YAŞAR UNIVERSITY
GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES

MASTER THESIS

ADAPTIVE REUSE OF SILO BUILDINGS WITH CONTEMPORARY APPROACHES

GÖKHAN FIRAT KARAMUSTAFA

THESIS ADVISOR: ASST. PROF. (PHD) N. EBRU KARABAĞ AYDENİZ

DEPARTMENT OF INTERIOR ARCHITECTURE

PRESENTATION DATE: 29.12.2019

BORNOVA / İZMİR
JANUARY 2020

We certify that, as the jury, we have read this thesis and that in our opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science,

Jury Members: **Signature:**

Asst. Prof. (PhD) N. Ebru Karabağ AYDENİZ

Yaşar University

Assoc. Prof. (PhD) Gülnur BALLICE

Yaşar University

Prof. Dr. Deniz GÜNER

Dokuz Eylül University

Prof. Cüneyt GÜZELİŞ
Director of the Graduate School

ABSTRACT

ADAPTIVE REUSE OF SILO BUILDINGS WITH CONTEMPORARY APPROACHES

Karamustafa, Gökhan Fırat

Msc, Interior Architecture

Advisor: Asst. Prof. (PhD) N. Ebru KARABAĞ AYDENIZ

January 2020

Contemporary interventions to the historical buildings are one of the most discussed issues in the field of conservation. On the one hand, contemporary intervention is desired to be compatible with the old structure in terms of scale, character, material, and on the other hand it is desired to use the materials and technology of its era in a conscious way. When these conditions are met, modern interventions help to enrich the social, functional and aesthetic character of the existing structure and to increase the value of the urban identity by branding. A number of principles and methods have been identified to interfere with the impact of experiences in the conceptual development process, with the contribution of the texts published by the theoreticians and international organizations. However, as the historical, cultural, urban / rural context and level of protection of each sample varies, appropriate intervention approaches also change.

According to the conservation theory that has been developing since the 19th century, structures that are important for human history should be preserved as they are. Designers are allowed to act more flexibly to more recent structures with interventions. Silos, which are modern monuments of industry, are one of these types of buildings. This type of building, developed starting from the second half of the 19th century, turned into giant concrete monuments in the 20th century. Nowadays, the examples that have remained dysfunctional have been destroyed or lost their identity through unqualified interventions. Whereas, even small-numbered examples

show that this building has the potential to enrich the environment while meeting the functional needs of contemporary life.

Therefore, the aim of this study is to discuss through silo structures, how historical, environmental and contextual data should be used in the architectural design process in order to develop approaches regarding interventions to the existing structure. In this context, the expansions in the theoretical base which contain the principles of contemporary interventions are reviewed in a chronological order and the selected examples will be evaluated critically.

Key words: Silo, Adaptive Reuse, Industrial Heritage, Intervention, Heritage Conservation.

ÖZ

SİLO YAPILARININ ÇAĞDAŞ MÜDAHALELERLE YENİDEN İŞLEVLENDİRİLMESİ

Karamustafa, Gökhan Fırat
Yüksek Lisans Tezi, İç Mimarlık
Danışman: Dr. Öğr. Üyesi N. Ebru KARABAĞ AYDENİZ
Ocak 2020

Tarihi yapılara yapılan çağdaş müdahaleler, koruma alanında en çok tartışılan konulardan birisidir. Çağdaş müdahalelerin bir taraftan eski yapıya ölçek, karakter, malzeme vb. açılardan uyumlu olması, diğer taraftan da kendi döneminin malzeme ve teknolojisini bilinçli bir biçimde kullanması beklenmektedir. Bu koşullar sağlandığında çağdaş müdahaleler mevcut yapının sosyal, işlevsel ve estetik karakterini zenginleştirmesine ve kent kimliğinin korunarak geliştirilmesine yardım etmektedir. Fakat müdahalenin nasıl yapılması gerektiğine ilişkin kalıcı bir metot tanımlamak mümkün olmamaktadır. Günümüze kadar olan kavramsal gelişim sürecinde deneyimlerin etkisi ve kuramcıların ve uluslararası örgütlerin yayınladıkları metinlerin katkısıyla müdahale için bir takım ilkesel kararlar alınmıştır. Fakat her örneğin tarihsel, kültürel, kentsel/kırsal bağlamı ve korunmuşluk seviyesi farklılık gösterdiğinden, ihtiyaç duyduğu müdahale yaklaşımı değişmektedir.

19. yüzyıldan bu yana gelişen koruma kuramına göre insanlık tarihi açısından önem taşıyan anıtların olduğu gibi korunması istenmektedir. Daha yakın tarihli yapılara uygulanacak müdahalelerde ise tasarımcıların daha esnek davranmasına izin verilmektedir. Endüstrinin modern anıtları olan silolar bu yapı türlerinden birisidir. 19. yüzyılın ikinci yarısından başlayarak gelişim gösteren bu yapı türü, 20. yüzyılda dev betonarme anıtlara dönüşmüştür. Günümüzde işlevini kaybeden silolar yıkılmakta veya niteliksiz müdahalelerle özgün niteliklerini kaybetmektedir. Oysa başarılı müdahale örnekleri, bu yapı türünün çağdaş yaşamın işlevsel gereksinimini

karşılarken, bulunduğu çevrelerin kimliğini koruyarak zenginleştirdiğini göstermektedir.

Bu sebeple çalışmanın amacı, mevcut yapılara yapılan müdahalelere ilişkin yaklaşımların geliştirilmesine yönelik tarihsel, bağlamsal verilerin mimari tasarım sürecinde nasıl kullanılması gerektiğini silo yapıları üzerinden araştırmaktır. Bu kapsamda çağdaş müdahalelere ilişkin ilkeler içeren uluslararası metinlerdeki açılımlar kronolojik bir sırayla gözden geçirilmekte, seçilen örneklerin başarısı eleştirel ve analitik bir yaklaşımla değerlendirilmektedir.

Anahtar sözcükler: Silo, Yeniden İşlevlendirme, Endüstriyel Miras, Müdahale, Miras Koruma.

ACKNOWLEDGEMENTS

First of all, I would like to express my sincere gratitude to my supervisor Assist. Prof. (PhD) N. Ebru KARABAĞ AYDENIZ for her continuous support, guidance, motivation and patience during this study.

I would like to thank to the rest of my thesis committee: Assoc. Prof. (PhD) Gülnur BALLICE and Prof. Dr. Deniz GÜNER for their guiding comments and suggestions.

My sincere thanks go to my lovely wife Gözde Karamustafa, for her support and encouragement throughout my whole life.

I want to thank my friends Begüm Cansu Aydın and Özüm Karadağ for their support and encouragement during the study.

Finally, I would like to express my enduring love to my big family, who are always supportive, loving and caring to me in every possible way in my life. Love you all…

Gökhan Fırat KARAMUSTAFA

Izmir, 2020

TEXT OF OATH

I declare and honestly confirm that my study, titled "ADAPTIVE REUSE OF SILO BUILDINGS WITH CONTEMPORARY APPROACHES" and presented as a Master's Thesis, has been written without applying to any assistance inconsistent with scientific ethics and traditions. I declare, to the best of my knowledge and belief, that all content and ideas drawn directly or indirectly from external sources are indicated in the text and listed in the list of references.

Gökhan Fırat KARAMUSTAFA

Signature

……..

January 28, 2020

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

UNESCO	United Nations Educational, Scientific and Cultural Organization
ICOMOS	International Council on Monuments and Sites
COE	Council of Europe
FICCIM	First International Congress on Conservation of Industrial Monuments
SICCIM	Second International Congress on Conservation of Industrial Monuments
TICCIH	The International Committee fort the Conservation of the Industrial Heritage
ERIH	European Route of Industrial Heritage
DOCOMOMO	Documentation and Conservation – Modern Movement

CHAPTER 1

INTRODUCTION

Conservation studies, that were conducted through political, ideological, religious etc. reasons, have been established on a theoretical basis and become a systematic and scientific method. Previously, only singular monumental buildings were protected, and today, all the above ground, underground and underwater movable and immovable assets and intangible values of the past are conserved as cultural heritage. However, there is a great diversity of cultural heritage from different periods in the world that needs to be protected. Today, the conservation theory continues to develop due to the impossibility of defining a permanent scientific method for architectural intervention of these buildings.

Cultural heritage buildings have a great architectural diversity such as housing, religious buildings, industrial buildings, and these types differentiate within the category they are under. These structures are functionally obsolete and in need of functional renewal/re-functionalization. The unique characteristics of all these types of structures need to be defined, and functional transformation approaches that do not harm these qualities need to be developed. Reinforced concrete silos, which are a part of the industrial heritage, are one of the building types that must be preserved. With its authentic qualities like its monolithic mass, huge dimensions and iconic appearance, these buildings have an important place in the urban identity of the area in which they are located. These structures, which are the symbols of early engineering and industrialized cities, are functionally worn out and some of them have been demolished due to the rapidly growing urban development. However, these structures, that represent modern form and mass of their production era, need to be converted into contemporary venues and to take an active role in city life via qualified interventions.

Examples of successful conversions conducted in developed countries illustrate that these types of structures hold a potential to improve their environment's social, functional and aesthetic characteristics while fulfilling the functional needs of

contemporary life. Because of the deficiencies in the conservation and design in Turkey, as in other cultural heritage buildings, there seems to be no silo structure that is conserved with a qualified intervention, which protects the qualities of the structure, and add value to it. Therefore, it has become crucial to determine the principles for incorporating scientific methods in the functional transformation of this type of building.

AIM OF THE STUDY

Reinforced concrete silos, which began to be built all over the world in late 19th century-early 20th century, vary in terms of scale, form, mass and construction system. Most of these buildings still maintain their original function. However, due to urban development, as industrial production, port and railway activities have started to move out of city, silo structures along with other industrial structures, which have lost their function, are abandoned in some cities, and need to be re-functionalized with contemporary intervention. Yet, there are some difficulties in the reuse of this type of structure, which is formed by the combination of large-size thick reinforced concrete rollers, within the scope of industrial heritage and modern heritage, due to differences in design, material, production, usage etc. Hence the principle decisions of the conservation theory involve all heritage structures, several conservation criteria focusing on protection and re-use of reinforced concrete silo structures of various values need to be determined. In this study, in order to develop intervention approaches to silo structures which constitute a different architectural typology within modern heritage and industrial heritage structures;

- Identifying the original characteristics of silo structures by investigating the features such as plan, volume, spatial relations,
- Investigation of how to use contextual data in intervention design by maintaining the original characteristics in silos which are re-designed due to functional transformation,
- It is aimed to evaluate the results of the pre-selected theoretical criteria in practice, and to determine conservation approaches specific to silo structures based on the data obtained from these evaluations, and to develop principles.

SCOPE OF THE STUDY

The study investigates the unharming intervention that conserves the original qualities of silo structures, and functional transformation of reinforced concrete silo structures, which was developed in the 19th century by increasing the capacity of agricultural trade and later transformed into a kind of machine. Silo examples that are not made of reinforced concrete materials are excluded from the scope of this thesis.

The study consists of four parts. In the first chapter, aim, scope and method are explained. In the second part, the development of the conservation theory and industrial heritage, as a subheading of cultural heritage, are examined. Then, some examples of contemporary intervention to cultural heritage structures are evaluated. In the third chapter, the original characteristics and values of silo structures, as a subheading of industrial heritage and modern heritage, are defined. After that, eight contemporary intervention examples made in silos are examined in detail. These examples consist of contemporary interventions to reinforced concrete silos in urban areas in different parts of the world in the late 19th and early 20th centuries. The fact that these samples, in different forms, scales and positions, were re-functionalized with different approaches led them to be included in this study. In the fourth chapter, besides the evaluation of the findings; foundations about using and protecting this type of structure, which became the symbol of industrialized wealth in the city, in daily life are determined.

HYPOTHESIS OF THE STUDY

Since ancient times, warehouse structures have been made of local materials and techniques for mankind's vital requirement, the storage of grain, and in the 19th century, with the developing technology, reinforced concrete silos began to be built as a symbol of early stages of engineering and industrialization of agriculture. Nowadays, these buildings have gradually become dysfunctional as industrial production developed, and maritime and rail transport activities have moved out of cities. This type of structure carries unique characteristics due to be a part of the industrial heritage and modern heritage and requires functional

transformation with quality interventions. The hypothesis, that constitutes the basis of this study, is that defining the original characteristics of silos and designing interventions to protect these qualities will provide a new perspective to the conservation theory.

LIMITATIONS OF THE STUDY

There are many silo structures produced from various materials in different parts of the world. Of these, the reinforced concrete silos are used in the storage of materials such as grain, cement, coal and sand. New functioning in reinforced concrete silos is an approach which has the earliest example in 1973, but mainly applied after 2000.

Today, there are many silo structures which have been re-functioned over the world. The number of samples can be increased; however this study is limited to eight samples because of time limitation. The samples analysed could not be visited and observed on site due to the fact that they are located in various parts of the world. Additionally, there was no meeting with the architectural firms that intervened in the buildings. The information gathered is limited to information extracted from the internet and printed resources. Examined eight concrete silo samples are varies in size, cylinder number, the way each is pieced together, and construction method. In these examples, it has been understood that the contemporary intervention approaches applied vary depending on their contextual characteristics.

METHODOLOGY OF THE STUDY

Redesigning heritage structures due to functional transformation is one of the major researches, discussion and application issues of architecture. With the impact of experience and with the contribution of theorists and general opinions in the conceptual development period, the conservation studies have been established on a theoretical basis and turned into an occupation with scientific and systematic methods based on certain principles. Today, classical restoration approaches have been displaced by innovative and creative approaches, and discussions about sustainability of conservation have taken place on the agenda. However, it is not possible to define a doctrine valid for the entire architectural heritage, as the

contextual characteristics of each sample and the purpose of the new design vary, contemporary interventions need to be developed individually in accordance with the characteristics of each heritage structure.

In this thesis, which focuses on the diversity of intervention approaches in the functional transformation of reinforced concrete silo structures of industrial and modern architectural heritage, a theoretical foundation has been established by investigating the primary sources of re-functionalization. An evaluation method was developed by using theoretical discussions and principles from significant documents relating to the new design of historical context, such as significant agreements, conventions, charters, etc., published by organizations such as UNESCO, COE, ICOMOS, TICCIH. Silos, an industrial and modern heritage element, are different from other heritage structures due to their monolithic concrete masses. Consequently, this method includes a number of comments and evaluations supported by reviews.

Then, the intervention approaches, implemented to silo structures, were examined eight of these transformation examples, attracting attention from the architecture platforms in recent years, have been assessed analytically according to this method. In the selection of samples, the difference and variety of each silo type and intervention are minded. Therefore, the samples located within European countries, Turkey, South Africa and China are selected as each was different from another due to the intervention approach. Thus, functional transformation potential of an architectural type, silo structures has been defined, and principles have been determined to maintain its tangible and intangible values. It is thought that this study evaluating silos, transformed into contemporary places, will set an example for illustrating how silos can be re-functionalized in the future.

CHAPTER 2

DEVELOPMENT OF THE CONSERVATION THEORY THROUGH CONSERVATION OF STRUCTURES AND FUNCTIONAL TRANSFORMATION

In this section, the conceptual development of the conservation theory from the 19th century to the present will be explored. In this context, texts prepared by organizations such as UNESCO, ICOMOS, CoE will be examined besides the views of the theorists. Resulting, a table will be created to determine the perspective of the conservation theory on getting a new function and contemporary intervention. Then, the development of industrial heritage and the texts aiming the protection of aforementioned heritage will be investigated. In line with the information obtained, recent examples of contemporary intervention will be evaluated according to the principle decisions of the conservation theory.

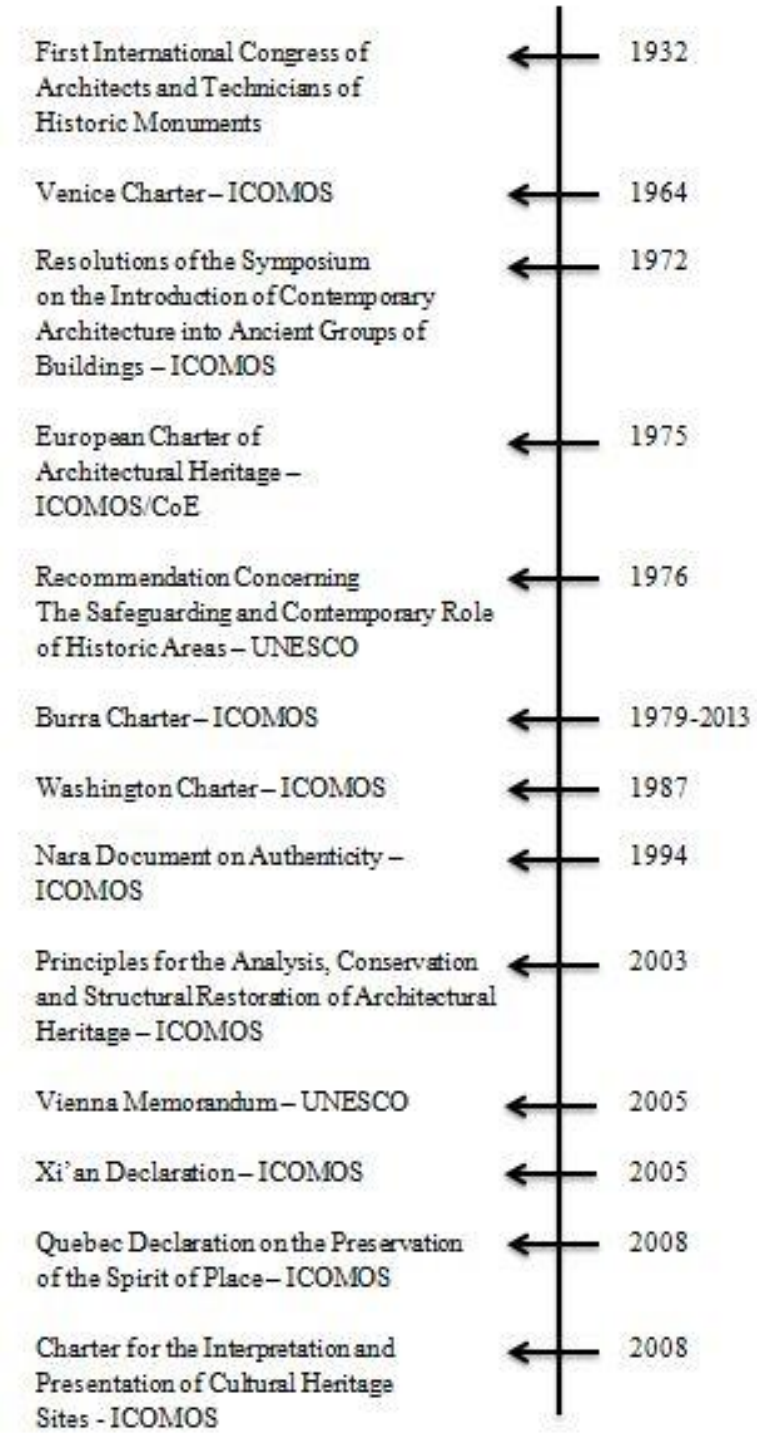
2.1 Development of the Conservation Theory from 19th Century to Present

Conservation studies, which were founded in the 19th century, has recently been oriented around certain principles on a scientific basis rather than personal opinions and current architectural trends. (Ahunbay, 1996, 8) The necessity to use the structures in order to concerve them has been emphasized in every stage of theoretical development process.

Early restorations concerning the idea of stylistic unity, led by Viollet le Duc, caused controversy. In response, a romantic approach was put forward, led by John Ruskin and William Morris, suggesting no restoration at all for aforementioned structures. Later, historical restoration and contemporary restoration theories, which accelerated the development of conservation theory, were developed. (Ahunbay, 1996, 818-19)

Until very recently, some organizations which are concerned only in the conservation of the tangible and intangible heritage have been established, and they have set up various meetings. (Table 2.1)

Tablo 2.1: Names and historical order of the texts and their publishers that were examined among the texts published in the theoretical development process. (Karamustafa, 2019)



The first of these is Conservation of Historical Monuments of the First International Conference of Architects and Technicians in 1932. In these principles, this organization has suggested the buildings to be used in order to survive, while highlighting the necessity of forming the usage to be respectful and suitable for the structure's aesthetical and historical identity. It is stated that the environment of

historical monuments should also be respected, and in some cases, the building clusters and picturesque formations should be protected. These principles, adopted at the Athens Conference, gained legal identity in Italy in 1932 under the name of "Carta del Restauro". (Restoration Regulation) (ICOMOS, 1931)

The Venice Charter in 1964, which was a turning point in the theoretical development, has redefined historical monument. The definition involved urban and rural settlements that witnessed a certain age, besides singular structure, ultimately, resulting with gained importance of the environment of the monuments. The content of conservation has been expanded to include not only important works of art, but also all works that have gained cultural significance. The adopted regulation recommends that it be used for useful social purposes without changing the plan and decoration of historical buildings. By that, it allows contemporary -appropriate for the time being- new additions where necessary without harming the structure's traditional position, composition, balance and relationship with its environment under the condition of being distinguishable from the architectural composition. (ICOMOS, 1964)

Resolutions of the Symposium on the Introduction of Contemporary Architecture into Ancient Groups of Buildings, which constituted in 1972, have drawn attention to the necessity of conserving the structure a whole within the context of its past, present and future for structures reflecting the era they were constructed in. In this decision, it is stated that there should not be any additions that will harm the authenticity, artistic and historical value of the historical structures and groups. However, it is stated that the re-functionalization of the building group, which is considered a whole with its internal, external features and its environment, could be processed only on the condition of not harming the structure group. (ICOMOS, 1972)

The Council of Europe (CoE) designated the year 1975 as the Year of European Architectural Heritage. In the European Charter of Architectural Heritage, published in the same year, it is stated that each generation is building their own time by interpreting the past differently and taking new inspirations, as the formation of settlements has spread over centuries. For this reason, it is stated that integrated

conservation does not prevent modern architecture from interfering historical environments, as long as the existent context, proportion, form, size and scale are respected and traditional materials are used. (ICOMOS-CoE, 1975)

Recommendation on the Conservation and Contemporary Role of Historical Areas, published by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in 1976, states that cultural revitalization of historical sites, which have an active role in the existence of society, can only be achieved by transforming these areas into cultural activity centres, and subsequently via their role in the cultural development of the surrounding communities. (UNESCO, 1976) This decision enabled preserving the physical properties of heritage structures while emerging the need of additional social functions.

Cultural importance in the Burra Charter, adopted in 1979 by the Australian National Committee of International Council on Monuments and Sites (ICOMOS), is updated periodically to reflect the developing understanding of cultural heritage management in theory and practice; and is defined as having aesthetic, historical, scientific or social values of past, present and future generations. If the additions and changes are made respectfully without damaging the cultural importance of the building, it is accepted and proposed to be designed in harmony with the historical context, scale, character, texture and material. Furthermore, the need to use historical places in settlements with contemporary activities and incorporating tangible and intangible values into this relationship has been mentioned. (ICOMOS, 2013)

The Declaration of Historic Cities and Urban Spaces, published by ICOMOS in 1987, emphasizes that the new function should be created in a way that does not contradict the characteristics of the historic city and the urban area. Additionally, it is reported that contemporary elements should be encouraged to be defined in harmony with the environment as it will contribute to the enrichment of the area. (ICOMOS, 1987)

In 1994, Nara Document on Authenticity, issued by ICOMOS emphasized that culture and cultural heritage should be conserved together with all forms and historical periods one structure contains. Moreover, the commitment of a monument

or site to the nature and culture of it depends on the authenticity, its design and form, its material, its use and function, its traditions and techniques, its position and placement, its spirit and expression, its initial design and its historical evolution. (ICOMOS, 1997)

In 2003, The Principles for Analysis, Conservation and Structural Restoration of Architectural Heritage, prepared by ICOMOS, mentioned that cultural heritage structures are a unique product of the construction technology of their period with all components and the existing concept, technical and historical values of cultural heritage structures are to be preserved to ensure that they are understandable for future generations. (ICOMOS, 2003) This article is important in terms of the authentic architectural typologies of heritage structures to be intact and understandable.

In the Vienna Memorandum published in 2005, it is stated that contemporary architecture increases the urban identity value by branding it along with historical buildings and urban landscapes, and that contemporary design can be a powerful and competitive vehicle that attracts public, tourist and the capital. However, it is emphasized that contemporary architecture in the historical environment is a complex design problem since it must respond to the developing dynamics to facilitate socio- economic change and growth on the one hand and correspond to the cultural heritage structures and spaces on the other. (UNESCO, 2005)

In 2005, in Xi'an Declaration, established by ICOMOS, cultural heritage is examined within the context of its relationship with its environment. Accordingly, heritage structures have gained their importance and distinctive characteristics through their meaningful relationship between the location’s physical, visual and spiritual properties. (ICOMOS, 2005)

The structures and areas of historical and cultural value also have the spirit that is being transferred from generation to generation. Decisions on the protection of tangibe cultural values have already been taken in many declarations and regulations, and the inclusion of intangible values in the conservation theory was made by the Quebec Declaration for the Protection of the Spirit of the Place, published by

ICOMOS in 2008. In this declaration, the spirit of the place is defined as the totality of tangible and intangible concepts. Considering the evolving nature of the spirit of the place, it is stated that it will be located in the memory of different cultures and in different time periods, and it is emphasized that it provides efficient protection, use and development between the society and their interaction with the heritage areas as it will be communicated to the next generations by these people. Therefore, the interaction of the structure with the people will contribute to the conservation of the place by keeping the spirit alive. (ICOMOS, 2008)

All tangible and intangible values of structures and building groups must be preserved and made available to the public. Therefore, Charter for the Interpretation and Presentation of Cultural Heritage Sites, published by ICOMOS in 2008, notes that the tangible and intangible values of the cultural heritage sites must be protected with the natural and cultural environment and the social context that inhabit them. Additionally, it is stated that the authenticity of cultural heritage sites should be considered, and in this context, unqualified interpretations should be prevented from damaging the historical texture and cultural values of the site. (ICOMOS, 2008)

As can be seen, the conceptual development, which started with monument preservation, tended to protect not only the tangible but also the intangible. To summarize, these texts stated that there was a necessity of coherence with the aesthetic and historical values of cultural heritage structures and environments; intervening with the current context, proportion, form, size, texture, material, personality and scale while being reused for the benefit of the society; maintaining and using the traces of time and the spirit of the place in a way to respond to the dynamics of contemporary life. It is highlighted that contemporary interventions, which are compatible with the historical context, use the materials and technology of their time carefully, are appropriate to the spirit and texture of the place, provide the opportunity to enrich the social, functional and aesthetic character of the existing texture, and increase the value of the city identity by branding it with the historical buildings.

Theorists also played an important role in the conceptual development of conservation. Worthington (1998, 3), states that modern additions can be made to

support urban life by preserving the values of the past. According to Clark (2013, 4), the cultural value of the site, which has heritage value, should be protected and the new function should accommodate cultural appropriateness. The main purpose of functionalization is not to freeze the site, building or environment as it is, but to add another layer to the existing union of layers and to protect its history, to conserve the cultural texture of the region for future generations and the continuation of its use. De Sola Morales Rubio (1996, 230) specifies that the new architectural design created by intervention must physically resemble the existing structure and contribute to the structure spatially. However, there must be dimensional, typological and figurative compatibility between the old and the new.

Kuban (2000, 117-119) states that the mass and facades of the original structure are important components for the historical environment, and that the intervention should be coherent with the prior. To him, in some special cases or important structures, it is a necessity to protect the structure as it is, whereas, it is not necessary to protect the structures of recent past or of no economic and cultural value as they are. In such cases, irreversible interventions can be made considering the importance of the original architectural typology for the historical environment.

Although to Kuban (2000, 112-120), there are basic principles of the intervention, they are not considered the only solution, as a result, different approaches can be followed due to the changing living conditions and the developing conservation theory. Intervention can be a dynamic adaptation that emphasizes formal opposition or an attitude that rejects compliance. However, it is an important principle that the intervention does not dominate the historical structure, does not incorporate the historical structure as an annex and does not go beyond the capacity of the old structure.

As can be seen, general principles, that include all cultural heritage structures, have been specified in the conservation theory that has been developing since the 19th century. However, the structures that have survived from the past to the present day have a great variety in terms of the type of structure, the period in which it was built, and the conditions effective in its design, and it has not been possible to define a doctrine involving all structures. Industrial heritage structures hold a significant

position in this diversity. In the process of conceptual development until today, studies have been carried out to protect this heritage type and to transfer it to the future.

2.2 Development and Scope of Industrial Heritage

In the 18th century, industrialization period has started with the use of steam power in machinery, and significant developments followed in many parts of the world. In the process defined as the transfer of production source from manpower to machinery, the production facilities, which have increased number rapidly. (Köksal, 2012)

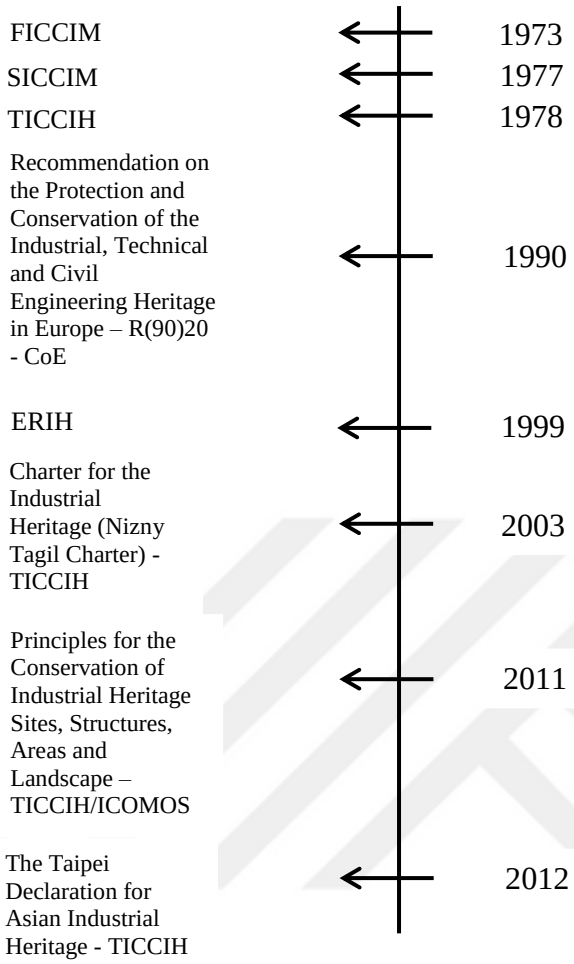
Efforts of conserving the old industrial buildings began in Britain in the early 20th century, and the so-called industrial monuments were recorded. The concept of industrial heritage has emerged as a result of the international dimension of the conservation works. (Saner, 2012, 53)

Tanyeli (2000) defines the concept of industrial heritage as a cultural heritage that covers the specific architectural entirety in which the activity of producing goods and/or services with mechanical tools and devices takes place.

To date, organizations interested only in the protection of industrial heritage have been established and these organizations have held various meetings. (Table 2.2)

The First International Congress on Industrial Monuments (FICCIM), held in 1973 in the UK, was arranged second time in 1977 due to its positive aftereffects by the name Second International Congress on the Conservation of Industrial Monuments (SICCIM). The International Committee for the Conservation of Industrial Heritage (TICCIH), published in 1978 as a follow-up of FICCIM and SICCIM conferences, has enabled old industrial structures to be considered within the scope of heritage, and spread to a wider audience, by using “industrial heritage” statement instead of “industrial monument”. (Saner, 2012, 54-55)

Table 2.2: Names and historical order of the texts and their publishers, which were analyzed among the published texts to preserve the industrial heritage in the theoretical development process. (Karamustafa, 2019)



The concept of industrial heritage is one of the main focuses of CoE. In 1990, the recommendation (R (90) 20) on the protection of the industrial, technical and civil engineering heritage in Europe put special emphasis on the identification, observation and investigation of the technical, industrial and civil engineering heritage, as well as the promotion of tourism by informing the public. The purpose of this decision is not only to address buildings, technical monuments, sites or objects, but also to address the physical surrounding, the integrity of knowledge, the technique and the way of life. (CoE, 1990)

The European Route of Industrial Heritage (ERIH), which was prepared in 1999 with the support of the European Union, is a project aiming to promote the industrial heritage as a tourism brand and to extensify the concept of industrial heritage by

creating a relationship and sightseeing route between the location of industrial heritage structures and ruins. (ERIH (a), 2019) It is aimed to transform the industrial buildings into symbols, re-functionalize them as living museums, and achieve these objectives in accordance with certain values. (ERIH (b), 2019)

For documenting and protecting industrial structures for future generations, Charter for the Industrial Heritage (Nizhny Tagil Charter) was formed in Nizhny Tagil, Russia in 2003 by TICCIH. This regulation states that the buildings constructed for the purpose of industrial activities, the equipment used, and all other tangible and intangible characteristics of structure's location are of great importance. Ultimate aim is to examine them, to teach their history, to make their meaning and importance available to everyone, to identify the most remarkable and typical examples, to protect these structures, to use them today and in the future. (TICCIH, 2003) This regulation is one of the most comprehensive studies prepared for the identification and conservation of industrial heritage structures.

Changes that would jeopardize the historical integrity and authenticity of the very important industrial sites are not permitted and are preferred only where the re-use allows the recovery of industry structures. On the other hand, renewal by re-functionalization is accepted for sites that do not have a specific historical significance. Moreover, new uses which pay attention to the characteristics of the industrial site and protect the original function and mechanism models are suggested. (TICCIH, 2003) Hence, the level of intervention, planned to be applied to the industrial heritage structures, is determined by the attributions of the buildings.

A document was created for Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes in 2011, in Dublin, Ireland with the partnership of ICOMOS and TICCIH. It states that industrial areas include the tangible heritage of engineering, architecture and urban planning linked to technology and production processes, as well as the intangible heritage that includes the memories and social lives of labour workers and their communities. It is specified that new uses of industrial heritage sites and structures are to be recorded and documented including the processes of suitability for the site's interesting features, equipment, transport and activity distribution characteristics, reliable that

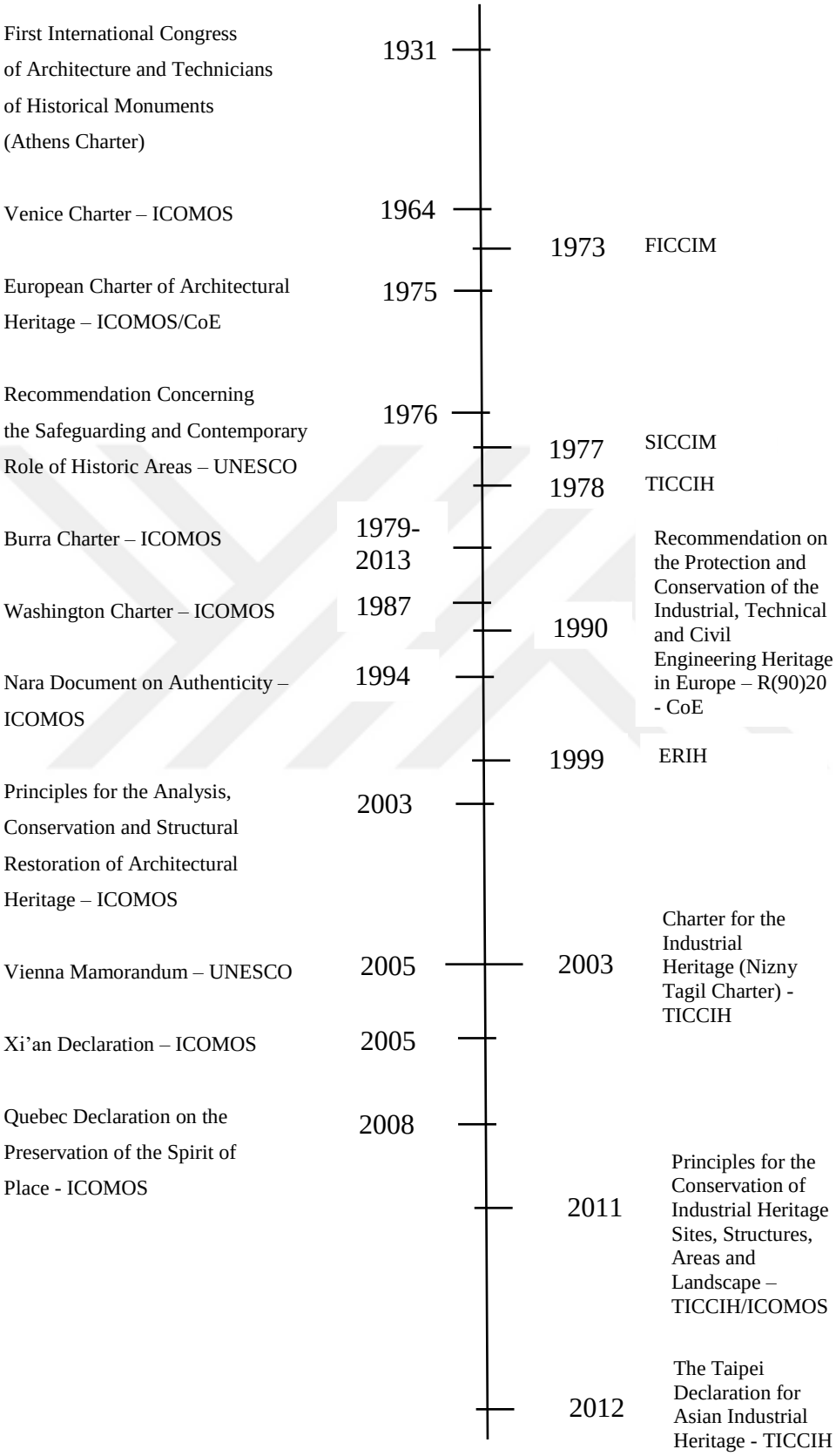
the intervention is as reversible as possible, appropriatiness to the age, important marks and signs of the building, and destructibility of the components when re-functioning. (ICOMOS – TICCIH, 2011)

The Taipei Declaration for Asian Industrial Heritage (2012) by TICCIH states that industrial heritage is linked to regional development, natural resources and the vernacular economy, and emphasizes that conservation approaches should be flexible for the sustainability of industrial heritage excluding architectural and aesthetical structures. However, the re-functionalization should be such that it does not harm the existing values of the structure. (TICCIH, 2012)

Looking at the contemporary movement product structures and building groups built in the 19th and 20th centuries, it is seen that there are industrial buildings among them. Industrial buildings constructed in this period are considered as contemporary heritage. Therefore, industrial heritage structures are also of interest in the Documentation and Conservation – Modern Movement (DOCOMOMO) besides TICCIH and ICOMOS. To draw attention to the importance of architectural typology, which is the product of the modern movement, to promote and support the development of appropriate techniques and methods for protection and re-functioning against destruction are the main focused of DOCOMOMO. (WHO (a), 2019)

To summarize, organizations have been formed and many texts have been published, starting from 1973 to preserve industrial heritage structures and sites in the development process of the theory of conservation. (Table 2.3) In the aforementioned texts, conservation of industrial heritage has many ways such as preserving its physical surrounding, information whole, equipment, transportation, activity distribution characteristics, respecting its current values and re-functioning by converting them into symbol.

Table 2.3: The theoretical development process, which has included the industrial heritage as a subtitle since 1973. (Karamustafa, 2019)



In the process to date, six items have been developed to guide the new design in line with the information obtained from the international texts developed to preserve the heritage structures, and by reviewing and interpreting documents containing articles related to contemporary intervention in the historical context. (Table 2.4) The items developed in this table were obtained as a result of the interpretation of the articles in the international texts examined.

Table 2.4: Evaluation criteria for contemporary interventions applied to cultural heritage structures, developed from international principal texts. (Karamustafa, 2019)

1. Contemporary intervention should reflect the material, technology and design understanding of its era.		
ICOMOS 1964	Venice Charter	In necessary cases, new additions that do not harm the traditional location, composition, balance and its relation with the environment, are understood from the architectural composition and bear the traces of the day are allowed.
ICOMOS 2003	Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage	The structures‘ technology of the period with all the components of the heritage structures is a unique product.
2. Tangible and intangible values should also be kept alive by maintaining existing values.		
ICOMOS 1994	Nara Document on Authenticity	Culture and its cultural heritage must be preserved, along with all forms and historical periods.
ICOMOS 2003	Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage	The existing concept, technical and historical values that will make cultural heritage structures understandable for future generations should be preserved.
ICOMOS 2008	Quebec Declaration on the Preservation of the Spirit of Place	The spirit of the place, tangible and intangible concepts need to be preserved as a whole.
TICCIH 2003	Nizny Tagil Charter for the Industrial Heritage	Structures built for industrial activities need to be preserved with all the tangible and intangible features of the equipment used and the area in which they are located, and should be looked after for use today and in the future.
TICCIH 2011	Taipei Declaration for Asian Industrial Heritage	The re-functioning should not harm the existing values of the building.
ICOMOS 1979/2013	Burra Charter	The historical places in the settlements should be associated with contemporary events, and tangible and intangible values should be included in this relationship.

ICOMOS 1972	Resolutions of the Symposium on the Introduction of Contemporary Architecture into Ancient Groups of Buildings	Structure groups, past, present and future contexts need to be preserved as a whole. It will be appropriate to give a new function to the building group that is integrated with its interior, exterior features and surroundings only if there is no damage to these features.
ICOMOS 2008	Charter for the Interpretation and Presentation of Cultural Heritage Sites	The tangible and intangible values of cultural heritage sites need to be protected along with their natural and cultural environment and social context. In this context it is necessary to respect the authenticity of cultural heritage sites and to prevent damage to the historical texture and cultural values of the site with unqualified interpretations.
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.		
ICOMOS 1987	Charter for the Conservation of Historic Towns and Urban Areas	It is emphasized that the function should be created in a way that does not contradict the character of the historical city and urban area. However, the definition of contemporary elements in an environmentally compatible manner should be encouraged, as this will contribute to the enrichment of the area.
UNESCO 2005	Vienna Memorandum	In the historical environment, contemporary architecture needs to respond to its evolving dynamics to facilitate socio-economic change and growth, while respecting cultural heritage structures and areas.
TICCIH 2003	Nizny Tagil Charter for the Industrial Heritage	Reuse is preferred in cases where industry structures are saved.
4. The new function needs to contribute to the enrichment of the area by adapting to the context.		
ICOMOS/COE 1975	European Charter of the Architectural Heritage	It is stated that integrated conservetion does not prevent modern architecture from entering historical environments, provided that it is respectful to the current context, proportion, form, size and scale, and traditional materials are used.
UNESCO 1976	Recommendation Concerning the Safeguarding and Contemporary Role of Historic Areas	It is emphasized that the cultural revitalization of the historical areas that have an active role in the existence of the society is possible only by turning these areas into cultural activity centers.
UNESCO 2005	Vienna Memorandum	In the historical environment, contemporary architecture needs to respond to its evolving dynamics to facilitate socio-economic change and growth, while respecting cultural heritage structures and areas.

COE 1990	Recommendation on the Protection and Conservation of the Industrial, Technical and Civil Engineering Heritage in Europe - R(90)20	It places special emphasis on ensuring the definition, observation and examination of the heritage of industrial and civil engineering, protection and promotion of tourism by informing the public.
ICOMOS 2005	Xi'an Declaration	It is stated that heritage structures gain the importance and distinctive character with the physical, visual, spiritual and meaningful relationships of the region in which they are located.
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.		
ICOMOS 1964	Venice Charter	It is recommended to be used for useful social purposes without changing the plan and decoration of historical buildings. In necessary cases, new additions that do not harm the traditional location, composition, balance and its relation with the environment, are understood from the architectural composition and bear the traces of the day are allowed.
ICOMOS 1979-2013	Burra Charter	If the additions and changes are made in a respectful manner without harming the cultural significance of the structure, it is accepted and it is recommended to be designed in accordance with the historical context, scale, character, texture and material.
ICOMOS 1987	Charter for the Conservation of Historic Towns and Urban Areas	It is emphasized that the new function should be created in a way that does not contradict the character of the historical city and urban area.
ICOMOS 2003	Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage	The existing concept, technical and historical values that will make cultural heritage structures understandable for future generations should be preserved.
TICCIH/ ICOMOS 2011	Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes	New uses need to respect the interesting features, equipment, transportation and efficiency distribution features of the site. The intervention should be as reversible as possible, respecting the age of the building, its important traces and signs.
6. The new additions should be a creative and differentiating design.		
UNESCO 2005	Vienna Memorandum	In addition to the legibility of the traces of the past, the main goal is to continue the cultural heritage with qualified interventions.

2.3 Contemporary Intervention Examples to Cultural Heritage Buildings

Cultural heritage structures are abandoned over time for various reasons, and need to be repaired and re-functionalized. Thus, the structure continues to survive by engaging in daily life, and a sustainable development is provided by preserving the urban identity. However, despite all the theoretical studies to date, general principles have not been defined but a doctrine about how the interventions should be done has not been developed yet. For this reason, the re-functionalized examples, that have attracted attention in recent years, will be investigated through the conservation theory. Since the historical context and function of the selected examples differ, the examples are analyzed for illustrating their diversity rather than comparison.

During the reconstruction of historical centres in the post-World War II period (1939-1945), the establishment of the relationship between the traditional and the contemporary, and the restoration of monumental buildings became important issues. (Scarpa (a), 2019) Carlo Scarpa (1906-1978), one of the leading architects in the contemporary transformation of buildings in this period, has added a differing contemporary layer to reveal different period marks (Figure 2.2) on Casterveccio Museum in Verona. (Figure 2.1) He has achieved it by drawing attention to the contextual and historical qualities in his approach based on the interpretation of the meaning of the original structure. Contrary to the classical forms of restoration, he has brought historical aspects to the fore with new materials, combining the elements of modern architecture with the old texture of the historical structure, and eventually, introducing a new form of architecture. (Figure 2.3) (Bollack, 2013, p.14-16) Scarpa has achieved a successful harmony between the historical and the new while preserving the building's place in the urban texture.

Figure 2.1: View from the central courtyard of Castelvecchio
Retrieved from: https://archiobjects.org/museo-castelvecchio-verona-italy-carlo-scarpa/ on 12.05.2019

Figure 2.2: Distinction between walls and floors on the interior of Castelvecchio
Retrieved from: https://archiobjects.org/museo-castelvecchio-verona-italy-carlo-scarpa/ on 12.05.2019

Figure 2.3: Contemporary staircase attached to Castelvecchio
Retrieved from: https://archiobjects.org/museo-castelvecchio-verona-italy-carlo-scarpa/ on 12.05.2019

The terminal structure, Gar d'Orsay, which was completed in 1900, was designed by French architect Victor Laloux (Figure 2.4)Due to the inability to meet the growing needs of the developing city, the structure was not used as often as it used in 1939 and was abandoned over time.(Erdogan ve Erdogan, 2013) In 1978 the National French Museum Board proposed to turn Gar d'Orsay into a Museum of Modern Art; Gae Aulenti's project was chosen as a result of the design competition, and the construction work completed in 1986 was carried out by a team of experts. (Museum Orsay, 2007) (Figure 2.5) Aulenti considered the station structure as a historical monument and she gave a new function to it. (Kupfer Schneider, 1998, s.31) (Figure 2.6)

Aulenti has created a central gallery with her intervention in the wide gap of the historical building. The visitors were directed to the side areas and the upper galleries where artworks were exhibited. In this regard, Aulenti has re-interpreted the historical terminal building by preserving the spirit of the place with a creative approach.

Figure 2.4: Panoramic view of Gar d'Orsay in historic France
Retrieved from: http://paris1900.lartnouveau.com/paris07/gare_d_orsay.htm on 27.11.2019

Figure 2.5: The facade of the Musee d'Orsay, today.
Retrieved from: https://www.istanbulsanatevi.com/dunya-muzeleri/orsay-muzesi-hakkinda-bilgi-eserler/ on 27.11.2019

Figure 2.6: The intervened exhibition area of the Musee d'Orsay .
Retrieved from: https://www.istanbulsanatevi.com/dunya-muzeleri/orsay-muzesi-hakkinda-bilgi-eserler/ on 27.11.2019

The Reichstag, which was built in 1894 by the architect Paul Wallot in Berlin as the German Parliamentary building (Figure 2.7), was damaged and abandoned for various reasons. (Brooker and Stone, 2004, 63) Winning the competition in 1992, Foster and Partners redesigned the dome with glass and steel materials, aiming to transform the structure into a living museum (Figure 2.8) The glass dome on top of the parliament hall offers a 360-degree Berlin panorama via a spiral ramp, allowing visitors to look at the parliament hall. (Douglass-Jaimes, 2019) (Figure 2.9) Physical interventions that occurred in the building throughout historical events, such as the writings of Soviet soldiers on the walls, were preserved. The uniqueness of the structure has been preserved with the traces and layers that have occurred in time, and the contemporary sustainable dome has become a new landmark symbolizing the transparency of German democracy with the extraordinary intervention of the designer. (Figure 2.10) (Foster and Partners, 2019) The intervention, which conserves urban memory of the building, its place in the urban identity, has created a new attraction centre by adding value to the building.

Figure 2.7: Initially designed dome in the original Reichstag building.
Retrieved from: https://www.tutor2u.net/history/reference/reichstag on 14.05.2019

Figure 2.8: The dome designed by Norman Foster after the re-functionalization.
Retrieved from: http://justfunfacts.com/interesting-facts-about-the-reichstag-building/ on 14.05.2019

Figure 2.9: Observation platform inside the glass dome.
Retrieved from: https://www.berlin.de/en/attractions-and-sights/3560965-3104052-reichstag.en.html on 14.05.2019

Figure 2.10: Exterior view of the glass dome of the Reichstag building.
Retrieved from: https://www.architravel.com/architravel/building/reichstag-dome/ on 14.05.2019

Bankside Power Plant (Figure 2.11), designed by Giles Gilbert Scott in London and completed its construction in 1891, was used until 1981. (Tate (a), 2019) The building was transformed into a contemporary art museum in 2000 by Herzog and de Meuron, without destroying its historical characteristics. In 2012, three oil tanks of the structure were opened for use as galleries. The authentic structure of the cubic chimney is intended to be kept and protected due to its enormous impact on the

urban memory. The addition of the glass strip extending along the structure, which contrasts from the dark brick walls of the original structure, draws attention in the distinction of old and new on the exterior. (Figure 2.12) Landscaping was applied around the building and it was opened for use in accordance with its new function. There are large cavities, which are directly proportional to the size of the tribunes, in the structure. In the intervention, the tribunes were removed, unlike the floor which was not divided by slabs to avoid disturbing the perception of size. (Jones, 2013) (Figure 2.13)

The abandoned power plant has been re-functionalized compatibly with its historical background. While the region where the building was located was an industrial zone, it became an attraction centre operating in culture and arts. While preserving the original structure's appearance in the city skyline, it has gained a contemporary appearance with new annexes.

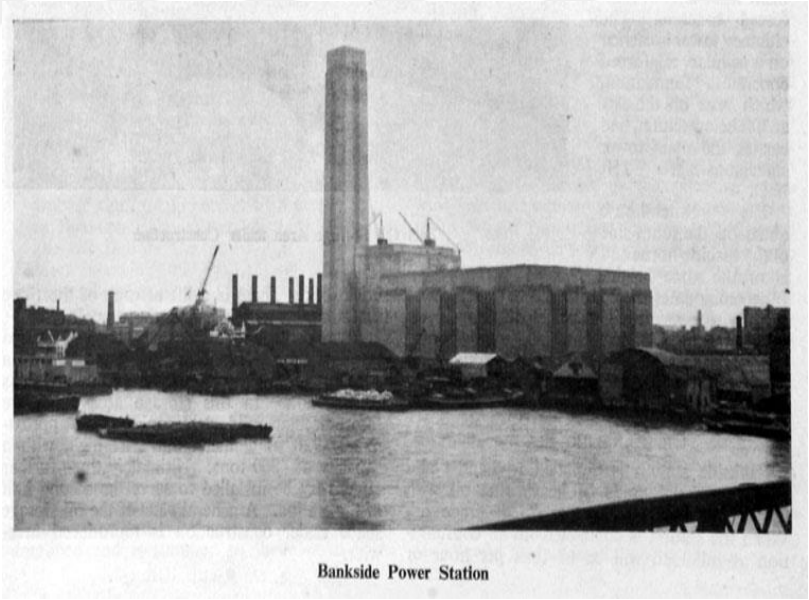


Figure 2.11: Bankside Power Plant, 1953
Retrieved from: https://www.gracesguide.co.uk/bankside_power_statio the on 27.11.2019

Figure 2.12: Tate Modern, which has been re-functionalized into a contemporary arts museum with a view of the Thames
Retrieved from: https://commons.wikimedia.org/wiki/file:tate_modern_-_bankside_power_station.jpg on 27.11.2019

Figure 2.13: The inner courtyard formed after the removal of the electric stands.
Retrieved from: https://www.archdaily.com/429700/ad-classics-the-tate-modern-herzog-and-de-meuron/52291c42e8e44e1a330000cd-ad-classics-the-tate-modern-herzog-and-de-meuron- on 27.11.2019

Hezog and De Meuron intervened with the electrics factory (Figure 2.14), which was built in early industrial era Madrid, Spain, to transform it into an arts and cultural centre in 2008. Apart from the usable exteriors of the authentic structure, the interior and the base were completely removed. By removing the floor, the structure

appeared to be standing in the air, and subsequently, a protected square was formed. A theatre hall, few service rooms and a car park were placed in the underground part of the area where the original structure was located. A lobby, galleries, management office and restaurant were created with the intervention on it. (Herzog et al, 2019)

The abandoned structure, which does not have an important place in the identity of the city, has become the centre of attraction with this extraordinary intervention. (Figure 2.15) The intervention to the building, which takes part in cultural and arts activities, has provided a contemporary appearance by conserving the appearance of the original structure. A public space was created by severing the connection of the original structure to the ground, and it was intended to attract the passers-by. In this way, the harmony of internal and external cohesion was ensured. The removal of the building from the ground provided the creation of basement additions, thus meeting the spaces needed by the new function. The contemporary structure, which was created by preserving the outer shell of the original structure, maintains its identity in the urban identitiy.

Figure 2.14: Authentic electric factory building.
Retrieved from: https://arcspace.com/feature/caixa-forum/ on 14.05.2019

Figure 2.15: Re-functionalized contemporary building.
Retrieved from: https://www.e-architect.co.uk/madrid/caixa-forum on 14.05.2019

High Line, the 2.33 km abandoned elevated railroad which transformed into a park, completed in Manhattan, New York in 2009. (Figure 2.16) The project, designed by James Corner Field Operations and Diller Scofidio&Renfro, was selected by the local council in 2004 with an international competition.. (Cilento, 2009) The project, which offers an innovative approach to the transformation of the old industrial transportation facility into a public area, has become a pioneering example not only with its architectural intervention, but also with the support of the public. (High Line (a), 2019) Robert Hammond, co-founder of the 1999-founded High Line Friends' Association, describes High Line as a historic monument, a unique urban landscape, a social centre and inspiring example for the changing environment. (Figure 2.17) (High Line (b), 2019)

Figure 2.16: The New York High Line railway before the intervention.
Retrieved from: https://www.customhomeonline.com/houses/a-look-at-the-high-line-before-it-was-the-high-line_c on 27.11.2019

Figure 2.17: The New York High Line railway after the intervention.
Retrieved from: https://txcreativep1.wordpress.com/2013/04/21/the-high-line/ on 27.11.2019

As a result, the examples of the rearranged old structures, for the purposes of culture, art and entertainment, illustrate that the cultural heritage can be revived and reused for many years when taken with the right approaches. In order for the functional transformation to be successful, the spirit of place and its historical continuity must be maintained without losing the original values of the structure. However, the intervention approaches diversify as the historical, contextual and environmental characteristics of the structure it is observed that the heritage structures examined above are integrated to society through interventions made in various styles.

CHAPTER 3

TRANSFORMATION OF SILOS TO SOCIAL SPACES WITH RE-FUNCTIONING

In this chapter, the development of storage structures and silo types from prehistoric ages to the present will be briefly examined. Then, all the re-functionalized concrete silo samples will be scanned from the architectural platforms and among these examples, eight reinforced concrete silo structures, will be examined analytically. Selected samples will be analysed and interpreted in order to demonstrate the diversity of the intervention approach.

3.1 Storage Structures from Past to Present: Silos and Their Values

Since ancient times, people have built sheltered structures to store goods such as raw materials and food. Although the first construction date of the buildings, arising from the need for storage is unknown, there are many archaeological remains. One of the earliest finds; the ruins in Jordan (Figure 3.1), dating back to the 10th century B.C., have a cylindrical architectural typology, like modern-day silos. (Kuijt, Finlayson, 2009) Similarly, this architectural typology can be found in the archaeological sites in Tel Tsaf (Figure 3.2), Israel, dating back to the 6th century B.C. (Garfinkel, Ben-Shlomo, Kuperman, 2008)

Figure 3.1: Archeological remainings of storage structures dating back to 10th century BC in Jordan. Retrieved from https://www.pnas.org/content/106/27/10966 in 16.09.2019

Figure 3.2: Archeological remainings of storage structures dating back to 6th century BC in Tel Tsaf Israel. Retreived from https://journals.plos.org/plosone/article/figure?id=10.1371/journal.pone.0092591.g002 in16.10.2019

Throughout history, small scale silo samples, in cubic, cylindrical etc. form, were encountered with materials, such as wood (Figure 3.3), stone block (Figure 3.4), special curved tile (Figure 3.5) due to differences in region, period, culture, environment, local techniques and so on, and large scale reinforced concrete silos (Figure 3.6) started to be built from the beginning of the 20th century (Beedle, 2001, 3). At the present time, instead of huge concrete structures, steel silos are built via the developing materials and technology due to the cheaper cost and shorter duration of construction. (Fernandez, 2018) (Figure 3.7)

Figure 3.3: Wooden hexagonal silo locaten in Utah, US.
Retreived from https://www.uglyhedgehog.com/t-464900-1.html in 16.09.2019

Figure 3.4: Stone block silo located in Gallpville, New York
Retreived from http://agri007.blogspot.com/2012/11/stone-silo.html in 16.09.2019

Figure 3.5: Tile silo located in Warrensburg Missouri
Retreived from http://www.wilsonhurst.com/irontone/?p=1221 in 07.10.2019

Figure 3.6: World's largest reinforced concrete silo with a capacity of 275.000 tons located in South Africa
Retreived from https://www.xtraspace.co.za/blog/articles/five-of-the-worlds-biggest-storage-spaces-no5 in 16.09.2019

Figure 3.7: World's largest steel silo facility with a capacity of 1,3 million tons located in Egypt. Retrieved from http://www.feedandgrain.com/news/worlds-largest-silo-order-completed-in-egypt in 16.09.2019

In the second half of the 19th century, this type of structure, that's early examples are basic warehouses, was converted into a kind of machine by using a steam grain elevator, by Joseph Dart and Robert Dunbar in Buffalo, the United States, where agricultural trade is rapidly increasing. (Kowsky, 2006, 23) The most important contribution to the development of these high towers, that are usually constructed in cylindrical shape, was provided by C.F. Hanglin, who designed the form that made it more resistant to pressure in 1899, and found a new mould system for pouring the most suitable material for this model, reinforced concrete; that resulted with the modernization of silo structure. (Kowsky, 2006, 39) In this time period in which agricultural production developed as part of a large trade network, the silo type was transformed from a simple warehouse to a steam machine and then to giant concrete monument. Erich Mendelsohn, Walter Gropius and Le Corbusier would praise these silos in their publications in the early 20th century and show their pure geometry and functionality as a new source for contemporary architecture. (Örmecioğlu, 48) So much so that Walter Gropius in his 1911 *Monumentale Kunst und Industriebau, Vortrag mit Lichtbildern* speech, described silos, the anonymous structures of the industry, as the contemporary style of the time (Meija, 2014). On the other hand, Le Corbusier (1986, 8) described the history of architecture, as a phenomenon developed for centuries. However, he indicates that newer possibilities and larger

building capacities will be possible with materials such as steel and concrete, which have started to be used with developing technology.

The grain elevator, which started with Dart and Dunbar, continues to be used in modern silo structures today. First, the new product is taken to the incoming compartment, then moved to the top of the structure through bucket scallions or strip bands. At this stage, it is determined by the technician which silos the product will be discharged to. The cover of the silo to be discharged is automatically opened and the product that comes to the top of the structure is emptied with the help of the bands. The discharge of the stored product is carried out with the help of gravity from the discharge funnels under the silos[1]. (Figure 3.8)

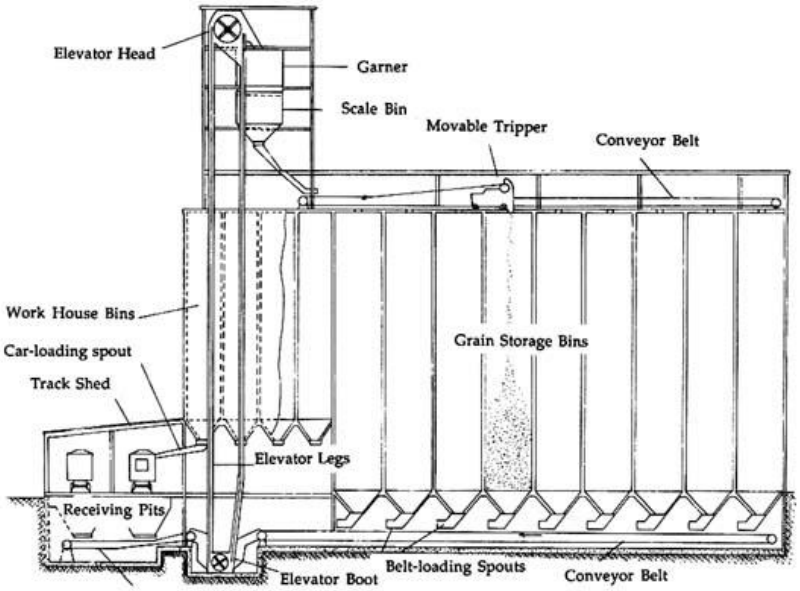


Figure 3.8: Scheme of filling and discharging materials to silos. Retreived from https://publishing.cdlib.org/ucpressebooks/view?docId=ft8f59p27j&doc.view=popup&fig.ent=https://publishing.cdlib.org/ucpressebooks/data/13030/7j/ft8f59p27j/figures/ft8f59p27j_00000.jpg in 02.01.2020

Although silo structures are also located in grain production areas, large-scale silo structures are generally located in areas close to the port and railway, where the distribution of the stored product is much easier. (Elevator, 2019) For that, reinforced concrete silos are an important asset to the industrial area which they are located. They should be taken as a whole not only with the transportation and distribution

[1]The information about the distibution system of silos are obtained from assistant manager of Izmir Grain Board Mücahit Azap in 26.02.2019

network structures such as rail and port, but also with the bands and cranes carrying the product, warehouses and other industrial buildings in the surrounding area.

Due to the shape and masses of contemporary architecture forms and their internal structure, which is an advanced type of machine, these structures constitute a subheading of the industrial heritage. These buildings are qualified parts of the city, aside from the substantial industrial heritage buildings, railroad and harbour facilities around them. In order to sustain the historical continuity and the integrated development of cities, silo structures must be re-functionalized by conserving their mass plastic parts and survive. Today, however, some of these buildings are abandoned for various reasons, functionally worn out, and sometimes destroyed. Moreover, silo examples, which have been re-functionalized with successful interventions after losing their original function, show that these structures are used with protection and enrich their environment. (Taddonio et al., 2016, 76)

However, functional transformation of reinforced concrete silos requires a very laborious and expensive process. The monolithic structures, consisting of reinforced concrete cylinders designed for storing grain, coal, cement etc., cause spatial and structural difficulties on creating places to fulfil the needs of contemporary life, and building their relationship. Contrarily, qualified interventions that do not harm the original characteristics of the structure and its relationship with its environment, add value to the silos, and enable them to take part in contemporary life. Thus, abandoned silos are protected by interacting with the contemporary society, their tangible and intangible values are kept alive, improving the social, functional and aesthetic qualities of their texture. For this reason, it is important to define the qualifications of the silo structures that are protected and used with qualified interventions.

Feilden and Jokilehto (1998, 18-21) have collected the values of the heritage structures and heritage sites under two main headings. These are cultural and socio-economic values. They state that the perception of value found in the structure or site could change over time. Moreover, the existence or absence of these values remains critical in maintaining the continuity of the heritage.

Cultural values that provide interpretation of the heritage structure or the cultural characteristic of its environment are divided into three categories as identity, artistic/technical and rarity values. Fielden and Jokilehto states that (1998, 18), the structures and sites associated with emotional qualities, such as tradition, continuity, monumentality, religious, symbolic, political and national values, constitute identity value. Accordingly, all silo structures that remain as symbols in their region, with their architectural characteristics, maintain their identity value. Heritage buildings have artistic and technical values based on their design, technical, structural and functional significance. (Fielden, Jokilehto, 1998, 19) According to this, concrete silos have artistic value through design of cylindrical structures, technical value with moulding method and functional value with storage method and capacity. It is seen that all silo structures have technical value. The scarceness and uniqueness of the structure determine its rarity value. (Fielden, Jokilehto, 1998, 19) The exclusive architectural typologies of reinforced concrete silo structures began to be encountered in different parts of the world since the 19th century. There are still numerous reinforced concrete silo buildings based on 19th century construction principles. For that, these structures will gain their rarity value not by the architectural typhology but by the contemporary interventions made to re-function. (Table 3.1)

In addition to the cultural values of heritage structure, there are also socio-economic values rooting from use. This value is examined under five categories, which are economic, functional, educational, social and political values. The economic value designated to heritage structures is defined as the financial source obtained through tourism, trade and use. (Fielden, Jokilehto, 1998, 19) Silo structures have economic value due to their contribution to commercial activities around their location. However, the non-functioning silo structures have lost their value, hence they do not pursue their activities. Yet still, it is possible for the non-functioning reinforced concrete silo structures to regain economic value with the new function that is to be given to them.

Functional value, in relation to economic value, is associated with the continuity of the original function or the new function of the structure. A functional use, that is

suitable to the structure, will support the conservation of it, whereas an inappropriate use can lead to deterioration and destruction. (Fielden, Jokilehto, 1998, 20) Accordingly, the concrete silo structures that maintain their original function conserve their functional values. It is seen that the silo structures can regain these values according to the new function to be given to the dysfunctional structures.

The integration of the region, where the historical sources of a heritage exist, to a public use portrays its educational value. (Fielden, Jokilehto, 1998, 20) In Nizhny Tagil Charter (TICCIH, 2003), it states that the industrial heritage is not only a singular structure but the totality of it with all equipments and surrounding. Therefore, it is necessary to integrate the silo structures into daily life by conserving not only the structure but also the background. Through this way of the re-functionalization, educational value will be created in the silo structures.

The contemporary interaction and social/cultural identity of the heritage structure, with the society, defines the social value of that structure. (Fielden, Jokilehto, 1998, 20) The re-functionalized silo structures improve the social environment compatible with its new function. Therefore, it can be said that they have social values. Heritage structures, which are linked to a political event or person, today or in history, have a political value. (Fielden, Jokilehto, 1998, 20) All reinforced concrete silo structures are built coherently with the development of economy. The silos, which do not constitute any political connection in its environment, do not have political values. (Table 3.1)

In addition to these values defined by Fielden and Jokilehto, Madran and Kılınç also defined certain values for the heritage structures. For them (2008, 147), the historical background of the industrial structure, which has a technological importance in the urban history of its location, shows that it carries historical value. Accordingly, all silo structures maintain their historical values due to their time periods and histories.

It is an evidence, that the structure maintains its place and improves its environment, that it conserves its environmental value. (Madran, Kılınç, 2008, 147) Silo structures are generally located close to railway, port and industrial zones due to

the storage function. Although these relationships have been damaged in accordance with the needs of developing cities, silo structures maintain their environmental values to a great extent.

If the historical layer, design, material and location of the building are intact, it indicates that the structure maintains its authenticity value. (Madran, Kılınç, 2008, 148) The design and materials, and thus their authenticity, are largely preserved by means of the reinforced concrete monolithic structures of the silos. However, while these elements meet the requirements of the new function, the conservation of authenticity becomes hard, and the intervention becomes irreversible. (Table 3.1)

Table 3.1: According to the values defined for cultural heritage buildings according to Fielden - Jokilehto and Madran - Kılınç, the values carried by the silo structures. (Karamustafa, 2019)

	Heritage Structures	Silo Structures
Identitiy	+	+
Technical	+	+
Rarity	+	-
Economic	+	+
Functional	+	+
Educational	+	+
Political	+	-
Social	+	+
Historical	+	+
Environmental	+	+
Authenticity	+	+

Together with these defined values, reinforced concrete silo structures have other features that need to be preserved. Pöğün et al. states that (1999, 38-39), construction of solid structures, are possible with the development of building technologies in the industrialization process. According to them, flexible re-functioning interventions can be seen in industrial buildings with wide openings. The most important issue to be considered is the need to choose a function that will not harm the spacial perception of the structure. In this regard, the preservation of the cylindrical wide

openings of the silo structures is the main issue to be considered. However, it is difficult to preserve these features due to spatial needs in these storage structures that have been transformed into contemporary living spaces.

Le Corbusier (1986, 31) expressed the impressiveness of huge masses consisting of primitive shapes such as cubes, cones, pyramids and cylinders. He states that the huge cylindrical forms of silos are the remarkable works of the new age. In the Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage (ICOMOS, 2003), it is stated that, together with all the components of the heritage structures, the construction technologies of the period in which they were built should be preserved as unique examples. On the other hand, Ahunbay (2011, 30) mentions that documented structures bearing the traces of production techniques, building types and technical development should be protected with all these features. In this regard, reinforced concrete silo structures, with their striking geometries, machine-like structure and production techniques, bear the traces of their own period and need to be preserved as a whole.

In the Nizhny Tagil Charter (TICCIH, 2003),it is stated that the structures built for industrial activity and its surroundings are whole with all the tangible and intangible features. According to Kariptaş et al. (2009, 996-1006), handling the buildings of industrial heritage individually, shows that it will not fully reflect the values of the era it belongs to if they are. For this reason, individual buildings should be handled together with the landscape and equipment as a whole. In this way, the industrial areas considered as a whole will fully reflect their current values and as a result, they will be preserved and reused by qualified interventions. According to Cengizkan (2002, 40), the industrial structures and areas, together with the equipment and structures where the production is carried out, are an indicator of the socio-economic development of the region where it is located and should be preserved as a whole. London power station (Tate Modern), industrial area of Ruhr valley (IBA Emscher Park), Paris train station (Musee d'Orsay), Bakırköy powder mill (Yunus Emre Cultural Center), Kayseri Sümerbank textile factory (Abdullah Gül University education and culture center) are some of the examples in which industrial structures and areas are re-functional as a whole. Reinforced concrete silos, which are industrial heritage, should be handled as a whole, together with their equipment, transport

connections, environmental relations and should be preserved and integrated into daily life.

Additional articles developed in addition to the evaluation method consisting of six points guiding the new design in the historical context, developed by examining and interpreting the international texts and theorists' views to preserve the heritage structures, were developed by defining the characteristic architectural typology and values of the silo structures as industrial heritage. (Table 3.2) This evaluation method, consisting of a total of nine points, will enable the evaluation of contemporary intervention approaches applied to silo structures through the theoretical debates and principal decisions developed in the field of architectural design and architectural conservation.

Table 3.2: Additional evaluation criteria for contemporary interventions applied to silo structures, developed by examining this type of structure as an industrial heritage. (Karamustafa, 2019)

7.	The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.
8.	The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.
9.	Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).

Reinforced concrete silo structures, which are an important part of the industrialization process, are the building types that have an important place in the city and city memory and should be preserved as architectural heritage. International texts and the opinions of theorists should be followed during the preservation of these structures with qualified interventions and transferring them to future generations with new functions. Handling the examples from this point of view will enable the intervention approach to be evaluated in terms of compliance with theoretical debates and principals from significant documents.

3.2. Examples of Re-functioned Concrete Silos with Contemporary Interventions

In this section, intervention approaches applied to reinforced concrete silo structures, which are a part of the industrial heritage, are examined and evaluated within the context of the criteria set out above. Firstly, remarkable reinforced concrete silo structures with new function, published on architectural platforms in the last five years were examined. Then, different examples were selected in terms of diversity of interventions, and evaluated within the context of criteria determined for silos. Since each sample differs in terms of scale, design and environmental relations, etc. contemporary interventions applied to selected samples are also diversified. As a result of the data obtained from the samples examined, the characteristics of the interventions applied to the reinforced concrete silo structures are discussed.

When the examples are examined, it is seen that the interventions vary between preserving the silo structures as they are and reconstructing them in cylindrical form completely. The grain silos located in the harbour in Oulu, Finland were demolished due to material degradation (Figure 3.9), and in 2014, Pave Architects conserved its silhouette and built a contemporary residential structure, The Tervahovin Silos. (Tapia, 2018) (Figure 3.10) In the planning of the new design, the spatial arrangements, required by the housing function, were made, and the front and side façades, that were important for the city centre were constructed with metal cages in a cylindrical form to resemble the silo structure. The windows opened on this surface provide the required amount of light, for the new function, without disturbing the cylindrical façade of the old structure. This example supports Kuban's view (2000, 113) that form is the base and material is the preceding. Although the silos, which occupy an important position in the urban identity, were completely destroyed, however, have been rebuilt by conserving the cylindrical form to sustain the urban memory. However, since the original structure, which is a symbol of the region, was completely destroyed, the new structure built in the same form, although the composition formed by the cylinders seem to be preserved, the circular space inside the cylinders is not preserved. In addition, its authentic structure and its relationship with its environment have been disturbed and a new and modern living space has been created that is appropriate to the silo form.

Figure 3.9: Authentic Tervahovin silos.
Retrieved from http://www.siilot.fi/kuvia/ in 24.05.2019

Figure 3.10: New construction after authentic structures were demolished.
Retrieved from http://www.siilot.fi/kuvia/ in 24.05.2019

Silos, built for storing grain in Hico, US underwent functional transformation in 2015. (Siloville, 2019) The factory building, located next to the original silo structure (Figure 3.11), was demolished. The intervention has conserved the original structure as it was. (Figure 3.12) With the demolition of the industrial buildings around it, the relationship of the silos with their surroundings has deteriorated. New additions have been made to the interior and exterior walls of the structure, for the new function that

is designated as a climbing tower. (Figure 3.14) Circular spaces are preserved with minimum intervention applied to the interior of the silos. However, the geometry and monolithic reinforced concrete texture of the silos are clearly visible. Contrary to Tervahovin Silos, the intervention was implemented in such a way to minimize the interference to the architecture of the authentic building. By doing so, the structure was conserved as it was, and the intervention is reversible.

Figure 3.11: Painting of the authentic form of the climbing tower.

Retrieved from https://www.facebook.com/Silovillle/photos/a.1453408504956016/1453408494956017/?type=3&theater in 09.12.2019

Figure 3.12: Newly formed exterior façade of the climbing silo after the intervention.

Retrieved from https://visithicotexas.com/play/ in 09.12.2019

Figure 3.13: Newly attached climbing modules inside the climbing silo after the intervention. Retrieved from https://www.facebook.com/Silovillle/photos/a.1419449571685243/1680513178912213/?type=3&theater in 09.12.2019

Many reinforced concrete silo structures have been constructed in different parts of the world for varying purposes until today. These structures, generally located near the port and railway, play a vital role in the agricultural and economic development of the region. However, with the urban development, these structures remain within the city and lose their functions, demolished or re-functioned with unqualified interventions.

As a result of the literature review, twenty-three silo transformation samples were found in various regions of the world. It has been observed that these examples have been re-functioned under five main headings: arts, sports, residence, office and hotel. (Figure 3.14) Two of the twenty-three different samples were built to store cement, and one was to store sand. (Table 3.3)

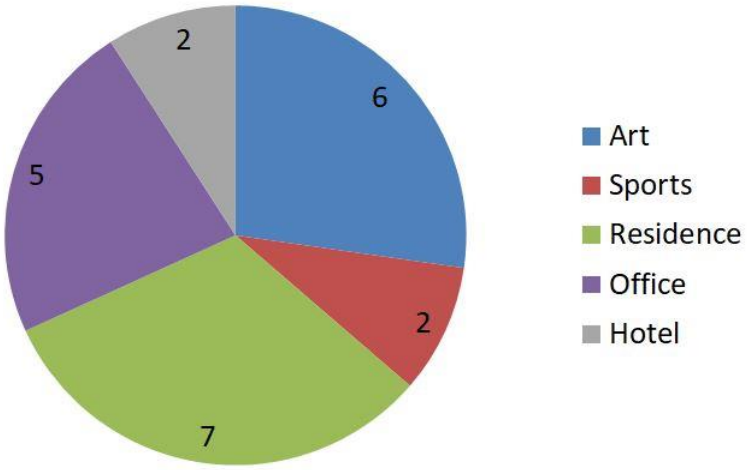


Figure 3.14: Functional distribution of twenty-three reinforced concrete silo re-function samples reached in the literature review. (Karamustafa, 2020)

In this study, eight of the twenty-three silo re-function samples (Table 3.4) from different regions of the world, which were reached in the literature review, were selected and investigated. With the selected examples, it was aimed to develop intervention approaches applied to silo structures by emphasizing the diversity of this architectural typology and interventions. Moreover, by examining the values defined in the industrial heritage structures and the unique architectural typologies of the silo structures, 3-clause criteria formed and added to 6-clause criteria formed by the examination of theoretical debates and principals from significant documents. (Table 3.3) The selected samples were examined with the evaluation method created.

The selected samples will be evaluated according to the 9-point evaluation method above. Thus, the intervention approach will be evaluated in terms of suitability for theoretical discussions and principles from documents.

Table 3.3: Evaluation method developed for contemporary interventions applied to silo structures. (Karamustafa, 2019)

1.	Contemporary intervention should reflect the material, technology and design understanding of its era.
2.	Tangible and intangible values should also be kept alive by maintaining existing values.
3.	The new function should be properly functioned with the old structure and respond to developing urban dynamics.
4.	The new function needs to contribute to the enrichment of the area by adapting to the context.
5.	The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.
6.	The new additions should be a creative and differentiating design.
7.	The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.
8.	The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.
9.	Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).

Table 3.4: Examples of re-functioned reinforced concrete silo that have been implemented or projects worldwide. (Karamustafa, 2019)

NO	NAME	COUNTRY	CONS. YEAR	INT. YEAR	ARCH. FIRM	NEW FUNC.	OLD FUNC.	AREA (M^2)
1	Guangdong Glass Factory	China	1970's	2013	O-Office Arch.	Biennale Exibition	Sand	2.662
2	Siloo O (Project)	Amsterdam	-	2009	NL Arch.	Sports and Culturral Facility	Grain	-
3	Silo Climbing Wall	Iowa	-	2001	Don Briggs (Climber)	Climbing Wall	Grain	-
4	The House of the Living and Dead (Project)	Sweden	-	2016	Frerdik Thornstörm and Karolina Pajnowska	Crematorium and Residence	Grain	-
5	Minsheng Wharf Silo	China	1970's	2017	Atelier Deshaus	Art Exibition	Grain	18.600
6	La Fabrica	Spain	-	1973	Ricardo Bofill	Contemporary Living Space	Cement	5.000
7	Siloetten	Denmark	-	2010	C.F. Moller / Christian Carlsen	Residence	Grain	4.500
8	The Tervahovin Silos	Finland	-	2014	Pave Arch.	Residence	Grain	7.700
9	The Silo	Denmark	-	2017	COBE Arch.	Residence	Grain	10.000
10	Kanaal	Belgium	1857	2015	Stephane Beel Arch.	Residence	Grain	13.090
11	Armani Silos	Italy	1950	2015	Unknown	Exibition Area	Grain	4.500

12	Sugar Silos	Amsterdam	1919	2000	Cobraspen Group	Office	Sugar	-
13	The Zwarte Silo	Holland	1923	2016	Wenink Holtkamp Arch.	Multipurpose Space	Grain	-
14	Zeitz MOCCA	South Africa	1925	2017	Heathwick Studio	Contemporary Arts Museum	Graim	102.000
15	Marine A Grain Elevator	Buffalo-USA	1925	-	-	Workshops and Exibition Area	Grain	-
16	Silo d'Arenc	France	1927	2011	Carta Arch.	Concert Hall, Art Exibition	Grain	16.000
17	Plange Mühle Campus	Germany	1929	2016	Ingenhoven Arch.	Office	Grain	5.650
18	Quaker Square Inn	Akron-USA	1932	1970	-	Dorm of University of Akron	Grain	-
19	Polatlı City Council	Turkey	1933	2019	Polatlı Municipality	Council Building	Grain	-
20	Ibis Hotel	Turkey	1934	2007	Çakar Arch.	Hotel	Grain	10.000
21	Das Silo	Hamburg	1935	2005	Limbrock & Tubbesing Arch.	Office	Grain	15.750
22	Gemini Silos	Denmark	1963	2005	MVRDV	Residemce	Grain	39.000
23	Portland Towers	Denmark	1979	2014	Design Group Arch.	Office	Cement	12.000

3.2.1 Frosilo (Gemini Residence), MVRDV, 2015, Denmark, 39.000 m^2

The authentic structure was built in 1963 to store grain in the harbour area (Figure 3.15) of Copenhagen, Denmark. (Figure 3.16) With the closure of the soybean processing plant in the harbour, residential and office buildings were started to be built in the region. The building, which was closed to use in 1990, was transformed into a contemporary living space by MVRDV in 2005. (Meinhold, 2013)

While the designers intervened in the silos, they aimed to maintain the circular space, which is one of the main eye-catching features of the structure. (MVRDV (a), 2019) Therefore, the 8-floor living space is located outside the original structure, (Figure 3.17) inside, corridors placed parallel to the wall of the silo on each floor, and the central scattered stairs and elevators connecting these corridors, are located. (MVRDV (b), 2019) These elements match their shape and position to the cylindrical form of the silo, while differentiating with the white colour. (Figure 3.18) Despite the difficulties of the circular form of the building, functional solution of the living areas has been useful, and the cylindrical form which is important for the urban identity has been conserved.

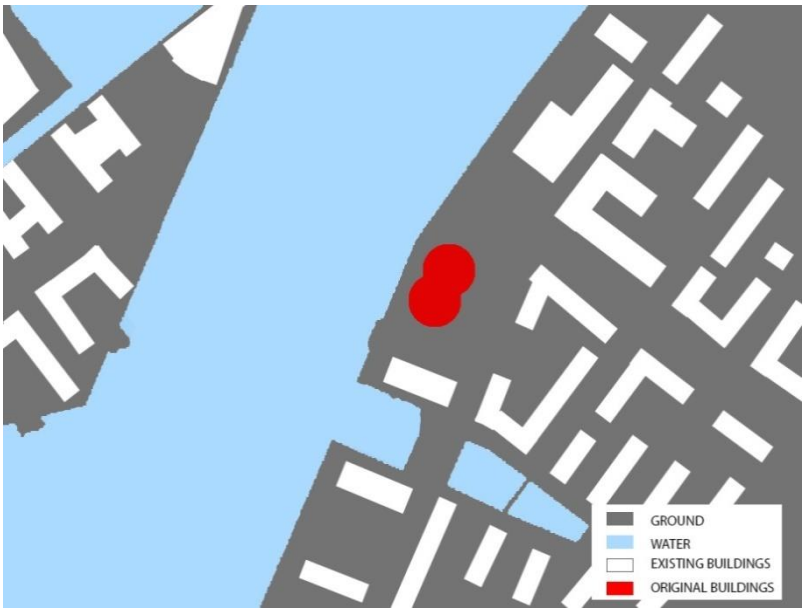


Figure 3.15: Location of the Gemini Silos near to the port in Copenhagen.
Map is retrieved from
https://www.google.com/maps/place/Gemini+Residence,+2300+København,+Danimarka/@55.6610359,12.5662

603,17z/data=!3m1!4b1!4m5!3m4!1s0x4652536f404e7025:0xee6e59a04c805715!8m2!3d55.6610359!4d12.568449 in 13.06.2019. Coloring was done by the author.

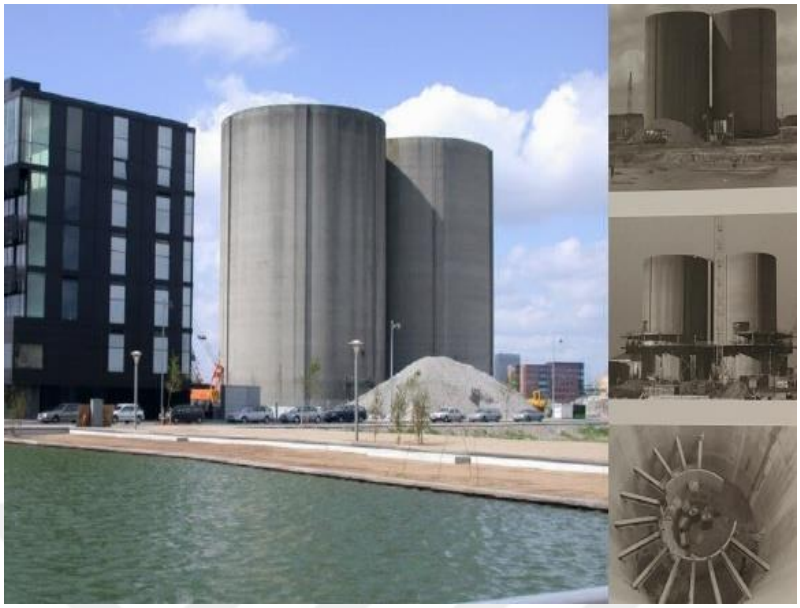


Figure 3.16: Authentic silo structures.
Retrieved from https://html1-f.scribdassets.com/6ltp428ebk5vsqb5/images/1-46e8122ed6.jpg in 13.06.2019

Figure 3.17: Contemporary living spaces created with intervention on the exterior façade of the authentic structures.
Retrieved from https://inhabitat.com/mvrdv-converts-twin-silos-into-the-gemini-residences-located-on-copenhagens-waterfront/gemini-residences-mvrdv-1/ in 13.06.2019

The flooring, that contain the living spaces, was not made up to the floor of the silo and were left blank to avoid losing the brutalist form of the structure. The silo cavity, containing circulation elements, was illuminated with natural light by covering the ceiling of the silo cavity with glass and stretch ceiling system. (MVRDV (c), 2019) By locating the annexes, that host the residence areas, on the exterior of the silos, the openings, forming the entrance doors of the flats, were made on the reinforced concrete surface of the silo, while the natural light was maximized with the completely transparent surfaces leading to the balconies. (Figure 3.19)

Figure 3.18: Circulation axis consisting of stairs, corridors and elevators formed inside the silo structures. Retrieved from https://photorator.com/photo/83302/inside-the-gemini-residence-converted-into-a-residential-building-from-two-silos-by-mvrdv-copenhage- in 13.06.2019

With the intervention made, the new annexes, in the original structure re-functioned as housing, reflect the materials and technology of its time. When before and after images are examined, it is seen that the intervention carried out by maintaining the existing values without damaging the texture integrity of the authentic reinforced concrete structure. Additionally, the new function has been assigned related with the form of the existing structure, and the circular space, which is the most important feature of the silos, was maintained. The creative and distinctive intervention design aesthetically improved the authentic structures' appearance in the city skyline. It was observed that the intervention was a design that was appropriate to the form, scale, character of the authentic structure, and corresponds to the developing urban dynamics. However, the machinery and equipment that are part of the industrial

history within the structure have not been preserved. Besides, the traces around could not be preserved, due to the stopping of industrial activities in the region.

Figure 3.19: Living space and balkony separated with glass from ceiling to floor.
Retrieved from https://inhabitat.com/mvrdv-converts-twin-silos-into-the-gemini-residences-located-on-copenhagens-waterfront/gemini-residences-mvrdv-4 in 07.11.2019

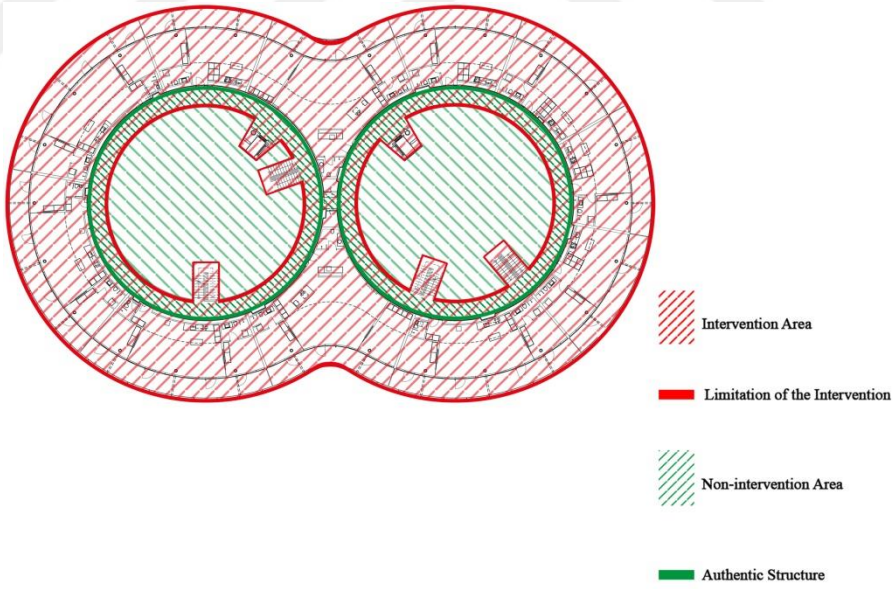


Figure 3.20: Visual showing the lines of intervention on the plan of the Gemini silos.
Plan retrieved from https://www.architectour.net/opere/opera.php?id_opera=5542&nome_opera=Frøsilos&architetto=MVRDV in 13.06.2019. The diagram showing the intervention was created by the author.

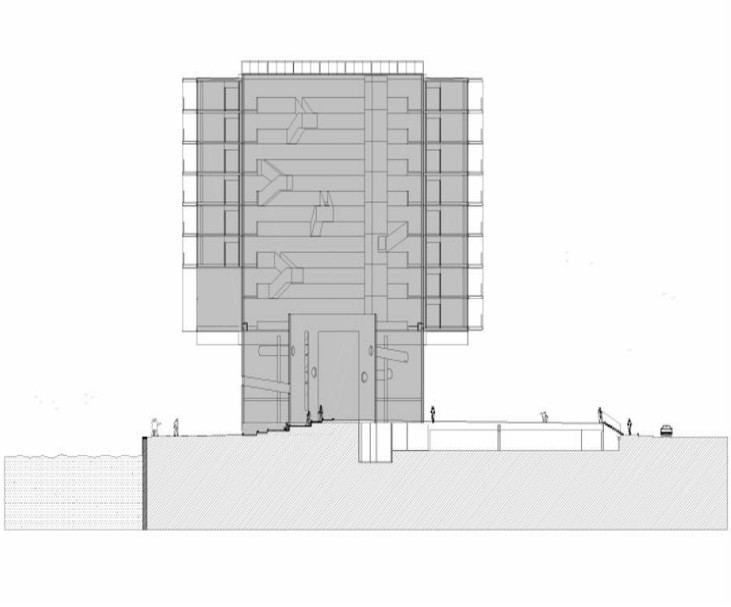


Figure 3.21: Section of one of the Silos.
Retrieved from https://www.jjw.dk/?projekt=frosiloen in 13.11.2019

Table 3.5: Evaluation of the intervention in Gemini silos according to theoretical concepts.
(Karamustafa, 2019)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON GEMINI SILOS	
CONSERVATION PRINCIPLES	GEMINI SILOS
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	+
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	+
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	+
6. The new additions should be a creative and differentiating design.	+
7. The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the	+

	cylinders must be preserved.	
8.	The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	+
9.	Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	-

3.2.2 Siloetten, C.F. Moller/Christian Carlsen Arch., 2010, Denmark, 4.500 m^2

The authentic structure was built to store grain in the Logten region of Denmark. (Figure 3.22) One of the structures consisting of two silos demolished for the intervention due to its bad condition. (Figure 3.23) In 2010, C.F Moller and Christian Carlsen transformed the other silo (Figure 3.24) into a contemporary residential building by making insertions to it. (Sebastian, 2010)

Figure 3.22: Location of Siloetten near to the railroad.
Map retrieved from https://www.google.com/maps?client=safari&rls=en&sxsrf=ACYBGNToVMgBFlCX7hgzFtjyxF9be5iIOw:1576177868023&uact=5&q=siloetten&um=1&ie=UTF-8&sa=X&ved=2ahUKEwj8qLnu6LDmAhWQRRUIHUxKC_UQ_AUoAnoECAwQBA in 07.11.2019. Coloring was done by the author.

Figure 3.23: Demolition of one of the authentic silos.
Retrieved from https://pleasure.borsen.dk/bolig/artikel/1/218972/fra_kornsilo_til_ikonisk_superbolig.html in 07.11.2109

Figure 3.24: Authentic silo structure.
Retrieved from https://www.archdaily.com/64519/siloettenthe-silohouette-c-f-m%25c3%25b8ller-architects-in-collaboration-with-christian-carlsen-arkitektfirma/500930b228ba0d27a7001d36-siloettenthe-silohouette-c-f-m%25c3%25b8ller-architects-in-collaboration-with-christian-carlsen-arkitektfirma-photo in 13.06.2019

In the contemporary intervention, the spatial arrangements required by the housing function were made, and the cubic form, which is important for the urban texture, was conserved, and annexes were added to its façades. Contrary to the additions to the silo, the original form is detected as there was no interference with the front side. The living spaces, spread over eleven floors on the authentic reinforced concrete structure, are connected with steel construction. (Figure 2.25)

Each housing is different from another on the plan scale, because the new annexes are modular. (Figure 3.26) The annexes are positioned to obtain the most reasonable level of sunlight, required by the residential function. (Figure 3.28) Flooring, as many as the stories of the building and as high as a regular floor, was created, wet areas, stairs and elevators are located in the silo. The houses are accessed through the steel structures and the door openings to the surface of the silo's reinforced concrete structure. On the ground, a town centre, consisting of shopping centres, was established, and the surrounding area was arranged with green areas and terraces. (Sebastian, 2010)

Figure 3.25: Contemporary living space.
Retrieved form https://www.archdaily.com/64519/siloettenthe-silohouette-c-f-m%25c3%25b8ller-architects-in-collaboration-with-christian-carlsen-arkitektfirma/500930b928ba0d27a7001d37-siloettenthe-silohouette-c-f-møller-architects-in-collaboration-with-christian-carlsen-arkitektfirma-photo in 14.06.2019

The new annexes reflect the material of its time and the contemporary design. It responds to the developing urban dynamics with its new function in the intervention design, made in accordance with the cubic and minimal lines of the authentic structure. The city centre, which is created on the ground of the contemporary residence structure, contributes to the environment's improvement. Considering the overall of the contemporary structure, intervention design is creative and innovative. However, due to the spatial need, circulation axis and wet areas, consisting of stairs, elevators and corridors, are located in the authentic silo. Therefore, the space of the authentic silo cannot be maintained. Moreover, although the building is located next to the railway, it has lost traces of industrial activity in and around it. (Figure 3.27) The contemporary structure, which was re-functionalized for housing, cannot preserve the current values it has. Likewise, there is no structural legibility with the coating applied on the authentic façade.

Figure 3.26: Visual showing the lines of intervention on the plan of the Siloetten.

Plan retrieved from https://www.archdaily.com/64519/siloettenthe-silohouette-c-f-m%25c3%25b8ller-architects-in-collaboration-with-christian-carlsen-arkitektfirma/500930e728ba0d27a7001d42-siloettenthe-silohouette-c-f-m%25c3%25b8ller-architects-in-collaboration-with-christian-carlsen-arkitektfirma-level-5 in 14.06.2019. The diagram showing the intervention was created by the author.

Figure 3.27: Top view of the area which Siloetten is located.

Retrieved from https://inhabitat.com/old-silo-transformed-into-rural-high-rise-in-denmark/siloetten-9 in 09.12.2019

Figure 3.28: Interior of Siloetten.

Retrieved from https://www.archdaily.com/64519/siloettenthe-silohouette-c-f-m%25c3%25b8ller-architects-in-collaboration-with-christian-carlsen-arkitektfirma/500930e728ba0d27a7001d42-siloettenthe-silohouette-c-f-m%25c3%25b8ller-architects-in-collaboration-with-christian-carlsen-arkitektfirma-level-5 in 14.06.2019

Table 3.6: Evaluation of the intervention in Siloetten according to theoretical concepts.
(Karamustafa, 2019)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON SILOETTEN	
CONSERVATION PRINCIPLES	SILOETTEN
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	-
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	+
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	-
6. The new additions should be a creative and differentiating design.	+
7. The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.	-
8. The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	+
9. Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	-

3.2.3 Zeitz Museum of Contemporary Arts, Heathwick Studio, 2017, South Africa, 102.000 m^2

The building was constructed in the port area (Figure 3.29) of Cape Town, South Africa in 1924 to store grain. (Figure 3.30) After being shut down in 1990, Heathwick Studio transformed it into the African Museum of Contemporary Arts and hotel complex in 2017. (Castro, 2017) (Figure 3.31) New function's requirement of spatial arrangements has been made in the contemporary design, and the intervention has been minimized by preserving the exterior form, that is important for the city.

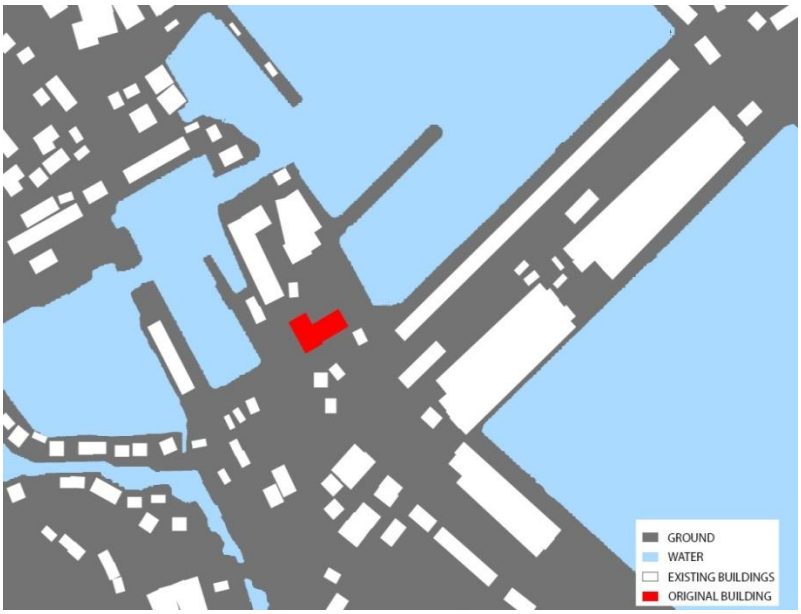


Figure 3.29: Location of Zeitz MOCCA in the port.
Map retrieved from https://www.google.com/maps/place/Zeitz+Museum+of+Contemporary+Art+Africa/@-33.9083692,18.420793,17z/data=!3m1!4b1!4m5!3m4!1s0x1dcc67596cf4d0dd:0x8f7985bd761d1118!8m2!3d-33.9083737!4d18.4229817 in 14.06.2019. Coloring was done by the author.

Figure 3.30: Authentic silo structure,
Retrieved from https://www.inexhibit.com/wp-content/uploads/2015/02/Zeitz-MOCAA-museum-Cape-Town-05.jpg in 14.06.2019

The building, which was in poor condition, was restored before the intervention, and the walls were painted white during the renovation works. During the intervention phase, white paint was removed, and the original material of the

building was exposed. (Kırlar, 2017) The three-dimensional curved windows, that are located on top of South Africa's highest and significant industrial heritage structure, allow sunlight to reflect from various angles, and by doing so, provide the required amount of light into the building. (Castro, 2017) (Figure 3.31) With this approach, the intervention of the exterior was minimized, and a distinctive value has been added by conserving its own.

Reinforcement works were carried out during the carving and breaking of the interior walls of the 42-piece reinforced concrete silo structure, and the silo walls of insufficient thickness were thickened. (Figure 3.34) As a result of this, plentiful exhibition areas, galleries and a large atrium were created. (Figure 3.32) The form of corn grains, which make up a large part of agricultural production the history of Cape Town, was inspired during the creation of the atrium. Floors are formed using reinforced glass to allow natural light to get in the remaining silos, and to create an elegant look. (Castro, 2017)

Figure 3.31: Contemporary structures' exterior façade after the intervention.

Retrieved from https://www.archdaily.com/879763/zeitz-museum-of-contemporary-art-africa-heatherwick-studio/59bc1871b22e38139f000155-zeitz-museum-of-contemporary-art-africa-heatherwick-studio-photo in 14.06.2019

Figure 3.32: Corn grain-formed atrium inside the contemporary arts museum.
Retrieved from https://www.archdaily.com/879763/zeitz-museum-of-contemporary-art-africa-heatherwick-studio/59bc17a6b22e38ff0100037f-zeitz-museum-of-contemporary-art-africa-heatherwick-studio-photo in 14.06.2019

Contrary to the dominant opinion about art and architecture of the period, Gordon Matta Clark described abandoned buildings as art objects, and intervened to restore the urban texture. He was criticized for being "destructive" rather than "constructive" in his intervention approach. (Kırlar, 2017, 18) However, according to Sharr, quoting from Heidegger (2007, 72); the purpose of re-functionalization of an unused structure should not be to convert it into an artwork, if it is to be re-functionalized it must be done for a purposeful use.

In this context, the designer Thomas Heathwick stated that his aim was to transform the building into a design that could not be detected at first glance, rather than creating a sanctuary. (Frearson, 2018) With the intervention, the original structure became an artistic work as in the works of Matthew Clark, and a new function was assigned for a purposeful use, as Heidegger stated. The authentic structure's exterior façade has been highly conserved and a row of curved glass has been added to the upper circumference. The new annexes on the interior and exterior façades reflect the material and design concept of their time. Besides, the circular space that needs to be protected was reinterpreted by excessive intervention in the internal silos, and consequently, was preserved. Thus, the present values are protected, and their tangible and intangible values are kept alive. In the contemporary

structure, which is in harmony with the industrial zone at the background, the discharge funnels and hardwares are conserved. The new function, which is coherent with the surroundings, responds to developing dynamics, and improves its environment. The intervention is compatible with the character, material, texture and scale of the authentic structure, and recognizes its history and values. The intervention that can be described as destructive creativity is a creative and differentiating design.

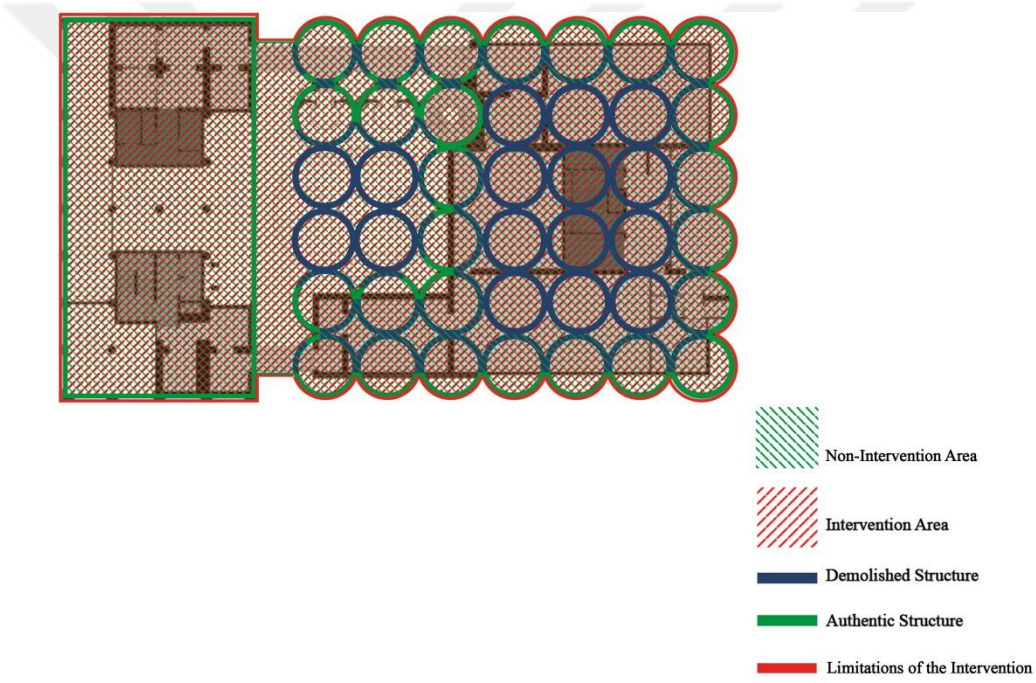


Figure 3.33: Visual showing the lines of intervention on the plan of the Zeitz MOCCA.
Plan retrieved from https://www.archdaily.com/879763/zeitz-museum-of-contemporary-art-africa-heatherwick-studio/59bc18acb22e38ff01000385-zeitz-museum-of-contemporary-art-africa-heatherwick-studio-plan-level-1 in 14.06.2019. The diagram showing the intervention was created by the author.

Figure 3.34: Reinforcement works during the intervention to Zeitz MOCCA's silos.
Figure retrieved from the 02:00 minute of the video from https://www.youtube.com/watch?v=7EsMdF8BsyY in 09.12.2019

Table 3.7: Evaluation of the intervention in Zeitz MOCCA according to theoretical concepts. (Karamustafa, 2019)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON ZEITZ MOCCA	
CONSERVATION PRINCIPLES	ZEITZ MOCCA
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	+
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	+
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	+
6. The new additions should be a creative and differentiating design.	+
7. The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the	+

	cylinders must be preserved.	
8.	The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	+
9.	Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	+

3.2.4 Kanaal, Stephane Beel Arch, 2015, Belgium, 13.090 m^2

The authentic structure was built in 1857 to store grain for the malt plant located on the banks of the river (Figure 3.35) in Wijnegem region of Belgium. (Vervoordt, 2017) (Figure 3.36) In 2015, the new building's required spatial arrangements were made by Stephane Beel Arch, and workshops, working areas, exhibition halls, offices, parking and housing were established. (Figure 3.37) Two of the eight silos in the authentic structure have been demolished due to technical concerns, and instead, square silos with large spans, so-called white silos, were built. The other six silos were called gray silos, and window cavities were opened in a way that would not disrupt the exterior form. Gray silos were connected with white silos via glass bridges, and different floor plans were obtained on each floor. (Tapia, 2017)

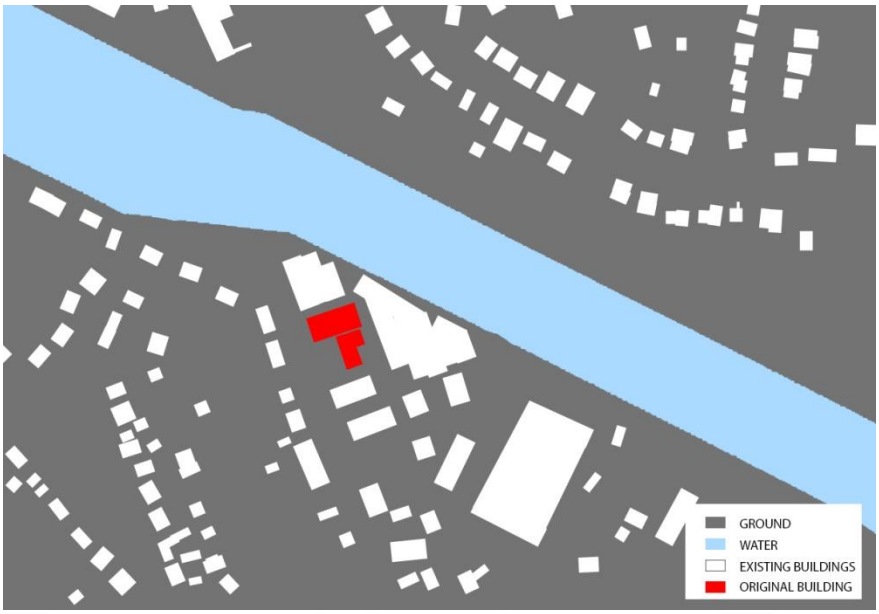


Figure 3.35: Location of Kanaal silos in Wijnegem district.
Map retrieved from https://www.google.com/maps/place/Axel+Vervoordt+NV/@51.223614,4.5421093,17z/data=!3m1!4b1!4m5!3m4!1s0x47c3f8e75f4b6ad9:0x7322de11a3fa8cdd!8m2!3d51.223614!4d4.544298 in 15.06.2019. Coloring was done by the author.

Figure 3.36: Authentic structure before intervention.
Retrieved from https://www.worldarchitecturenews.com/article/1518107/kanaal-begins-new-chapter-belgium in 15.06.2019.

Figure 3.37: Contemporary structure after the intervention.
Retrieved from https://www.archdaily.com/885884/kanaal-in-wijnegem-stephane-beel-architects/5a3b35e8b22e38b00a00022d-kanaal-in-wijnegem-stephane-beel-architects-photo in 15.06.2019

Two of the eight silos of the authentic structure were demolished and rebuilt in a prismatic form with contemporary materials and design. The composition formed by the reinforced concrete blocks of different sizes and forms of the silos was preserved, but the circular space inside the cylinders could not be preserved. The authentic characteristic of the structure is partially conserved by protecting the original parts of the structure to create an art gallery. (Figure 3.38) Likewise, the industrial buildings around the structure have mostly been conserved and given a variety of new functions. Moreover, the new annexes are properly functionalized with the authentic structure, responding to the developing dynamics, and enriching the environment through contemporary form and function. It is a creative and diversifying design that adds to the authentic structure and mass, rhythm and characteristic.

Figure 3.38: Art gallery in Kanaal and the funnels left from authentic function.
Retrieved from https://magazine.bellesdemeures.com/en/luxury/lifestyle/kanaal-foundation-axel-vervoordt-wijnegem-belgium-article-31357.html in 27.11.2019.

Figure 3.39: Inner façade of the contemporary structure as living space.
Retrieved from https://www.worldarchitecturenews.com/article/1518107/kanaal-begins-new-chapter-belgium in.

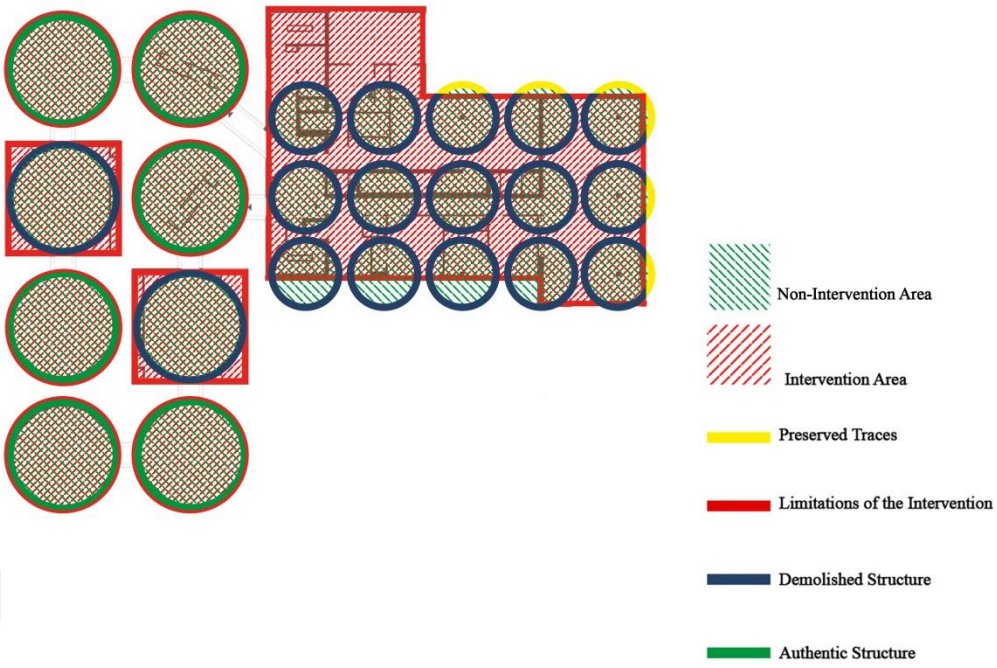


Figure 3.40: Visual showing the lines of intervention on the plan of Kanaal.
Plan retrieved from https://www.archdaily.com/885884/kanaal-in-wijnegem-stephane-beel-architects/5a3b2f6db22e384b3a00013e-kanaal-in-wijnegem-stephane-beel-architects-third-level-plan in 15.06.2019. The diagram showing the intervention was created by the author.

Table 3.8: Evaluation of the intervention in Kanaal according to theoretical concepts.
(Karamustafa, 2019)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON KANAAL	
CONSERVATION PRINCIPLES	KANAAL
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	+
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	+
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	+

6.	The new additions should be a creative and differentiating design.	+
7.	The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.	-
8.	The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	+
9.	Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	+

3.2.5 Silo d'Arenc, Carta Arch, 2011, France, 16.000 m^2

The authentic structure was built in 1927 in France to store grain in the port area (Figure 3.41) of Marseille. (Figure 3.42) The structure, which was used until the end of 1980s, lost its function. In 2004, it was named as a heritage of the twentieth century by the CoE (Council of Europe), and aimed to conserve the authentic structure. The designer of the building, Carta has pointed out to the necessity of transforming the structure, rather than demolishing it, and has transformed it into a mixed-use contemporary space, that includes an office, a performance hall etc. in 2011. (Figure 3.43) A show centre was created for 2000 people by completely carving and breaking the internal silos of the structure consisting of a 57-piece reinforced concrete silo. (Carta, 2019) (Figure 3.44) In the intervention, spatial arrangements for the new function were made, the exterior form, which was important for the city, was conserved; but window openings were created in each façade of the building. The structure is originally positioned on top of long columns, allowing vehicles to be loaded with grain and transported underneath. Therefore, in the new function, stairs and bridges, which are differentiated from the structure with red colour and metal materials, are made to the high entrances. (Figure 3.43)

Figure 3.41: Location of Silo d'Arenc between the port and railroad.
Map retrieved from https://www.google.com/maps?client=safari&rls=en&oe=UTF-8&q=silo+d%27arenc&um=1&ie=UTF-8&sa=X&ved=2ahUKEwifqo-g6rDmAhXSTxUIHYwgC2YQ_AUoBHoECAwQBg in 15.06.2019. Coloring was done by the author.

Figure 3.42: Authentic silo structure.
Retrieved from http://www.culture.gouv.fr/Regions/Drac-Provence-Alpes-Cote-d-Azur/Politique-et-actions-culturelles/Architecture-contemporaine-remarquable/Le-label/Les-edifices-labellises/Label-Architecture-contemporaine-remarquable-Bouches-du-Rhone/Marseille/Marseille-2e-Silo-d-Arenc in 15.06.2019.

Figure 3.43: Contemporary structure with new function.
Retrieved from https://www.ascender.es/galleries/le-silo/le-silo-marseille-1-2/ in 15.06.2019.

The materials and technology, used in the interventions on the interior façade of the authentic structure with the addition of numerous window openings and red staircases attached to the exterior façade, reflects its era. It is a design that responds to the dynamics of the urban life and develops its environment in cultural activity. As the silos were carved into the concert hall, the circular space could not be protected (Figure 3.44), however, the discharge funnels under the silos were conserved and an art gallery was created in this area. (Figure 3.45) Therefore, it retains its current values partially. In addition, industrial equipment from previous function could not be seen around the building. Taking into account all the criteria, the intervention is an unimaginative design that is incompatible with the history and form of the existent structure.

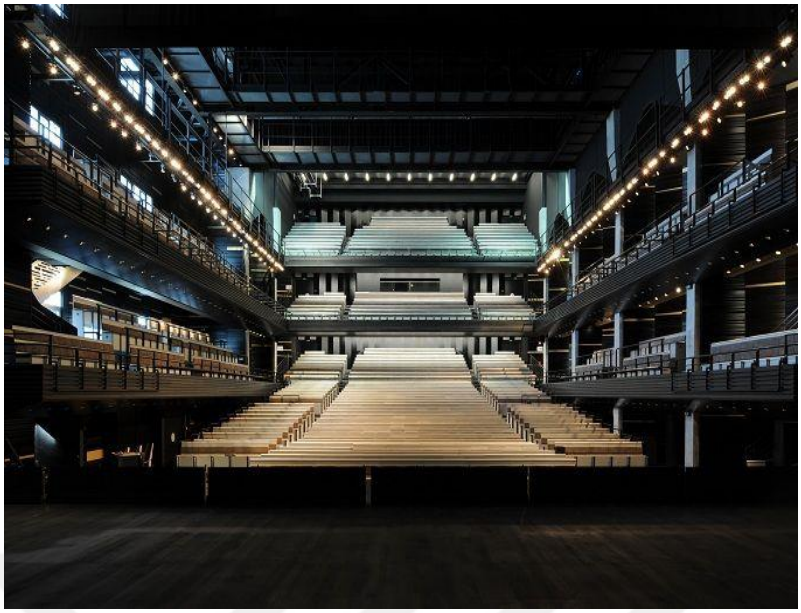


Figure 3.44: Interior of the new building, which was completely emptied by the intervention.
Retrieved from https://www.treehugger.com/urban-design/abandoned-grain-silo-france-now-theater.html in 15.06.2019.

Figure 3.45: Art gallery where the funnels under the silos, which were completely emptied by the intervention, were created by preserving them.
Retrieved from http://www.philippeconti.com/nav.php?root=data&proj_nb=1&photo_nb=0 in 27.11.2019.

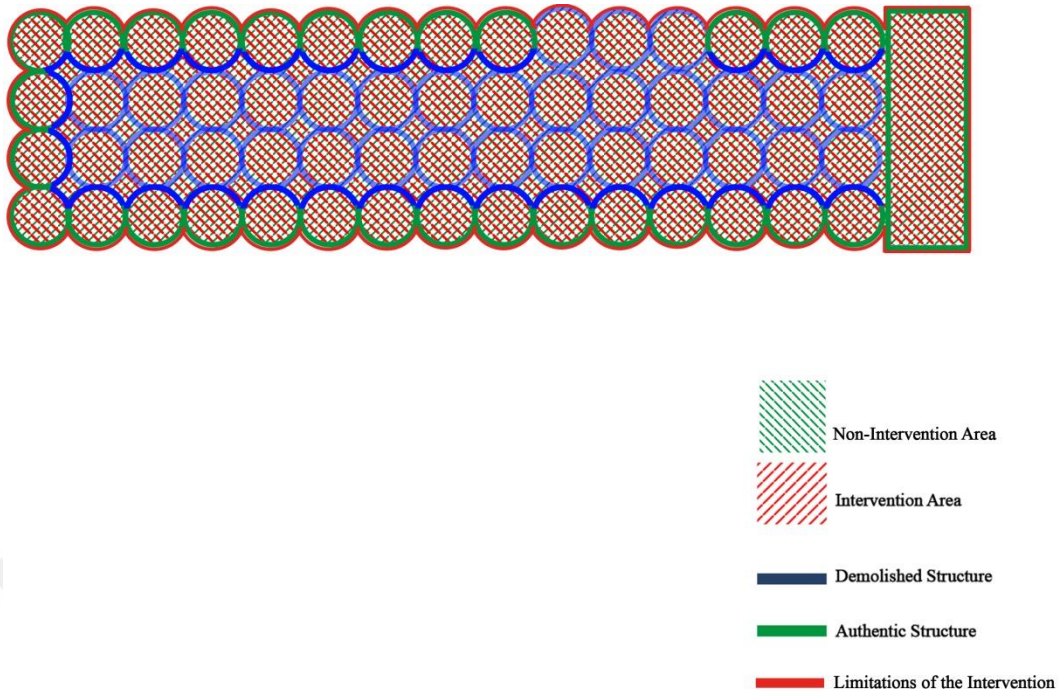


Figure 3.46: Visual showing the lines of intervention on the plan of Silo d'Arenc.
Plan retrieved from http://www.castaldi-architecte.com/projet/le-silo-d-arenc/21/Plans in 15.06.2019. The diagram showing the intervention was created by the author.

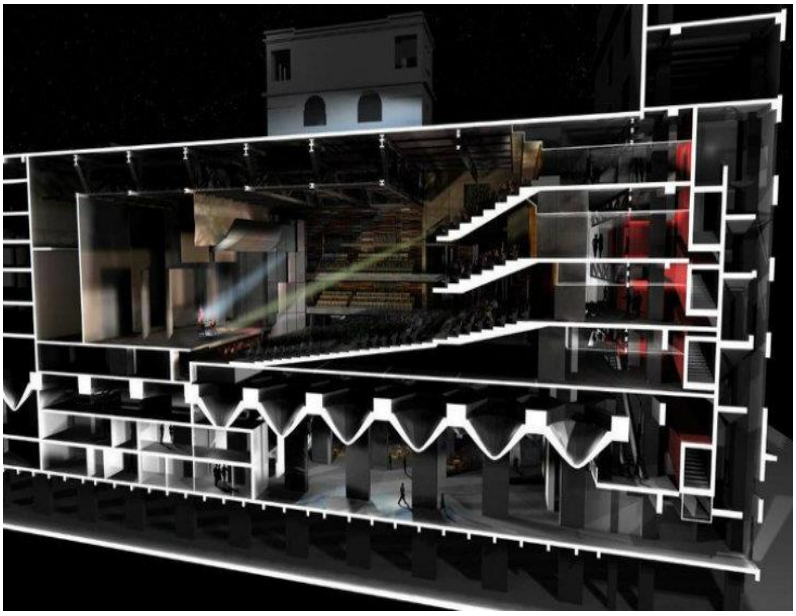


Figure 3.47: Perspective section of Silo d'Arenc.
Retrieved from https://inhabitat.com/abandoned-grain-silo-converted-into-arenc-silo-opera-house-in-marseille/silo-opera-house-ct-architectures-11b in 13.11.2019.

Table 3.9: Evaluation of the intervention in Silo d'Arenc according to theoretical concepts.

(Karamustafa, 2019)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON SILO D'ARENC	
CONSERVATION PRINCIPLES	SILO D'ARENC
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	-
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	+
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	-
6. The new additions should be a creative and differentiating design.	-
7. The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.	-
8. The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	-
9. Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	-

3.2.6 La Fabrica, Ricardo Bofill, 1973, Spain, 5.000 m^2

The authentic structure was built in Catalonia region in Spain (Figure 3.48) for producing and storing cement in the early stages of industrialization. (Figure 3.49) In 1973, Ricardo Bofill converted the eight conserved silos into a contemporary place that consists of an office, residential area, library, archives, a studio and a cathedral. (Bofill, 2019)

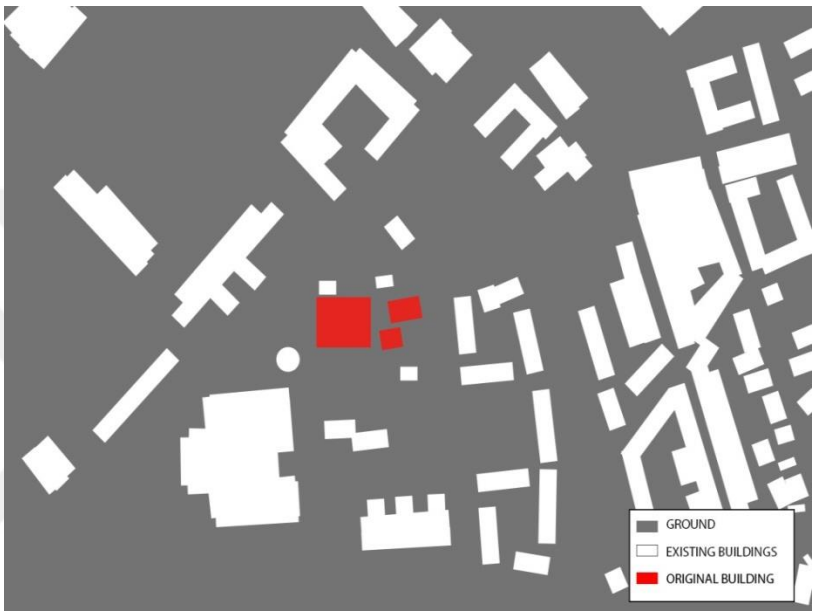


Figure 3.48: Location of the structure in the city center.
Map retrieved from
https://www.google.com/maps/place/Sant+Just+Desvern,+Barselona,+İspanya/@41.3811195,2.0680418,160m/data=!3m1!1e3!4m5!3m4!1s0x12a49986943b723f:0x427a970d9bacc708!8m2!3d41.383333!4d2.0666616 in 07.08.2019. Coloring was done by the author.

Figure 3.49: Authentic silo structure.
Retrieved from https://www.gzt.com/aktuel-kultur/eski-cimento-fabrikasini-muhmetesem-bir-eve-donusturdu-2621155 in 07.08.2019.

In the authentic structure, there are dysfunctional forms such as stairs without connection points, huge concrete spaces, and large machine rooms. Therefore, explosives and hand tools were used to make the structure functional in some parts of the building. As a result of these processes, deaf spaces were made available which could not be used before the intervention. (Sánchez, 2019) A green plant layer dangling from the walls and roof was added to the exterior of the concrete silos and masses that form the contemporary structure. (Figure 2.50) By this, the brutalist façade of the gigantic cement factory has come to life. The spatial arrangements required by the new function have been made within the contemporary structure and silos. The studio, which forms the majority of the structure, is spread over four floors. Access between the floors is provided by stairs located on the inner wall of the silos. The walls of the studio are painted white, and the doors, windows and decorative elements are chosen to differentiate from the industrial architecture of the authentic structure. The brutalist effect was conserved both on the interior and the exterior. (Figure 3.51)

The structural integrity of the entire structure is maintained by minimum intervention. Moreover, there is almost no difference between the contemporary structure and the authentic one. Therefore, while conserving the existing values, tangible and intangible values are also protected. Window and door cavities were

opened to the reinforced concrete silo structures, and they were covered with contemporary materials. For these reasons, it is a creative and differentiating design that reflects its own era, which distinguishes between the old and new, and which is compatible with its history. In addition to including its current characteristics, the circular space and composition created by different size of silos are preserved. (Figure 3.52) Nevertheless, the unique elements and the industrial environment around the contemporary building have been preserved as a whole.

Figure 3.50: The new form of the structure with minimum intervention to the exterior and the green texture. Retrieved from https://www.gzt.com/aktuel-kultur/eski-cimento-fabrikasini-muhmetesem-bir-eve-donusturdu-2621155 in 07.08.2019.

Figure 3.51: Entrance to the silos from the studio and discharge funnel of small silos. Retrieved from https://www.ricardobofill.com/la-fabrica/read/ in 07.08.2019.

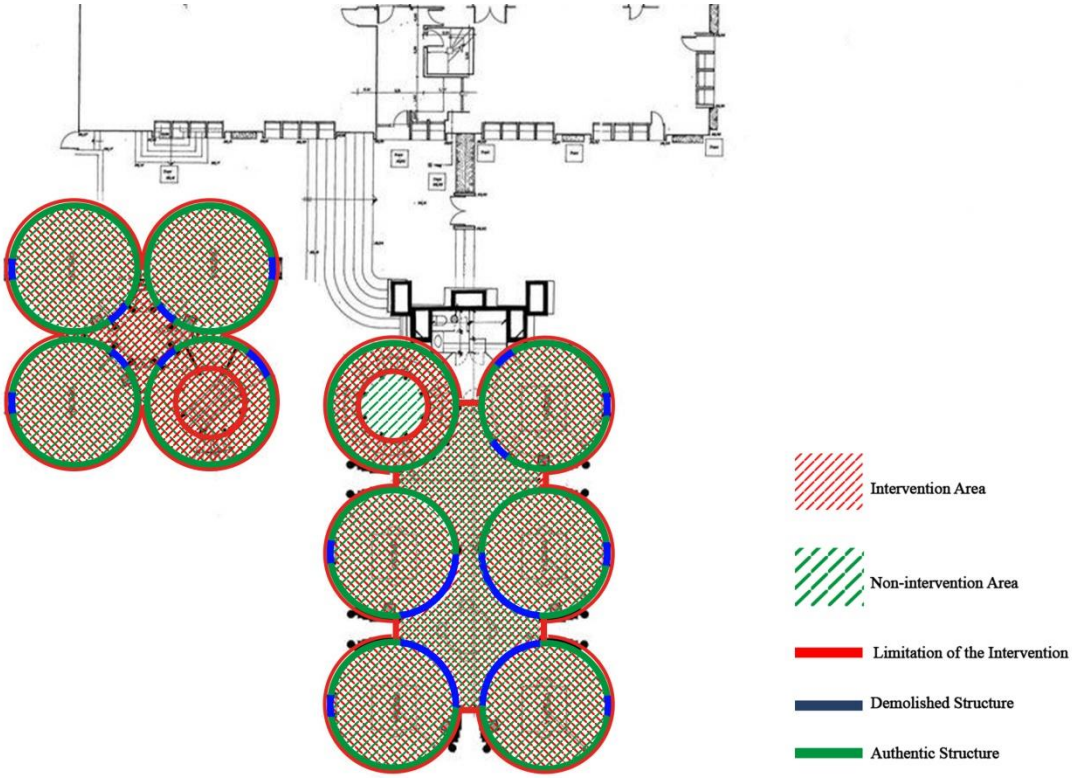


Figure 3.52: Visual showing the lines of intervention on the plan of La Fabrica.
Plan retrieved from https://www.ricardobofill.com/la-fabrica/read/ in 07.08.2019. The diagram showing the intervention was created by the author.

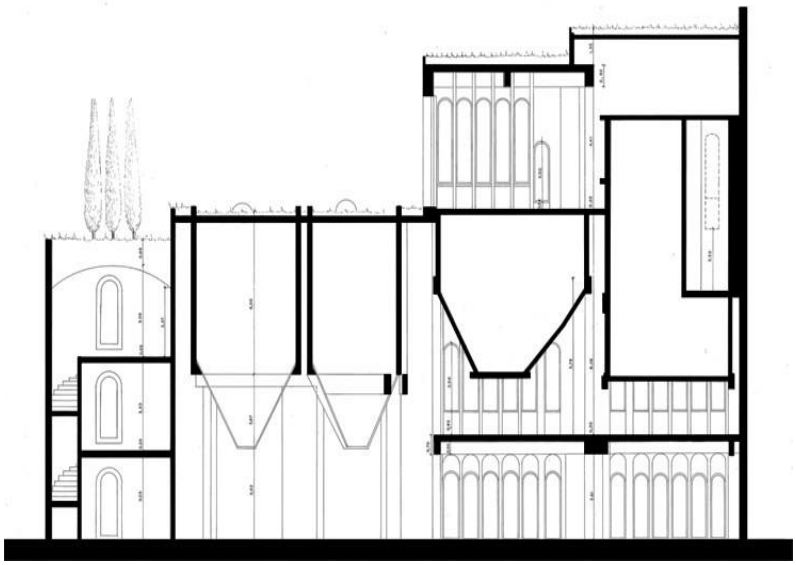


Figure 3.53: Section of La Fabrica.
Retrieved from https://artevitae.it/la-fabrica-ricardo-bofill-arteviate/#jp-carousel-20602 in 07.08.2019.

Table 3.10: Evaluation of the intervention in La Fabrica according to theoretical concepts. (Karamustafa, 2019)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON LA FABRICA	
CONSERVATION PRINCIPLES	LA FABRICA
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	+
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	-
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	+
6. The new additions should be a creative and differentiating design.	+
7. The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.	+
8. The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	+
9. Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	+

3.2.7 Ibis Hotel, Çakan Arch, 2007, Turkey, 10.000 m^2

The structure was built by the French Froment-Clavier company in 1934 to store grain for Turkish Grain Board near the railway station in the city center of Eskişehir. (Figure 3.54) (Figure 3.55) The building reopened as a hotel in 2007 and was registered by the cultural heritage protection board in 2012[2]. There are 12 concrete silos in the structure, which is considered one of the first reinforced concrete structures in Turkey[3]. There is also an administrative building at the height of the structure next to the silos. (Figure 3.56)

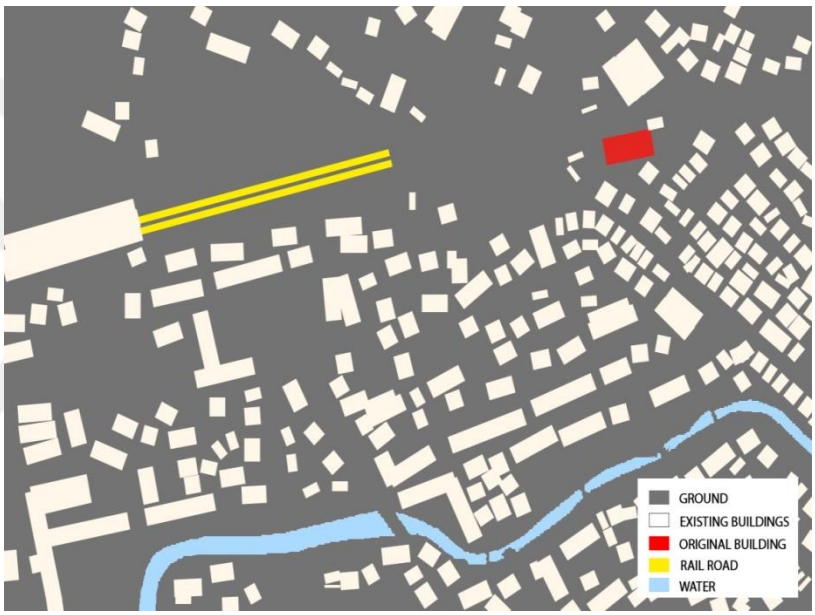


Figure 3.54: Location of the structure near to the railroad in the city center.
Map retrieved from
https://www.google.com/maps/place/ibis+Eskisehir/@39.7806052,30.5124287,18.77z/data=!4m8!3m7!1s0x14cc15e2579942ff:0xcba856ffe02373af!5m2!4m1!1i2!8m2!3d39.780535!4d30.512898 in 10.10.2019. Coloring was done by the author.

[2] The information was obtained from the oral interview with Eskisehir Cultural Heritage Protection Board and from the work of Örmecioğlu (2006).
[3] Other concrete silos built in Turkey between 1933-1937 are: Ankara central silo, Konya central silo, Derince silo, Ankara Polatlı silo, Afyon central silo, Yerköy silo, Çiftlik silo, Sivas silos. (Örmecioğlu, 2006, 49)

Figure 3.55: Picture showing the first years of the structure, obtained from the archive of TMO. Turkish Grain Board 1938-1959, 1959, Ankara: It was extracted from the work published by Turkish Grain Board. Copyright Owner is Turkish Grain Board.

The spatial arrangements, required by the new function, were made in the intervention process due to the silos' structural gap. The window gaps were opened to correspond to the accommodation conditions of the reinforced concrete structure of the building. In the building, which has transformed to be re-used as a hotel, a restaurant, a lobby, meeting rooms and 108 bedrooms were formed. (Figure 3.58) The materials used in the hotel building, created by the intervention applied to the original building, were used in accordance with its own period and are oriented towards the needs of the developing city. However, no characteristic of the authentic silos has been conserved except the cylindrical exterior formation. That being said, this new building, created by intervention, is a non-creative design that does neither contribute to the enrichment of the environment, nor incompatible with the current context. The silo, which is close to the railway, remained in the developing city over time and lost its relationship with its surroundings. However, due to the spatial needs required by the new function inside the silos, the interior equipment has been completely removed.

Figure 3.56: Authentic structure before the intervention.
Retrieved from https://i.pinimg.com/originals/ff/6f/06/ff6f0660040120bc20f07e3fe9c4f78d.jpg in 10.10.2019.

Figure 3.57: Heat insulation installation to the exterior façade during the intervention phase.
Retrieved from http://www.fekamuhendislik.com.tr/portfolio-item/ibis-hotel-eskisehir-3/ in 10.10.2019.

Figure 3.58: Contemporary structure with it's new function.
Retrieved from http://ibisturkiye.blogspot.com/2007/08/ibis-eskiehir.html in 07.11.2019.

Figure 3.59: Lobby of the hotel that created after the intervention.
Retrieved from http://ibisturkiye.blogspot.com/2007/08/ibis-eskiehir.html in 07.11.2019.

Table 3.11: Evaluation of the intervention in Ibis Hotel according to theoretical concepts. (Karamustafa, 2019)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON IBIS HOTEL	
CONSERVATION PRINCIPLES	IBIS HOTEL
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	-
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	-
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	-
6. The new additions should be a creative and differentiating design.	-
7. The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.	-
8. The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	-
9. Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	-

3.2.8 Minsheng Dock Silo, Atelier Deshaus, 2017, China, 18.600m^2

The authentic building group is located in the Pudong district of Shanghai, close to the harbour. (Figure 3.60) The silos, which were built in the 1970s to store grain, were shut down in the 1990s. (Figure 3.61) Atelier Deshaus has created a cultural activity center consisting of exhibition halls, walking tracks and rings to be used in Shanghai Urban Space Art Season (SUSAS) 2017. (Deshaus, 2019) (Figure 3.62)

Figure 3.60: Location of the building group in the port area in city center.
Map retrieved from
https://www.google.com/maps/place/Pudong,+Şanghay,+Çin/@31.2475722,121.5373635,16.68z/data=!4m5!3m4!1s0x35ad8c73cd3952c7:0xbb190e9364c4e592!8m2!3d31.221517!4d121.544379 in 10.12.2019. Coloring was done by the author.

In the intervention implemented with the understanding of protecting the tangible and intangible values of the environment in which the building group is located, minimal addition was made to the exterior façade of the silo structures. The circulation axis connecting the ground floor and the roof floor of the building is added to the outer shell without damaging the cylindrical components of the building. (Figure 3.63) By doing that, both the integrity of the building is conserved, and the panoramic city view is intended to be provided for the visitors. (Deshaus, 2019)

Arrangements were made within the structure corresponding to the need of the new function. The ground and top floor of the building are used as exhibition halls. The funnels and machine parts of the silos were conserved in the exhibition hall on the ground floor. By this, newly functioned structure is harmonized with the outdated. Silos were mostly untreated and intended to be conserved as they were. It is also possible to reach the roof of the building by means of a spiral ramp formed on the inner façade of a silo other than the access element in the outer shell. (Figure 3.64)

The building, in which the additions reflect the time, is compatible with the outdated and the new, and the annex respects its cultural and historical values. Moreover, by conserving the other structures in the vicinity of the building, the crane and hardware remaining from the old function, the relationship between the building and its environment and the value of it remain conserved. With minimal intervention, the monolithic structure and the circular space of the silos are preserved, and its appearance in the urban memory continues with its new function.

Figure 3.61: Authentic building group.
Retrieved from https://www.shine.cn/news/metro/1710014516/ in 10.12.2019.

Figure 3.62: The whole contemporary facility and the crane that preserved. Retrieved from https://www.archdaily.com/901937/atelier-deshaus-transforms-shanghais-riverfront-in-3-cultural-projects/5b98def6f197ccd7fe000135-atelier-deshaus-transforms-shanghais-riverfront-in-3-cultural-projects-photo in 10.12.2019.

Figure 3.63: Circulation axis created by intervention to the outer shell of the contemporary structure. https://www.behance.net/gallery/59550679/Minsheng-Dock-Silo-renovation-Atelier-Deshaus in 10.12.2019.

Figure 3.64: Spiral ramp built into one of the silos.

Retrieved from http://www.deshaus.com/En/Script/detail/catid/8/id/19.html in 10.12.2019.

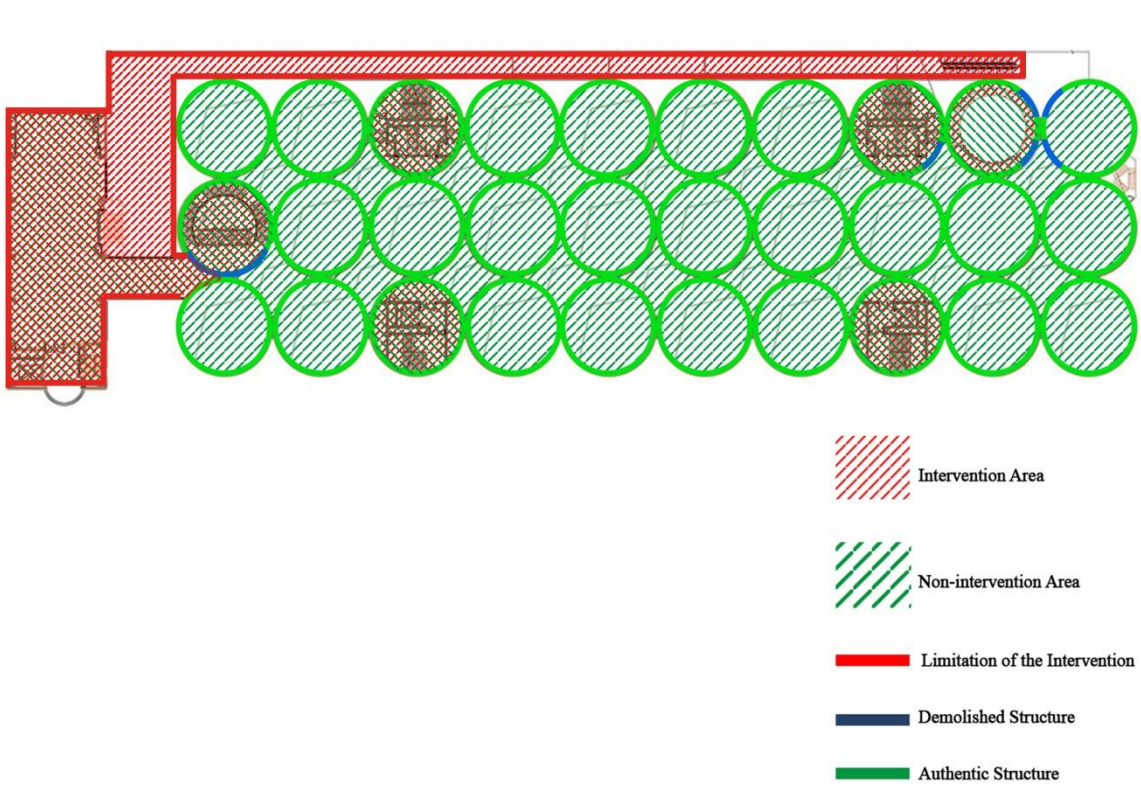


Figure 3.65: Visual showing the lines of intervention on the plan of Minsheng Silos.

Plan retrieved from https://i.pinimg.com/originals/b0/5b/da/b05bda582118d6c9db14ef84ca7fa924.jpg in 10.12.2019. The diagram showing the intervention was created by the author.

Table 3.12: Evaluation of the intervention in Minsheng Silos according to theoretical concepts. (Karamustafa, 2019)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON IBIS HOTEL	
CONSERVATION PRINCIPLES	MINSHENG
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	+
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	+
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	+
6. The new additions should be a creative and differentiating design.	+
7. The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.	+
8. The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	+
9. Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	+

As a result, in the data obtained from the research, it was seen that the re-functionalized reinforced concrete silo samples were located close to the port and/or railway. There are also reinforced concrete silos built for storage purposes in rural areas where production is dense, but their current status remains unknown. Industrial zones located in urban areas are moving out of the city due to population growth and rapid urbanization. For this reason, industrial structures in dormant industrial zones need to be given new functions to meet the needs of population growth.

According to the conservation theory, the interventions made to the cultural heritage structures reflect their own period by respecting the tangible and intangible values of the existing structure, responding to the dynamics of contemporary life, contributing to the enrichment of the environment by harmonizing with the context, respecting the form, mass, rhythm, texture, material, scale, and having a creative and differentiating design are basic requirements.

In this study, in which the silo samples that have attracted attention in architectural platforms and have been re-functioned with different approaches in recent years, in addition to the general decisions determined by the international texts and theorists, in order to transform the reinforced concrete silo structures, which are a different typology within the cultural heritage, these criteria are determined;

- The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.
- The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.
- Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).

According to the evaluation, the composition created by the combination of the cylindrical masses of the original silo structures consisting of reinforced concrete cylindrical volumes and the space inside the cylinders must be preserved. When the examples are examined in this context, Gemini Residence, Zeitz MOCCA, La Fabrica and Minsheng silos, where the circular space is preserved, are qualified examples. However, preservation of circular space is a difficult criterion. Although the extreme destructive intervention applied in the Silo d'Arenc example is similar to the intervention approach applied in Zeitz MOCCA, the space could not be preserved since the cylindrical form of the silos was not preserved. In this type of vertical working side-by-side reinforced concrete silos, the destruction of each of them and giving them a substantial function, such as a culture centre, leads to the deterioration of the protection-use balance. The circular space does not exist in Silhoetten and

Kanaal, that are re-functionalized as residential areas, as the structure has been divided by flooring, unlike Gemini silos' intervention method, also re-functionalized as residence. For this reason, intervention to the reinforced concrete silo structure, which will be given the dwelling function, should be done to prevent losing the circular space. In the case of Ibis, which is given a hotel function, the whole building is divided into stories due to functional needs. In the intervention approach applied to meet the spatial requirements of the hotel function in the reinforced concrete silos, the balance of protection-use is disrupted. Therefore, the hotel function is not suitable for reinforced concrete silos. (Table 3.12)

In line with the new function given to reinforced concrete silos, the impressive huge geometries of the silos and monolithic reinforced concrete structures must be preserved and the intervention must be done without damaging these qualities. In this context, it was not possible to preserve the structural integrity of the Ibis Hotel, Silo d'Arenc and Siloetten after the intervention. On the other hand, Zeitz MOCCA, La Fabrica and Minsheng silos, where the structural integrity is preserved in line with the nature of the intervention applied, are qualified examples. In Gemini silos, the intervention was applied to the upper part of the building and the base of the structure was left empty so that the authentic texture could be seen by the visitors. For this reason, the authentic structure of Gemini silos can be partially observed. (Table 3.12)

Industrial heritage structures must be conserved with the entire relationship network, that is with all their tangible and intangible values, the traces of railroad around, machinery etc., and not as a singular structure, as TICCIH published documents suggest. Over time, the urban development caused the industrial zone to move out of the city. In this context, the relationship between the samples examined and their environment has not been conserved to a large extent. However, in the Kanaal example, other structures around the structure were partially conserved. In addition to this, the cement production plant and industrial traces to which the silos are connected are conserved in La Fabrica. In Minsheng silos, the entire network is concerved, including silos, surrounding warehouses, industrial conveyor belts and cranes. Therefore, Minsheng and La Fabrica samples are qualified examples. Nevertheless, contrarily, in Zeitz MOCCA, Kanaal and Silo d'Arenc the relationship

of the structure and its environment was not conserved, but the existent discharge funnels, the machine parts such as conveyor belts and structural components were maintained. (Table 3.12)

As seen, reinforced concrete silos, that have lost their function in urban areas, are hard to conserved via qualified intervention due to their unique architectural typology. Defining such structures with large functions such as cultural centres, showrooms or functions for the use of numbers of people such as hotels/dwellings is not suitable as this would damage the protection/use relationship. However, with the implementation of the intervention in accordance with the specified additional criteria, there will be a qualified conservation approach as in the case of Zeitz MOCCA and Minsheng silos. Additionally, as in all industrial heritage buildings, the structure/environment relationship must be maintained in reinforced concrete silo structures. It is not possible for the conservation approaches to be qualified in singular structures where solely the building is protected.

In this context, the intervention approaches applied to Zeitz MOCCA and Minsheng Silos are qualified and successful according to the data obtained through theoretical concepts, text and selected additional criteria. (Table 3.12)

ANALYTIC AND CRITICAL EVALUATION APPROACH ON SILO BUILDINGS								
CONSERVATION PRINCIPLES	Gemini	Siloetten	Zeitz	Kanaal	Arenc	La Fabrica	Ibis Hotel	Minsheng
1. Contemporary intervention should reflect the material, technology and design understanding of its era.	+	+	+	+	+	+	+	+
2. Tangible and intangible values should also be kept alive by maintaining existing values.	+	-	+	+	-	+	-	+
3. The new function should be properly functioned with the old structure and respond to developing urban dynamics.	+	+	+	+	+	+	+	+
4. The new function needs to contribute to the enrichment of the area by adapting to the context.	+	+	+	+	+	-	-	+
5. The new function must be appropriate and respectful to the form, proportion, mass, scale, rhythm, character, texture and material of the historical building.	+	-	+	+	-	+	-	+
6. The new additions should be a creative and differentiating design.	+	+	+	+	-	+	-	+
7. The composition formed by the combination of different sizes of reinforced concrete cylinders and the circular space inside the cylinders must be preserved.	+	-	+	-	-	+	-	+
8. The impressive huge geometries and monolithic reinforced concrete structures of the silos must be preserved and the intervention must be done without damaging these qualities.	+	+	+	+	-	+	-	+
9. Silos need to be protected as a whole with all hardware, context and environmental relations (railway, port, industrial area, etc.).	-	-	+	+	-	+	-	+

Table 3.13: Evaluation of the intervention in all silo examples according to theoretical concepts. (Karamustafa, 2019)

CHAPTER 4

CONCLUSION

Nowadays, cultural heritage structures play an active role in daily life, is one of the requirements of modern life. For this reason, qualified modern interventions that will preserve and transfer these structures to the future should be designed to meet the needs of the developing society. Otherwise, these structures are doomed to be abandoned. However, harmony between the old structure and the new structure created by the intervention requires an intellectual effort, and the complexity of the relationships with historical / contextual data prevents the formation of successful interventions. The old-new unity created by contemporary intervention must meet the needs of the developing society on the one hand, and on the other hand, it must gain new values by preserving the documentary value and authenticity of the old structure. Interventions made with modern and qualified approaches enrich the existing context by adding a new layer, and improve it with their environment while reviving the structures that were abandoned / not used effectively.

Today, there is a large stock of historical buildings waiting to be intervened with contemporary approaches, these structures vary with their architectural typology, context, construction system and materials, and the intervention approach they need is different. In this thesis, which focuses on the functional transformation of reinforced concrete silo structures that is within the scope of industrial heritage and modern heritage, intervention approaches designed to use this building type while preserving original values and to add new values were investigated. However, new decisions that have to be taken into account in the functional transformation of silo structures have been defined.

According to the conservation theory, functionally obsolete cultural heritage structures are intended to serve a use that coincides with their original function. However, it is not possible to function silos made for storing various materials by fulfilling this condition. Preserving the structures consisting of thick reinforced concrete walls, mostly in cylindrical form, and transforming them into contemporary living spaces creates a complex design problem. On the other hand, the unique

qualities of these gigantic monolithic structures, which are a kind of machinery, and their place in urban identity, are not adequately understood by the central and local administrations, the public and the designers.

As contextual features differ in silo structures as in all cultural heritage structures, it is impossible to handle all silo structures with the same approach. The historical, physical, environmental and functional features of these structures should be examined and evaluated in their own context, and the type and amount of intervention should be determined according to these evaluations. Achieving comprehensive information about the current structure by understanding all tangible and intangible values, enables determination of compatible and respectful qualified approaches to the structure.

Reproducing the structures in accordance with their original form, making new structures by ignoring all their properties and values constitute the points in these approaches. Such approaches should not be selected as they could cause mismatch between old and new while deteriorating the existent values. The other point in the approaches is to use the reinforced concrete structure without any intervention. In this case, the structure consisting of reinforced concrete monolithic cylinders made for storage purposes becomes difficult to meet the functional requirements of modern life. It is not possible to set precise rules for this process, which has many inputs, and different methods can be followed. The balance of using/protection varies between the two endpoints. In the event that new annexes and intervention are dominant, the authenticity of the existing structure is lost. However, the influence of the historical structure is weakened in the interventions that are too ordinary. For this reason, functional, spatial, physical and visual associations should be provided between new and old sections by developing contextual data as the input of the new design, in accordance with decisions, respectful to the current context, and developing creative approaches.

REFERENCES

"Memleketimizde Silo İnşaatı", Arkitekt Dergisi, 1937, sayı 4, sf. 127-128

"Haydarpaşa Silosu İnşaatı", Arkitekt, 1954, no 1954-07-08

Ahunbay, Z. (2011). Tarihi Çevre Koruma ve Restorasyon, YEM Press, 6. Edition

Beedle, P. L. (2001). Giving Old Barns New Life. Silos: An Agricultural Success Story. Web: http://learningstore.uwex.edu/Assets/pdfs/G3660-04.pdf (retrieved on 17.07.19)

Bilsel, C., (2009), İzmir'de Cumhuriyet Dönemi Planlaması (1923-1965): 20. Yüzyıl Kentsel Mirası, Ege Mimarlık, No:71, 4, 12

Birol, G. (1996). 19. Yüzyıl Endüstri Devrimi Sonrası Mimari Akımlar, Balıkesir Üniversitesi, Masters Thesis

Bofill, R. 2019, La Fábrica. (n.d.). Retrieved August 18, 2019, from https://www.ricardobofill.com/la-fabrica/read/

Bollock, F. A. (2013) Old Buildings New Forms New Directions In Architectural Transformations, USA, The Monacelli Press

Brooker, G. Stone, S. (2004) Rereadings, Londra, RIBA Enterprises Ltd.

Buchanan, A. (2014) The Origins And Early Days Of The AIA, Industrial Archeology News, 169. Retrieved March 8, 2019, from: https://industrial-archaeology.org/wp-content/uploads/2015/10/origins.pdf

Carta, 2019, Visite du CEPAC SILO. (2019, January 29). Retrieved June 15, 2019, from https://www.conciergeriedusilo.com/visite-du-cepac-silo

Castro, F. (2017, September 18). Zeitz Museum of Contemporary Art Africa / Heatherwick Studio. Retrieved June 14, 2019, from

https://www.archdaily.com/879763/zeitz-museum-of-contemporary-art-africa-heatherwick-studio

Cengizkan, M. (2002) Endüstri Arkeolojisinde Mimarlığın Yeri: Sanayinin Terkettiği Alanlarda Yeniden Mimari, Mimarlık, No 308, 40

Cilento, K. (2009, June 9). The New York High Line officially open. Retrieved November 27, 2019, from http://www.archdaily.com/24362/the-new-york-high-line-officially-open

Clark, J. (2013) Adaptative Reuse of Industrial Heritage: Opportunities & Challenges, Melbourne, Heritage Council of Victoria. Retrieved April 18, 2019, from: http://heritagecouncil.vic.gov.au/wp-content/uploads/2014/08/HV_IPAWsinglepgs.pdf

CoE, (1990), *Recommendation No. R(90)20 on the Protection ad Conservation of the Industrial, Technical and Civil Engineering Heritage in Europe*, Retrieved April 15, 2019, from: https://search.coe.int/cm/Pages/result_details.aspx?ObjectID=09000016804e1d18

Çıkış, Ş., (2009), Endüstriyel Bir Miras Alanında Dönüşüm: İzmir Liman Arkası Bölgesi, Ege Mimarlık, No: 70, 3, 10

De Sola-Morales Rubió, I. (1996) "From Contrast to Analogy. Developments in the Concept of Architectural Intervention.", Ed.: Kate Nesbitt, Theorizing a New Agenda for Architecture: An Anthology of Architectural Theory 1965 – 1995, New York, Princeton Architectural Press, s.230-237.

Deshaus, 2019, (n.d.). Retrieved December 12, 2019, from http://www.deshaus.com/En/Script/detail/catid/8/id/19.html

Douglass-Jaimes, D. (2018, October 25). AD Classics: New German Parliament, Reichstag / Foster Partners. Retrieved May 14, 2019, from https://www.archdaily.com/775601/ad-classics-new-german-parliament-reichstag-foster-plus-partners

Ekizoğlu, G. (2012) Demiryolu Yerleşkelerinin Endüstriyel Miras Olarak Korunmu Sorunları: İzmir-Aydın Hattı Üzerindeki Demiryolu Yerleşkeleri, Dokuz Eylül Üniversitesi, Masters Thesis

Elevator, 2019, projects, C. to W. (2020, January 8). grain storage building. Retrieved December 5, 2019, from https://www.wikizeroo.org/index.php?q=aHR0cHM6Ly9lbi53aWtpcGVkaWEub3JnL3dpa2kvR3JhaW5fZWxldmF0b3I

Ender, C., (1977). Venedik Tüzüğü Tarihi Bir Anıt Gibi Korunmalıdır, ODTÜ Mimarlık Faculty Press, No: 2, 3, 167

Erdoğan, H. Erdoğan, E. (2013), Reuse of Historical Train Station Buildings: Examples from the World and Turkey.

ERIH (a), ABOUT US – ERIH's HISTORY. (n.d.). Retrieved from https://www.erih.net/about-erih/erihs-history-and-goals in May 10, 2019

ERIH (b), THE MILESTONES OF EUROPEAN INDUSTRIAL HERITAGE: ANCHOR POINTS. SELECTION CRITERIA AND PROCEDURE. (n.d.). Retrieved May 10, 2019, from https://www.erih.net/about-erih/route-system/anchor-points-selection-criteria-and-procedure/

Fernández, P. (2018, September 27). Advantages of a Steel Silo vs. a Concrete Silo for grain storage. Retrieved December 20, 2019, from https://siloscordoba.com/blog/grain-storage/advantages-of-a-steel-silo-vs-a-concrete-silo-for-grain-storage/

Fielden, B. M. Jokilehto, J. (1998), Management Guidelines for World Cultural Heritage Sites, ICCROM International Committee on Archeological Heritage, Italy, Retrieved from: https://www.iccrom.org/sites/default/files/2018-02/1998_feilden_management_guidelines_eng_70071_light_0.pdf in 02.12.2019

Foster and Partners, (n.d.). Reichstag, New German Parliament: Foster Partners. Retrieved May 14, 2019, from https://www.fosterandpartners.com/projects/reichstag-new-german-parliament/

Frearson, A. (2018, March 20). Thomas Heatherwick describes his Zeitz MOCAA museum in Cape Town. Retrieved June 14, 2019, from https://www.dezeen.com/2017/09/22/thomas-heatherwick-interview-zeitz-mocaa-art-museum-cape-town/

Garfinkel, Y. Ben-Shlomo, D., Kuperman, T. (2008), Large Scale Storage of Grain Surplus in the Sixth Millennium BC: the Silos of Tel Tsaf, Antiquity, Vol:83, Issue 320, p. 309-325

Herzog J. De Meuron, P. CAIXAFORUM MADRID. (n.d.). Retrieved May 14, 2019, from https://www.herzogdemeuron.com/index/projects/complete-works/201-225/201-caixaforum-madrid.html

High Line (a), (n.d.). THE HIGH LINE. Retrieved November 27, 2019, from http://www.fieldoperations.net/project-details/project/highline.html

High Line (b), James Corner / Field Operations, DILLER SCOFIDIO RENFRO, Iwan Baan · HIGH LINE, SECTION TWO. (n.d.). Retrieved November 27, 2019, from http://divisare.com/projects/170323-james-corner-field-operations-diller-scofidio-renfro-iwan-baan-high-line-section-two

ICOMOS, (1932), *Carta Del Restauro,* Retrieved April 2, 2019, from: http://www.icomos.org.tr/Dosyalar/ICOMOSTR_tr0660878001536681682.pdf

ICOMOS, (1964), *International Charter for the Conservation and Restoration of Monuments and Sites (The Venice Charter),* Retrieved April 2, 2019, from: https://www.icomos.org/charters/venice_e.pdf

ICOMOS, (1972), *Resolutions of the Symposium an the Introduction of Contemporary Architecture into Ancient Groups of Buildings* Retrieved April 2, 2019, from: https://www.icomos.org/en/charters-and-texts/180-articles-en-

francais/chartes-et-normes/383-resolutions-of-the-symposium-on-the-introduction-of-contemporary-architecture-into-ancient-groups-of-buildings-at-the-3rd-icomos-general-assembly

ICOMOS, (1975), *European Charter of Architectural Heritage,* Retrieved April 3, 2019, from: https://www.icomos.org/en/charters-and-texts/179-articles-en-francais/ressources/chartersand-standards/170-european-charter-of-the-architectural-heritage

ICOMOS, (1979-2013), *Charter for Places of Cultural Significance (The Burra Charter),* Retrieved April 3, 2019, from: https://australia.icomos.org/publications/charters/

ICOMOS, (1987), *Charter for the Conservation of Historic Towns and Urban Areas (Washington Charter),* Retrieved April 4, 2019, from: https://www.icomos.org/images/DOCUMENTS/Charters/towns_e.pdf

ICOMOS, (1994), *The Nara Document on Authenticity,* Retrieved June 10, 2019, from: https://www.icomos.org/charters/nara-e.pdf

ICOMOS, (2003), *Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage,* Retrieved April 5, 2019, from: https://www.icomos.org/images/DOCUMENTS/Charters/structures_e.pdf

ICOMOS, (2005), *Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas,* Retrieved June 10, 2019, from: https://www.icomos.org/images/DOCUMENTS/Charters/xian-declaration.pdf

ICOMOS, (2008), *Charter for the Interpretation and Presentation of Cultural Heritage Sites,* Retrieved April 3, 2019, from: http://icip.icomos.org/downloads/ICOMOS_Interpretation_Charter_ENG_04_10_08.pdf

ICOMOS, (2008), *Quebec Declaration on the Preservation of the Spirit of Place,* Retrieved April 7, 2019, from:

https://www.icomos.org/images/DOCUMENTS/Charters/GA16_Quebec_Declaration_Final_EN.pdf

ICOMOS-TICCIH, (2011), *Principles for the Conservation of Industrial Heritage Sites, Structures, Areas and Landscapes (Dublin Principles)*, Retrieved April 16, 2019, from: https://ticcih.org/about/about-ticcih/dublin-principles/

Jokilehto, J. (1998) Organizations, Charters and World Movements-An Overview Ed.: J Warren, J Worthington, S Taylor, Context: New Buildings in Historic Settings, Oxford, UK: Architectural Press, s. 40-50.

Jones, R. (2013, September 17). AD Classics: The Tate Modern / Herzog & de Meuron. Retrieved November 27, 2019, from https://www.archdaily.com/429700/ad-classics-the-tate-modern-herzog-and-de-meuron

Kariptaş Seçer, F. Altuncu, D. (2009) Re-Evaluation of Industrial Buildings Within the Scope of Industrial Archeology Under Present Day Conditions, LIVENARCH IV, (RE/DE) Construction in Architecture, Karadeniz Teknik University, Trabzon

Kırlar, İ. (2017) Between Art And Architecture Redefining Adaptive Reuse In The Works Of Gordon Matta-Clark, Yaşar University, Masters Thesis

Kowsky, F. R. (2006), Monuments of a Vanished Prosperity: Buffalo's Grain Elevators and the Rise and Fall of the Great Transnational System of Grain Transportation, Reconsidering Concrete Atlantis: Buffalo Grain Elevators, (edt. by Lynda H. Schneekloth) p.20-44

Köksal, G. (2012). Endüstri Mirasını Koruma ve Yeniden Kullanım Yaklaşımı, Güney Mimarlık, No: 8, 18-23

Kuban, D. (2000) Tarihi Çevre Korumanın Mimarlık Boyutu Kuram ve Uygulama, YEM Press

Le Corbusier, (1986), Towards a New Architecture, Dover Publications INC.

Madran, E. ve Kılınç, A. (2008). Endüstri Mirasının Korunması ve Değerlendirilmesi Atölye Sonuçları. Korumada Yeni Tanımlar Yeni Kavramlar "Endüstri Mirası", TMMOB.

Madran, E., (1977). Kültürel Varlıkların Korunması ve Onarılması, Vakıflar Dergisi, No:11

Meinhold, B. (2013, March 19). MVRDV Converts Twin Silos into Gemini Residences on Copenhagen's Waterfront. Retrieved June 13, 2019, from https://inhabitat.com/mvrdv-converts-twin-silos-into-the-gemini-residences-located-on-copenhagens-waterfront/

Mejía Moreno, C. (2014). The "Corporeality" of the Image in Walter Gropius' Monumentale Kunst und IndustriebauLecture. Intermédialités / Intermediality, (24-25). https://doi.org/10.7202/1034165ar

Museum Orsay, The museography. (2007, July 31). Retrieved November 27, 2019, from http://www.musee-orsay.fr/en/collections/history-of-the-museum/the-museography.html

MVRDV (a), 2019, (n.d.). Gemini Residence: MVRDV. Retrieved June 13, 2019, from https://www.archilovers.com/projects/48245/gemini-residence.html

MVRDV (b), (n.d.). Retrieved June 13, 2019, from https://miesarch.com/work/1487

MVRDV (c), (n.d.). Retrieved June 13, 2019, from http://webcache.googleusercontent.com/search?q=cache:ijyqwUHYepgJ:https://en.wikipedia.org/wiki/Gemini_Residence&client=safari&hl=tr&gl=tr&strip=1&vwsrc=0

Nevell, M., (2006). A Major Change in Human Evolution, British Archeology, January-February, 31-33. Retrieved May 2, 2019, from: https://www.researchgate.net/publication/274714907_A_Major_Change_in_Human_Evolution

Örmecioğlu, H.T. (2006). Erken Cumhuriyet Döneminde Tarımsal Endüstrinin Betonarme Anıtları: Silolar, TMMOB Mimarlar Odası Dosya Dergisi, October, No 45, sf. 48-52, Retrieved April 28, 2019, from: http://www.mimarlarodasiankara.org/dosya/dosya3.pdf

Pöğün, Y. Akyurtlaklı, S. Çaylan, D. (1999). Olanaklar, Ege Mimarlık, 3, Retrieved January 27, 2020, from: http://egemimarlik.org/31/13.pdf

Sánchez, D. (2012, November 15). The Factory / Ricardo Bofill. Retrieved August 18, 2019, from https://www.archdaily.com/294077/the-factory-ricardo-bofill

Saner, M. (2012). Endüstri Mirası: Kavramlar, Kurumlar ve Türkiye'deki Yaklaşımlar, Planlama, No 1-2

Scarpa (a), (n.d.). Retrieved May 12, 2019, from https://museodicastelvecchio.comune.verona.it/nqcontent.cfm?a_id=44455&tt=museo

Schneider, A. K. (1998). Creating the Musée Dorsay: The Politics of Culture in France. University Park, PA: Pennsylvania State Univ. Press.

Sebastian, J. (2010, June 17). Siloetten / Christian Carlsen Arkitektfirma C.F. Møller. Retrieved June 13, 2019, from https://www.archdaily.com/64519/siloettenthe-silohouette-c-f-m%c3%b8ller-architects-in-collaboration-with-christian-carlsen-arkitektfirma

Sharr, A. (2017) Mimarlar İçin Düşünürler, İstanbul, Yapı Endüstri Merkezi Press, 2. Edt.

Siloville, 2019, Siloville Climbing Gym. (n.d.). Retrieved December 9, 2019, from http://www.siloville.com/

Taddonio, S. Aydeniz, N. E. Üstünes, Y. (2016) İzmir Alsancak Bölgesinde Toprak Mashulleri Ofisi Silo Yapısı İçin Bir İşlevsel Dönüşüm Önerisi, İçmimar, No:47, 76-81

Tanyeli, G. (2000). Endüstri arkeolojisi yapılarının korunması ve yeniden işlevlendirilmesi. Domus m, 8, 50-51.

Tapia, D. (2017, December 22). 'Kanaal' in Wijnegem / Stéphane Beel Architects. Retrieved June 15, 2019, from https://www.archdaily.com/885884/kanaal-in-wijnegem-stephane-beel-architects

Tapia, D. (2018, January 28). The Tervahovi Silos / PAVE Architects. Retrieved May 24, 2019, from https://www.archdaily.com/887591/the-tervahovi-silos-pave-architects

Tate (a), projects, C. to W. (2020, January 25). Former Power Station in the Borough of Southwark, London; Tate Modern building. Retrieved November 27, 2019, from https://www.wikizeroo.org/index.php?q=aHR0cHM6Ly9lbi53aWtpcGVkaWEub3JnL3dpa2kvQmFua3NpZGVfUG93ZXJfU3RhdGlvbg

TICCIH, (2005), *The Nizhny Tagil Charter for the Industrial Heritage,* Retrieved April 15, 2019, from: https://ticcih.org/about/charter/

TICCIH, (2012), *Taipei Declaration for Asian Industrial Heritage,* Retrieved April 15, 2019, from: https://ticcih.org/about/charter/taipei-declaration-for-asian-industrial-heritage/

Toner, K. S., (2000). Grain Silos: With Special Reference to Meadowside, Glasgow School of Aer, Mackintosh School of Architecture, 6 Retrieved April 28, 2019, from: https://www.academia.edu/2297477/Grain_Silos_With_Special_Reference_to_Meadowside_Granary

UNESCO, (1976), *Recommendation Concerning the Safeguarding and Contemporary Role of Historic Areas,* Retrieved April 3, 2019, from: http://portal.unesco.org/en/ev.php-URL_ID=13133&URL_DO=DO_TOPIC&URL_SECTION=201.html

UNESCO, (2005), *Vienna Memorandum on World Heritage and Contemporary Architecture Managing the Historic Urban Landscape and Decision 29 COM 5D,* Retrieved April 3, 2019, from: https://whc.unesco.org/en/documents/5965

Vervoordt, A. 2017, Inside Kanaal: Axel Vervoordt's new 'city' outside Antwerp. (2017, November 30). Retrieved June 15, 2019, from https://thespaces.com/axel-vervoodts-kanaal-gallery-launches-in-antwerp/

WHO (a), (n.d.). Retrieved October 21, 2019, from https://whc.unesco.org/archive/websites/valencia/us/conference/institutions/pgs.instit/docomomo.htm

Worthington, J. (1998) Introduction: Managing and Moderating Change. Ed.: J Warren, J Worthington, S Taylor, Context: New Buildings in Historic Settings, Oxford, UK: Architectural Press, s. 1-6.