Computational Materiality for Sustainable Architectures and Comprehensive Skins

FINAL ASSIGNMENT PRESENTATION

ASSIGNMENT GUIDE 04

Architectural envelope detailed design and conceptual prototype fabrication

PROTOTYPE

πρωτο, "first in time " e τύπος, "type"

1. device to run observations and tests on project development ...mostly built by craftsmen;

2. In philology, as a synonym of archetype, to indicate the most ancient example, known or reconstructed, which can be traced back to a tradition, a narrative, illustrative vein, etc .;

3. With hyperbolic use, who presents characteristics, qualities, defects typical of a certain category

The purpose of this final assignment is to collect and to integrate all the material of the previous assignments with the drawings and analysis produced in the other two teaching modules. This first part has to be completed with another part specifically dedicated to describe the envelopes solutions.

Cover.
Antonio di Pietro Acerlino (FIlarete), Adam, 1460-64.

This page: Nikos Karatolios, Environmental Design A.A. 2013-14

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Environmental Design | 2017-18
Architecure and Environment Lab | Master Class | prof. G. RIdolfi, PhD
ASSIGNMENT GUIDE 04
Final Assignment | Architectural Envelope

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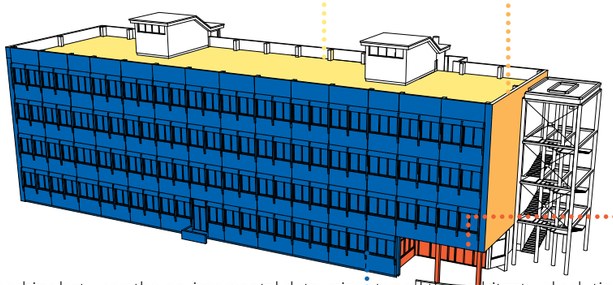
What to do

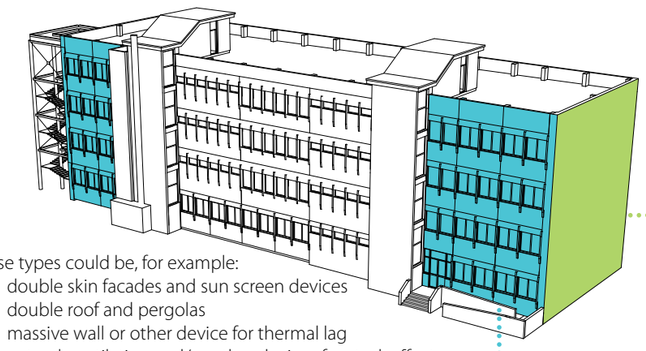
To carry out this assignment each group, is required to prepare an album where to collect the most meaningful elements produced in the present teaching module and to integrate them with the architectural design proposal and the analysis operated in the Design and Environmental control technique modules. In addition and in separate section, it is required to indicate, the different envelope solutions adopted for each part of the buildings and to develop the technological detail of a significant portion of it. Those solutions have to be developed at a conceptual level as a schematic prototype proposals for all the solutions and as a real model for the selected portion. That model can concern the roofing system, a specific façade, or the proposal of an envelope system with indication of the invariant parts and variables components to be adopted to fit different requirements.

How to do

To develop the first part of the assignment, students should have to describe all the design process starting from the briefing (client profile and users' requirements), place assessment, environmental analysis, up to the architectural proposal showing the



relationships between the environmental determinants and the architectural solutions.
In the second part, related to the architectural envelope prototypes, is required to identify, for each part of the buildings, the requirements system including environmental, architectural and functional goals. Some of the features to be considered are: exposure (wind and sun), views of the external landscape, accessibility to and from the outside, type of activities and the consequent internal environmental needs (illumination, thermo-hygrometric comfort, etc.). Consistently, students will have to:
- identify specific envelope types;
- specify, for each of them, their technological solutions
– indicate their positions on the project.



These types could be, for example:
- double skin facades and sun screen devices
- double roof and pergolas
- massive wall or other device for thermal lag
- natural ventilation and/or other devices for stack effect.

Proposed solutions can be represented using drawings, photos, and images of existing buildings or commercial solutions. This specification has to be integrated with brief description and diagrams/ideograms in order to give evidence of the positive and negative aspects for each of the proposed solutions.
For this part, the use of the energy modeling tools is required, at the mass level and at the analytical detail as well. To effectively synthesize results can be helpful the use of the SWOT technique.

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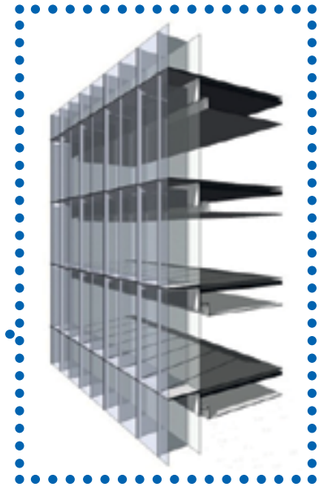
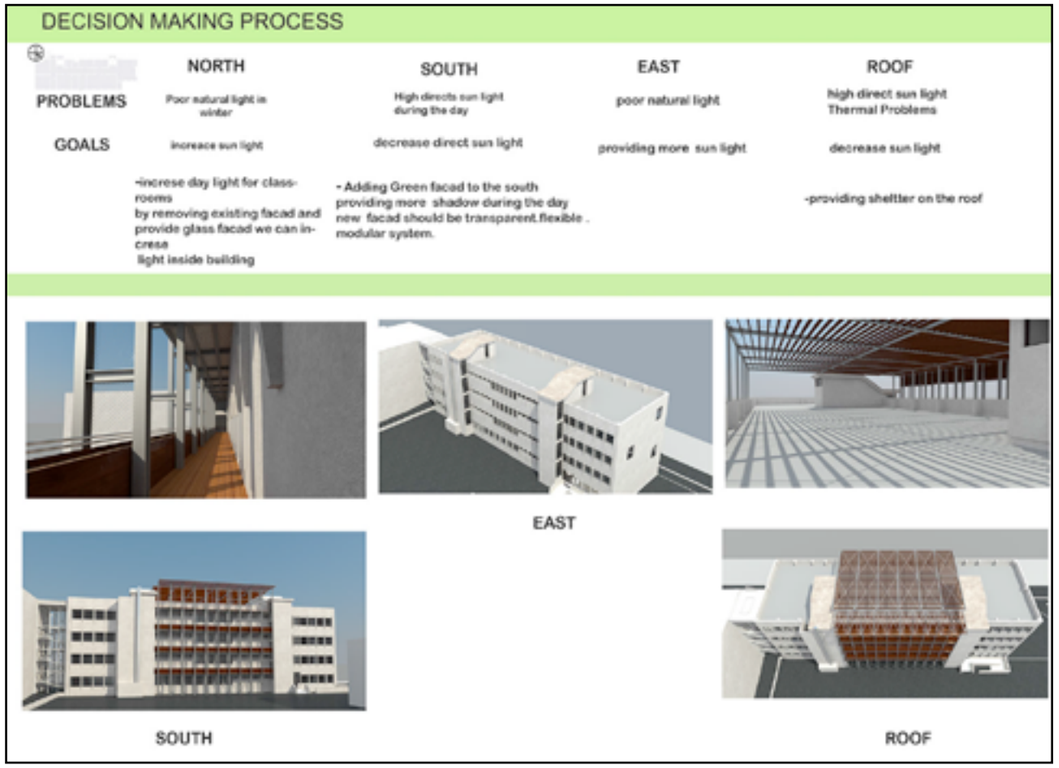
	WEAKNESS	PROPOSAL	REFERENCES
ROOF	HIGH INSOLATION	ADD A NEW VENTILATED COVERING ON THE EXISTING ROOF	
WEST FACADE	EMPTY SURFACE_ EMERGENCY STAIRS	ADD A NEW VENTILATED COVERING ON THE EXISTING ROOF	
ENTRANCE	NOT CLEAR	ADD A DISTINGUIBLE ELEMENT	
NORTH FACADE	LOW DIRECT SUN LIGHTING	REMOVE THE WALL AND CREATE A TOTAL GLASS DOUBLE SKIN FACADE	
EAST FACADE	EMPTY SURFACE	ADD A "NEW ARCHITECTURE" TO INCREASE SPACES	
SOUTH FACADE	HIGH DIRECT LIGHTING_ ABSORBING SUN RADIATION WHERE ARE NO TREES	ADD A "NEW FACADE" TO CREATE SHADOW	

"Hedge building" pavilion IGA, RostocK 2003_Germany



University of New Hampshire research 2012_USA

Valode & Pistre biopark 2006_Paris

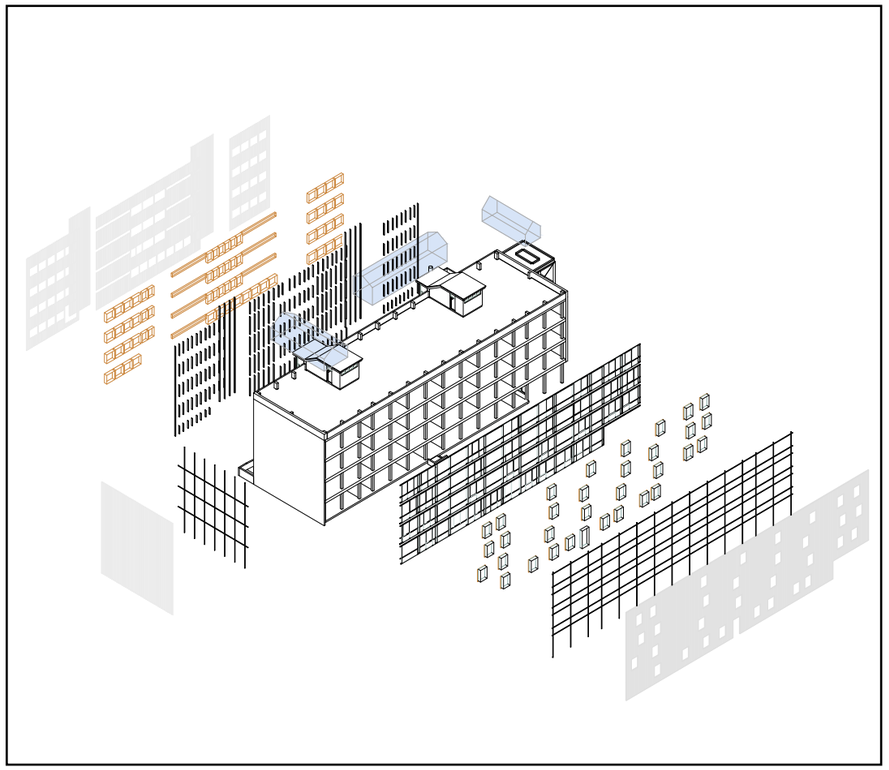


Previous page:
Marta Vannucci, Environmental Design, A.A. 2013-14

Left:
Tamara Ghanbari, Environmental Design, A.A. 2013-14

Right:
Olivia Gori, Environmental Design, A.A. 2013-14

Down:
Lornezo Antinori, Environmental Design, A.A. 2013-14



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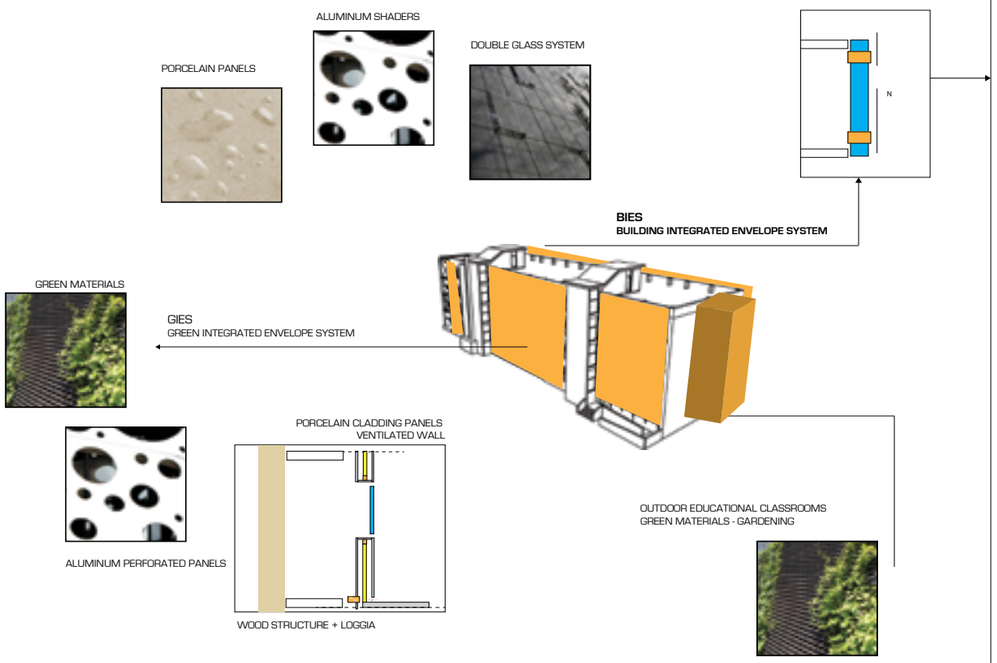
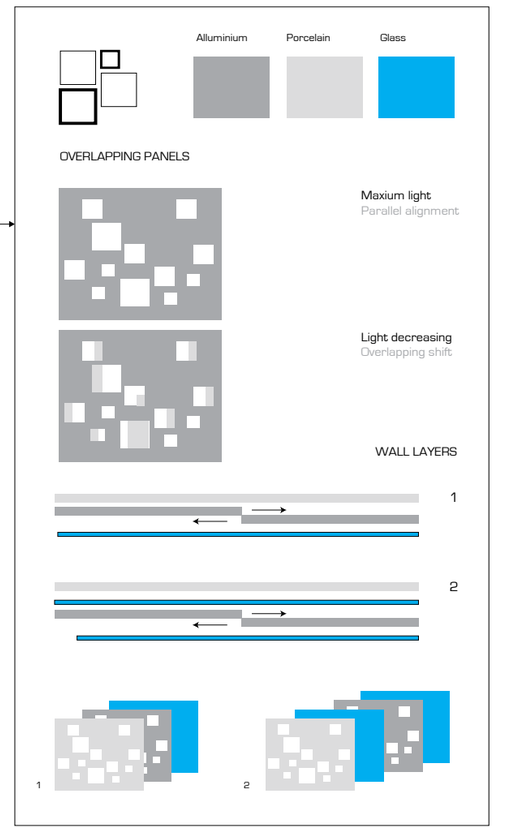
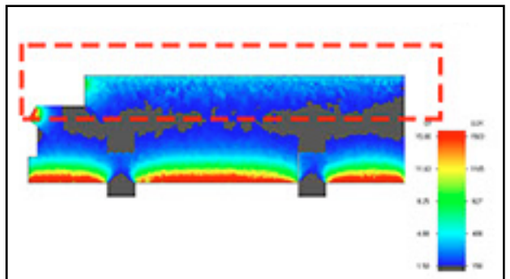
INTERVENTION STRATEGIES

STRATEGIES

- DESIGN SELF BEARING STRUCTURE
- MODIFY INTERNAL FUNCTIONS AND SPACES
- REMOVE PREFAB CONCRETE PANELS







Right:
Arman Saberi, Environmental Design, A.A. 2013-14

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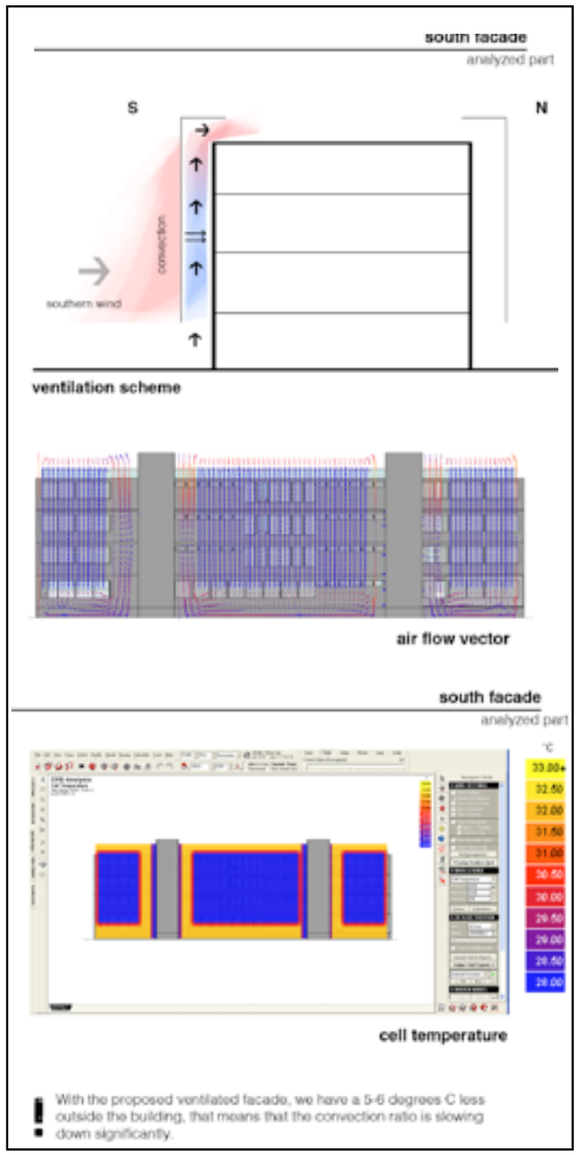
Nikos Karatolis, Environmental Design, A.A. 2013-14

Next page
Robert Kane, Environmental Design, A.A. 2013-14



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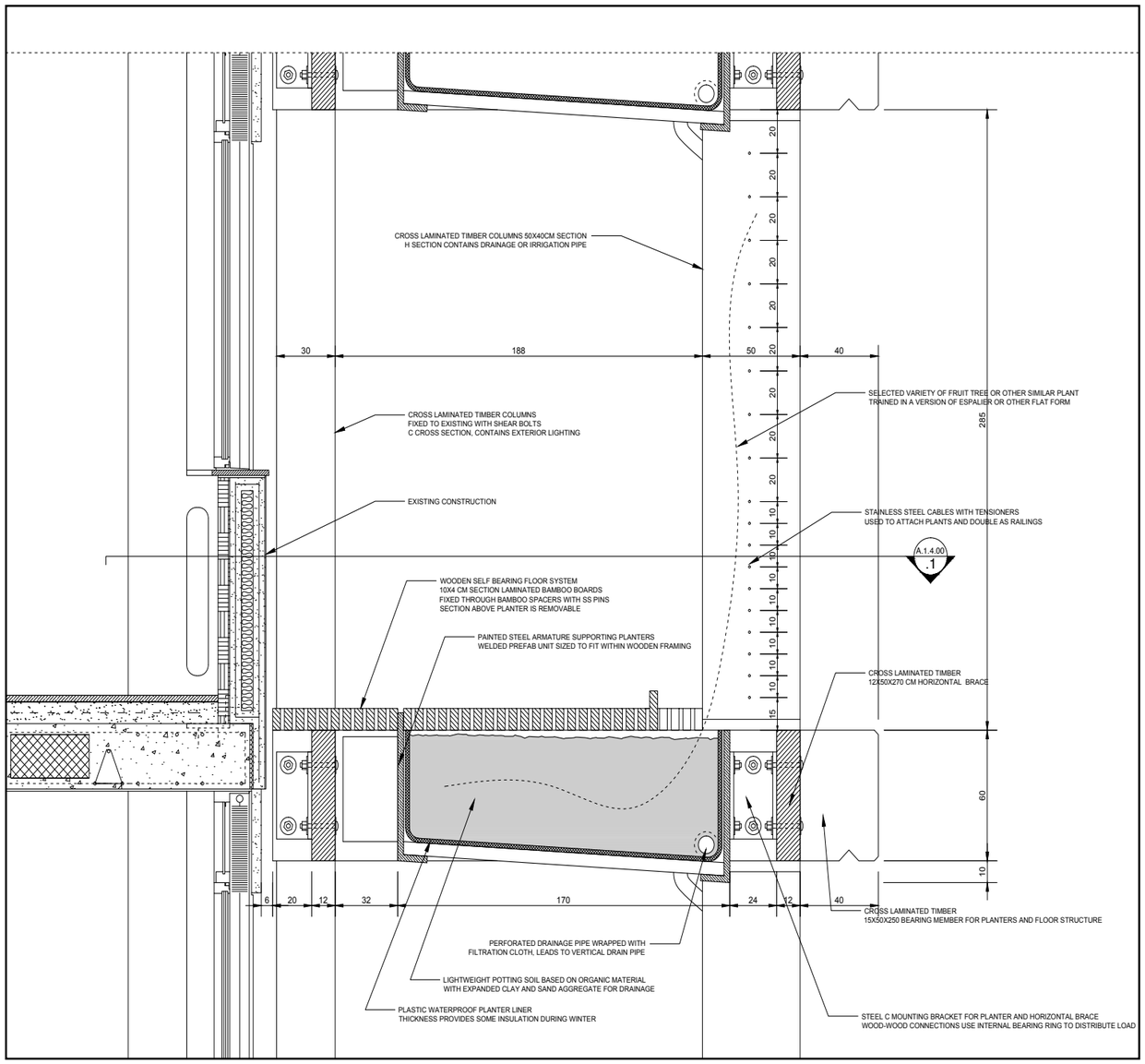
On the basis of this classification, for the last part of the assignment it is required to identify a significant portion of the envelope system in order to fabricate a conceptual prototype model.
Therefore, it is advisable to choose solutions that allow feasible execution: a non-minor and unamendable aspect of building architectures.
Model should be integrated by the by technological-constructive details referred to foundation, structural parts, sub-structure, bracing devices, opaque cladding, glazing & shading elements, ... but, more than that, is required to present the construction drawing for the model fabrication in relation to the fact that is mandatory required the use of digital technologies (laser cutting, 3D printing, etc.).

The model scale is free, to be defined in relation to the thickness and size of materials available on the market.
The use of adhesives for the assembly of the various components is very limited therefore the main purpose of the model implementation will be the study of the junction systems.
If dynamic and/or adaptive systems are to be implemented, the necessary technical and material support will be provided during class activity.
In addition to the completion of the final model, students will have to document the making process and all the experiments conducted up to the final production. Photos, sketches, drawings, and/or renderings can be used for this documentation. In any case a brief explanation of each pictures or process are strictly required.



This process could be also documented through the creation of a brief explanatory video.
In this video a section must be reserved to describe the assembly phase. It can be realized n a virtual way (ie through CAD animations) and/or through the operation phase shot during the assembly process. For this latter mode, a suggested technique is "stop motion".

The most important aspect to cover in the definition of the model is its environmental behavior related to daylight, thermal load, ventilation,... Therefore, energy simulations and other outputs showing performances of the final solution and previous alternatives are mandatory required.

Outcomes & Evaluation

Students are asked to submit a UNI A1 binder (horizontal pagination) articulated in the following sections:

• PART 1 - Project description (max 10 pages) to give an integrated presentation of the project and to describe the decisional process through which the final solutions have been selected. Its suggested articulation is:

1. project statement & mood board, space program, users' requirements ;
2. lay-out organization integrated with the final space specification and program occupation;
3. climate, site, & place analysis integrated with environmental design strategies;
4. final masterplan and landscape design;
5. conceptual mass definition showing the optioneering process of decision making with environmental motivations as a synthesis of the "Environmental Control Techniques" module activity and followed by final architectural drawings (plan, sections, 2D & 3D views,...).

• PART 2 - Enveloepes definition (n° 3 pages) to collect all the envelope types used in the final project and their localization. Its suggested articulation is:

1. technical description of the adopted envelopes types integrated by their requirements, details and environmental performances;
2. localization of the envelopes types on the different part of the buildings;
3. render and visualization of some envelopes types applied on the project showing its integration inside the architectural context.

Nikos Karatolis, Environmental Design,
A.A. 2013-14

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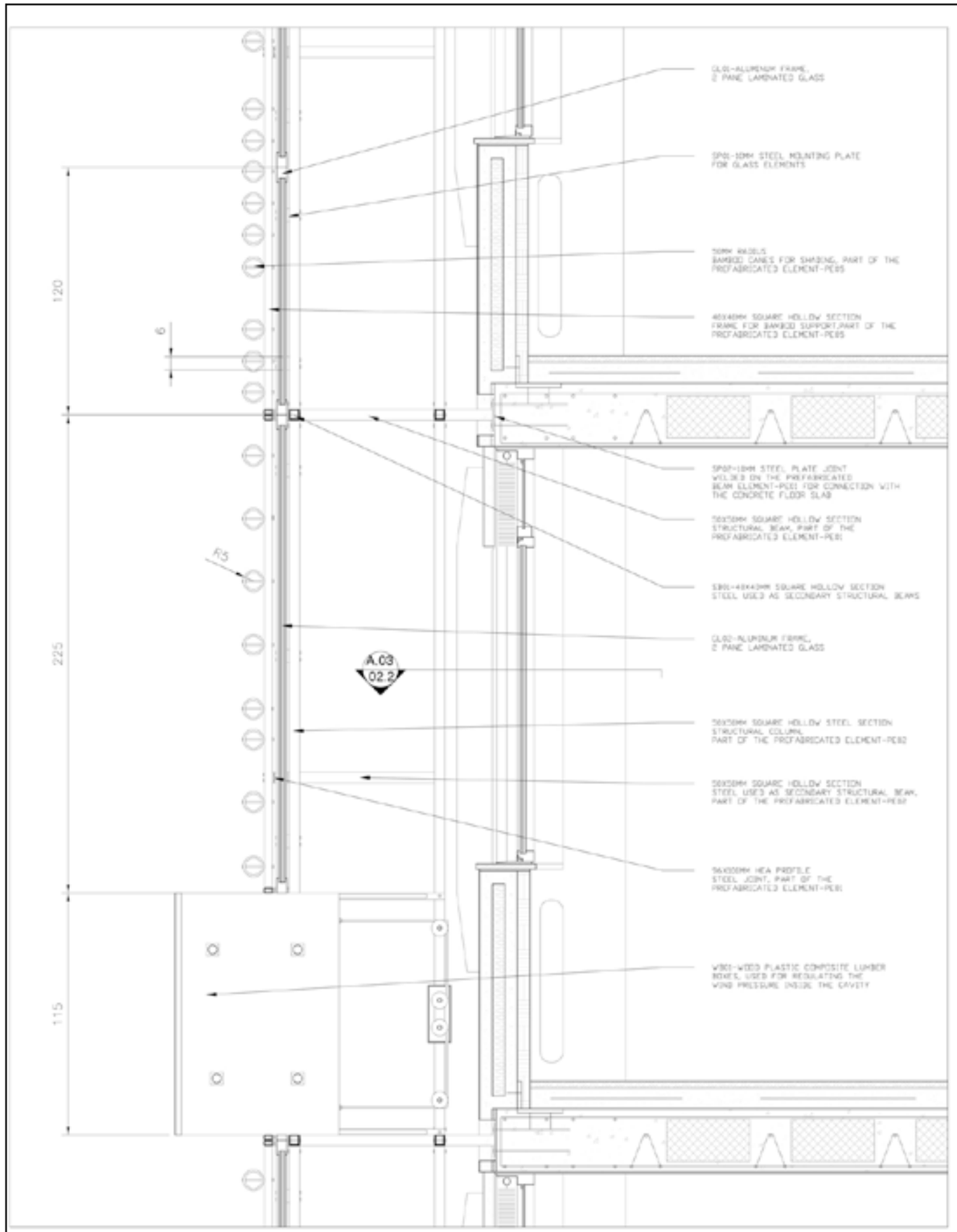
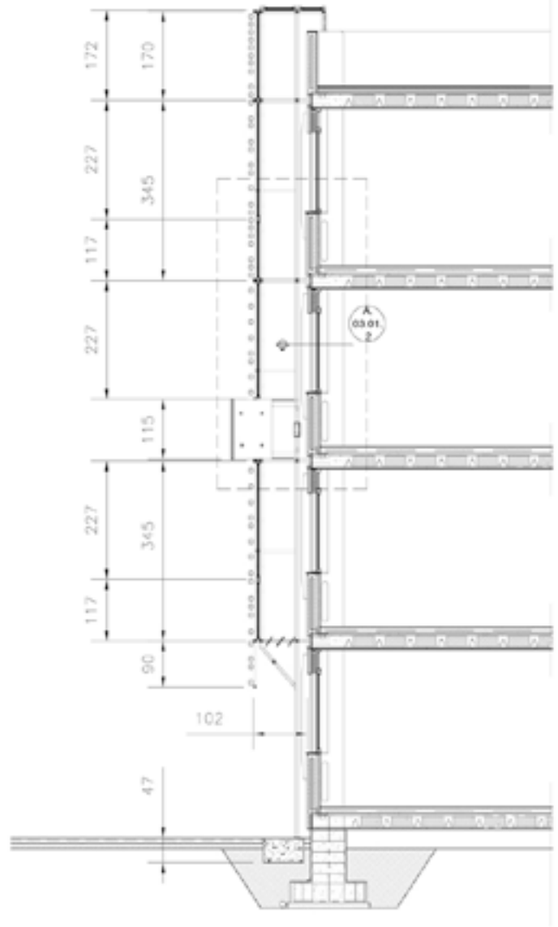


A.03.01.2 DOUBLE SKIN FACADE DETAIL 1:10



A.03.01.1 DOUBLE SKIN FACADE SECTION 1:50

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DI FIRENZE_DIDA
Dipartimento di Architettura
iCad International Course
Architectural Design

Environmental Lab

prof Giuseppe Ridolfi
a.y. 2013/2014

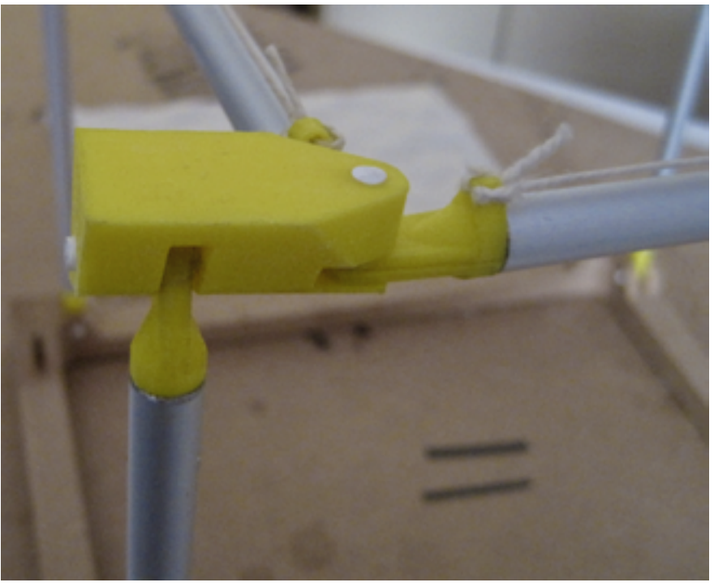
TECHNOLOGICAL ANALYSIS
OF THE DESIGN PROPOSAL
Assignment C

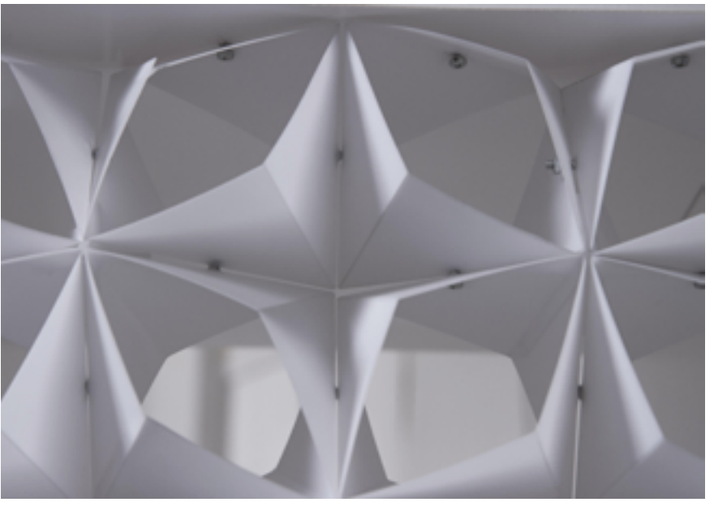
Nikos Karatolis

A.03.01 DOUBLE SKIN FACADE
VERTICAL SECTION AND DETAIL

A.03.01

Project:
MIDDLE SCHOOL
MALAPARTE
VIA BALDANZI, 18
PRATO





• PART 3 Conceptual Envelope Prototypes (n° 3 pages) to describe environmental requirements & performance, technical details, concept and fabrication process, final result. Its suggested articulation is:

1. conceptual design of the envelope system including the comparison of evaluable alternatives through appropriate energy modeling;
2. technical description of the architectural solution and the detail design used for model fabrication;
3. description of the fabrication and assembly process;
4. documentation through renders and other techniques of the final solution.

Optional video must be realized in a full HD -1080p ((1920x1080 24fps - 72 dpi) and can be introduced by a preliminary description of the architectural building but, in any case , it will have to be closely focused on the envelope system and the model making process.
Evaluations of this assignment will take place during the final exam in the form of a joint grade by the three teachers.

Keep in mind that for this module the main evaluation criteria will concern, in addition to the quality and level of detail of the solutions adopted, the clear and coherent illustration of the processes. These concern the reasons for the choices to be made through the formulation and evaluation of alternatives based on performance; the phases of conception and production to be documented also through the illustration of the various attempts and correction of errors.

This Page:
Diego_Detassis, Structural Design, A.A. 2013-14

Alessio Gasbarro, Environmental Responsive Skins, International Workshop 2016

Giuseppe Laudante, Environmental Responsive Skins, International Workshop 2016

Next Page:
Tomas Usovas, Structural Design, A.A. 2013-14

Ettore Catani, Erica Passavinti, Structural Design, A.A. 2013-14

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References

- **Students' Examples**

http://www.mailab.biz/portfolio_page/w11_form/

http://www.mailab.biz/portfolio_page/from-origami-to-architecture/

http://www.mailab.biz/portfolio_page/lighting-facade/

http://www.mailab.biz/portfolio_page/from-origami-to-architecture/

https://vimeo.com/199699060

- **Environmental References**

https://issuu.com/artichoc/stacks/e9c428624cfb4c148f0055371df06620

https://it.pinterest.com/mailab_/environmental-design/

- **Envelope examples**

https://it.pinterest.com/mailab_/pattern-tessellation-parametric/

https://it.pinterest.com/mailab_/parametric-and-kinetic-envelopes/

- **Envelope technologies**

http://www.mailab.biz/wp-content/uploads/LECTURES/_04. THE BUILDING ENVELOPE .pdf

http://www.mailab.biz///wp-content/uploads/2015/01/04.-JOINING-STRUCTURES-.pdf