

COMPARING GREEN BUILDING CERTIFICATION SYSTEMS FOR
EVALUATING ADAPTIVE REUSE OF HERITAGE BUILDINGS: THE CASE
OF BOĞAZİÇİ UNIVERSITY GÖZLÜKÜLE RESEARCH CENTER

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ABSTRACT

COMPARING GREEN BUILDING CERTIFICATION SYSTEMS FOR EVALUATING ADAPTIVE REUSE OF HERITAGE BUILDINGS: THE CASE OF BOĞAZİÇİ UNIVERSITY GÖZLÜKULE RESEARCH CENTER

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This study explores the potential for heritage buildings to achieve green building certification through adaptive reuse. The research focuses on four leading certification systems: LEED (United States), BREEAM (United Kingdom), DGNB (Germany) and YeS-TR (Türkiye). The study aims to identify the key strategies and criteria involved in the process of heritage buildings gaining green building certification through a comparative analysis of the Boğaziçi University Gözlükule Research Center building, which has successfully achieved LEED Gold certification. The findings will shed light on how these buildings have met the necessary certification requirements and compare the strengths and limitations of each system. Based on this comparative analysis, recommendations will be provided to develop the YeS-TR certification framework for Türkiye to support sustainable adaptive reuse practices of heritage buildings. This research makes a significant contribution to the field of building science by bridging heritage conservation and green certification and offers a pathway for sustainable redevelopment in the Turkish context.

Keywords: Adaptive Reuse, Heritage Buildings, Green Building Certification System, Sustainability, BOUN Gözlükule Research Center



ÖZ

MİRAS BİNALARIN UYARLANARAK YENİDEN KULLANIMININ DEĞERLENDİRİLMESİ İÇİN YEŞİL BİNA SERTİFİKASYON SİSTEMLERİNİN KARŞILAŞTIRILMASI: BOĞAZİÇİ ÜNİVERSİTESİ GÖZLÜKULE ARAŞTIRMA MERKEZİ ÖRNEĞİ

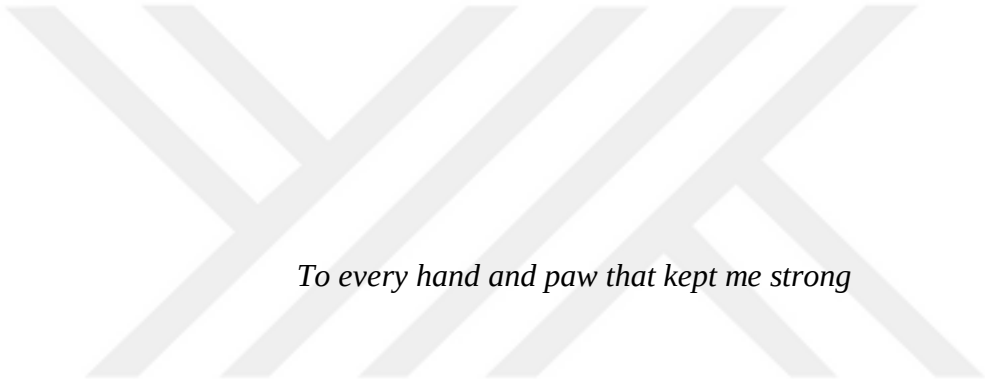
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Bu çalışma, miras yapılarının uyarlanabilir yeniden kullanım yoluyla yeşil bina sertifikası alma potansiyelini araştırmaktadır. Araştırma, önde gelen dört sertifika sistemine odaklanmaktadır: LEED (Amerika Birleşik Devletleri), BREEAM (Birleşik Krallık), DGNB (Almanya) ve YeS-TR (Türkiye). Çalışma, LEED sertifikasını başarıyla kazanmış olan Boğaziçi Üniversitesi Gözlükule Araştırma Merkezi binasının karşılaştırmalı analizi yoluyla, miras binaların yeşil bina sertifikası alma sürecine dahil olan temel stratejileri ve kriterleri belirlemeyi amaçlamaktadır. Bulgular, bu binaların gerekli sertifika gerekliliklerini nasıl karşıladıklarına ışık tutacak ve her bir sistemin güçlü yönlerini ve sınırlamalarını karşılaştıracaktır. Bu karşılaştırmalı analize dayanarak, miras binaların sürdürülebilir uyarlanabilir yeniden kullanım uygulamalarını desteklemek üzere Türkiye için YeS-TR sertifikasyon çerçevesinin geliştirilmesine yönelik öneriler sunulacaktır. Bu araştırma, mirasın korunması ile yeşil sertifikasyon arasında köprü kurarak yapı bilimi alanına katkıda bulunmakta ve Türkiye bağlamında sürdürülebilir yeniden geliştirme için bir yol sunmaktadır.

Anahtar Kelimeler: Uyarlanabilir Yeniden Kullanım, Miras Yapıları, Yeşil Bina
Sertifikasyon Sistemi, Sürdürülebilirlik, BOUN Gözlükule Araştırma Merkezi





To every hand and paw that kept me strong

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LIST OF ABBREVIATIONS

ABBREVIATIONS

LEED	Leadership in Energy and Environmental Design
BREEAM	Building Research Establishment Environmental Assessment Method
DGNB	Deutsche Gesellschaft für Nachhaltiges Bauen
YeS-TR	Türkiye Yeşil Sertifika
BD+C	Building Design + Construction
ID+C	Interior Design + Construction
O+M	Operation + Management
AR	Adaptive Reuse
ICOMOS	International Council on Monuments and Sites
UNESCO	United Nations Educational, Scientific and Cultural Organization
TICCIH	International Committee for the Conservation of the Industrial Heritage
GBCI	Green Business Certification Body
USGBC	US Green Building Council
MPR	Minimum Program Requirement
BOUN	Boğaziçi University
3D	3 Dimensional



CHAPTER 1

INTRODUCTION

At a time of heightened environmental concerns and their impacts on cultural heritage, the adaptive reuse of heritage buildings has emerged as an attractive and highly relevant strategy for sustainable urban development. This approach not only brings historic buildings back to life, but also minimizes the negative environmental impact of new construction. However, the successful integration of green building principles with historic fabric preservation can pose some significant challenges.

Focusing on the leading green building certification systems (LEED (from US), BREEAM (from UK), DGNB (from Germany) and YeS-TR (from Türkiye)), this study examines the characteristics of the Boğaziçi University Gözlükule Research Center, an industrial heritage building that has achieved LEED Gold certification after being adaptive reused, and compares its potential for obtaining other green building certification systems.

1.1 Problem Statement

The increasing climatic-change challenges and concerns of today have prompted an increase in global energy consumption and, consequently, carbon emissions. This situation has also prompted the construction sector, which is largely responsible for these increases, to adopt more sustainable practices (UNEP, 2021). Considering this situation, the concept of adaptive reuse of heritage buildings has emerged as an important strategy that can combine sustainability goals with the preservation of cultural heritage identities. Designing buildings for adaptive reuse not only extends the life of the structures and reduces carbon emissions but also contributes to the conservation of cultural heritage and historical values (Bullen & Love, 2011; Langston et al., 2008). However, green building certification systems designed to

measure sustainable practices in buildings and encourage their implementation have not shown sufficient progress in the adaptive reuse of heritage buildings; they are more suitable for new construction. For example, green building certification systems such as LEED (Leadership in Energy and Environmental Design), BREEAM (Building Research Establishment Environmental Assessment Method), and DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen) are internationally recognized certification systems; however, their evaluation mechanisms are largely based on new construction or simple renovations. This makes it quite challenging for heritage buildings to meet the sustainable technical prerequisites and performance-based criteria within the framework of adaptive reuse. (Elefante, 2007; Yung & Chan, 2012; English Heritage, 2008).

In Türkiye, a national green certification system called YeS-TR (Türkiye Yeşil Sertifika) has been developed to guide and certify buildings in accordance with the sustainability criteria. Like the other international certifications mentioned above, the YeS-TR certification, which is a national certification, does not include special provisions or flexibilities specific to heritage buildings. This deficiency becomes more pronounced and complex in the case of industrial heritage structures that require rigid spatial geometries, have wide openings, use traditional construction materials, and conflict significantly with green building criteria but require legal protection. (Avrami et al., 2019; ICOMOS, 2011).

The award winning and green certified Gözlükule Research Center, located in the Tarsus district of Mersin Province and belonging to Boğaziçi University, can be considered as an important and interesting case study for evaluating issues in certification systems within the framework of its successful applications in terms of both industrial heritage identity and sustainability. The structure, which has served as an industrial storage and cotton ginning (*çır çır*) facility since its initial construction, has been successfully transformed into a research and education center through an adaptive reuse project. The structure, which is the subject of this thesis as a case, combines local materials from the region and passive energy systems with a restoration approach that preserves industrial heritage. Thanks to the success of its

restoration, the building has been awarded the Europa Nostra Award and, although it is not a certification type developed in terms of adaptive reuse or heritage preservation, it has earned the LEED BD+C (New Construction and Major Renovation) Gold certificate within the framework of green buildings. This situation raises concerns about the suitability and functionality of such certifications in the context of heritage preservation.

As is the case with international certifications worldwide, the absence of consideration for the concept of adaptive reuse in Türkiye's green building certification system represents a significant gap that needs to be addressed. If necessary updates or additions are not made within the framework of adaptive reuse for cultural and historical heritage structures, which are significant in numbers in our country, the likelihood of these structures obtaining green building certification will decrease not because they are not designed according to sustainable criteria, but because the evaluation systems are insufficient in understanding and defining the character of heritage structures and the constraints specific to the structure. For this reason, this thesis study focuses on the adaptive reuse strategies of industrial heritage structures at the Gözlükule Excavation Research Center, evaluating their compatibility with international green building certification systems such as LEED(from US), BREEAAM(from UK), and DGNB(from Germany), and to support the efforts of our national certification, YeS-TR (from Türkiye), to achieve sustainability principles specific to heritage structures, and to develop the necessary design principles to enhance the certification's applicability to this end.

1.2 Aim of the Study

The applications of well-established international and national green building certification systems for new buildings such as LEED, BREEAM, DGNB and YeS-TR have not been sufficiently explored in the adaptively reused heritage buildings, which present both a complex challenge and opportunity when it comes to integrating sustainability with historic preservation. This research aims to identify

strategies on how green building certification systems can be applied to the adaptive reuse of heritage buildings and how Türkiye's certification system can be improved to better support these projects.

1.3 Research Questions

1. What challenges exist in achieving LEED, BREEAM, DGNB, and YeS-TR green building certification systems after adaptive reuse of heritage buildings?
2. Which common sustainable strategies should be prioritized in achieving LEED, BREEAM, DGNB, and YeS-TR green building certification systems after adaptive reuse of heritage buildings?
3. To what extent can the sustainability-focused provisions found in LEED, BREEAM, and DGNB certifications, which can also be used for the adaptive reuse of heritage buildings, be adapted to Türkiye's certification system YeS-TR?
4. What are the shortcomings or limitations of Türkiye's certification system, YeS-TR, in supporting adaptive reuse projects for heritage buildings?
5. How can experiences gained from international systems be utilized to improve the performance of the YeS-TR certification in this regard?

1.4 Hypotheses

- Adaptive reuse projects for industrial heritage buildings can successfully obtain certification by integrating sustainable strategies specific to heritage building into green building certification systems such as LEED, BREEAM, DGNB, and YeS-TR.
- The integration of some basic strategies that can also be applied to historic buildings by LEED, BREEAM, and DGNB into the YeS-TR certification

system could increase the system's applicability and effectiveness in supporting the sustainable adaptive reuse of heritage buildings in Türkiye.

1.5 Research Methodology

This study focuses on the evaluation of sustainability interventions alongside heritage values following the adaptive reuse project of the Boğaziçi University Gözlükule Research Center, which has been awarded LEED Gold certification and the Europa Nostra Award. Within this scope, the adaptability of international and national green building certification systems (LEED, BREEAM, DGNB, and YeS-TR) to heritage structures has been evaluated.

In the first phase of the study, informations about the award-winning case study was collected from the architect of the building(Architect Saadet Sayın), Boğaziçi University, which is the owner of the building, and site visits. Restoration project documents, types of materials used in the building, and passive and active energy and water system applications were analyzed in detail. In this context, the heritage values of the structure and sustainable green interventions were also examined through technical drawings, photographs, and project reports submitted to the LEED certification team.

In the second phase, all the data obtained was evaluated, and the building was scored according to the relevant criteria of each of the four green building certification systems covered by the thesis. This evaluation was carried out to reveal the strengths and weaknesses of the building in terms of both the preservation of its heritage values and sustainability criteria. The findings of the study were presented with graphical tables and comparative explanations, and the relevant credit areas that could be met under each green building certification system were identified. In conclusion, the flexibilities and challenges associated with certifying existing heritage buildings under the four relevant certifications have been compared, and recommendations

have been developed to enhance the YeS-TR certification system, which is Türkiye's national certification system.

1.6 Disposition

This thesis study consists of five chapters.

In the first chapter of thesis which is Introduction, general arguments, aim and scope of the study, research questions, and objectives explained detailly.

In the second chapter of thesis which is Literature Review, detailed definitions of all concepts needed to understand the concept of adaptive reuse in heritage buildings and emphasizes the importance and potential of existing heritage structures from the perspective of sustainable architecture. Concurrently, a detailed examination of three international (LEED, BREEAM, DGNB) and one national (YeS-TR) green building certification systems are examined in detail, and the structure, focus points, and scoring systems of each system are explained.

In the third chapter which is Material and Method, the materials and methods used in the thesis research are summarized. In this context, the main subject of the thesis, the BOUN Gözlükule Research Center case, is examined in detail in terms of the building's location, historical significance, and architectural features, the restoration of the building's structural and architectural interventions, and the improvements and interventions made in terms of green interventions.

The fourth chapter which is Evaluation, the data collected as a result of the case study evaluation is explained through graphs and tables, and the results are presented. In addition, a discussion specific to the results of the study is also included in this section.

The fifth and last chapter which is Conclusion, conclusions and recommendations are presented.

CHAPTER 2

LITERATURE REVIEW

2.1 Adaptive Reuse

The term “adaptation”, defined as the act or process of adapting, is originates from the Latin word “adaptare,” meaning “to adapt,” and the prefix “ad,” indicating the direction of movement. (Douglas, 2006) The process of Adaptive Reuse (AR) is the modification and transformation a building to make it compatible with the needs of new or existing occupants (Latham, 2000; Wilkinson et al., 2009).

“Conversion” term, as proposed by Douglas, refers to the process of evaluating the transformation of one type of use into another and adapting the new function to fit the existing building. It describes functional changes such as converting an office building into a residential building (Douglas, 2006).

The term “renovation,” as defined by Giebeler et al., refers to the process of bringing a building up to current standards. It is typically applied to the energy performance of an existing building (Giebeler, Krause, & Fisch, 2009).

Table 1 shows different definitions of these terms in relation to adaptive reuse in literature.

Table 1. Different definitions of terms related to adaptive reuse, in literature.

<i>Terms</i>	<i>Definitions</i>	<i>Author / Book</i>
Adaptation	To modify a structure to make it suitable for its proposed new use.	Icomos New Zealand, 2010
Conversion	Work involving a change in function or use, such as the conversion of a building used as an office into a residential building.	(Watson, 2009)
Extension	The act of extending the capacity of a building vertically or horizontally.	(Douglas, 2006)
Refurbishment	Meaning of refurbishment a building is bringing it up to current standards due to changes in user requirements or new technical regulations.	(Giebeler, Krause, & Fisch, 2009)
Rehabilitation	Rehabilitation is the action or process of ensuring that a property is used in a manner consistent with its historical, cultural, or architectural value through repair, alteration, and additions.	United States Secretary of Interior 1995
Renovation	Renovation preserves the functionality and value of an existing building by applying appropriate maintenance techniques rather than adding new architectural elements.	(Giebeler, Krause, & Fisch, 2009)

Although applying new uses to old buildings is not a novel one in the academic literature, the term Adaptive Reuse (AR) first emerged in the 21st century (Cohen & Robbins, 2011). Converting the existing functions of buildings to other functions may require significant changes in the interior layout and the provision of new or improved services. Adaptive reuse does not only encompass large-scale changes; it may also require small-scale restoration work, and the building's primary functional use may remain unchanged. However, adaptive reuse process of historic buildings not only preserves the building itself but also safeguards the efforts, skills, and dedication of the original designers (Love and Bullen, 2009). Additionally, adaptive reuse process preserves the architectural, social, cultural, and historical values of the

structure in question (Latham, 2000). The concept of adaptive reuse of historic buildings is addressed in various internationally recognized regulations, such as the ICOMOS Burra Charter and the UNESCO Historic Urban Landscape Recommendation (Truscott, 2014).

The adaptative reuse of historic buildings, and the consideration of sustainability values during the functional transformation of abandoned existing structures, is of great importance. (Wang & Liu, 2021) Adaptive reuse can also be defined as the process of converting existing buildings into new uses that are economically viable. In this process, structures whose functions are altered and repurposed can include various options such as residential (Petković-Grozdanovića et al., 2016), institutional (Wang & Liu, 2021), commercial (Wilkinson & James, 2011), and museum (Elsorady, 2014) uses. In particular, structures whose function is transformed into a structure with cultural value (library, museum, art gallery, etc.) are recognized as an important method of urban sustainable transformation (Niemczewska, 2021).

2.2 Sustainability

The word sustainability, derived from the roots sus– (under) + tenere (to hold), means to maintain and protect or extend the duration of existence. (Lacroix & Stamatiou, 2007 refers to Bourg, 2002) Sustainability, defined as maintaining the ability to continue while ensuring productivity and diversity, is a concept that was firstly introduced in the 1987 report titled “Our Common Future” published by the World Commission on Environment and Development, which operates under the United Nations. It is defined as development that meets the needs and expectations of the present without compromising the ability of future generations to meet their own needs and expectations. (The Brundtland Commission, 1987) If we examine the concepts of sustainable architecture and green architecture in a broader sense, the aim of sustainable architecture is minimizing the negative environmental impacts of structures while increasing efficiency in the use of materials, energy, and resources. (Lacroix & Stamatiou, 2007 refers to Ducroux, 2002)

Architectural sustainability is a concept directly related to the terms “green architecture” or “green building” (Lacroix & Stamatiou, 2007 refers to Erkman, 1998) yet these two terms are often used interchangeably (Lacroix & Stamatiou, 2007 refers to Jancovici, 2002) when referring to structures designed with environmental goals in mind, regardless of their actual function.(Lacroix & Stamatiou, 2007 refers to Jolliver, 2001)

According to (Sachanowicz, 2020), the most important characteristics of sustainable buildings, which emerged with the concept of sustainable architecture, are listed below.

- Sustainable buildings not only preserve the structure, scale, and materials of their surroundings but also contribute to their development.
- Sustainable buildings are structures that have social and cultural value.
- Sustainable buildings are structures that can easily adapt to uses other than their original intended use.
- Sustainable buildings are flexible and adaptable structures.
- Sustainable buildings are resource-efficient structures that avoid material and energy waste.
- Sustainable buildings are structures with a lifespan of over 100 years.

2.3 Industrial Heritage Buildings

In the initial period of the 19th century, industrial enterprises, which were symbols of social and economic development and power, became abandoned and neglected structures, especially after the de-industrialization process in Europe (Vizzarri et al., 2021). As a result, many factories were closed down and numerous industrial facilities were abandoned. The concept that industrial architecture constitutes a heritage worth preserving was first introduced in the 1970s by UNESCO, ICOMOS,

and TICCIH (International Committee for the Conservation of the Industrial Heritage).

Industrial buildings are generally characterized by their large size and single-story structure, and due to their spacious open areas and volume, some industrial buildings can be easily converted into conference centers, museums, or libraries. However, the adaptative reuse of industrial buildings also brings with it numerous challenges encountered when converting them into smaller-scale residential or office spaces. Since size and current condition are crucial factors for the adaptation and reuse of these spaces, structures are more often converted into large-scale functions such as museums, conference halls, restaurants, etc. (Douglas, 2006).

As a developing country, Türkiye's transition from an agriculture-based economy to an industry-based economy has been slower than that of other countries. Industrialization, which began in the 1950s with the Marshall Plan, resulted in the construction of numerous industrial structures in the cities of Istanbul, Ankara, and Izmir, which were the main centers of industrialization for many years (Dedekarginoğlu, 2016). Many of these industrial buildings, whether still in use or abandoned, hold significant importance as documents of the early republican era's architecture. The idea of preserving and repurposing industrial structures in Türkiye emerged in the 1990s with the advent of the notion of the concept of “industrial heritage” and the growing pressure to protect industrial buildings in this direction. (Dedekarginoğlu, 2016)

2.4 Green Building Certification Systems

The advent of the industrial revolution, accompanied by the rapid evolution of technology, the need to control energy consumption has arisen with problems such as global warming, climatic challenges and depletion of energy resources. Since buildings consume a large portion of the world's energy, energy certification systems

have gained importance today. Among these, BREEAM from the UK, LEED from USA, DGNB from Germany and YeS-TR from Türkiye stand out.

In Table 2 below, you can see the criteria required for green building certification systems to be gained after adaptively reused heritage buildings and the criterias of the certification specific to these relevant criteria.

Table 2. Categorisation of Green Building Certification systems in terms of Heritage Buildings

CATEGORIES & SUBCATEGORIES		BREEAM	LEED	DGNB	YeS-TR
ENERGY	Energy Efficiency		EAc3		IBD 04 C4
	Reducing energy use and carbon emissions	ENE 01	EAp1		
	Energy efficient equipment	ENE 08			
	Energy efficient laboratory systems	ENE 07			
	Low carbon Design	ENE 04	IPp3		
	Energy Monitoring	ENE 02			IBD 02 C14
	Renewable Energy		EAc4		EUE 02 C1 / EUE 02 C2
	Preliminary research/analysis on energy and evaluation of possible strategies				IBD 02 C2
WATER	Enhanced Water Efficiency		WEc2		
	Rainwater Management		SSc3		WWM 01 C5
	Water Consumption	WAT01			IBD 04 C4
	Water Monitoring / Metering	WAT02	WEc1		WWM 01 C3
	Water Leak Detection	WAT03	WEc1		WWM 01 C2
	Water Efficient Equipment and Fittings	WAT04			WWM 01 C1
	Preliminary research/analysis on water and evaluation of possible strategies				IBD 02 C3
	Wastewater reuse (grey water)				WWM 01 C6
MATERIALS	Low Environmental Impact of Materials	MAT01	MRC3	ENV1.1	BMLC 01 C1
	Responsible Sourcing of Construction Products	MAT03			
	Designing for Durability & Resilience	MAT05			
	Usage of local resources				BMLC 05 C1
	Usage of recovered materials				BMLC 06 C1
	Use of products with recycling content			TEC1.6	BMLC 06 C3

Table 3. Continued

MATERIALS	Planning the process of separation of the material from the building after the end of the building life				BMLC 06 C4
	Material Efficiency	MAT06			
WASTE	Construction Waste Management	WST01			
	Recycled Aggregates	WST02			
	Adaptation to Climate Change	WST05			
	Separation of wastes on site, collection in appropriate places and volumes		MRC5		WWM 02 C2
SITE & ECOLOGY	Minimising impact on existing site ecology	LE 03		ENV1.2	IBD 04 C5
	Protection of Ecological Features	LE 02			
	Electrical Vehicles		LTc5		
	Accessible Outdoor Space		SSc2		
	Heat Island Reduction		SSc5		
	Light Pollution Reduction	POL 04	SSc6		
	Reduction of Noise Pollution	POL 05			
INDOOR ENVIRONMENT QUALITY	Thermal Comfort	HEA 04		SOC1.1	IEQ 03 C1
	Indoor Air Quality	HEA 02	EQc1	SOC1.2	IEQ 04 C1
	Acoustic Comfort	HEA 05	TEC1.2	SOC1.3	IEQ 02 All Credits
	Visual Comfort	HEA 01		SOC1.4	IEQ 01 C5 / IEQ 01 C6 / IEQ 01 C7
	Occupant Experience		EQc2	SOC1.5	
MANAGEMENT	Life Cycle cost and service life planning	MAN 02	ECO 1.1	ENV1.1	BMLC 01 C1
TECHNICAL	Fire Safety			TEC1.1	IBD 02 C10
INNOVATION	Innovative value in Green Building Certification	INN 01			INNO 01 C1

2.4.1 BREEAM (Building Research Establishment Environmental Assessment Method)

In 1990, the firstly established green building certification system which was recognized as the most trusted certification system today was developed (Uruk & Külünkoğlu İslamoğlu, 2019) in the UK by BRE and was called the Building Research Establishment Environmental Assessment Method (BREEAM). BREEAM certification is an assessment system that evaluates the impacts of the buildings on environment by determining sustainability criteria. (Cole & Valdebenito, 2013) It can be said that the main purpose of the BREEAM Certification system is to encourage buildings to use innovative sustainable solutions by creating measurement criteria above the existing regulations.(Roderick et al., 2009)

The BREEAM Certification system, which stands out with its features that can be adapted to current changes, updated according to environmental policies and its alignment with local conditions, is classified in numerous categories depending on to the intended use of the building and countries, showing that this system aims to adapt to different local conditions and standards (Figure 1 & Table 3). (Uruk & Külünkoğlu İslamoğlu, 2019) In addition, BREEAM certification has played crucial role in facilitating the adaptation of other countries to this system, as it organizes its criteria in the energy field in accordance with European energy performance measurements.(Roderick et al., 2009)

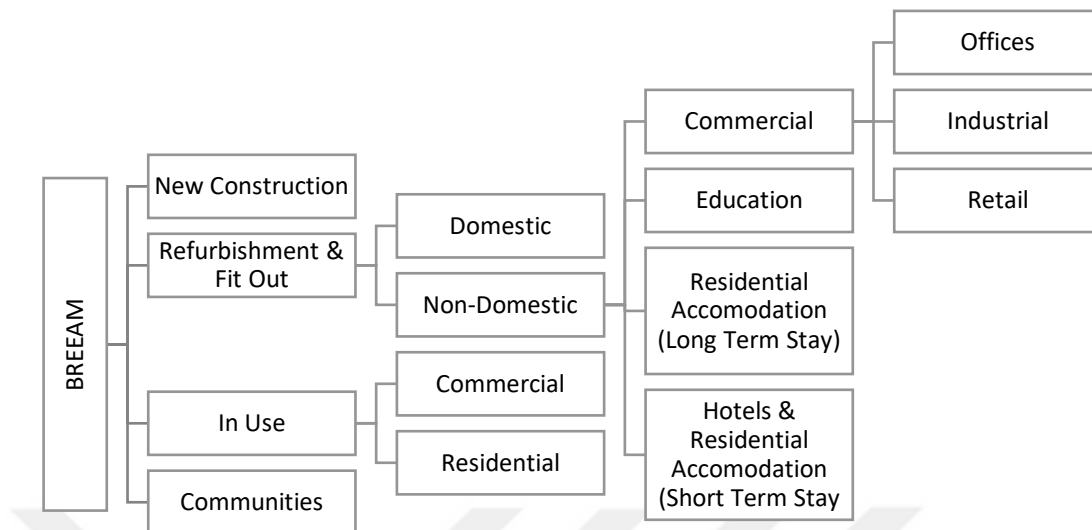


Figure 1. Categories of the BREEAM Green Building Certification System (Source: BREEAM,2024)

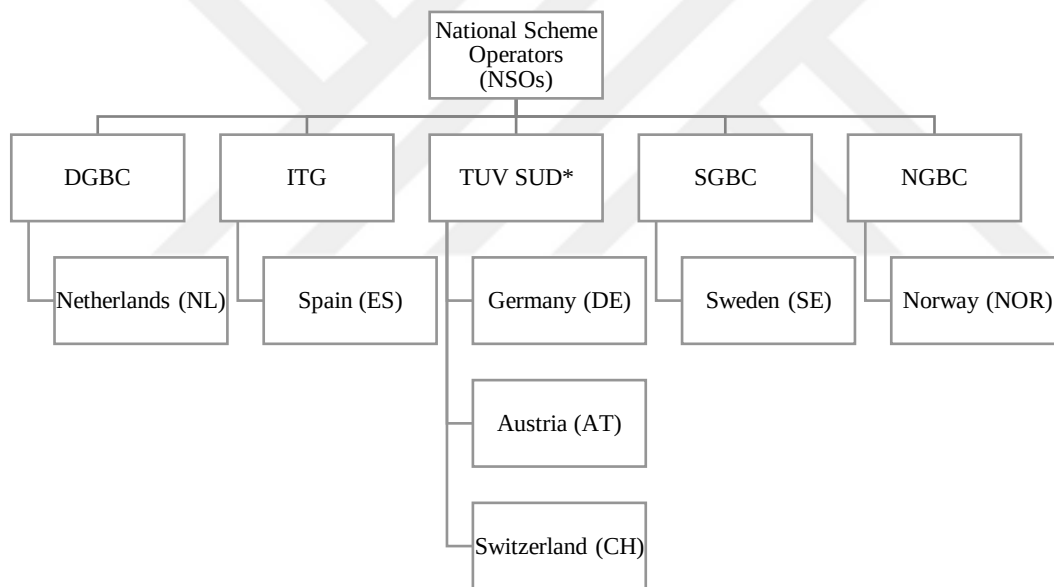
Table 4. Variations of the BREEAM Green Building Certification System in the UK and other European Countries

	<i>New Construction</i>	<i>Refurbishment & Fit-Out</i>	<i>In-Use</i>	<i>Communities</i>
<i>UK</i>	BREEAM	BREEAM	BREEAM	BREEAM
<i>Netherlands</i>	BREEAM NL	BREEAM NL	BREEAM NL	BREEAM NL
<i>Spain</i>	BREEAM ES	BREEAM ES	BREEAM ES	BREEAM ES
<i>Norway</i>	BREEAM NOR	BREEAM NOR / BREEAM International*	BREEAM International*	BREEAM International*
<i>Austria</i>	BREEAM AT	BREEAM International*	BREEAM AT	BREEAM International*
<i>Germany</i>	BREEAM DE	BREEAM International*	BREEAM DE	BREEAM International*
<i>Switzerland</i>	BREEAM International*	BREEAM International*	BREEAM CH	BREEAM International*
<i>Sweden</i>	BREEAM SE	BREEAM SE /BREEAM International*	BREEAM International*	BREEAM International*

*BREEAM International is also used in countries besides those listed above

National Scheme Operators (NSOs) shown in Figure 2, are organizations that operate country-specific BREEAM schemes adapted under the BREEAM license, partner with the certification, help to deliver certification and improve sustainability around the world:

- Local knowledge: industry knowledge and understanding that can only be obtained through engagement with the local environment
- Market presence: a well-established itself and respected entity within the company with a good position in the sustainability and construction sectors.
- Local stakeholder engagement: The possession of a network of contacts within the industry that can provide invaluable guidance on the development and direction of BREEAM. (BREEAM, 2024)



DGBC: Dutch Green Building Council

ITG: Instituto Tecnológico de Galicia

TUV: Technischer Überwachungsverein (Technical Inspection Association)

SUD: Süddeutschland (Southern Germany)

SGBC: Sweden Green Building Council

NGBC: Norwegian Green Building Council

Figure 2. National Scheme Operators (NSOs) of BREEAM
(Source:BREEAM,2024)

The Refurbishment & Fit-out certificate from BREEAM certification systems would be a suitable option for adaptively reused heritage buildings. In the context of evaluating heritage buildings is understood to encompass any buildings or monuments that are formally listed and protected under international, national or local legislation and therefore are subject to local planning, including buildings located in a heritage conservation area. As any intervention in such buildings will require authorization from the relevant local, national or international historic buildings authorities such as UNESCO, etc., there are compliance notes that should be consulted when assessing a historic building. (BREEAM, 2015)

BREEAM certification can also be used to assess newly constructed extensions to existing buildings. The choice of scheme varies depending on the scope of the new build and refurbishment works and there are several options for assessment and certification, as follows:

1. The new building extension can be included as part of the BREEAM Refurbishment and Fit-out assessment under the following conditions
 - a) Where the original building area is less than 500m² and the new addition to the building is less than 40% of the original building area
 - b) Where the original building area is greater than 500m² but less than 2500m² and the new extension is less than 30% of the original building area
 - c) Where the original building is larger than 2500m² and the new extension is not more than 20% of the original building area
2. Where new building additions are above these thresholds, two different options are available, as described below:
 - Option 1: Obtain two separate certificates and ratings, BREEAM International New Construction for new additions and BREEAM International Renovation and Refurbishment for renovated parts of the building
 - Option 2: The building is certified and rated under the BREEAM International Bespoke New Construction and Renovation and Refurbishment and Fit-out certificate, with both the new additions and the renovated parts being certified and

rated under a single certificate. (BREEAM International Non-Domestic Refurbishment 2015, Technical Manual)

The BREEAM Refurbishment & Fit-out certification system is designed to have a total of 10 main headings, as shown in Table 4; Management 21 points, Health and Wellbeing 21 points, Energy 35 points, Transportation 13 points, Water 9 points, Materials 12 points, Waste 11 points, Land Use and Ecology 4 points, Pollution 14 points and Innovation 10 points. It is a prerequisite to score the required points to reach 150 points in total. (Uruk & Külünkoğlu İslamoğlu, 2019) (Figure 3)

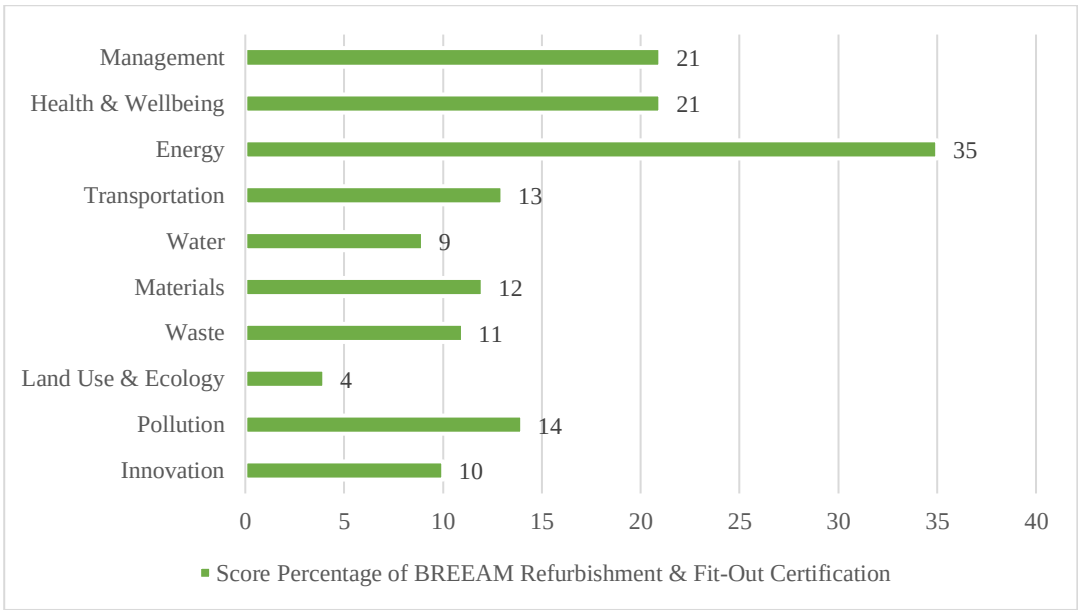


Figure 3 Score Percentage of BREEAM Refurbishment & Fit-Out Certification
(Source: BREEAM,2024)

The detailed point system of BREEAM Refurbishment & Fit-Out Certification system is presented in the Appendix B

The obligation for the designer of the building to work with the BREEAM official, which has been developed in order to ensure adaptation of the projects applying to the BREEAM Certification System from outside the UK to the certification system, is the goal of the BREEAM certification system to provide the project with a green building certificate as soon as possible. The scores of the buildings according to the

criteria of the BREEAM certificate, which has 5 different certification classes (Table 4), are evaluated and accordingly, it is determined whether they are entitled to certificates with a validity of 3 years (Figure 4). The buildings that are entitled to the certificate are required to apply to the certification system again after the completion of 3 years and update their certificates. (Uruk & Külünkoğlu İslamoğlu, 2019)

Table 5. BREEAM Rating Benchmarks

BREEAM Rating	% Score
OUTSTANDING	≥ 85
EXCELLENT	≥ 70
VERY GOOD	≥ 55
GOOD	≥ 45
PASS	≥ 30
UNCLASSIFIED	< 30



Figure 4. BREEAM Certification Process (Prepared by the author according to (Cenk & Öztürk, 2024))

2.4.2 LEED (Leadership in Energy & Environmental Design)

Leadership in Energy & Environmental Design (LEED), which is a green building certification from the USA, for rating the most recognized and preferred environmentally friendly buildings in Türkiye and in the world. The LEED certificate is issued by GBCI (Green Business Certification Body), and was created by the US Green Building Council (USGBC) in 1998; ever since it has been successfully implemented in 165 countries. The purpose of the LEED certification system is to provide a basis for all individuals and organizations involved in the building sector to create highly efficient, healthy and cost-effective environmentally friendly buildings by drawing their attention to environmental values. The fact that there is no obligation to work with an official as in the BREEAM certification system and that it is possible to apply for certification after both the design and construction phases, are the main reasons why the LEED certification system is preferred. (URL-1)

As shown in Figure 5, the LEED green building certification system covers all processes from the selection of the project site to the final completion of construction in existing buildings that have been in use for at least 1 year for Operation and Maintenance (O+M); Building Design + Construction (BD+C) for new projects with different functions such as Office, Hotel, School, Core and Shell, Data Center, Hospital Warehouse and Interior Design and Construction (ID+C) for commercial interior projects. (URL-2)

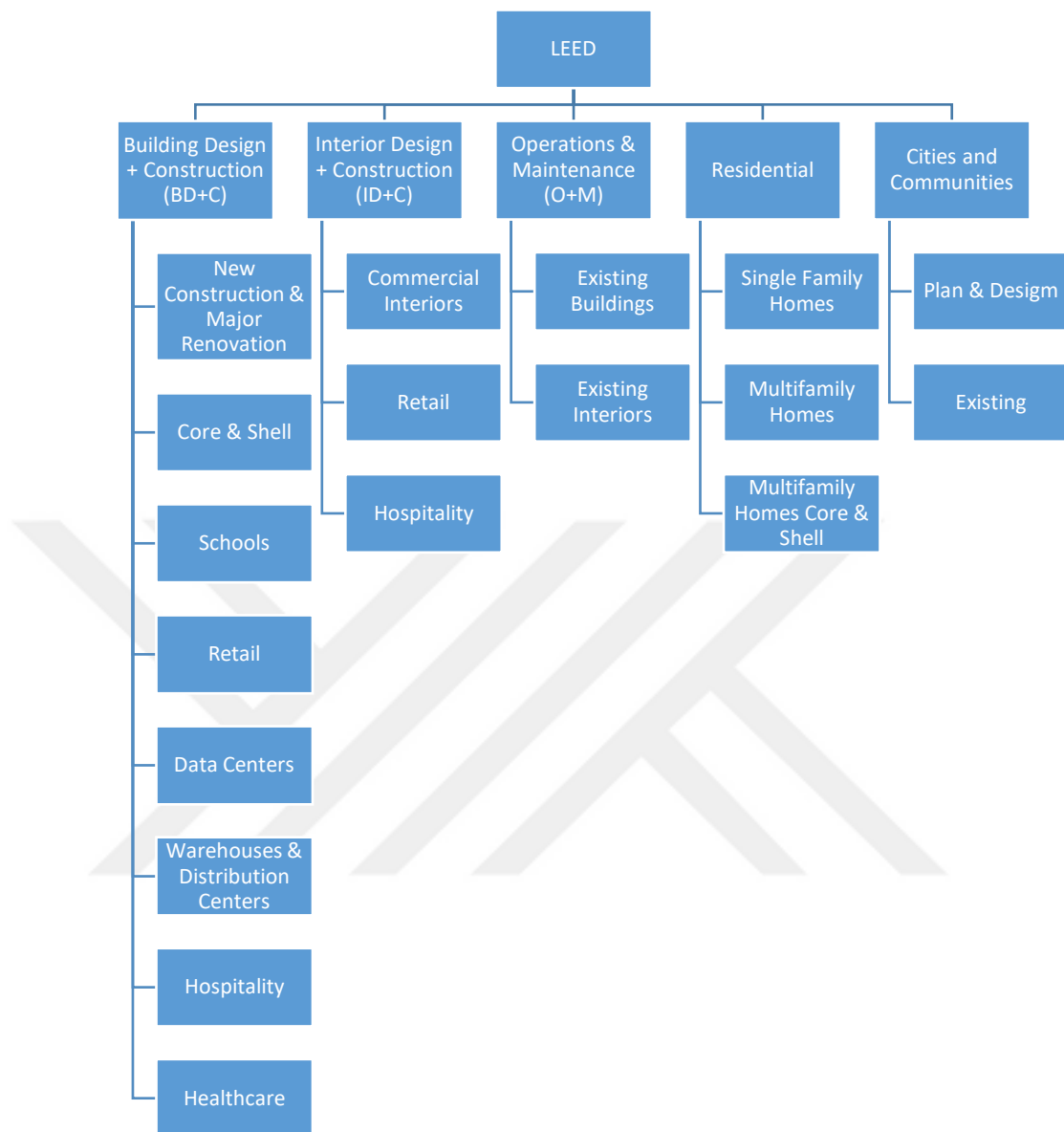


Figure 5. LEED Certification System Categories (Source: URL-3)

Before enrolling in the LEED certification system, projects are required to meet Minimum Program Requirements (MPR), which have three main objectives: to protect the integrity of the LEED certification program, to reduce complications that may arise in the LEED certification process (Figure 6), and to provide guidance to clients. According to the Minimum Program Requirements, MPR1: The Building to

be certified must not be relocated, MPR2: It must have an acceptable project area and boundary, and MPR3: The project must comply with dimensional requirements (LEED BD+C and O+M Certification Systems and LEED ID+C Certification Systems). Buildings that do not meet the prerequisites are not eligible for certification. (URL-3)



Figure 6. LEED Certification Process (Prepared by the author according to (Cenk & Öztürk, 2024))

For LEED Building Design + Construction (BD+C): New Construction & Major Renovation green building certification, the building must meet all prerequisites and earn a minimum of 110 points under in 8 categories (Figure 7). The detailed version of this summary is presented in Appendix C.

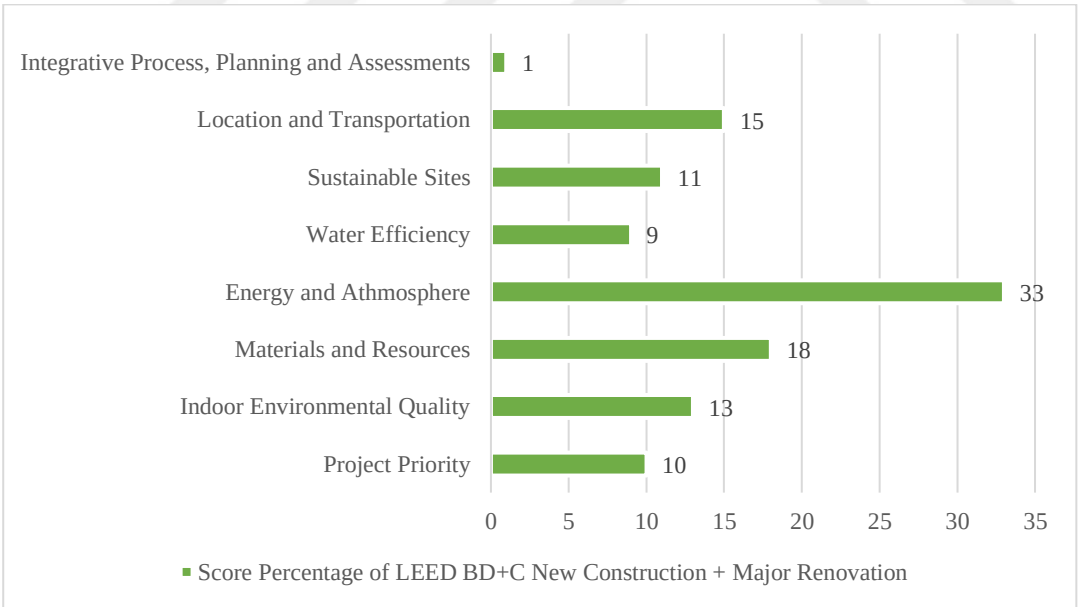


Figure 7. Sub-categories of the LEED V5 Building Design + Construction: New Construction & Major Renovation Certification System System Score Percentages (Source: URL-4)

In the LEED certification system, there are four different certification levels as shown in Table 5; according to the scores obtained by the building and as a result of the points given by the authorized organization GBCI, the building that meets all the prerequisites is entitled to the certificate at the level corresponding to the score it receives. (USGBC, 2023)

Table 6. LEED Rating Benchmarks

LEED Rating	Point Score
Certified	40-49 points
Silver	50-59 points
Gold	60-79 points
Platinum	80-110 points

2.4.3 DGNB (Deutsche Gesellschaft für Nachhaltiges Bauen)

DGNB stands for German Sustainable Building Council is an independent non-profit association that was founded in 2007 and has developed into Europe's largest network for sustainable building. The DGNB energy certification system, which aims to develop innovative materials for sustainability, manage the construction and operation process of construction, solve problems, provide a quality label for buildings, use resources efficiently and create infrastructure suitable for user comfort and well-being, has developed the energy certification system, which was launched in 2009 for general office use and administrative use, into an international system in 2010. (DGNB, 2022)

In order to assess and present the sustainability of one or more buildings in as differentiated a manner as possible, the DGNB system evaluates buildings and districts at different stages of their life cycle according to multiple criteria from a total of six thematic areas (DGNB, 2022)(Figure 8).



Figure 8. Thematic Areas of DGNB for New Constructions (Source: DGNB, 2022)

The criteria and thematic areas are weighted differently depending on whether the project to be certified is a new building, a building in use, an existing building, a renovation project, an interior design, a deconstruction, a construction site or an entire city district, and on the type of system it corresponds to (e.g., an office building; as given in Figure 9. (DGNB, 2022)

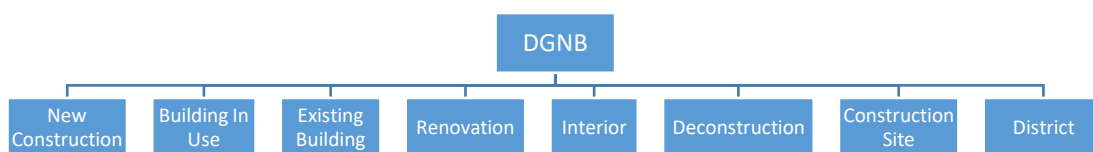


Figure 9. Categories of the DGNB Certification System (Source: DGNB, 2022)

The Renovation category from DGNB certification systems would be a suitable option for adaptive reuse of heritage buildings. A minimum requirement of the certification is to conduct an inventory as a basis for planning to ensure appropriate

treatment of the existing building and to avoid unnecessary demolition. In addition, the certification supports resource-conserving remediation of pollutants. Measures to strengthen the recycling economy are rewarded with bonus points in a variety of ways. The unsealing of surfaces and the preservation of biodiversity are also promoted with a view to conserving resources. The certification also takes into account the special requirements of listed buildings. At the same time, a holistic understanding of sustainability certification focuses on people and their needs for health and comfort, as well as the long-term economic viability of the building projects (Figure 10).

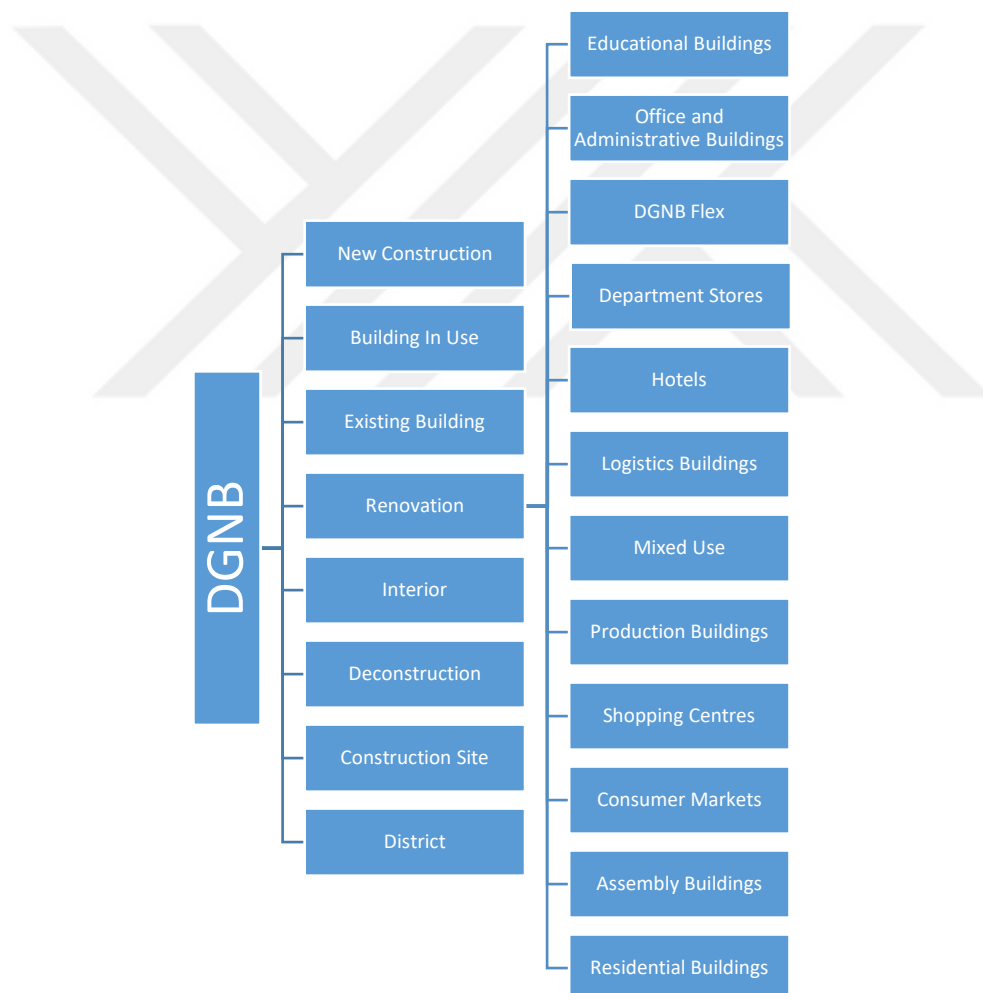


Figure 10. Subcategories of DGNB Certification (Source: DGNB, 2022)

The DGNB system, which differs from other international certification systems due to its emphasis on life cycle assessment, holistic approach and performance orientation, can provide worldwide certification as it can be easily applied to the climatic, cultural and regulatory characteristics of other countries. (DGNB, 2022)

The DGNB certificate, which is given in two stages, is first given as a preliminary certificate during the design phase and then the final certificate is given after the building is completed (see Figure 11). Thus, it is ensured that sustainability-oriented optimization is optimized from the design stage and official records of this process are created. (Doğan et al., 2018)



Figure 11. DGNB Certification Process (Produced by the author according to (Cenk & Öztürk, 2024))

The DGNB Renovation certification system is designed to have a total of 6 main headings, as shown in Figure 12. In the context of quality, buildings evaluated according to these criteria, which are classified under the headings of environmental, technical, process, sociocultural, economic, functional and land/region/region, are graded according to four different certification levels. In the DGNB certification system, 35-49 points is designated as Bronze, 50-64 points as Silver, 65-79 points as Gold and over 80 points is awarded Platinum; as listed in Figure 13 (Doğan et al., 2018)

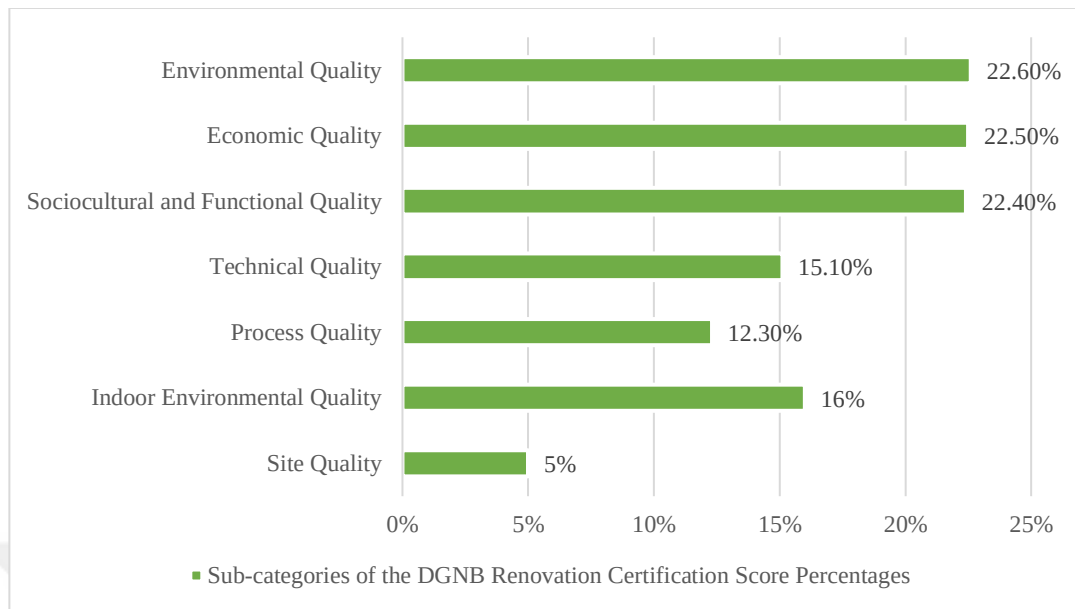


Figure 12. Sub-categories of the DGNB Renovation Certification System Score Percentages (Source: DGNB, 2022)

	 Platinum	 Gold	 Silver	 Bronze*
Total performance index	80% and higher	65% and higher	50% and higher	35% and higher
Minimum performance index	65%	50%	35%	-- %

* This award only applies to certification of existing buildings/the Buildings in Use certificate.

Figure 13. Certification Levels of DGNB Certification Systems (Source: DGNB,2022)

The detailed version of this summary is presented in the Appendix D

2.4.4 YeS-TR (Türkiye Yeşil Sertifika)

The Yeşil Sertifika Sistemi (Green Certification System) of Türkiye called Yes-TR, which was initiated by the Ministry of Environment and Urbanization of the Republic of Türkiye with the publication of the 'Regulation on the Certification of Sustainable Green Buildings and Sustainable Settlements' in the Official Gazette No. 29199 in 2014 in order to encourage energy efficient, environmentally friendly building and settlement practices at national and local levels. It is involved in the evaluation and certification of buildings and settlements that are suitable for climate data and the region, consume as much energy and water as they need, and use renewable energy resources. (Kiliçarslan et al., 2019) The objectives of the certification system are stated in the guideline that sets out the duties and qualifications of the green certification experts responsible for this process and sets out the performance criteria and percentages for the certification of buildings (Cenk & Öztürk, 2024)

YeS-TR Certificate is valid for both existing and new buildings and can be obtained for Housing Projects, Hotels, Offices, Factories, Shopping Centers, Health Buildings and other types of buildings. (Figure 14) (URL-5)

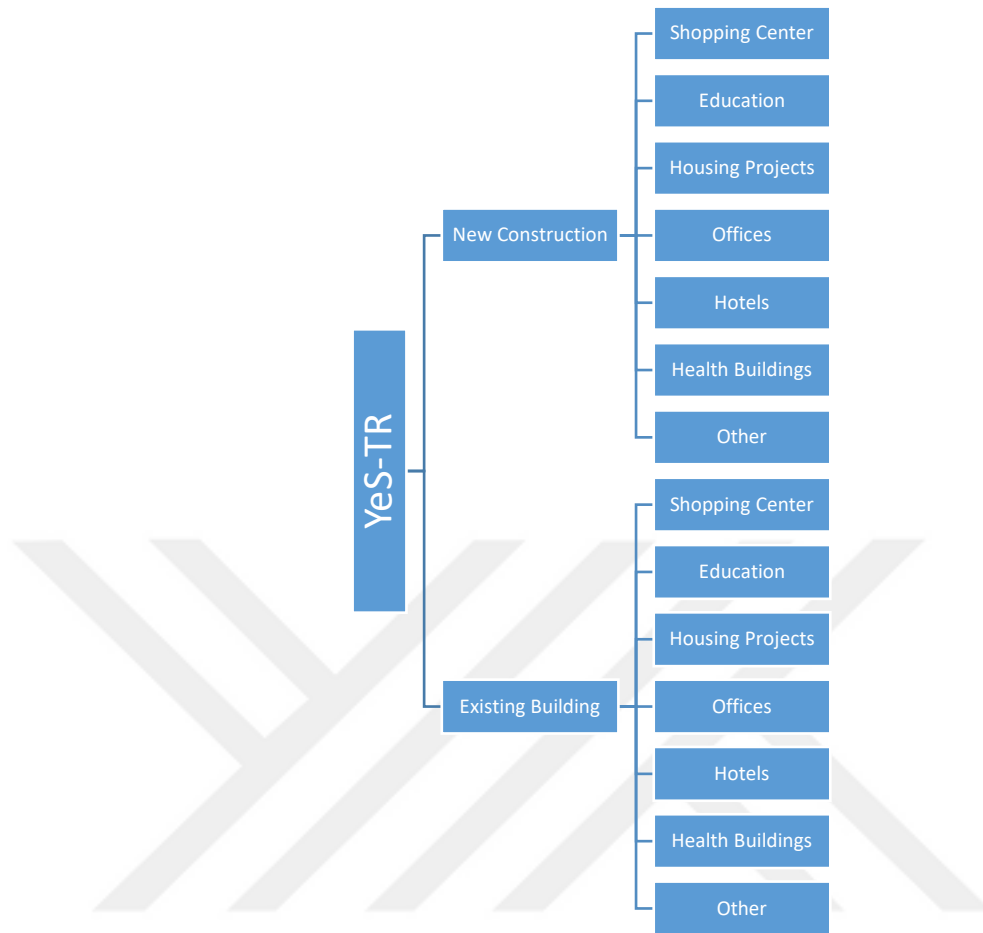


Figure 14. YeS-TR Certification System Categories according to URL-5

The first step in the assessment of buildings completed in three steps according to the YeS-TR certification system is Planning and Design, which is the preliminary step where the necessary permits and procedures for grading are completed before construction begins. The second step, Construction/Development, is the proof of completion of 50-75% of the development area and fulfillment of permits. The final step Post Construction/Post Development, can be characterized by 100% completion of construction. In order for buildings to be rated with the YeS-TR certificate, it is necessary to register in the system, upload the necessary information and documents and be evaluated by experts. (Cenk & Öztürk, 2024)(Figure 15)

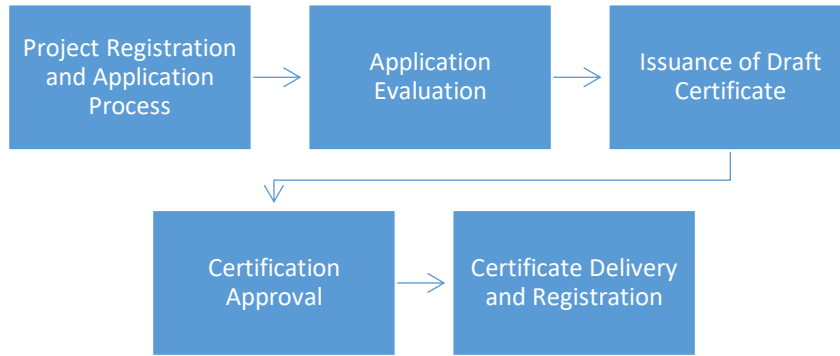


Figure 15. YeS-TR Certification Process (Prepared by the author according to (Cenk & Öztürk, 2024))

Green Certificate degrees are determined according to the total amount of credits to accumulate a maximum of 100 credit points for each module. The credits obtained in each module are multiplied by the weighting coefficients that the relevant modules differ by building type to arrive at the total weighted credits. The total weighted credits required for grading are obtained by summing the weighted credits obtained for the modules. The weighting coefficients and total weighted credits of the modules for new and existing buildings differ and are presented in Table 6 and Table 7. (YeS-TR, 2021)

Table 7. Coefficient and credit distribution for New Buildings by building type

NEW BUILDING	HOUSING		OFFICE		EDUCATION		HOTEL		HEALTH		SHOPPING CENTER		OTHER	
	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS
IBD	0.15	15	0.14	14	0.14	14	0.13	13	0.13	13	0.14	14	0.14	14
BMLC	0.16	16	0.16	16	0.16	16	0.16	16	0.16	16	0.16	16	0.16	16
IEQ	0.20	20	0.20	20	0.20	20	0.20	20	0.20	20	0.20	20	0.20	20
EUE	0.25	25	0.30	30	0.30	30	0.30	30	0.30	30	0.30	30	0.30	30
WWM	0.24	24	0.20	20	0.20	20	0.21	21	0.21	21	0.20	20	0.20	20
TOTAL	100		100		100		100		100		100		100	
INNO	+ 10		+ 10		+ 10		+ 10		+ 10		+ 10		+ 10	

Table 8. Coefficient and credit distribution for Existing Buildings by building type

EXISTING BUILDING	HOUSING		OFFICE		EDUCATION		HOTEL		HEALTH		SHOPPING CENTER		OTHER	
	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS	COEFFICIENT	CREDITS
IBD	0.10	10	0.10	10	0.10	10	0.10	10	0.10	10	0.10	10	0.10	10
BMLC	0.16	16	0.16	16	0.16	16	0.16	16	0.16	16	0.16	16	0.16	16
IEQ	0.20	20	0.20	20	0.20	20	0.20	20	0.20	20	0.20	20	0.20	20
EUE	0.26	26	0.30	30	0.30	30	0.30	30	0.30	30	0.30	30	0.30	30
WWM	0.28	28	0.24	24	0.24	24	0.24	24	0.24	24	0.24	24	0.24	24
TOTAL	100		100		100		100		100		100		100	
INNO	+ 10		+ 10		+ 10		+ 10		+ 10		+ 10		+ 10	

Within the scope of the Yes-TR certification system, there are six modules used to assess the green and sustainable characteristics of buildings, addressing various aspects of buildings, environmentally friendly practices and energy efficiency. These modules are: Energy efficiency, indoor environmental quality, building materials and life cycle assessment, water and waste management, innovation, integrated building design and construction process and management.(Table 8) (YeS-TR, 2021)

Table 9. The six sub-headings of the YeS-TR New Building Certification Score Percentages

ISSUE	CREDITS
INTEGRATED BUILDING DESIGN, CONSTRUCTION & MANAGEMENT	Total: 14 credits
INDOOR ENVIRONMENT QUALITY	Total: 20 credits
BUILDING MATERIAL & LIFE CYCLE	Total: 16 credits
ENERGY USE & EFFICIENCY	Total: 30 credits
WATER & WASTE MANAGEMENT	Total: 20 credits
INNOVATION BUILDING	Total: + 10 credits
Grand Total: 110 credits	

The detailed version of this summary table is presented in the Appendix E

According to the score obtained, 32-39 is Pass, 40-54 is Good, 55-74 is Very Good, 75 and above is National Superior (Table 9) (YeS-TR, 2021)

Table 10. Certification Levels of YeS-TR Certification Systems for New Buildings according to (YeS-TR, 2021)

YeS-TR Rating	Point Score	
Pass	32-39 points	IBD – 3 credits
		BMLC – 4 credits
		IEQ – 4 credits
		EUE – 3 credits
		WWM – 4 credits
		(Remained- 14 credits can be taken from the desired criteria)
Good	40-54 points	IBD – 5 credits
		BMLC – 6 credits
		IEQ – 6 credits
		EUE – 4 credits
		WWM – 5 credits
		(Remained- 14 credits can be taken from the desired criteria)
Very Good	55-74 points	IBD – 8 credits
		BMLC – 8 credits
		IEQ – 8 credits
		EUE – 6 credits
		WWM – 7 credits
		(Remained- 18 credits can be taken from the desired criteria)
National Superior	75 and above points	IBD – 10 credits
		BMLC – 10 credits
		IEQ – 10 credits
		EUE – 10 credits
		WWM – 10 credits
		(Remained- 25 credits can be taken from the desired criteria)



CHAPTER 3

MATERIAL & METHOD

This research was conducted on a certified and award winning project in Türkiye, in order to first evaluate and then compare the 3 international certification systems, LEED, BREEAM and DGNB as well as the national certification of YeS-TR. The materials and methodology of research are presented in the following sections.

3.1 Research Material

This research material consisted of the credit/point allocation systems of LEED, BREEAM, DGNB and YeS-TR; that can be used for evaluating projects regarding adaptive reuse of Heritage buildings. To this end, a heritage building in Türkiye whose adaptive reuse and restoration project had been awarded a LEED certificate was selected as the case study building; namely, the Bogaziçi University Gözlükule Excavation Research Center, in Tarsus district of Mersin city in Türkiye; also called the BOUN Gözlükule Research Center.

3.1.1 The Case Study Building

The case study building which was a cotton ginning (*çırçır*) factory commonly known as the *Çiğdemler Çırçır Fabrikası* for a long time by the local people of Tarsus. It was one of the first industrial buildings of the region and is said to have been built by the British in the 2nd half of the 19th century. Due to its historical importance the *Çırçır* factory was registered as an immovable cultural property in need of protection by the Adana Regional Board for the Protection of Cultural and Natural Heritage on 22.03.2002. Thereafter, it was restored and repurposed to be

used as an excavation research center by the Boğaziçi University (Bosphorus University) at Istanbul.(Soyupak & Cardak, 2024) (SAYKA, 2025)

Table 11. General Aspects of the Building

Attribute	Details
Architect	Unkown
Adaptive Reuse Project Architect	Architect Saadet Sayın (SAYKA) ⁽¹⁾
First Built Year	2nd half of the 19th Century ⁽¹⁾
Adaptive Reuse Year	2013-2017 ⁽¹⁾
Previous Usage	Cotton Ginning (Çırçır) Factory
Current Usage	Bogazici University Gözlükule Research Center
Area (m ²)	2569 m2 ⁽¹⁾
Sustainability Aspects	Solar Panels (Electricity and Hot Water) Skylight (Natural Light and Air) Rainwater collection system ⁽²⁾
Green Building Certification Type	LEED Gold (2016) ⁽²⁾
Awards	• European Heritage Awards / Europa Nostra Awards (2019) • 13th TSMD Architecture Awards / Building Award (2019) • Aga Khan Architecture Awards (2022) ⁽²⁾
Heritage Status	Registered by Adana Regional Directorate for the Protection of Cultural Assets (22.03.2002) ⁽²⁾

(1)(SAYKA, 2025) (2) (Soyupak & Cardak, 2024)

The BOUN Gözlükule Research Center, as it is called now, is located in the centre of Tarsus in the bazaar area where various shops, shopping arcades etc. are located (Figure 16). The building is at a comfortable walking distance from the Gözlükule archeological excavation site. There is a minibus (*dolmuş*) stop 350 metres away from the building and a bus stop 450 metres away; thus, being located on the main

transportation route this heritage building is easily accessible and highly visible (Figure 17).

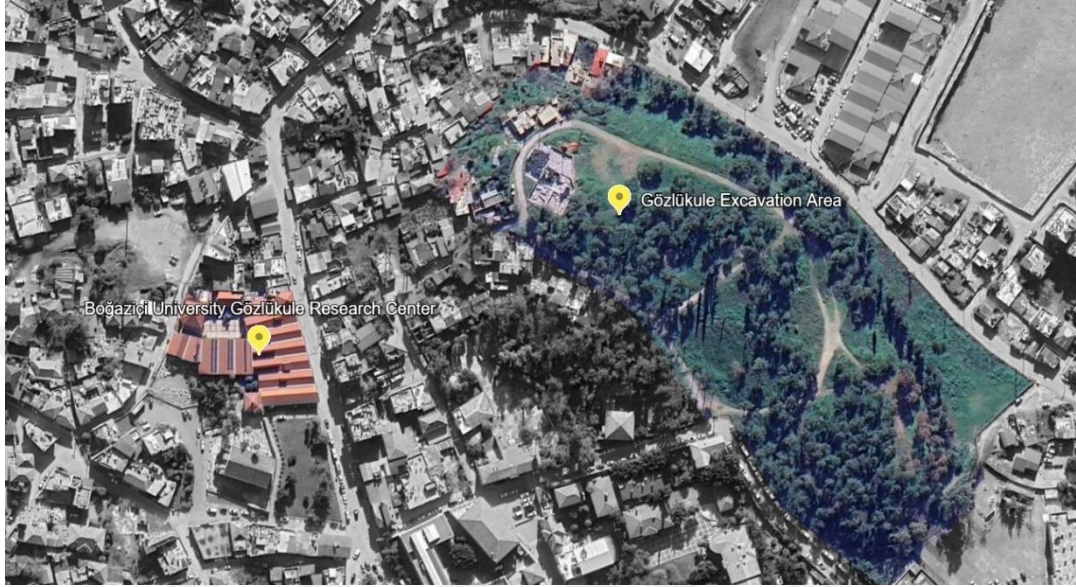


Figure 16. Locations of BOUN Gözlükule Research Center and Gözlükule Excavations (<https://earth.google.com/>, Edited)

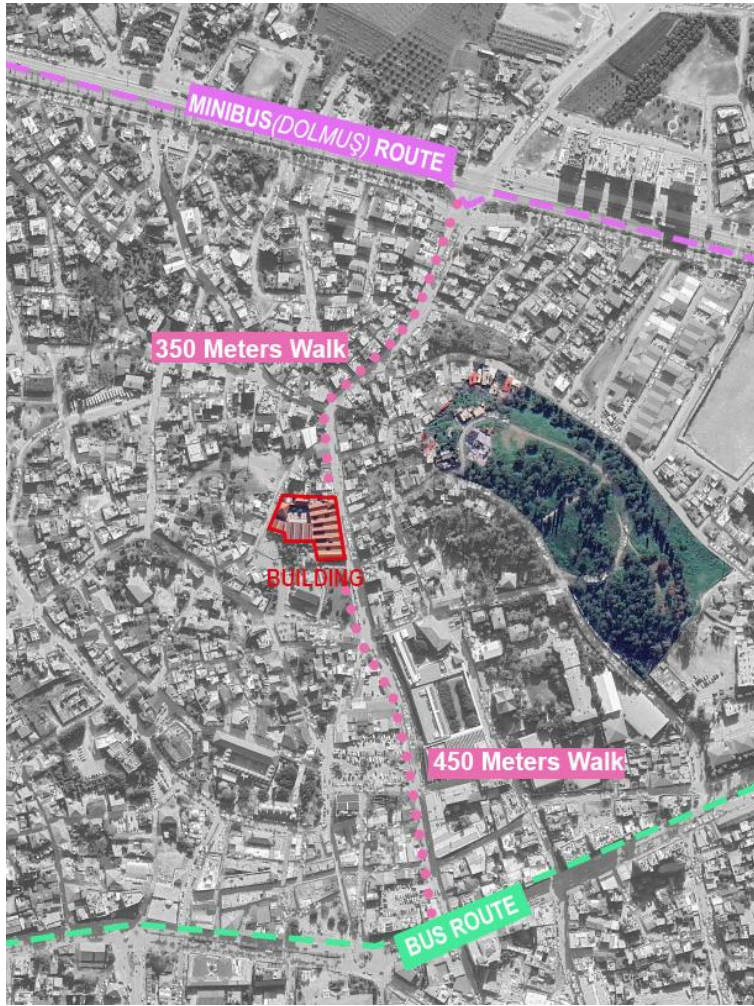


Figure 17. Transportation Routes of BOUN Gözlükule Research Center

The historical Çiğdemler Çırçır factory had large production and storage areas in four buildings around a courtyard. It is considered to be a heritage building of architectural value as it conveys the architectural quality and construction technique of early 19th century industrial buildings, to the present day with its spatial organization, material use, structural system and architectural elements.

The 4 main structures of the factory can be seen in Figure 18; the largest structure, labeled as building A, consists of five different spaces and the last space connecting three of these spaces; buildings B and C consist of spaces opening directly to the courtyard and building D consists of a two-storey reinforced concrete structure.(Uçar, 2019)(SAYKA, 2025)

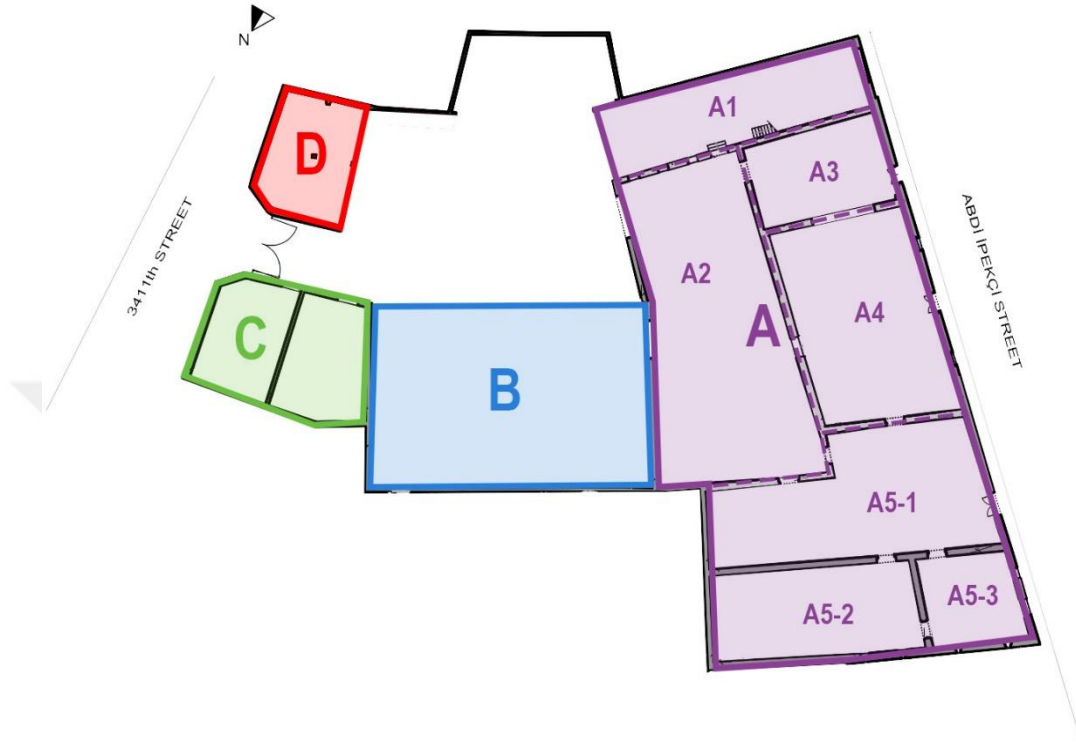


Figure 18. Condition of the Çırçır Factory before restoration and parts of the building based on the drawing by (Uçar, 2019)

The largest structure in the cluster, building A, consists of hangars divided by partition walls inside, and has five separate entrances from Abdi İpekçi Street. On the long facade of this structure, there are 6 triangular pediments forming the gable ends of the roofs.(SAYKA, 2025) (Uçar, 2019)

The building's walls were built with stone masonry technique. On the façade facing Abdi İpekçi Street, fine cut stone and lime mortar were used, while the rest of the walls were constructed with alternating rubble stone and mud mortar. Although the corrugated sheet metal roof of the building is not original, the wooden trusses carrying the roof are. At the same time, the roof lanterns (Figure 19) that provide

natural ventilation and natural lighting in the upper level have been retained from the original structure to the present day. (SAYKA, 2025)



Figure 19. Roof Lanterns on the roof of Exhibition Hall in Building A (Source: Arkiv, 2025)

The BOUN Excavation Research Center project (Figure 20) adopted the concept of a building that is open to use by the public, universities, researchers and non-governmental organisations, while functional spaces such as exhibition hall, conference hall, library, dining hall, artifact storages, laboratory were provided around an inner courtyard (Figure 21). The designer of the restoration project had proposed to open the conference hall directly to the courtyard, but upon the request of the excavation director, it was placed at the back of the building A. The inner courtyard, which is one of the important features of the building, was connected to Abdi İpekçi Street by an inner street in order to provide easy access to the public. (SAYKA, 2025)



Figure 20. General overview of the complex from courtyard (Building A located at the end of the Picture, Building B and C located on the right side of the Picture and Building E located in the left side of the Picture) (Source: Arkitera, 2025)

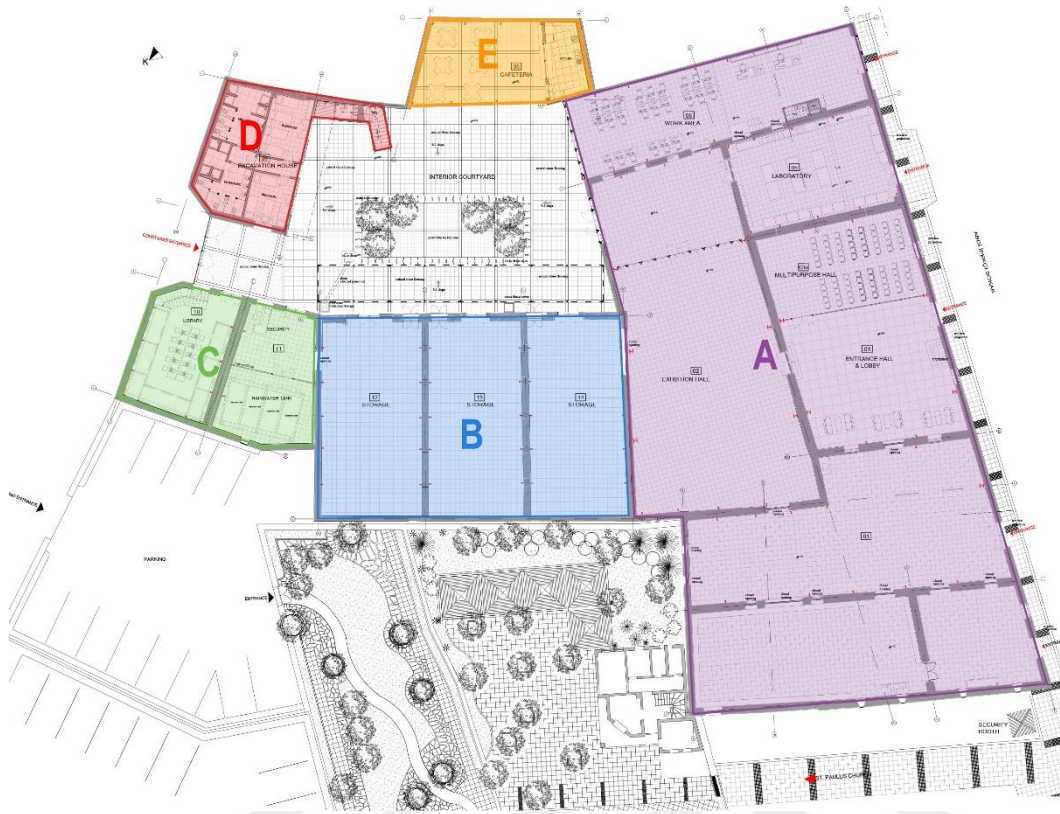


Figure 21. Current Distribution of Spaces (SAYKA,2025)

The building complex, consisting of five main structures enclosing the courtyard, has a total of five entrances: one from the courtyard and the other four from Abdi İpekçi Street (Figure 22) . Building A contains the excavation director's flat (Figure 23), an open work area (Figure 24), a conference room and an exhibition hall (Figure 25). Building B contains artifact storages areas and a laboratory (photographs are given in Figure 25 and Figure 26, respectively). There is also a wooden porch in front of this building for the use of the excavation team. Building C has a gallery floor built with wooden flooring on a steel structure and has been arranged as a library. (Figure 27) Although the library structure has been completed, it has not been opened to public use because the books have not yet arrived. There is also a rain water tank in building C, where rain water collected from the roof and the courtyard is stored. (Figure 28) The reinforced concrete building labelled D contains the dormitories of the excavation team and the washbasins, toilets and showers

(Figure 29). Building E is used by the excavation team as a cafeteria (Figure 30).
(All of the architectural drawings can be found in the appendix)



Figure 22. Excavation director's flat in Building A, accessible via stairs from open work area (Arkiv, 2025)



Figure 23. Open Work Area in Building A, view from the courtyard (Arkiv, 2025)



Figure 24. Exhibition Hall in Building A



Figure 25. Artifact Storages in Building B (Arkiv,2025)



Figure 26. Laboratory in Building A which can be reached from Exhibition Hall in Building A (Arkiv, 2025)

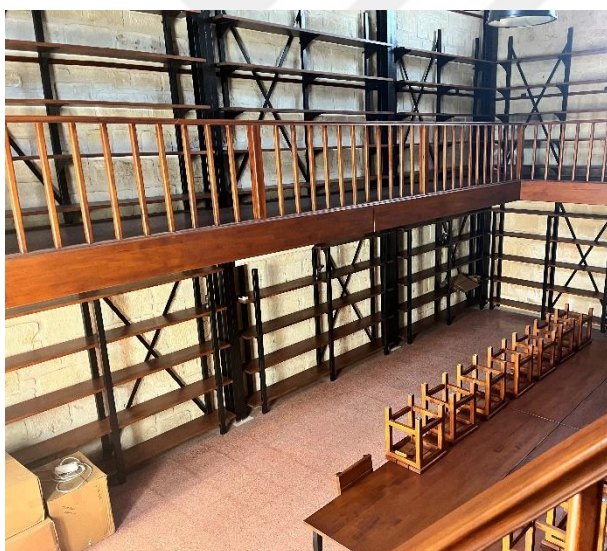


Figure 27. The library in Building C, which has a mezzanine floor accessible by a steel-framed wooden staircase, has wall-mounted shelves and tables on the ground floor



Figure 28. Rainwater Storage Tank in Building C is located in Security room which is the room next to the library



Figure 29. Building D converted into a Dormitory (Arkiv,2025)



Figure 30. Newly added Cafeteria is located in Building E (Arkiv, 2025)

3.1.2 Restoration Project

The interventions to be made in the restoration of buildings in the historical environment should be designed with recyclable structural solutions without damaging the historical structure. To this end, the following items were taken into consideration in the interventions made to the buildings cluster regardless of function

- Removal of inappropriate layers of plasters and building materials,
- Preservation of original architectural elements with minimum intervention,
- Additions arising from functional and structural necessities should be recyclable, compatible with the structure and traceable

In 2001, the Republic of Türkiye Ministry of Culture and Tourism commissioned SAYKA Architecture and Construction to design the Tarsus City Research Center, and the survey-restitution-restoration and engineering projects were prepared by the firm. While the project design process of the building cluster with an area of 2500 m² was in progress, the Ministry allocated four hangars in building number 1 with

building was repaired with funds from the Ministry of Culture and given to the use of the Excavation Directorate.(Figure 32) However, the restoration of the rest of the building group was not funded and no work was carried out on the buildings until 2011.(SAYKA, 2025)

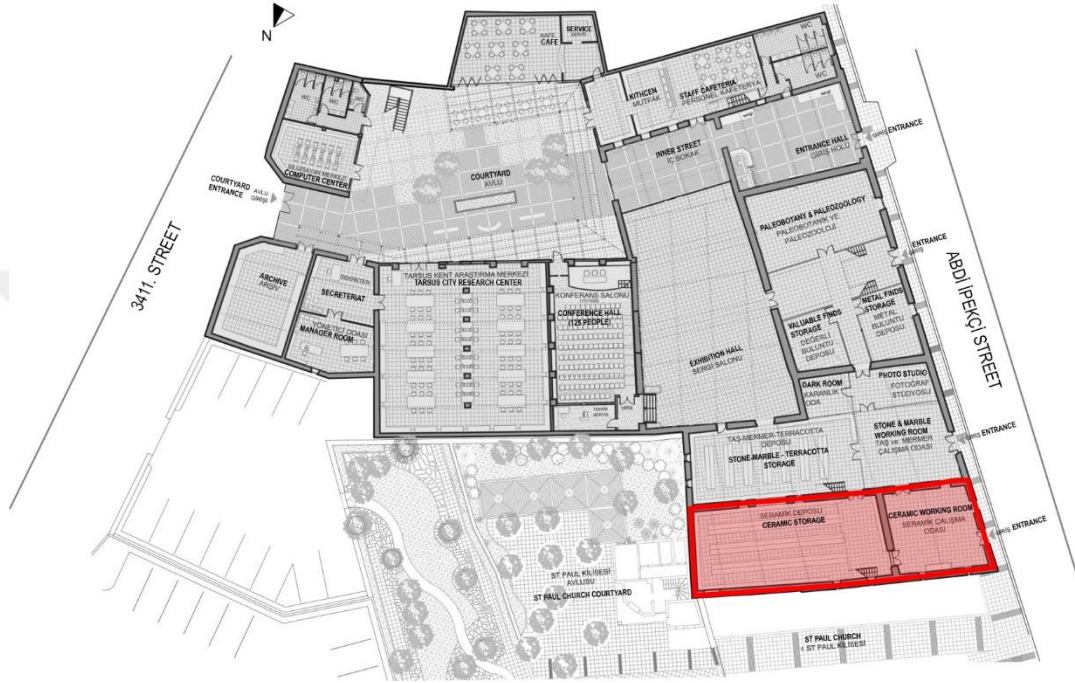


Figure 32. Restored part at 2001

In 2011, Boğaziçi University decided to start the restoration of the section allocated to the university, thanks to the funding provided by the Ministry of Development. Serious deformations had occurred in the building due to the fact that the building had been vacant for 10 years. In 2011-2012, the removal of inappropriate additions such as plaster, research to determine the deformations in the building, sanitization, cleaning, emergency interventions and strengthening works were carried out. Priority interventions in this direction were as follows;

- The cement-added plasters on the wall surfaces were cleaned and the deterioration of the stones was detected.(Figure 33)



Figure 33. Cement-added plaster on the old walls of the building (SAYKA,2025)

- Local deformations in the walls caused by the use of earth mortar (Figure 34) were eliminated and suspension and reinforcement works were carried out.



Figure 34. Deformations on the existing walls (SAYKA,2025)

- Because of the material and structural problems identified by the 2011-2012 studies, the decisions for intervention were reconstructed and the engineering projects were reconsidered to address the existing problems in the building. (SAYKA, 2025)

In 2019, the building won the European Union Cultural Heritage Awards / Europa Nostra award for its valuable restoration decisions and practices. In its evaluation report, the jury stated that it “*admired the new function of the building, which is as original as its history*” and that “*research has shown that the complex of simple and*

functional architecture has an important place in European history. In addition, the functional integration of the converted industrial heritage site into the urban area contributes to the transformation of its surroundings “. The innovative technologies added to the building and developed for energy needs are an important model for the sustainable adaptive reuse of cultural heritage sites. *"highly ambitious in dealing with the sustainability requirements of the 21st century ”* (SAYKA, 2025)

We can examine the interventions in the this important restoration process of the building in 4 main categories. These are; Floors, Walls, Roof Structure and Covering, and Architectural Elements.

a) Floors

The existing damaged rammed earth flooring, which is presumed to be original, has been renewed with a form material and technique that does not refer to them in order to be understood that it has been renewed and not to be confused with the floors in similar industrial buildings that can be encountered. During this renovation, the spaces in the building were paved with terracotta and artificial stone(Figure 35), taking into account the needs of the spaces in the building and the need for a simple flooring in order to maximize the perceptibility of the wooden trusses and stone walls, which are important for the identity of the space.(Soyupak & Cardak, 2024)(SAYKA, 2025)

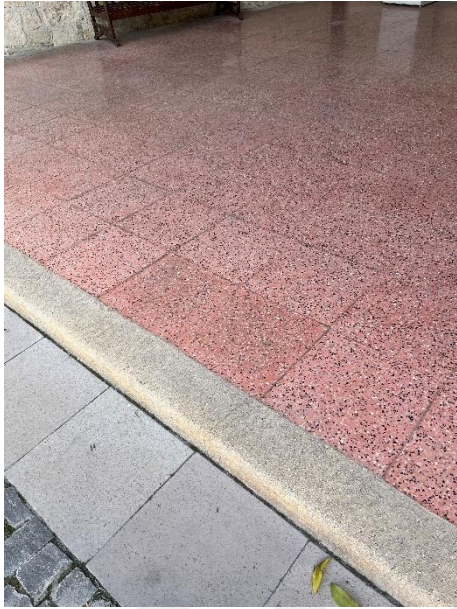


Figure 35. New Flooring materials of the Building E (red and white ones) and courtyard (grey ones)

After it was decided to use the opening between the building group as a courtyard, the pavement of the courtyard was covered with stone pavement in contemporary forms (Figure 36). Under this courtyard pavement, a sustainable system was created to collect rainwater, filter it and send it to the rainwater tank inside the building. With this system, the water used by the excavation team to wash the artifacts was also saved.(SAYKA, 2025)



Figure 36. New Floorings of the courtyard

b) Walls

Although the stones in the masonry stone building generally preserved their load-bearing qualities, some of the original stones had lost their load-bearing qualities due to the cement-added plaster(Figure 37), which was estimated to be non-original through old photographs, and the destruction of the structure by external conditions.(SAYKA, 2025) (Soyupak & Cardak, 2024)



Figure 37. Interior Stone walls with the finishing of Cement-Based Plaster (Source: SAYKA,2025)

For this reason, the existing stones, which had a bearing quality, were removed from the wall in 1m² modules and numbered (Figure 38), cleaned and placed in their places after reinforcement. Since it was requested that the stones that had lost their load-bearing qualities be renewed in a way to preserve the original material and form, it was determined that the stones were brought from Nacarlı quarry, a quarry close to Tarsus, in line with the material analysis of the existing stones. After this determination, the same stones were requested from this quarry again and brought to the site. These stones, which were brought to the site in their entirety, were broken one by one in the field according to their original dimensions and a different texture was applied to the surfaces of the stones by scratching the surfaces of the stones with a hammer in order to understand that it was a modern-day intervention. The stones were placed in the missing places of the existing walls and the walling process was completed.(Figure 39) Although it was requested that these stone masonry walls be visible from the outside after the stone walling process, the brick pediments connecting the roof and the wall were covered with plaster after the restoration. (Soyupak & Cardak, 2024)(SAYKA, 2025)

Pictures regarding to restoration process of the walls and timbers works are provided in the appendix F



Figure 38. Numbered Stones (Source: SAYKA,2025)



Figure 39. Restoration of the stone walls (BOUN,2025)

Another element on the walls that had lost its load-bearing quality was the wooden beams. These beams were renewed in their original material and form. (SAYKA, 2025) The walls of the 2-storey reinforced concrete building located in the northeast of the courtyard (building numbered), which was used as an excavation dormitory, were only cleaned and strengthened. (SAYKA, 2025)

c) Roof Structure and Covering

The structural system of the building is divided into two as walls and roof carriers. As explained in section b of 3.1.2, the load-bearing stones on the masonry walls were preserved by cleaning them and the stones that lost their load-bearing qualities were renewed with local materials and techniques. (Soyupak & Cardak, 2024)

The form of the wooden roof trusses (Figure 40) that form the upper cover, which add value to the building in terms of architecture and carry the roof, and the roof lanterns(Figure 41) which is important for daylighting of the building space on the roof preserved their original quality. However, the wooden trusses, which had lost their load-bearing capacity due to the long years of inactivity of the building and the damages caused by the external conditions, were carried to a recyclable steel system(Figure 42) to carry only their own weight and to carry the load of the roof independently from the stone walls and wooden trusses. This steel system is not coated and is placed inside the building in a way that it is visible from the outside. In this direction, engineering projects were prepared according to the 3D diagram (Figure 43) created for the load-bearing system during the construction process and steel profiles were placed at a distance of 30 cm from the walls. The existing wooden trusses, which had lost their bearing capacity, were cleaned with bristle brushes, reinforced with injection method and restored and additional steel and wooden elements (Figure 44) placed between the steel profiles in their original places.(SAYKA, 2025)



Figure 40. Original Roof Trusses of the Building B (Source, 2025)

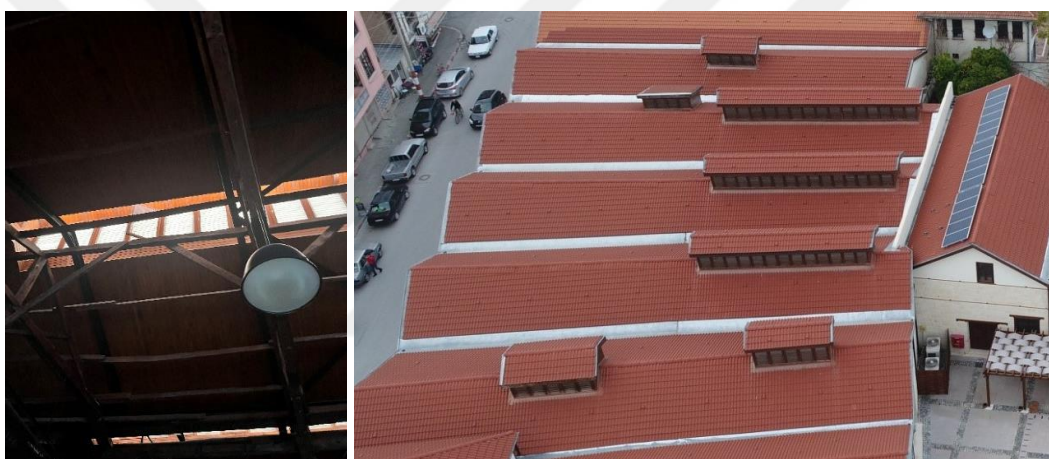


Figure 41. Roof Lanterns from interior (Left) and Exterior (Right) (Source: Author Archive (Left) SAYKA (Right),2025)



Figure 42. Steel Structural System of Building



Figure 43. 3D Diagrams of the Steel Structural Elements (Source: SAYKA, 2025)



Figure 44. Addition of Steel elements for strengthening to the existing wooden trusses which originally carries the roof in the past

The wooden ceiling coverings (Figure 45), which were not originally in the building, were placed in such a way that they do not refer to the old buildings around and do not damage the structure.(SAYKA, 2025)



Figure 45. Newly added wooden ceiling coverings of the buildings (Source: SAYKA, 2025)

Photovoltaic panels (for heating) and solar panels (for hot water) were placed on the roof to sustainably meet the electricity and hot water needs of the buildings after the completion of the restoration works on the roof cover(Figure 46).(SAYKA, 2025) At the same time, the roof water collection system placed on the roof is a sustainable example of using water within the building. Uçar, 2019)



Figure 46. Photovoltaic and Solar Panels of the building for heating and hot water, on the roof of Building B and C(Source: SAYKA, 2025)

d) Architectural Elements

The existing original wooden doors, windows and shutters on the facades and interiors of the building group were repaired and preserved in their places. Contemporary materials and details compatible with the building were used in the doors and windows used for their functions inside the space. The spider glass cladding facade system (Figure 47) used in the building complex due to the complete destruction of the facade of the office facing the courtyard and the inability to trace the period traces of the materials is an example of this. Due to the unavailability of the original materials for the restoration of the doors on the facade facing Abdi İpekçi Street, a door detail that does not refer to the doors in similar industrial heritage buildings but is compatible with the original doors has been developed by adding glass with iron railing detail, taking into account the light needs of the spaces they open to these doors.(SAYKA, 2025) The louvered system detail added to the doors of the Building D, which is used as an excavation dormitory, provides air circulation inside the rooms and keeps the rooms cool in a sustainable way.(Figure 48) (Uçar, 2019)



Figure 47. Spider glass cladding facade system of open work area in Building A, view from courtyard. (SAYKA,2025)



Figure 48. Louvered Doors of the Building D, First floor view (Source: SAYKA, 2025)

Apart from these, a wooden pergola (Figure 49) was added to the courtyard for the use of the excavation team, which will not pose a problem in terms of dating since there are no examples in the region. (SAYKA, 2025)



Figure 49. Pergola, located in front of Building B, doors behind pergola opens to the storages of the Building B

3.1.3 Green Interventions

The restoration and adaptive reuse project supported contemporary conservation approaches with sustainability and exemplified the applicability of the necessity of

eco-friendly and climate-friendly design in cultural heritage buildings. (Uçar, 2019) BOUN Gözlükule Excavation Research Center became the first LEED GOLD certified (Figure 50) cultural asset in Türkiye by developing valuable sustainable solutions after its restoration. (SAYKA, 2025)



Figure 50. LEED Gold Certification of the Building (Source: SAYKA, 2025)

Europa Nostra awards jury member also commented on the sustainable elements of the building " *Innovative technologies developed for the energy needs of the complex have created a model for the sustainable transformation of cultural heritage sites, and a new system has been developed to store rainwater that can be used by the excavation team to clean artifacts. In addition, electricity and hot water are provided by solar and photovoltaic panels on the roof, thanks to these applications, all energy and hot water requirements of the research center are met by solar energy, thus greatly reducing the carbon footprint of the complex. The jury stated that “this intervention, using quality materials, carries the building into the future” and that this approach is “highly ambitious in dealing with the sustainability requirements of the 21st century” .*

Sustainable elements in the building are listed below:

- Systems have been developed to collect and store rainwater in the building. In this direction, rain gutters were used on the renovated roof and hollow

slabs (Figure 51) were used in the courtyard and around the building to collect rainwater. Thus, the collected rainwater is collected in the rainwater tank (Figure 28) in Building D and used as needed. For example, this collected water is used for washing the excavated artifacts.



Figure 51. Hollow Slabs for the collecting rainwater

- After the restoration, photovoltaic panels and solar panels were added to the roof, thus creating a sustainable system that ensures that the hot water and heating needs of the building are met by the sun. This greatly reduces the carbon footprint of the building.
- The roof lanterns, which were also present in the original building, were preserved after the restoration and the sustainable passive system that will provide natural ventilation and natural lighting inside the building has become one of the important sustainable elements of the building.
- It is also important in terms of sustainability that the stone used during the restoration of the building is a local and original stone material and that it is a solution that is compatible with the building but will be distinctive in the periodization of the building.

3.2 Method

The methodology of this thesis is structured on the basis of literature review and a case study "BOUN Excavation Research Center". Literature review was conducted through a variety of articles and books containing informations in various research areas to understand three main topics: adaptive reuse of heritage buildings, green building certification systems and sustainability. In this context, the search for articles containing the keywords of the research topic: Adaptive Reuse, Heritage Buildings, Green Building Certification System, Sustainability, BOUN Gözlükule Excavation Research Center, as well as for case study reviews, the same keywords were searched primarily through Science Direct, Google Scholar, Mendeley and some AI tools to find examples from all over the world. Then, to diversify the results obtained and to find other related articles, the artificial intelligence called "Litmaps", which creates connections between articles worldwide and maps them, and the artificial intelligence called "Sourcely", which provides various articles related to the research topic, were used. The articles that were mapped with Litmaps and found with Sourcely were examined one by one and the research continued on the articles that were directly related to the subject. After the information in the articles classified according to keywords and categories was prepared for the literature review, it was examined in detail and the literature review was written. During the writing process, "Mendeley" was used for citations and references, and "Trinka" artificial intelligence was used to eliminate errors in the literature review in order to find possible citation errors and to check for plagiarism.

The technical documents of the green building certificates(LEED, DGNB, BREEAM, YeS-TR) were examined in detail and the scoring systems of each of the criteria were learnt.

In this framework, building-specific assessments were made based on official technical documents. In order to support the findings of this thesis, the selected case study was thoroughly examined in terms of technical characteristics, sustainability criteria, and gained LEED certification using the internet sources. Subsequently,

meetings were held with Architect Saadet Sayın and her team at SAYKA Architecture, the restoration architecture firm responsible for the building, to access old and new photographs, drawings, and detailed information about the structure, which were then utilized into the thesis. Contact was made with Boğaziçi University to arrange a site visit, and this allowed to take the current photographs of the structure and learn about its current condition from the individuals working on-site. The information obtained was grouped using the "Excel" application and then converted into a table format.

In addition to these, ‘‘Julius AI’’ tool have been used to enable fast and reliable calculations based on building materials or building mass, thereby facilitating the completion of certification requirements within these parameters. For the use of these AI tool, the necessary information about the building was loaded into the AI tool, the calculations were performed, and then the results were interpreted.



CHAPTER 4

EVALUATION

4.1 Evaluation in Terms of Restoration

In the newly constructed buildings' design or adaptive reuse of historic buildings around historic buildings, it is an important requirement that the final product is in harmony with the historic building and its surroundings, whether it is an imitation of the existing style, an emulation of traditional approaches, or an approach that respects or contradicts traditional approaches. For this reason, in new design approaches, the environment of the historic building should be well analyzed and interpreted, and attention should be paid to the sustainability of the existing values important for the people and the building. In addition, in new structural design approaches in the historic environment, it is important to carefully consider international standards, principles and regulations (Table 11) related to the subject, together with all these approaches, in order to preserve and maintain the existing quality of the historic environment in question.(Arslan, Orhan, Dişli et al., 2020)

Table 12. Internationally recognised conservation principles in conservation and restoration around historic buildings (Arslan, Orhan, Dişli et al., 2020)

Name of the Document	Article	Content of the Article
Valetta Principles for the Conservation and Management of Historic Towns and Urban Areas, 2011 (ICOMOS, 2011)	Article 2/b Article 4/c	New buildings in historic districts should be compatible with their context, respectful of the scale, perspective, appearance, focal points and visual extensions of the area, and in a clear relationship with existing architectural structures and their surroundings.
Charter of Athens, 1933 (CIAM, 1993)	Article 70	When new buildings are constructed in historical environments, it is not desirable to use architectural languages of the past periods due to aesthetic concerns.
Amsterdam Declaration, 1975 (ICOMOS, 1975)	b	Since architectural heritage is a common value of peoples, factors such as negligence, intentional destruction/damage and irregular construction should be seen as a common responsibility for the people and buildings should be protected with this awareness.

The detailed version of this summary table presented in the Appendix G

Considering the above criteria, according to below Arslan, Orhan, Dişli et al., (2020) there are 10 articles that can be used for the evaluation of adaptative reuse project of historic buildings. These are listed in Table 12 below, along with the photos of the work done according to each article and the pertinent evaluation .All of the pictures except the cited ones are taken by the author in Table 12 below.

Table 13. Evaluation of the structure according to (Soyupak & Cardak, 2024)

ARTICLES	PICTURES	EVALUATIONS
Article 1: The new design should be compatible with its existing surroundings in terms of mass, form, proportion and color.)	 1 2	New additions after the restoration were found to be compatible with the general design of the building. 1: Newly added Windows 2: Newly added glass facade
Article 2: The additions or changes in the new design must be clearly recognizable and must not damage the documented character of the historic building in such a way as to mislead future research.	 1 2	The stones on the walls of the building that preserved their bearing capacity were preserved and the stones that lost their bearing capacity were replaced with the same stones quarried from the same quarry by giving them a different texture. Likewise, the material used as flooring is terracotta or artificial stone, not to be confused with similar historic examples of the region. 1: Floors 2: Walls

Table 14. Continued

Article 3: The new design should not devalue the cultural values and traditional character of the existing neighborhood	 1	The use of the structural elements of the period in which the building was built in the restoration shows that the building's cultural values are also preserved. 1: Original column of the factory building
Article 4: New design and its implementation should utilize current technologies and avoid imitating the styles of the past.	 1	While the building was being restored, the addition of a steel bearing frame system to the structure to carry the wooden trusses and roof, which had lost their carrier, and the addition of doors and windows containing today's systems to the structure are indicators of the use of current technologies. 1: Steel frame and wooden trusses at Exhibition Hall in Building A

Table 15. Continued

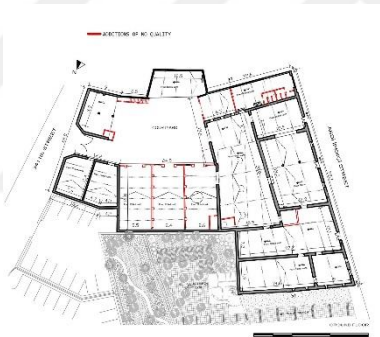
Article 5: The Building's new design should maintain the existing physical, cultural and social relationships in its surroundings.	 (Source: Soyupak & Cardak, 2024)	Due to the importance of the continuity of social and cultural relations in the historical building, the exhibition and conference halls of the building were designed in such a way that the public, universities and institutions can use them, thus encouraging the citizens for events such as conferences, interviews, etc.
Article 6: The new design shall be in harmony with the existing spatial organisation and composition and preserve the existing balance of relationship, function and order.	 (Source: SAYKA, 2025)	The restoration project was made with minor additions and arrangements so as not to disturb the existing spatial fiction.
Article 7: The new design should be compatible with the surrounding historic fabric in terms of height and massing and should not overwhelm it.	 1	The pergola structure added to the courtyard of the building is compatible with the fiction of the building and supports the relationship of solid and void by not getting in front of the building with its general mass. 1: Pergola in the courtyard (Located in front of the Building B)

Table 16.Continued

Article 8: The new design shall not reduce the structural and aesthetic value of its surroundings.	 (Source: SAYKA, 2025)	The building did not decrease the value of the buildings around it with the techniques used in restoration, on the contrary, it increased the value of its surroundings by setting an example to its surroundings with its design.
Article 9: New alterations to the building must be made with materials that are compatible with the overall mass of the building and are not different in appearance and texture.	1  2  3 	The new stones used in the walls of the building, the new flooring materials and the steel structure carrying the roof are designed to be very compatible with the original mass and materials of the building. 1: New and Existing stones combination of the wall. 2: Newly added different types of floorings 3: Newly added steel structure

Table 17.Continued

Article 10: The connections and contrasts between the characters of the parts forming the building groups must be in aesthetic harmony.		As a result of the destruction of the facade facing the courtyard of the building A which is currently used as an open work area, a spider glass curtain wall was added to the building. This addition is important in terms of reflecting the contemporary technological knowledge of its period and offering a neutral approach to the general fiction of the building.
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4.2 Evaluation in Terms of Sustainability

4.2.1 General Sustainability Aspects of the building

The general sustainability features of the building can be analysed under 7 main headings. These are: Site selection and Land use, Energy Efficiency, Water Management, Material and Resource Usage, Waste Management, Indoor Quality and Cultural- Social Sustainability.

a) Site Selection and Land Use

The adaptive reuse project of an existing heritage building and the fact that the building is not built on an unspoilt natural area reduces the building's carbon footprint and ensures that the land use is sustainable in terms of cultural heritage protection.

The building is located in the central market area of Tarsus district in Mersin province, 350 meters away from a minibus (*dolmuş*) stop and 450 meters away from a bus stop. Therefore, the building is accessible both by public transportation and private vehicles. The fact that the building is not accessible solely by private vehicles has positively impacted the carbon footprint.

b) Energy Efficiency

The utilization of passive and active energy systems is of paramount importance in ensuring the sustainability of the structure. The integration of passive building systems is indicated by the implementation of natural ventilation in the structure through the installation of shutters on the doors and windows. The integration of passive solar systems is further evidenced by the provision of natural sunlight to the roof lanterns and windows. It was determined that the structure in question was not sufficiently illuminated from within, as evidenced by the findings of the site visit. It

has been determined that there is a regular need for illumination devices due to the absence of light during daylight hours. The integration of solar panels and photovoltaic panels into the roof post-restoration has been instrumental in providing hot water and electrical energy to the building, thereby enhancing its sustainability as a model of active energy systems. (Figure 54)



Figure 52. Poor daylighting of open work area from the entrance of Building A from Abdi İpekçi Street.

c) Water Management

Thanks to the perforated floors in the courtyard (Figure 55) of the building and the rainwater gutters added to the restored roof, the rainfall was stored in the water tanks in the space and used when needed, which also shows that the building is a sustainable building within water management.



Figure 53. New perforated Floor for rainwater drain of the courtyard

d) Material and Resource Usage

During the restoration of the structure, a large portion of the existing stones were utilized, and for those stones that were unusable because of a reduction in strength due to degradation over time, identical stones were sourced from a local quarry that had previously supplied stones for the existing structure. These stones were transported to the site as a single unit and then broken down into the desired sizes on-site. To ensure that the new stones could be distinguished from the existing ones, they were carved with a different texture. Similarly, the wooden trusses supporting the roof were cleaned, reinforced, and reinstalled in their original locations. However, due to the loss of their load-bearing properties, steel elements were added to the structure as a recyclable material to support the wooden trusses and the roof. Due to these features, the usage of the materials and resources of the building was made in accordance with the principles of sustainability.

e) Waste Management

The waste materials that will be generated during the restoration construction process of the building have been analysed in detail, and the fact that the building materials are largely preserved and reused in the parts of the building after cleaning and

strengthening processes has shown that the construction site process is managed very sustainably.

f) Indoor Quality

The presence of architectural elements that allow natural ventilation and natural light into the building, the energy efficient selection of the lighting used in the building, the ability to provide sound insulation with the thick stone walls in the original building, and the ability to also adjust the indoor temperature with these walls (e.g. cold inside the building on hot summer days) show the quality of indoor is high.

g) Cultural and Social Sustainability

The fact that the conference hall and exhibition hall were designed to be used by the local community, universities and institutions during the restoration project design period of the building and that the building has been actively used by the aforementioned users since its opening is an important indicator of cultural and social sustainability.

4.2.2 Green Building Certification Systems

Boğaziçi University Gözlükule Excavation Research Centre was awarded LEED Gold certification for its sustainability and green building characteristics after the restoration project. Within the framework of the characteristics of the building, it will be important at this stage to analyse the building item by item in terms of the certification systems which are BREEAM, LEED, DGNB and YeS-TR discussed in the thesis. The credits for each criterion have been calculated and presented in the next section.

The scoring of all certificates analysed below is based on the published technical manuals of the relevant certificates (BREEAM,2015) (LEED,2025) (DGNB.2022) (YeS-TR,2021). In these manuals, each criterion is examined in detail and the maximum points that can be obtained after these examinations are given.

a) BREEAM

The building can receive ‘‘ BREEAM OUTSTANDING’’ Certificate with 91 points in total. The detailed examination of the building in BREEAM Refurbishment and Fit Out category is shown in Table 13 below.

Table 18. Comments on BREEAM Refurbishment and Fit Out Certification related with the building

Issues	Comments	Credits
MANAGEMENT		
Man 01	At the start of the project, sustainability goals were set and coordination between different disciplines was ensured in line with these goals.	3
Man 02	Although detailed life cycle costs have been shared only to a limited extent, plans have been made for a long service life due to the building's heritage structure.	2
Man 03	Waste control and environmental impacts have been taken into consideration during construction.	4
Man 04	No handover	0

Man 05	Although there is limited information, there is no monitoring mechanism in place.	0
		Total: 9 credits

Table 19. Continued

HEALTH & WELLBEING		
Hea 01	Interventions have been made to optimise the openings of the building, giving priority to natural light. In this direction, new openings were added to the building.	4
Hea 02	Both passive and mechanical ventilation systems are integrated into the structure.	3
Hea 03	The laboratory area where processes such as the analysis, cleaning, and documentation of archaeological artifacts are carried out is not considered high risk and is therefore not required for this category of building. Not applicable	N/A
Hea 04	The preservation of thick stone walls and the replacement of those that cannot be preserved with the same material, along with the integration of passive systems into the structure, have ensured the building's comfort in both summer and winter. Thermal insulation also exists on the roof of the building.	3
Hea 05	The coefficient of sound absorption of the material of wooden cladding, which is the ceiling covering of the building, cannot provide the required value. High sound insulated external stone walls and internal stone walls have fulfilled the criteria. The floor material consisting of terracotta and artificial stone has low sound insulation	2
Hea 06	As it is a public building, it is protected by Boğaziçi University security personnel. Not applicable	N/A
Hea 07	Tarsus region where the building is located is a 3rd degree earthquake zone. The building can be considered strong against earthquake due to the strengthening of the building materials in the building's restoration.	1
		Total: 13 credits
ENERGY		
Ene 01	Electricity and hot water can be produced thanks to the solar and photovoltaic panels used in the building, which aims for the high efficiency of energy.	7
Ene 02	Monitoring for energy is performed.	1
Ene 03	There is a limited number of exterior lighting with low energy consumption.	1

Ene 04	Passive systems are used in the design of the building as a general design principle (Solar and photovoltaic panels, rainwater storage, etc.).	5
Ene 05	There is A++ and above energy efficient refrigerator and freezer in the kitchen section of the building.	2

Table 20. Continued

Ene 06	There are no electrical circulation elements in the building, only stairs. Not applicable	N/A
Ene 07	In addition to passive ventilation, mechanical ventilation and air conditioners are also used in the all spaces except storages, kitchen and working area.	1
Ene 08	Low energy consumption lighting is used, but mechanical ventilation and air conditioners are also included in the building.	1
Ene 09	No drying space	0
Total: 18 credits		
TRANSPORTATION		
Tra 01	There is a minibus (<i>dolmuş</i>) route within 350 metres of the building and a bus route within 450 metres.	6
Tra 02	Since the locaiton of the building is in the centre of Tarsus, it has access to amenities	2
Tra 03	There are no bicycle lanes and bicycle parking areas	0
Tra 04	A car park was designed next to the building in the most effective way possible.	1
Tra 05	There are no travel plans that promote sustainable modes of transport.	0
Total: 9 credits		
WATER		
Wat 01	Passive systems such as low-flow fittings and rainwater storage systems that reduce water use are used	4
Wat 02	Water monitoring is performed	1
Wat 03	There is no systematic leak detection and prevention.	0
Wat 04	Effective equipments and passive systems are used.	1
Total: 6 credits		
MATERIALS		
Mat 01	During the construction, the existing materials were largely preserved and local materials were preferred for the materials which are new to be used.	6
Mat 03	For the stone materials on the walls, the quarry from which the existing stone materials were extracted was found and the same stones were brought from there again.	4
Mat 05	The materials in the design have been restored to last a long time.	1

Mat 06	The materials have been restored with the least possible loss and brought back to the building.	1
		Total: 12 credits

Table 21. Continued

WASTE		
Wst 01	Waste segregation during the construction site process has been done very well.	5
Wst 02	Recycled aggregate was not used.	0
Wst 03	It is assumed that care is taken in the kitchen and laboratory.	1
Wst 04	There is no finishing	0
Wst 05	There is no situation with this issue.	0
Wst 06	Functional adaptability is available due to the building materials and building openings.	1
		Total: 7 credits
LAND USE & ECOLOGY		
LE 01	There were no ecological features as it is adaptive reuse project	0
LE 04	No damage to existing land	1
LE 05	Trees belonging to the region were brought and planted in the courtyard.	1
		Total: 2 credits
POLLUTION		
Pol 01	Air conditioning is used in the building.	1
Pol 02	There is no fuelled system.	0
Pol 03	There are systems for storing rainwater on the roof and in the courtyard.	4
Pol 04	Ligthing fixtures used in the structure are effective products that will not make light pollution.	1
Pol 05	There are mechanical equipments outside of the building	0
		Total: 6 credits
INNNOVATION		
Inn 01	It is a project that is exemplary in the local context and uses innovative systems while contributing to the protection of cultural heritage.	10
		Total: 10 credits
Grand Total: 91 credits		

b) LEED

The building can receive ‘‘ LEED GOLD’’ Certificate with 70.5 points in total. The detailed examination of the building in LEED Building + Design: New Construction and Major Renovation category is shown in Table 14 below.

Table 22. Comments on LEED BD+C Certification related with the building

Issues	Comments	Credit
INTEGRATIVE PROCESS, PLANNING AND ASSESSMENTS		
IPp1	Required	Required
IPp2	Required	Required
IPp3	Required	Required
IPc1	Analyses were made in the early design phase, energy and water strategies were used in the design, and sustainability principles were used as an important element at every stage of each design.	1
Total: 1 credit		
LOCATION AND TRANSPORTATION		
LTc1	Since the building was constructed by adaptive reuse of an existing heritage building, it prevents new construction	1
LTc2	The building contributes to the development of the local community and current region and the region's local people	2
LTc3	Since the location of the building is the central bazaar area of Tarsus, there is the necessary density of people, although it is less compared to the centre of Mersin. Also, there is a minibus (<i>dolmuş</i>) route within 350 metres of the building and a bus route within 450 metres but mainly transportation is mostly by personal vehicles. Despite this, since the building is in the bazaar area, there are multiple shops around it that can be reached on foot in case of need.	4
LTc4	Although Tarsus is quite far from Mersin city centre, there is a minibus (<i>dolmuş</i>) route within 350 metres of the building and a bus route within 450 metres.	3
LTc5	There are no electric vehicle charging points around the building or in the building.	0
Total: 10 credits		

Table 23. Continued

SUSTAINABLE SITES		
SSp1	Required	Required
SSc1	As an adaptive reuse project, the existing site has been respected and the building has been restored in a way that does not harm the ecosystem or environmental impacts. The green areas around the building were designed by preserving them.	2
SSc2	There is courtyard space in the building	1
SSc3	Architectural solutions have been implemented to collect and use rainwater in the building.	3
SSc4	The building zone is a 3rd degree earthquake zone. During building's restoration, it is foreseen that the building has been protected against earthquakes due to the strengthening operations performed on the structural elements.	1
SSc5	Factors such as the trees in the courtyard of the building and the light coloured walls of the building are elements that can help prevent the formation of heat island. For this reason, the building can get half a point here.	1
SSc6	Lighting fixtures used in the structure are effective products that will not make light pollution.	1
Total: 9 credits		
WATER EFFICIENCY		
WEp1	Required	Required
WEp2	Required	Required
WEc1	There is a water meter in the building.	1
WEc2	Since the building is an excavation research centre, the artefacts unearthed as a result of excavations need to be washed. The water used in these washing processes is made with the water obtained after the storage of rainwater at rainwater tank.	4
Total: 5 credits		
ENERGY AND ATMOSPHERE		
EAp1	Required	Required
EAp2	Required	Required
EAp3	Required	Required
EAp4	Required	Required
EAp5	Required	Required
EAc1	Thanks to the photovoltaic panels and solar panels in the building, electricity needs can be met to a great extent and hot water can be produced.	3

Table 24. Continued

EAc2	Thick stone walls, pergola and passive ventilation systems are used and mechanical systems are used at a minimum level.	2
EAc3	Stone walls with high thermal mass prevent the building suddenly heated and cooled. Thanks to the number of openings in the building and the size of the openings, the building needs less lighting. However, LED lighting is also preferred in the building. Passive systems are largely used for natural ventilation in the building and mechanical equipment is used only in storage and laboratory sections that need mechanical ventilation. Apart from these, photovoltaic panels and solar panels added to the building help the building to produce both electricity and hot water. The number of devices using electricity in the building is also low. When we take these into consideration, it can be said that the building saves 20%-30% energy.	3
EAc4	There are photovoltaic panels and solar panels in the building which can produce heat and hot water	5
EAc5	The building is predominantly passive air conditioned and there are no complex HVAC systems. Enhanced commissioning reports are also available for the building.	3
EAc6	There is no such system in the building.	0
EAc7	The standard split air conditioners used in the building meet the LEED criteria as they are elements with low global warming potential volume.	1
Total: 17 credits		
MATERIALS AND RESOURCES		
MRp1	Required	Required
MRp2	Required	Required
MRC1	In the restoration of the building, the existing materials were restored and reused to a great extent.	2
MRC2	The existing building elements were preserved to a great extent and local and low carbon materials were used for the materials that could not be preserved. Steel materials were used in very small amounts.	2
MRC3	The building has been restored with a focus on natural materials. There are no high volatile organic compound (VOC) sources such as PVC, suspended ceiling in the building.	1
MRC4	There are locally produced materials and materials from sustainable sources.	1
MRC5	Since it is an adaptive reuse project, the building was preserved and materials were reused. For this reason, demolition waste was not generated to a great extent.	1
Total: 7 credits		

Table 25. Continued

INDOOR ENVIRONMENTAL QUALITY		
EQp1	Required	Required
EQp2	Required	Required
EQp3	It is forbidden to smoke inside the building and there is no vehicle entry into the building campus.	1
EQc1	Natural ventilation was used to a large extent, but mechanical systems were also used due to the spaces that need to be mechanically ventilated.	0.5
EQc2	User comfort increases in terms of natural ventilation of the building, daylight and material quality. The fact that the building has an inner courtyard and the presence of plants or canopy in the courtyard also increases the quality of use in the space.	7
EQc3	The building is not fully accessible for all users since access between floors is solely facilitated by stairs.	0
EQc4	It can be predicted that the building has developed this strategy due to criteria such as the use of the thermal mass of the stone wall material of the building and the use of passive design strategies in the building, the strong access to the infrastructure due to the location of the building in the centre and the high physical durability of the building.	2
EQc5	It can be said that the building has good air quality due to natural ventilation and the use of materials with low VOC emissions.	1
Total: 11.5 credits		
REGIONAL PRIORITY		
PRc1	Since the building is an adaptive reuse project, it is designed with the priorities of preserving cultural heritage, being an easily accessible building for the public, being designed with an environmentalist sustainable approach, being in the category of educational institution since it is an excavation research centre, and adopting strategies such as daylight-natural ventilation.	9
PRc2	The criteria is met.	1
Total: 10 credits		
Grand Total: 70.5 credits		

c) DGNB

The building can receive ‘‘ DGNB PLATINUM’’ Certificate with 72.9 points in total. The detailed examination of the building in DGNB Renovation category is shown in Table 15 below.

Table 26. Comments on DGNB Renovation Certification related with the building

Issue	Comments	Credits
ENVIRONMENTAL QUALITY		
ENV1.1	Although detailed life cycle costs have been shared only to a limited extent, plans have been made for a long service life due to the building's heritage structure.	7.0 %
ENV1.2	It was ensured that the construction site wastes to be generated during the construction site were separated because the existing elements were largely used in the construction of the building.	4.7 %
ENV1.3	During the construction, the existing materials were largely preserved and local materials were preferred for the newly added materials to be used. For the stone wall materials, the quarry from which the existing stone materials were extracted was found and the same stones were brought from there again.	2.0 %
ENV1.4	Since the building is an excavation research centre, the artefacts unearthed as a result of excavations need to be washed. The water used in these washing processes is made with the water obtained after the storage of rainwater at rainwater tank.	2.4 %
ENV1.5	Since the existing idle building was restored and reused, the impact on the environment was minimised.	2.0 %
ENV1.6	As an adaptive reuse project, the existing site has been respected and the building has been restored in a way that does not harm the ecosystem or environmental impacts. The green areas around the building were designed by preserving them.	1.2 %
Total: 29.3 % credits		
ECONOMIC QUALITY		
ECO1.1	Although detailed life cycle costs have been shared only to a limited extent, plans have been made for a long service life due to the building's heritage structure.	6.0 %
ECO2.1	The building is a structure with large openings. This feature shows that the adaptability of the building is high. It is already an adaptive reuse project.	5.7 %
ECO2.2	The building is a research centre. Although it is not a commercial building, it has an income as the conference and exhibition hall can be rented.	3.0 %
Total: 14.7 % credits		

Table 27. Continued

SOCIOCULTURAL AND FUNCTIONAL QUALITY		
SOC1.1	The preservation of thick stone walls and the replacement of those that cannot be preserved with the same material, along with the integration of passive systems into the structure, have ensured the building's comfort in both summer and winter. Thermal insulation exists on the roof of the building.	3.2 %
SOC1.2	Both passive and mechanical ventilation systems are integrated into the structure.	4.3 %
SOC1.3	The coefficient of sound absorption of the material of wooden cladding, which is the ceiling covering of the building, cannot provide the required value. High sound insulated external stone walls and internal stone walls have fulfil the criteria. The floor material consisting of terracotta and artificial stone has low sound insulation	1.0 %
SOC1.4	Interventions have been made to optimise the openings of the building, giving priority to natural light. In this direction, new openings were added to the building.	2.8 %
SOC1.5	The indoor temperature of the building can be adjusted with the mechanical ventilation systems inside the building and the lighting can be adjusted with artificial lighting.	1.4 %
SOC1.6	Both interiors and exteriors are functional and user-friendly designed to maximise the efficiency of all spaces.	1.0 %
SOC1.7	The building has the necessary signs and fire plans for emergency evacuation. The security of the building is also carried out by security guards who are employees of Boğaziçi University.	0.9 %
SOC2.1	The building is not fully accessible for all users since access between floors is solely facilitated by stairs.	0 %
Total: 14.6 % credits		
TECHNICAL QUALITY		
TEC1.1	A fire plan has been made for the building. In this direction, the route for fire escape has been determined, the required number of fire cabinets and exit indicators have been placed in the required locations.	2.5 %
TEC1.2	The sound absorption coefficient of the wooden cladding, which is the ceiling covering of the building, cannot provide the required value. High sound insulated external stone walls and internal stone walls have fulfil the criteria. The floor material consisting of terracotta and artificial stone has low sound insulation	0.9 %
TEC1.3	The outer walls of the building consist of thick stone walls. This means that they provide sound and thermal insulation of the building to a great extent.	2.5 %
TEC1.4	Innovative applications have been implemented with the objective of improving the quality of the people using the building have been implemented.	1.0 %
TEC1.5	Natural stone walls with a rough surface are not easy to clean, but the possibility of dirt retention is very high. Terrazzo floor coverings are an easy-to-clean material. Glass on the glass facade is also a material that can be easily cleaned.	0.7 %

Table 28. Continued

TEC1.6	The existing building elements were preserved to a great extent and local and low carbon materials were used for the materials that could not be preserved. Steel, wood, natural stone walls and terrazzo flooring were used in the building, which are recyclable low carbon materials.	2.5 %
TEC1.7	While the mechanical equipment exterior the building is an element that may disturb the environment in terms of sound, but the lighting fixtures used in the exterior are effective products that will not make light pollution.	0.2 %
TEC3.1	There are minibus (<i>dolmuş</i>) and bus routes very close to the building. However, only personal vehicles can pass in front of the building and the roads in this area are very narrow.	0.7 %
Total: 11 % credits		
PROCESS QUALITY		
PRO1.1	The project is presented in all details in the specifications.	1.4 %
PRO1.4	Sustainability principles have been very important and taken into consideration since the first designs of the building.	1.2 %
PRO1.5	The building has fulfilled all the documents related to sustainability and has been awarded LEED certification.	1.6 %
PRO1.6	The building does not have similar characteristics with the surrounding buildings.	0 %
PRO2.1	Since the building is an adaptive reuse project, issues such as waste management, safety precautions and the required labour force were examined in great detail and successfully implemented.	1.0 %
PRO2.2	The restoration and renovation project, which was carried out by preserving the heritage value of the building, is of high quality both aesthetically and structurally.	0.8 %
PRO2.3	It is functioning properly and this is documented.	1.6 %
PRO2.4	From the beginning to the end of the design of the building, the excavation directorate closely followed the process and conveyed their demands, while the design team shared the process with the users in detail.	1.1 %
PRO2.5	During the restoration of the building, it was foreseen that the materials and the overall structure would be used in the long term, and the strengthening and cleaning processes were carried out accordingly.	0.2 %
Total: 8.9 % credits		
SITE QUALITY		
SITE1.1	Since the building is designed with adaptive reuse project, the land where it is located is an existing land, but the building is designed in a way to enhance the architectural characteristic of the environment but not to harm it.	0.7 %
SITE1.2	The design of the building is intended to complement the architectural characteristic of the environment but not to harm it.	0.9 %

Table 29. Continued

SITE1.3	There is a minibus (<i>dolmuş</i>) route within 350 metres of the building and a bus route within 450 metres.	1.0 %
SITE1.4	Since the region of the location of the building is the central bazaar area of Tarsus, there are multiple shops around it that can be reached on foot in case of need.	1.7 %
		Total: 4.3 % credits
Grand Total: 72.9 % credits		

d) YeS-TR

The building can receive “ YeS-TR Very Good” Certificate with 68.78 points in total. The detailed examination of the building in YeS-TR is shown in Table 16 below.

Table 30. Comments on YeS-TR Certification related with the building

Issue	Comments	Credits
INTEGRATED BUILDING DESIGN, CONSTRUCTION & MANAGEMENT		
IBD 01 C1	Required	Required
IBD 01 C2	The certification expert is involved in the process from beginning to end.	5 credits
IBD 01 C3	Required	Required
IBD 01 C4	An existing idle building has been reused.	1 credits
IBD 02 C1	Required	Required
IBD 02 C2	Energy strategies were prepared and the design was revised to improve energy performance.	4 credits
IBD 02 C3	Analyses have been made for in-building water use and studies have been carried out to explore reducing water use in the building.	2 credits
IBD 02 C4	There are openings for daylight and artificial lighting.	4 credits
IBD 02 C5	Acoustic reports have been prepared.	2 credits
IBD 02 C6	There are mechanical equipment in the exterior of the building.	0 credits
IBD 02 C7	Building materials and passive systems are the elements evaluated in terms of thermal comfort.	3 credits
IBD 02 C8	Design strategies have been created to ensure natural air flow.	3 credits
IBD 02 C9	The building has the necessary signs and fire plans for emergency evacuation.	2 credits

Table 31. Continued

IBD 02 C10	The building has the necessary signs and fire plans for emergency evacuation.	2 credits
IBD 02 C11	Life cycle analyses have been performed.	2 credits
IBD 02 C12	Operational life planning have been made	2 credits
IBD 02 C13	Innovative applications aiming to improve the quality of life of the users have been implemented.	1 credits
IBD 02 C14	Monitoring and evaluation system has not been developed	0 credits
IBD 03 C1	The necessary documents have been prepared and submitted.	4 credits
IBD 04 C1	Safe access to and around the construction site	7 credits
IBD 04 C2	There are sound sensitive buildings such as churches and education centres in the vicinity of the building.	0 credits
IBD 04 C3	Required	Required
IBD 04 C4	It is foreseen that water and energy control is provided at the construction site due to construction site activities.	7 credits
IBD 04 C5	It was ensured that the construction site wastes to be generated during the construction site were separated because the existing elements were largely used in the construction of the building.	5 credits
IBD 05 C1	These systems and related teams do not exist.	0 credits
IBD 05 C2	Commissioning programmes have been prepared for building services.	8 credits
IBD 06 C1	Building maintenance and renovation operations reports have been made.	2 credits
IBD 06 C2	Necessary information was provided to the building users and reports were prepared.	1 credits
IBD 06 C3	Appropriate design was made by collecting the necessary user information.	1 credits
IBD 06 C4	There are no reports or systems for post-settlement measurements.	0 credits
Total: 69 credits x Coefficient: 0.14 = Overall 9.66 credits		
INDOOR ENVIRONMENT QUALITY		
IEQ 01 C1	Required	Required
IEQ 01 C2	In the building, natural lighting was targeted to a large extent, but at the same time led lighting was used.	4 credits
IEQ 01 C3	Lighting calculations were made for both natural and artificial lighting in the spaces.	2 credits
IEQ 01 C4	The colours of the lights used in the building are chosen in colours that will not strain the eyes.	5 credits
IEQ 01 C5	With the number of the openings and lanterns in the building, natural lighting can be provided in a way of reducing the need of using of artificial lighting in the interiors of the spaces.	3 credits
IEQ 01 C6	The windows in the building masses remain on a small scale compared to the wall ratio.	0 credits

Table 32. Continued

IEQ 01 C7	The fact that there is no sun shading on the facade of the working office of the building and that the whole facade is glass causes sunlight control to be impossible.	0 credits
IEQ 02 C1	It is foreseen that the acoustic report is made during the project design process.	4 credits
IEQ 02 C2	It is foreseen that the acoustic report is made during the project design process.	4 credits
IEQ 02 C3	The coefficient of sound absorption of the material wooden cladding, which is the ceiling covering of the building, cannot provide the required value.	0 credits
IEQ 02 C4	The external stone walls have high sound insulation and fulfil the criteria.	3 credits
IEQ 02 C5	The internal stone walls have high sound insulation and fulfil the criteria.	3 credits
IEQ 02 C6	The floor material consisting of terracotta and artificial stone has low sound insulation.	0 credits
IEQ 02 C7	Impact-induced sound insulation of the floors must meet at least C class	2 credits
IEQ 03 C1	Considering the indoor temperature, relative humidity and U-values of the stone wall, the PPD and PMV values of the building remain in an average range.	8 credits
IEQ 04 C1	There is no CO2 sensor where the building is naturally ventilated.	0 credits
Total: 38 credits x Coefficient: 0.20 = Overall 7.6 credits		
BUILDING MATERIAL AND LIFE CYCLE		
BMLC 01 C1	The terracotta and artificial stone floor coverings and steel carriers used in the building are EPD certified materials, and the natural stone walls and wooden trusses used in the building are reused and less processed materials.	30 credits
BMLC 02 C1	Required	Required
BMLC 02 C2	The materials used are either natural materials or artificial stone materials with clean content.	12 credits
BMLC 03 C1	Required	Required
BMLC 04 C1	This article applies to materials such as steel, natural stone and wood as they are used in construction.	7 credits
BMLC 05 C1	The stone wall material used in the building is extracted from a quarry in the Tarsus region.	6 credits
BMLC 06 C1	Since the building is an adaptive reuse project, most of the materials used were removed from the existing structure and reused as reinforced.	5 credits
BMLC 06 C2	Steel structural elements were used in the building.	5 credits
BMLC 06 C3	Steel structural elements, wood and stone were used in the building.	6 credits

Table 33. Continued

BMLC 06 C4	Since the building is an adaptive reuse project, the existing materials were reinforced and reused. For this reason, it is foreseen that these materials will be used for a long period of time.	8 credits
BMLC 07 C1	The existing materials in the building were cleaned and reused after being strengthened.	2 credits
BMLC 07 C2	The existing materials in the building were cleaned and reused after being strengthened.	6 credits
Total: 87 credits x Coefficient: 0.16 = Overall 13.92 credits		
ENERGY USE AND EFFICIENCY		
EUE 01 C1	The local and natural materials used in the building, solar control and natural lighting, natural ventilation and the use of less mechanical systems, design in accordance with the local region's climate show that the building provides improvement within energy consumption and CO2 emissions.	50 credits
EUE 02 C1	Preliminary analyses have been made for the use of renewable energy.	7 credits
EUE 02 C2 (*)	There are solar panels and photovoltaic panels in the building.	15 credits
Total: 72 credits x Coefficient: 0.30 = Overall 21.6 credits		
WATER AND WASTE MANAGEMENT		
WWM 01 C1	The lavatory fittings used in the building are not photocell fittings. However, rainwater collection systems have been placed on the roof and courtyard of the building so that rainwater can be collected in the rainwater tank and water can be used from there when needed.	10 credits
WWM 01 C2	No measures have been taken for losses and leakages in water.	0 credits
WWM 01 C3	Required	Required
WWM 01 C4	There are water monitoring	5 credits
WWM 01 C5	Rainwater collection systems have been placed on the roof and courtyard of the building so that rainwater can be collected in the rainwater tank and water can be used from there when needed.	7.5 credits
WWM 01 C6	Wastewater reuse (grey water) is not utilised	0 credits
WWM 02 C1	Required	Required
WWM 02 C2	Waste segregation during the construction site process has been done very well.	20 credits
WWM 02 C3	Since the building is an adaptive reuse project, most of the materials considered as construction site wastes were reinforced and reused in the building.	8 credits
WWM 02 C4	Such a segregation is not made.	0 credits
WWM 02 C5	Since the it is an adaptive reuse project, most of the materials considered as construction site wastes were reinforced and reused in the building.	5 credits
Total: 55.5credits x Coefficient: 0.20 = Overall 11 credits		

Table 34. Continued

INNOVATION BUILDING		
INNO 01 C1	It has a holistic and interdisciplinary approach	25 credits
INNO 01 C2	Building design and the used materials of the building increase the comfort of thermal, visual and acoustic issues of the building in an innovative way.	25 credits
INNO 02 C1	There are traditional systems for monitoring water, heat and energy performance, but no innovative systems.	0 credits
Total: 50 credits x Coefficient: 0.10 = Overall 5 credits		
Grand Total: 68.78 credits		

4.3 Comparison

The DGNB (from Germany) renovation certificate has received the highest score among the other three certificates. This demonstrates that the DGNB certificate is also compatible with the conditions for adaptive reuse of existing buildings. For achieving the green building certification of heritage buildings after adaptive reuse, DGNB could be a good option and its criteria could assist in the development of the YeS-TR certification.

The second certificate that has received the highest score after DGNB is the LEED (from US) BD+C New Construction & Major Renovation certificate. While the certificate's detailed examination of topics such as energy, materials, and indoor air quality offers significant advantages for adaptively reused heritage buildings, its performance-based approach may also pose a disadvantage as it requires a detailed analysis of the buildings.

The YeS-TR certificate, developed in Türkiye by taking into account environmental data, energy efficiency, and local conditions, offers medium-level certification flexibility by achieving the third highest score. Although there are no specific criteria developed for the adaptive reuse of heritage buildings, some of the existing criteria can be applied to these structures. While the local focus and ease of implementation

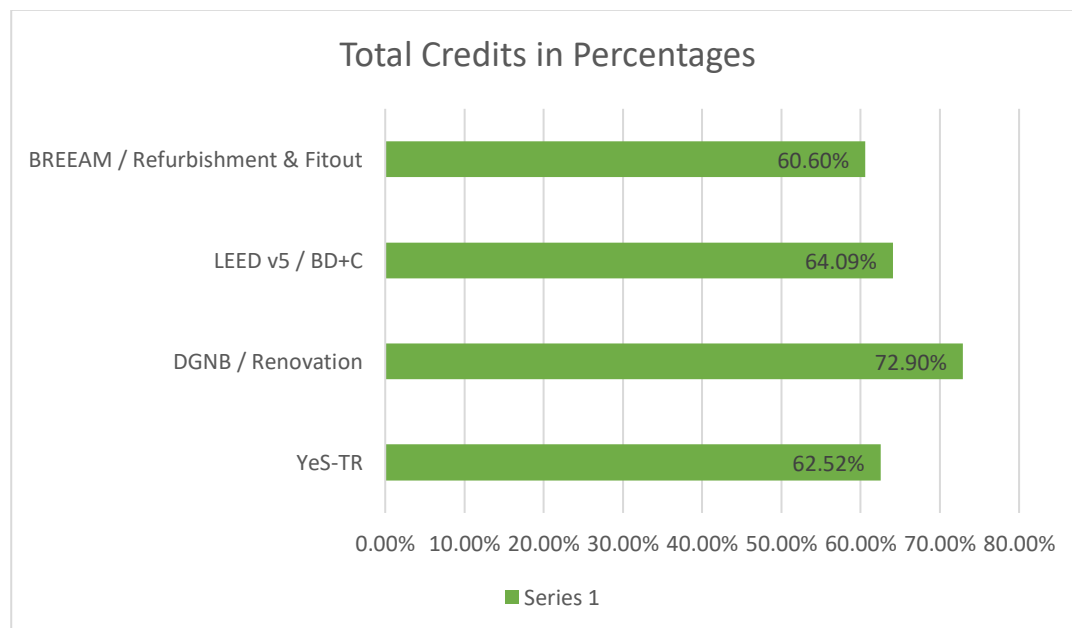
offer advantages for the adaptive reuse of heritage buildings, there are still many areas that require further development.

The certification with the lowest score and least flexibility in this regard is the BREEAM (from the UK) Refurbishment and Fit-out certification. The BREEAM certification, which is process-oriented rather than performance-oriented, places great emphasis on documentation and process management. While some criteria of the certification may be applicable in the design and construction phases of adaptive reuse projects for heritage buildings, the certification's flexibility for such structures is virtually non-existent.

In conclusion, although the DGNB certificate is the most suitable certificate for adaptive reuse projects of heritage buildings, the YeS-TR certificate also has many criteria that can be developed specifically for these buildings.

Comparison of total credits in percentages of the mentioned four green building certification can be seen in Table 17 below.

Table 35. Comparison of Total Credits in Percentages



CHAPTER 5

CONCLUSION

The adaptive reuse project of Boğaziçi University Gözlükule Excavation Research Centre is a valuable example not only of the preservation of heritage but also of a building designed with sustainable principles. In this context, the building has become an intersection point of both cultural heritage conservation and sustainability. In this thesis, the BOUN Excavation Research Centre building has been examined in detail within the framework of three international green building certification systems, BREEAM (from UK) , LEED(from US) and DGNB(from Germany), and one national green building certification system,YeS-TR(from Türkiye), and the compatibility of the building with these certificates has been critically evaluated from a important point of view and it has been investigated to what extent it has been taken into consideration in protecting the important characteristics of heritage buildings.

As a result of the researches and evaluations, the findings show that the Gözlükule Excavation Research Centre building, which has received LEED Gold certification in the category of Building Design + Construction; New Construction and Major Renovation, can fully account for restoration and renovation works such as cleaning, strengthening and reusing the existing materials during the process, integrating passive energy systems into the building and developing restoration strategies that respect the identity of the building, which is a historical and cultural heritage. The performance-based criteria of the LEED (BD+C) certification and the phased assessment structure integrated into the credit system of the BREEAM Refurbishment & Fit out certification are highly comprehensive and critical for new buildings; however, they offer very limited possibilities and no alternative solutions for adaptable reuse projects (Yung & Chan, 2012; Elefante, 2007).

In addition to these certifications, the DGNB Renovation green building certification systems have been analyzed in detail, and it can be stated that these certifications have more sensitive criteria within the framework of adaptive reuse projects for heritage buildings. For example, the DGNB Renovation certification has incorporated life cycle aspects, cultural heritage values, and adaptability/flexibility into its credit system. This has resulted in a certification that is more sensitive to the complexities and challenges of heritage building adaptation and reuse projects (DGNB, 2023).

In contrast, Türkiye's local green building certification system, YeS-Tr certification, although quite detailed in regional terms and quite advantageous in terms of accessibility, does not have the criteria required for the documentation and certification of adaptive reuse projects of heritage buildings. The current situation does not address the cultural, social and historical values inherent to heritage buildings carefully enough and does not provide flexible performance criteria and alternative criteria applicable to registered heritage buildings under protection. This situation reduces the applicability of YeS-Tr certification to adaptive reuse of heritage buildings such as Gözlükule Research Centre and reduces the adaptive reuse potential of registered heritage buildings, which are very numerous in our country, by protecting their heritage values within the framework of sustainability principles.

As a result, the need to revise and develop the YeS-TR certificate to better support the certification of adaptive reuse projects, especially those involving heritage buildings, and to expand its criteria has reached a critical level. In this direction, some of the criteria that the certificate should include may be as follows;

- Adding credit routes specific to heritage buildings or improving existing credits by making them more flexible,
- Flexible design solutions for heritage buildings that can adapt to today's needs,
- Developing solutions in integrated energy, water, ventilation and insulation categories that do not damage the historical and architectural values of

heritage buildings and do not visually interfere with the facades/mass of the building,

- Integrating qualitative and contextual assessment criteria into the certification criteria,
- Integrating sustainability principles, which can be integrated in a way that does not affect the values of cultural and architectural of the building, into the rating system as the main category for heritage buildings,
- In order to ensure that heritage buildings do not lose their social value, integrate criteria that reward the active use of the public by organising events, exhibitions and shows in cultural, educational, etc. categories.

In a nutshell, Yes-TR certification can adopt the best practices of international systems in adaptively reused heritage buildings projects and adapt them to our local heritage conditions by developing other elements that are not found in other certification systems. Thus, the YeS-TR certificate can be transformed into a more harmonious and inclusive and highly effective certificate that can blend the architectural heritage of our country, which is rich in heritage buildings, with environmental and cultural sustainability goals. In this regard, the Gözlükule Excavation Research Centre building, which is examined as a case study in this thesis, not only highlights the gaps in certification systems, but also provides a roadmap for certification reform in a way that bridges conservation/restoration practices and sustainable performances in the case of heritage buildings in our country.



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URL-3: <https://www.usgbc.org/leed/v41#bdc> (Access date: 04.01.2024)

URL -4 : <https://www.leedsertifkasi.com.tr/leed-sertifkasi-kriterleri-neler/> (Access date: 04.01.2025)

URL-5 : <https://yestr.org/> (Access date 06.01.2025)

APPENDICES

A. Definitions of Terms Related to Adaptive Reuse

Table A.1. Different definitions of terms related to adaptive reuse used in the literature

<i>Terms</i>	<i>Definitions</i>	<i>Author / Book</i>
Adaptation	Any work performed on a building that is not part of routine maintenance and is intended to change the building's function or performance.	Building Adaptation (Douglas, 2006)
	To modify a structure to make it suitable for its proposed new use.	Icomos New Zealand, 2010
Conversion	To make a structure more suitable for another type of or similar type of single-use or mixed use.	(Douglas, 2006)
	Work involving a change of function or use, such as converting an office block into residential accommodation.	(Watson, 2009)
	Conversions can extend the concept of renovation in a building to include structural interventions, elements and/or interior layout.	Giebeler 2009 (Giebeler, Krause, & Fisch, 2009)
Extension	The act of extending the capacity or volume of a building vertically or horizontally.	(Douglas, 2006)
	Any extension work on the building will result in the creation of a new structure that is dependent on the use of the existing building.	(Giebeler, Krause, & Fisch, 2009)
Refurbishment	Performance change	(Watson, 2009)
	Refurbishment a building means bringing it up to current standards due to changes in user requirements or new technical regulations.	(Giebeler, Krause, & Fisch, 2009)
Rehabilitation	Modifying a source to meet contemporary functional standards or adapting it for new uses.	ICOMOS Appleton Charter 1989
	Rehabilitation is the action or process of ensuring that a property is used in a manner consistent with its historical, cultural, or architectural value through repair, alteration, and additions.	U.S. Secretary of the Interior 1995
Renovation	Renovation includes, repair, and conversion work to restore an old building to a usable condition.	(Douglas, 2006)
	Renovation preserves the functionality and value of an existing building by applying appropriate maintenance techniques rather than adding new architectural elements.	(Giebeler, Krause, & Fisch, 2009)

B. BREEAM Refurbishment & Fit-Out Certification Scores

Table A.2. Sub-headings of the BREEAM Refurbishment & Fit-Out Certification System Score Percentages

Issue		Credits
MANAGEMENT		
Man 01	Project brief and design	4
Man 02	Life cycle cost and service life planning	4
Man 03	Responsible construction practices	6
Man 04	Commissioning and handover	4
Man 05	Aftercare	3
		Total: 21 credits
HEALTH & WELLBEING		
Hea 01	Visual comfort	Building Type Dependent (Up to 7 credits)
Hea 02	Indoor air quality	Building Type Dependent (5)
Hea 03	Safe containment in laboratories	Building Type Dependent (2)
Hea 04	Thermal comfort	3
Hea 05	Acoustic performance	Building Type Dependent (4)
Hea 06	Safety & Security	N/A
Hea 07	Hazards	1
		Total: 21 credits
ENERGY		
Ene 01	Reduction of energy use and carbon emissions	Building Type and Scope Dependant (12)
Ene 02	Energy monitoring	Building Type Dependent (2)
Ene 03	External lighting	1
Ene 04	Low carbon design	6

Table A.3. Continued

Ene 05	Energy efficient cold storage	3
Ene 06	Energy efficient transport systems	3
Ene 07	Energy efficient laboratory systems	Building Type Dependent (Up to 5 credits)
Ene 08	Energy efficient equipment	2
Ene 09	Drying space	1
Total: 35 credits		
TRANSPORTATION		
Tra 01	Public transport accessibility	Up to 8 credits
Tra 02	Proximity to amenities	Up to 2 credits
Tra 03	Cyclist facilities	0
Tra 04	Maximum car parking capacity	Up to 2 credits
Tra 05	Travel plan	1
Total: 13 credits		
WATER		
Wat 01	Water consumption	5
Wat 02	Water monitoring	1
Wat 03	Water leak detection and prevention	2
Wat 04	Water efficient equipment	1
Total: 9 credits		
MATERIALS		
Mat 01	Environmental impact of materials	Up to 6 credits
Mat 02	Hard landscaping and boundary protection	N/A
Mat 03	Responsible sourcing of construction products	4
Mat 04	Insulation	N/A
Mat 05	Designing for durability and resilience	1
Mat 06	Material efficiency	1
Total: 12 credits		
WASTE		
Wst 01	Construction waste management	6
Wst 02	Recycled aggregates	1
Wst 03	Operational waste	1

Table A.4. Continued

Wst 04	Speculative finishes	1
Wst 05	Adaptation to climate change	1
Wst 06	Functional adaptability	1
		Total: 11 credits
LAND USE & ECOLOGY		
LE 01	Site selection	N/A
LE 02	Protection of ecological features	1
LE 03	Minimising impact on existing site ecology	N/A
LE 04	Enhancing site ecology	1
LE 05	Long term impact on biodiversity	2
		Total: 4 credits
POLLUTION		
Pol 01	Impact of refrigerants	4
Pol 02	NOx emissions	Up to 3
Pol 03	Flood risk management and reducing surface water runoff	5
Pol 04	Reduction of night time light pollution	1
Pol 05	Reduction of noise pollution	1
		Total: 14 credits
INNNOVATION		
Inn 01	Innovation	10
		Total: 10 credits
Grand Total: 150 credits		

C. LEED v5 BD+C: New Construction & Major Renovation Certification

Scores

Table A.5. Sub-headings of the BREEAM Refurbishment & Fit-Out Certification System Score Percentages

Issue		Credits
INTEGRATIVE PROCESS, PLANNING AND ASSESSMENTS		
IPp1	Climate Resilience Assessment	Required
IPp2	Human Impact Assessment	Required
IPp3	Carbon Assessment	Required
IPc1	Integrative Design Process	1 credit
		Total: 1 credit
LOCATION AND TRANSPORTATION		
LTc1	Sensitive Land Protection	1 credit
LTc2	Equitable Development	2 credits
LTc3	Compact and Connected Development	6 credits
LTc4	Transportation Demand Management	4 credits
LTc5	Electric Vehicles	2 credits
		Total: 15 credits
SUSTAINABLE SITES		
SSp1	Minimize Site Disturbance	Required
SSc1	Biodiverse Habitat	2 credits
SSc2	Accessible Outdoor Space	1 credit
SSc3	Rainwater Management	3 credits
SSc4	Enhanced Resilient Site Design	2 credits
SSc5	Heat Island Reduction	2 credits
SSc6	Light Pollution Reduction	1 credit
		Total: 11 credits
WATER EFFICIENCY		
WEp1	Water Metering and Reporting	Required
WEp2	Minimum Water Efficiency	Required
WEc1	Water Metering and Leak Detection	1 credit
WEc2	Enhanced Water Efficiency	8 credits
		Total: 9 credits
ENERGY AND ATMOSPHERE		
EAp1	Operational Carbon Projection and Decarbonization Plan	Required

Table A.6. Continued

EAp2	Minimum Energy Efficiency	Required
EAp3	Fundamental Commissioning	Required
EAp4	Energy Metering and Reporting	Required
EAp5	Fundamental Refrigerant Management	Required
EAc1	Electrification	5 credits
EAc2	Reduce Peak Thermal Loads	5 credits
EAc3	Enhanced Energy Efficiency	10credits
EAc4	Renewable Energy	5 credits
EAc5	Enhanced Commissioning	4 credits
EAc6	Grid Interactive	2 credits
EAc7	Enhanced Refrigerant Management	2 credits
		Total: 33 credits
MATERIALS AND RESOURCES		
MRp1	Planning for Zero Waste Operations	Required
MRp2	Quantify and Assess Embodied Carbon	Required
MRC1	Building and Materials Reuse	3 credits
MRC2	Reduce Embodied Carbon	6 credits
MRC3	Low-Emitting Materials	2 credits
MRC4	Building Product Selection and Procurement	5 credits
MRC5	Construction and Demolition Waste Diversion	2 credits
		Total: 18 credits
INDOOR ENVIRONMENTAL QUALITY		
EQp1	Construction Management	Required
EQp2	Fundamental Air Quality	Required
EQp3	No Smoking or Vehicle Idling	Required
EQc1	Enhanced Air Quality	1 credit
EQc2	Occupant Experience	7 credits
EQc3	Accessibility and Inclusion	1 credit
EQc4	Resilient Spaces	2 credits
EQc5	Air Quality Testing and Monitoring	2 credits
		Total: 13 credits
PROJECT PRIORITIES		
PRc1	Project Priorities	9 credits
PRc2	LEED Accredited Professional	1 credit
		Total: 10 credits
Grand Total: 110 credits		

D. DGNB Renovation Certification Scores

Table A.7. Sub-headings of the DGNB Renovation Certification System Score Percentages

Issue		Credits
ENVIRONMENTAL QUALITY		
ENV1.1	Building Life Cycle Assessment	9.5 %
ENV1.2	Local Environmental Impact	4.7 %
ENV1.3	Sustainable Resource Extraction	2.4 %
ENV2.2	Potable Water Demand and Waste Water Volume	2.4 %
ENV2.3	Land Use	2.4 %
ENV2.4	Biodiversity at the Site	1.2 %
		Total: 22.6 % credits
ECONOMIC QUALITY		
ECO1.1	Life Cycle Cost	10.0 %
ECO2.1	Flexibility and Adaptability	7.5 %
ECO2.2	Commercial Viability	5.0 %
		Total: 22.5 % credits
SOCIOCULTURAL AND FUNCTIONAL QUALITY		
SOC1.1	Thermal Comfort	4.1 %
SOC1.2	Indoor Air Quality	5.1 %
SOC1.3	Acoustic Comfort	2.0 %
SOC1.4	Visual Comfort	3.1 %
SOC1.5	User Control	2.0 %
SOC1.6	Quality of Indoor and Outdoor Spaces	2.0 %
SOC1.7	Safety and Security	1.0 %
SOC2.1	Design for All	3.1 %
		Total: 22.4 % credits
TECHNICAL QUALITY		
TEC1.1	Fire Safety	2.5 %
TEC1.2	Sound Insulation	1.9 %
TEC1.3	Quality of the Building Envelope	2.5 %
TEC1.4	Use and Integration of Building Technology	1.9 %
TEC1.5	Ease of Cleaning Building Components	1.3 %
TEC1.6	Ease of Recovery and Recycling	2.5 %
TEC1.7	Immissions Control	0.6 %
TEC3.1	Mobility Infrastructure	1.9 %

Table A.8. Continued

Total: 15.1 % credits		
PROCESS QUALITY		
PRO1.1	Comprehensive Project Brief	1.6 %
PRO1.4	Sustainability Aspects in Tender Phase	1.6 %
PRO1.5	Documentation for Sustainable Management	1.6 %
PRO1.6	Procedure for Urban and Design Planning	1.1 %
PRO2.1	Construction Site / Construction Process	1.6 %
PRO2.2	Quality Assurance of the Construction	1.6 %
PRO2.3	Systematic Commissioning	1.6 %
PRO2.4	User Communication	1.1 %
PRO2.5	FM-Compliant Planning	0.5 %
Total: 12.3 % credits		
SITE QUALITY		
SITE1.1	Local Environmental	1.1 %
SITE1.2	Influence on the District	1.1 %
SITE1.3	Transport Access	1.1 %
SITE1.4	Access to Amenities	1.7 %
Total: 5% credits		
Grand Total: 100 % credits*		

* The Points differs between building types(Offices,Education,Residential, etc.)

This tables show the percentages of Office Buildings

E. YeS-TR Certification Scores

Table A 9. Sub-headings of the YeS-TR Certification Score Percentages

Issue			Credits
INTEGRATED BUILDING DESIGN, CONSTRUCTION & MANAGEMENT			
IBD 01 Project Planning	IBD 01 C1	Establishment of a project team including relevant disciplines	Required
	IBD 01 C2	Involving the Green Certification Expert in the process	7 credits
	IBD 01 C3	Determination of the detailed project scope	Required
	IBD 01 C4	Selection of sustainable land and transport links	10 credits
IBD 02 Integrated Design	IBD 02 C1	Interdisciplinary stakeholder engagement	Required
	IBD 02 C2	Preliminary research/analysis on energy and evaluation of possible strategies	4 credits
	IBD 02 C3	Preliminary research/analysis on water and evaluation of possible strategies	4 credits
	IBD 02 C4	Visual Comfort	4 credits
	IBD 02 C5	Auditory comfort	2 credits
	IBD 02 C6	Controlling the noise emitted by the building	2 credits
	IBD 02 C7	Thermal comfort	3 credits
	IBD 02 C8	Air quality	3 credits
	IBD 02 C9	Preparation and updating of the building emergency plan	4 credits
	IBD 02 C10	Increasing fire safety in design	4 credits
	IBD 02 C11	Carrying out life cycle assessments	2 credits
	IBD 02 C12	Making operational life planning	2 credits
	IBD 02 C13	Engineering and design solutions that improve quality of life	1 credits
	IBD 02 C14	Monitoring and evaluation system has been developed	1 credits
IBD 03 Preparation Of Construction Related Documents	IBD 03 C1	Preparation of the contract, general specifications, special specifications, application project, technical specifications, cost estimate, and tender documents if the contractor has not been determined	4 credits
IBD 04 Construction	IBD 04 C1	Ensuring safe and adequate access	8 credits

Table A 10. Continued

	IBD 04 C2	Control of construction site noise	5 credits
	IBD 04 C3	Ensuring occupational health and safety	Required
	IBD 04 C4	Control of energy and water consumption	9 credits
	IBD 04 C5	Ensuring the management of wastes without harming the environment	5 credits
IBD 05 Control, Commissioning and Acceptance	IBD 05 C1	Defining the commissioning processes for the integrated operation of heating, water distribution, lighting, ventilation, cooling, fire protection (detection, extinguishing) and automatic control systems and determining the team to manage them	5 credits
	IBD 05 C2	Preparation of commissioning programme	9 credits
IBD 06 Operation, Maintenance, Measurement and Facility Management	IBD 06 C1	Defining building maintenance and renovation operations	2 credits
	IBD 06 C2	Transferring the necessary operating maintenance and renewal information to building managers and users	1 credits
	IBD 06 C3	Ensuring optimum operation of building systems according to user profile and behaviour	1 credits
	IBD 06 C4	Monitoring that the post-settlement operation of the building is carried out at an optimum level	3 credits
Total: 100 credits x Coefficient: 0.14 = Overall 14 credits			
INDOOR ENVIRONMENT QUALITY			
IEQ 01 Visual Comfort	IEQ 01 C1	Ensuring the required level of illumination	Required
	IEQ 01 C2	Ensuring the required uniformity of illumination (Uo)	4 credits
	IEQ 01 C3	The built lighting systems provide the required glare (UGR) values	4 credits
	IEQ 01 C4	The artificial lighting systems provide the required colour rendering index (Ra) value	5 credits
	IEQ 01 C5	Ensuring adequate daylight performance	4 credits
	IEQ 01 C6	Ensuring adequate external visibility	4 credits
	IEQ 01 C7	Ensuring solar control	4 credits
IEQ 02 Auditory Comfort	IEQ 02 C1	Environmental noise and neighbourhood noise do not exceed the indoor noise limit values	5 credits

Table A 11. Continued

	IEQ 02 C2	Mechanical system noise does not exceed the indoor noise limit values	5 credits
	IEQ 02 C3	Ring time does not exceed the limit values	3 credits
	IEQ 02 C4	Airborne sound insulation in exterior building elements must meet at least C class	3 credits
	IEQ 02 C5	Airborne sound insulation of interior partition walls must meet at least class C.	3 credits
	IEQ 02 C6	Airborne sound insulation of the slabs must meet at least class C.	3 credits
	IEQ 02 C7	Impact-induced sound insulation of the floors must meet at least C class	3 credits
IEQ 03 Thermal Comfort	IEQ 03 C1	Percentage of Thermal Dissatisfaction (PPD index) and Average Thermal Sensation Indicator (PMV index) TS EN ISO meet the conditions specified in the standard	25 credits
IEQ 04 Air Quality	IEQ 04 C1	Ensuring fresh air intake in accordance with TS EN 16798-1 standard to ensure indoor comfort in natural or mechanical ventilation methods	25 credits
Total: 100 credits x Coefficient: 0.20 = Overall 20 credits			
BUILDING MATERIAL AND LIFE CYCLE			
BMLC 01 Building Material Life Cycle Assessment (LCA) and Environmental Product Declaration (EPD)	BMLC 01 C1	Selecting the material with low environmental impact value in the Environmental Product Declaration (EPD)	36 credits
BMLC 02 Health Product Declaration (HPD)	BMLC 02 C1	Material volatile organic compound (VOC) emission level	Required
	BMLC 02 C2	Material content	15 credits
BMLC 03 Radiation Release	BMLC 03 C1	Submission of radiation certificate	Required
BMLC 04 Responsible usage of resources	BMLC 04 C1	Responsible usage of resources	8 credits

Table A 12. Continued

BMLC05 Usage of local resources	BMLC 05 C1	Usage of local resources	6 credits
BMLC 06 Use of Reused, Reclaimed or Recyclable Materials	BMLC 06 C1	Usage of recovered materials	5 credits
	BMLC 06 C2	Use of detachable, attachable finished prefabricated products	5 credits
	BMLC 06 C3	Use of products with recycling content	6 credits
	BMLC 06 C4	Planning the process of separation of the material from the building after the end of the building life	10 credits
BMLC 07 Durable Material Usage	BMLC 07 C1	Maintenance and repair frequency	3 credits
	BMLC 07 C2	Durable architectural design	6 credits
Total: 100 credits x Coefficient: 0.16 = Overall 16 credits			
ENERGY USE AND EFFICIENCY			
EUE 01 Building Energy Performance	EUE 01 C1	Increasing weighted energy performance (weighted improvement ratio of energy demand, energy consumption and CO2 emission compared to the Reference Building)	75 credits
EUE 02 Renewable Energy Technologies	EUE 02 C1	Study on renewable energy systems	7 credits
	EUE 02 C2 (*)	Use of Renewable Energy (OPTION-1- Installation and use of renewable energy technologies)	18 credits
		Use of Renewable Energy (OPTION-2 Purchase of renewable energy from off-site)	10 credits
Total: 100 credits x Coefficient: 0.30 = Overall 30 credits			
WATER AND WASTE MANAGEMENT			
WWM 01 Water Management	WWM 01 C1	Selection of appropriate fittings and equipment for efficient and effective use of water (Improvement rate according to reference value) Note: The reference value for the existing building is the existing state of the building to be evaluated before the improvement.	20 credits
	WWM 01 C2	Prevention of losses and leakages in water distribution / taking necessary measures	10 credits

Table A 13. Continued

	WWM 01 C3	Monitoring and recording of water use with meters	Required
	WWM 01 C4	Control of Water Quality	5 credits
	WWM 01 C5	Rainwater collection, treatment and utilisation	7.5 credits
	WWM 01 C6	Wastewater reuse (grey water)	7.5 credits
WWM 02 Waste Management	WWM 02 C1	Preparation of waste management plan (Compulsory)	Required
	WWM 02 C2	Separation of wastes on site, collection in appropriate places and volumes	20 credits
	WWM 02 C3	Reducing the volume of waste to be removed by encouraging and ensuring the reuse of separated waste	10 credits
	WWM 02 C4	Recovery of biodegradable wastes by composting, energy recovery	15 credits
	WWM 02 C5	Separate collection and reuse of demolition waste	5 credits
Total: 100 credits x Coefficient: 0.20 = Overall 20 credits			
INNOVATION BUILDING			
INNO 01 Engineering and Design Solutions that Improve Quality of Life	INNO 01 C1	Innovation: Providing applications that are not included in the existing certification requirements but have innovative value in green building certification	25 credits
	INNO 01 C2	Improvement: Providing improvements that increase the quality of life of building users with innovative applications to be developed	25 credits
INNO 02 Improvement of Monitoring and Evaluation System	INNO 02 C1	Monitoring: The project includes innovative solutions for monitoring, measuring and evaluating water, heat and energy sustainability	50 credits
Total: 100 credits x Coefficient: 0.10 = Overall 10 credits			
Grand Total: 110 credits			

* EUE 02 C2 For the Use of Renewable Energy criterion, points can be obtained from only one of OPTION-1 or OPTION-2 (1- Installation and use of renewable energy technologies or 2-Purchase of renewable energy from off-site).

F. Pictures of Restoration Process of the Building Materials



Figure A. 1. Removal of the Stones and Wooden Lintels (Source: SAYKA,2025)



Figure A. 2. The process of crushing the stones brought to the building area in whole form in accordance with their original dimensions (Source: SAYKA, 2025)



Figure A. 3. Giving different texture to the new stones with hammer (Source:SAYKA,2025)



Figure A. 4. Cleaning process of the wooden trusses with bristle brushes (Source: SAYKA, 2025)



Figure A. 5. Reinforcing the wooden trusses with injection method (Source: SAYKA, 2025)



Figure A. 6. Restoring Wooden Trusses (Source: Arkiv,2025)

G. Internationally Recognised Conservation Principles

Table A.14. Internationally recognised conservation principles in conservation and restoration around historic buildings

Name of the Document	Article	Content of the Article
Venice Charter, 1964 (Source: ICOMOS, 1964)	Article 6	It is important that the monuments are preserved together with their surroundings, that the traditional environment in which they are located is not disturbed, and that the mass or color relations are not changed/destroyed by new additions to the buildings.
ICOMOS Türkiye Architectural Heritage Protection Declaration, 2013 (Source: ICOMOS Türkiye, 2013)	Article II and Article III-2	Architectural building conservation, as part of cultural and environmental development, cannot be said to be conserved in cases of reconstruction of buildings built in a new environment or in cases of reconstruction with a changed environmental context, without taking into account the original location, design, material and workmanship characteristics.
Valetta Principles for the Conservation and Management of Historic Towns and Urban Areas, 2011 (Source: ICOMOS, 2011)	Article 2/b Article 4/c	New buildings in historic districts should be compatible with their context, respectful of the scale, perspective, appearance, focal points and visual extensions of the area, and in a clear relationship with existing architectural structures and their surroundings.
Charter of Athens, Carta del Restauro, 1931 (Source: CIAM, 1931)	Article 6	When restoration is carried out, care should be taken to respect the environment of historical buildings and not to destroy the different periods belonging to the buildings. The buildings around the historical buildings to be restored should not be demolished and buildings that are incompatible with the quality, colour characteristics and building styles of the region should not be built around these historical buildings.
Charter of Athens, 1933 (Source: CIAM, 1933)	Article 70	When new buildings are constructed in historical environments, it is not desirable to use architectural languages of the past periods due to aesthetic concerns.

Table A.15. Continued

Amsterdam Declaration, 1975 (Source: ICOMOS,1975)	b	Since architectural heritage is a common value of peoples, factors such as negligence, intentional destruction/damage and irregular construction should be seen as a common responsibility for the people and buildings should be protected with this awareness.
ICOMOS Traditional Architectural Heritage Charter, 1999 (Source: ICOMOS, 1999)	Article 2	Contemporary interventions to traditional buildings can only be implemented if they respect cultural values and characteristic features.
UNESCO Nairobi Declaration, 1976, Recommendations On The Conservation Of Historic Sites And Their Contemporary Role (Source: UNESCO, 1976)	Article 4 Article 28	The buildings and environment around Historic areas should be preserved and protected against uses that are contrary to the originality of the buildings, additions and changes that are wrong or out of context. Urban environment analysis should be made within the framework of the colour, material, form, facade and roof elements, building's location within the parcel and the dimensions of the relevant parcel.
Convention for the Protection of European Architectural Heritage/Granada Convention, 1985 (Source: Council of Europe, 1985)	Article 4-2b	Renovation projects, demolition of buildings and construction of new ones in their place, which will partially or completely affect the historic building or group of buildings, which will disrupt their characteristic features, should be submitted to the relevant authorities for their authorisation.

H. Architectural Drawings

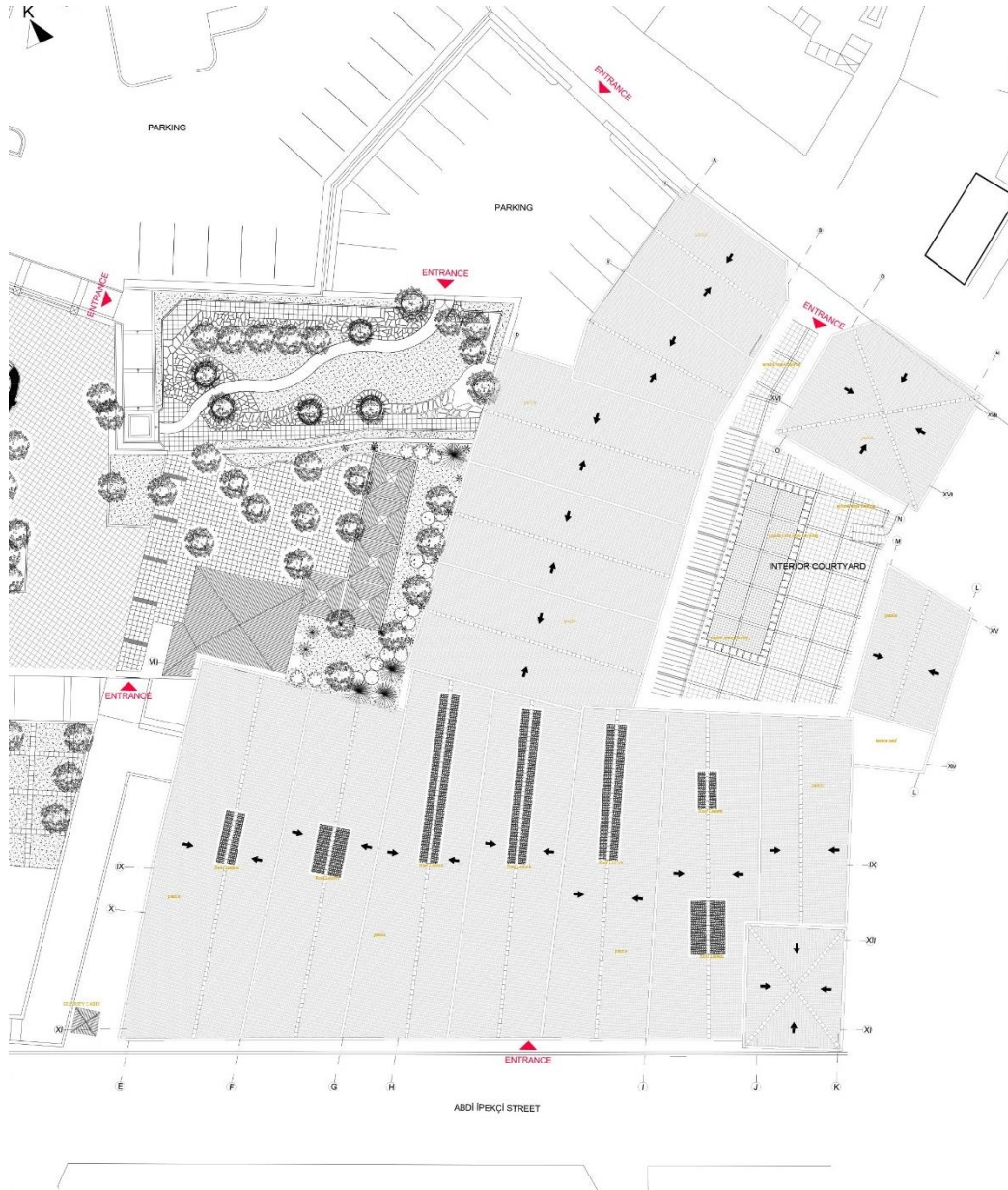


Figure A. 7. Site Plan of Gözlükule Excavation Research Center, Tarsus, Mersin(Source: BOUN, 2025)

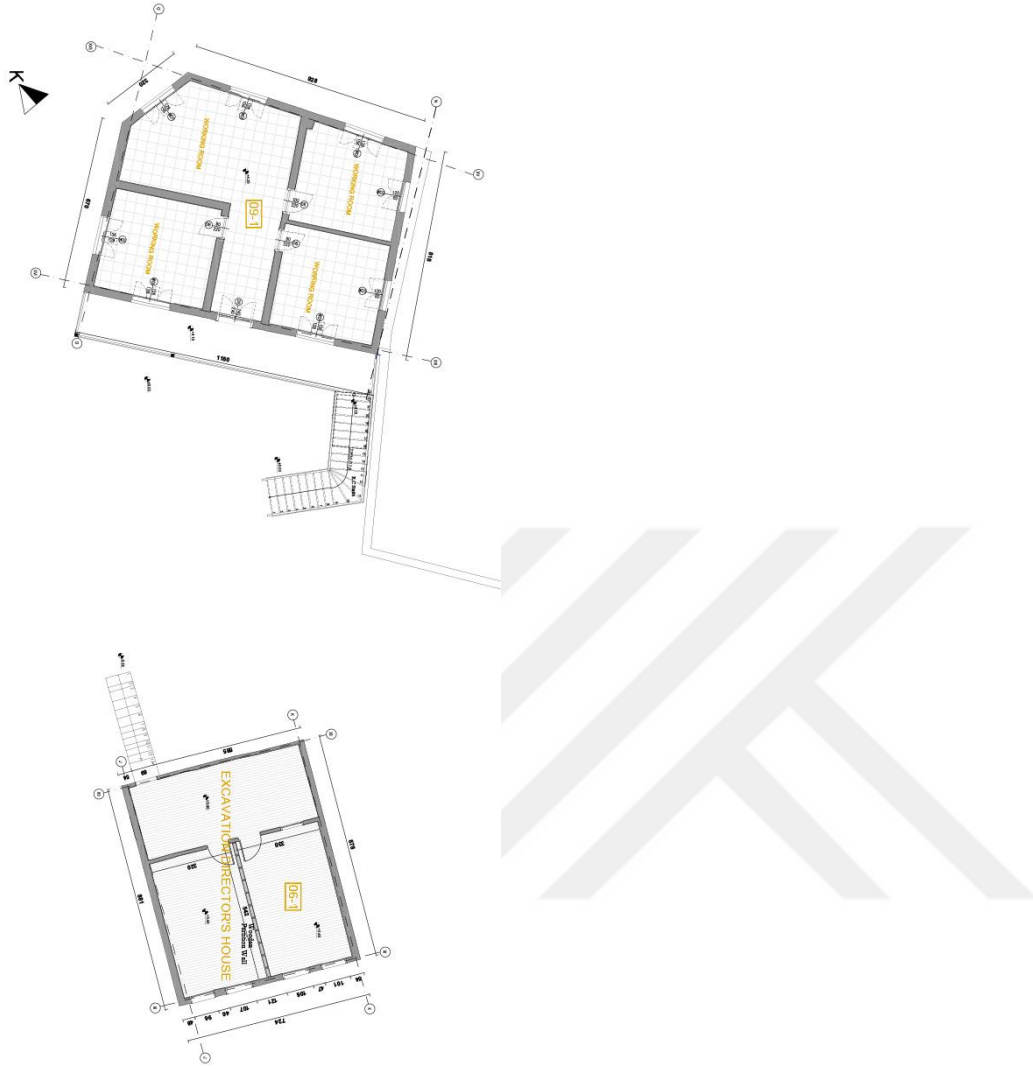


Figure A. 9. First Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

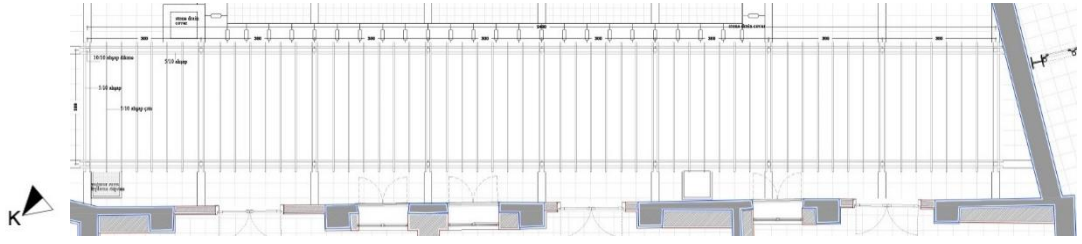


Figure A. 10. Courtyard Pergola Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

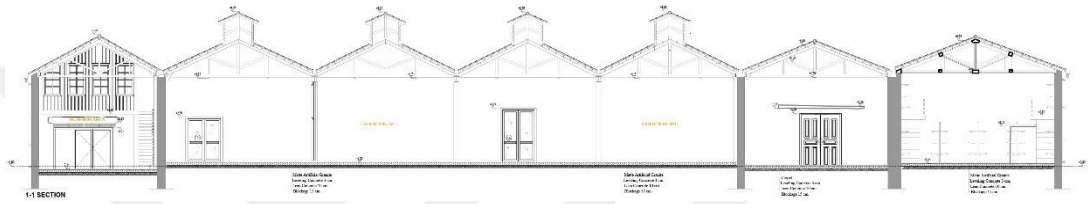


Figure A. 11. Section 1-1 of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)



Figure A. 12. Section 2-2 of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

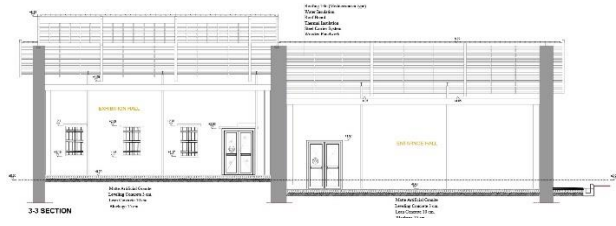


Figure A. 13. Section 3-3 of Gözlükule Excavation Research Center, Tarsus, Mersin
(Source: BOUN,2025)

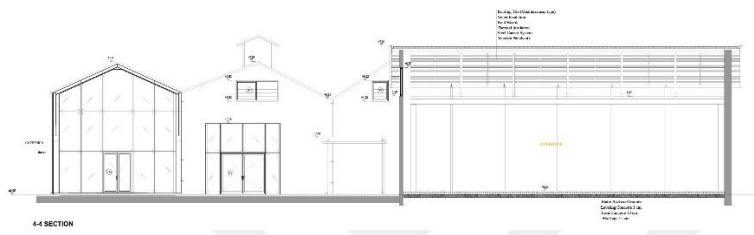


Figure A. 14. Section 4-4 of Gözlükule Excavation Research Center, Tarsus, Mersin
(Source: BOUN,2025)

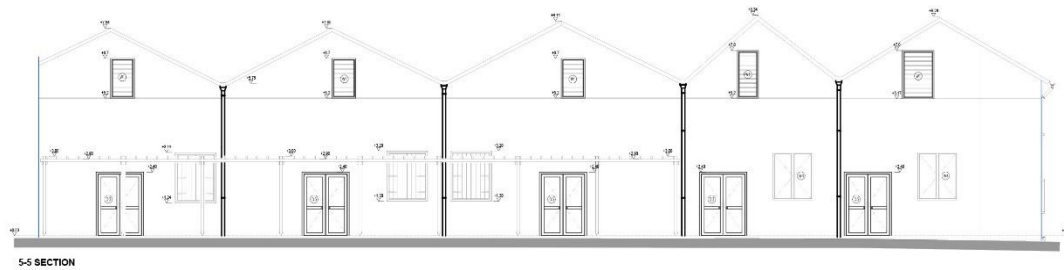


Figure A. 15. Section 5-5 of Gözlükule Excavation Research Center, Tarsus, Mersin
(Source: BOUN,2025)

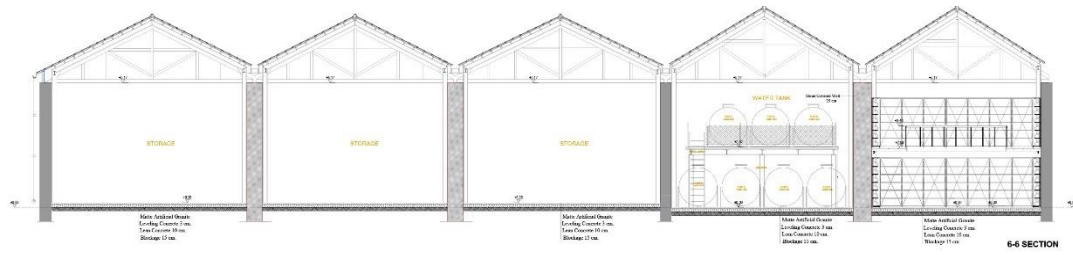


Figure A. 16. Section 6-6 of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

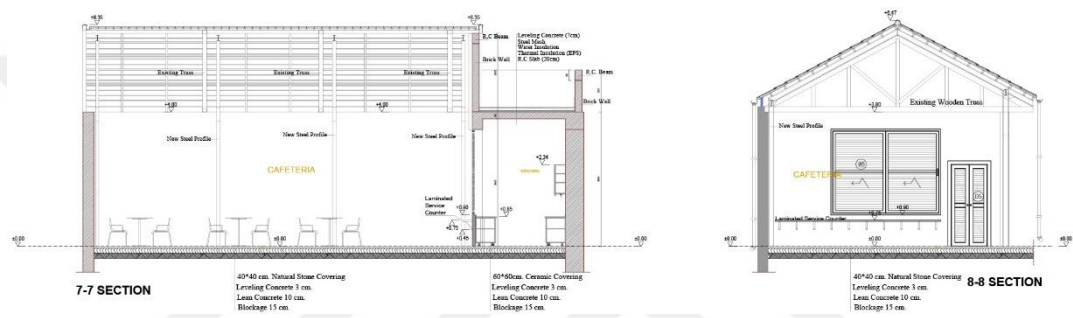


Figure A. 17. Section 7-7(Right)/Section 8-8(Left) of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

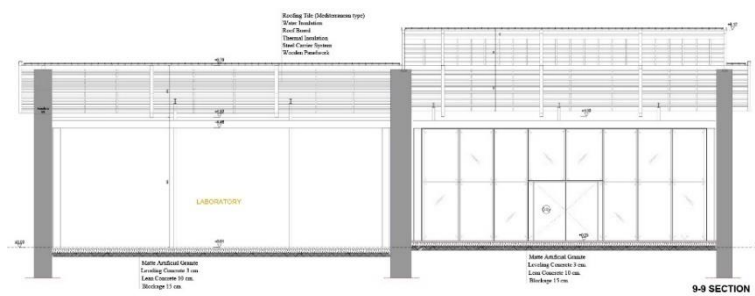


Figure A. 18. Section 9-9 of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

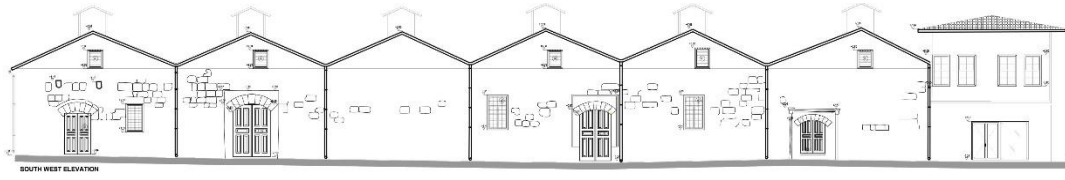


Figure A. 19. South West Elevation of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

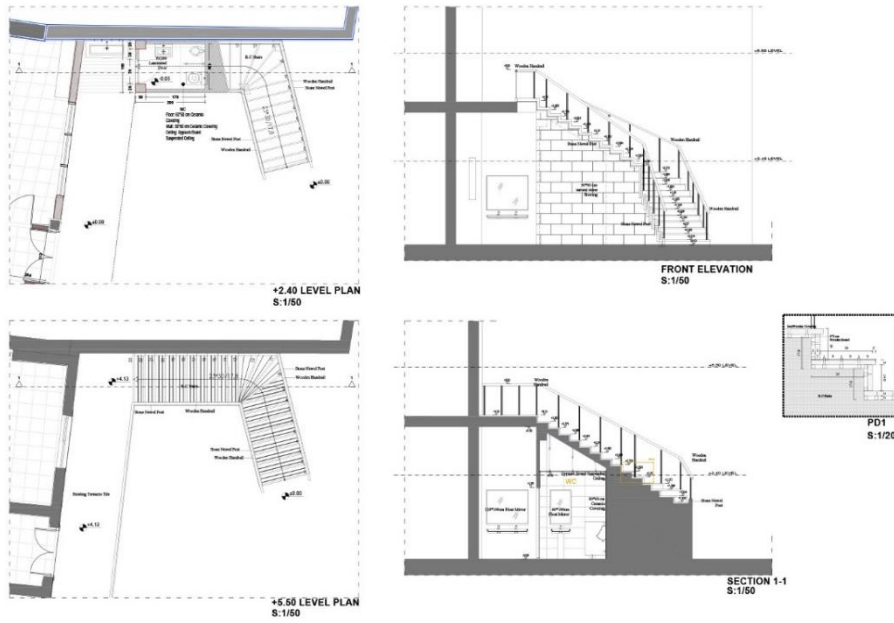


Figure A. 20. Courtyard Stair and Wet Area of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

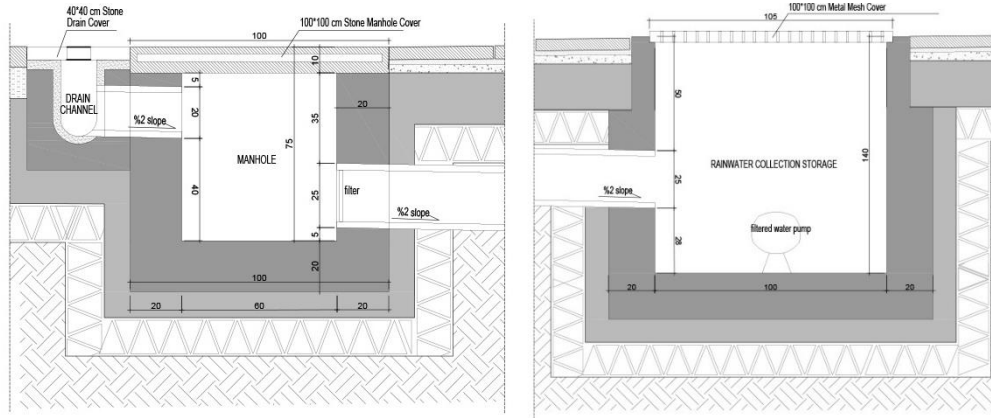


Figure A. 21. Rainwater Collection System Detail of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

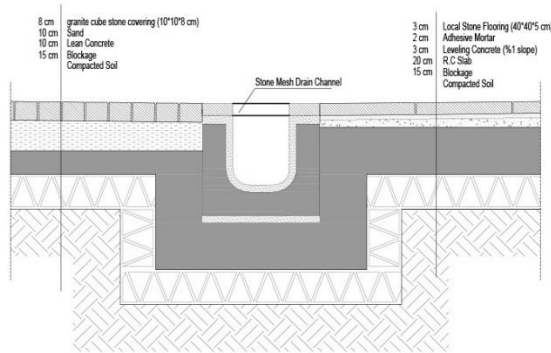


Figure A. 22. Courtyard Flooring Detail of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

I. Mechanical Drawings

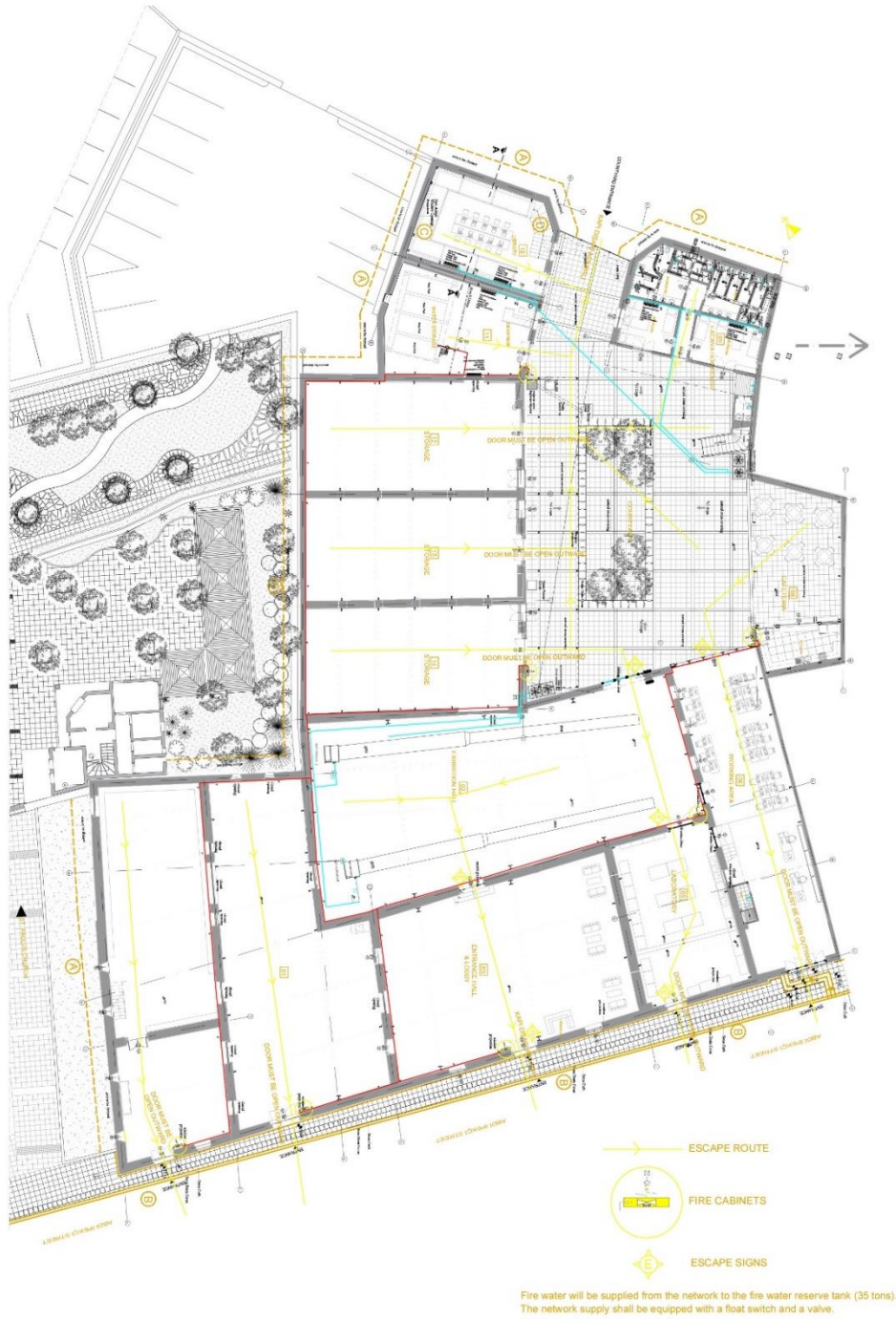


Figure A. 23. Fire Escape Ground Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)



Figure A. 24. Ventilation Ground Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

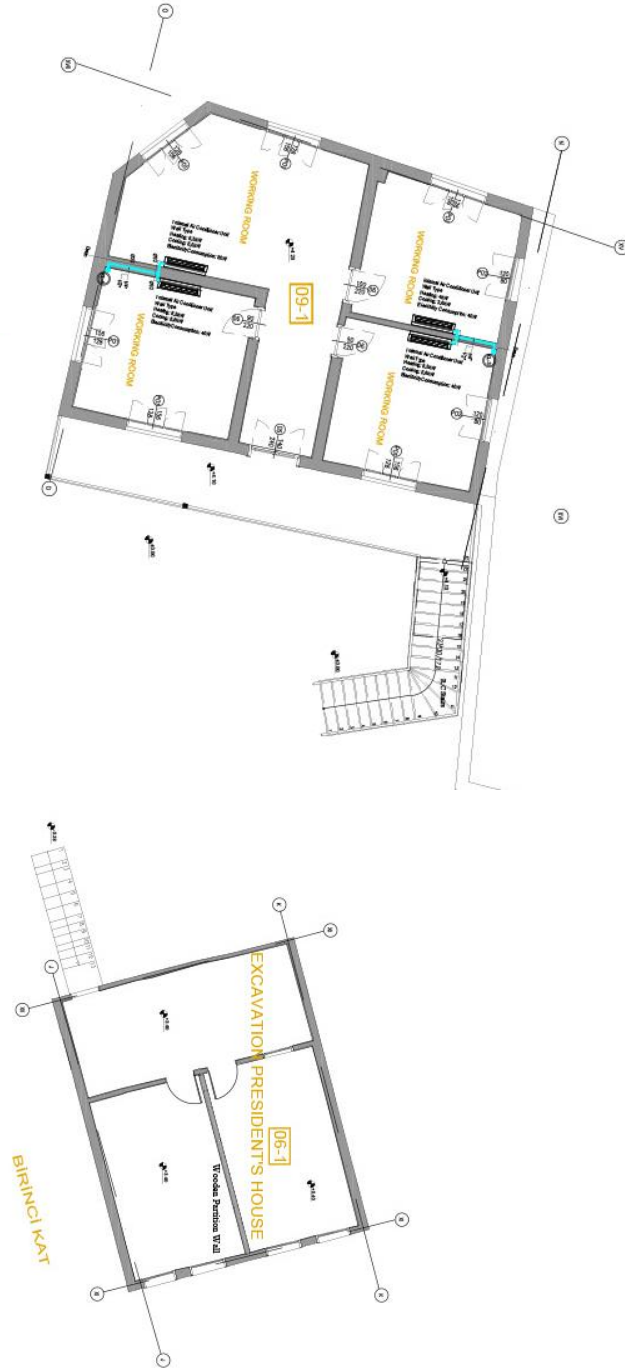


Figure A. 25. Fire Escape and Ventilation First Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

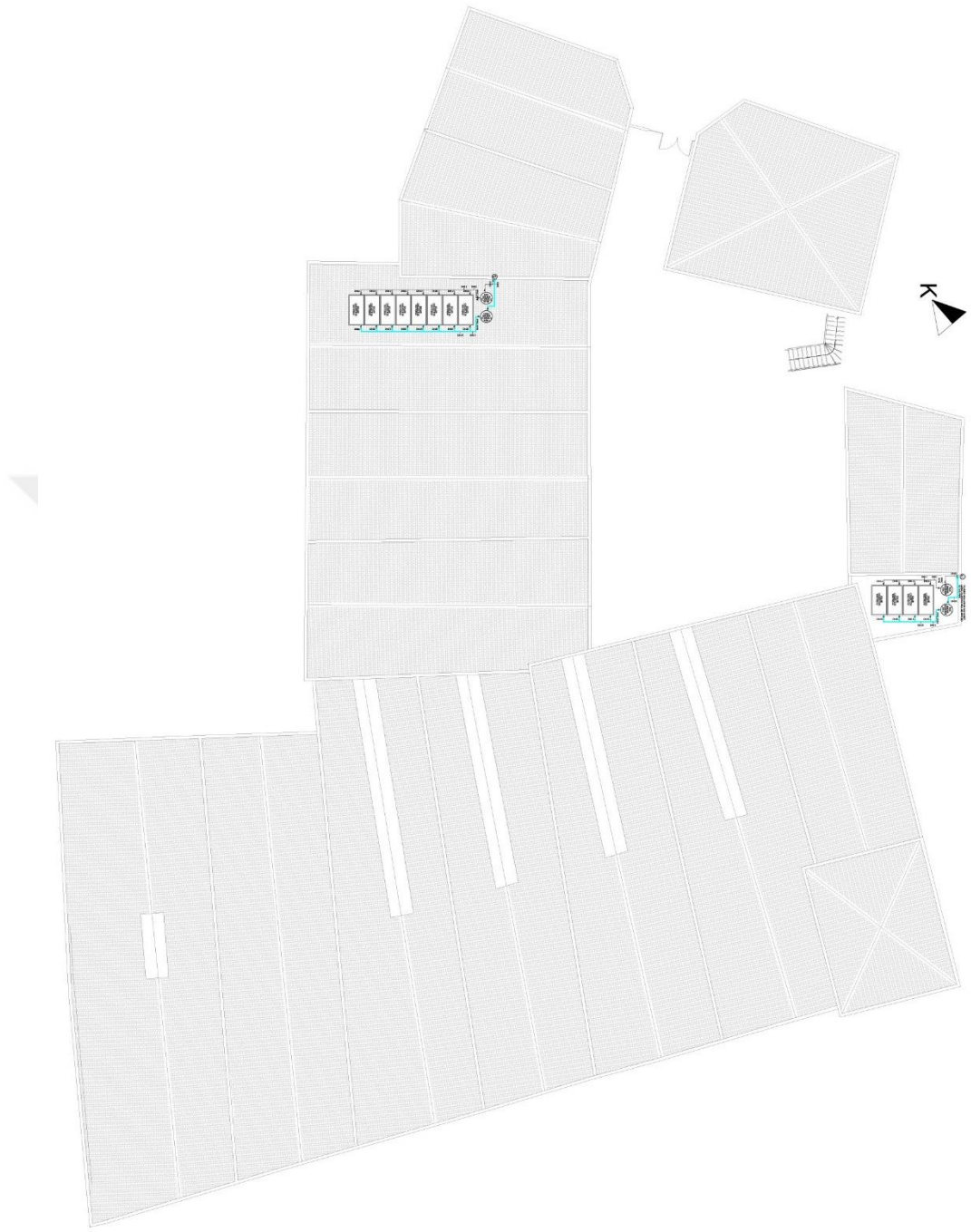


Figure A. 26. Roof Plan of Gözlükule Excavation Research Center, Tarsus, Mersin
(Source: BOUN,2025)



Figure A. 27. Waste Water Plumbing Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)



Figure A. 28. Clean Water Plumbing Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

Flow: 5m³/h
Pressure: 3mSS
Power: 1500W
One Level
1 Original, 1 Backup

Pressure: 3mSS

Power: 1500W

One Level

1 Original, 1 Backup



Figure A. 29. Rainwater Collection Manhole Detail of Gözlükule Excavation
Research Center, Tarsus, Mersin (Source: BOUN,2025)

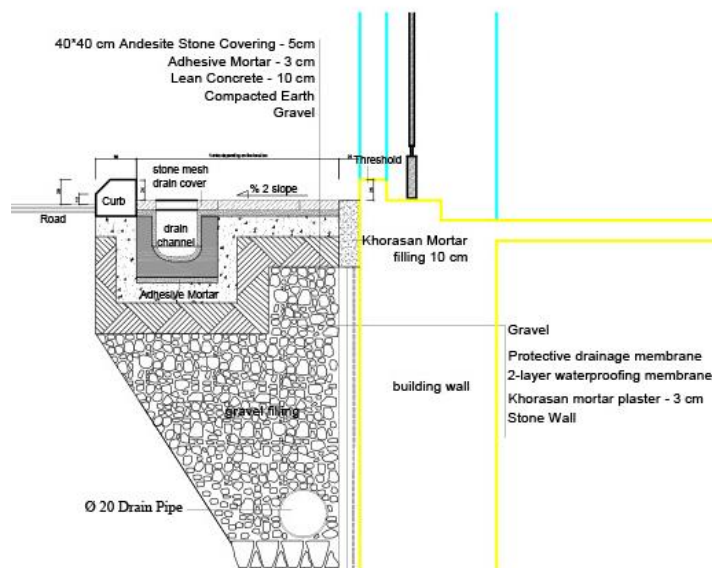


Figure A. 30. Drain and Pavement Detail of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

J. Electrical Drawings



Figure A. 31. Weak Current Ground Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

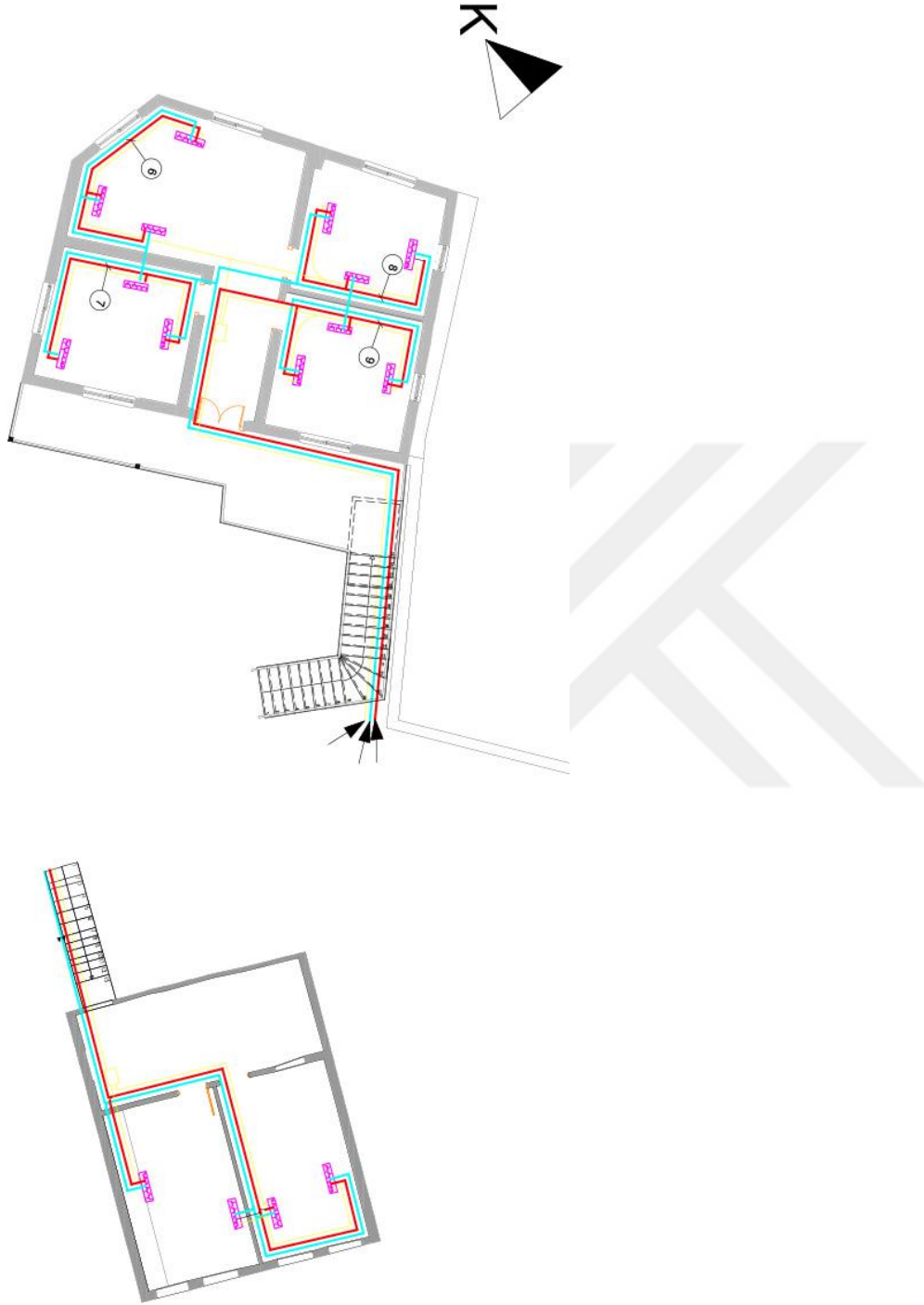


Figure A. 32. Weak Current First Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)



Figure A. 33.Fire Detection and Camera Connection Ground Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

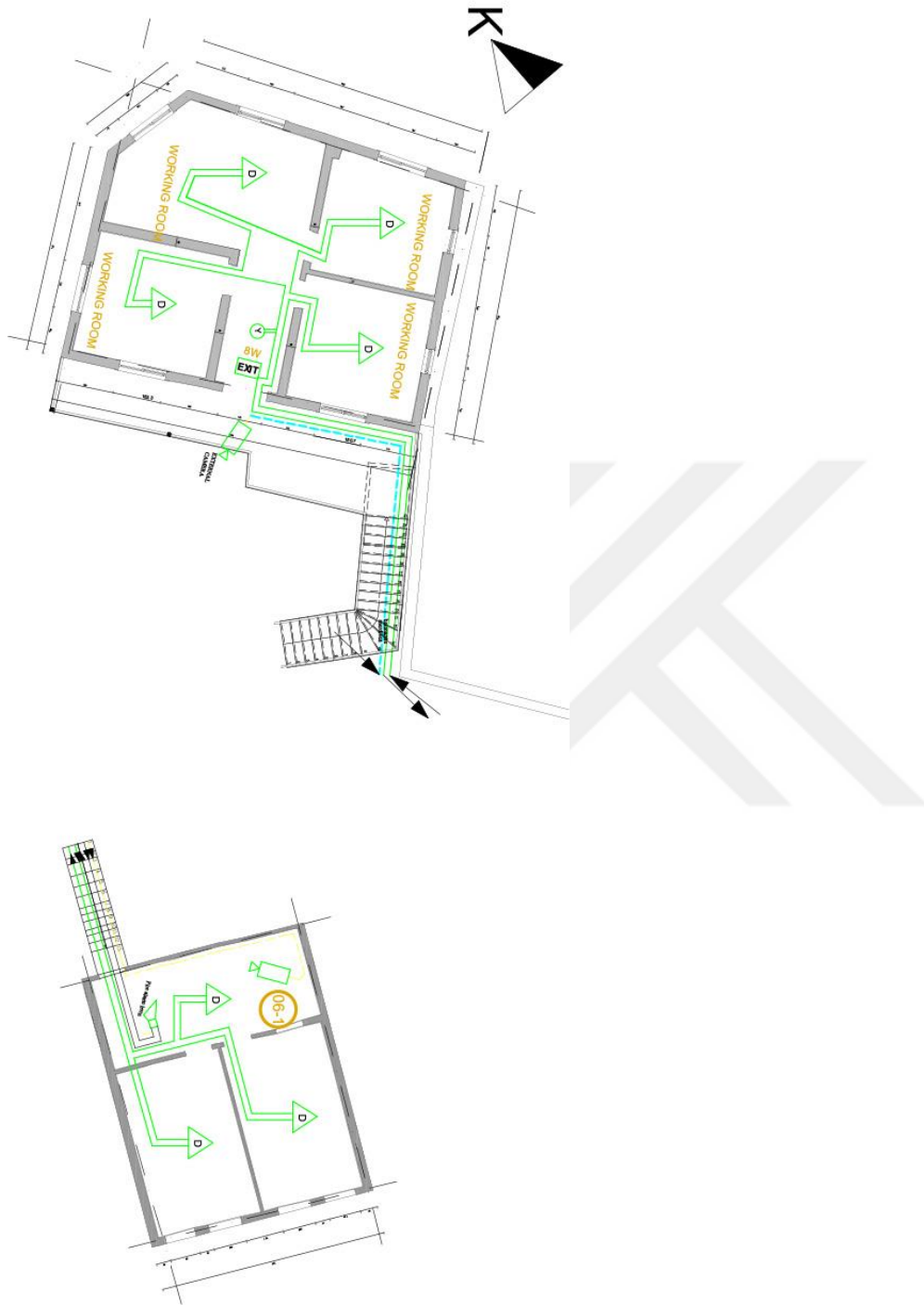


Figure A. 34. Fire Detection and Camera Connection First Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)



Figure A. 35. Lighting Ground Floor Plan of Gözlükule Excavation Research Center, Tarsus, Mersin (Source: BOUN,2025)

