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# Lessons learned from heritage structures conservation projects of Iscarsah Members

Prepared by the Examples Initiative Working Group

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# Executive Summary

This is the final report of the Examples Initiative Working Group from Iscarsah. The examples presented by the Committee members provided personal experiences and real issues faced during the implementation of projects. Each contribution focused on a particular project where the member was closely involved, and a critical analysis of the project was provided. This led to discussions on each of the case studies. The examples and the lessons learned would address all kinds of interventions, the pros and cons of these interventions, and the final results of past interventions.

The report first introduces the activities of the working group and the case study presenters, as well as the working group members and observers. This is then followed by the summaries of the nine examples that were presented.

*Figure 1: Locations of examples that were presented:  Iran, Morocco, Nepal, Nigeria, Portugal, Russia, Slovenia, Türkiye and United States*

The report then goes on to present a table of the main issues that were identified through the examples, organized under six main themes: value-based interventions, materials, context, legal provisions and practice, knowledge and skills and appropriate interventions. In the final section before concluding, the report assesses on whether the Iscarsah Guidelines provide sufficient guidance to resolving the issues that were raised. There are clearly themes that the Iscarsah Guidelines does not address, which will need to be discussed further during a next cycle of amendments.

## Table of Contents

# 1 Introduction (Kai Weise)

## 1.1 The Proposed Initiative

The 'Examples Initiative' was proposed based on the understanding that Iscarsah members are working all over the world and have a wealth of knowledge and experience, which has much value to be disseminated to the heritage conservation community. The initiative established a platform for Iscarsah members to share their experiences. Each contribution would focus on a particular project where the member was closely involved, and a critical analysis of the project would be provided. This would then lead to discussions on each of the case studies within the Working Group. Finally, the outcome would be presented in the form of 'lessons learned'. The differences in opinions would be documented, to show that may not be always a single correct solution when dealing with complex projects.

The examples and the lessons learned would address all kinds of interventions, the pros and cons of these interventions, and the final results of past interventions. As an example, the use of anastylosis could be discussed. Furthermore, discussions could also address safety standards for historical structures, how is safety assessed, as well as how safety is regulated through national building codes. The discussions could also touch on better understanding traditional technology and materials, or the involvement of traditional craftspeople. Finally, all the topics discussed would be compiled in the form of 'lessons learned' related to specific themes such as 'technology', 'materials', 'know-how', 'procedures', 'funding', 'research', 'community', 'change', etc.

The timeline for the initiative began with setting up the working committee of Iscarsah members by the end of November 2023, as detailed next. Originally, there would be a call for examples and by end of January 2024 the case studies would be collected and tentatively 25 would be selected. This would then lead to be a series of online meetings to discuss the examples, which would end by September 2024. A report of the examples was planned to be compiled by the end of December 2024. Possibilities for external publication would be explored. Finally, by July 2025, a webinar for public discussion and final update of report would be organised, to be uploaded in the Iscarsah website.

When implementing the initiative, things changed slightly, with varying interest shown by the members. The focus also moved to reviewing the outcome of the discussions in relationship to the Iscarsah Guidelines 2.0 (revised and approved by the committee in September 2024).

## 1.2 Summary of the Initiative

Description of initiative as per initial presentation:

Are the points provided on the slide agreeable to the working group? Are there further points that need to be included?

It is critical to understand that there are different opinions and that we will need to agree to accept and benefit from different views. However, justifications are required and will be reviewed by the working group. At the time this template was created Iscarsah had no clear template to aid in consistent branding.

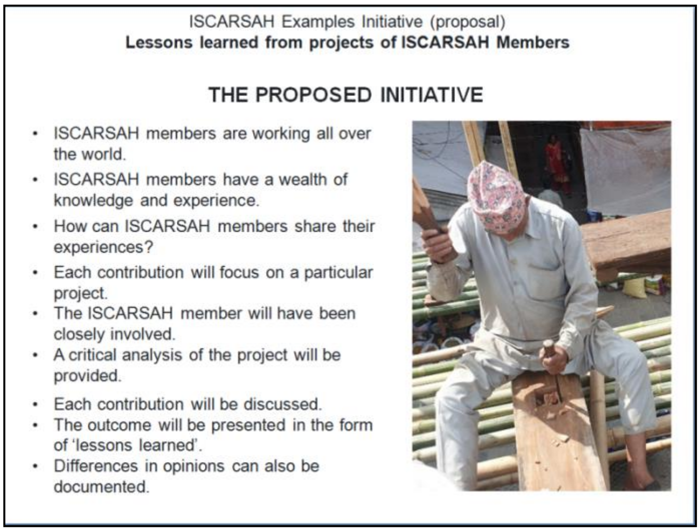

*Figure 2: Description of initiative*

Choice of Examples:

The choice of examples will be agreed upon by the working group based on criteria (which need to be prepared). This will go hand-in-hand with the themes that are chosen to present the "lessons learned". As mentioned, the point is not to say one solution is correct and the other incorrect, but to provide different arguments for the options. Comparative assessments will be important.

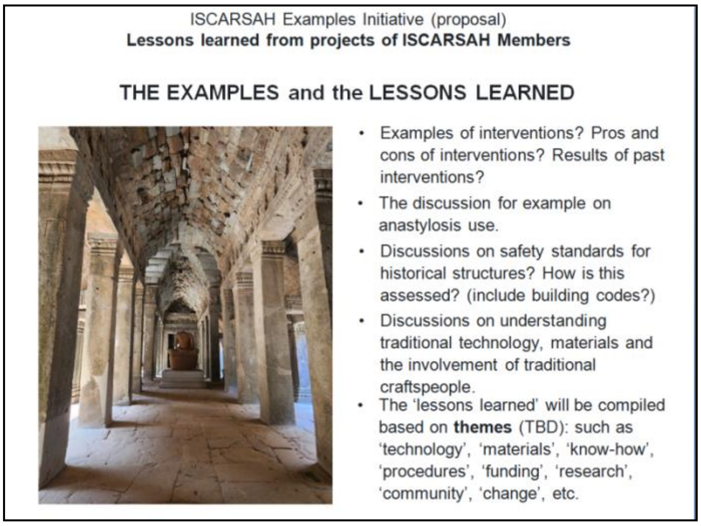

*Figure 3: Choice of Examples*

Finalise Timeline:

We will issue a call for examples as soon as possible.

This would be followed by a series of online meetings that will also need to be scheduled. The different examples will need to be presented, but a report will also need to be submitted. All this will need to be defined in detail.

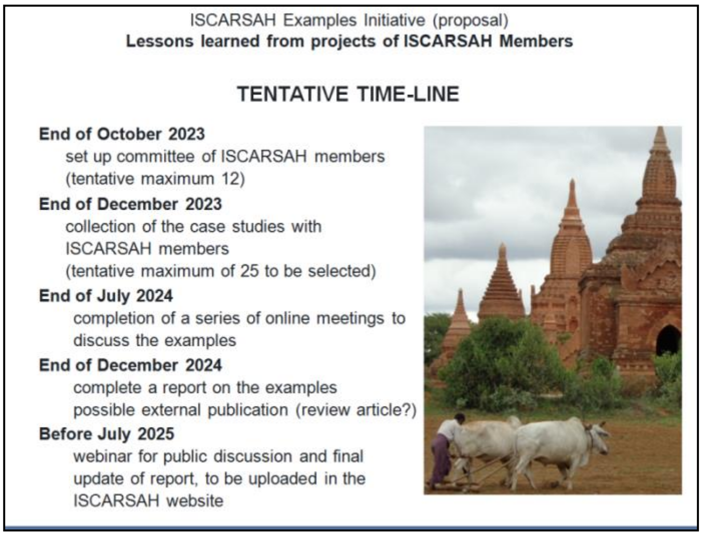


*Figure 4: Choice of Examples*

# 2 Setting Up the Working Group (Kai Weise)

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It must be noted that not all the members attended the sessions.

# 3 The Examples

The proposed initiative "Lessons learned from projects of Iscarsah Members".  was presented at the Iscarsah Annual General Meeting in Kyoto on 11th September 2023. The proposal was selected and the working group was established in November 2023. The call for examples led to the following presentations.

A focus on two heritage sites from Morocco, the Tinmel Mosque and the Kasbah/Citadel of Agadir Oufella, particularly after the 2023 Al Haouz Earthquake: The lessons learned
Khalid El Harrouni and Satwant Rihal [1 February 2024]

Public Bath Number 7
Donald Friedman [1 February 2024]

Restoration of 15 c. Faraskatta Church in the Northern Caucasus. Traditional and Advanced Technology.
Ivan Strelbitskii [1 February 2024]

Chancel for Cathedral of Porto, Portugal
Paulo B. Lourenço [4 March 2024]

Negova Castle, Slovenia
Nataša Jurgec Gurnick [4 March 2024]

Restoration of the Historical Complex of Mofakham in Bojnurd (Iran) and the Lessons Learned

Mehrdad Hejazi [4 April 2024]

Villa Tarabya building, structural documentation and visual damage assessment
Meltem VATAN [4 April 2024]

Developing A Value System for Restoration Work in the West African context
Sola Akintunde [7 May 2024]

Post-earthquake reconstruction of Kasthamandap
Kai Weise [7 May 2024]

## 3.1 A Focus on Two Heritage Sites from Morocco, The Tinmel Mosque and the Kasbah/Citadel of Agadir Oufella, Particularly After The 2023 Al Haouz Earthquake: The Lessons Learned (Khalid El Harrouni and Satwant Rihal)

Summary

On September 8, 2023, a magnitude 6.8 earthquake struck the Al Haouz region of Morocco, causing widespread destruction to the built heritage across the High Atlas. This paper examines the impact on two nationally significant heritage sites — the Tinmel Mosque and the Kasbah/Citadel of Agadir Oufella — drawing on field observations, expert consultations, and participation in post-earthquake forums organized by the Moroccan government and academic bodies.

Both sites present contrasting typologies — a 12th-century Almohad Mosque built of earthen brick and lime mortar, and a six-century-old coastal hilltop fortress already undergoing rehabilitation — yet both expose common vulnerabilities in historic earthen and masonry construction when subjected to seismic loading.

The Two Sites

Tinmel Mosque

Located in the Nfis River valley of Al Haouz, the Tinmel Mosque occupies a roughly 48 × 43 m footprint. Its walls, arches, and exterior minaret — incorporating the mihrab — are constructed of brick and mortar composed of earth, stone, and lime. The earthquake struck while restoration work was already underway. The ICOMOS Morocco/Spain site visit documented: collapse of significant wall and arch sections; emergency sorting of reusable solid brick elements; inventory and storage of architectural and decorative fragments; and temporary propping of standing sections. The Ministry of Habous and Islamic Affairs is managing recovery and will issue a new tender for restoration. The mosque's earthen construction proved highly susceptible to out-of-plane failure and wall separation under seismic loading.

Kasbah of Agadir Oufella

Classified as a Moroccan historical monument in 1932 and largely destroyed in the 1960 earthquake, the Kasbah's rehabilitation was underway under the Urban Development Program 2020–2024. The multidisciplinary project engages archaeologists, historians, anthropologists, architects, and engineers, incorporating participatory methods and advanced digitalization. The

2023 earthquake provided a real-time stress test of the rehabilitation approach and highlighted the need for seismic detailing within heritage conservation guidelines.

Key Discussion Points

Earthen construction vulnerability: Both sites are built predominantly from earth-based materials (pisé, adobe brick, lime mortar). These perform poorly under cyclic seismic loading — particularly for out-of-plane wall stability — and require targeted retrofitting compatible with heritage values.

Intervention during active restoration: The Tinmel Mosque suffered damage while restoration was in progress, raising critical questions about temporary stabilization protocols and site safety in seismically active zones.

Governance and coordination: Post-earthquake response involved multiple ministries, regional authorities, universities, NGOs (ICOMOS), and international partners, highlighting the need for pre-defined coordination frameworks between cultural heritage and civil protection agencies.

Multidisciplinary approach: The Agadir Oufella project demonstrated the value of integrating archaeology, architecture, engineering, and community science before a disaster strikes — pre-existing documentation accelerated post-earthquake assessment.

Community and stakeholder engagement: Local communities, historical societies, and public institutions were central to both projects, strengthening both cultural legitimacy and practical resilience of conservation efforts.

Lessons Learned

Pre-disaster documentation is indispensable: Comprehensive digital records — drawings, photogrammetry, structural assessments — made damage evaluation far more efficient at Agadir Oufella than at Tinmel, where documentation was less complete at the time of the earthquake, but it is still underway.

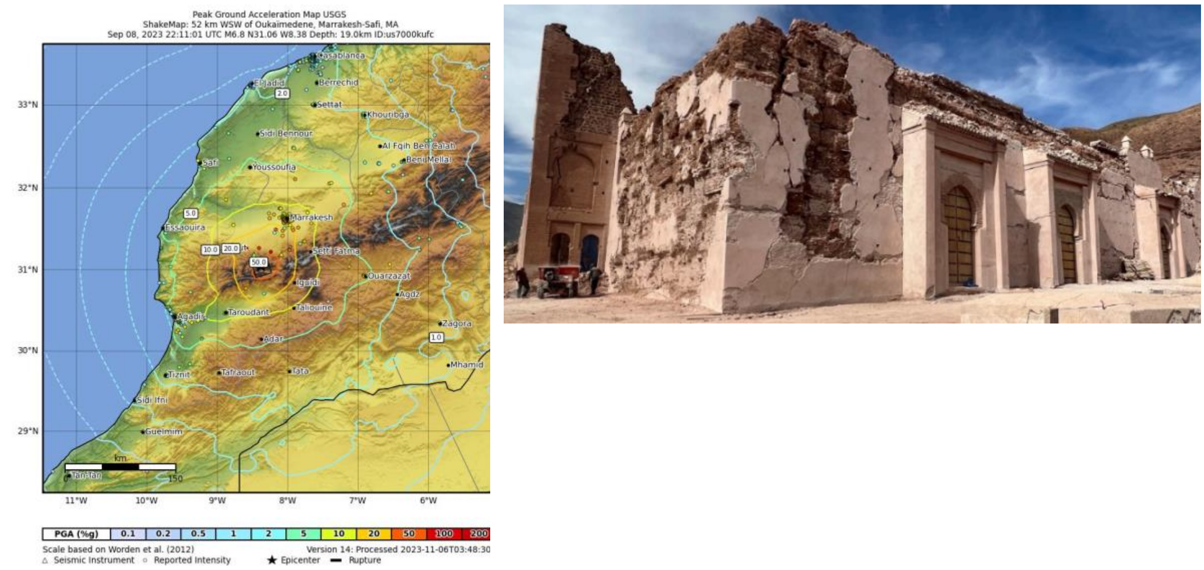
Integrate seismic risk into heritage conservation planning: Conservation plans for earthen or masonry heritage in seismic zones must incorporate structural vulnerability assessments and reversible reinforcement measures from the outset.

Temporary stabilization protocols must be defined in advance: For sites undergoing active restoration, pre-agreed emergency measures (propping, netting, temporary covers) should be contractually embedded in works contracts.

Material authenticity and seismic resilience are not mutually exclusive: Techniques such as compatible earthen mortar repointing and discrete tie-rod systems can improve seismic performance without compromising heritage character.

Establish regional heritage seismic risk inventories: Morocco's concentration of earthen heritage in the Atlas seismic zone argues for a systematic national inventory of at-risk sites, prioritizing those with highest historical significance and structural vulnerability.

The Agadir Oufella model as a replicable blueprint: The multidisciplinary, participatory, and digitally documented rehabilitation approach provides a transferable methodology for other earthen heritage sites in seismically active regions of the MENA and beyond.




(a) (b)

*Figure 5: (a) Peak Ground Acceleration map, Al Haouz earthquake M6.8, Sep 8 2023 (USGS), (b) Tinmel Mosque after the earthquake showing severe wall damage*


(a) (b)

*Figure 6: (a) Aerial view of the Kasbah Agadir Oufella rehabilitation (Salima Naji) (b) Wall construction and reinforcement technique, Kasbah Agadir Oufella (Salima)*

## 3.2 Public Bath Number 7 (Donald Friedman)

Involvement: Old Structures was the engineering consultant for the investigation and repair of the building in 2016-2019, responsible for analysis and future safety.

Background: Public Bath Number 7 in Brooklyn is an ornate, roughly 1000-square meter building constructed by the city of New York 1906-1910 to address the hygiene needs of the surrounding Gowanus neighborhood. Many of the residents lived in Old-Law tenements (constructed 1867 to 1901) as originally built, without provisions for bathing. The New Tenement Law of 1901 required new buildings to have baths for every apartment; the city constructed bath houses for people living in older buildings. Bath Number 7 was constructed to the standards of the day: the roof and upper floors were carried on steel girders and trusses supported by steel columns, embedded in the self-supporting exterior masonry walls. The large terra-cotta-block cornice was supported on steel outriggers and hangers; the tall walls of the main space were braced by steel framing connected to the columns. Per the requirements of the 1901 New York City Building Code, there was no explicit design for lateral loads because the building was less than 100 feet (30.5m) tall and has a slenderness of less than 4. The building was converted to gymnasium use in the 1930s, and to a private event space in the 1990s. It was designated as a New York City landmark in 1984, on the basis of its classical architecture and because it was the best surviving example of a New York public bath. During a renovation in 2014, the steel structure was found to be extensively damaged by water, compromising the floors and roof, and the stability of the exterior walls.

Project: Old Structures was hired to assist the project architect renovating the brick and terra-cotta facade. The project owner was a developed who had constructed a new building adjacent to the bath and combined the two buildings into one lot for tax and zoning purposes. The developer's intent was to rent the bath, and was turned into a commercial gym after the renovation was complete. The team originally hired by the owner – architect, engineer, and general contractor – were experienced in new buildings and declined to be involved with the bath house. The owner hired a restoration architect (Walter B. Melvin Architects) to work on the exterior; when they found the damaged steel, they recommended hiring Old Structures.

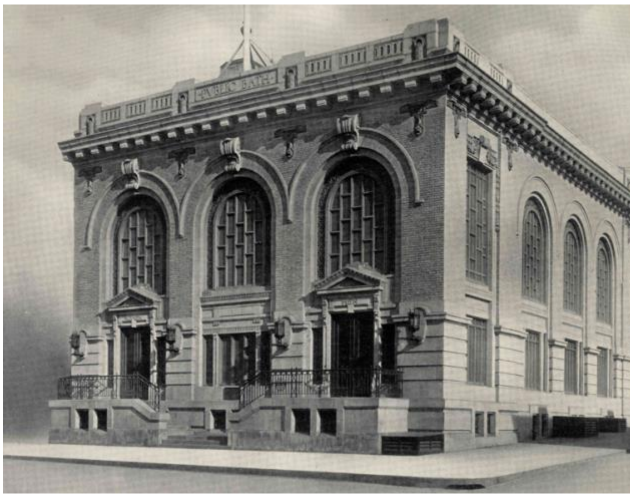
The steel condition varied from mild rusting to near-complete loss of section in some columns. In the latter case, it was clear that the facade masonry in which the columns were embedded was carrying the structural load and was being damaged in the process. The other potential imminent hazard was the deterioration of the outriggers and tie-down hangers of the cornice.

The Old Structures analysis of the building showed no evident damage from lateral loading or movement. The columns were sized adequately to carry gravity load but not the combined axial forces and moments that lateral-load analysis of the building frame would require. In the interest of promoting the rental, the developer had original stated that the building should be entirely brought up to current- code standards, which would require either that the steel structure be reinforced to carry wind and seismic loading or that the masonry walls be reinforced to meet requirements for shear walls. Either form of reinforcing would have greatly increased the cost and intrusiveness of the repair work, without adding any obvious benefit. The decision was made by the entire team, based on the Old Structures recommendation, to rely on code grandfathering of the original structural design and on the demonstrated strength of the exterior walls to act as de facto shear walls. The damaged steel was repaired and sistered as required for gravity loads. The project was completed in that manner.

Conclusion:

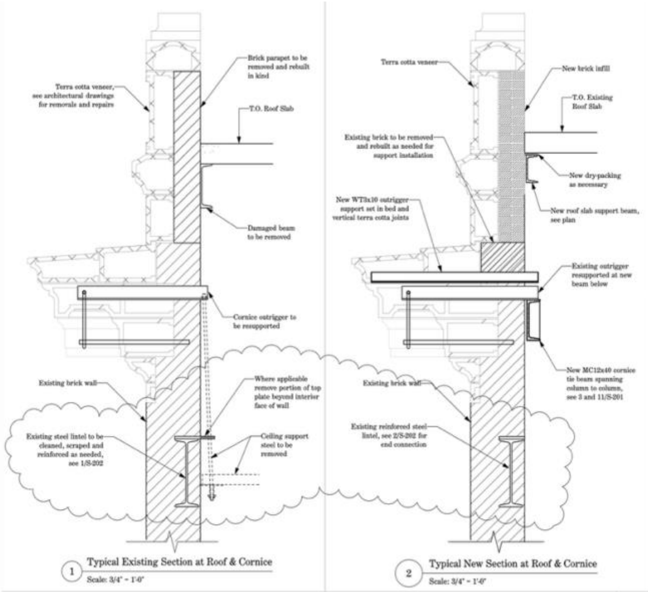
Just because a building has a steel frame does not mean that the frame was designed for all applicable loads in something like the modern method. Many early-modern buildings are hybrids, mixing steel and reinforced concrete with structural unreinforced masonry. In some cases, such as New York's old code provisions, such hybrid buildings may have been exempted from analytic structural design.

Whether or not this now-obsolete form of design is a problem in current-day analysis depends on the building performance: if there is no damage associated with the empirical portions of the original design, they can be restored to their original condition rather than upgraded. The use of investigation to determine empirical performance is based in part on the Iscarsah Principles section 2.3.2; the repairs to replicate the original structural capacity and function conform in part to section 4.3.



(a) (b)

*Figure 7: (a) An illustration of the building from 1910, shortly after completion, from The Brickbuilder. 19 (3), Match 1910. Public domain, (b) A photo of a condition found at the roof spandrel beam. Property of Old Structures Engineering.*


(a) (b)

*Figure 8: (a) A photo of a corner column showing deterioration and sister column (gray) during the repairs. Property of Old Structures Engineering., (b) Details for cornice stabilization. Property of Old Structures Engineering. Note the attached photos and drawings are all property of Old Structures Engineering*

## 3.3 Restoration of 15 c. Faraskatta Church in the Northern Caucasus. Traditional and Advanced Technology (Ivan Strelbitskii)

On the territory of North Ossetia there are a large number of architectural monuments, the most prominent of which are medieval towers, castles, sanctuaries and churches. Among them were churches, mosques, public and residential buildings as well as ancient stone battle and residential towers, sanctuaries and churches in the Caucasus mountains, starting from the 12th century.

Built of rough processed stone and lime mortar, the Farascatta church dates back to the second half of the 15th century. Originally, it could have been a burial shrine. In 1837 it was "renovated" and served as a church although traditional rituals have continued until today.

The main defects are associated with a long-term lack of maintenance of the main load-bearing structures.

The stone retaining wall 2 m to the east of the church has collapsed and surface waters were soaking the masonry of the church walls.

The masonry has weakened from washing out the lime mortar from the joints between the stones of the walls and slate roof. There were a number of cracks in the masonry, probably of seismic origin.

The roof slabs were deformed under the influence of moisture accumulation between the slabs under conditions of alternating temperatures. In the 1990s, a temporary steel conservation roof was installed on racks made of metal pipes.

In the course of restoration in 2020-21, work was carried out to strengthen the load-bearing structures of walls and vaults with pitching and grouting. The vault was strengthened. A hidden waterproofing layer using modern materials was installed on a reinforced screed. The historic slate slab coating of the roof was restored, preserving 70% of the original material. It was decided to remove the unsightly conservation roof after testing the insulation layer beneath the visible outer surface of the stone roof over the interior and restored walls. The retaining wall standing higher from the church was restored. To prevent further damage to the monument a vertical layout was carried out to ensure the removal of surface water from the walls.

Introduction

On the territory of North Ossetia there are a large number of architectural monuments, the most prominent of which are medieval towers, castles, sanctuaries and churches widespread in the mountainous zone of the North Caucasus. I have been engaged in the conservation and restoration of historical monuments of North Ossetia since 2006. Among them were churches, mosques, public and residential buildings in Vladikavkaz - the capital of this republic, as well as ancient stone battle and residential towers, sanctuaries and churches in the Caucasus mountains, starting from the 12th century.

In the Digorsky gorge in the Makhchi region in the village of Nizhny Faraskatta, a church building has been preserved, which dates back to the second half of the 15th - early 16th centuries.

The village of Faraskatta is located on the right bank of the river Aigamugidon, high on the mountainside.

The village consists of two parts: the sparsely populated Lower Faraskatt and the deserted Upper Faraskatt located higher up the slope.

It is known that the church in Lower Faraskatta was "renovated" in 1837: Orthodox services began to be held in the building. Apparently, then the old transverse wall was dismantled and some alterations were made.

In the mountains of the Caucasus, as well as in Scotland, Christianity, as a rule, was quite peacefully and organically intertwined with each other. Pagan beliefs were not destroyed by "fire and sword" as, for example, in Russia or in western India in Goa in the 16th century. Perhaps this is due to the conditions of life in the mountains, where it was easier to hide from overly active missionaries. Until now, ancient holidays are held in some Ossetian churches. The ancient gods received their counterparts in the Christian pantheon of saints. So Uastirdzhi - the patron of men, travelers and warriors is revered as St. George, and Uatsilla - the thunderer and lord of storms, the patron of agriculture and harvest, like St. Elijah. Each religious holiday is accompanied by a feast with a strict order of toasts in honor of the patron saints.

Farascatta is still gathering people. Here, the feast of the sanctuary of Rohs Dzuar is celebrated every year, representatives of families who come from the village gather. People come with three pies, the meat of a sacrificial animal and Ossetian beer, and those who have had children especially prepare for this holiday and consecrate their special offering here. Every year the right to hold a celebration is transferred from one family name to another.

In Soviet times, Christianity was not encouraged, many churches and sanctuaries were destroyed or abandoned, but I have never come across defiled sacral buildings. The descendants of ancient families continued to come to the ancient shrines and celebrate on certain dates in honor of their long gone relatives and patron saints. With a gradual decrease in the population in uncomfortable mountain villages, the condition of the ancient priceless monuments is gradually deteriorating. The main reasons are natural weathering of the stone masonry, influence of surface water, vibration from seismic activity reaching up to 8 points, and most importantly, the lack of the necessary regular maintenance.

Technical assessment of the church before restoration

Farascatta Church is located on a leveled area with a general slope of the mountain slope from east to west. To the east of the church, at a distance of 2.1 m, a retaining wall of roughly worked stones 1.8 m high was built to drain surface water from the building. By the beginning of the work, the retaining wall was significantly damaged and surface water freely penetrated the area around the church and influenced the church itself, soaking and weakening the stonework of the walls. The slopes of the surface along the perimeter of the church did not contribute to the removal of surface water from the walls.

The church was built of roughly processed stone on a lime-clay mortar, covered with lime plaster inside and out. The outside dimensions of the church are 4.2x4.6 m, the thickness of the walls is 0.8-0.9 m. The height of the walls is 3.2 m, along the ridge 4.8 m. stones. Above the vault, on a backfill of torn stone, a traditional stone roof was built from wide slate slabs, covered from above by a row of the same slabs. Along the edges, the roof passes into cornices of three rows of slabs with a total extension of up to 30 cm. By the beginning of the restoration, only a part of the cornices had been preserved.

The lime coating of the outer surface of the walls of a grayish-yellowish color was only partially preserved, the masonry was weakened by washing out of the lime mortar from the joints between the stones. Water entered the masonry walls through the damaged roof and from surface runoff in the absence of an organized drainage system. There are a number of insignificant vertical and slightly inclined cracks in the masonry, probably of seismic origin. Areas of masonry unprotected by coating expose seams with destructed filling.

The low entrance to the church (1.24 m) with an arched lintel is located in the center of the western facade. The door is made of three wide hewn boards connected with wooden dowels. Instead of hinges for opening and closing doors, vertical releases from the end board up and down are used, installed in stone nests. The top outlet is lost and replaced with a wooden block. The wood of the door leaf is partially damaged by rot.

The slate roof slabs were deformed under the influence of moisture accumulation between the slabs under conditions of alternating temperatures. Biomass from grass and small bushes began to appear between individual slabs. In the 1990s, a metal conservation roof was installed on racks made of metal pipes.

From the inside, the coating was renewed more often, so its condition, on the whole, is in better condition. At the same time, due to the increased humidity on the white surface of the lime plaster, spots of mold of a pale pink color, apparently Serratia marcescens, are noticeable. Sources of humidity - wetting the walls with surface water, leaks from the roof, insufficient ventilation of the interior.

The interior had a transverse wall similar to an altar barrier, traces of which are visible on the walls and part of the vault, dismantled during the last alteration in 1837 and replaced with a supporting wooden structure made of hewn timber. One small window to the east and a massive wooden front door made of hewn boards on the opposite side do not contribute to the necessary ventilation of the room.

The main defects are associated with a long-term lack of maintenance of the main load-bearing structures. The stone retaining wall to the east of the church has collapsed by 2m and surface water is soaking the masonry walls. There is no blind area, and the slopes on three sides of the building prevent the free flow of water.

Restoration

The restoration of the Elias Church in the village of Faraskatta took place in several stages over two seasons.

The pace of work depended on the regularity of funding.

At the first stage, the grass was mowed along the entire perimeter of the site around the church, the fallen roof slabs and cornices were collected and stored for later use.

The retaining wall on the east side of the church was repaired. To do this, crumbling boulders were dismantled and the top of the foundation under the wall was cleared. After washing the foundation, it was strengthened by pouring voids in it with cement mortar.

The base of the masonry was leveled with a reinforced screed, after which the masonry of the retaining wall was restored with a slope of 20° from the vertical.

The soil above the retaining wall was leveled away from the wall with a 5% slope in the opposite direction of the slope for a distance of 2 meters to form a surface water intercepting ground channel, diverting surface water away from the retaining wall and the church. Part of the intercepted runoff was absorbed into the ground.

A stone blind area has been formed from the eastern facade with a tray that drains water on both sides along the slope along the side facades at a distance of at least 2 meters from them along the slope. Along the side facades there is a pavement of stone slabs with a transverse slope of 5%. The longitudinal slope corresponds to the general terrain. Outside the blind area, the site was also covered with stone slabs with slopes from the church 3%.

In the interior, the exposed masonry above the altar barrier was cleaned, the seams were caulked and injected with lime-cement mortar. Irregularities on the walls and the vault from the adjoining wall were preserved.

Late plastering in the interior of the church was removed, weak seams were cleared, empty and cleared seams were minted. The surface was disinfected with a special biocidal composition to eliminate mold residues and prevent the formation of a new one. Weak seams in the masonry of the walls and lancet vault were cleaned and caulked with a lime-based restoration mortar, and empty seams were also filled.

Vertical cracks were injected with indirect reinforcement with fiberglass reinforcement of a periodic profile d = 8 through horizontal masonry joints with a step of 300-400 on both sides of the crack in a checkerboard pattern with an inclination of 45 degrees to the wall. The holes cross the crack in the middle. The injection solution filled the volume of the crack, voids inside the masonry and monolithic reinforcement inside the boreholes. Thus, the bonding of masonry broken by the crack is partially restored and the strength of the wall is increased.

The masonry of the walls was injected through the seams with a lime-based restoration mortar from the inside along the entire perimeter from the bottom up in increments of ≈500x500. When injecting, it was necessary to monitor the possible accidental release of the injection solution. At the same time, the pressure was released, the fistula was plugged with plaster, after some time the injection was resumed. After strengthening the walls, the walls of the interior were coated with lime mortar.

The pillars of the conservation roof were raised with metal bushings to allow work on the restoration of the stone roof. The installation of a hidden conservation roof was carried out as follows.

The remaining slate slabs were marked, dismantled and stockpiled for later use. The backfill under the old roof was leveled to create a slope corresponding to the slope of the roof, and covered with a lime-cement reinforced leveling screed. On top of the screed, a layer of rolled waterproofing based on fiberglass was applied and protected from above by another layer of reinforced cement screed, coated on top with coated waterproofing. The top of the screed corresponded to the top of the middle of the three cornice slabs. Outside the screed, copper drainage strips were fixed on both sides over the middle cornice slab. From below, these stripes remained invisible. The slabs of the upper row of cornices covered the metal tide.

On top of the waterproofing layer, a top layer of slate roofing slabs was laid in mortar, keeping the original slabs in place with the addition of missing ones from new material. After checking the effectiveness of the waterproofing of the roof, the temporary conservation roof was dismantled.

The weakest coating from the front surface of the facades was removed. The surviving plastering was strengthened and additionally fixed to the wall masonry. Destructed and missing masonry joints were cleared and filled with lime masonry mortar. It was decided to cover missing parts of the coating with the new one, the color of which should contrast with the original. It is not the perfect color for my taste, but what has been done is done.

The entrance door has been restored with the restoration of the original "heel hinge" opening mechanism. At the contact of the door leaf with the masonry of the wall, slots are provided for ventilation of the interior.

(a) (b)

*Figure 9: (a) The Faraskatta church before conservation, (b) Conservation roof installed in the 1990s*

(a) (b)

*Figure 10: (a) Hidden insulation layer inside the roof., (b) Restoration of upper layer of the original slate roof*

(a) (b)

*Figure 11: (a) Roof after the restoration, (b) The church after the restoration.*

## 3.4 Chancel for Cathedral of Porto, Portugal (Paulo B. Lourenço)

Over the last 20 years, various inspection, diagnosis, consolidation and structural strengthening works, and monitoring have been carried out on different parts of the Cathedral of Porto, namely in the chapel of S. Vicente, in the towers, on the main facade, in the dome, in the staircase leading to the upper courtyard, and, more recently, the main chapel (or chancel). The chancel had important structural damage, which led to inspection and diagnostic work, and, subsequently, the preparation of the intervention project. Following the conclusions of the inspection and diagnosis, the intervention included the following main works: (1) consolidation and strengthening of the vault intrados in the area of the altarpiece and strengthening of the longitudinal ribs with cracks; (2) replacement of the roof; (3) capping of the walls; (4) consolidation and strengthening of the corners and the back wall with vertical cracks; (5) cleaning and treatment of stonework and exterior grilles of large windows.

The project includes the following techniques for consolidating and reinforcing the vault next to the altarpiece: (1) filling cracks with an opening greater than and equal to 20 mm with thixotropic mortar based on natural hydraulic lime and, if necessary, with granite stone units ; (2) injection of cracks with an opening of less than 20 mm with lime-based fluid grout; (3) cleaning the corrosion of existing metal clamps and applying anti-corrosion protection based on aluminium epoxy; (4) application of stainless steel plates to the ribs with the highest concentration of damage; (5) anti-corrosion treatment of the metal supports and strengthening of the wooden structure of the altarpiece's, and application of new supports connected to the back wall, with the aim of reducing the concentration of forces applied to the soffit of the vault. The project also included the repair and strengthening of the cracks in the longitudinal ribs, existing close to the connection with the transverse ribs, using injection of lime-based fluid grout and the application of two diagonal anchors with a sleeve (M16 stainless steel rod).

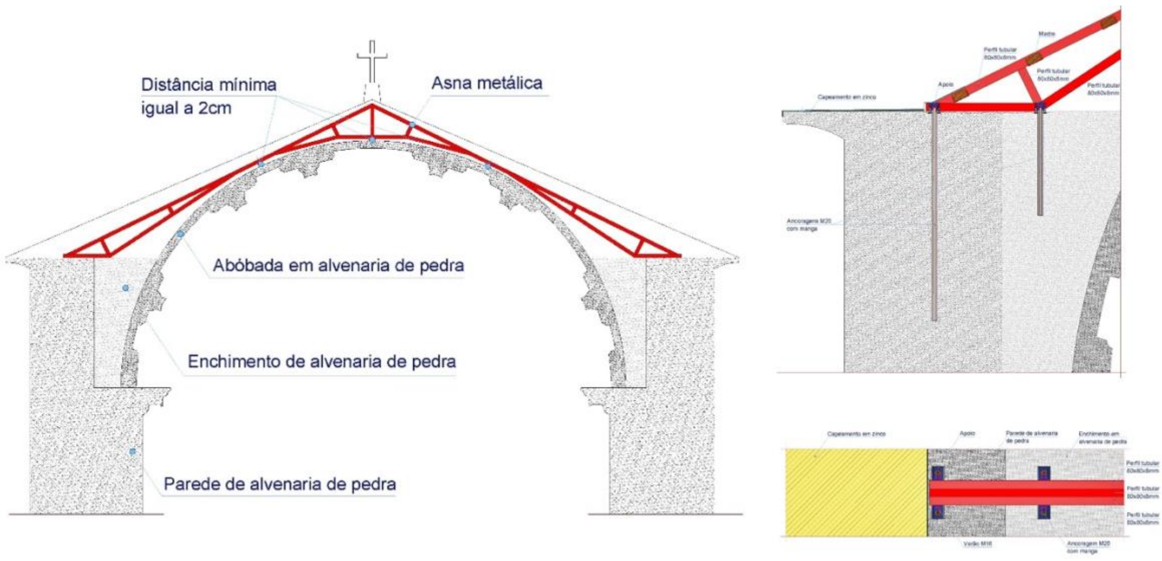
With regard to the intervention on the roof, the project includes the following works and construction techniques: (1) removal of the non-structural filling material from the vault's extrados up to the crowning level of the longitudinal walls (around 80 Tons), with the objective of reduce the horizontal component transmitted by the vault to the longitudinal walls, and remove existing tiles; (2) application of a new roof structure and ventilated roof. The new roof structure was defined taking into account the following criteria: (1) not to transmit load from the structure to the upper surface of the vault, that is, ensuring sufficient distance to accommodate the deformations of the structure without contact with the vault ; (2) not to transmit horizontal forces at the top of the longitudinal walls, so as not to cause deformations in these walls out of their plane; (3) not to exceed the height of the existing roof, which significantly affected the height available for implementation in the new roof.

To consolidate and reinforce the rear wall and corners, the following design techniques were defined: (1) application of two tie rods (M20 in stainless steel) with a sleeve injected with fluid grout into the rear wall, including the execution of holes (65 mm in diameter) by rotation with a coring equipment, without causing damage, application of stainless steel anchoring crosses and application of pre-stress on the tie rods (5% of the yield strength of the steel); (2) treatment of vertical cracks, by removing existing deteriorated repair mortar and filling with mortar based on natural hydraulic lime with colour adjusted to the existing appearance.

Finally, the project also included non-structural works, such as: (1) removal of downpipes and crack monitoring test pieces from the rear facade; (2) dry and wet cleaning of stonework, cleaning and treatment of joints and application of water repellent; (3) treatment of the openings, including treatment and reinforcement with stainless steel sheets of the lintels with slots; (4) treatment of the exterior metal grilles of the large windows, including cleaning, removing aged paint layers and applying a paint scheme with an enamel paint finish.

a b c

*Figure 12: (a), (b), (c) Existing condition*




a b

*Figure 13: (a), (b) Structure of the new roof*

## 3.5 Negova Castle, Slovenia (Nataša Jurgec Gurnick)

The Negova Castle Complex stands as a remarkable example of fortified castle architecture and is among the largest and most complex architectural ensembles in Slovenia. With origins dating from the 12th century and significant transformations during the Renaissance and later periods, the complex evolved from an early defensive structure into an extensive residential estate, incorporating the old castle core, a new residence, defensive towers, curtain walls, and associated outbuildings.

During the 20th century, the complex underwent prolonged periods of neglect combined with adaptive reuse for housing and storage, which resulted in extensive structural deterioration, loss of architectural elements, and material decay. In response, a series of investigations and phased interventions were initiated from the beginning of the 21st century onwards. These investigations, particularly related to the old castle, included visual surveys, archival research, archaeological investigations, and structural and material assessments, which identified key issues such as foundation instability, cracking of load-bearing masonry, moisture-related deterioration, and damage caused by previous interventions and environmental exposure.

A key characteristic of the intervention strategy is the application of two distinct approaches carried out in different periods and by different expert teams, reflecting both the state of preservation and evolving conservation methodologies.

The reconstruction-based approach, implemented between 2004 and 2008, focused on the new residence, where the historic fabric had been largely lost following earlier destruction, particularly due to the fire in 1938. The intervention aimed to re-establish a defined historical phase based on archival documentation, archaeological findings, and typological comparisons with similar castles in Slovenia and Austria. The works included reconstruction of volumes, walls, and roof structures, as well as the reinstatement of architectural elements using materials compatible with the historical context.

In contrast, the conservation-based approach, carried out from 2023, is being implemented in the old castle, where a significant portion of the original fabric has been preserved. This phase follows a different methodological framework, emphasizing minimal intervention and the retention of historic material. The works include consolidation of masonry through lime-based grouting and crack injection, stabilization and partial rehabilitation of foundations, improvement of drainage conditions to mitigate moisture-related deterioration, repair of plasters using compatible lime-based materials, and local structural strengthening where necessary. Additional measures include cleaning and protection of stone elements, repair of joints, and removal of incompatible later additions.

The comparison of these two approaches within the same complex demonstrates a significant evolution in conservation practice over a relatively short period of time. While the earlier intervention prioritized reconstruction and the re-establishment of a historical image, the more recent approach emphasizes material authenticity, minimal intervention, and the acknowledgement of uncertainty. This shift reflects broader developments in international conservation principles, which increasingly recognize the limits of reconstruction and the importance of preserving the evidential value of historic fabric.

This comparison also raises critical questions regarding the role and justification of reconstruction in cases where available evidence is incomplete, and whether such interventions risk presenting interpretative assumptions as historical fact. In contrast, the current conservation approach prioritizes the retention of original fabric and the acknowledgement of uncertainty, allowing the monument to be understood as a layered historical structure.

The overall intervention strategy aims to ensure structural stability, preserve material authenticity where possible, and enable the long-term use of the complex for cultural and museum functions, while respecting its historical and architectural values.

Discussion Points

The case of the Negova Castle highlights the application of two fundamentally different approaches within the same complex, carried out in different periods and under different methodological frameworks.

The reconstruction of the new residence (2004–2008), based on limited archaeological and archival evidence and supported by typological analogy, raises important questions regarding the objective and limits of reconstruction in heritage practice. Subsequent discoveries, including previously unavailable photographic documentation, indicate that such interventions may not fully correspond to the historical reality, emphasizing the risks associated with reconstructing on incomplete data.

In contrast, the conservation of the old castle (ongoing project) reflects an approach, focused on minimal intervention, retention of original fabric, and material authenticity, highlighting a shift in conservation philosophy over time.

The coexistence of these approaches within one complex illustrates the tension between architectural legibility and historical authenticity, particularly when reconstruction aims to complete or reinterpret missing parts of the structure.

The case raises the broader question of whether reconstruction should aim to recreate a presumed historical state, or rather to acknowledge uncertainty and preserve the evidential value of the existing fabric.

The involvement of different expert teams further demonstrates how professional approaches and conservation principles evolve, influencing intervention outcomes and interpretations of heritage.

Lessons Learned

The Negova case demonstrates that reconstruction and conservation are not equivalent approaches but are based on fundamentally different principles and should be applied with clearly defined objectives.

Reconstruction based on incomplete or uncertain evidence carries a significant risk of misinterpretation, which may only become apparent with new research or documentation.

It is essential to critically assess the justification for reconstruction, particularly when it aims to represent a specific historical phase without sufficient supporting evidence.

Conservation approaches should prioritize material authenticity, minimal intervention, and compatibility, especially in areas where historic fabric is preserved.

The case underlines the importance of continuous research, as new findings significantly alter the understanding of the site and the validity of previous interventions.

Clear documentation and distinction between original and reconstructed elements are essential to ensure transparency and allow future reinterpretation.

The long term management of heritage sites should incorporate flexibility and adaptability, recognizing that knowledge about the structure may evolve over time.

a b

*Figure 14: (a) Reconstruction based approach - before, (b) Reconstruction based approach - after*


a b

*Figure 15: (a) Conservation based approach, (b) Conservation based approach*

## 3.6 Restoration of the Historical Complex of Mofakham in Bojnurd (Iran) and the Lessons Learned (Mehrdad Hejazi)

The Mofakham Historical Complex, located in Bojnurd, Northeast Iran, represents a pinnacle of late 19th-century Qajar architecture. Constructed between 1871 and 1881 A.D., the complex comprises two primary structures: the Mofakham Building (approximately 49 m by 22 m and 9 m high) and the Mirror Building (approximately 18 m by 11 m and 8 m high). Both are two-storey masonry structures that have functioned as museums in recent decades. The region's high seismicity was tragically highlighted by the 5.7-magnitude earthquake on May 13, 2017, which caused significant visible damage and raised urgent questions regarding the structural integrity of these heritage monuments (Figures).

Following the earthquake, a collaborative research project was initiated in 2019 between the University of Isfahan and the Ministry of Cultural Heritage. The study was structured into six comprehensive volumes to ensure a holistic diagnosis:

- Seismic & Geotechnical Assessment: Regional seismicity was re-evaluated, and hand-drilled sondages and machine boreholes were utilized to verify foundation-soil interaction.
- Material Characterization: Laboratory tests were conducted to determine the mechanical properties of the historic brick, lime-based mortars, and timber elements.
- Pathology and Documentation: High-resolution photography and field surveys were used to classify cracks and moisture-related decay.
- Guidelines: All interventions were developed in strict accordance with Iscarsah recommendations, focusing on the principles of authenticity, reversibility, and minimal intervention.

The research revealed a critical distinction between "seismic damage" and "chronic decay."

- Masonry Behaviour: Analysis of the brick masonry façades and internal gypsum plasters showed that many fissures were pre-existing and structurally non-critical. The earthquake primarily exacerbated existing vulnerabilities rather than creating new global failures.
- Foundation Stability: Despite initial fears of settlement, geotechnical studies confirmed that the foundations were in good condition with no evidence of differential settlement, thereby avoiding the need for invasive underpinning.
- The "Nakeshkosh" Failure: A primary finding was the failure of the traditional moisture vent systems (Nakeshkosh). Over time, these vents became obstructed, leading to capillary rise and a reduction in the compressive strength of the base masonry.

The conservation plan moved beyond simple repair, focusing on seven distinct structural and environmental zones:

- Timber Roof Reinforcement: The dual-layer roofing system (a flat structural roof supporting a secondary sloping roof) was identified as a key seismic asset. Interventions included replacing decayed members with treated timber, improving joint continuity with diagonal bracing, and creating air circulation paths to prevent biological degradation.
- Moisture Remediation: A comprehensive drainage canal was designed to surround the buildings, coupled with the mechanical cleaning and rehabilitation of original moisture vents.
- Masonry Consolidation: Crack repair was handled locally through "stitching" and the use of compatible lime-based mortars, ensuring the breathability of the historic walls.
- Strategic Monitoring: Three autonomous systems were designed to monitor crack width, groundwater fluctuations, and ambient moisture/temperature to provide early warnings of structural distress.

The restoration of the Mofakham Complex offers several vital lessons for the preservation of Qajar-era masonry in seismic zones:

- Seismic Isolation through Timber: The separation of the heavy masonry mass from the flexible timber roofing acts as a natural dampening system. Preserving this "disconnection" is more effective than rigid reinforcement.
- Environmental Maintenance as Structural Prevention: The study concludes that moisture management is as important as seismic strengthening. Most structural vulnerabilities were rooted in water-induced material degradation.
- Integration of Traditional and Modern Science: The project successfully bridged the gap between traditional master builders (Me'mars) and modern finite element analysis, proving that traditional expert opinions often align with scientific seismicity findings.

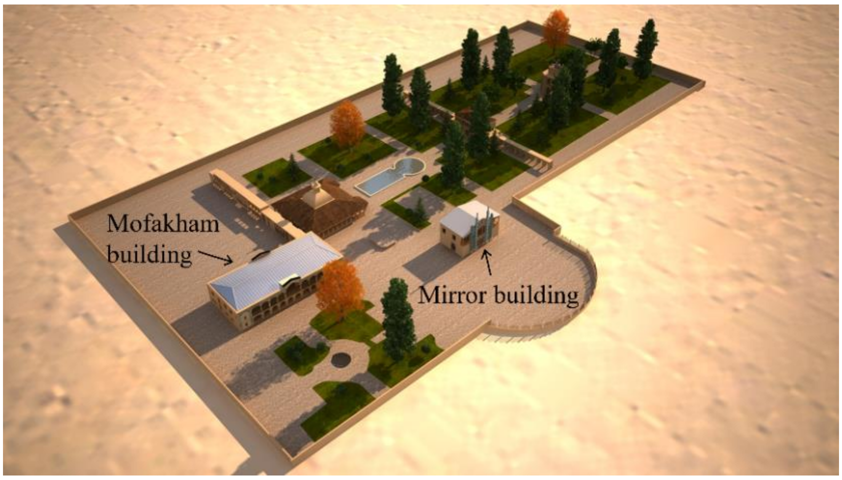



*Figure 16: Historical complex of Mofakham, 1871-1881 A.D.*

a b

*Figure 17: (a) Mofakham building, (b) Mirror building*

a b

*Figure 18: (a) and (b) Visible cracks*

## 3.7 Villa Tarabya Building, Structural Documentation and Visual Damage Assessment (Meltem Vatan, Elif Somer)

In its history, Istanbul has experienced many devastating earthquakes that caused severe damage to the buildings. Accordingly, local construction techniques have been developed based on those experiences. The existing traditional timber-frame buildings in Istanbul demonstrate very well earthquake behavior, by shoving a good performance under the shake where timber can resist tensile and flexural forces, which is suitable for seismic behavior utilizing simple details such as nailed solutions. Therefore, timber-framed buildings continued to be used as the prevailing construction technique in and around Istanbul even after the introduction of industrialized building materials, mainly used for significant buildings. Documentation of those examples is one of the fundamental actions for preventing and safeguarding cultural heritage. This study aims to document the structural system, construction materials, and degradation of the structural timber of Villa Tarabya, the Summer Embassy Palace of Italy (Figure 1, Figure 2), using visual data gathered during two site visits in 2011 and 2019. Villa Tarabya, located along the Bosporus in Istanbul, was constructed in 1905–1906 by Raimondo D'Aranco at the location of the former embassy building, and its current damaged condition is facing a state of disrepair. The building represents both the Art Nuevo style and the characteristics of traditional half-timbered (hybrid use together with masonry) Ottoman mansions, including vernacular details, with a masonry ground floor. The main goal of this study is to document Villa Tarabya as one of the striking examples of 20th-century timber-framed buildings along the Bosporus.

Villa Tarabya has experienced extensive deterioration due to long-term neglect, lack of maintenance, and prolonged exposure to moisture. The most severe damage is concentrated in the structural timber elements, particularly in areas affected by roof failure and inadequate rainwater drainage. Water penetration accelerated the decay process, causing deformation, weakening, and deterioration of wooden components. Moisture infiltration through damaged roof sections and facade cavities continues to threaten the structural stability of the building. Timber elements exposed to persistent humidity show signs of biological degradation and advanced wear (Figure 3).

The staircase represents one of the most critical structural risks within the building (Figure 4). Temporary supporting scaffolding installed in 2008 prevented immediate collapse; however, ongoing deformation indicates that the structural condition continues to worsen. Since comprehensive restoration measures were not implemented after the initial emergency interventions, deterioration has progressively spread throughout the entire structure.

Environmental factors have also contributed to material degradation. Wind erosion altered the thickness of timber facade claddings, while prolonged ultraviolet exposure caused surface discoloration and darkening of wooden surfaces. Although some facade elements remain relatively stable, the overall condition of the building demonstrates continuous structural and material decay. The current state of Villa Tarabya (Figure 5) highlights the urgent need for immediate conservation measures and comprehensive structural intervention to prevent irreversible damage and possible collapse.

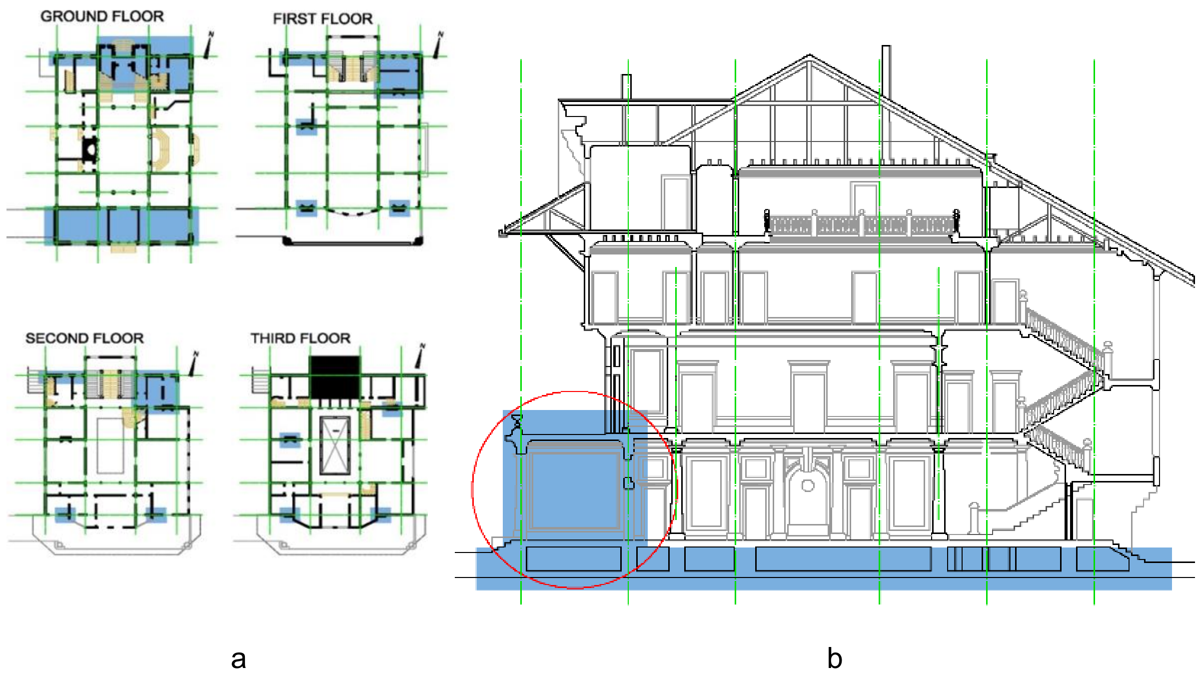



*Figure 19: (a) Floor plans showing masonry in blue, (b) Structural system axis is continuous on the section; damaged parts are indicated by red color*

*Figure 20:* Damage to the masonry parts and floors – 2019.

a b

*Figure 21: (a) View to the second floor through the landing of the main staircase, (b) Partial collapse and damage state of the roof of south-façade*

## 3.8 Developing A Value System for Restoration Work in the West African Context (Sola Akintunde)

The presentation introduced the Nigerian Rail Heritage and the work that has been going on between the Oxford Martin School and Legacy 1995, a Nigerian historical and environmental interest group. The project was an effort to engage with the history of Nigeria's Railways through the perspective of a conversation between past, present and future. It linked the documentation and conservation of Nigeria's railway heritage infrastructure with how it is used, experienced and imagined today, and how that interacts with contemporary conversations on railway development. This involved bringing up themes of history and identity, personal and official memory, colonialism and independence, ruination and reconstruction, and ways of thinking about and rethinking modernity and imagining pasts and futures.


a b

*Figure 22: (a) and (b) Images of Lagos Terminus and the old Loco shed (Images: Dr Oliver Owen)*

The presentation also introduced the Legacy 1995, an architectural foundation that brings the public inside the city's landmark industrial, historical, and modern spaces. Since being founded in 1995 by a group of naturalised expatriates and indigenous professional Nigerians, LEGACY has seen itself rise to become the foremost Historical and Environmental Interest Group of Nigeria. The society was formed with the objective of gathering together committed men and women, Nigerians and non-Nigerians, united for the common cause of promoting and preserving the character and' appearance of historic monuments and the environment and cultural entities in all parts of Nigeria.

Presently housed in the most beautiful 118-year-old house in Lagos, donated by the Nigeria Railway Corporation and restored to its lost glory by Prof. John Godwin in 2010. Named Jaekel House, after the late Francis Jaekel OBE, a former superintendent of the Corporation; he retired in the seventies after almost thirty years of service for the Corporation. He came to Nigeria in 1938 and was the driver of the Royal Train from Lagos to lbadan during the visit of HM The Queen in 1956. Jaekel House was formerly the residence of the General Manager and was later converted to a senior staff rest house. The location has featured in a number of art/fashion photo sessions over the years and in the notable independence-era movie October 1. Now a museum that you can visit whenever you feel the need to get a full dose of Railway History spanning about 150 years and be introduced to our efforts in preserving and restoring significant buildings around Lagos.

**Error!** **Error!**

a b

*Figure 23: (a) Jaekel House and (b) school children at the museum (https://legacy1995.ng/)*

## 3.9 Post-Earthquake Reconstruction of the Kasthamandap (Kai Weise)

The Kasthamandap, a historic timber pavilion, and eponym of Kathmandu, collapsed during the Gorkha Earthquake that struck central Nepal on 25th April 2015. The reconstruction was completed in 2021. The presentation examines the complex negotiations of finalising the procedures and design for this iconic structure. Initial proposals which integrated strengthening elements using modern engineering technology were criticised by the heritage professionals and the community activists who stalled the project for three years. During this period, it was possible to carry out investigations on the foundations and salvaged materials, which then became the basis for the final design. The research also provided the opportunity to improve the understanding of the history of the structure through material dating, and clarifying the reason for its collapse. The presentation provides a detailed account of how the traditional knowledge and skills of the building craftspeople determined the reconstruction process, while modern engineering was used to crosscheck the outcome and fulfil government procedures. The reconstruction of the Kasthamandap has set an example for post-disaster reconstruction of historic monuments respecting the historical construction practices and showcasing the need for an interdisciplinary approach to preserve heritage.

The reconstruction of the Kasthamandap raised many questions on how reconstruction of historical monuments should be carried out. There are several critical points that need to be noted, and possibly further discussed. The Kasthamandap did not collapse during the Great Nepal Bihar Earthquake of 1934, but due to lack of maintenance and inappropriate interventions collapsed in 2015. The brick masonry in mud mortar, particularly in the foundations, has survived over fourteen centuries and are still in good condition. There is still research to be done on better understanding confined masonry in the superstructure, as well as timber joinery. There are over two dozen types of timber joints, each for a specific location and function but slowly this knowledge is being lost. How can such knowledge be documented and further integrated into structural modelling to have better understanding of the traditional structures and its seismic performance?

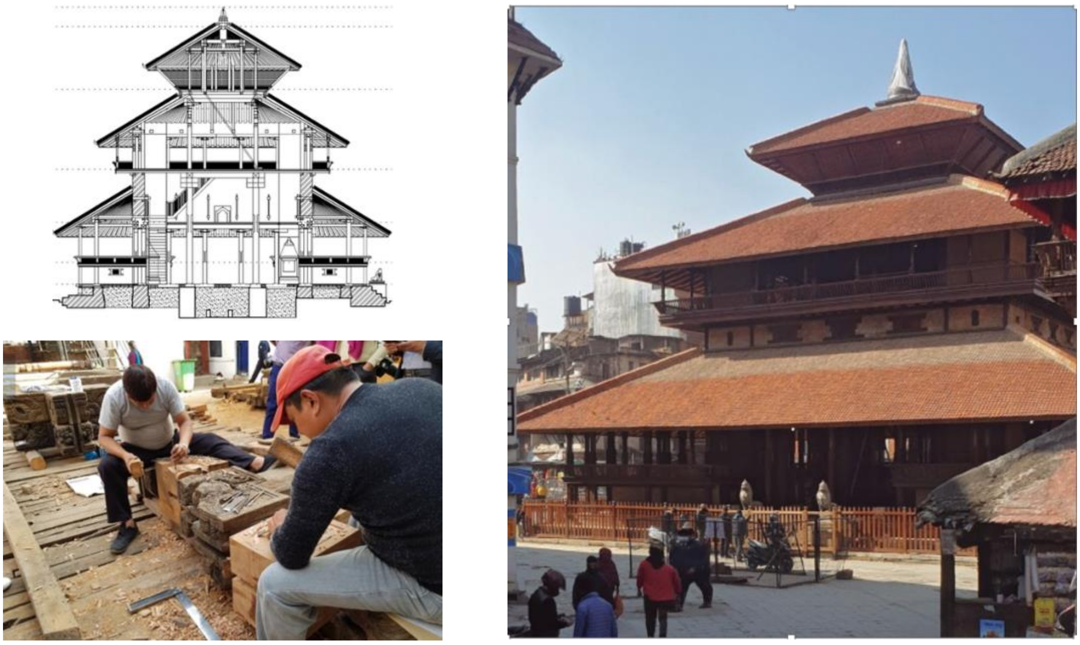
It was clear with the example of the Kasthamandap that the implementation of such restoration and reconstruction projects can only be achieved as long as there are traditional craftspeople available who have the knowledge and skills to do the required physical work to maintain, restore or reconstruct the monuments. The reconstruction costs for the Kasthamandap were estimated at 19.2 crores Nepali Rupees (ca 1.12 million Euros) based on technical drawings that were initially prepared, but the project was implemented with the final cost of approximately 11.5 crores Nepali Rupees (ca 670,000 Euros). The project cost less than 60% of the estimated cost, raising questions on cost implication of project using traditional materials and skills. It is considered that using traditional skills and material is very expensive as cost of skilled craftspeople is very high and materials are difficult to source. However, this project revealed that it is not the case if there is intent to safeguard traditional building practices.

The extent of damage to the monuments in the Kathmandu Valley indicated that without regular maintenance and the introduction of inappropriate interventions during restorations were the cause for these monuments to become vulnerable, as was the case of the Kasthamandap. There were examples of monuments in the Kathmandu Valley with major intervention carried out in the last 50 years using modern materials which were damaged during the 2015 earthquake. This was an opportunity to understand what intervention worked and what did not, but there was insufficient research done. To ensure protection of these historic monuments, a continuity plan is required which focuses on multidisciplinary research of the traditional techniques, providing support to the traditional craftspeople and regular maintenance, with appropriate interventions on the monuments.

The creation legends of the Kasthamandap are still revered. So that the gods and spirits that were kept to witness the construction of the *sattal* would not leave, the monument was never completed, and it was decided that consecration would only be done "when the price of oil and salt were equal". This was respected and the final consecration was not carried out on the *gajur*.

a, b c

*Figure 24: (a), (b), (c) View, the collapsed structure, reconstruction using bamboo scaffolds*



a, b c

*Figure 25: (a), (b), (c) Section, traditional carpenters are work, and the completed reconstruction*

# 4 Themes and Issues Derived from the Presented Examples (Kai Weise)

*Table 1: Themes and issues raised*

| | | | | |
|---|---|---|---|---|
| A. Values based interventions | 1. Value: What to keep and what to change? | 2. Various periods: how to deal with the different layers | 3. Wholeness: when required by religious or local sentiments – how to fully restore? | 4. Change in function: How much of the structure can be changed? |
| B. Materials | 1. Use of modern materials and technology: strength and quality? | 2. New protective elements: when to introduce new roof? New details? | 3. Compatibility of materials: between natural and modern materials | n/a |
| C. Context | 1. Context ground: stability of ground, ground water, and when to rebuilt foundations? | 2. Context climate: How to deal with climate change, humidity, flooding, heavy rain, etc. | 3. Natural hazards: adaptation to address vulnerabilities | n/a |
| D. Legal provisions and practice | 1. Building code for historic structures: do they consider traditional technology? | 2. Long term performance: how to relate this to legislation? | 3. Traditional knowledge: how to include this in legislation and procedures? | n/a |
| E. Knowledge and skills | 1. Traditional or original materials: knowledge of materials? | 2. Traditional or original materials: how to ensure sourcing? | 3. Traditional skills: availability and use of traditional skills? | 4. Design details impacting structure: shape, openings, tall walls, etc. |
| F. Appropriate interventions: | 1. Material deterioration and loss of stability: appropriate maintenance? | 2. No gravitational load changes: What to do when no change in loads and forces? | 3. No visual changes: what kind of interventions are acceptable? | 4. Retain maximum of the original, replace only the essential |

# 5 The Themes and the Iscarsah Guidelines (Kai Weise)

The issues that were raised during the presentation of examples were organised into themes. The presenters raised questions on how to address certain issues during the implementation of their projects. During the discussions, the participants shared their ideas and opinions on how they would have addressed the issues. The Iscarsah Guidelines were developed and adopted to provide exactly such guidance. This section reviews the provisions of the Iscarsah Guidelines 2.0 (2024) to examine whether it actually addresses the issues that were raised.

## 5.1 Theme A: Values Based Interventions

The first theme that is being raised is related to understanding value, and taking value into consideration when developing and deciding on appropriate interventions. The challenge of protection and conservation requires interventions, that in some cases are intrusive to some extent.

**A1: Value based intervention**

*Where does the value lie? Can we protect those elements, while other parts are changed? Can there be a prioritisation of components that are of value, which are protected, while those with less value can be allowed to be impacted or changed.*

**Response to A1 in Guidelines [sufficient]**

The Guidelines presents a clear understanding that any intervention should, as far as possible, respect the structure's cultural value and the historical evidence that it provides, and any intervention should have the lowest possible impact on its heritage value (1.1). The Guidelines have a separate section on heritage values a character-defining elements, which takes into account not only the tangible, but also the intangible elements (1.2). These have been merged into four categories: Aesthetic, historical, technical and social values. It is also necessary to have sufficient information to be able to assess the impact on heritage values (material testing), which also is the case when introducing alternative usage, the choice should be based on the most compatible option to the heritage value (1.4).

**A2: Addressing different historic layers**

*Monuments and sites are composed of structures from various periods which require different approaches to restoration and protection. How do we deal with different layers of history?*

**Response to A2 in Guidelines [further discussion needed?]**

The Guidelines recommends that research is carried out on the structure to assess what the original structure/elements/materials were, and what changes were made on the structure, as well as past conservation, modifications and interventions, which means the entire past life of the structure (2.2). The Guidelines provides a clear understanding of what needs to be considered under Chapter 4 Therapy, however, there are not recommendations on how to deal with different layers of history. This may be something to be further discussed.

**A3: Restoration to wholeness**

*When the function requires full restoration / reconstruction, what would the process be? For example, religious structures need to be 'whole' and 'complete', such as churches, temples, mosques, etc. What is more important, the 'authenticity' of the damaged structure, or the religious value/sentiments of the communities?*

**Response to A3 in Guidelines [further discussion needed?]**

The Guidelines provides means of stabilising and structural conservation but do not delve into the discussions on conservation principles or approaches. There are comments in respect to minimum intervention (1.3) and the criteria for interventions (4.1) which provides guidance on planning appropriate interventions. There are also considerations of the performance of structures based on safety, safeguarding valuable immovable content and the integrity of the structure itself as cultural heritage object (3.1). However, the Guidelines do not address the specific concern raised in respect to the requirement of 'wholeness'. Here, there might need to be a clear understanding of what circumstances the Guidelines are dealing with, or then further discussion are required in respect to context where the structures are constructed of more fragile materials, where elements can be replaced, and wholeness is expected.

**A4: Changing functions**

*Changes in function require changes to the historic monument (e.g. bathhouse to multifunctional space).*

**Response to A4 in Guidelines [sufficient]**

The importance of determining the original use and function, as well as historical value relative to the function of the building, has been stated under 1.2, and the need to research the changes of use has been included in 2.2. In general, the criteria for interventions have been provided under 4.1, which adheres to the approach of minimum interventions, defined in 1.3. The Guidelines do not specifically discuss the change in function, but again, this may not be a relevant aspect, and can be understood through the points mentioned above.

## 5.2 Theme B: Materials

The second set of issues have been categorised under the theme of materials. This addresses the concerns of material use in interventions. It also includes additional elements of modern materials to protect the original structure.

### B1: Modern materials and technology

*The use of modern technology and materials to strengthen/stabilise existing historic structures. Use of grouting and steel ties and the quality of these materials. The question arises of compatibility between the various materials used? Could this reinforcement be carried out using traditional materials?*

**Response to B1 in Guidelines [sufficient]**

The discussion on appropriate use of materials in the interventions has been explained under intervention criteria (4.1) and application of intervention criteria in practice (4.2). There are no specific materials mentioned, except that interventions need to be minimum (possibly the use of ties may be better than replacement of wooden floors with reinforced concrete slabs to improve structural stability in 1.3). There are also recommendations to use materials that can be maintained and if required removed, and replaced, rather than considering only durability. However, where possible it is advisable to use the more durable material such as the use of stainless steel rather than carbon steel. The discussion on use of 'traditional materials' for structural improvements has however not been specifically discussed, but has not disproved either.

### B2: Introducing protecting elements

*Introduction of new technology and materials to address new circumstances for entire elements, for additional protection. New roofing tiles and water proofing materials, water-proofing membrane under slate, etc.*

**Response to B2 in Guidelines [sufficient]**

The Guidelines do not specifically address issues concerning the protection of the structure, such as in respect to introducing waterproofing components, or even entire elements to cover the historical structure. However, the guidance under intervention criteria (4.1) and application of intervention criteria in practice (4.2) provides the basic principles that need to be considered when developing solutions for any kind of interventions.

### B3: Compatibility of materials used

*Structures are originally designed using particular materials. When later interventions are introduced, new materials are often used to provide better stability, stiffness, strength, water proofing, insulation, etc. How much understanding is there on the compatibility of these materials to the original components?*

**Response to B3 in Guidelines [sufficient]**

As mentioned under B1, the discussion on appropriate use of materials in the interventions has been explained under intervention criteria (4.1) and application of intervention criteria in practice (4.2). The consideration on compatibility of materials has been discussed in detail under 'Compatibility with the original materials and techniques". This is also included in the checklist which includes chemical, physical and mechanical compatibility.

## 5.3 Theme C: Context

The second set of issues have been categorised under the theme of context. This addresses the concerns on geology, climate change and other natural hazards. Do these Guidelines provide guidance for all geographic locations and climatic conditions?

**C1: Ground stability and foundations**

*Slope stability and its impact on structures. Stabilise the slope, foundations using modern materials and retain foundations, or remove and reconstruct the entire structure? Move monuments to new location if stability is questions (also considering the situation at Abu Simbel)?*

**Response to C1 in Guidelines [sufficient]**

Usually, soil and slope stability are less of an issue for historical structure, considering that these have been located there for a long period, however, erosion, ground water levels, etc. can change the conditions. The discussion on slope and ground stability has been addressed in the Guidelines under various sections. When designing interventions, minimum intervention and only actions that are indispensable should be undertaken requiring through documentation including foundation soil conditions (1.3). In the same manner, the studies should be carried out within multidisciplinary teams including geophysicists (1.4). Surveys need to be carried out on soil conditions and ground water levels (2.3.1) along with in-situ and laboratory testing on the morphology of foundation and soil (2.3.4). However, further discussion on issues concerning appropriate mean of stabilisation of the soil and foundations might be necessary.

**C2: Addressing climate change**

*Climate change and its impact on monuments that are centuries old. This can be changes in ground water, increased rainfall, drought or even change in the flow of rivers. Climate change can also have indirect effect on the function of historic buildings.*

**Response to C2 in Guidelines [sufficient]**

Similar to what was presented under C1, the discussion on climate change has been included in various locations of the Guidelines. The Guidelines embrace environmental impact reduction and enhancing the resilience of historical structures against climate change (1.1). When designing interventions, minimum intervention and only actions that are indispensable should be undertaken requiring through documentation including environmental conditions (1.3). The impact of climate change must be considered in conservation studies and actions (2.1). Surveys need to be carried out on identification of any ongoing environmental and climate change effects (2.3.1). Climate change also requires regular monitoring of impact on the historical structure and materials (2.4.1).

**C3: Vulnerability to natural hazards**

*Introduction of new designs into an area which is prone to specific hazards. This could be introduction of inappropriate designs to seismic areas, to areas prone to flood and storms, but also the risks of fire.*

**Response to C3 in Guidelines [further discussion needed?]**

The impact of earthquake on historical structures can be studied in past interventions (1.3). The consideration of in pre- and post-natural hazards maintainability (4.3) has been addressed by the Guidelines. Here, the focus is on the impact of earthquakes on structural stability. The statement that mentioning "seismic or other natural disasters" shows that the Guidelines have not considered broader approaches to disaster risk management and the related terminology (possibly natural hazards are meant here!) Hazards such as storms and fires have also not been mentioned. It would be necessary to further discuss these points, or clearly state that such points are beyond the scope of the Guidelines.

## 5.4 Theme D: Legal Provisions and Practice

The fourth set of issues have been categorised under the theme of legal provisions and practice. This addresses the concerns on building codes, consideration of long-term planning and maintenance, and the integration of traditional knowledge in legislation.

**D1: Building code for historic structures**

*Often changes to seismic zoning occur after a large earthquake. The impact of listing monuments and the related legislation. If there are no changes in loads and lateral forces, should the historic structure be changed?*

**Response to D1 in Guidelines [sufficient, but further guidance is helpful]**

The Guidelines dedicates an entire section on 'Limitations of codes and conventional methods - proposed approach' (1.4). The need to consider the structure's cultural value and therefore accept a safety level lower than those in codes for modern buildings is also mentioned under the section on 'aim of diagnosis and assessment of the structural performance' (3.1). This is clearly a critical discussion which has been addressed by the Guidelines, but may require further discussion.

**D2: Long-term performance**

*How do we understand structures that have performed well over hundreds or thousand years? How can this knowledge be converted into modern 'engineering' knowledge and be reflected in the legislation?*

**Response to D2 in Guidelines [further discussion needed?]**

There are some principles such as durability, re-treatability, removability and sustainability that have been defined under intervention criteria (4.1). The possibility of using non-invasive and removable systems made of a not[sic]-so-durable material that can be maintained, removed and replaced might be more acceptable (4.2). The need to consider solutions for long-term, which means for over several hundred years, requires a very different approach towards developing solutions and designing interventions. This may need further discussion. Furthermore, how these points may be included within legislation has not been clarified.

**D3: Traditional knowledge in legislation**

*What design details impacts the structure? Irregular attachments, large openings, tall walls without additional support, etc.*

**Response to D3 in Guidelines [further discussion needed?]**

There is a section on the limitations of codes and conventional methods (1.4). There is an understanding, from both traditional knowledge, as well as scientific calculations that certain types of designs would be more stable than others, for example when taking into account seismic forces. There is also a mentioned in the Guidelines that the judgements on heritage values differ from one culture to another (1.2), allowing for different approaches, such as substitution of structural members. There is also mention of historic approach to understand the structure over time, the damage history, to understand the "whether the structural system has performed satisfactorily in the past" (3.3). Certain examples were presented where structures have survived over a millennium, with regular maintenance, but have collapsed due to recent inappropriate interventions. How, would this be understood within the Guidelines, and what provisions may be necessary within legislation to address such concerns?

## 5.5 Theme E. Knowledge and Skills

The fifth set of issues was categorised under the theme of knowledge and skills. This addresses the concerns on building crafts, understanding traditional materials and technologies, and sourcing construction materials that are similar to the original. These discussions have not been included in the Guidelines.

**E1: Knowledge of materials**

*How much understanding do we have of the traditional materials? What research has been carried out?*

**Response to E1 in Guidelines [further discussion needed?]**

The knowledge of traditional materials is central to protecting and conserving traditional structures. The challenges of having sufficient knowledge on the nature of the materials (namely masonry, timber, earth, concrete, iron, steel, etc.) is mentioned under 1.4. That the value of the structure can be based on the materials and fabric itself, has been mentioned under 1.2. How does one define earthen structures, or the use of mud mortar?

**E2: Sourcing of traditional materials**

*Loss of knowledge of sourcing traditional materials. For example, the location for good soil for mortar, wood, stone, etc.*

**Response to E2 in Guidelines [further discussion needed?]**

Similar to E1, in many cases, the sourcing of original material for maintenance and conservation work may be difficult. The need to consider the availability of materials has been mentioned under 4.1. The same section also mentions the sustainability of using traditional materials, which often "such as timber, lime mortar and clay brick, requires comparatively low energy consumption compared to other materials such as concrete and steel". Further discussion on sourcing traditional materials, or what needs to be done when unable to obtain such required materials, would be an important contribution to the Guidelines.

**E3: Availability and use of skills**

*Traditional materials are generally utilised in historic monuments using traditional techniques and skills. Are the craftspeople available who have the skills (and knowledge) to work the materials in the traditional manner?*

**Response to E3 in Guidelines [further discussion needed?]**

The required craftspeople and their skills for maintenance and restoration have not been addressed in the Guidelines. It is touched upon under 1.2, that in "geographic areas where substitution of structural members may be regarded as an approach consistent with the history and tradition of maintenance" […] "keeping alive traditional construction practices may be prioritized over the conservation of the original material". This is standard practice probably in most parts of the world and would need to be addressed accordingly. There may be a need for differentiation between cultures that have lost their continuity with the traditional craftspeople and those where the continuity still exists.

**E4: Structural impact of design details**

*How do design details impacting structure? What kind of timber joinery is used? Detailing of brick and stone masonry? How have these been dealt with in the historic structure? Are these issues that need to be addressed by using modern approaches? Modern joinery, connections, ties?*

**Response to E4 in Guidelines [further discussion needed?]**

Detailing is critical for traditional structures, since this is where the traditional knowledge exists. Traditional structures have over a hundred different types of joints. How do these impact the structure. The Guidelines does mention that the heritage values also lie in construction details and connections (1.2). The Guidelines also mentions under the definition of Therapy "with the necessary design details and specifications of materials and techniques" (A1-4). The structure depends on careful detailing, which needs to be further discussed, and appropriate guidance given.

## 5.6 Theme F. Appropriate Interventions

The sixth set of issues has been categorised under the theme of appropriate interventions. This addresses the concerns maintenance, acceptance of non-visual changes and retaining maximum of the original. Many of these principles have been addressed by the Guidelines.

**F1: Maintenance and deterioration**

*Deterioration of material, maintenance and loss of stability. Lack of or inappropriate maintenance. What kind of maintenance is required? Who can carry out this maintenance?*

**Response to F1 in Guidelines [sufficient]**

The need for maintenance has been dealt with by the Guidelines in various sections. For example, the history and tradition of maintenance is mentioned, particularly that these can differ depending on location and culture (1.2). Under the phase of control, it is mentioned that a detailed maintenance plan must also be included (1.5), ensuring quality during the maintenance phases (1.5). The investigations also require evaluation of the maintenance condition (2.3.2). Interventions using not-so-durable materials could also be acceptable, should there be proper maintenance (4.2). Solutions for interventions should also consider the possibility of repairability or maintainability (4.3). The importance of maintenance has been highlighted in the Guidelines.

**F2: When no change in loads / forces**

*If the historic structure has passed the test of time, the design of the original structure should be allowed to remain?*

**Response to F2 in Guidelines [sufficient]**

This was a very specific issue that was raised. When carrying out maintenance of a structure that has been standing there for over half a century, and not changes are done to the loading or function, should the building be required to be "safer"? The Guidelines do touch on this issue. This research should cover, as far as possible, the entire past life of the structure (2.2). A whole section is dedicated to the concept of minimum interventions (1.3). Some additional consideration may be made on the possibility of non-intervention, which would be the ideal solution, if possible.

**F3: Non-visual changes acceptable?**

*Changes to be carried out so that it is not visible? Is that acceptable?*

**Response to F3 in Guidelines [sufficient]**

The Guidelines do not address the issue of visual impact. However, under minimum interventions (1.3), and interventions that are non-invasive and removable (4.1), there are only limited possibilities to develop interventions that are 'hidden'.

**F4: Retain maximum of original**

*In restoration, ensure to retain and protect as much of the original material as possible, while ensuring visible recognition of what has been added. Is that an acceptable approach?*

**Response to F4 in Guidelines [further discussion needed?]**

Under the Section on Therapy (4), the various approaches to designing interventions have been provided, with the clear understanding of minimum intervention. However, the discussion of aesthetics, and the differentiation of new and old materials is not discussed in detail. This may be a topic for further discussion.

# 6 Conclusion (Kai Weise)

Hopefully this provides an easy reference.

The Examples Initiative was proposed based on the fact that Iscarsah members are working all over the world and have a wealth of knowledge and experience. The working group was established in November 2023. The call for examples led to nine examples being presented. Based on the challenges faced during the implementation of these projects and the questions that were raised, solutions were sought in the Iscarsah Guidelines. Answers of many of these questions were found, however, there are topics which the Guidelines do not address clearly. It could be that some of these topics go beyond the original concept of the Guidelines, which may require a statement on their scope and limitations. Alternatively, the Guidelines would benefit from addressing some critical questions that have been raised in the practical examples. These include:

- hazards beyond earthquakes, such as fire, storms, flooding, etc.
- stabilisation of soil and foundations;
- discussion on materials, their characteristics and use;
- differentiation of how traditional structural systems are understood;
- traditional knowledge, skills, craftsmanship;
- learning from the resilience of historical structures;
- further discussion on inappropriate interventions;
- consideration of the non-intervention option;
- detailing and connections for integral structural behavior;
- aesthetics and visual impact;
- legislation compatible to historical structures (currently being addressed in another Working Group)

The Guidelines have been recently revised, and a new version has been adopted by the Iscarsah Committee. The initiative on learning from examples of Iscarsah members is an excellent contribution to an amendment process that may be started, aiming at having the Guidelines as a doctrinal ICOMOS text. The points presented in this report may go through further discussions and will be helpful for the envisaged amendment.