3. Listed Buildings

Selected Projects 1986-2019
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3. Listed Buildings

3.1 Bank and Office Building, Kifissia, Athens

Office and bank building in Kefalari, Kifissia, with reinforced concrete frame, used as a hotel until 1980. In 1984, it underwent an architectural redesign that was always based on his original style. Part of it, built in 1956, was demolished and rebuilt.

It consists of two buildings with ground floor, three floors and a basement. They are separated by an expansion joint. The oldest building dates back to 1952 and covers about 60%, while the newest building was built in 1984. The first floor was reconstructed with highly increased live loads.

After examining the situation of the existing one, it was proposed to strengthen this area. The reinforcement should only be on the first floor, while the building should remain fully functional in the remaining rooms.
The solution provided for the reinforcement of the three 16-meter frames on the first floor to support the three overlying storeys and hang the ground floor below. It was the only way not to intervene in other places. However, the pillars of the facade also required a reinforcement on the ground floor, without significant cross-sectional enlargement, for aesthetic reasons. The reinforcement of the frame also increases the resistance of the building during an earthquake. However, this was not the main objective of the operation.

It was proposed to convert the reinforced concrete with structural steel elements into a composite material, but also to constrict the existing concrete with steel elements, to jacket the columns with sheet steel and to ensure the full connection of the two materials. Non-shrinking, high strength mortar was used to fill the cavities. Many extraction tests, measurement of the strength of the post tensioned bolts and weld quality tests were carried out by a specialist workshop.
Strengthening by steel composite method, Strengthening with adhesively bonded steel plates and stripes, Inspection of weldings, Threaded rods, Addition of reinforcement

HPC jacket
The columns were jacketed with sheet steel and thus obtained multiple strength and ductility. In some beams, carbon stripes, sheet steel and in some masonry, steel frames with stiffeners made of framework were used.

The building has not undergone architectural change and is an example of the possibility of invisible surgical intervention in listed buildings.

Suspended slabs using steel profiles, Strengthening with adhesively bonded steel plates and stripes, Steel jacket, Strengthening by steel composite method, Chemical anchoring, Threaded rods, Addition of reinforcement
Chemical anchoring, Suspended slabs using steel profiles, Chemical anchor pull out test

Steel bracings
Concrete filled steel tubes, Completed building

Concrete filled steel tubes, Completed building

Concrete filled steel tubes, Completed building

Concrete filled steel tubes, Completed building

cubus engineering - Bank and Office Building, Kifissia, Athens
3.2 Hydrotherapy Center and Spa, Vouliagmeni Lake, Athens

Existing, listed hydrotherapy building, built in 1930, on the lake of Vouliagmeni, Attica. The lake is a natural phenomenon of great beauty, by the sea, with sweet, hot, healing water fed by the earth.

The building is made entirely of reinforced concrete, external walls and interior partitioning and is one of the early applications of reinforced concrete in Greece.

The purpose is to rebuild the building with new partitioning and use it as a hydrotherapy facility. The proposed solution is perfectly compatible with the original construction and in order to make the new partitioning, a new reinforced concrete frame is created inside. Slabs and vertical elements are replaced, and the new elements are linked to the existing exterior, which is maintained, in a new completely anti-seismic structure. Corrosion that has undergone the outer casing (reinforcement corrosion, concrete cover) needs to be repaired and restored with very modern means.

The architecture of the old building will be completely preserved at a minimal style, symmetrical, imposing, reminiscent of Bauhaus, and the result of the new architectural solution will be achieved internally in order to be used for modern needs. The E / M installations will be completely rebuilt to fully exploit the healing function of the hydrotherapy building.

The construction of the building has not yet been implemented.

Listed buildings, Existing building
Existing building, Earthquake analysis building model, Internal concrete skeleton frame

Architectural views
The historic monument preserved to this day is the 17th-century Petmeza Castle in Kalavryta, which played an important role in the revolutions of 1770 and 1821, referring to historical books as a warrior’s residence and battlefield. The tower was built in the traditional way and was a fortified house with many loopholes. In 1972, the castle was upgraded on the initiative of Admiral G. Petmezas and in 1989, his son, A. Petmezas, asked to make them earthquake resistant.

The solution provided for the creation of an internal skeleton of corner columns and reinforced concrete slabs to strengthen the castle as well as keep it fireproof and safe. The walls were plastered in with high strength mortar on reinforcing net.

a) Tower
b) Cottage

Listed building
Existing building

Architectural views

υπνοδωμάτιο 10m
Λουτρό 4,5m
υπνοδωμάτιο 9,5m
WC 1,7m κουζίνα 3m
καθίστικο 18m
ανεμοφράχτης
εξόδος προς τον κήπο
είσοδος

κουζίνα 4,6m
Αποθήκη 2,2m
WC 2,2m
Προθήκη Προθήκη
Είσοδος

Βιβλιοθήκη

Ανεμοφράχτης 1,0m

κατοψή οροφής οροφής - οπλισμόι δοκού
κατοψή στεγής - ξυλοκατασκευή

Ξύλεια διατομής 240x100

10 Ø16+4 Ø12 Συν.
Ø10/10
Ω16
Ø12 3
Ø16 2
Ø10/10 1

cubus engineering - Historical Tower, Kalavryta
3.4 Folk Museum, Andritsaina

The Folklore Museum of the historic town of Andritsaina, on the borders of the prefectures of Ilia and Arcadia, in the Peloponnese, near the famous temple of Epicurios Apollo, a work of Pheidias, built after the Parthenon. It is housed in a traditional building, a bequest of Galini Kanellopoulou in the Municipality of Andritsena. The restoration was financed by herself in 1987.

The building was built in the early 19th century, from stone masonry, was in excellent condition and served as a family home. It consists of a basement, boxed on the ground from both sides, a ground floor and a first floor. The basement, which served as a warehouse, consists of two stone vaults, extending all over the building.

The vaults had begun, near to their coronation, to get disorganized, mainly due to differential settlements. A strengthening with reinforced shotcrete was required, as well as the strengthening of the foundations, in order to remove the causes of the settlement.

For the same reason, it was decided to settle the groundwater from Lykaion, passing under the building and flowing to the famous “Trani Vryssi” of Andritsena.
The ground floor showed no damage, despite the earthquake ground. The first floor was also strengthened internally, with shotcrete and a peripheral reinforced concrete frieze was built in the coronation of the building, where the visible wooden roof was safely supported.

The building is now in excellent condition, it operates as a museum and hosts all the exhibits of the folklore of the area.
3.5  Winery, Zakynthos Isle

An old winery with stone walls on the island of Zakynthos, whose renovation and restoration was demanded in 2006. Its form, the stone masonry and the inclined wooden roof should be preserved.

For this purpose, a reinforced concrete frame was built, which was completely connected to the supporting masonry by bolts. The masonry was fully embedded in the frame. The new vertical elements were well-founded, while the existing foundations were reinforced. A new floor slab was constructed.

The new reinforced concrete frame has sloped beams that form the new pitched roof. Its beams were reconstructed from wood, as well as its predecessor.

This was a very extensive reconstruction of the building, which was completed successfully and with absolute certainty and provided a very satisfactory result, static and architectural.

Listed buildings, Completed building
Strengthening of foundation, Foundation of shear walls and cores, Internal concrete skeleton frame, Reinforcement drawings
3.6 "Goethe" Institute, Thessaloniki - Building A

Earthquake rehabilitation and fire protection

In 2015, all three buildings of the Goethe-Institute Thessaloniki were upgraded, under the direction of the Federal Office for Building and Regional Planning, in particular under the aspects of seismic safety and fire protection. The work took place during ongoing operation and could be completed within the planned time and budget, due to the close and trusting cooperation between project management, planning team, users and general contractors.

The ensemble with the main building, built around 1930, a landmarked house and a multiply extended newer building is grouped around the courtyard and the garden. 

Construction began in March 2015 and was completed in November 2015. In 2016, the garden of the Goethe-Institute was also redesigned.

The Goethe-Institute Thessaloniki has been housed since 2001 in three buildings of a spacious property south of the city center. Originally the German School was located here.

Reference by Bundesamt für Bauwesen und Raumordnung (BBR)
https://www.bbr.bund.de/BBR/DE/Bauprojekte/Ausland/KulturundBildungseinrichtungen/GoetheInstitutThessaloniki/githessaloniki.html

cubus engineering   - "Goethe" Institute, Thessaloniki - Building A
Structural situation

The most important reasons for the 2015 interventions were the overdue seismic retrofitting of all buildings as well as the necessary measures for fire protection, especially in the main building. The limestone and brick structures were heavily eroded and suffered from repeated earthquakes. The working group of the architect Dr. Thomas Greve and the structural engineer Dr. Antonis Kanellopoulos took over the planning and implementation of the project.

Renovation of the main building

In the main building, seismic retrofitting was also concentrated on the outer shotcrete shell, here as a composite structure with embedded steel trusses. In terms of stability in case of fire, the structure is supplemented on the inside by a new steel structure with 8 columns and beams. Far-reaching measures serve the fire protection with emphasis on the upgrading of the existing escape routes and the creation of new ones by additional external stairs and exits. In this building as well, the renovation of the façade was not only used for energetic upgrading but also for restoring the historical appearance.

The green facade to the west with the roof terrace is a reference to the new coastal promenade of Thessaloniki.

On the ground floor, an inviting reception and consultation area has been created, whose luminous ceiling leads the visitor to the multi-purpose area and the event hall.

Model of building before strengthening, Push over results, Seismic damages
With limited resources, new spatial experiences were created through individual architectural elements such as lighting, exhibition system and color scheme. In all buildings, the technical equipment was supplemented or renewed. The main building, the library and listed building received new air conditioning. All classrooms have been equipped with cable channels for IT and electrical connections. On the ground floor of the main building, the technical equipment of the new foyer, the exhibition and multipurpose area and the event hall have been upgraded.
Foundation of shear walls and cores

Strengthening of foundation

Chemical anchor pull out test, Composite Steel construction with gunite
Foundation of shear walls and cores, Steel skeleton frame
Completion of the renovation work

In November 2015, the Goethe-Institute Thessaloniki celebrated its 60th anniversary in refurbished premises, which are now structurally, technically and creatively equipped for its growing role as the city’s internationally networked cultural pole.

In the course of an art project and in cooperation with the planner, a garden was created on the grounds of the Goethe-Institute in 2016, in addition to the interventions carried out.
Threaded rods

Steel skeleton frame

Reinforcement drawings, Composite Steel construction with gunite
Steel concrete composite slabs

Steel stairs, Construction phases
Listed buildings, Completed building

cubus engineering - "Goethe" Institute, Thessaloniki - Building A
Retrofit of the listed building

First of all, the listed building with café and guest room was extensively gutted for seismic retrofitting and rebuilt with reuse of the existing building components, from the interior doors to the wooden staircase. Due to specifications of the monument protection, individual elements such as the roof and the windows were put into the supposed original state. For this reason, the designation of a large seminar room was approved on the ground floor. The seismic upgrading of the façade was carried out by an internal shotcrete jacket, while the ceilings were constructed as reinforced concrete composite structures.
Model of building before strengthening, Seismic damages

Model of strengthened building, Gunite jacket

Gnite jacket, Steel concrete composite slabs, Construction phases
Strengthening of foundation

Gunite jacket, Steel concrete composite slabs, Reinforcement drawings

Gunite jacket, Reinforced masonry, Construction phases
Steel concrete composite slabs

Construction phases, Completed building
Listed buildings, Completed building

cubus engineering - "Goethe" Institute, Thessaloniki - Building B
3.8 "Goethe" Institute, Thessaloniki - Building C

Works on the administrative and library building

In order to minimize the internal interventions, the administrative and library building was earthquake-proofed by an outer shotcrete shell. His statically separated parts of the building were connected by prestressed tie rods. The old part was stiffened on the upper floor with a new reinforced concrete composite ceiling, which rests on four additional internal steel columns. The reconstruction of the façade was used in addition to energetic upgrading.
Earthquake analysis building model

Push over results, Seismic damages
Gunit jacket, Addition of vertical elements, Connection of buildings

Construction phases
Addition of vertical elements

Gunite jacket

Strengthening of foundation

1.48

2.12

C1 30x30

C2 30x30

C3 30x30

C4 40x40

C5 30x30

W5 433x27

W1 449x27

W2 470x27

W3 759x27

W4 631x27

B2 20x85

B1 20x85

B3 20x60

B4 20x60

C6 30x30

C7 30x30

C8 40x40

C9 30x30

Hebe 360

Hebe 360

Cubus engineering - "Goethe" Institute, Thessaloniki - Building C
Gunite jacket, Reinforced masonry, Connection of buildings

Reinforced masonry, Addition of vertical elements

Connection of buildings

Gunite jacket, Reinforced masonry, Connection of buildings
Addition of vertical elements

Reinforcement drawings

Gnite jacket
Addition of vertical elements

Gunite jacket, Reinforced masonry

Steel skeleton frame, Existing building

Addition of vertical elements
Addition of vertical elements, Steel skeleton frame,
Connection of buildings, Construction phases
Listed buildings, Completed building

cubus engineering - "Goethe" Institute, Thessaloniki - Building C
3.9  Listed Building, Aeolou, Athens

Two neo-classical, heritage-listed buildings of the 1920s and 1930s, located in the center of Athens, on a busy shopping street in Aiolou Street, will be renovated, connected and internally redesigned to be used as shops and offices. This also requires the redesign of their E-M installations.

The proposed solution against static and seismic loads is the construction of a new load-bearing structure made of reinforced concrete with a new core in the stairwell and the elevator, which is properly founded. In the peripheral walls, inside, “concealed” shotcrete composite columns with built-in steel profiles were built to take over the loads of the new reinforced concrete slabs and the horizontal seismic loads.
It is a safe solution, completely anti-seismic and fireproof, with several elements of conventional design, making it easy to implement.

The solution also provides for the foundation of all new elements and the construction of a new wooden roof, that rests on the reinforced concrete slab.

**Architectural views**

**Foundation of shear walls and cores**
Reinforcement drawings, Flat slab, Steel concrete composite columns

Strengthening with new shear walls and cores, Gunite jacket, Composite Steel construction with
### 3.10 Listed Building, Eressou, Athens

Neo-Classical listed building of the 1930s in Exarchia, in the center of Athens, with walls of stone masonry. It consists of a basement, a ground floor and a first floor and is to be completely rebuilt in relation to the supporting structure and E-M installations and used as a family residence.

The method of strengthening internally the peripheral walls was chosen, applying a steel skeleton with shotcrete, on which the new composite slabs were supported. The inert walls were built in drywall. This solution made the building completely anti-seismic and transformed the peripheral walls into load-bearing, of increased strength against horizontal earthquake forces.

The construction was simple, fast and required no major intervention at the foundation level, except at the steel supports.

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![Listed buildings, Completed building](image)

*Earthquake analysis building model, Steel structure, Composite Steel construction with gunite*
Strengthening of foundation, Chemical anchoring

Addition of vertical elements, Steel structure, Steel concrete composite slabs
A heritage-listed building in the center of Athens, consisting of basement, ground floor, 1st and 2nd floor and an attic, is being renovated and converted into a shop and 4 apartments on the floors. It was built in the 1930s by brick walls and reinforced concrete slabs. In the basement and the ground floor are stone masonry and in the floors brick walls. The slabs are partly supported on beams and partly on the masonry. Inside the building are a few thin concrete columns supporting the beams.

The strengthening method provides that the masonry is converted into reinforced masonry by applying a layer of high strength cement mortar about 7 cm thick containing the required reinforcement. It is a class C90 / 105 high performance concrete and is self-compacting and non-shrinking. It is placed in all the perimeter walls as well as in the main wall, which is located in the building.

A new slab on the roof is concreted on the existing slab and joined to this and the vertical jackets of the walls. This results in a box with vertical and horizontal discs, which has the required rigidity and resistance to static and seismic loads. The beams are reinforced as well as the columns with a sheet metal jacket. The interior and exterior decoration has been completely restored, the wooden staircase and the window frames are being repaired.
Earthquake analysis building model, HPC jacket, Deformation of building under earthquake
### 3.1 Bank and Office Building, Kifissia, Athens

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<th>Location</th>
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### 3.2 Hydrotherapy Center and Spa, Vouliagmeni Lake, Athens

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### 3.3 Historical Tower, Kalavryta

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### 3.4 Folk Museum, Andritsaina

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### 3.5 Winery, Zakynthos Isle

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### Project Info

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#### 3.9 Listed Building, Aeolou, Athens

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#### 3.11 Listed Building, Emm. Mpenaki, Athens

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WEB PAGE
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AREA MAP
You may consult the following map to locate the offices of cubus engineering

![Map of the area](image-url)