SEVEN

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This course has been taught in 2005 and 2006 by Associate Professor Athanassios Economou and Assistant Professor Frances Hsu at Georgia Institute of Technology in Atlanta, Georgia. It is the introductory design studio in the graduate program, the first in a series of 6 design studios. It is taken by students with liberal arts undergraduate degrees.

This course explores the Vitruvian triad *venustas, utilitas, firmitas* in the context of design studio. Form, function (program) and material are explored as aesthetic, conceptual and linguistic generators. "Grammars," i.e., complete systems of form (whether alphabetical or algebric) occur across the disciplines of architecture (Bauhaus), music (Schönberg), poetry (Valéry), and art (Cubism). This studio starts with Vitruvius and builds upon the writings of architects including Alberti, Laugier and Semper. Later, in the early twentieth century, the Modern Movement assumption that history was not directional and linear enabled architectural thought to be "recast" by architect-theorists such as Le Corbusier and Adolf Loos. More rececently, task of establishing anew the terminology of architecture has been explicitly undertaken by Rem Koolhaas, whose notions, of Bigness, the generic city, indeterminate specificity, and junkspace, etc., have expanded the terrain and the framework of architectural discourse.

The course follows a series of triadic exercises which are posited in the spirit of a "chinese menu." In the course of six short problems, students are asked to explore each component of the Vitruvian model and to make propositions based upon possible relations of those constituent parts to each other. The first three exercises explore the individual components of the Vitruvian model. The second cycle is based on dual combinations of form, program and materiality. "New" notions of architectural space are to be generated through the description, evaluation and interpretation of precedent. Exercises are progressively multifold and multi-scalar, based on mechanisms of reorganisation, revision, recombination, and representation. The final exercise of the semester is a 5-week project for the design of a building addressing all three components.

The pedagogical objectives of this introductory design course are twofold. The course seeks both to promote facility in form-making and to critically investigate

permutation and emergence in design. The premise is that these aspects working in tandem are primary modes of invention and knowledge. The development of the critical capacity requires rigor of action and of thought, in visual and in the verbal realms, as well as in the linkage of the two. The discipline of architecture is itself manifold, encompassing not only (built) form but also representation and discourse. Thus students are asked to develop specific skills by 1) working across the matrix of digital media, analogue media, 2D, and 3D descriptive techniques and 2) participating in the seminars, lectures and group discussions required in addition to studio work.

The structure of the exercises is derived by a precise set theoretical analysis of the framework of the class. The possible combinatorial subsets of the Vitruvian triad are $2^3=8$ including the empty set. Assuming that the empty set suggests a null input and response the possible theoretical constructs for making in studio are 7. These constructs are nicely mapped into studies, seminars and readings that inform one another. Furthermore, these 7 studies are structured in 3 phases that correspond to the 3 subsets of distinct ordinal numbers for the Vitruvian set; 3 studies isolate 1 element of the discourse {V}, {U}, {F}, 3 studies are comprised by 2 elements {V,U}, {V,F}, {U,F}, and the last study is the complete triplet {V,U,F}. Exercises will be distributed on different handouts.

The exercises are as follows: Exercise 1/7: Mapping: Venustas (V) Form: Exercise 2/7: Modeling: Utilitas (U) Program; Exercise 3/7: Folding/Formwork: Firmitas (M) Material; Exercise 4/7: Catalyst: Firmitas-Utilitas (FU) Material-Program; Exercise 5/7: Adaptation: Venustas-Utilitas (VU) Form-Program; Exercise 6/7: Prototype: Venustas-Firmitas (VF) Form-Material; Exercise 7/7: A Lovely Place: Venustas-Utilitas-Firmitas (VUF) Form-Program-Material.

1/7 : MAPPINGS

Venustas (V) Form

The goal of this introductory exercise is to engender both forms of order (organization) and orders (organizations) of form. Given a set of objects and a set of operations students are asked to manipulate (transform) structures, patterns and geometries. Classical discrete compositional devices frame the formal translations which occur with 2D, 3D, digital, and analogue representation. How many ways can an artifact can be described? What representational languages can be used as filters through which an object can be formulated? Addition, deletion, superimposition, sampling, mixing. This first exercise sets the course for a studio which is predicated on the notion that analysis equals creation. Students are asked to use media including photography, digital image processing (including photography, collage), museum board model-making, pencil or ink line drawing. The required reading is “Mappings” (1974) by Lionel March in *Geometry of the Environment*.

2/7 : MODELING

Utilitas (U) Program

This exercise is a first exposure at the historical, logical and spatial role of function in the description and construction of space. Function, a direct descendant of Vitruvian *utilitas*, sets forward a distinct vocabulary and world-making that often is examined and understood in its own terms. This exercise privileges function as an aesthetic component of form--an underlying order that can be used as scaffolding for the generation of form. The study explores aspects of algorithmic composition of form based on variations upon underlying functional network structures. biological analogies and kinetic models are explored. Media includes digital lathe models, Bezier models, NURBS models, engineering drawing. Also wireframe and surface model, digital crafted diagrammatic drawings and digital collages. The seminar reading is "On the Comparison of Related Forms" (1914) by D'Arcy Thomson in *On Growth and Form*.

3/7 : FOLDING/FORMWORK

Firmitas (F) Material

Exercise 2 is an investigation of systems of materiality through the creation of boundary conditions. The exercise follows a two-step process. The first is to create a skin that supports itself using one sheet of Arches. The entire piece of paper must be used. Students are asked to operate on the paper—to cut, fold, crease, pleat, tuck, crumple, wrinkle, score, incise, etc. The second step entails enclosing a volume with the skinning techniques invented and explored in step one. The skin is to provide all the structure and enclosure. Media skills are developed to include measured drawing, digital drawing, model making and use of the laser cutter. The reading is
"Structure, Construction, Tectonics" by Eduard Sekler in Gyorgy Kepes, ed., *Structure in Art and in Science*. An alternative exercise was also taught, addressing the material and formal possibilities of working with resin. Repetition and modularity, complex forms, form and formwork were explored. In this case, media included digital 3d surface modeling, digital fabrication, laser cutter, formwork, casts

4/7 : INTERFACE

Utilitas - *Firmitas* (UF) Program - Material

Exercise 4 explores material systems and programmatic organizations. Students are asked to design an urban catalyst in Midtown. This could be a billboard, roof structure, bus stop, theatre, slide/skate park, market, etc. The exploration includes the analysis of movement, narratives of encounter, thresholds, perception and framing as well as aspects of materiality pertaining to tactility, transparency, reflectivity, weight, texture, detail, joinery, etc. An alternative exercise addressed the design of an exhibition space in the architecture building. Media included sketching, notational diagrams, digital and physical model-making, measured drawing. The reading given was “On Site" by Carol Burns in *Drawing, Building, Text.*

5/7 : ADAPTATION

***Venustas* (V) – *Utilitas* (U) Form - Program**

Project
Form + function: form follows function; function follows form. This exercise addressed the type and typology of programmatic organizations in the design of a domestic space for one person in the architecture building. The syntax and semantics of a number of architectural precedents were investigated. Formal and programmatic languages were then generated through the description, interpretation and evaluation of models. 2D and 3D diagrams will be produced. Media included analog orthographic, axonometric, and exploded axonometric drawings, digital models. Also space measuring, diagrams, analogue and digital modeling. The reading is “Formulation" by John Peponis (2005) in *The Journal of Architecture.*

6/7 : PROTOTYPE

***Venustas* (V) – *Firmitas* (F) Form - Material**

Exercise 6 foregrounds the mutual relationship between form and materiality, between geometry and fabrication; some geometries are informed by specific models of construction and some construction techniques are developed to meet geometric demands. And often the materiality of form - hard, soft, elastic, opaque, transparent, translucent, often underlines, enables, comments, or even contradicts the construction of space. This exercise focuses on concrete and especially on two aspects of its properties; 1) surface continuity permitted by simple casts, and 2) surface duality with

its formwork. Techniques such as fabric-formed, pre-cast, cast-in-place, and more recent digitally oriented practices have been designed to explore the ways two dimensional surfaces (of wood, steel, fiberglass, etc.) may be manipulated in order to render curvature, folds, ruled surfaces, and complex geometries. The task is the design of a cast module of a topological genus 1 (a surface with a single hole within it) within a limit boundary box of 3'x9'x12' feet; the program of the cast is deliberately subdued and simple interpretations of the cast include programmatic elements such as a wall with a window, a keyhole mechanism –for an *xz* orientation of the cast, a floor with a staircase, or a well on the ground –for an *xy* orientation of the cast, and so forth. Media included physical prototypes, fabrication techniques, digital fabrication, formwork, casts, engineering drawings. Students were asked to read "Constructing Complexity" (2005) by William Mitchell in *Computer Aided Architectural Design Futures*.

7/7 : A LOVELY PLACE

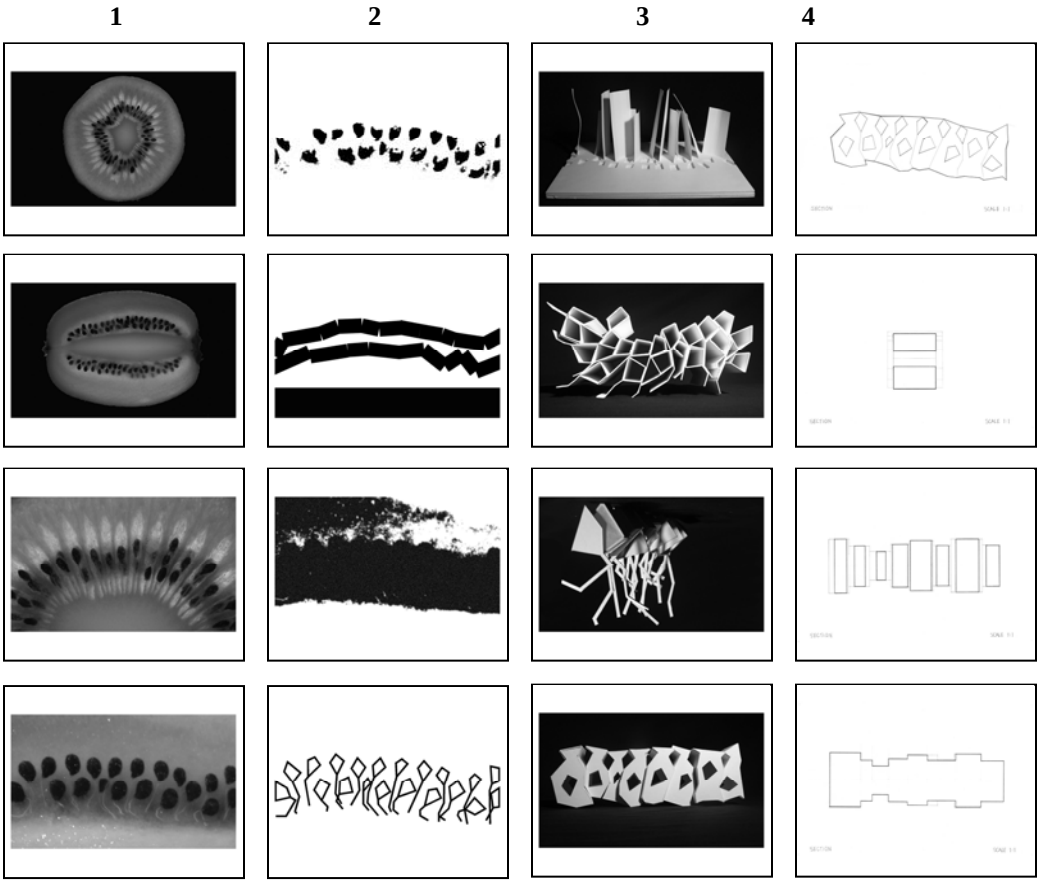
***Venustas - Utilitas - Firmitas* (VUF) Form - Program - Material**

This exercise brings together form, program and material for a residential guest house, a hotel, for visiting scholars at Georgia Tech on a site in Midtown. The building combines two discrete functions to address the collective as well as the individual. The program includes civic space and private spaces for temporary inhabitation including an enclosed public room and an outdoor garden. The public space was conceived to serve multiple programmatic and urban functions. The degree of enclosure was open to individual exploration. A range of functions were suggested including congregation, exhibition, community outreach, dining, study, sport, etc. The program asks for single-occupancy rooms, each with its own bathroom and kitchenette. The design objective is not to create unique, atypical units but rather to design and organize a series of similar rooms with ingenuity given the constraints of horizontal and vertical circulation, structural systems, building footprint, urban grain, orientation, private space and public address. Alternatively, students were asked to investigate the multiple interactions of site with form, material and program for a project in Midtown Atlanta for a contemporary dance conservatory. Regular activities of the dance center include training, rehearsals and workshops. Spaces required include a performance theatre, dance studios, cafeteria and living units for guest companies and artists. In both cases the reading given was an excerpt from Camillo Sitte (1889), *City Planning according to its Artistic Principles.*

TITLE: **MAPPINGS**

OBJECT: **KIWI**

WORK: **STEPHEN FERRIN AND MIHARU MORIMOTO**



REFLECTIONS:

1A **Kiwi Short Section**

1B **Kiwi Long Section**

1C **Kiwi Short Section Zoon @ Seeds**

1D **Kiwi Long Section Zoom @ Seeds**

2A **Punctuation**

2B **Rhythm**

2C **Layers**

2D **Structure**

3A **Positive + Negative Extrusions (Z) of Seeds and Stems: HT = Outline Length**

3B **Extrusion (Z) + Compression (X) of Seed-Stem Outlines: HT = Outline Length**

3C **Extrusion (Z) + Stacking (Z) of Seed-Stem Elements: HT = Distance between Seeds**

3D **Extrusion (Z) of Non-Seed/Non-Stem Elements: HT = Distance between Seeds**

4A **Section X-Y Plane**

4B **Section Y-Z Plane**

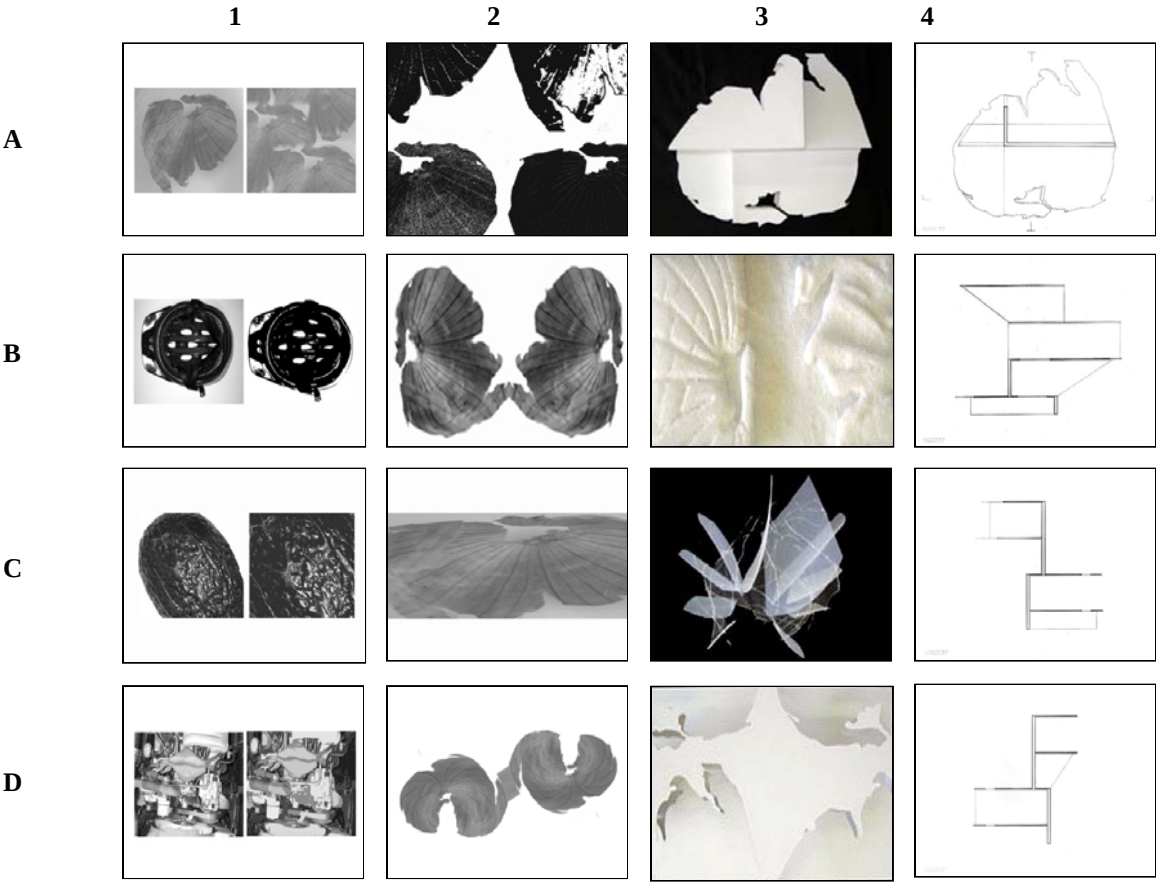
4C **Section X-Z Plane @ Seeds**

4D **Section X-Z Plane @ Non-Seeds**

TITLE: MAPPINGS

OBJECT: ONION PEEL

WORK: JILL MALINO AND WILLIAM ROOSENBERG



REFLECTIONS:

1A Onion Peel - Cloned Spatially

1B Bike Helmet - Stamped Effect

1C Avocado - Zoomed & Stylized

1D Automobile Motor - Paper Cutouts

2A Warhol inspired composition of four, distorted onion peels

2B Reflection

2C Stretched Perspective

2D Reflection and Rotation

3A Extrusion of the four, cropped images, which are rotated to recompose the original object

3B Contrast of negative space: the left side shows the contours of the arteries as void, the right side shows the spaces between as void

3C Explores the connectivity and layers of the arteries and veins

3D Positive and negative space of the 2D image

4A Plan View

4B Horizontal Section Cut

4C Vertical Section Cut (Right)

4D Vertical Section Cut (Left)

TITLE: **MODELING**

OBJECT: **TRIPOD**

WORK: **STEPHEN FERRIN AND ERASMUS IKPEMGBE**

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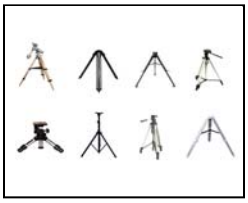
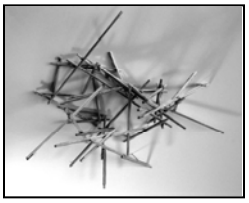
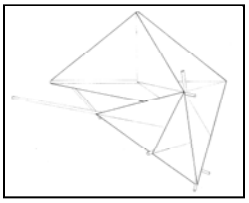
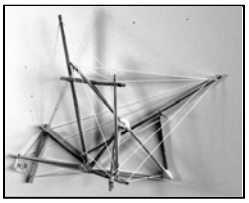
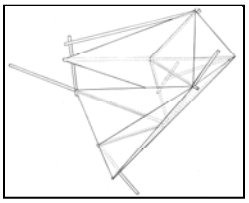
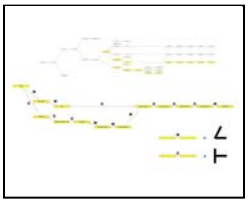
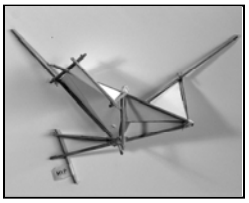
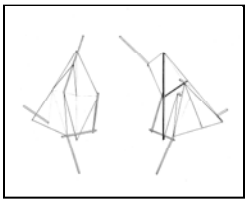
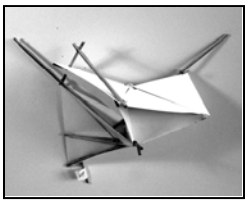
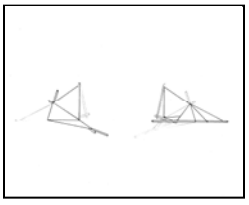
A			
B			
C			
D			

REFLECTIONS:

1A **Class**

1B **Object and Function**

1C **Diagram**

1D **Wireframe Model**

2A **Subset of Wireframe Structure**

2B **Evolving Structure with Lines**

2C **Skinning with Intersecting Planes**

2D **Volumes formed by Intersecting Planes**

3A **0° Axon - Volumetric Model**

3B **90° Axon - Volumetric Model**

3C **Top & Bottom Plan Views**

3D **Front & Rear Elevations**

TITLE: MODELING

OBJECT: UMBRELLA

WORK: ADA (HIU TUNG SUNG) AND JEN YOON

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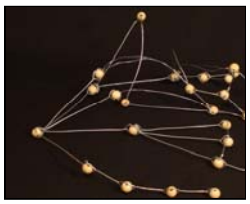
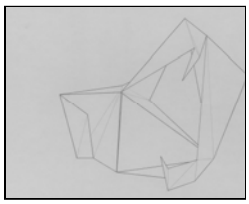
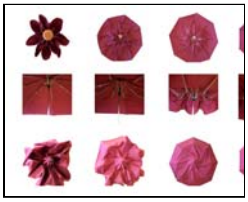
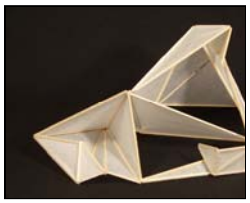
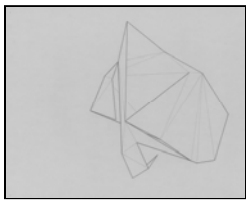
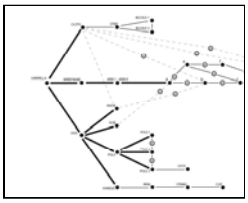
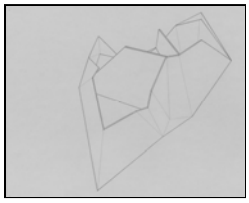
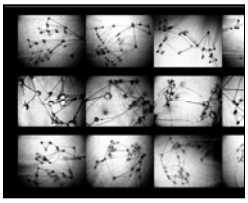
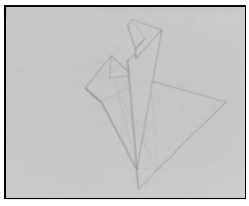
A			
B			
C			
D			

REFLECTIONS:

1A: Photographs of different types of umbrellas

1B: Photographs of kinetic properties of object

1C: Diagram of object

1D: Photographs of kinetic properties of wire model

2A: Wire model

2B: Surface model 1 (exterior surface)

2C: Surface model 2 (surface wrapping wire frames)

2D: Surface model 3 (surface in between frames)

3A: Axonometric 1

3B: Axonometric 2

3C: Axonometric 3 (section)

3D: Axonometric 4 (section)

TITLE: FORMWORK

OBJECT: CONCRETE BENCH

WORK: KRISTA IGOU AND MIHARU MORIMOTO

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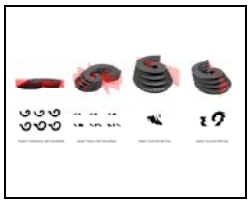
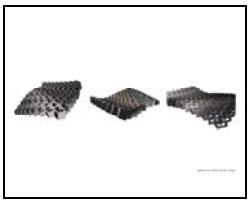
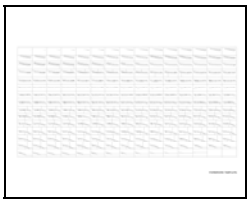
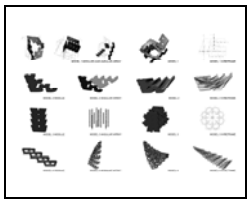
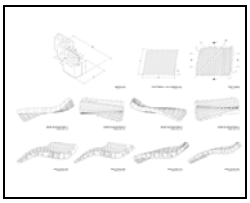
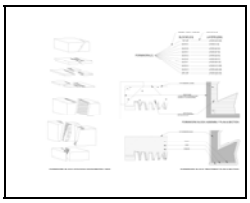
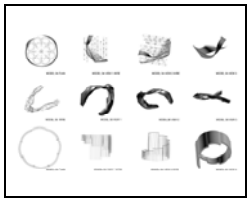
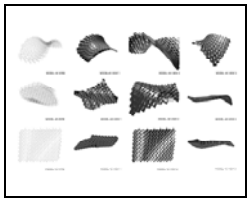
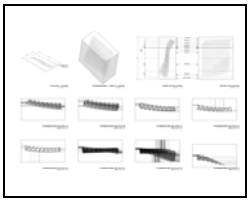
A			
B			
C			
D			

REFLECTIONS:

1A Object: Sectional Studies

1B Models: Four Schemes Based on Angular/Linear Displacement and Repetition Operations

1C Model 3: Development of Three Variations

1D Model 4: Development of Three Variations

2A Model 4C: Perspective Views

2B Model 4C: Engineering Drawings

2C Formwork: Perspective Views

2D Formwork: Engineering Drawings

3A Formwork: Sectional Template for Production

3B Formwork: Assembly Description

3C Model 4C: Casted Form

3D Formwork: Assembled Formwork

TITLE: FORMWORK

OBJECT: CONCRETE BENCH

WORK: ROSS WALLACE AND STEVE FERRIN

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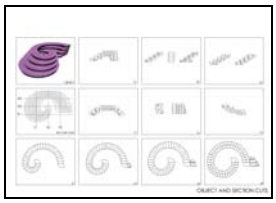
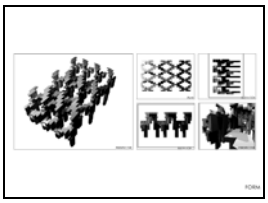
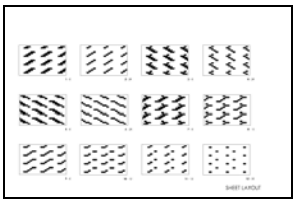
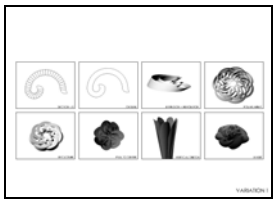
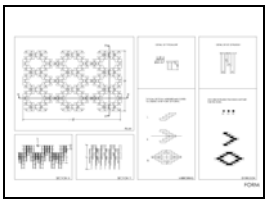
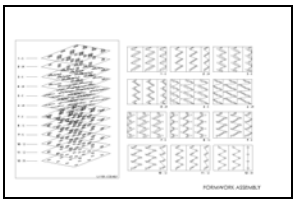
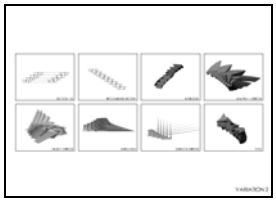
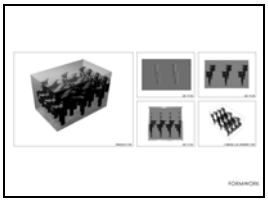
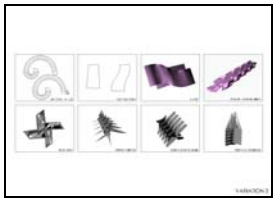
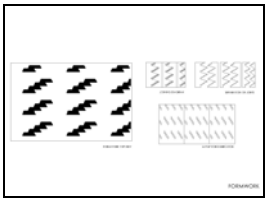
A			
B			
C			
D			

REFLECTIONS:

1A Object and Section Cuts

1B Variation 1

1C Variation 2

1D Variation 3

2A Form: Design

2B Form: Engineering

2C Formwork: Design

2D Formwork: Engineering

3A Formwork: Sheet Layout

3B Formwork: Assembly

3C Formwork

3D Casted Form