



UNIVERSITY OF WEST ATTICA
SCHOOL OF ENGINEERING
Dept. of Civil Engineering

Thesis

« Architectural Formulation and Arrangement of
Summer Houses made by Containers »

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Supervisor

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Examining Committee

Dr. Nikoloutsopoulos Nikolaos
Dr. Tsoukatou Stella

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Special Thanks

I could not thank enough the supervisor of my thesis **Dr. Kourniatis Nikolaos** for his valuable guidance as well as his trust and appraisal.

Abstract

The purpose of this thesis is the architectural formulation and arrangement of summer houses using containers, in the area of Nea Makri.

Four different houses are analysed so that each one of them meets the requirements and needs of a three / four member family. A different view of a summer house, whose main skeleton is the metal element of container, is displayed. Finally, the advantages of using the container relating to safety, quality, economy and ecology are being presented.

Keywords:

Architecture, Formulation, Resolution, Summer, House, Containers

Περίληψη

Ο στόχος της παρούσας εργασίας είναι η αρχιτεκτονική σύνθεση και επίλυση εξοχικών κατοικιών χρησιμοποιώντας containers, στην περιοχή της Νέας Μάκρης. Γίνεται ανάλυση τεσσάρων διαφορετικών κατοικιών ούτως ώστε η καθεμία να πληροί τις προϋποθέσεις και τις ανάγκες μιας τριμελούς / τετραμελούς οικογένειας. Προβάλλεται μια διαφορετική άποψη εξοχικής κατοικίας της οποίας κύριος σκελετός είναι το μεταλλικό στοιχείο του container.

Τέλος, παρατίθενται πλεονεκτήματα χρήσης του container που αφορούν την ασφάλεια, την ποιότητα, την οικονομία και την οικολογία.

Λέξεις - Κλειδιά:

Αρχιτεκτονική, Σύνθεση, Επίλυση, Εξοχικές, Κατοικίες, Containers

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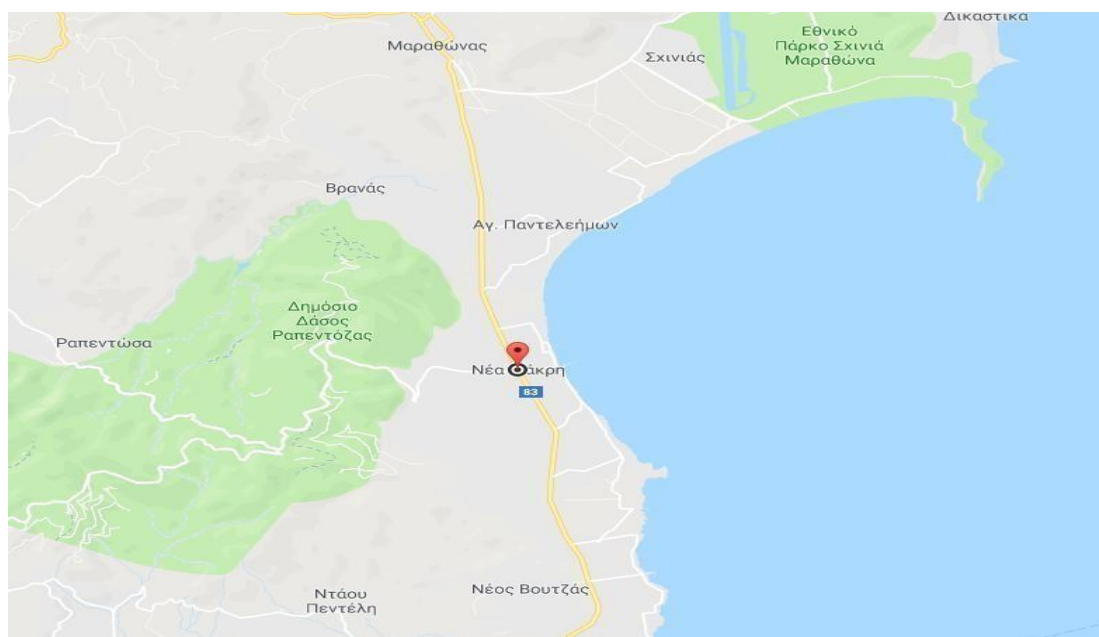
Chapter 1

The Area of Nea Makri

Nea Makri is a small town in southeast Attica and it belongs to the municipality of Marathon. Its population, according to 2011 census, amounts to almost 16,000 residents. Nea Makri borders Marathon to the north, Rafina to the south, Penteliko mountainous site and Dionysos to the east, as well as it is surrounded by South Evoikos to the east in a coastline of around 10 km. The town center is 32 km far apart from Athens, through Marathonos and Mesogeion Avenues. Its distance from Eleftherios Venizelos airport is 12 km through Marathonos Avenue and Attica highway.

The area's climate is auspicious enough, since it is suitable for many different fruit and vegetables crop species to grow. Nevertheless, it varies depending on when someone opts to visit it. For example, during summer that the temperature is high, let alone in urban centers, many people opt to sally to any of the beautiful beaches of the region, contributing to the boost of local tourism. Winter season is also a great opportunity for a field-based rush, since the heavy downfalls and the cold atmosphere are common characteristics of our country.

Picture 1: The location of Nea Makri



Source: Google Maps

Chapter 2

Property

2.1 Morphology of Property

The property is located in the municipality of Marathon and specifically in Nea Makri area at the junction of Sotiriou Loui and Roumelis streets. In the field there are rocks that at times favour vegetation and at times not. Its location is advantageous since it is near the beach.

Picture 2: Photo of Property



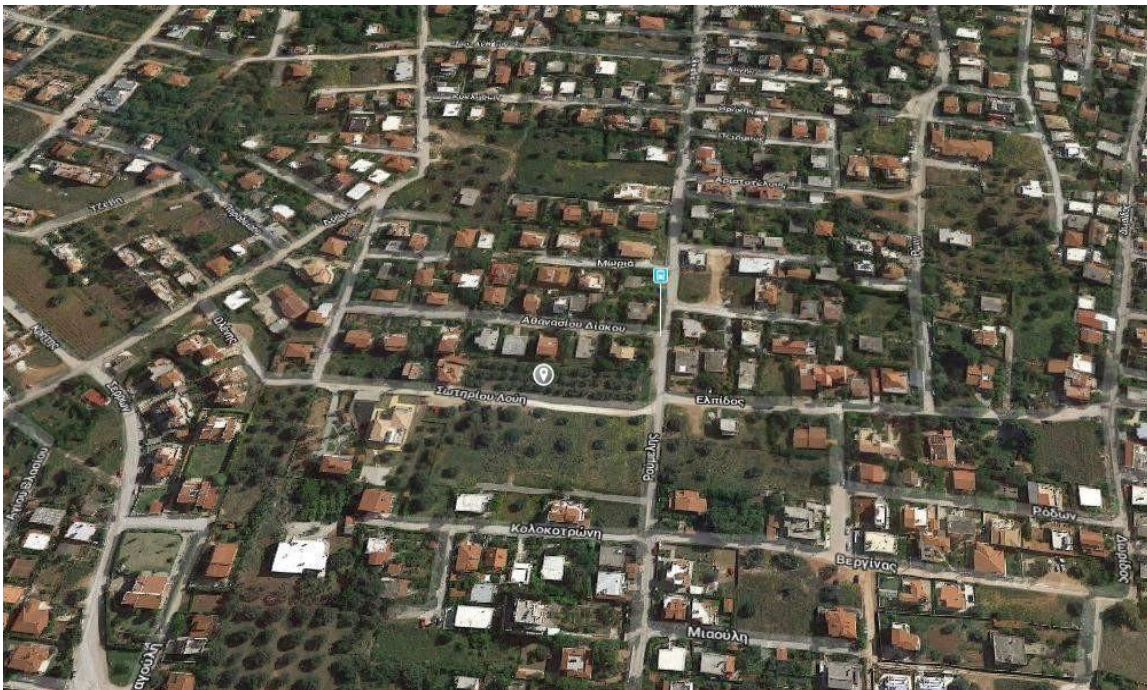
The property's acreage is 2,261.78 m², without any eminent gradient. Its facade sits at Sotiriou Loui street and looks to the north while its rear looks to the south where the sea lies.

Picture 3: Photo of Property (2)



Source: Google Earth

Picture 4: Photo of Property (3)



Source: Google Earth

2.2 Legal inspection of the allotment

From the urban development of Marathon in which the area of Nea Makri belongs to, we took the following structuring conditions:

Government Gazette D 28/1990

Minimum Acreage: 1,000 m²

Minimum Facade: 15 m

Coverage Percentage: 20%

Structuring Factor: 0.20

Maximum Height: 8.50 m

The building is freely placed in the holding.

The holding's acreage is 2,261.78 m² and its facade is 88.63 m, so it is considered even and buildable.

Allowed Traits of Structuring and Coverage:

Coverage: $2,261.78 \times 20\% = 452.36 \text{ m}^2$

Structuring: $2,261.78 \times 0,20 = 452.36 \text{ m}^2$

Buildings' Acreage (Structuring):

Type "A" Summer Houses (2): 100.14 m²

Type "B" Summer Houses (5): 216.43 m²

Type "C" Summer Houses (2): 103.17 m²

Total Acreage: 419.74 m²

Buildings' Acreage (Coverage):

Type "A" Summer Houses (2): 86.83 m²

Type "B" Summer Houses (5): 229.52 m²

Type "C" Summer Houses (2): 110.58 m²

Total Acreage: 426.94 m²

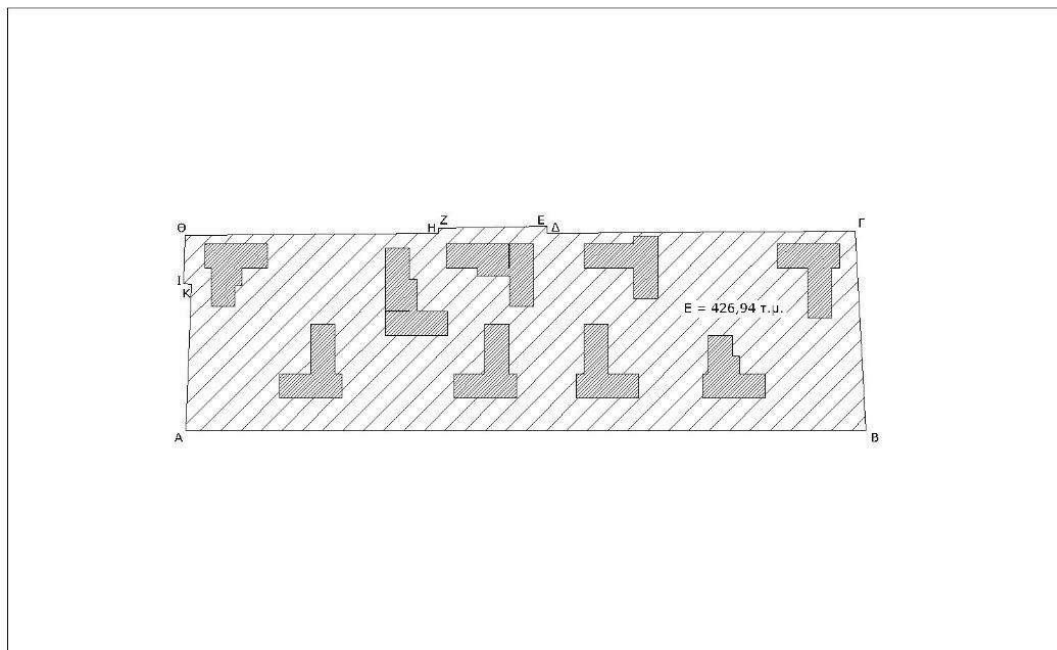
Legal Traits of Structuring:

Coverage: $426.94 \text{ m}^2 < 452.36 \text{ m}^2$

Structuring: $419.74 \text{ m}^2 < 452.36 \text{ m}^2$

Max Building's Height: $5.226 \text{ m} < 8.50 \text{ m}$

Picture 5: Coverage of Property



Chapter 3

Why shall I choose a container as summer house?

Over the last years, humans hunt for every possible affordable solution for accommodation. Several people look up on the Internet second-hand containers to be transforming into beautiful summer houses, considering them a good choice, since they are durable and feature all eases. Containers consist of stainless steel and panel walls with polyurethane insulation. The floor can either be metal or laminate. Below, their main advantages are presented.

STRENGTH AND DURABILITY

Containers are designed to be resistant to corrosion and can endure extended exposure to extreme weather conditions like, whirlwinds, earthquakes, even hurricanes, which makes them astonishingly secure and great for building in regions struck by natural disasters. Actually, containers are the strongest available structure-stronger than wood, concrete and even buildings made of steel.

ECOLOGICAL IMPORTANCE

At the moment, there are many containers which remain unexploited due to the fact that imports outreach exports. Considering that, we can convert them into dwellings and at the same time their usage will be recycled. Containers gain traction since more and more people search for sustainable, ecological lifestyle. Tons of containers remain idle and often are getting melted, resulting in environmental pollution and utilizes huge amounts of energy as well. Recycling and reuse of containers is a more environmentally friendly option.

REDUCED COST

The cost of a container is noticeably lower than that of a respective conventional construction made of brick and cement, which means that it can be reduced by at least 30%. Furthermore, they are completely manufactured, lowering the total cost even more, given that no man-hours are required for the completion of the construction.

FOUNDATION

Containers are designed to be resting upon their four angle and a special foundation is not required for their installation. Usually, they are laid on cement board of +30cm. The four angles of the roof are very strong too, because they are intended to potentially support additional arrays of containers.

INSULATION AND HEAT CONTROL

Since containers are big metal boxes, insulation is a huge factor. The problem can be resolved by using the right type of paint and insulation.

Containers definitely represent a good alternative to accommodation. The transformation of a container from a rusty crate to a nice and unique house requires time and effort, but the results will surely be impressive, as it will be discussed in the next chapter about the arrangement of summer houses.

Alternative usage of containers:

- Cafés - Bar - Restaurants
- Offices and Workplaces
- Changing areas
- Garages
- Depository

Chapter 4

Arrangement of Summer Houses

The four different instances of summer houses somebody can find in this thesis, were designed to fulfill the needs of up to four people, as well as people with special needs. They also need to provide the capability for people to enjoy the surrounding area and the beauty of nature.

Initially, before we proceed with the formulation of two containers, we settled on a container with 8.00m x 3.00m dimensions, on which the adequate design will be applied, so that the appropriate living of these people to be attained.

In our property, there are nine summer houses, which divide into:

Two type "A" summer houses,

Five type "B" summer houses (custom-built for people with special needs included) and

Two type "C" summer houses

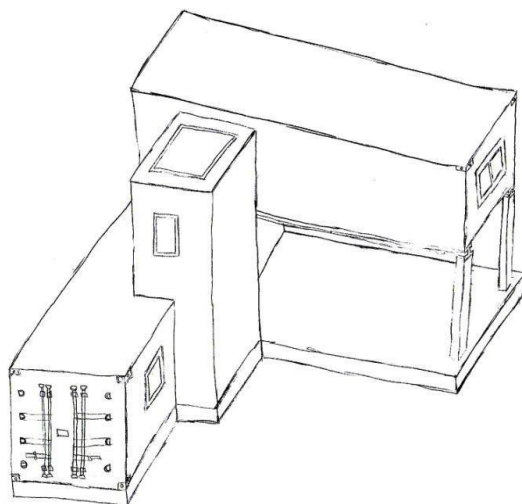
All containers are laid on cement board of +30 cm

Type "A" Summer House

The particular two-storey house, consists of two containers which intercommunicate through a staircase made of a +3.00m height concrete and a 10cm panel sheathing of +5.20m height. The overall height of the house totals to +6.33m. On the first floor, there are the living room, the kitchen and the WC, while on the second floor there are the two bedrooms and the bathroom. The junction of the two containers is accomplished through an HEA 200 metal beam.

The total acreage of the house is 50.07m².

After thorough rumination and dozens of sketches, I ended up in the underneath drawing as the final house format.



Picture 6: Type "A" House Sketch

Type "B" Summer House

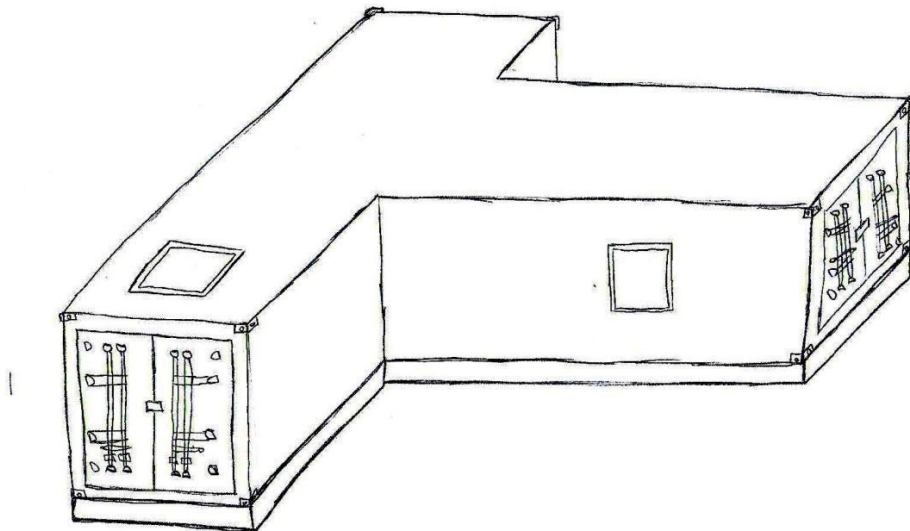
The particular first-floor house consists of two containers which cross with each other, featuring a final height of +2.668m. In the first container there are the living room and the kitchen while in the second one there are the two bedrooms and the bathroom. The total acreage of the house is 43.29m²

Type "B" Summer House (custom-built for the living of people with special needs)

The particular first-floor house is especially arranged for a decent living of people with special needs. It consists of two containers which cross with each other, featuring a final height of +2.668m. In the first container there are the living room and the kitchen while in the second one there are the two bedrooms and the bathroom. The right inner dimensions have definitely been considered, so that formidable problems will not be induced while moving around with the wheelchair.

The total acreage of the house is 43.29m².

After thorough rumination and dozens of sketches, I ended up in the underneath drawing as the final house format.



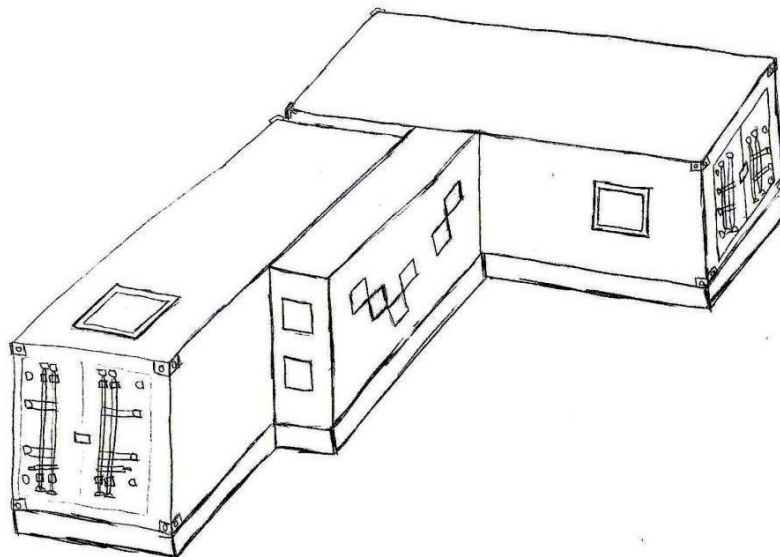
Picture 7: Type "B" House Sketch

Type "C" Summer House

The particular first-floor house, consists of two containers which form a "Γ" angle with each other, featuring a final height of +2.668m. In the first container there are the living room and the kitchen while in the second one there are the two bedrooms and the bathroom. The connection between these spaces is achieved through the use of a special hallway of 0.95m amplitude and of 4.40m length, while its sheathing is made of a 10cm panel of 2.668m height.

The total acreage of the house is 51.58m².

After thorough rumination and dozens of sketches, I ended up in the underneath drawing as the final house format.



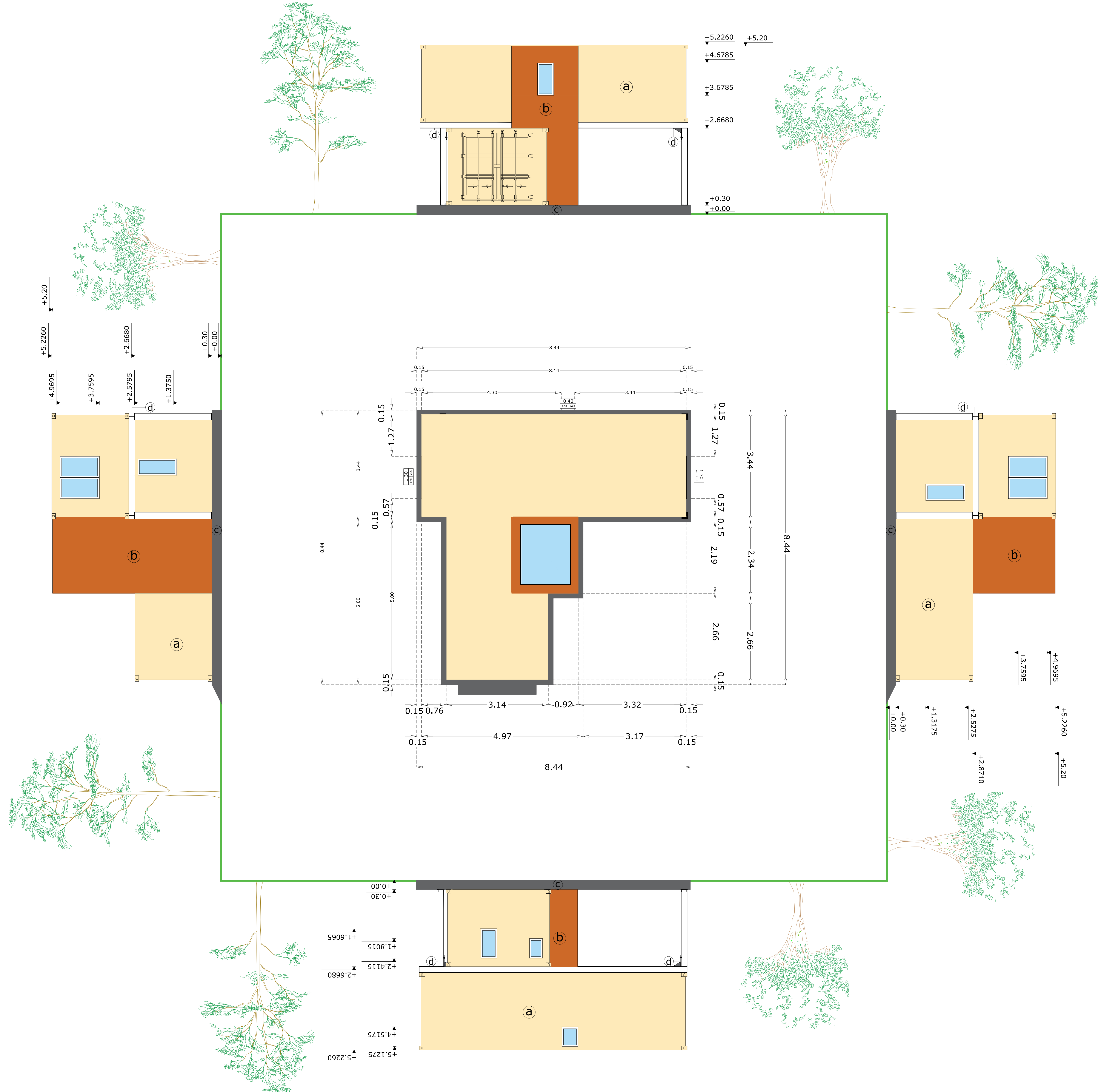
Picture 8: Type "C" house sketch

APPENDICES

APPENDIX A - Designs

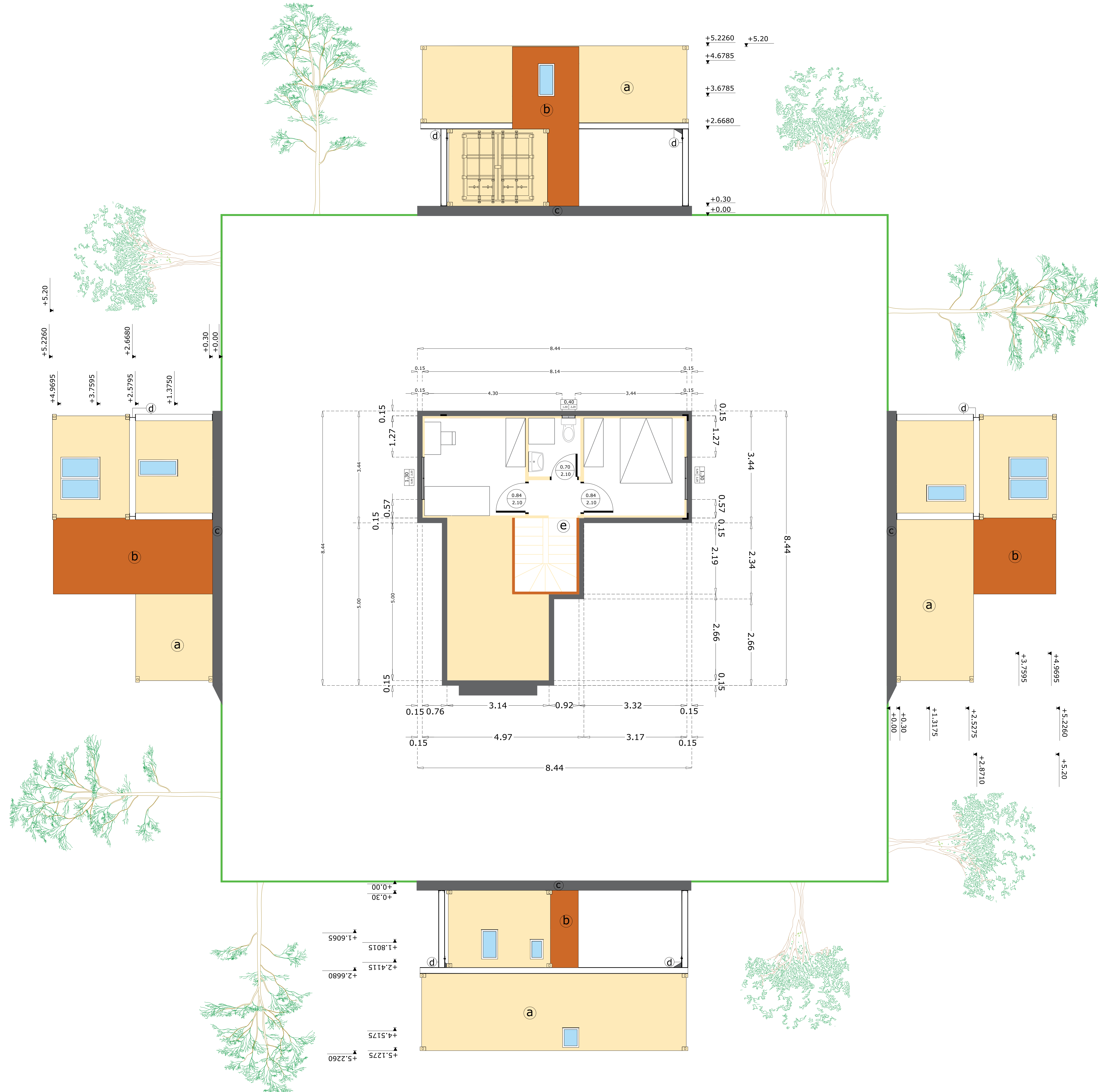
UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "A" TOP VIEW OF ROOF / VIEWS	NUMBER OF DESIGN: 001
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "A" TOP VIEW OF ROOF / VIEWS
a) Acrylic beige color of exterior panel
b) Acrylic mahogany color of exterior panel
c) Cement board of +30 cm
d) Black metallic columns and beams (HEA 200)



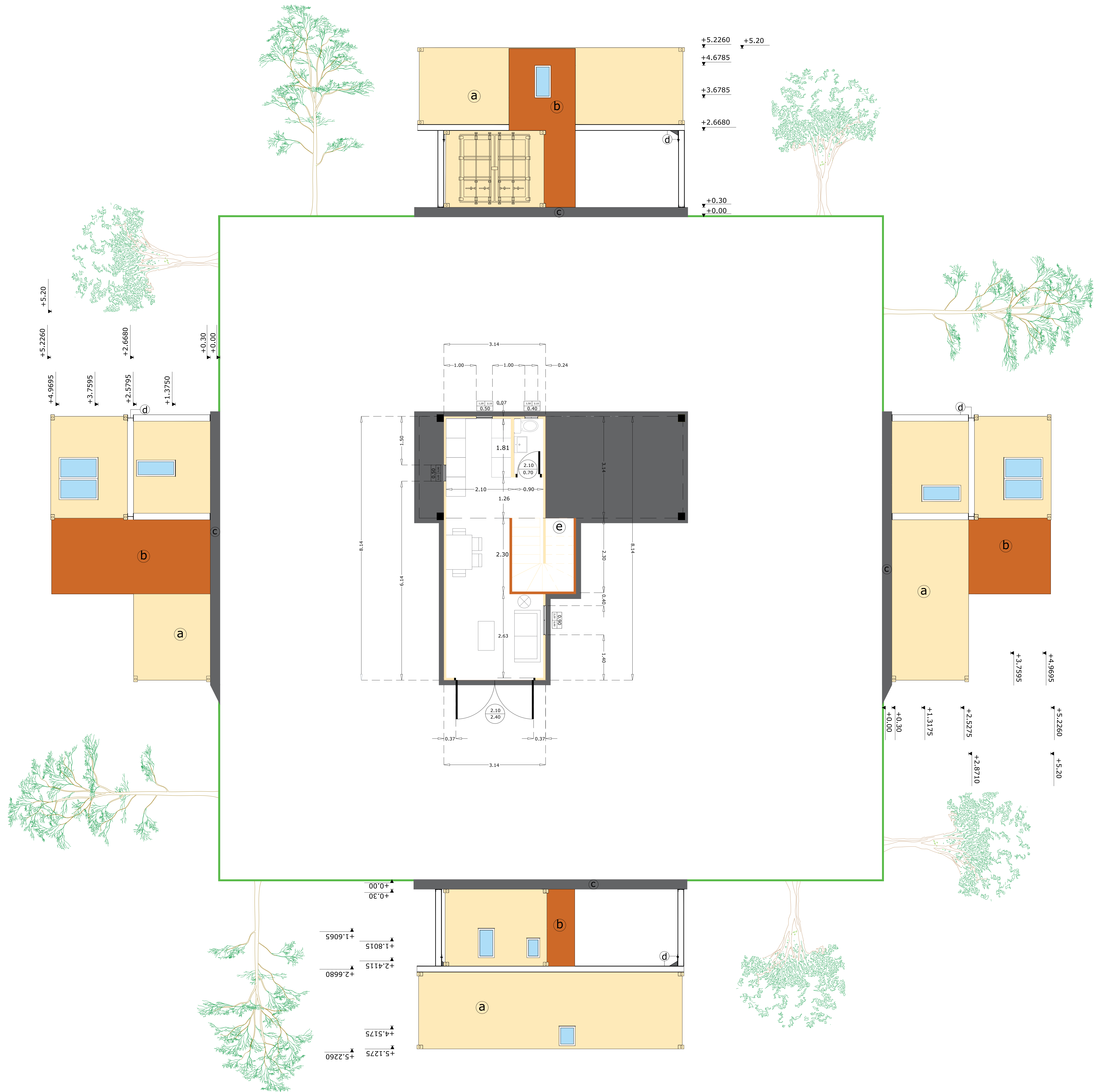
UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "A" TOP VIEW OF LEVEL 2 / VIEWS	NUMBER OF DESIGN: 002
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "A" TOP VIEW OF LEVEL 2 / VIEWS
a) Acrylic beige color of exterior panel
b) Acrylic mahogany color of exterior panel
c) Cement board of +30 cm
d) Black metallic columns and beams (HEA 200)
e) Beige interior stairs made by concrete



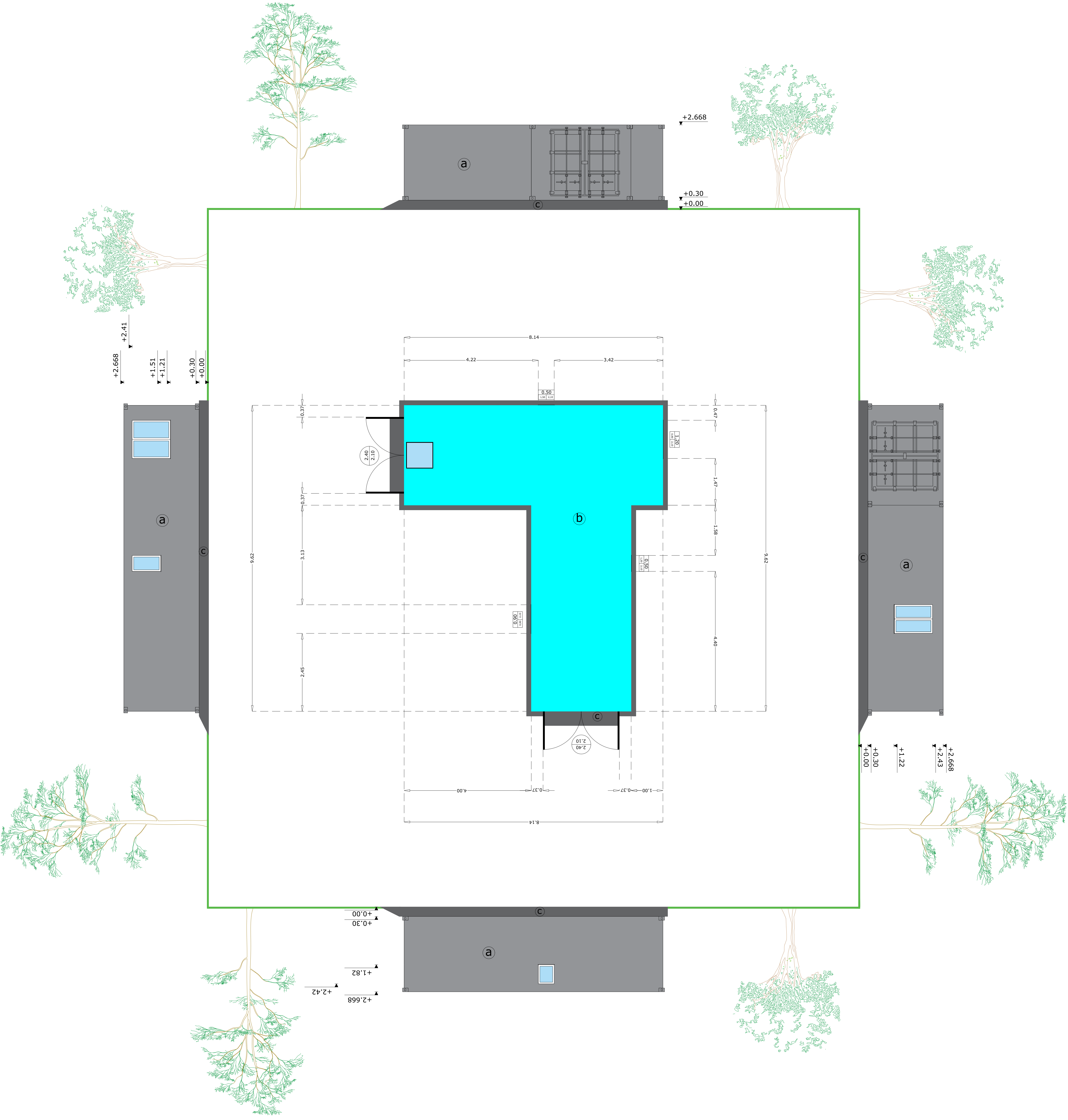
UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "A" TOP VIEW OF LEVEL 1 / VIEWS	NUMBER OF DESIGN: 003
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "A" TOP VIEW OF LEVEL 1 / VIEWS
a) Acrylic beige color of exterior panel
b) Acrylic mahogany color of exterior panel
c) Cement board of +30 cm
d) Black metallic columns and beams (HEA 200)
e) Beige interior stairs made by concrete



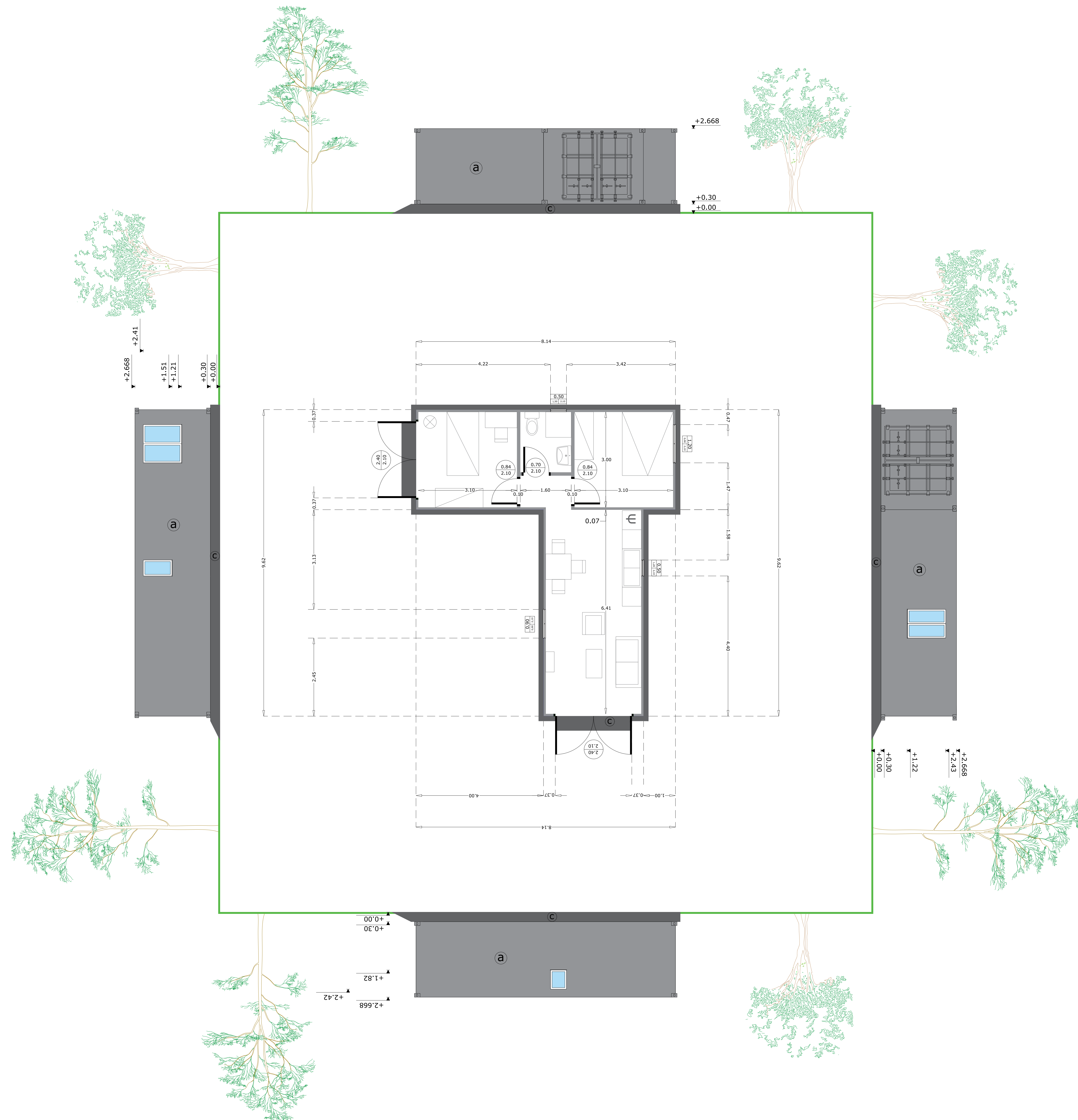
UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "B" TOP VIEW OF ROOF / VIEWS	NUMBER OF DESIGN: 004
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "B" TOP VIEW OF ROOF / VIEWS
a) Acrylic grey color of exterior panel
b) Acrylic cyan color of exterior panel
c) Cement board of +30 cm



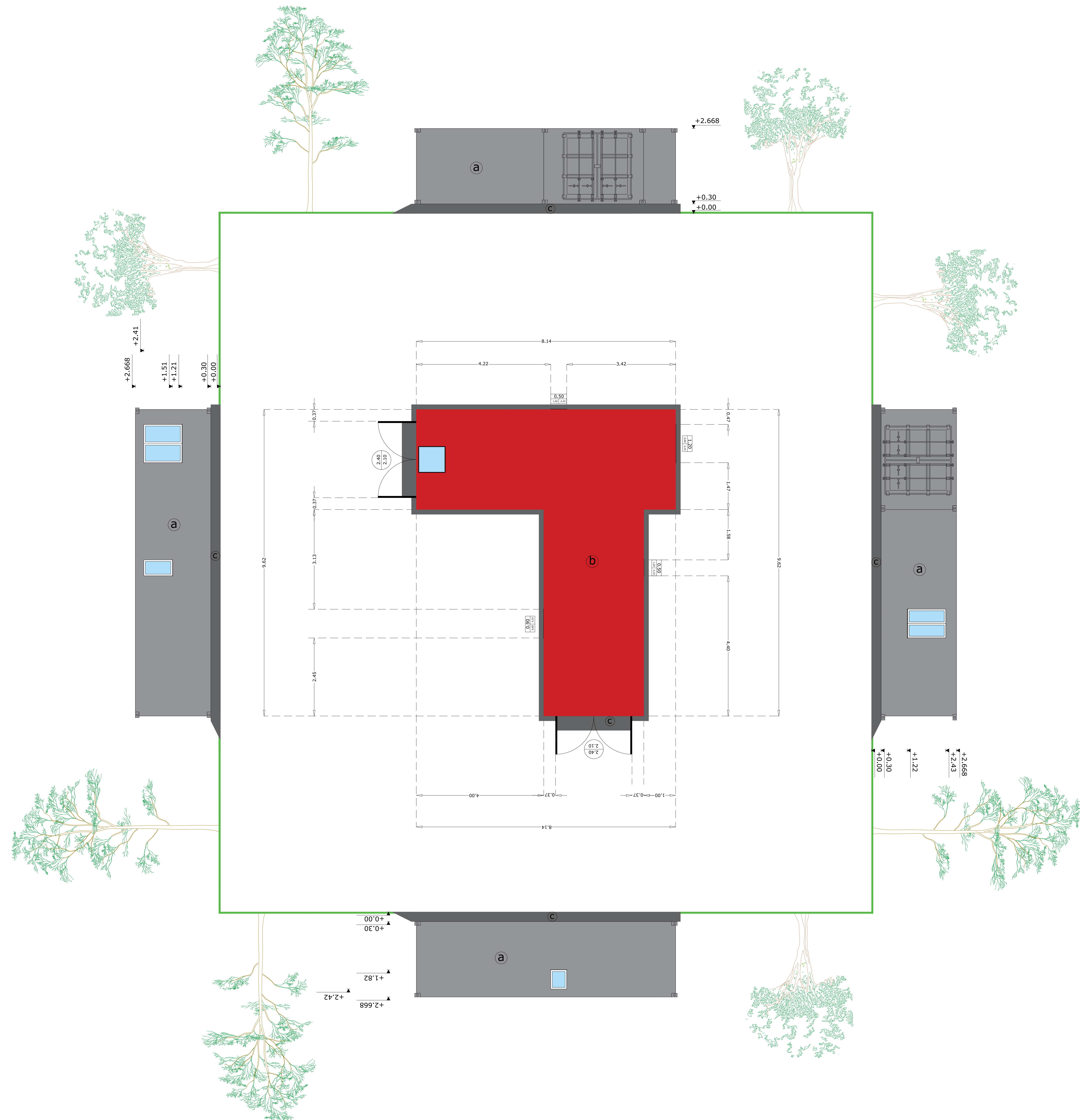
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THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "B" TOP VIEW OF LEVEL 1 / VIEWS	NUMBER OF DESIGN: 005
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "B" TOP VIEW OF LEVEL 1 / VIEWS
a) Acrylic grey color of exterior panel
c) Cement board of +30 cm



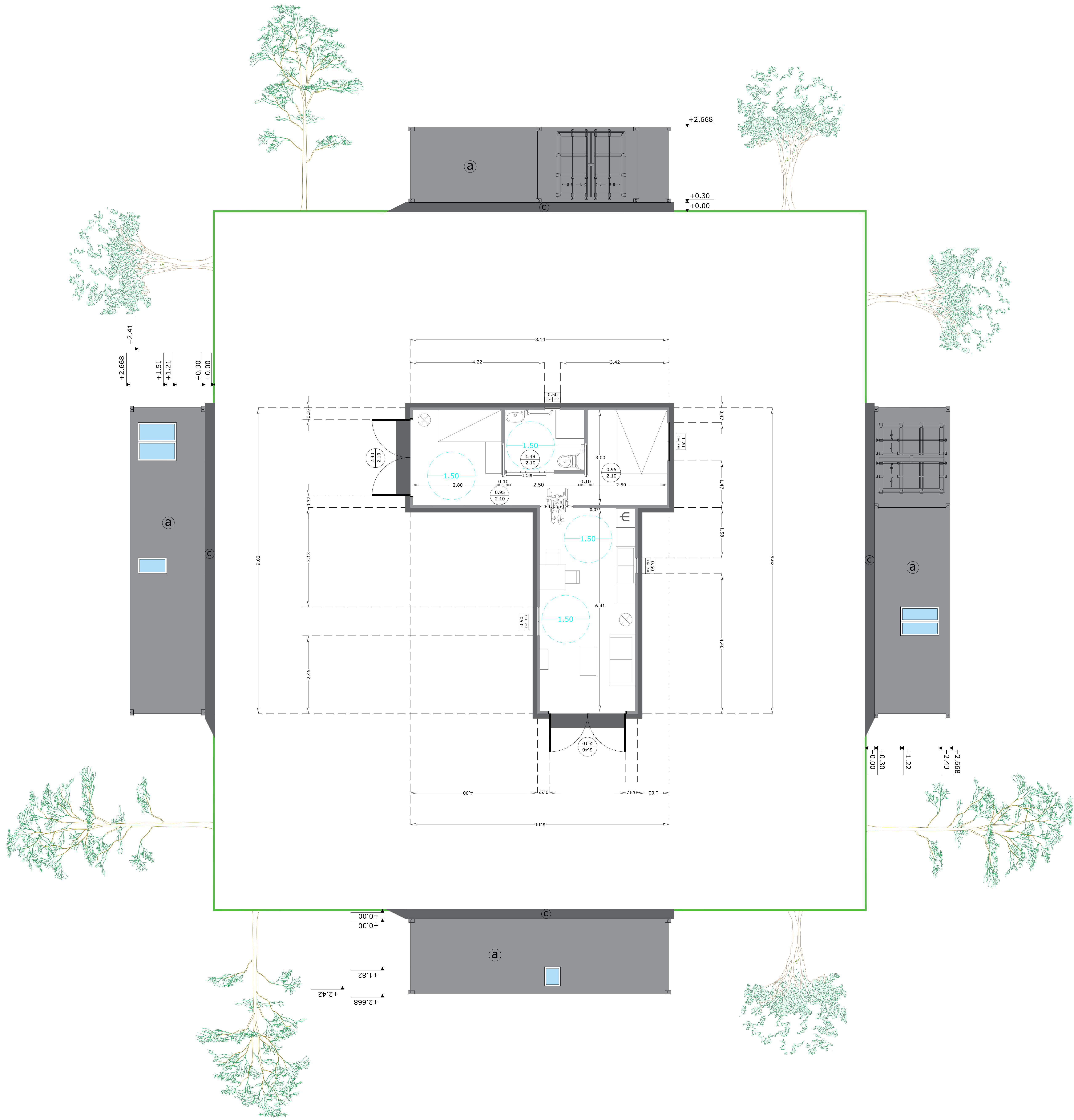
UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "B" (custom-built for people with special needs)	NUMBER OF DESIGN: 006
TOP VIEW OF ROOF / VIEWS	
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "B" (custom-built for people with special needs)	
TOP VIEW OF ROOF / VIEWS	
a)	Acrylic grey color of exterior panel
b)	Acrylic vermilion color of exterior panel
c)	Cement board of +30 cm



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THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "B" (custom-built for people with special needs) TOP VIEW OF LEVEL 1 / VIEWS	NUMBER OF DESIGN: 007
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "B" (custom-built for people with special needs) TOP VIEW OF LEVEL 1 / VIEWS
a) Acrylic grey color of exterior panel
c) Cement board of +30 cm



UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "C" TOP VIEW OF ROOF / VIEWS	NUMBER OF DESIGN: 008
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "C" TOP VIEW OF ROOF / VIEWS
a) Acrylic beige color of exterior panel
b) Acrylic mahogany color of exterior panel
c) Cement board of +30 cm



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THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "C" TOP VIEW OF LEVEL 1 / VIEWS	NUMBER OF DESIGN: 009
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

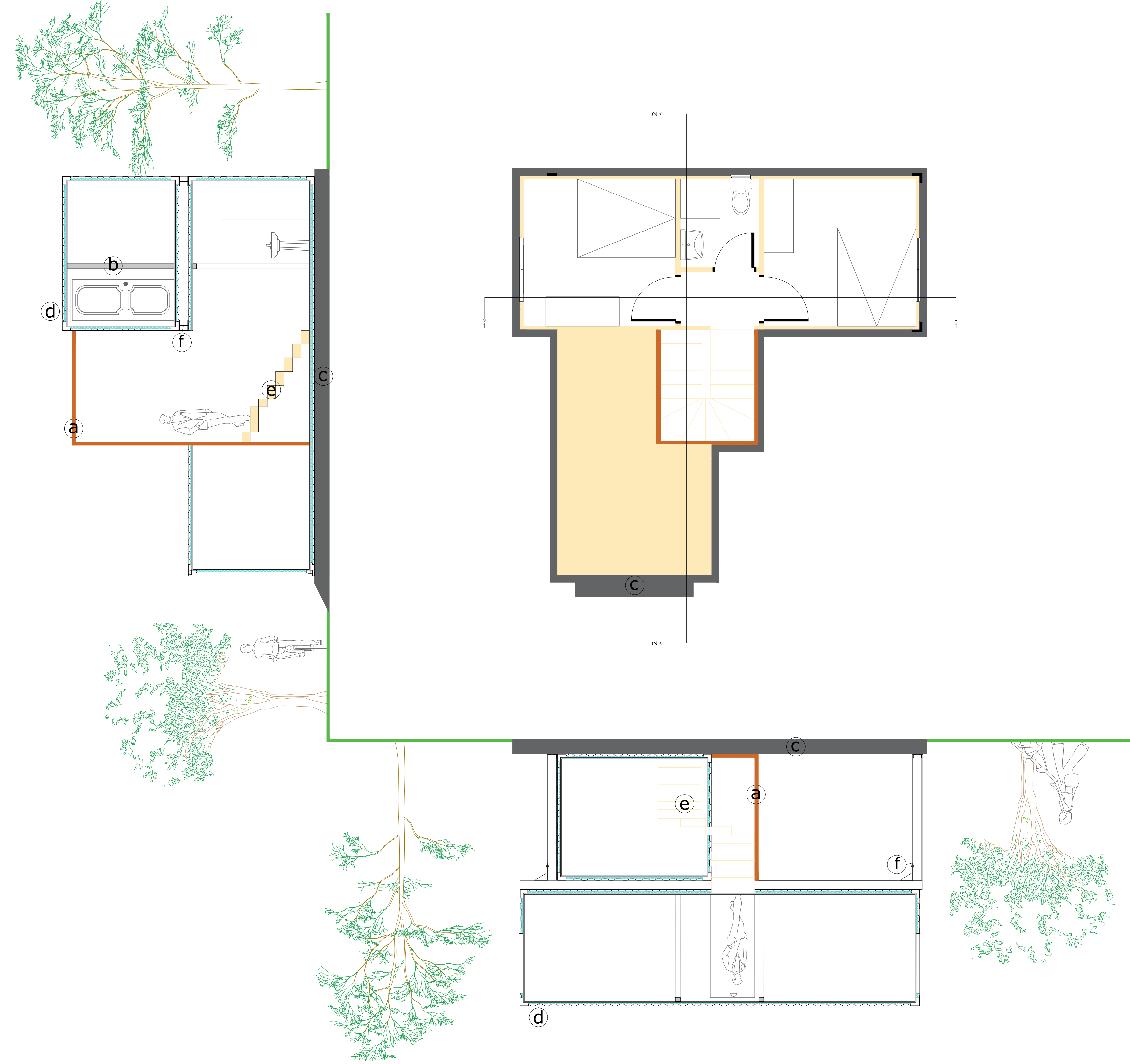
MATERIALS
SUMMER HOUSE "C" TOP VIEW OF LEVEL 1 / VIEWS
a) Acrylic grey color of exterior panel
c) Cement board of +30 cm



UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "A" SECTION 1-1 & SECTION 2-2	NUMBER OF DESIGN: 010
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

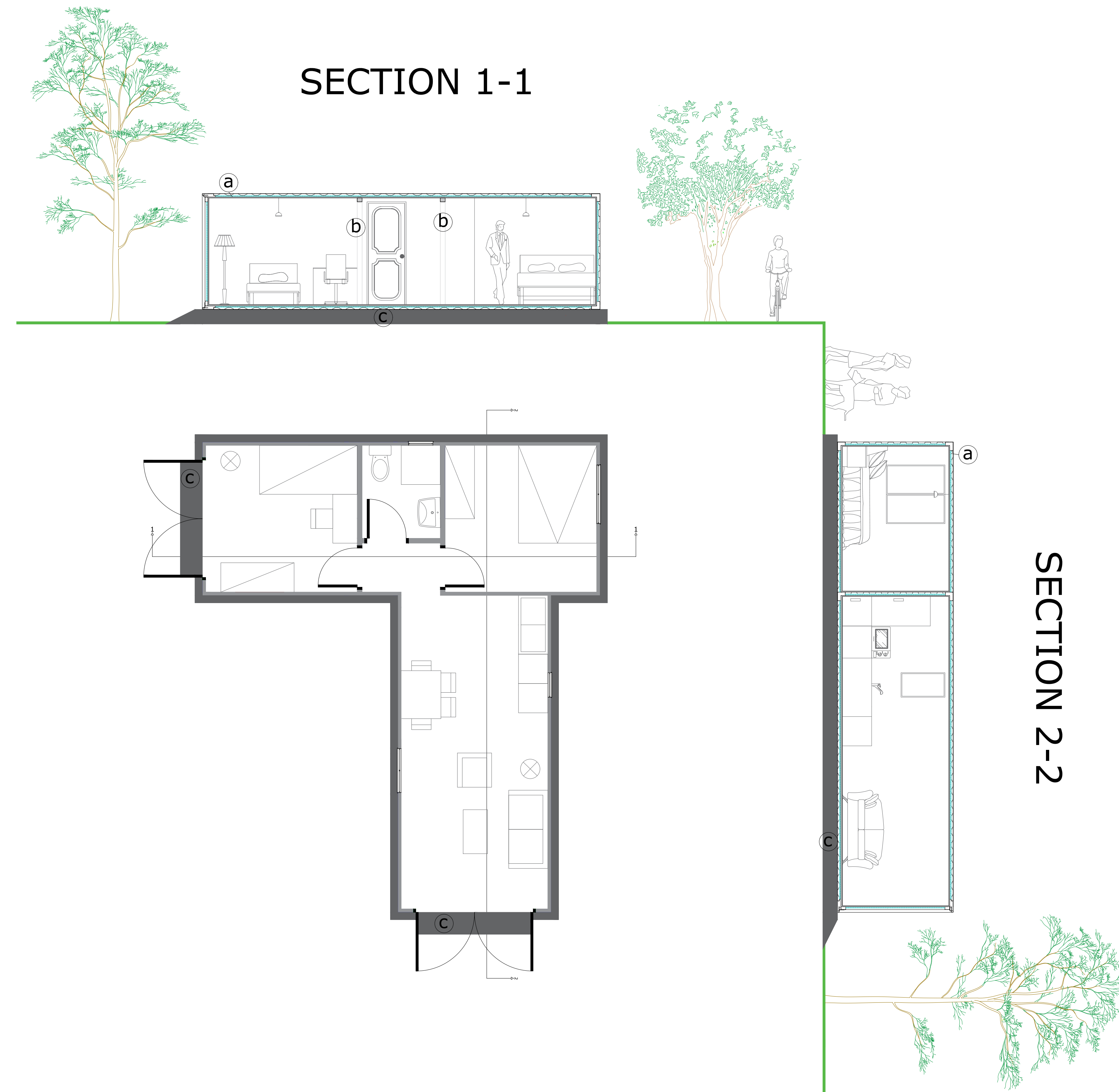
MATERIALS SUMMER HOUSE "A" SECTION 1-1 & SECTION 2-2
a) Stairs's cover by panel of 7 cm thickness of mahogany color
b) Divider plasterboard of 10 cm thickness
c) Cement board of +30 cm
d) Insulation by stone wool of 4 cm thickness
e) Beige interior stairs made by concrete
f) Black metallic columns and beams (HEA 200)

SECTION 2-2



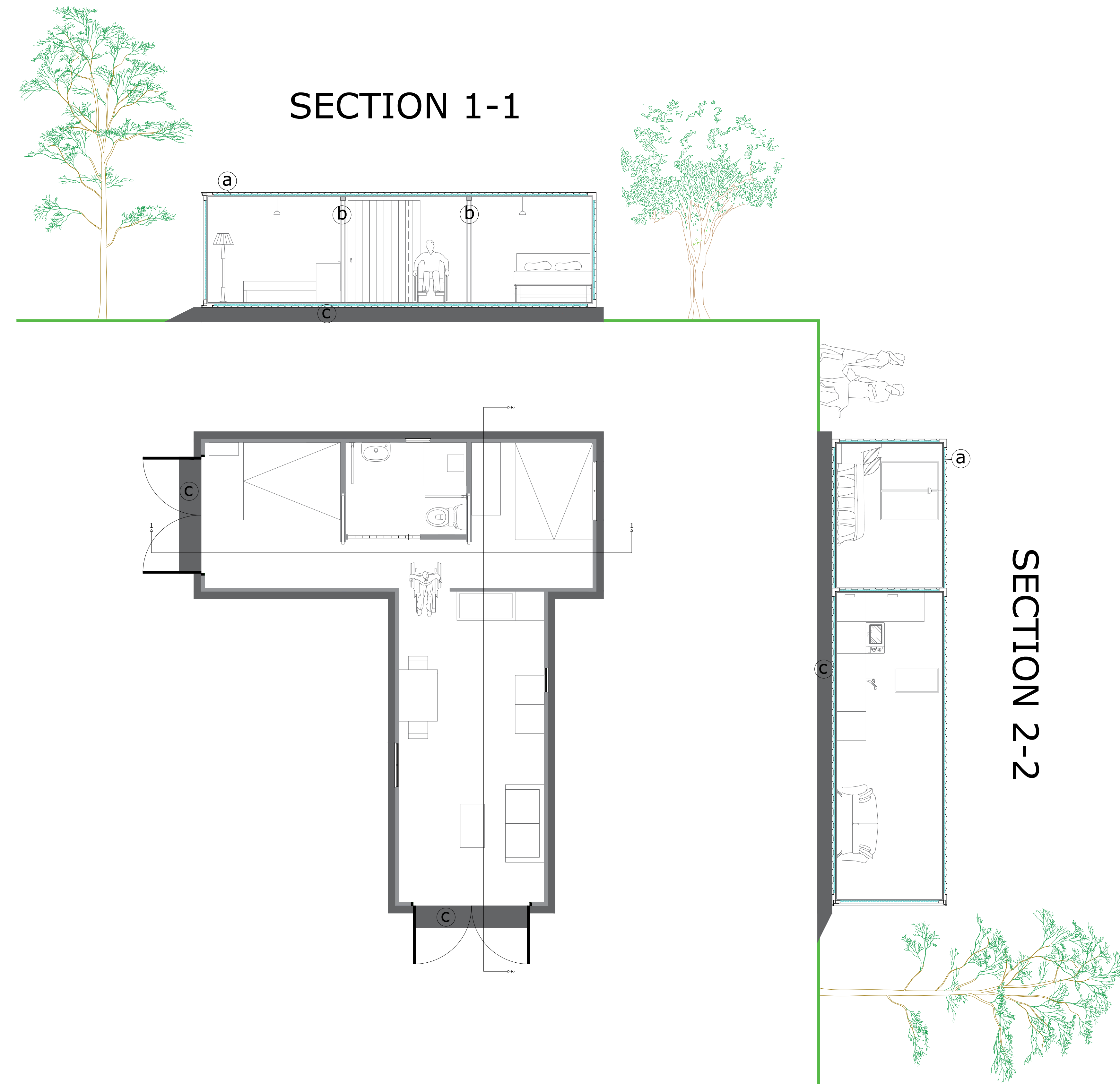
SECTION 1-1

UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "B" SECTION 1-1 & SECTION 2-2	NUMBER OF DESIGN: 011
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	



MATERIALS SUMMER HOUSE "B" SECTION 1-1 & SECTION 2-2
a) Insulation by stone wool of 4 cm thickness
b) Divider plasterboard of 10 cm thickness
c) Cement board of +30 cm

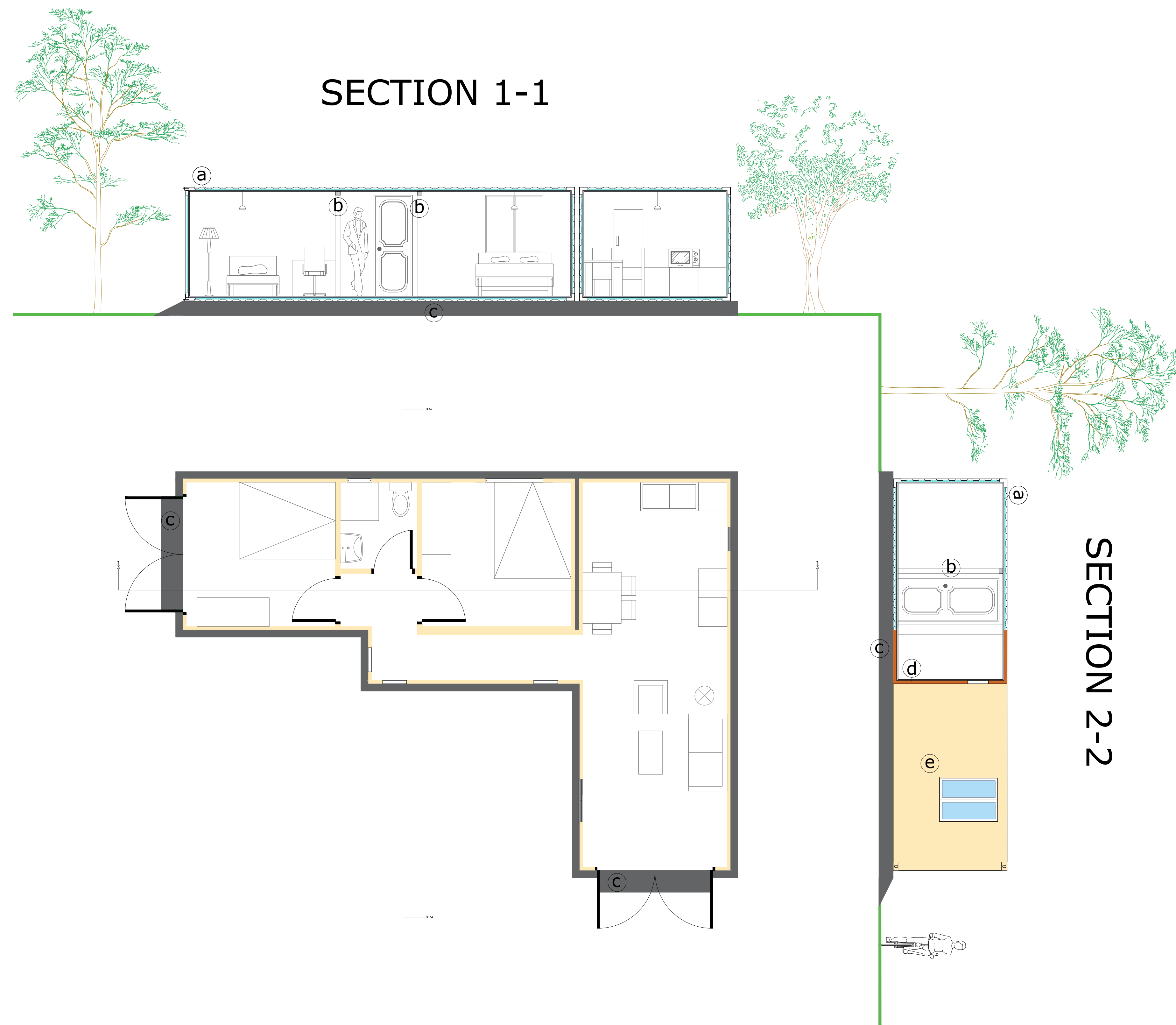
UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "B" (custom-built for people with special needs) SECTION 1-1 & SECTION 2-2	NUMBER OF DESIGN: 012
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	



MATERIALS SUMMER HOUSE "B" (custom-built for people with special needs) SECTION 1-1 & SECTION 2-2
a) Insulation by stone wool of 4 cm thickness
b) Divider plasterboard of 10 cm thickness
c) Cement board of +30 cm

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THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: SUMMER HOUSE "C" SECTION 1-1 & SECTION 2-2	NUMBER OF DESIGN: 013
SCALE 1:50	
STUDENT: PANOS ZOGRAFOS	

MATERIALS SUMMER HOUSE "C" SECTION 1-1 & SECTION 2-2
a) Insulation by stone wool of 4 cm thickness
b) Divider plasterboard of 10 cm thickness
c) Cement board of +30 cm
d) Acrylic mahogany color of exterior panel of 7 cm thickness
e) Acrylic beige color of exterior panel

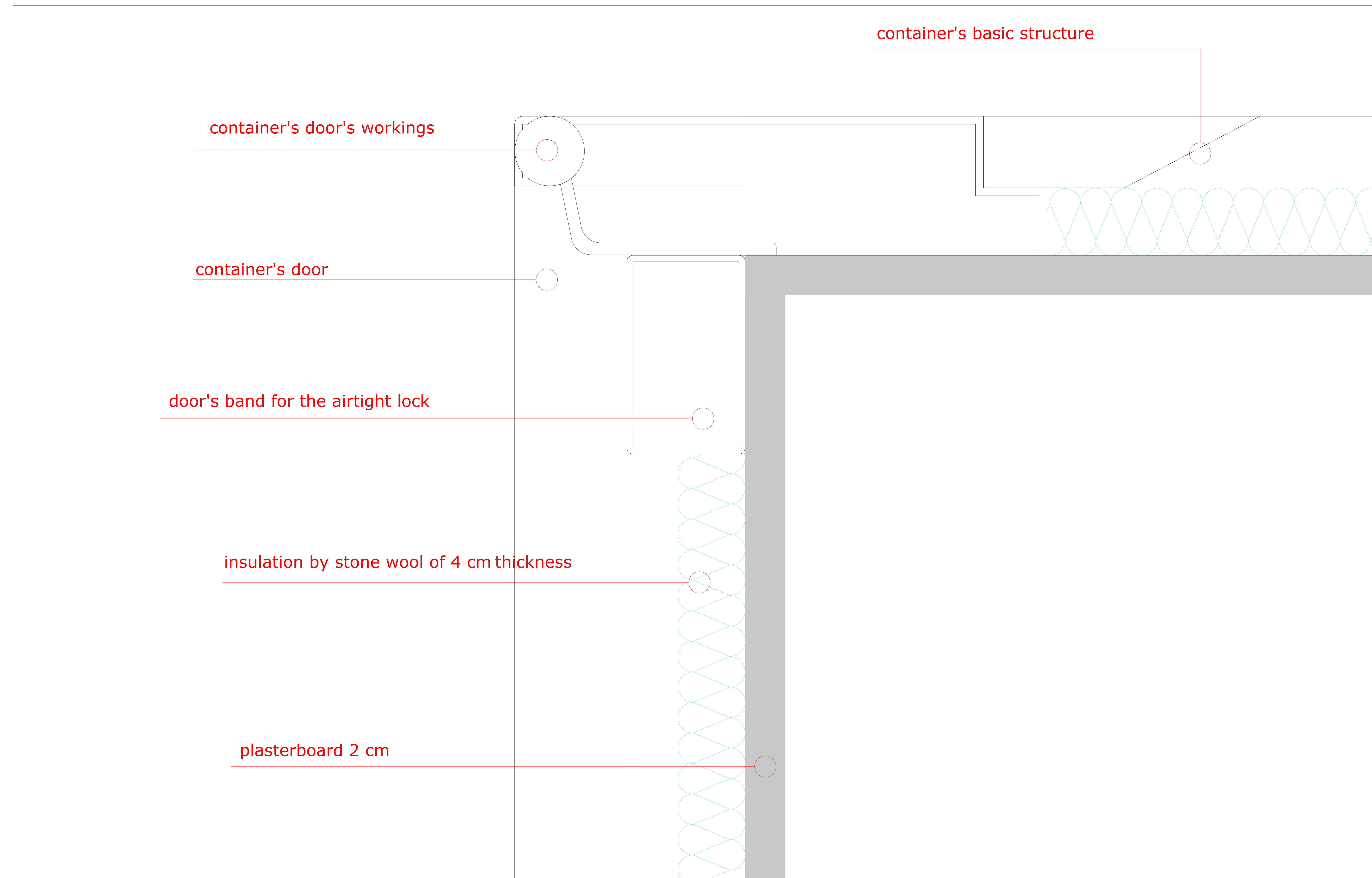


SECTION 1-1

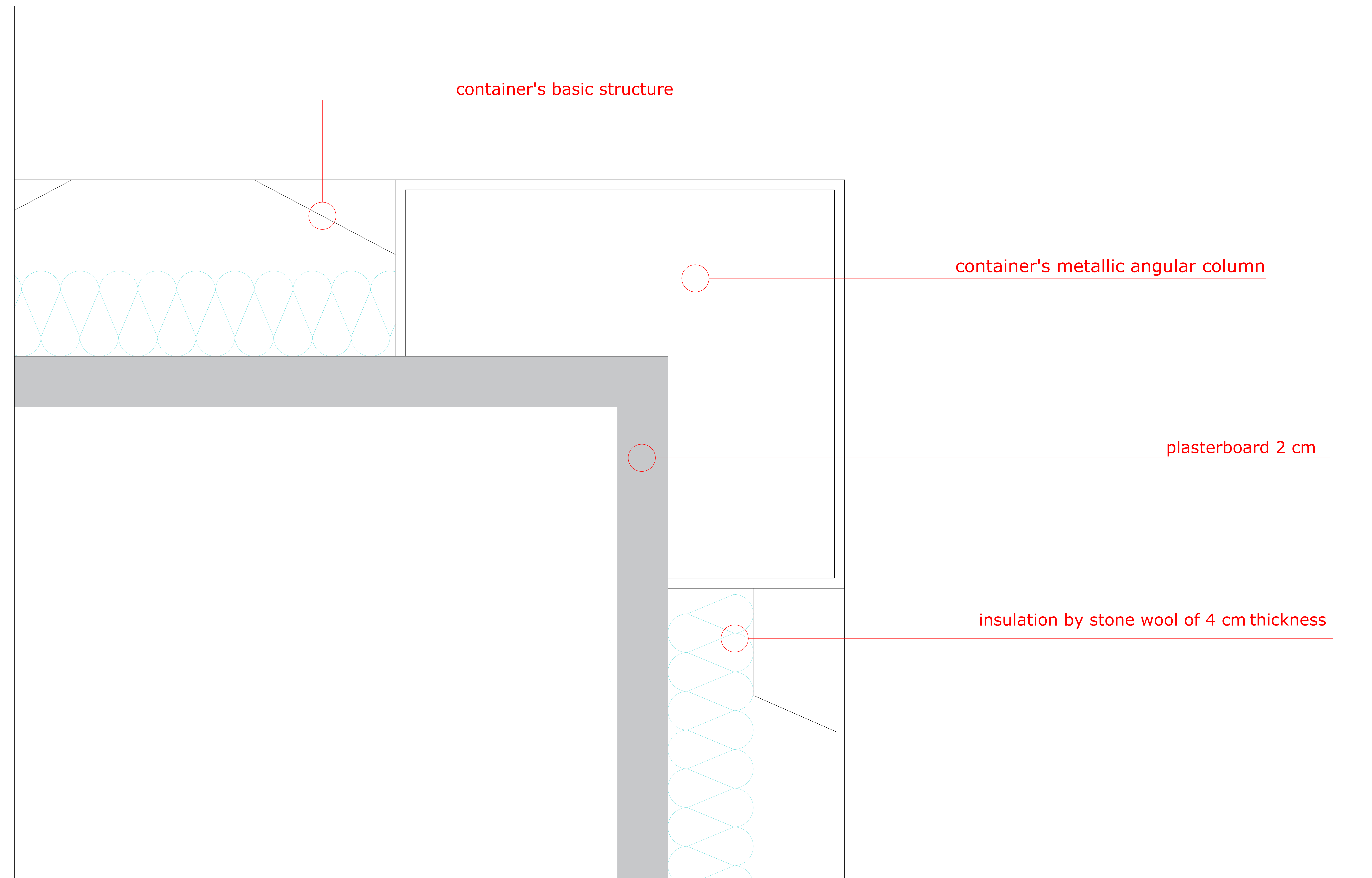


SECTION 2-2

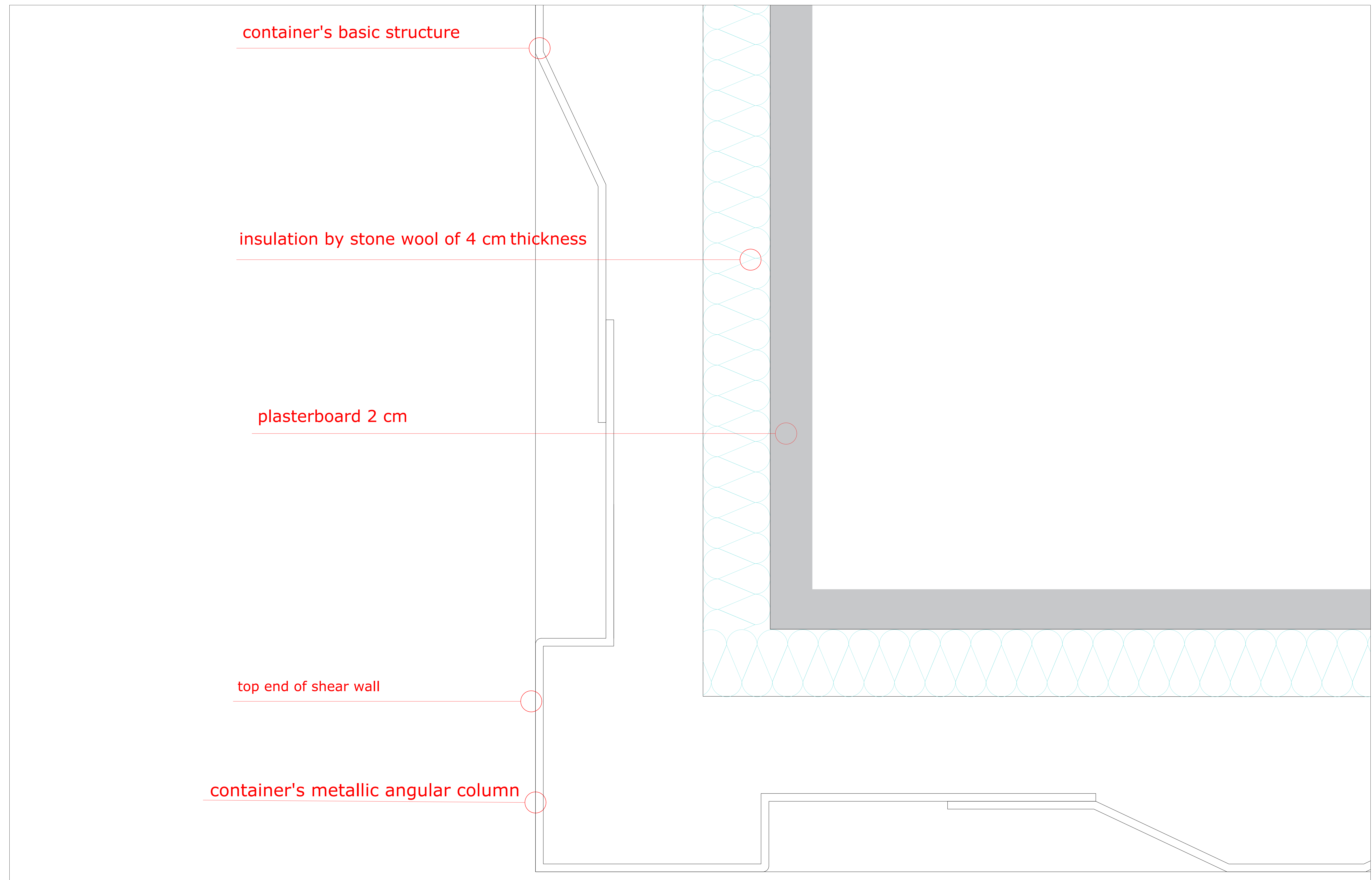
UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: PROPERTY DETAILS DOOR & FRAME	NUMBER OF DESIGN: 015
SCALE 1:20	
STUDENT: PANOS ZOGRAFOS	



UNIVERSITY OF WEST ATTICA Dept. of Civil Engineering	
THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: PROPERTY	NUMBER OF DESIGN: 016
DETAILS FRAME	
SCALE 1:20	
STUDENT: PANOS ZOGRAFOS	



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THESIS	
SUBJECT: ARCHITECTURAL FORMULATION AND ARRANGEMENT OF SUMMER HOUSES VIA CONTAINERS	
DESIGN: PROPERTY DETAILS BASIC STRUCTURE	NUMBER OF DESIGN: 017
SCALE 1:20	
STUDENT: PANOS ZOGRAFOS	



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THESIS

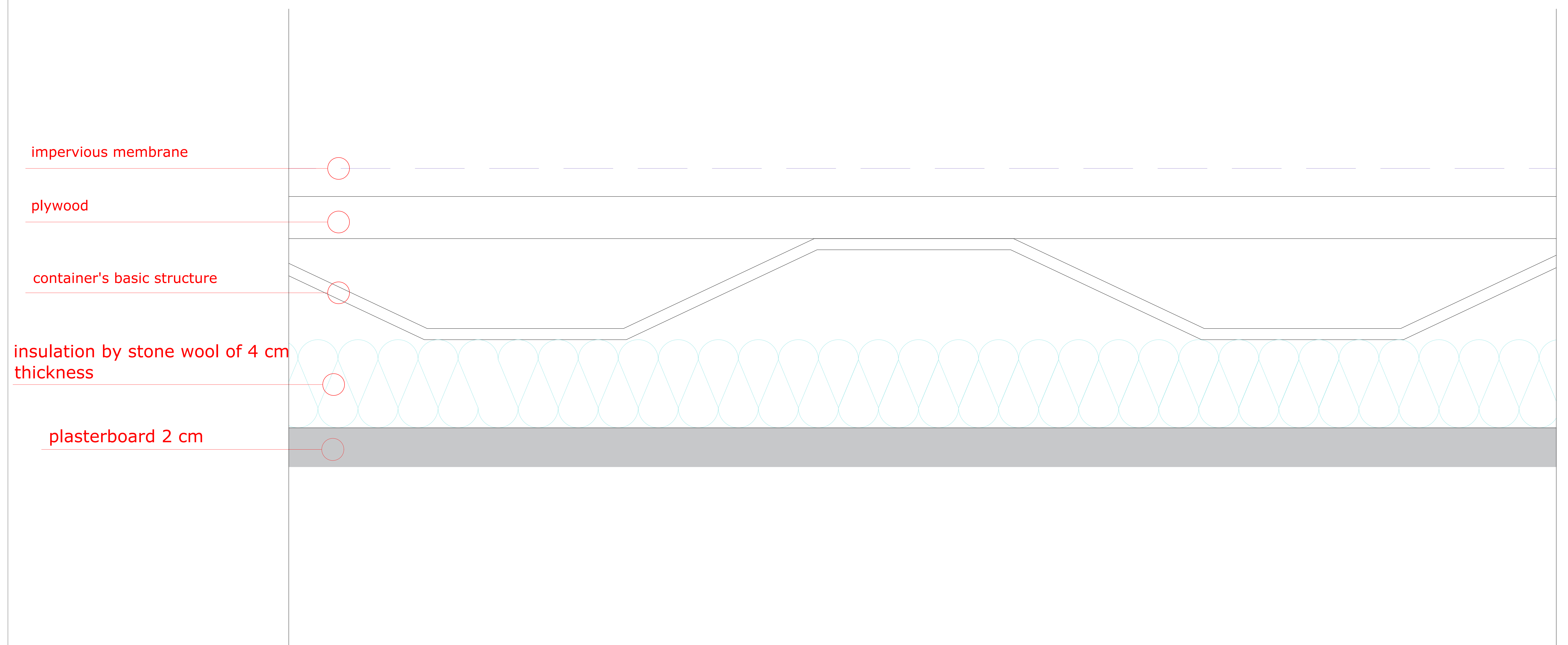
SUBJECT:
ARCHITECTURAL FORMULATION AND
ARRANGEMENT OF SUMMER HOUSES
VIA CONTAINERS

DESIGN:
PROPERTY
DETAILS
BASIC STRUCTURE

NUMBER OF DESIGN:
018

SCALE 1:20

STUDENT:
PANOS ZOGRAFOS



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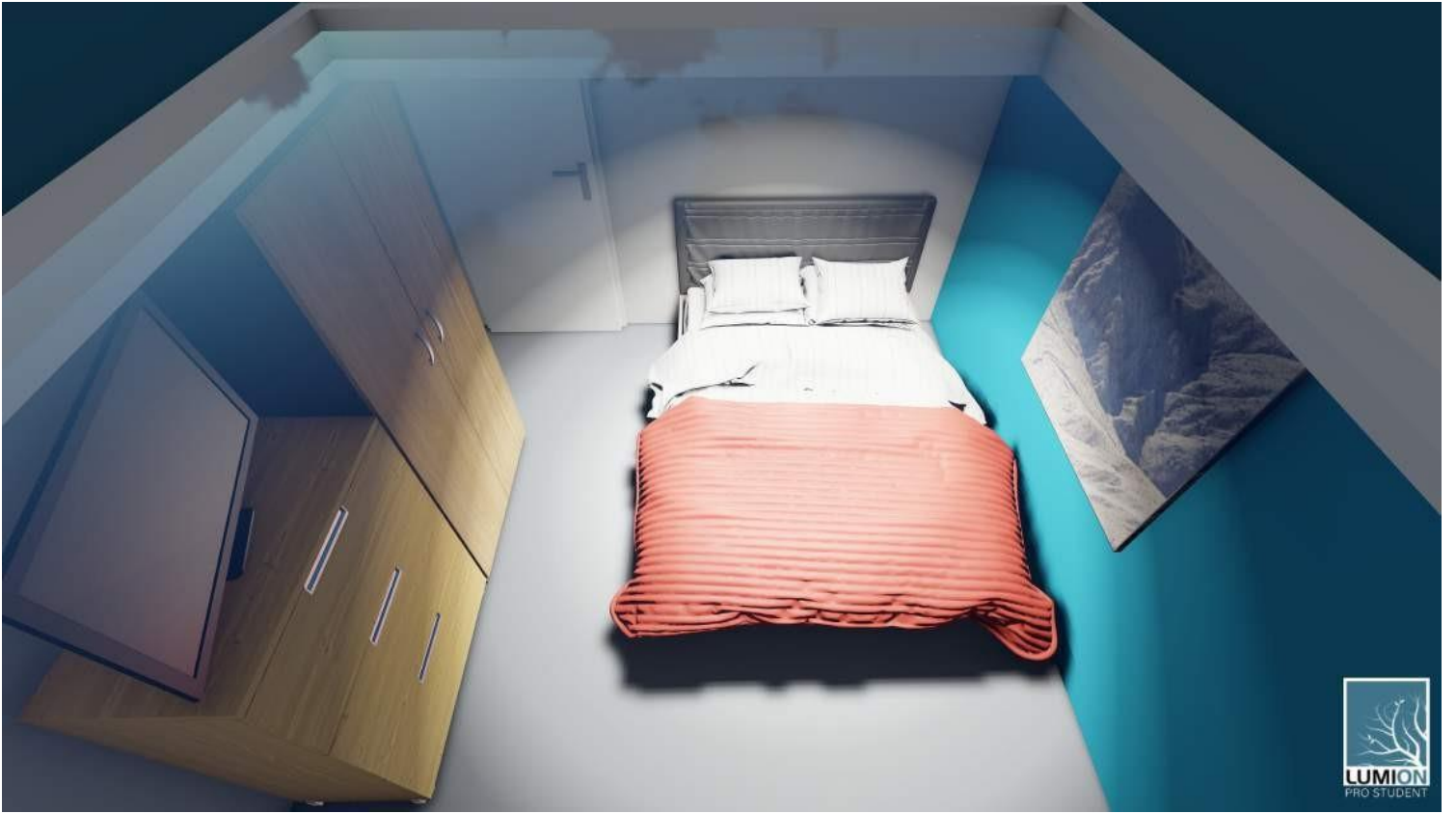




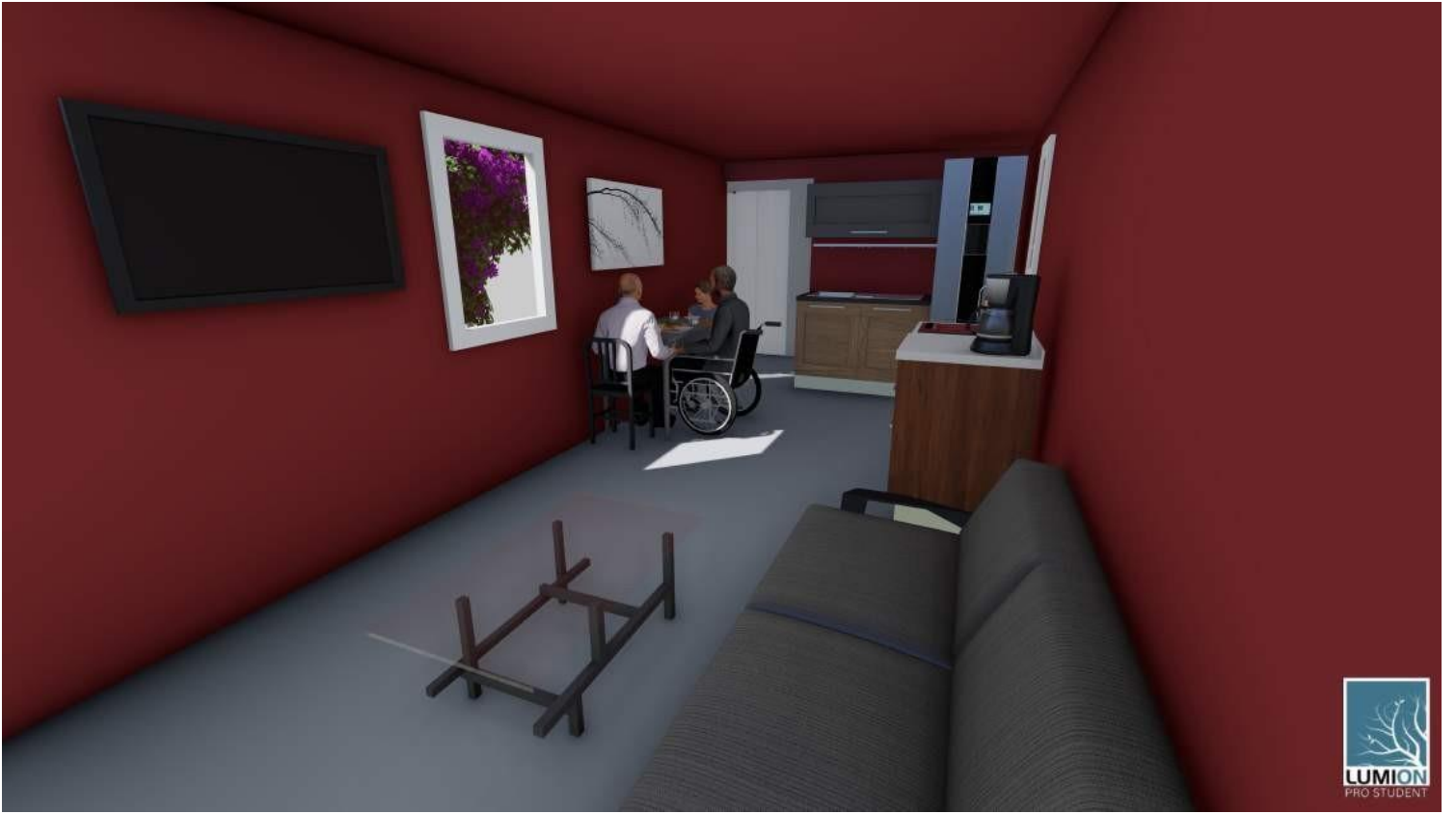








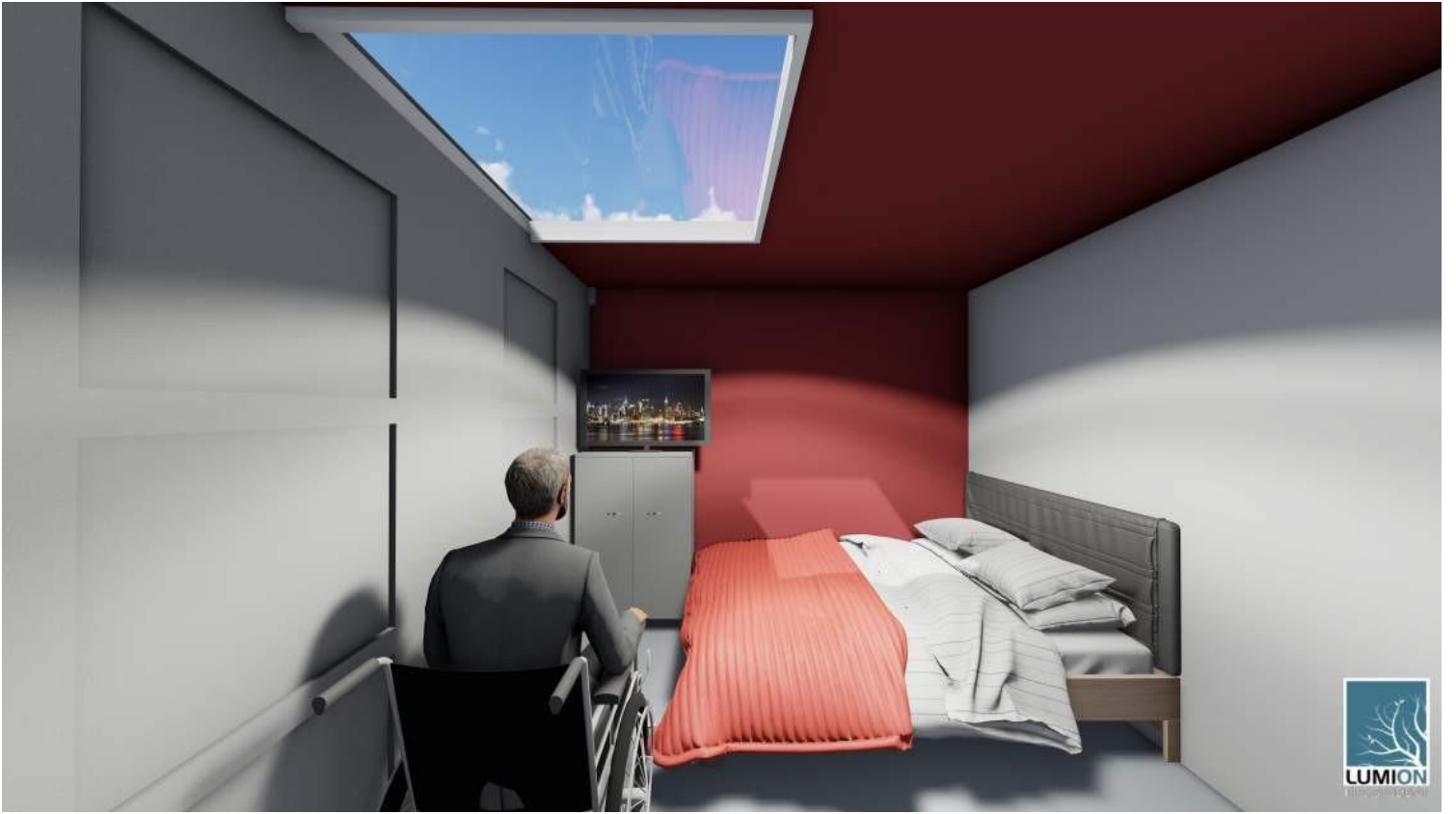


































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ΔΗΛΩΣΗ ΣΥΓΓΡΑΦΕΑ ΠΤΥΧΙΑΚΗΣ ΕΡΓΑΣΙΑΣ

Ο/Η κάτωθι υπογεγραμμένος/α Ζωγράφος Παναγιώτης του Θεοδώρου, φοιτητής του Τμήματος Πολιτικών Μηχανικών του Πανεπιστημίου Δυτικής Αττικής, πριν αναλάβω την εκπόνηση της Πτυχιακής Εργασίας μου, δηλώνω ότι ενημερώθηκα για τα παρακάτω:

«Η Πτυχιακή Εργασία (Π.Ε) αποτελεί προϊόν πνευματικής ιδιοκτησίας τόσο του συγγραφέα, όσο και του Ιδρύματος και θα πρέπει να έχει μοναδικό χαρακτήρα και πρωτότυπο περιεχόμενο.

Απαγορεύεται αυστηρά οποιοδήποτε κομμάτι κειμένου της να εμφανίζεται αυτούσιο ή μεταφρασμένο από κάποια άλλη δημοσιευμένη πηγή. Κάθε τέτοια πράξη αποτελεί προϊόν λογοκλοπής και εγείρει θέμα Ηθικής Τάξης για τα πνευματικά δικαιώματα του άλλου συγγραφέα. Αποκλειστικός υπεύθυνος είναι ο συγγραφέας της Π.Ε, ο οποίος φέρει και την ευθύνη των συνεπειών, ποινικών και άλλων, αυτής της πράξης.

Πέραν των όποιων ποινικών ευθυνών του συγγραφέα, σε περίπτωση που το Ίδρυμα του έχει απονείμει Πτυχίο, αυτό ανακαλείται με απόφαση της Συνέλευσης του Τμήματος. Η Συνέλευση του Τμήματος με νέα απόφασή της, μετά από αίτηση του ενδιαφερόμενου, του αναθέτει εκ νέου την εκπόνηση Π.Ε με άλλο θέμα και διαφορετικό επιβλέποντα καθηγητή. Η εκπόνηση της εν λόγω Π.Ε πρέπει να ολοκληρωθεί εντός τουλάχιστον ενός ημερολογιακού δμήνου από την ημερομηνία ανάθεσής της.»

Ο Δηλών



Ημερομηνία

1/11/2020