

# PROCEEDINGS

10<sup>th</sup> International Conference

# Kerp'ic'23

26-28 October 2023

Diyarbakır / TURKEY

“GAIN INFORMATION FROM THE TRADITIONAL EARTHEN ARCHITECTURE“

Organized by

Prof. Dr. Bilge IŞIK

Doç. Dr. Şefika ERGİN

Supported by

Kerp'ic Akademi, Kerp'ic Network  
Dicle University, Faculty of Architecture

Edited by

Öğr. Gör. Dr. Aysel TARIM



United Nations  
Educational, Scientific and  
Cultural Organization

DICLE UNIVERSITY  
FACULTY OF  
ARCHITECTURE



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**“GAIN INFORMATION FROM THE TRADITIONAL EARTHEN ARCHITECTURE”**

**DİCLE UNIVERSITY – PRESS**

**10<sup>th</sup> International Conference Proceedings**

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Dicle University, Faculty of Architecture & Kerpik Akademi & Kerpik Network

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## **THEMES OF THE CONFERENCE:**

Main theme: **Gain Information from the Traditional Earthen Architecture**

Topics: All studies on earthen buildings such as:

- Learning from earthen architecture in climate change
- Sustainability in building materials
- Sustainable architecture and sustainable cities
- Rebuilding cultural landscape after disaster, war
- Social, cultural, touristic reuses of heritage
- Researches on principles and methods of conservation
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- Repair and strengthening strategies and techniques
- Evaluation of Risk and Protection against environmental effects and disasters
- Traditional construction techniques
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- Traditional materials and current research



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We are pleased to announce the call for the 10h International Conference on kerpik2023 “GAIN INFORMATION FROM THE TRADITIONAL EARTHEN ARCHITECTURE” and the post-conference workshop on earthen building production. The Conference will be held on 26 October – 28 October 2023 and organized by Kerpik Akademi, Kerpik Network and Dicle University, Faculty of Architecture.

The aim of the conference is to gather the findings and knowledge regarding the theme “Gain Information from the Traditional Earthen Architecture” and transfer these to the new generation.

The conference will focus on using earth as a building material and the event will include graduate students, academics and professionals exchanging their findings and experiences. The conference will provide for an opportunity to understand the strategies involved, advantages of and advances made in the contemporary construction technology of earth-based material.

Since 1978, Kerpik Network has been conducting research on seismic response and contemporary production techniques of earthen construction. The durability research is based on gypsum stabilized earth (alker); the seismic response research is based on horizontal energy dissipating surfaces on the load bearing walls and additional research has been conducted on production techniques of earthen materials and walls.

# **PROCEEDINGS: ABSTRACT PAPER OF AUTHOR (S)**

## **Load Bearing Capability of Earthen Structures**



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### **ABSTRACT**

Scientists from all around the world are focusing on earth-based materials, particularly adobe, due to the need to create building materials with advantageous sustainability qualities, the requirement to conserve local building cultures, and the desire to protect and improve existing earthen buildings. Adobe is one of the world's oldest and most used building materials. An estimated 30% of all buildings in the world are composed entirely or partially of earth. However, the lack of adobe building norms and regulations makes it impossible for architects and engineers to adapt the material for modern construction. Earth can therefore be employed in these constructions as a load-bearing material or as fill inside another bearing structure. A wall is a crucial load-bearing element in structures made of raw soil. Because adobe walls are a primary load-bearing part of raw earth constructions, damage to them frequently leads to structural problems. A load-bearing adobe wall must have a minimum thickness of 0.40 m, according to Peruvian standards. A minimum wall thickness of around 25 cm is allowed under the New Mexico Earthen Building Materials Code for unstabilized adobe walls. Adobe construction is confined to one-story structures, with the exception of two-story structures built by a qualified design expert. For the outside walls of one-story buildings, the International Building Code 2021 mandates a minimum thickness of 254 mm. The internal load-bearing walls' minimum thickness must be 203 mm. Any wall made of adobe units is only allowed to reach a height that is not more than ten times its thickness. When tested in accordance with ASTM C67, Adobe units must have an average compressive strength of 2068 kPa. Under seismic pressure, catastrophic breakdown and destruction of these structures inevitably result in the loss of human lives and economic losses. A load-bearing wall is a crucial component of raw soil constructions.

**Keywords:** Building Code, Earthen Materials, Load Bearing Walls, Adobe

## **Educational Campaign for Southeast Anatolian Region (GAP): Adobe Construction Model Proposal for Primary Schools:**



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### **ABSTRACT**

Increasing efforts have been made to engage more children in primary school education on the Southeast Anatolian Region of Türkiye especially during the last two decades by government agency offices and by private social platforms in Türkiye, such as Ministry of Industry and Technology Southeastern Anatolia Project Regional Development Administration and Herkes İçin Mimarlık (Architecture For Everyone) platform. To reach a wider segment of society and to ensure continuity for the development of personal and environmental awareness several participatory school examples have been constructed, yet through those examples none of a common modeling of primary schools could be developed. This might be seen the basic problem of none having success on educational campaign on this region. Here, establishing a common model for fast and low-budget school buildings in order to provide formal education on a wide spread area is of great importance in order to ensure the aforementioned education mobilization. Thus, it seems that, the adobe can be defined as the most basic structural solution product that can solve these architectural needs and necessities. In this sense, it should be once again remembered the importance of the building constructional examples of Hassan Fathy in adobe material that he created for the geography of Middle East, and how these examples could be easily and fastly constructed and used on a longlived period by Eayptian modern civilization. It should not be forgotten that, the main philosophy of local material based modern architecture creation focused Hassan Fathy's architecture dominated the 20th century architectural field, which includes a series of architectural principles, such as creating an architectural language to the common benefit of the society, which is not breaking the relation with traditional background, while actualizing the constructing, both formally, technologically and as a way of production on designing the fastest, cheapest and the most function-oriented examples. One of the latest Project of Fathy, the Dar al- Islam, Islamic Education Center, is one of the most important community project that designed by him. As a nonprofit educational organization in Abiquiu, New Mexico, the center is constructed in 1979. The design principle of the center is based on Nubian vernacular models that return New Mexico's traditions of adobe construction to their Arabic origins in North Africa. This building can be seen as an important example of the preference to the use of a public space rather than adobe residential housing architecture. Therefore, adobe material based architectural production can be still defined as the most trustful construction methodology of creating the modern building examples on regional structural needs in different functional basis.

In this context, the research text will focus on the construction modelling of fast, easy-to-produce and low-budget school models based on adobe materials, which will provide the best possibility for primary education mobilization on the GAP region of Turkey.

**Keywords:** Adobe, Southeast Anatolia (GAP), Primary School modelling, Hassan Fathy

## **A Theoretical Study of Mud Brick Techniques Around the Nile River in Egypt**



**Rasha Elborgy**

Architect Ph.D.

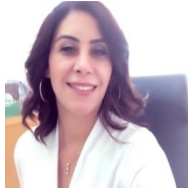
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### **ABSTRACT**

Earth architecture is one of the most environmental material used since ancient times and in various civilizations from East to West. There are many methods of earth architecture, the most prominent was mud brick, as in the civilizations of Mesopotamia, which date back to 8000 BC, and that also found in Egypt. Mud bricks were used in Egypt in early time in the dynastic era, and the Egyptian history is full of different examples, it was used in the tombs of Abydos, Kom Ombo and Ramesseum, also has been used in building houses for people of different levels from the past till now, in ancient Egypt the design differed according to the level of the people. This shows that mud bricks were not using only in funerary buildings or temples. The evidence for using mud bricks in ancient Egypt is the drawings that illustrate the process of building with mud which found in temples, starting with bringing mud from the bottom of the Nile River, then preparing the mixture, and then pouring it into molds. The process of building with mud did not differ much from the past till now, whether in the mixture or in the method used in preparing the brick mold, In this paper, will present the theoretical technique of the mixture and the structure in building with mud brick, and how to take advantage of this technique to adapt it to revive this heritagewith, the presentation of some recommendations for the revival of such cultural heritage.

**Keywords:** Earth architecture, Adobe technique, Adobe in Egypt, ancient Egypt.

## **Structural Analysis of Adobe Tandoori Houses: The Case of Van Province**



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### **ABSTRACT**

Adobe is one of the oldest materials that has been shaped and used since the caves, which were used for the need of shelter, evolved into building mastery. Its use in the past has been unearthed with the architectural remains of the ancient age, continues to exist particularly in rural architecture today. Adobe is a common building material in various parts of the world due to its suitability for arid climate conditions, high thermal insulation properties, humidity control, flexibility of use, sustainability and low cost. Moreover, as a traditional solution, adobe has become widespread in terms of creating the comfort and health conditions required in the indoor environment with minimum energy and cost. In this respect, it is important to investigate the examples and principles of adobe architecture to bring them into the literature, document them and ensure their sustainability. In this study, which aims to examine the structural analysis of tandoori houses, the material and construction techniques of the building envelope of the adobe tandoori houses selected in the rural settlements of Van province were investigated. The technical features and construction techniques of the adobe material used in the walls, floors and top covers of the tandoori houses built adjacent to the houses are explained with photographs and drawings. Tandoori houses, examples of traditional adobe architecture, are original examples developed as a result of the experience against physical environmental conditions. Therefore, it should be examined and documented as a cultural value and should be protected as its original structure.

**Keywords:** Adobe, tandoori house, rural architecture, traditional dwellings



## **Learning Earthquake Safe Adobe Construction Technology**



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### **ABSTRACT**

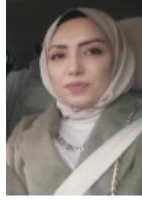
Earthquake occurred on Southeast of Turkey at 6<sup>th</sup> February 2023. According to the National Earthquake Information Center, there is an average of killed people approximately 50 500. The damage was caused by the collapse of buildings with people inside them. There is a need for making earthquake-proof loadbearing buildings. Because in the last century, engineers learned and introduced framework structure, new designs and building materials like reinforced concrete to better equip buildings and did not get much information on loadbearing wall-structures to withstand earthquakes.

The horizontal load by earthquake, causes the “diagonal rupture” and the entire loadbearing wall structure collapse. The engineers use the methods: vertical reinforcement in the wall or reinforcement of the wall surface for earthquake safety. Test on the reinforced wall system shows that it is not trustworthy. Istanbul Technical University studied on earthquake-proof earthen loadbearing wall buildings since 1990, and the findings helped buildings withstand earthquakes. The main earthquake proof loadbearing wall is constructed with force absorber in the loadbearing wall horizontally at 20cm or 60cm levels. The method tested in laboratory and the design is used on the real buildings at İTÜ-1995, faced the real earthquake at 1999. The second building was constructed at 2000 in Urfa and faced the earthquake at 6February 2023. The buildings were not affect from earthquake.

The study will summaries the research on 1. durability of earthen construction material, 2. industrial construction technology, and 3.to handle vertical forces and earthquake safety of loadbearing wall system.

**Keywords:** Earthen construction, earthquake, safety, force absorber,

## **Investigation On Structural Systems Of Traditional Hüseyinik Houses In Elazığ**



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### **ABSTRACT**

Vernacular settlements are characterized, in the most basic sense, as 'the architecture of the people'. These settlements contain important design solutions that reflect the architectural identity of the region and period to which they belong. Local structures have been shaped by trial and error in the historical process; in line with the possibilities and needs of users; It was built in accordance with the characteristics of the region such as climate, topography and materials. As a result of this, a traditional building typology unique to each region has emerged. For this reason, traditional Anatolian houses, which are basically the continuation of the same cultural heritage, contain regional differences. Traditional buildings, with their unique design features, are important cultural heritage items that have become the architectural symbols of the region they belong to. This traditional civil architectural heritage should be preserved, kept alive and passed on to future generations to ensure its continuity. Therefore, the analysis of local architecture data is a critical step. The determination of the structural systems that sustain the building is important for the preservation of this local architecture. For this reason, traditional civil architecture should be examined, structural system solutions should be analyzed and data should be documented.

This study examines the original construction system and material properties of traditional houses in the Hüseyinik region of Elâzığ province in Turkey. The region was established in the northeastern part of the province of Elâzığ and is a very old settlement. The fact that the region has preserved its original texture and the lack of studies examining the region from this point of view in the literature have been effective in the selection of the site. Locally-specific construction techniques and the use of materials can be easily read throughout the settlement. For this purpose, the structures located here were examined; Structural system features in the region were determined. This study, which is based on fieldwork and literature review, is important in terms of determining the construction techniques and details specific to the region. General qualifications on the construction technologies of traditional Hüseyinik houses are presented with photographs and detailed drawings.

**Keywords:** Vernacular architecture, traditional construction techniques, traditional materials

## **Bio-Inspired Design Approach: Earthen Beehive Dome Forms of Harran houses**



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### **ABSTRACT**

Studies of natural systems have at all times been inspirational for design. Biomimicry in design is often unfairly associated with the stylistic imitation of natural forms, but Janine Benyus – the researcher who coined the term – believes a biomimetic approach is one that favours ecological performance research and metrics over shape making.

Through an examination of existing biomimetic technologies. It is apparent that there are three levels of mimicry; the organism, behaviour and ecosystem. The organism level refers to a specific organism like a plant or animal and may involve mimicking part of or the whole organism. The second level refers to mimicking behaviour, and may include translating an aspect of how an organism behaves, or relates to a larger context. The third level is the mimicking of whole ecosystems and the common principles that allow them to successfully function.

Then these three levels consist of form, material, manufacturing technology, process. Within each of these levels, a further five possible dimensions to the mimicry exist. Within each of these levels, a further five possible dimensions to the mimicry exist. The design may be biomimetic for example in terms of what it looks like (form), what it is made out of (material), how it is made (construction), how it works (process) or what it is able to do (function).

There is a strong temptation to assume that biomimetics is merely a matter of copying a structural idea that is found in nature. However, this overlooks the process of structural design which is much more than creating a certain structural to transfer and adapt the structures, material behaviour and methodologies to bio-inspired technical structures, the geometry model and the material parameters need to be scaled up and adapted to applications in building constructions in a further step. Biologically Inspired Design (BID) sometimes shortened in “bio-inspired design”, “bioinspiration” and “biodesign” is at least as old as the oldest biomorphic cave paintings, which date back to 40,000 YBP. Bio-inspired technical solutions are the elucidation of movement patterns and of actuation principles and their interplay with the structural set-up of the mechanism because geometrical characteristics and material parameters are inseparably linked and similarly affect the motion behavior of the compliant mechanism.

In the context of bionics and biomimetics, the "evolution" and "adaptation" of traditional architectures is most interesting. By analyzing biomimicry in general terms with natural methods and inspired by these processes taking design. In this context, earthen beehive dome forms of houses in Harran today "inspired by nature", which is widely used in all fields of as the first area where learning/adaptation and/or application technique is implemented can be named. The importance of Traditional and Bio-Inspired architecture of Harran earthen beehive dome as a source of innovation is inadequately identified and used.

The case study on the adaptation of the traditional architecture on the Urfa Harran house. Beehives will present an approach to identify architectural qualities for further application.

**Keywords:** Earthen Beehive Domes, Traditional architecture, Biomimicry; bio-inspired design; ecology.

**Paper Number:15**

## **A Sample for The Use of Adobe in The Experimental Archaeology In Turkey: Kültepe**



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### **ABSTRACT**

Experimental Archaeology is a method used over all globe in recent years for both explanation of undiscovered parts and ease of perception of periods and objects for guests. For example, Roman boat was reconstructed in 2022 with materials of its original era and sailed on shores of Danube and similar method was used on boat remains from the Yenikapı Excavations which were sailed on Bosphorus. The in-situ reconstructions of city wall of the Hittite capital Hattusa and Neolithic adobe residences of Aşıklı Höyük, both again with material and technique of the era, are other important examples.

Another important recent project is “Neighborhood of Assyrian Merchants” which is being reconstructed and expected to resurrect the commercial hub of the era, Kültepe, which was the center of the Kanesh Kingdom and the capital of the Assyrian Trade Colonies.

Kültepe dates back to 4000 BC. Excavations began in 1948 by Prof. Dr. Tahsin Özgüç. The “Archaeological Site of Kültepe-Kanesh” was accepted into UNESCO World Heritage Tentative List in 2014. Currently, the excavation project is operated by Prof. Dr. Fikri Kulakoğlu from Ankara University.

Similar to the once applied for single residences in Aşıklı Höyük, a new reconstruction is going to be built on neighborhood pattern scale in Kültepe. According to the project report, this application aims to “Re-tell the story of the residences and the neighborhood of both Assyrian and local merchants settled in Karum, which is unavailable over the current architectural remains”. The chosen place for this project is the site excavated between 1948-1958, for which Mahmut Akok also prepared restitutions. Adobe was named as main construction material of the site and even measurements of blocks were explained in many sources.

This proceeding will examine use of adobe in experimental archaeology in Turkey and focus on “Neighborhood of Assyrian Merchants Project” of Kültepe in detail.

**Keywords:** Adobe Architecture, Kültepe, Experimental Archaeology, Assyrian Merchants, Aşıklı Höyük

## **Adaptable Reuse and Restoration of Florya, Senlikkoy Old Church – Mosque**



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### **ABSTRACT**

The church, at Şenlikköy, (a small Rum village in the 1800's), was built in the 1900's. The decrease of the Anatolian Rum population in years and even the extinction due to migration, the church was converted into a mosque as Muslim families settled in the village. In the oral history interviews with the elders and the headman (muhtar) of Şenlikköy, it was used as a mosque. It was learned that a timber minaret was added to the structure, but any visual material could not be obtained about it.

Due to the decrease or even disappearance of the Christian community, minarets were added to some churches. Such Greek, Rum and Armenian churches in Anatolia and some districts of Istanbul were converted into a mosque (Fig.1,2,3,4). It is mostly seen similar examples in Fatih District, İstanbul. Imrahor Mosque is the most well-known example of the basilica church type in Turkey (Church of Yoharines Studios). Over time Basilicas in Anatolia, a development has occurred that will affect the form. The best-known examples in Istanbul can be listed as follows:

- Acem Ağa Masjid (1484) (Chelkopratia Church) (5th century)
- Atik Mustafa Pasha Mosque (16th century) (St. Peter's Church) (11th century)
- Kefeli Masjid (1935) (St. Nikolaus Church) (16th century)
- Monastery Masjid (15th century) (Monastery Church) (11th century)
- Sekbanbaşı Masjid (15th century) (Name not known) (?)
- Sinan Pasha Masjid (16th century) (Red Church) (14th century)

The political and religious aspects of the conversion of small-scale churches into mosques are not discussed in this report, it is not the subject.

A new function as a library and cultural center is aimed to be given this historic building as mentioned (FLORYA, SENLIKKOY OLD CHURCH MOSQUE) with a revitalization project.

**Keywords:** The church in Şenlikköy, revitalization project, new use, adaptable reuse, Florya, restoration.



## **Material Waste Management in the Construction Industry: Brick Waste**



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### **ABSTRACT**

Waste is a critical and worldwide problem that should be dealt with to manage the sources well. Construction wastes are the results of evitable and inevitable activities that do not create value, originate from different reasons such as stakeholders, building production processes, force majeure and occur in physical forms such as materials, labor, equipment or in non-physical forms such as cost, time, quality. Construction wastes have been known to generate large and diverse quantities of waste with 37.5% [1]. In many countries, material wastes, one of the physical wastes, generation increased by 342% in the last years [2]. Transparency Market Research [3], states that annual construction waste is expected to reach 2.2 billion tons globally by 2025. This amount is expected to generate 2.59 billion tons of construction material waste (CMW) annually by 2030 and to rise further to 3.40 billion tons by 2050. These statistics show the importance of CMW management in the construction industry to manage the sources for circular economy and sustainability. Material waste management encompasses collection, transporting, storage, treatment, recovery, and disposal of waste, and is defined as a comprehensive, integrated, and rational system approach towards achievement and maintenance of acceptable environmental quality and support of sustainable development. Well organized and implemented CMW management in the construction industry provides reduced demand for landfill spaces, improved resource management, productivity, and quality improvement as well as economic benefits. As a result of this, waste management in the construction industry needs a holistic perspective that should be cared both material and building life cycle. On the purpose of optimizing the limited sources for sustainable environment and contributing zero-waste circular economy in scope of waste evaluation, re-use fields of material wastes and natural materials should be considered. EPA [2]'s report emphasizes that more than 75% of all construction waste from wood, drywall, asphalt shingles, bricks and clay tiles ends up in landfills. As a result of this, it is thought that material and building life cycle should be evaluated with a circular perspective in terms of zero-material waste idea.

Brick, one of most used material in the construction and demolition processes, is a natural material which has been used for many years and could be evaluated sustainable material in terms of zero-waste circular economy. In this study, clay brick is evaluated as a commonly used construction material from an environmental and waste perspectives. There are several common waste management scenarios such as reuse, recycling, and landfill for the brick life cycle as the common CMW management strategies. The typical process of clay brick production involves clay mining, transportation to the factory, clay preparation, manufacturing, drying, firing, and packaging. Construction, use, and end-of-life stages follow the brick production. Brickwork can be separated, cleaned, reused, or demolished, broken down to a smaller size, and used for a variety of purposes,

such as foundation construction, hardcore for below slab support, etc. Even though the brick wastes are of great importance for the circular economy, Environmental Product Declarations (EPDs) usually lack waste data for the construction-installation information module (A5) in the construction process and waste processing module (C3) in the end-of-life process. Several EPDs include information in the reuse, recovery, and recycling potential module (D). In this context, this study will question the potential of brick waste by evaluating the waste scenarios reported in the brick EPDs and the research in the literature with the Life Cycle Assessment (LCA) approach. Resource efficiency, energy efficiency, and carbon emissions will be assessed by developing a waste management flow diagram. It is thought that the findings of this study will contribute to the identification of various waste-minimizing strategies and the development of waste management during the brick life cycle.

**Keywords:** Construction material waste, waste management, brick, circular economy, life cycle assessment

## **The Earthen Architecture Example In Nature Conservation Area: Sindelhöyük**



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### **ABSTRACT**

This study focuses on the Sindelhöyük Neighborhood, situated in the Develi district of Kayseri province, Turkey, which encompasses a collection of structures that have survived over time and were constructed employing the earliest known earthen construction technique.

Sindelhöyük is situated on the outskirts of Sultan Marshes, a significant natural site known as both a national park and a Ramsar area. This area is a crucial habitat for Anatolian wildlife, especially birds, and is home to numerous endemic plant species. The local community relies on these resources for sustenance. The unique construction method used in the settlement's buildings involves load-bearing walls made of clamped blocks, adorned with clay resin. The roofs are covered with straw and soil, reminiscent of ancient carpet structures.

Additionally, the use of peat in the region involves a rare method of cutting and drying pebble soil, which distinguishes it from more commonly known construction techniques. This distinctive approach underscores the importance of preserving this knowledge and communicating it to future generations, especially considering the protective environment in which it operates.

The earthen structures found in the tombs are examples of rural cultural heritage and were built by the local community. Our documentation work involved a blend of written research and oral and visual information obtained directly from the local people, who possess invaluable knowledge of this architectural tradition. Through this approach, we strive to both embrace and transmit our cultural heritage to future generations.

**Keywords:** Earthen Architecture, Sindelhöyük, Sultan Marshes, Vernacular Construction, Traditional Adobe.

Paper Number: 19

## Evaluation of Period of Vibration and Vulnerability Assessment of a Historical Masonry, Sama Center: A Case Study



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### ABSTRACT

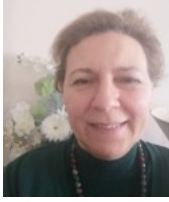
The restoration of 'Kathmandu University Bal Krishna Sama *Saichik Guthi*<sup>1</sup> (Sama Center)'; the birthplace of the foremost Nepali playwright and artist Bal Krishna Sama; is being carried out by Kathmandu University with the vision of the amalgamation of tangible and intangible heritage in Nepal. This historically important Rana-period<sup>2</sup> architectural heritage will be ultimately transformed into an academic discourse center and a hub for music, theatre and literature. This paper analyzes the old structure of the Sama Center through contemporary approaches in order to create a practical database for future conservation of archaic, diverse and valuable Nepalese heritage sites. Despite the Finite element analysis of masonry buildings being very difficult to be considered feasible for analysis of the traditional unreinforced masonry structures due to the deficiencies faced during the modeling of the building in the computer program, it is widely used for the analysis of masonry due to the ease in studying the global seismic response of the structure. The primary objective is to study the structural performance of the building using a preliminary method of linear static analysis during the earthquake. The seismic coefficient and response spectrum method are adopted to analyze the dynamic nature of the building. The assumptions of materials have been considered with a similar review of the structures in Kathmandu valley whereas the connections and behaviour of elements are assumed and need to be refined in further analysis since the seismic inputs need proper care with the professional experience in how the building reacted to the earthquake. The time period of the existing building was measured using the ambient vibration method which was checked with the model in the computer program and further proposed building was studied in axial and shear stresses. Finite Element Modeling of the building is performed in CSI ETABS.

<sup>1</sup> Educational Trust

<sup>2</sup> Neoclassical buildings were built when Rana rulers were leading Nepal in the mid-19<sup>th</sup> – mid-20<sup>th</sup> century

**Keywords:** Linear Analysis, Ambient Vibration Test, Finite Element Method, Historical Masonry Building, Tangible and Intangible Heritage

## **Architectural and Social Adaptation of Traditional Housing from Past to Present; The Sample of Karahüyük in Konya**



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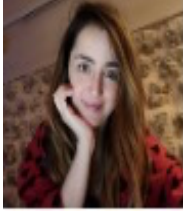
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### **ABSTRACT**

The rapid urbanization caused by Industrial Revolution has become a problem for all cities around the world. The transformation began with reinforced concrete structures and continued with the use of iron and steel has led to a new era in buildings. With the recent social and cultural changes, traditional materials and sustainable housing are no longer preferred. Therefore, people are abandoning their traditional homes and neighborhoods. The recent increase in apartment construction has narrowed the distance between people, but has also led to a lack of social interaction. In contrast, when distances are greater in traditional housing neighborhoods, human relationships become stronger, and traditional living spaces close to nature also create a comfortable social space. Therefore, restoration and reinforcement work, including addressing spatial and structural deficiencies, is necessary for traditional living areas to continue to be used. Konya is one of the cities where villages on the outskirts of the city are undergoing transformation and becoming central neighborhoods. One of these transformations is taking place in the Karahüyük neighborhood of Meram district in Konya. While the neighborhood continues to stand with original and traditional materials and techniques, it is caught in an intermediate section between rapid urbanization. In this study it is shown that a traditional residential structure can meet the needs of modern life and the requirements of a modern family while providing comfort. The condition of a building made with traditional materials and structure, such as adobe, in a traditional region is discussed, and the spatial happiness of a modern family living with a traditional perspective in the region is conveyed. In conclusion it is reached that social, ecological, and economic sustainability can be achieved without disrupting traditional pattern and construction.

**Keywords:** Adaptation, Adobe Houses, Konya-Karahüyük, Historical Housing Style

## **Adobe Materials Decay Patterns of Historical Buildings in The Southeastern Anatolia Climate**



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### **ABSTRACT**

Adobe, made from mud bricks, is an expression of diverse cultural values tied to architectural heritage by different societies. In this context, adobe can vary in physical, chemical, and mechanical properties in different geographical contexts. For an effective preservation program for adobe structures, diagnostic and conservation interventions need to take place within a socio-cultural context. When examining studies on adobe structures in various geographical and socio-cultural contexts, it's evident that degradation types in adobe materials exhibit different patterns in different regions. Specifically in structures located in the Southeastern Anatolia region, it is known that they are generally subject to degradation due to environmental factors. This study identifies degradation patterns resulting from environmental factors in adobe structures within the Southeastern Anatolia Region. These problems are classified based on structural elements and the factors causing the issues are explained within the geographical context. The results highlight that the storage and transfer properties of adobe material have a significant impact on degradation patterns due to the climatic conditions in the Southeastern Anatolia region. These conditions rapidly alter the material properties of adobe structures, leading to various types of degradation. Issues such as cracks and deformations, warping and bending, and changes in color were observed in structures due to temperature variations. These problems were most notably observed in the load-bearing exterior walls. Additionally, it was observed that physicochemical events significantly affecting the mechanical properties of the adobe and extreme temperatures causing drying and cracking issues in wooden floors in the region.

**Keywords:** Building; Adobe material, Decay, Southeastern Anatolia climate, Temperature differences



## **Examining Architectural Restoration Trainings in Terms of Professional Equipment and the Place of Adobe in Education**



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### **ABSTRACT**

Although Architectural Restoration education is given in two-year vocational school in Turkey, four-year education is also given in different programs that train conservators and restorers in different universities. Within the scope of the study, an evaluation will be made on the example of Mimar Sinan Fine Arts University Vocational School Architectural Restoration Program. This department trains restorers as technical intermediate staff. In this program, mostly architects and restorers, faculty members from various disciplines give lectures, and support is received part-time from experts in their fields in certain courses. In the two-year program, practical courses and internships are of great importance. This program, which cooperates with the sector and local municipalities from time to time in order to create conservation awareness and support it with restoration education, organizes workshops for its students to protect traditional cultural assets and provide practical training. Although there are lessons on Stone, Wood and Metal materials in the trainings, Adobe is briefly explained in only one lesson. In the study, the importance of adobe as a natural material and the necessity of its inclusion in education will be emphasized.

**Keywords:** Architectural Restoration, Professional Equipment, Adobe, Material

*Paper Number: 25*

## **Drafting an Approach for The Preservation and Rehabilitation of The Murcheh-Khortcastle-Village**



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### **ABSTRACT**

Iran has several numbers of fortified complexes and settlements. These architectural constructions played an essential role in people's social, economic, and political lives throughout history. Fortified complexes of Iran, called Qaleh or Qal'eh in Persian, neglecting the value of their cultural heritage, are left abandoned for the sake of unbalanced development.

Lack of documentation and monitoring of these historical compounds threatens these properties and delays the development of an appropriate management mechanism to preserve them with rural and urban development. Residential fortifications, in which defensive structures serve to protect the settlement and residential units, are one type of fortified complex.

Murcheh-khort is one of the largest adobe residential fortifications (castle-village) of Iran and a great example of these architectural complexes which three main elements of water resources, roads, and proximity to the city of Isfahan generated its formation.

Murcheh-khort castle-village is located in the Murcheh-khort rural district, 40 km from Isfahan in Iran. This fortified settlement was located beside the main ancient road of Iran, the secondary road of the silk road, that crossed from north to south of the country and had a crucial role in the historical events and the development of Isfahan during different dynasties.

During the last century, with rural development, population growth, industrial development, and socio-political transitions in Iran, this complex lost its function and gradually became depopulated and abandoned. The authenticity and integrity of the Murcheh-khort fortification have been hampered by decay, and it is mainly abandoned currently.

Since significant numbers of fortifications of this type and scale are present in almost all the provinces of Iran from north to south, this research work will serve as an example of the sustenance of the heritage structures of this scale and values.

The research process revolves around information obtained through a number of sources and institutions, as well as a limited observation made on the site and its surrounding. This research-based study aims to demonstrate a clear image of Murcheh-khort castle-village, and the influential factors on its creation, continuity and destruction.

Based on the information retrieved from several analysis in different levels and aspects, it was learned that the cohesion and interwoven framework of the fortification prevented the destruction of the main structure of this historical monument. Besides the community's attachment to this cultural asset, this interwoven framework didn't let the owner destroy and reconstruct their property. Religious buildings as the core of the castle-village are the only functioning buildings in the area that have remained standing all these decades.

Highlighting the religious buildings as the core of the site and considering the socio-economic relation of the old and new inhabitants of the village and all the internal and external potentials and threats, policies and regulations for the site and the entire village, future possibilities for the historical site and its surrounding was predicted and the rehabilitation proposal was proposed to preserve this cultural heritage and generate the development of the village and prevent its decay.

**Keywords:** Residential fortification, rehabilitation, castle, village, destruction.

## Timber Supported Mudbrick Masonry in Ancient Architecture in Anatolia: An Evaluation of R. Naumann's Work



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### ABSTRACT

Although the characteristics of vernacular architecture and their importance for sustainable new designs and technologies has become a focus of architecture, this data generally excludes and disregards archaeological research. Among the reasons for this are the facts that excavation and survey data is difficult to reach because reports and publications rarely include such details, and that archaeologists rarely look at continuing tangible and intangible building traditions in their vicinity. Although archaeological research in the last 50 years in Anatolia has created a great amount of additional data, Rudolf Naumann's book *Ancient Architecture in Anatolia* (1955, 1971), still remains to be the seminal work on this subject, bringing together the information from many sites in Turkey and explaining the basic principles and connections. Both an architect and archaeologist, Naumann was able to see the connections others overlooked.

This paper focuses on a presentation and evaluation of Naumann's work on historic mudbrick architecture in Anatolia, and especially on the use of timber elements as beams (*hatıls*) in masonry. Naumann looked at examples from different sites and building types, beginning from the Neolithic period to the end of the Hittite Period, and compared his findings with contemporary rural or vernacular examples. Evidence for timber beams were present in archaeological finds. These were used between stone wall footings or foundations and mudbrick walls; horizontally, parallel and sometimes vertical to wall faces to strengthen the masonry; and/or vertically to support walls, sides of openings, and timber superstructures.

**Keywords:** Ancient Mudbrick Technology, Mudbrick Architecture in Anatolia, Timber Beams (*Hatıls*), Rudolf Naumann

## **An Investigation on Translucent Adobe as an Exterior Wall Material**



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### **ABSTRACT**

Exterior walls have many functions and a great influence on spaces since they are the borders between interiors and exteriors also, represent the culture or some messages as an “interface” for the observers. All these functional requirements and meanings have shaped the exterior wall throughout the history by means of both the construction techniques as well as the materials. The need of getting light into spaces was achieved through windows in the early eras of the history of architecture but the desire of letting more sunlight in or having an uninterrupted relationship with surroundings made many kinds of translucent and transparent materials being used for exterior walls. For adobe as an exterior wall material, there are many studies to enhance its insulation or mechanic performance using different kinds of reinforcements but the possibility of it becoming a translucent material still remains undiscovered. There are some studies on translucent concrete, which includes recycled glass aggregates, plastic optic fibers or glass fibers also on providing translucent wood by adding some polymers while excluding lignin. It is thought that it can also be possible to produce translucent adobe too by using some reinforcements or additives. This study aims to investigate whether is it possible to make adobe as a translucent material and what would be the advantages or disadvantages of using this material in building exterior walls in means of performance requirements and ecological sustainability.

**Keywords:** exterior wall; material technology; translucent adobe; reinforcements for adobe.

Paper Number: 30

## **The use of hemp as a sustainable building material and its potentials in Turkey**



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### **ABSTRACT**

One of the most destructive and extensive interventions of mankind in the environment is the construction activities. Concrete is used in most of these construction activities today. Looking at the manufacturing process of concrete and its components, it is a building material that is far from sustainable, as it requires a lot of energy and has a strong impact on the environment. The increasing environmental problems make it necessary to reconsider natural, sustainable, harmless to human health and traditional building materials with modern techniques. In this context, practices that focus on energy savings and human health in the production and use of buildings are gaining importance. The hemp plant, a fiber crop that has been cultivated by humans for about 10,000 years, is used in many fields such as textiles, cosmetics and food. Hemp is a fast-growing renewable resource that can be cultivated in most regions of the world. Hemp, which has been rediscovered as a building material in Europe in recent years, can be used to make insulation and filling materials, as well as building materials similar to concrete and brick. Legal regulations and incentives for the use of hemp are being created worldwide, and research is being conducted into the efficient use of the material. This study first gave examples from the literature on the use of hemp plants such as hempcrete (hemp concrete), hemp wool, fiberboard, insulation material and evaluated the use of hemp as a building material in the context of sustainability. Hempcrete, first used in France in the 1990s, is a carbon-negative, lightweight and environmentally friendly building material obtained by mixing hemp stalks with lime. The material can be used in the form of blocks or as a filler material, as well as in plaster or spray molds. Hemp wool is used for the production of thermal and sound insulation panels, which can be used on ceilings, walls and floors. The study also discussed the production and use of hemp in Turkey, evaluated the relevant regulations, and made suggestions for its widespread use. It is recommended that regulations and incentives be established for the use of hemp as a building material, which is produced in 19 cities in Turkey. As a result, the use of hemp in construction enables the realization of energy-efficient, economical, thermally and acoustically efficient and healthy constructions and contains potentials in the context of meeting sustainable development goals. Hemp can be an alternative to concrete as an economical, safe and healthy local building material in Turkey.

**Keywords:** Sustainability, Hempcrete, Building materials

## **Use of Adobe in the Kurul Fortress (Ordu, Türkiye)**



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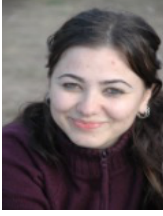
### **ABSTRACT**

Mudbrick is a basic architectural material that has been used for thousands of years to satisfy the human need for shelter. Mudbrick is still in common use, especially in rural areas, and can be considered a carrier of thousands of years of knowledge, tradition and culture – a phenomenon that can clearly be seen at Kurul Fortress – a Late Hellenistic period settlement (120–63 BC) that contributes significantly to the archeological knowledge of the Black Sea region. Aside from the large number of mudbrick fragments dislodged from the walls that have been found inside the rooms, thousands of mudbrick blocks that formed the walls have been unearthed in-situ. An analysis of mudbrick samples reveals them to be created from local soils, aggregates, and, in some samples, dried grass or straw. Considering the use of mudbrick for the construction of the walls of almost all of the structures of the Kurul Fortress, it can be understood that tens of thousands of mudbricks were produced, and when the time, climate, labor force and cost associated with mudbrick production is considered, it can be understood that a highly elaborate production process would have been required to support the construction of the Fortress.

This paper provides qualitative and quantitative information about the mudbrick blocks used in the construction of Kurul Fortress, which can be considered an important source of data due to the existence of in-situ mud-brick walls, of which there are few examples from the Hellenistic period. The acquired data can contribute further to literature through comparisons with other archaeological settlements in terms of the constructed architectural features.

**Keywords:** Kurul Fortress, Black Sea Region, Architecture, Hellenistic Period, Mudbrick

## **Specialized Architects in Earthen Architecture**



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### **ABSTRACT**

Earthen building material has been used in building production since history and still continues to be used. In this study, the process of using earthen building material in the world from history to the present day was described, the situation after changing environmental policies was evaluated and the current use process was discussed. Afterwards, the earthen construction application examples of the architects who left their mark on the earthen architecture were examined and an evaluation was made on the usage patterns of the earthen building material. Thus, an evaluation was made on the current transformation of earthen architecture, and it was examined at what points the material was developed and at which points it was integrated into today's production. The fact that the earthen building material, which has been used throughout history and continues to be used in different forms, still continues and is preferred despite many weak features, shows its importance in spatial memory as well as other positive features and reveals that it is a timeless material. In this context, the production processes of the structures of Hasan Fathy, Nader Khalili, Gernot Minke, Martin Rauch and Anna Heringer were examined and the techniques they used to develop the material were discussed. The main purpose of this study is to make an evaluation on the architectural design processes of the selected applications of architects specialized in the field of earthen application and the way they use the material. In this way, an assessment was made of the current transformation of earthen architecture, and the material was examined at which points it was developed and at which points it was integrated into today's production.

**Keywords:** Earhen architecture, architectural design processes, usage of earthen building material.



## **Baghdadi Wall Techniques Used in Traditional Buildings: The Example of Diyarbakır Suriçi**



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### **ABSTRACT**

Traditional and historical buildings are cultural and architectural heritages that have survived from the past to the present. These structures were built with different construction techniques and materials according to the requirements and technology of the era in which they were built. The most common materials in traditional buildings built with different construction techniques are stone, brick, adobe and wood.

Baghdadi construction technique on the walls of some traditional and historical buildings is one of the traditional construction techniques that has survived from the past to the present.

Baghdadi construction technique; Horizontal wooden laths are nailed on both sides with 1-2 cm intervals on the wooden frame structure and it is formed by plastering it. In the Baghdadi wall construction technique, there are examples where the interior of the walls is left empty, as well as filled with mud bricks and bricks. Wooden material is generally used in this construction technique. The lightness of the wooden material and the low load it brings to the building provide an advantage in the bagdadi construction technique. The wooden material provides the horizontal continuity of the wall in the bagdadi wall construction technique and creates a rough surface for better adhesion of the plaster. There are many academic studies investigating the bagdadi construction technique used in traditional wooden buildings. The aim of this study; wood, mudbrick, wood, etc. used in the bagdadi construction technique. The purpose of this study is to examine the construction style, usage areas, positive and negative features of materials with examples built in Diyarbakır Suriçi Region.

There are many examples of using the bagdadi construction technique in the Suriçi Region, where traditional and historical buildings are located. A field study was carried out to determine the current status of the traditional building examples made with this construction technique and these buildings were documented with photographs.

**Keywords:** Baghdadi Construction Technique, Diyarbakır, Traditional House, Deterioration

## **Structural Damages Detected on Adobe Buildings In Hüseyinik (Ulukent) District In Elazığ Province 'Faik Bey Mansion Example'**



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### **ABSTRACT**

Elazığ province is one of the important settlement centers of Anatolia with its historical and cultural richness. The city, which has hosted many civilizations throughout history, has been preferred due to its location and fertile lands and has been the center of life for many civilizations. Harput is one of the most important residential areas of the city where traditional life is maintained and one of the oldest jades in Anatolia. There is a castle belonging to the Artuqid period in Harput, which is located on a high part of the city and is called a neighborhood today. The campus, which spread inside the castle and on the hill slope, disintegrated over time and moved towards the Elazığ plain.

Hüseyinik was one of the villages attached to the Harput sanjak in the 16th century [13]. With the transformation of Elazığ into the city center, Hüseyinik gained the status of a neighborhood under the name Ulukent. Hüseyinik (Ulukent) Neighborhood, located in the northwest of the city, is located in the high position of the city and has been the center of life for many civilizations living in the past. During the period of these civilizations, various structures were built in order to meet their needs such as shelter, worship and defense. Some of these structures were severely damaged or completely demolished and could not reach the present day. Most of the structures that have survived to the present day are traditional houses and are partially used today.

Hüseyinik houses were built similar to the traditional house typology of Elâzığ. Traditional houses, which are made of stone, wood and adobe materials, are usually two or three storeys. One of the houses in Hüseyinik (Ulukent) Neighborhood is Faik Bey Mansion on Dağ Street.

Faik Bey Mansion was built in 1911 with the traditional construction technique and with adobe as the main construction material, with a Ground +1 storey. In the adobe building, auxiliary materials such as stone, wood and binding mortars were used. The building, which was registered in 2014, is empty and not used for a long time. Today, the building has had structural problems due to neglect and external effects.

In this study, a field study was conducted in order to determine the structural problems and damages in the adobe wall and other structural elements in Faik Bey Mansion located in the Hüseyinik (Ulukent) District of Elâzığ. Existing structural problems were determined through observational determinations in the field study and these problems were documented with current photographs. It is aimed to create a preliminary study for possible repair applications related to the structure by presenting evaluations and suggestions for the damages determined by the study.

**Keywords:** Structural Damage, Hüseyinik, Adobe, Faik Bey Mansion

## **Re-Functioning of Tunceli Tozkoparan Primary School, A Republic Period Educational Building**



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### **ABSTRACT**

In the 1940s, as in many cities of our country, there are school buildings in Tunceli, which were designed under the influence of German architects. These school buildings located in the city were generally built in the villages. The use of these educational buildings, which were designed according to the needs of the period, decreased with the occurrence of migration from village to city throughout the country, also in Tunceli. Towards the end of the 20th century, they completely lost their functions. As an example of these buildings in Tunceli, the primary school building in Tozkoparan village of Pertek district is considered. The reason why this building is the subject of the study is that unlike other school buildings built in the same period in the city, this building was built with a mixed system using stone and adobe. This primary school building, which was built as a single-storey masonry structure in this village, where there are usually two-storey mudbrick buildings, is in a very neglected condition today, like other primary school buildings built in the same period in the city. It is thought that this primary school building in the village, where there are traditional buildings compared to other villages in the city, the population is relatively higher, and which also houses one of the most important mounds (höyük) in the city, should be preserved as both a traditional building example and a heritage of the Republic period and transferred to future generations. For this reason, it is suggested that the building be re-functionalized within the framework of a plan that will serve the common use of the village people and conserve and promote intangible cultural heritage values by evaluating other potentials in the village.

**Keywords:** Cultural assets, conservation, traditional building, republic period heritage

*Paper number: 40*

## **The Importance of Recognizance of "Creative Practice" on The Way of Traditional Architecture Conservation**

(By reviewing the practice of conservation and restoration in the historic Fenai house)



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### **ABSTRACT**

In the continuity of historical architecture, new architecture can or must carry the values and worthiness of the land's culture. To build such architecture, we, as architects, must learn first. In order to learn, one must study the historical architecture in which preservation, conservation, and rehabilitation of historical monuments and sites are striking proceedings. An aspect of the study process on historical architecture, which is mainly neglected, is "practicing to learn".

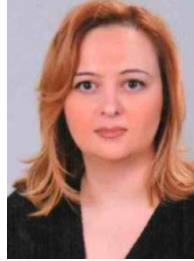
Practicing is a way of institutionalizing a value within the person who holds or believes in it. Although it has its own costs, without practicing, we wouldn't be able to continue if we say not the most, but one of the most efficient kinds of architecture through efforts for building in human history.

This article will present a sample of practicing building, following traditional earthen architecture in fields of preservation, restoration, and construction, Reviews the earthen architecture in the historical city of Yazd and comment on some worthless experiences which could have been prevented by mentioning.

Recent rebuilding and restoration performed in a historical house named Fanaei house (Yazd-Iran) are briefly described, emphasizing the criteria and techniques adopted and arising from the traditional architecture.

**Keywords:** Conservation, Traditional Architecture, Creativity, Practice And Learn, Fanaei House.

## **A Review of Vernacular Material Selection in Educational Buildings in the Context of Sustainable Architecture**



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### **ABSTRACT**

Sustainability in architecture has emerged intending to make designs that will meet the needs of people by minimizing the damage to the natural environment. Sustainable architectural design is design that respect people and the environment, do not harm natural resources, are compatible with the climate, consume less energy and use recyclable materials. Traditional architecture, on the other hand, is the climate and topography of the geography they are located in. It has emerged with the use of local building materials, which are compatible with the characteristics of the society, reflect the beliefs, traditions and life culture of the society, together with the past knowledge. In the studies on sustainable architecture, it can be said that there are similarities between traditional architecture and sustainable architecture and when it is examined, it is understood that the basis of the sustainability criteria is based on traditional architecture. Building materials, which are one of the main criteria in sustainable architecture and traditional architecture, have an important place in terms of energy consumption of buildings, conservation of natural resources and environmental health. Therefore, in this study, traditional building materials will be examined within the scope of sustainable architecture.

Sustainability is not just about the design of buildings. As the main purpose of sustainability, leaving a livable ecosystem to new generations will only be possible by raising young generations consciously. The impressions that the places in the schools leave on the children will affect their sensitivity to the environment. For this reason, raising awareness in the concept of sustainability should be one of the most important goals in education. In this study, it is aimed to reveal the relationship between the use of traditional materials and sustainability with examples from the world and Turkey, by examining the educational buildings that stand out with the use of traditional materials and design by considering the principles of sustainable architecture.

**Keywords:** Sustainability, Sustainable Architecture, Traditional Architecture, Traditional Materials, Sustainable Educational Buildings.

## **Biologically Improved Rammed Earth Blocks-BIRE Blocks-as the Keystones of a Contemporary Design and Production System**



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### **ABSTRACT**

This paper covers the intermediate results of the three-year research project, which aims to define a sustainable life-cycle process for designing and fabricating biologically improved rammed-earth blocks. The research is based on three primary methods such as (1) laboratory tests, (2) design and fabrication of earth blocks in the factory, and (3) prototype construction.

In this research, it was aimed to test the performance of different bio-stabilized earth mixtures by creating recipes to enhance some properties of the earthen blocks, i.e., weight, durability, or shrinkage parameters. In the scope of the laboratory tests, physical and mechanical properties of the mixes, which are formed by incorporating biological ingredients into the Alker recipe, were determined. The mixes produced with agricultural plant waste, such as peanut shells and rice husks, and also with the bacteria will be optimized during the block fabrication process in the factory.

In the scope of the design and fabrication process, the block types, components, and wall patterns that perform as massive walls, textured walls, or perforated walls were identified. The block design and layout strategies are expected to create various spatial qualities for different scenarios. The whole design and fabrication process planned via the life-cycle assessment approach is studied by the process diagram. This diagram enables the recognition of simultaneous and interrelated processes and also serves as a guide for sustainability issues.

This shift from the university laboratory tests to the factory production process entails standardization of the material, automatization of some tasks during block production, and some refinements through design. In conclusion, the fabrication process of the BIRE Blocks will be compared with traditional, on-site rammed-earth wall construction processes in order to evaluate it as a contemporary design and production system.

**Keywords:** Rammed earth, Fabrication, Compressed Earth Blocks (CEB) , Bio-stabilizers, Life Cycle Assessment (LCA)

## **Conservation Problems of Traditional Adobe House in Kırşehir Kayabaşı Neighborhood**



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### **ABSTRACT**

Using traditional construction methods, adobe structures, which are environmentally friendly and sustainable practices, are examples of traditional rural architecture of settlements. The most widely used and oldest material in Anatolia during the construction process, adobe is the material that produces the largest number of buildings. The number of adobe houses, which are widely used in the center and rural areas of many settlements, varies according to the settlement and usage situations. The adobe housing are defined as qualities worthy of protection, as the buildings that show the characteristics of the rural texture begin to set the agenda as a necessary value to be protected.

In this study, adobe houses located in Kırşehir were chosen as the study area. It has been determined that while some of the adobe houses are actively used, some houses are out of use. It has been determined that the houses that have been out of use for different reasons have been damaged at a level that cannot be used in the process and are on the verge of extinction. In this context, it is aimed to determine the protection problems of adobe houses in Kırşehir Kayabaşı Neighborhood, which are damaged at different rates. Suggestions for the solution of these problems are presented by grouping the damages of the used and unused houses. In the development process of the city, ideas that can be tried to be produced within the scope of protecting and using adobe houses.

**Keywords:** Kırşehir, Kayabaşı Neighborhood, Adobe House, Conservation Problems



## **Experimental Study on Thermal and Mechanical Characteristics of Compressed Earth Block Stabilized with Cement**



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### **ABSTRACT**

Considering the increased usage of compressed earth blocks as a modern earthen material in the construction industry, it is imperative to have an understanding of their efficacy. Therefore, this research highlights the impact of compacted pressure during production and the amount of cement content on both the strength and heat conductivity of compressed earth blocks. The result of the experimental study indicates that increasing the cement content and compaction pressure significantly improves the strength of the compressed earth blocks. The maximum strength of 13.3 Mpa was achieved by adding 5% cement with a compaction pressure of 20 Mpa. However, the minimum strength was recorded at 5.3 Mpa, which was fabricated without the use of cement and compacted at 10 Mpa. Based on the results, it can be concluded that the amount of cement has a negligible effect on the thermal conductivity of the specimens. Conversely, the compaction pressure significantly impacts the heat transfer of the compressed earth blocks.

**Keywords:** Compressed Earth Block, Compressive strength, Thermal conductivity, Cement stabilizer



## **Measurement of Architecture Students' Knowledge and Awareness Regarding the Use of Adobe**



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### **ABSTRACT**

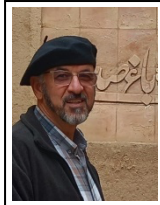
Adobe, one of the earliest building materials, has been extensively employed throughout history in various structures, serving different purposes. This natural, sustainable, 100% recyclable, and waste-free material is commonly utilized in traditional settlements. Its numerous advantages, including healthiness, affordability, ease of production using local resources and basic tools, as well as energy efficiency and minimal release of harmful gases such as CO<sub>2</sub>, enable adobe to be readily manufactured in many regions of Anatolia.

This study aims to evaluate the knowledge and awareness levels of architecture students enrolled in the Architecture Departments of Yozgat Bozok University and Dicle University regarding adobe materials. The adequacy of the information provided in the building materials courses within the architecture curriculum will be examined in relation to students' professional competencies. Furthermore, an endeavor will be made to determine the current utilization areas and techniques associated with adobe materials, ultimately shedding light on the contemporary usage status of this traditional building material.

The identification of the advantageous and disadvantageous characteristics of a building during its pre-construction phase, period of use, and periods of non-use has been requested. Additionally, the adequacy of the architectural education process has been investigated by comparing the responses of first and final-year students to a survey on adobe materials and structures. This study aims to contribute to the architecture curriculum and provide recommendations based on the data obtained from the survey results.

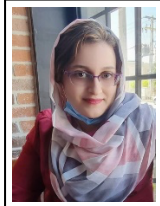
**Keywords:** Architecture student, adobe, Bozok University, material knowledge

## Contemporizing knowledge from historical buildings (case study: Farahza's house in Yazd, Iran)



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### ABSTRACT

The purpose of preservation and restoration of historical buildings is their revitalization and reuse in order to meet contemporary functional requirements while learning from these valuable buildings for the design and construction of new buildings. The lived experience in various historical spaces of Yazd city, especially being present in the historical space of the School of Art and Architecture of Yazd University, meets the functional requirements of the fields of architecture, urban studies, and art quite well. It has also inspired some of the professors and students to contemporize historical achievements and experiences and use them as a model in their studies, designs, and constructions. These items include the modeling of geometry and general design of the building, proportions, materials and construction details, decorations, facades, climatic solutions, and green space.

This article introduces a residential house as a case study in the new urban context of Yazd city, which has contemporized the historical models. Some of the interesting models used in this house include the general design, the contemporization of the windcatcher, the cellar, and sun shading louvres on the façade, which were partly influenced by the simultaneous design and construction of this house with the restoration of the historical complex of Hojat Abad Vazir. These items, along with historical cases will be further examined. It is worth mentioning that the habitants are relatively satisfied by the building's functional relations and thermal comfort in the harsh climatic conditions of the hot- arid region of Yazd city.

**Keywords:** Contemporizing, historical buildings, Farahza's house, Yazd

## The Renaissance of Earthen Building Materials



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### ABSTRACT

In the regions with high environmental awareness, with the trigger of climate and sociocultural crisis, buildings' carbon footprint, life cycle and embedded energies became some of the most requested performances. Plus, physiological and psychological problems caused by built environments came to the fore more frequently. In this context, the numbers of incentives together with sanctions increased towards de-carbonization, low energy consumption and healthy environment of living spaces.

In this frame, natural building materials, as being mostly the environmental friendly and healthy alternatives, became the necessity for the sustainable transformation of the building sector. Earthen building materials also took advantage from this agenda. Thus, they have diversified and improved their industrial standards especially in Europe. Until recently earthen materials were only known as 'adobe bricks' and their common memory was the 'ruined village house'. However, with contemporary technical developments, we are witnessing the resurrection and awakening of earthen materials.

In this context, the topics that will be covered in the presentation are the followings:

- The variety, features and implementation methods of widely used earth based natural building materials
- The factors contributing to the spread of these materials: Grassroots movements, developing standards and norms, politic mechanisms
- Leading works for the development of the ecosystem on natural building materials in Türkiye
- The industrial production and contemporary architectural applications of earthen based natural building materials

### Keywords:

Gebaute Beispiele:

- Biyoev
- Ahmet Keskin
- Integration in BAK, z.B. grünes Zentrum Immenstadt

Seit Ihr **Leicht**athleten zu einer **Schwer**bewaffnetten 60'er Feier bereit?  
Dann freue ich mich gemeinsam mit Euch ins nächste Jahrzehnt zu rutschen.  
Natürlich gerne in Begleitung Eurer besseren Helfte.

Tatort: Grüntenblick Agathazell.  
Am 24.Feb.2023 Freitag ab 19:00 Uhr

Für den leiblichen Wohl mit einem Fass Bier zum anzapfen ist gesorgt.

## **From Traditional Texture to Rural Design Guide: The Case of Tunceli-Tozkoparan Village**



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### **ABSTRACT**

Although there are documented traditional mudbrick structures and many academic studies in cities such as Elazığ and Malatya, which are close to the province of Tunceli, there are not enough field studies on this subject in Tunceli. This study focuses on the lack of work in the city on the subject and focuses on the production of adobe and the use of adobe in buildings in Tozkoparan Village of Pertek district of Tunceli province.

In the city where traditional buildings are quite scattered, Tozkoparan village creates a unique texture with its earth plastered mudbrick structures. The village was chosen as the study area because of this feature. The plaster of adobe houses was obtained using a yellow soil type from a nearby area. The houses plastered with this soil exhibit a characteristic appearance in the color specific to the area.

According to the oral interviews with the local people, the settlement in the village first started with a castle located at the foot of the mountain. After the destruction of the castle, the settlement area moved towards the lower levels. The mudbrick masters in the village built the houses with traditional adobe production using adobe blocks 30 cm & 15 cm (analı-kuzulu). Generally, masonry construction system and mixed system were used in the residences in the area. The lower floors of the houses, which were mostly built as two floors, were used for sheltering and storing animals. On the upper floor are the living areas. In addition, houses with a courtyard plan scheme, which is not a common type of plan in Tunceli, were also identified in the area.

Taking inventories of the mudbrick structures in the area is very important for the city of Tunceli, where there is not enough detection work and study about traditional construction systems. After this inventory study, it is aimed to develop conservation plans for the area. While this planning is being made, Tozkoparan Mound, which is still under excavation, will shed light on the past of the region and has a 5500-year history according to current information, will also be considered as an important potential. In addition, it is foreseen that the information to be obtained from this inventory study can be used as a base for the creation of a rural design guide for this city where ecological life is at the forefront.

**Keywords:** Cultural assets, conservation, traditional building

## **A Modern Religion House Complex on Adobe Material: Uzundere Djemevi and Sociocultural Center**



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### **ABSTRACT**

The Uzundere Djemevi and Sociocultural Center project competition, opened in 2017 by the municipality of Karabağ, İzmir. Slash Architects Architecture and Design office started to design the proposal project by asking a fundamental question of how to solve a particularly modest religious place and a sociocultural center connected to it, as it is showing the universal architectural fiction of nourishing by spirituality, and moreover than this as emphasizing the locality as a strong design element by using local material selection to indicate an identity of being simple and humble. Thus, the project was developed for the land located at the far end of Uzundere village and on a very challenging slope on adobe material to emphasized the humbel identity of belonging to the terra-cota/earth. Nevertheless, the project is designed as a modest, lively proposal that appeals to all age groups, while it is faithful to the scale of Uzundere village and as it respects to nature and the general view of the environment, yet it reflects a touch of contemporary look. It is believed by the designer Şule Ertürk that designing an adobe material based Djemevi in the village of Uzundere, where Alevi-specific habits and lifestyles are at the forefront, brought a modest religious place identity to the forefront.

According to the architect of the proposal project, the design of the Djemevi should emphasize the identity of the village and should exist in a location that symbolizes the inhabitants, at the heart of the selected project plot of the municipality. The main religious building of the project complex, which has the function of "Djemevi" is the main subject of the competition as existing in a prominent way at the highest elevation, but on the other hand, it modestly reveals the topography and the surrounding environment. Therefore, it was placed on the plot in such a way as to be in contact with the main geographic issue. The building, where the entrances are constructed from two different levels, the Park and the Djem Square, was reached through the ramps and stairs around. In this way, the Djemevi can take its place in a way that referred to the embracing identity of Alevism. For this reason, squares of different sizes were designed in the project. While the masses containing cultural and social functions generally hide the large square meter needs underground the plot and the functions that will activate the squares are left above the ground. On the other hand, one of the important decision is taken to preserve the effect of the scale and the texture of the village as it could be. The existence of building pairs in that sense are designed to be understood sometimes as hidden objects on the topography, sometimes as slightly exposed spaces and yet sometimes they elevated upwards completely from the ground and made themselves to be read as they are in a present unity. In this context, the paper will focus on the design process of Uzundere Djemevi and Sociocultural Center proposal project design criterias to show why using adobe material is quite significant on this type of space creations even they are seen as contemporary architecture examples.

**Keywords:** Adobe, Djemevi, Sociocultural Center, humble design, local material, universal sight.

## **The Changes of Traditional Adobe Residential Texture in Gündüzbey (Malatya) After Earthquakes**



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### **ABSTRACT**

Malatya is one of the provinces most affected by the 6, February 2023 earthquakes. After the earthquakes, thousands of our citizens lost their lives under the rubble and many of our citizens were injured. All citizens living in the city were affected by the earthquake and most of them had to leave the city. Malatya's building stock was also severely affected by the earthquakes, and many buildings were destroyed or severely damaged. The aim of the study is to investigate the deterioration of traditional adobe houses, which form the texture of the built environment, after the devastating earthquakes and to determine the impact of the change in the building stock on the urban landscape.

The study focuses on the urban landscape of Yeşilyurt district in Malatya. Yesilyurt is one of the historical settlements of Malatya. The examples of civil architecture built in this district in the mid-19th century reflect the characteristic features of Turkish houses in Malatya and form the built environment of Yeşilyurt. Due to these characteristics, Yeşilyurt was designated as an urban conservation area in 2005. A conservation development plan has been prepared for the neighborhood. The case study is the residential and commercial neighborhood of Yeşilyurt, which is designated as an urban conservation area and is located in the commercial center of the city. This area is designated as a historic preservation area in the development plan. Most of the buildings in the study area are two-story adobe buildings that fit into the urban landscape. The architectural style and construction techniques of the houses were developed using local materials. The base of the houses is made of stone, and the walls were constructed with adobe using nogging techniques. While the adobe walls are used as vertical beams in the houses, the wooden beams serve as horizontal beams. Thus, the adobe walls separated the rooms from each other and took over the load-bearing function

**Keywords:** Adobe, Earthquakes, Built Environment, Malatya, Traditional Turkish house

## **Prosperity in Shirazi Courtyard by Designing a Portico Shading with a Lightweight Structure at Yazd University**



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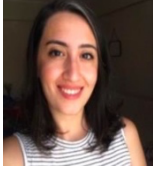
### **ABSTRACT**

This article is a report of the process of designing and building a light portico shading structure on a historic area surrounded by vernacular adobe houses called "Shirazi Courtyard". This courtyard is located in the historic city of Yazd and is part of the Faculty of Art and Architecture of the University of Yazd. Some traditional houses in the historical context of Yazd such as Lari's house, Rasoolian's house, and Sima Rasoolian's house surround the courtyard of Shirazi. To ensure the prosperity of this courtyard and to make this traditional and historical space more functional for the students, it was necessary to build a shade next to its southwest wall. The wall behind this portico is the Lari Panjdari room with five vertical windows overlooking the Shirazi courtyard. It was necessary to design a shading structure that would preserve and protect the trail southwest of this courtyard from wind, rain, and sunlight. It was also necessary that the structure is very light and have a minimum number of foundations to carry out any intervention on this historic site. This project was defined as the final exercise of the CONSTRUCTION III course for senior BArch students. The result of this exercise was the construction of an early prototype of a structure designed by students. The designed portico was a three-dimensional wooden structure that established a beautiful integrity between the roof and the columns and was covered with fabric between the truss spaces. During this exercise, students experienced the course description with a constructivist learning approach and understood their previous teachings about materials and structures as well as the climate in more depth and used them to design a highly efficient and environmentally sustainable structure.

**Keywords:** Shirazi courtyard, adobe architecture, student project, portico shading, construction.



## **Examination of Earth Structure Production in Sustainability**



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### **ABSTRACT**

Considering the fact that more than 50% of the world population lives in cities and in the course of the following 50 years this ratio will increase by approximately 60%, it is estimated that this growing population will increase resource consumption leading to an increase in the amount of the emissions and wastes. Land usage changes with urbanization and this causes pressure on the natural resources and ecosystems.

Throughout the world, day by day more countries adopt the ecological design principle and prefer environmentally friendly materials in building construction. In this regard, the systems in which the wastes are used as raw materials (industrial ecosystems) and the ecological design principle at the architectural scale have a positive effect on achieving energy and resource efficiency. Energy and resource usage and material selection are important parameters in ecological design. The materials that will be selected should be in compliance with the ecosystem and should not return as waste. Throughout its life cycle, the environmental effects of every material used in the building construction must be well known. In this context, soil-based materials are considered as economic, ecological, and non-waste-producing materials that comply with the ecosystem criteria and provide energy and resource efficiency.

In Turkey, the excavation soil observed to be increasing with the urban transformation activities can be considered to be used in construction of the modern earth structures within the concept of ecological design. Excavated soil can be included in the building construction to form a loop and if its structure is suitable it can even be used in industrial areas where the soil is the raw material.

In this study; it is aimed to investigate the soil structures that are constructed via different construction techniques within the concept of building life cycle. In this regard, it will be attempted to define the ecological characteristics of the soil material used as a building material.

**Keywords:** Ecological Design, Natural Resource Consumption, Industrial Ecosystem, Earth Construction Techniques, Earth Construction Standards and Regulations.



## **Heating And Cooling Loads of Building Compared with Concrete Block Wall and Earth-Alker Wall**



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### **ABSTRACT**

The increasing urbanization around the world has brought attention to the energy problem and negative environmental impacts, making the choice of building materials more important than ever. In Turkey, kerpiç or adobe is frequently used, especially in rural areas, due to 1-its low environmental impact, formation energy, and ability to create a healthy indoor environment. Adobe is a building material made of soil, water, and 2-plant fibers. To improve its strength and durability, reducing its sensitivity to moisture, as well as to prevent it from disintegrating in water, various additives such as cement, lime, have been added to the Adobe. Material known as alker is gypsum-stabilized adobe. Compared to traditional adobe, alker has significantly improved physical and mechanical properties. It is more resistant to water, pressure, cracking, and deformation, and has a lower thermal conductivity, which prevents heat loss in buildings. In addition, its high heat storage capacity, phase-shift time, and damping factor significantly reduce the heating and cooling loads during winter and summer, respectively.

In this study, the impact of alker and concrete block materials on the heating and cooling loads and energy performance of an office building in second degree-day regions in İzmir, was analyzed. Using a simulation program, the results showed that in hot climate regions, alker walls reduced heating loads by 60.08% and cooling loads by 26.19%, and primary energy demand by 29.31% compared to concrete block walls. These gains observed in alker walls with high heat storage and low thermal conductivity without the need for any additional insulation show that alker alone can make significant contributions to the energy performance of buildings and to reducing global environmental pollution by using fossil fuels.

**Keywords:** Alker, energy efficiency, cooling/heating loads.

## **Review of Utilization of Biopolymer in Earthen Construction Materials**



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### **ABSTRACT**

Interest in earth materials has gained popularity since 1970, as it is intended to provide the growing need for housing with low-cost materials. In recent years, earthen constructions have gained popularity with green credentials. With its characteristically low carbon footprint, usually, earthen constructions are considered sustainable forms of construction. Fine fraction, sand, and gravel are needed to obtain earthen construction materials. Earthen construction materials are of great importance in terms of having natural and sustainable properties. In addition, Gallipoli D. et al (2017) and Lax C. (2010) have proven that earthen constructions have become remarkable in modern construction due to their sustainability, low energy, and recycling characteristics. The main purpose of improving the earthen construction material is to provide them not affected by disasters such as heavy loading situations, earthquakes, or landslides. Bio-stabilization of earthen construction material is defined as the products or biological processes used to improve earthen construction material properties. Bio-stabilization techniques (e.g. biopolymer stabilization) are recommended as a potential alternative to chemical stabilizers. Polymers synthesized by biological processes are known as biopolymers. Earthen constructions are usually stabilized with stabilizers such as cement; biopolymers may be the green options available. Though bio-stabilization techniques have been used historically for improving the strength and durability performance of earthen materials, the use of biopolymers for stabilization in modern earthen construction is a novel idea. In this research, the utilization of biopolymers in stabilization for earthen construction materials is being reviewed and its advantages were discussed by considering the literature research that have been conducted up to the present day.

**Keywords:** Bio-stabilization, biopolymer, chitosan, earthen construction material stabilization, guar gum, xanthan gum

- Theme: Traditional materials and current research

## **The Earth as the Raw Material: Can the Earthen Buildings Be an Alternative Solution to The Climate Change And Energy Crises?**



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### **ABSTRACT**

Problems such as climate crisis, ecological destruction, increasing population, urbanization and sustainable use of natural resources cause a global crisis. In particular, the concrete-based construction sector, which is not long-lasting, is one of the reasons that triggers these crises. Considering that buildings are responsible for approximately 40% of global energy consumption, 25% of water consumption and one-third of carbon emissions, the importance of reducing the environmental impact of buildings becomes more evident. In this context, the importance of reusing the earth, which is a forgotten material, as a building material becomes vital. Earthen structures have superior advantages over reinforced concrete, steel etc. structures in terms of economy, energy saving, sustainability, health and comfortability. In the studies, it is stated that while the carbon emission of earthen structures is close to zero, it is a hundred times higher in a reinforced concrete structure. The thermal conductivity coefficient of earthen structures is 0.6-0.9 W/mk, providing a high level of energy savings, while the thermal conductivity coefficient of reinforced concrete structures reaches up to 0.8-2.5 W/mk [1]. It has been determined that the indoor temperature in earthen structures is 5 degrees warmer than the outside temperature in the winter seasons, and the indoor temperature in the summer season is 7 degrees cooler than the outside temperature. Again, in relation to the carbon footprint, the process-related embedded energy of earthen structures is 15 giga joules, while it goes up to 210 giga joules for reinforced concrete structures [2]. Therefore, it stands before us as an important nature-based alternative to the environmental, economic, ecological and energy crises we are in. The aim of this study is to evaluate the developing importance of earthen structures in the context of climate crisis and energy crisis, to mention the role of earthen structures in the creation of ecological and healthy cities, to make an evaluation through the life cycle and systemic thinking approach through the 1000-unit earthen container project developed for earthquake victims.

**Keywords:** Earthen building, earthen structures, earthen architecture, sustainability, earthen structure and energy efficiency, ecological planning.

## **Historical Timber and Earthen Constructions in Norway Vapour Permeable Surfaces –Restoration Challenges**



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### **ABSTRACT**

Weather protection and thermal insulation are major challenges in the restoration of historic timber and earthen structures in the Nordic coastal climate. Vapour impermeable surfaces and thermal insulation in historic timber and earthen buildings have increasingly been causing problems in Norway since the early 1970s. A disturbed water cycle and faulty ventilation have led to mould and wood rot. Healthy buildings have become sick: Sick Building Syndrome (SBS) has spread in Norway's humid coastal climate. The Norwegian Passive House Standard poses the danger that these risks will now increase.

Earthen surfaces, earthen infill and earthen mortars in Norwegian timber constructions have been proven to provide heat retention and moisture stabilisation over centuries of Nordic tradition. Their optimal function depends on the type of heat source, the layout of the building in relation to the local climate, the sun and the heat radiation properties of the building components.

Water, in its continuously changing physical states, serves as a natural regulator and plays a central role in the thermodynamics of our historical architectural heritage. In the future, more attention must be paid to the building physics of the natural water cycle when modernising historical timber and earthen buildings.

Modern buildings increasingly depend on technical improvements such as vapour barrier layers, ventilation technology, non-vapour-permeable coatings and heat pumps to regulate their interior climate. The consequence of these technical changes is that the physical system of the enclosure functions like a machine instead of a breathing organism, subject to the principles of building biology.

**Keywords:** Material properties, Building physics, Restoration practice

## **Analyzing Adobe Buildings in the Kayseri, A Study of Traditional Earthen Architecture in Zile Town**



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### **ABSTRACT**

The emphasis of this new study title is still on traditional earthen architecture, particularly the adobe structures in the Kayseri, Zile District. The subject stresses the need to preserve the authentic living spaces and regional knowledge found in these magnificent structures. The study aims to explore the cultural and architectural relevance of adobe structures and decorations while also emphasizing the insights they provide for modern architectural thinking and design.

This study focuses on adobe structures found in Zile Town of the Develi District of Kayseri in order to explore the rich history of traditional earthen architecture. Earthen architecture, which is closely woven with the local culture, is a tribute to eco-friendly building techniques and traditional knowledge. The purpose of this study is to explain the architectural and cultural value of adobe houses, shining light on the complex relationship that exists between dwellings and regional knowledge.

This study uses an interdisciplinary method to draw on anthropological ideas, historical study, and architectural analysis. The project aims to comprehend the spatial arrangements, building methods, Interior architectural decorations and cultural narratives encoded within these adobe structures through site visits, extensive architectural documentation, and interaction with local residents. The study also seeks to uncover the hidden lessons that these dwellings contain, which are comprised of regional customs, beliefs, and teachings.

It is anticipated that the results of this study project would advance both architectural knowledge and efforts to preserve and revive cultural heritage. This study aims to inspire modern design strategies that honor the past while solving the problems of the present by revealing the innate wisdom contained in conventional earthen construction. In the end, learning about the adobe structures in the Kayseri, Zile District opens a door to comprehending the enduring relationship between design, culture, and the built environment's resilience.

**Keywords:** Adobe, Earthen Architecture, Traditional Buildings, Vernacular Architecture, Zile Town

## Simulation of Passive Thermal Technique and Renovation of an Existing Reinforced Concrete Residential Building: A Case Study of a Building on Tokha Municipality, Kathmandu, Nepal



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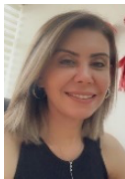
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### ABSTRACT

The transformation of conventional buildings towards an energy efficient building is soaring in the urban development of Nepal. Since, Nepal is considered as highly seismic zone, the buildings are seriously concerned to seismic resistant design mainly after Gorkha earthquake 2015 AD. Aged buildings which have withstood several earthquakes and have fulfilled its serviceability to the occupants undergoes renovation now days for a thermal comfort.

This study focuses on the retrofitting of an existing building with passive technique for thermal comfort along with strengthening. Based on e-mail and field survey data the simulation in ECOTEC V11 and ETABS V18 were carried out for energy modelling and structural analysis. The energy consumption for space heating and cooling on applying passive thermal retrofitting techniques were compared before and after retrofitting based on climatic data. Only four retrofitting techniques are used in this simulation; replacement of brick infill wall by EPS panel on top floor, use of insulation on ceiling and floor, reduction of infiltration and application of windows glass. Similarly, after energy retrofit, analyses of base frame, frame with infill wall and retrofit frame were studied comparatively based on fundamental time period, Base/story shear and Story displacement taking bare frame as a reference case. The susceptible structural elements – few beams and columns were retrofitted through reinforced concrete (RC) jacketing and fiber reinforced polymer (FRP) jacketing.

Results showed that infill wall and window alternation with change in orientation, size and material type enhances the thermal aspect of the building but affects the strength of the building against the future earthquake. It concluded that if any alternation in an aged building is made to enhance the thermal comfort of the building through passive technique the building must be strengthened.

**Keywords:** Building energy efficiency, Thermal Comfort, Passive retrofit, Simulation, Strengthening.



*Paper number: 62*

## **Improving Physical Properties of Gypsum Stabilized Adobe (Alker)**



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### **ABSTRACT**

Gypsum stabilized adobe, also known as Alker (an acronym for the Turkish terms for gypsum and adobe), is a building material that combines traditional adobe with gypsum to improve the structural strength and durability of the adobe bricks. The addition of gypsum reduces water absorption and increases erosion resistance, making the bricks more suitable for usage in damp and swampy regions. Gypsum stabilized adobe has several other advantages, including being eco - friendly (has a lower environmental impact than many other building materials), shrinks by just 2% compared to typical non-stabilized clay. It is also flexible and can be moulded into different shapes, making it suitable for a wide range of architectural designs. In general Gypsum stabilised adobe is a sustainable building material that has various advantages over ordinary adobe bricks, especially in dry, arid areas. However, there are some challenges associated with using gypsum stabilized adobe, including the need for skilled labour to manufacture the bricks and the potential for higher production costs compared to traditional adobe brick. Furthermore, Alkers physical qualities fall short when compared to alternatives such as reinforced concrete. In favour of enhancing and promoting the use of Alker as a more durable option for construction, fundamental information about its physical qualities had to be investigated. Specifically, flexural, compressive, (thermal and sound) insulation, and moisture permeability properties. This was accomplished by using appropriate testing methods to determine the current properties of Alker, analysing the results to identify areas for improvement and implementing changes to improve these properties. While continuously monitoring and improving these properties over time. The overall objective is to enhance its mechanical, (thermal and sound) insulation qualities and to ensure that Alker can successfully resist moisture. Hence yielding a sustainable and cost-effective alternative for creating earthen structures that function well in a variety of situations.

**Keywords:** Gypsum stabilized adobe, Alker, Physical properties, Sustainable, (Thermal and Sound) insulation, Flexural, Compressive, Moisture permeability properties.

*Paper number: 63*

## **A Summer Internship in Traditional Adobe Building Construction**



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### **ABSTRACT**

In order to leave liveable environments to the future generations, not only durable materials are used in the building production system but also it is necessary to choose environmentally friendly, recyclable, low energy consuming and affordable materials. As it is easy, economical and requires the least energy, adobe materials is one the preferred building materials. But due to the increase in buildings that made with modern materials, adobe buildings, which is one of the traditional materials, decreasing day by day. On this regard, tendency can be increased by raising public awareness. With the required awareness raising, people learned that living in adobe buildings is healthy and they moved towards it. With the awareness raising, it is aimed to teach traditional construction stages to the architecture students during their education life. In this respect, it is important to increasing tendency towards these structures with experiencing adobe building construction during internship periods. During the internship periods construction techniques are learned more accurately through these experiences. For that purpose, the single-storey adobe structure that located on the border of the Güzel Köy Karaçalı road in the Karabaş village of Diyarbakır's Sur district, has become a sample to architecture students of Dicle University about internship experience. The traditional structure that experienced with the is-situ method, has provided a chance for hands-on training to the architecture students outside of the theoretical courses. Awareness is raised about traditional buildings by taking part students in this type of work in architectural education. And this plays an important role in transferring and disseminating these structures to the future.

**Keywords:** Adobe, İnternship, Experience



*Paper number: 64*

## **Kept Alive by Children's Hands Traditional Adobe House Workshop: “Children's Adobe House Workshop” Creating sustainable living spaces for children”**



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### **ABSTRACT**

Day by day, we talk more frequently about the negative conditions affecting the planet we live in, the climate crisis. Most importantly, the reason for this is that we, human beings, see themselves at the top of the ecosystem and act with the idea that resources are unlimited. To date, 108 billion people have lived on our planet and we can still use the resources of our world. Different cultures, different climatic conditions, ancient knowledge and experiences have been transferred from generation to generation through stories, myths, songs, etc., and today we continue our lives by benefiting from them. We want to be the right guide, guide and model for children to raise sustainable generations today and tomorrow and to "live in harmony with nature".

In this sense, we carry out many studies in our School. First of all, we achieve our goal of becoming a zero waste environmentally friendly school, meaning "There is no waste in nature, there is a cycle", by utilizing all the waste around us without harming nature. We produce our own garden soil and grow our own plants. We share our garden with many live animal species. We produce our drawing papers from waste papers.

. We use natural resources. We collect rainwater from the roofs and use solar energy with solar panels.

The publication of "Adobe House - Workshop", one of the natural structures that is indispensable for our living space, was the biggest of our dreams. Today, we wanted to build a natural structure for the new generation of children who watch nature from windows, between four concrete walls in huge buildings in big cities, and who have little time and are separated from nature in tiny parks.

"Tiny Adobe House" in the Natural Garden, which spreads happiness and where children can instantly step in and embrace nature, whether inside or outside.

They are earthen structures that represent the power of nature. Soil was formed by the cooperation of many living and non-living entities during its formation phase that lasted for years. The power of nature appears before us once again. Nature is invincible but renewable. Soil represents life, its breathing and its combination with this beautiful texture connect us to itself. It reminds us that we are part and parcel of nature. Because we, human beings, are a part of nature and we cannot remain separate from it.

Inside that lumpy house, children's voices, laughter, songs come to life again, because it is life itself. During the journey of the construction research process of this Workshop, he was taken to

our teacher Prof. Bilge Işık, who is an expert on very valuable mud brick houses and has a lot of knowledge and experience.

As a result of many consultation meetings, with the support of our valuable teacher, the construction of our Adobe Workshop started in 2023 and was completed in a very short time. A concrete foundation was laid on the floor of our workshop. Since the soil in our region is very clayey, we brought soil from the Istanbul Technical University campus to our school in cooperation with the Metropolitan Municipality. The soil was mixed with lime, plaster mixture and a little water, and wall molds were made using the tamping method. The wooden molds were oiled, and the soil mixture was poured in, and the soil was compacted with each stroke of the tamper. The soil in the mold was left for a few days during the drying phase. Concrete pillars were erected. The molds were removed a few days later. Perfect walls appeared. We completed our workshop in a short time by taking rapid steps.

We provided the opportunity for our children to see every step of the workshop construction phase in person and gain opportunity and experience. We gave our children the opportunity to think about the construction of such a special Adobe House, synthesize information, develop different ideas, and develop their investigative skills. When they grow up, they may find opportunities to take this knowledge further and use it in different fields.

Our Adobe House Workshop has become one of the best examples of natural structures in the Bahçeşehir Region where we live and in our country. Students from different schools and universities visit our school. We hold many events here. Our first event started with the celebration day of the abundance of our country Turkey - “Locally made” special agricultural products. With this example study, it is important to explain and teach us how we can design our own living spaces and live in harmony with nature, starting with small steps.

We want these works to inspire many people and spread synergy for a sustainable World. The world is our home. Our existence depends on his existence. We must be in harmony together. The earlier children start working on natural design, the more they develop a positive awareness of nature. When they become adults, they will respect nature and all living things, prefer to evaluate rather than throw away, and will work to prevent our world from being destroyed by human hands.

Achievements of the project:

- 1.To provide a different perspective in early childhood education.
2. Gaining many experiences by doing and living. To ensure active participation. Taking responsibility. Working collaboratively. Increase your sense of self-confidence.
3. They learned about what nature provides us with, its importance in our lives, that soil provides food and living spaces for us, about working one-on-one with soil, and about adopting the culture of re-evaluation.

Suggestion: To carry out joint project studies with preschool and university students.

**Keywords:** Children's Adobe House, adobe, alker,

The aim of the conference is to gather the findings and knowledge regarding the theme “**Gain Information from the Traditional Earthen Architecture**” and transfer these to the new generation.

Since 1978, Kerpik Network has been conducting research on seismic response and contemporary production techniques of earthen construction. The durability research is based on gypsum stabilized earth (alker); the seismic response research is based on horizontal energy dissipating surfaces on the load bearing walls and additional research has been conducted on production techniques of earthen materials and walls.

**Prof. Dr. Bilge IŞIK**



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