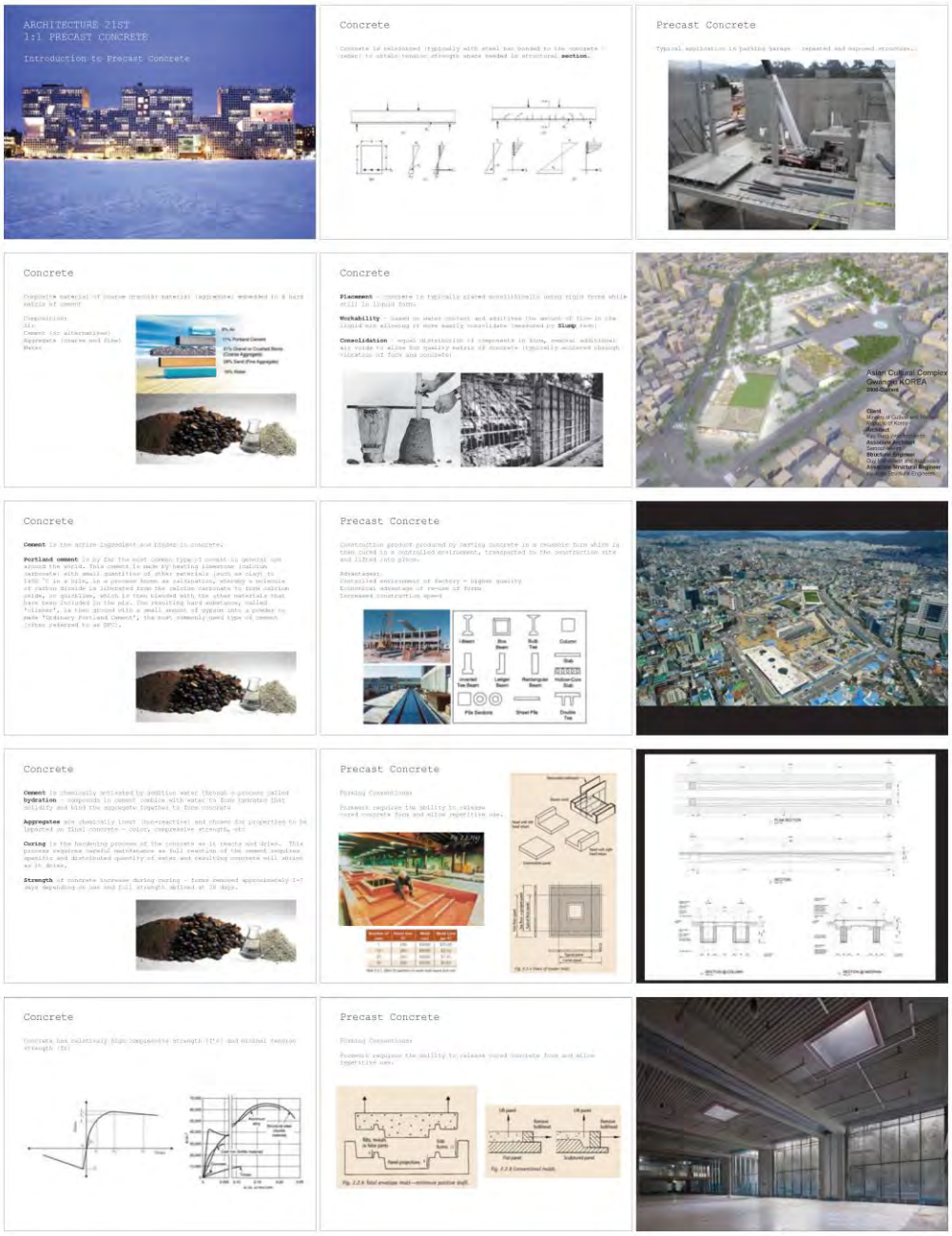
Rita Seraderian
PCI Northeast, Belmont MA

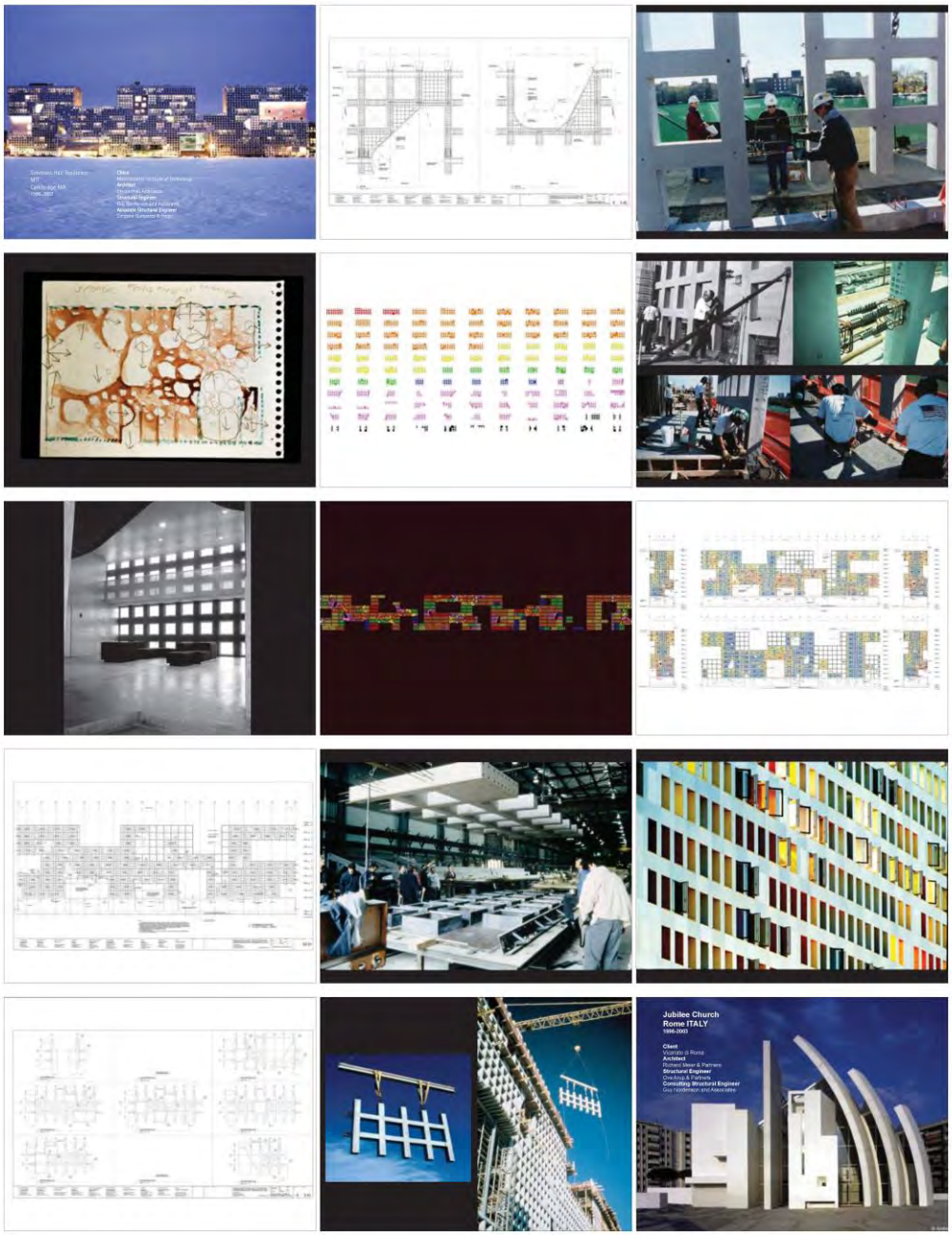
Leon Grant
Robert Del Vento
Coreslab Structures, Thomaston CT

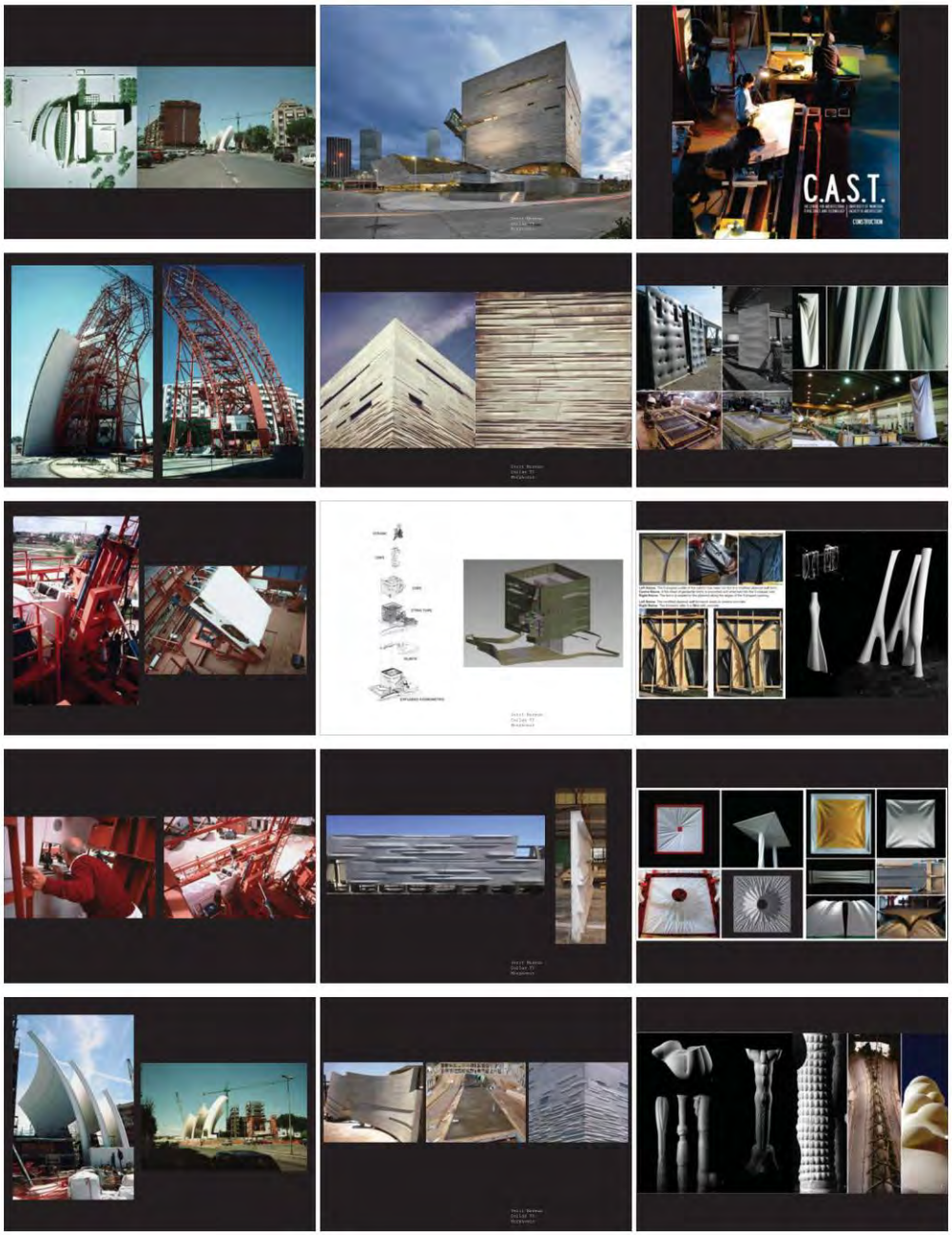
Bob Vitelli
Blakeslee Prestress, Branford CT

APPENDIX / ADDITIONAL COURSE DOCUMENTATION

The following is a reproduction of additional related course documentation including introductory lecture, assignment handouts, and workshop directions.




Jubilee Church
Rome ITALY
1996-2003
Client
Vicariato di Roma
Architect
Richard Meier & Partners
Structural Engineer
Ove Arup & Partners
Consulting Structural Engineer
Guy Nordenson and Associates


C.A.S.T.

Division of Architectural Studies
Rhode Island School of Design

1:1 Precast Concrete
Advanced Studio — Arch 21ST

Assignment #1

Assignment Description:

Research into various topics related to the fabrication of concrete in order to present to the studio group and produce a lexicon or encyclopedia of techniques for application (by you or your classmates) later in the semester. As multiple students will be addressing similar topics, we will focus individual research through discussion to prevent un-necessary repetition.

Research Topics:

1 Fabric Forms
2 Form Liners
3 Embedments/Inserts
4 Spray Casting
5 Fiber Reinforcement
6 Form Construction (rigid forms)

Deliverables:

Four page (minimum) dossier including both descriptive text and images for assigned topic with additional page for bibliography of sources (online digital and hardcopy sources). These dossiers will be compiled into a binder for common use (font and base format to be provided).

Powerpoint slides (equivalent to dossier) for presentation to the studio group.

Experimental model (no sample bigger than 1 cu ft) critically examining or explaining topic in medium of the student's choosing (with explanatory drawings as necessary).

Dates:

Feb 16	Bibliography and initial document collection
Feb 19	Interim pinup/discussion
Feb 26	Assignment Review (guests TBD)

Advanced Studio
Arch 21ST Spring 2015
Page 1

Precast Concrete Institute

Student Membership:
We recommend that you join the PCI as a student member (free)
http://www.pci.org/About_PCI/Join/Individual_Membership/

Reference Links:
Main link https://www.pci.org/
Resources https://www.pci.org/Project_Resources/

Course Bibliography and Additional Reference:

Available on PCI USB drive:
Architectural Precast Concrete 3rd ed, Precast Concrete Institute, Chicago IL 2007.
PCI Design Handbook 7th ed, Precast Concrete Institute, Chicago IL 2010.
See also numerous other resources provided here.

Available in Library:
Cohen and Moeller editors, *Liquid Stone: New Architecture in Concrete*, Princeton Architectural Press, New York NY 2006.
Bell and Buckley editors, *Solid States: Concrete in Transition*, Princeton Architectural Press, New York NY 2010.
Detail: Review of Architecture and Construction Details (Eng Edition), periodical, Institut für Internationale Architektur-Dokumentation, Munich, 2005-current.
Phillips and Yamashita, *Detail in Contemporary Concrete Architecture*, Lawerence King, London UK 2012.
Nervi, Aesthetics and Technology in Building, Harvard University Press, Cambridge MA 1965.
Kepes editor, *Structure in Art and in Science*, George Braziller, New York NY 1965.
Forty, *Concrete and Culture*, Reaktion Books, London UK 2012

Additional Sources online:
CAST University of Manitoba http://www.umanitoba.ca/cast_building/index.html

Division of Architectural Studies
Rhode Island School of Design

1:1 Precast Concrete
Advanced Studio Arch 21ST

Assignment Monday 2 March

Assignment Description:

React to 3 components of main design problem - note that we are purposefully not defining the terms of the design in greater detail (yet).

Given the following 3 components react to each in separate drawing in order to identify a question, represent an idea, or make a statement related to each. Consider the medium and method of making your drawing as integral to this process. The drawings need not be similar or in a series.

Object of Interface
Hard or Soft
Method of working with concrete

See course syllabus for some additional context in each case.

Deliverables:

3 drawings - medium of your choice, each not larger than 24x24in

We will pin up and discuss on Monday 3 March with intention to produce a series of (perhaps unrelated) ideas that we can then react to, reflect upon, or edit in light of additional description of design project.

In addition, please edit your Assignment #1 documentation for the following: Consistent format (header/footer, fonts, margins) per the template, topic title and name at top page 1 in title font and size, bibliography titled as such on separate page at end. Upload in base document and pdf to course google drive.

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Arch 21ST Spring 2015
Page 1

Division of Architectural Studies
Rhode Island School of Design

1:1 Precast Concrete
Arch 21ST Advanced Studio Spring 2015

Assignment #2

Assignment Description:

Design of an architectural object through serial experiments using small scale castings of the full object in addition to other representation. Students will choose a method from the catalog from Assignment 1 and define a specific function for their architectural surface to explore. Site is of your choosing with 1000ft radius of BEB.

Program
The program for the project is loosely defined as an architectural surface of interface with a more specific interpretation and application to be defined by the student - you need to design the interface. To begin this process we can define an interface as a point where two systems, subjects, organizations, etc., meet and interact. Consider the following:

- Is the project a singular object or a repeated piece? Standalone object or attached to building?

- What are the systems that interact and how is that interaction accomplished? Interaction: individual-individual, individual-collective, collective-collective

The scope of the design is limited to an object of roughly the scale of the human figure in order to ensure engagement in detail and in total of the object including the technical constraints of its production.

Method of Working/Fabrication
Choose a method from the lexicon produced for Assignment 1. This must be incorporated into the production of your object. Note that your object must be an element that is (pre)cast and then put into place.

Material Criticality
Your object must address the material of concrete critically relative to either engaging it as heavy or light (the interpretation of hard and soft is also for you to construct and articulate).

Deliverables:

Week 1 - Combine separate studies into a singular object in drawings (site plan, plan, sections, diagrams, fabrication drawings) and singular model (approximately 3"=1'-0" as agreed with critic).

Week 2-4 - Iterate and edit.

Review - 2 April. Requirements to be confirmed.

Notes: We will continue to work primarily in plaster and there will be at least 2 workshops in the first 2 weeks introducing mixing and casting of concrete. Mondays will be reserved for individual pinups in place of desk crits.

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Page 1

Division of Architectural Studies
Rhode Island School of Design

1:1 Precast Concrete
Arch 21ST Advanced Studio Spring 2015

Workshop #1 - Mixing Concrete and Simple Forming

Assignment Description:

Single group of students are to prepare batch of ready mix concrete and specified form (see attached drawings and instructions). Divide yourselves up as necessary.

Materials:

(3) 80lb bag of Ready-mix Concrete
5gal bucket
Measuring cups
Trowels
Large mixing tub
Test cylinders with lids
Metal testing tray
Slump cones
Scoops
Graduated tamping rods
Stripping tools
Sanded Plywood - 2'x4'x3/4"
Various 2x lumber
Form caulking
Wax release agent
Wood screws

Notes:

Allow 1cf of volume in mixing tub per 80lb bag - our tubs are approximately 4cf each

Base water is 6 pints per 80lb bag and final mix should be on order of 6-9 pints water

8 pints = 1 gallon and we have 5 gallon buckets and measuring

Consider the form thoughtfully relative to other materials and inserts in each case prior to any cutting.

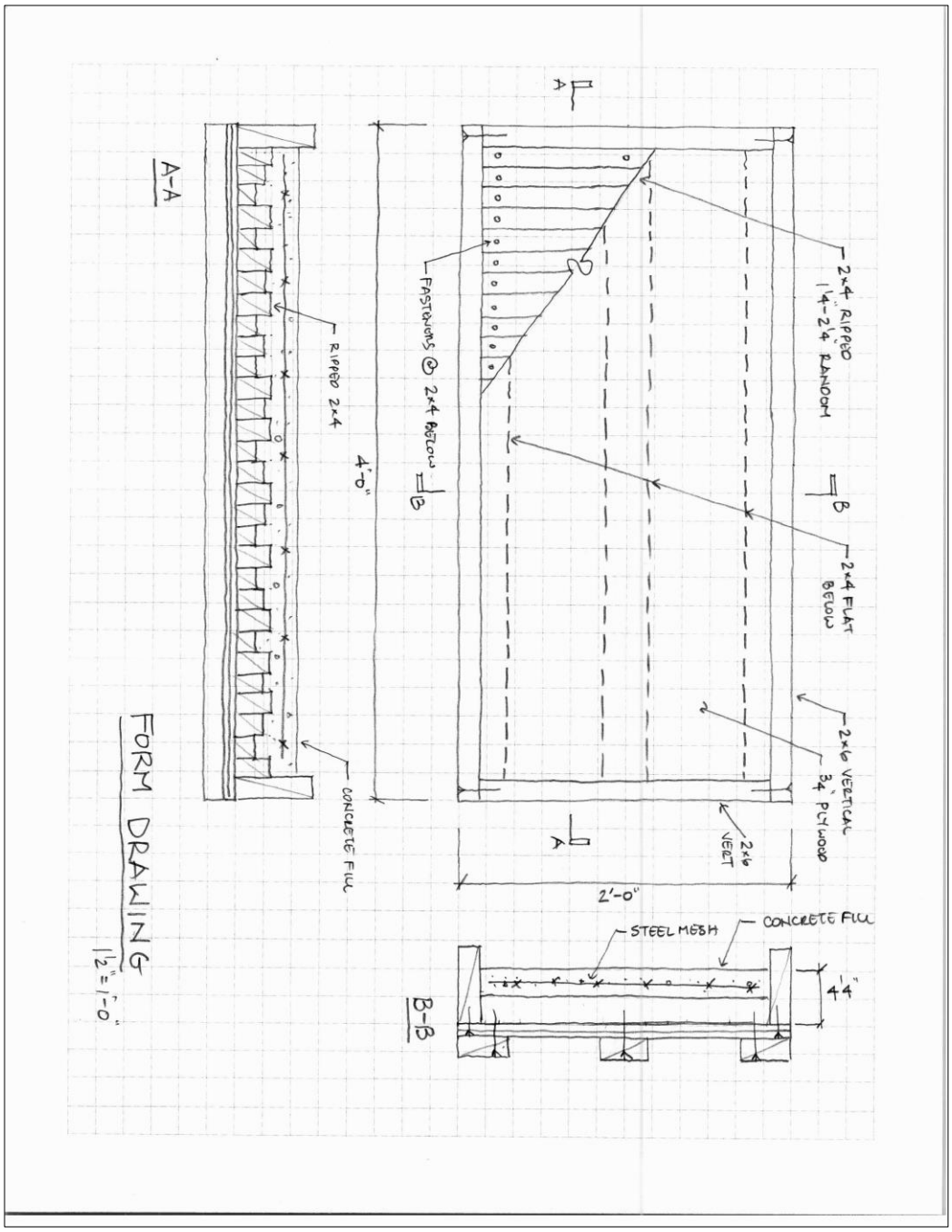
Seal all edges and prepare all surfaces with release coating as necessary.

Steel brackets and handles are available as you feel necessary.

Predrilling takes time but leads to better construction.

Do not forget to clean up when through.

Advanced Studio
Arch 21ST Spring 2015 Page 1


2×4 RIPPED
1'4"-2'4" RANDOM
2×4 FLAT BELOW
2×6 VERTICAL
3/4" PLYWOOD
2×6 VERT
2'-0"
FASTENERS @ 2×4 BELOW
4'-0"
RIPPED 2×4
CONCRETE FILL
A-A
B-B
STEEL MESH
CONCRETE FILL
4 1/4"
FORM DRAWING
1/2" = 1'-0"

QUIKRETE

CEMENT & CONCRETE PRODUCTS™

CONCRETE MIX

PRODUCT NO. 1101

DIVISION 3

Structural Concrete
03 31 00

PRODUCT DESCRIPTION

QUIKRETE® Concrete Mix is a pre-blended mixture of cement and aggregates for general structural uses, requiring only the addition of water.

PRODUCT USE

QUIKRETE® Concrete Mix is designed for pouring concrete 2" (51 mm) thick or more and building or repairing anything out of concrete, including:

- Foundation walls and footings
- Sidewalks, curbs, steps, ramps and walkways
- Appliance and equipment platforms
- Pipe and post footings
- Floor slabs and patios
- Pools, fish pools, stepping stones
- Splashblocks and bird baths
- Riprap & slope protection
- Driveway repairs

SIZES

- QUIKRETE® Concrete Mix is available in:
  - 40 lb (18.1 kg) bags
  - 60 lb (27.2 kg) bags
  - 80 lb (36.3 kg) bags

YIELD

- An 80 lb (36.3 kg) bag yields approximately 0.60 cu ft (17 L)
- A 60 lb (27.2 kg) bag yields approximately 0.45 cu ft (12.7 L)
- A 40 lb (18.1 kg) bag yields approximately 0.30 cu ft (8.5 L)

TECHNICAL DATA

APPLICABLE STANDARDS

ASTM International - ASTM C387 Standard Specifications for Packaged, Dry, Combined Materials for Mortar and Concrete

PHYSICAL/CHEMICAL PROPERTIES

QUIKRETE® Concrete Mix exceeds the compressive strength requirements of ASTM C387, as shown in Table 1.

TABLE 1 TYPICAL COMPRESSIVE STRENGTH[1]

Compressive strength, ASTM C39

Age	Typical Values
7 days	2500 psi (17.2 MPa)
28 days	4000 psi (27.6 MPa)
Slump Range	2" – 3" (51-76 mm)

[1]Tested under laboratory conditions in accordance with ASTM C387

INSTALLATION

PREPARATORY WORK

Stake out the planned area and remove sod or soil to the desired depth. Nail and stake forms securely in place. Tamp and compact the sub-base until firm.

MACHINE MIXING INSTRUCTIONS

QUIKRETE® Concrete Mix can be mixed in a barrel type concrete mixer or a mortar mixer.

- Choose the mixer size most appropriate for the size of the job to be done
- Allow at least 1 cu ft (28 L) of mixer capacity for each 80 lb (36.3 kg) bag of QUIKRETE® Concrete Mix to be mixed at one time
- For each 80 lb (36.3 kg) bag of QUIKRETE® Concrete Mix to be mixed, add approximately 6 pt (2.8 L) of fresh water to the mixer
- Turn on the mixer and begin adding the concrete to the mixer
- If the material becomes too difficult to mix, add additional water until a workable mix is obtained
- If a slump cone is available, adjust water to achieve a 2" - 3" (51 - 76 mm) slump

Note - Final water content should be approximately 6 - 9 pt (2.8 - 4.3 L) of water per 80 lb (36.3 kg) bag of concrete. For other bag sizes, use Table 2 to determine water content.

HAND MIXING INSTRUCTIONS

- Empty concrete bags into a suitable mixing container
- For each 80 lb (36.3 kg) bag of mix, add approximately 6 pt (2.8 L) of clean water
- Work the mix with a shovel, rake or hoe and add water as needed until a stiff, moldable consistency is achieved
- Be sure all material is wet
- Do not leave standing puddles

Note - For other bag sizes, use Table 2 to determine water content.

QUIKRETE

TABLE 2 MIXING WATER FOR QUIKRETE® CONCRETE MIX

Package size, lb (kg)	Starting Water Content, pt (L)	Final Water, Content, pt (L)
80 (36.3)	6 (2.8)	6-9 (2.8-4.3)
60 (27.2)	4 (1.9)	4-7 (1.9-3.3)
40 (18.1)	3 (1.4)	3-4.5 (1.4-2.1)

APPLICATION

Method for Pouring a Slab

- Dampen the sub-grade before concrete is placed
- Do not leave standing puddles
- Shovel or place concrete into the form; fill to the full depth of the form
- After concrete has been compacted and spread to completely fill the forms without air pockets, strike off and float immediately
- To strike off, use a straight board (screed), moving the edge back and forth with a saw-like motion to smooth the surface
- Use a darby or bull float to float the surface; this levels any ridges and fills voids left by the straight edge
- Cut the concrete away from the forms by running an edging tool or trowel along the forms to compact the slab edges
- Cut 1" (25.4 mm) deep control joints into the slab every 6' - 8' (1.8 - 2.4 m) using a grooving tool
- Allow concrete to stiffen slightly, waiting until all water has evaporated from the surface before troweling or applying a broom finish

Note - For best results, do not overwork the material.

Method for Setting Fence Posts

- Dig post hole about 3 times the diameter of the post. Hole depth should be 1/3 the overall post height
- Place 6" (152 mm) of dry concrete mix in the bottom of the hole. Position the post, checking that it is level and plumb. Combine concrete mix with water and place into the hole
- When standing water has evaporated from the concrete, smooth the surface. Taper it away from the post so rain will flow in that direction. Wait 24 hours before post is subjected to any strain
- For load-bearing applications, follow local building codes for proper footing specifications

FINISHING

Any standard concrete finishing technique is acceptable for use with QUIKRETE® Concrete Mix. Concrete can be hand troweled, power-troweled, broom finished or finished with other specialty finishes.

CURING

General

Curing is one of the most important steps in concrete construction. Proper curing increases the strength and durability of concrete, and a poor curing job can ruin an otherwise well-done project. Proper water content and temperature are essential for good curing. In near freezing temperatures the hydration process slows considerably. When weather is too hot, dry or windy, water is lost by evaporation from the concrete, and hydration stops, resulting in finishing difficulties and cracks. The ideal circumstances for curing are ample moisture and moderate temperature and wind conditions. Curing should be started as soon as possible and should continue for a period of 5 days in warm weather at 70°F (21°C) or higher or 7 days in colder weather at 50 - 70°F (10 - 21°C).

Specific Curing Methods

- QUIKRETE® Acrylic Cure & Seal – Satin Finish provides the easiest and most convenient method of curing. Apply by spray, brush or roller soon after the final finishing operation when the surface is hard. The surface may be damp, but not wet, when applying curing compound. Complete coverage is essential
- Other methods of providing proper curing include covering the surface with wet burlap; keeping the surface wet with a lawn sprinkler and sealing the concrete surface with plastic sheeting or waterproof paper to prevent moisture loss
- If burlap is used, it should be free of chemicals that could weaken or discolor the concrete. New burlap should be washed before use. Place it when the concrete is hard enough to withstand surface damage and sprinkle it periodically to keep the concrete surface continuously moist
- Water curing with lawn sprinklers, nozzles or soaking hoses must be continuous to prevent interruption of the curing process
- Curing with plastic sheets is convenient. They must be laid flat, thoroughly sealed at joints and anchored carefully along edges

PRECAUTIONS

- Curing compounds should not be applied if rain or temperatures below 50°F (10°C) are expected within 24 hours
- Curing with plastic or burlap can cause patchy discoloration in colored concrete. For colored concrete, wet curing or the use of QUIKRETE® Acrylic Cure & Seal – Satin Finish is recommended
- Do not use curing compounds during late fall on surfaces where de-icers will be used to melt ice and snow. Using curing compounds at that time may prevent proper air drying of the concrete, which is necessary to enhance its resistance to damage caused by de-icers
- Protect concrete from freezing during the first 48 hours. Plastic sheeting and insulation blankets should be used if temperatures are expected to fall below 32°F (0°C)

WARRANTY

The QUIKRETE® Companies warrant this product to be of merchantable quality when used or applied in accordance with the instructions herein. The product is not warranted as suitable for any purpose or use other than the general purpose for which it is intended. Liability under this warranty is limited to the replacement of its product (as purchased) found to be defective, or at the shipping companies' option, to refund the purchase price. In the event of a claim under this warranty, notice must be given to The QUIKRETE® Companies in writing. This limited warranty is issued and accepted in lieu of all other express warranties and expressly excludes liability for consequential damages.

The QUIKRETE® Companies
One Securities Centre
3490 Piedmont Rd., NE, Suite 1300, Atlanta, GA 30305
(404) 634-9100 • Fax: (404) 842-1425

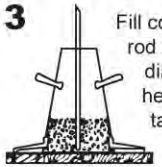
Refer to www.quikrete.com for the most current technical data, MSDS, and guide specifications

SLUMP TEST PROCEDURE
(FIELD TESTING)

1 To obtain a representative sample, take samples from two or more regular intervals throughout the discharge of the mixer or truck. DO NOT take samples at the beginning or the end of the discharge.

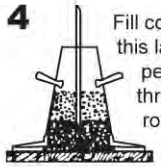
2 Dampen inside of cone and place it on a smooth, moist, non-absorbent, level surface large enough to accommodate both the slumped concrete and the slump cone. Stand or, foot pieces throughout the test procedure to hold the cone firmly in place.

3



Fill cone 1/3 full by volume and rod 25 times with 5/8-inch-diameter x 24-inch-long hemispherical tip steel tamping rod. (This is a specification requirement which will produce non-standard results unless followed exactly.) Distribute rodding evenly over the entire cross section of the sample.

4



Fill cone 2/3 full by volume. Rod this layer 25 times with rod penetrating into, but not through first layer. Distribute rodding evenly over the entire cross section of the layer.

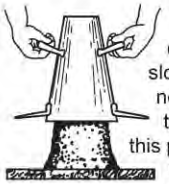
5

Fill cone to overflowing. Rod this layer 25 times with rod penetrating into but not through, second layer. Distribute rodding evenly over the entire cross section of this layer.

6

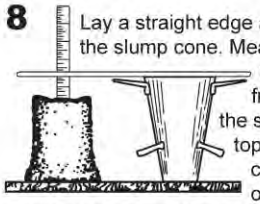
Remove the excess concrete from the top of the cone, using tamping rod as a screed. Clean overflow from base of cone.

7



Immediately lift cone vertically with slow, even motion. Do not jar the concrete or tilt the cone during this process. Invert the withdrawn cone, and place next to, but not touching the slumped concrete. (Perform in 5-10 seconds with no lateral or torsional motion.)

8



Lay a straight edge across the top of the slump cone. Measure the amount of slump in inches from the bottom of the straight edge to the top of the slumped concrete at a point over the original center of the base. The slump operation shall be completed in a maximum elapsed time of 2 1/2 minutes. Discard concrete. DO NOT use in any other tests