

1.1. Introduction of the context and previous researches

Turkish tribes who were coming and settled to Anatolia in 11th century were not sustained their sovereignty in the Western parts and they were returned to the eastern Anatolia again. However the Turkish invasions were started to the Western Anatolia again in 12th century. Turkish tribes were settled down in Anatolia in end of 13th and the beginning of 14th century. Because of the invasion of the Mongol's, the government of the Turkish seigniories in Anatolia delivered the Turkish tribes to the border line of the Byzantine Empire.

In the second half of the 13th century, Turkish tribes which were established their territories was formed the period of Turkish seignior. These period was continued since the establishment of Ottoman Empire. In these periods the architecture was shaped according to the integration of the cultures and the historical sequences.

In Turkish seignior period, was very rich in architecture. The previous researchers divided Turkish seignior period architecture into four different areas which were Western, Middle, East and South- East Anatolia.

In Eastern, South – Eastern and Middle Anatolian Turkish seigniories were under effect of Anatolian Seljuk's architectural essences. Western Anatolian Turkish seigniories were under effect of essences from Anatolia and Byzantine in the beginning establishment of the settlements. However the architecture in Turkish seigniories was under the development and forming the bases of the Ottoman architectural style.

The essences of the architecture and construction were coming from different origins in Osman Bey and Orhan Bey period in Ottoman (1299-1362). The building techniques were determined by masons which were worked in building field such as Cristian masons were used the construction techniques that gained before in Byzantine Empire. In contrary the Muslim mason's used their own construction techniques and architectural ornamentation styles.

In Anatolia there were always under the essences of different cultures and civilizations. Anatolian Seljuk's were one of the important civilization. The construction techniques and architectural styles were sustained in Anatolia in Turkish seignior period. Their essences were strong in shaping the Ottoman architectural style and construction techniques.

Other important aspect in Anatolia and Ottoman architecture was the reality of the Anatolian seismicity. From the past Anatolia passed many catastrophic earthquakes. Many buildings were collapsed in those periods of time. As well many buildings were survived since nowadays. Therefore construction techniques of Turkish seignior and early Ottoman were essential to understand the durability of remained structures.

The historical construction techniques in Turkish seignior period and early Ottoman was a wide subject for research. Many of the researchers and academicians who were national and international worked on this area. However the historical precautions of the seismicity was a specific subject which was necessary to research history, construction history and qualitative and quantitative analysis for the structures.

Similar studies was done before this research by Professor Borri and published with the name of "Manuale Delle Murature Storiche" and Randolph Langenbach and published with plenty of articles.

CHAPTER 1: INTRODUCTION

In the studies of Professor Borri; qualitative and quantitative methodological approaches were applied on stone masonry structures which were located in Italy. The outcomes of those studies brought the investigation methodological techniques of the quality of masonry structures and their seismic behaviors.

In the research of Randolph Langenbach, general construction details of the historical timber framed buildings and their behavior under the seismic activity were investigated. He noticed the structural behavior of ancient buildings under the seismic activity with different locations in the world and their comparisons.

1.2. Defining the research problem and case studies

Ancient historical Ottoman bath masonry structures in Anatolia and their preventive seismic construction techniques were not researched with the qualitative and quantitative methodological tools which were used in Italian ancient structures particular with the model of Professor Borri research. This was the gap in the historical construction research area. Also this gap is necessary to be filled with the question: The construction techniques in the history of Ottoman between 13th to 16th centuries were determined by seismic activity?

For examining this research question; abandoned and ruin Ottoman bath structures were decided as case studies. The structural details of those buildings were exposed and easily to identified. The locations of the case studies were differentiated according to the wide spectrum of the seismic frequency.

The research with those case studies were further the inquiry in the area of precautions of the seismicity in historical constructions. The decision of the cases in different locations with various seismic magnitude areas, provided comparison of the case study buildings as well their construction details. In addition, the application of qualitative methodology which were used in Italian historical buildings, on to ancient Ottoman baths, was demonstrate the quality of the masonry structures in a different point of view.

The importance of those case studies were not only their current ruined and location specifications as well their cultural, functional and structural significance.

As a cultural point of view, the acceptance of those functional units in Anatolia were easy because of their relation with water and fire which were important aspects for Turkish people from their past traditions. As well the functional specification of those buildings were composite. Ancient heating, piping, vaporization systems were solved in one buildings and also worked perfectly. The structural units of those buildings were composed of heating tunnels, masonry cells with closure elements.

As well as the cultural, functional and structural importance of the case studies, the location of the baths were significance in history of Ottoman Empire.

In Turkish seigniory and early Ottoman period, the building activity was high in cities, especially in capitals. Therefore in znik and Edirne which were capitals of Ottoman Empire, the building activity was very high in those period of time. Many different typological buildings were built in that regions. Baths were the one of those types of buildings. According to the patron and the budget of the construction various quality of bath structures were built.

Bilecik city was another important location in the beginning of Ottoman. In the period of Osman Gazi, this city was a location of Anatolian hinterland and stop between Bursa and Eski ehir. As well this city

was on the caravan road of İstanbul – Bagdad and played an important role of entrance from İstanbul to Anatolia.

1.3.Introduction of research steps (objectives, methodology, scope and importance)

The objective of the thesis was to understand the efficiency of the historical masonry wall structures and their construction details under the seismic activity. In addition, static collapse analysis of those structures were determined for realizing their behavior under the effect of the seismicity.

Two methodological analyses were applied to the case studies. In the first analysis; determination of quality of the masonry wall structures were done with IQM (quality index of masonry) method. In the second analysis; the case studies were examined with static collapse situations and focused their weakest structural points. The weakest points of the buildings were the clues of the collapse scenarios such as outer masonry walls as could be the starting point of the kinematic chain of structures. Moreover those weakest points were the evidence and reasons of supporting structural units which were designed by ancient masons.

The scope of the researched was determined by the question and the objectives. The Turkish seigniories and early period of the Ottoman Empire and their construction techniques and materials with examples were important parts to this research for understanding the details of building activity in those times.

The importance of this research question are very wide in scientific and historical directions of interests. In Turkey masonry buildings are assets that are represented as artifacts. They are worthy of significant interest both individually and for the unified whole.

The methods and techniques of intervention for the restoration and consolidation of the historical buildings have to be in logic. The expectations of the security issues of the structural system have to take into account adequately for protection of the architectural heritage. This direction pushes an increasing awareness of an asset that belong us which must be returned intact to new generations.

Historical buildings that mentioned in this context are worthy of significant importance. They were particular, their construction belonging to the fabric of a historical part of construction. Their specificity and legibility of its kind were formed with traditional materials for local and particular construction of the walls. These buildings come to us and used after centuries of life together constitute a material witness of the historical and cultural heritage that has dictated partly evolution of Ottoman cultural heritage that dictated the evolution of our civilization.

Seismic events of recent years have led the professionals to think about historical heritages for the consolidation of masonry construction. Hybrid consolidations between the historical masonry and reinforced concrete or steel elements that were used in these historical masonry constructions were occurred inconsistencies.

In part of the historical buildings in Turkey interventions were done with the usage of additional reinforced structural elements to secure a building for the seismic activity. However detailed knowledge of structure of these buildings and their construction were indicated the builders not to use appropriate interventions. This kind of reflection on the philosophy of interventions highlighted the particular attention to the study of pre-modern techniques to prevent earthquake. According to Antonino Giuffrè, “masonry buildings that have been well designed and maintained have been subjected several times of earthquakes with the great intensity and they were still standing and they were indicated their durability and ability to provide a level of safety at least comparable to that required in modern construction” (Borri, 2011).

CHAPTER 1: INTRODUCTION

In the first chapter of the thesis; introduction of the context, previous researches, defining the research problem, the case studies and introduction of research steps were identified.

In the second chapter of the thesis; historical reference outline of Turkish seigniory and early Ottoman architecture and its interaction with Roman and Byzantine architecture were examined. This chapter was the overview of Ottoman architectural history and the comparison of the building materials, structural elements, construction details and their applications.

In the third chapter of the thesis; Ottoman baths with their functional units and Turkish cultural traditions related with water were put forward.

In the fourth chapter of the thesis; “science of art”, methodological approaches were identified and summarized. In the first part; qualitative methodology for defining the masonry walls of bath structures were studied. In the second part; damage and collapse analysis method were studied.

In the fifth chapter of the thesis; current seismic situation, historical earthquakes, geological and geophysical properties of Anatolia were put forward.

In the sixth chapter of the thesis; locations of the case studies were examined according to their maps, history with the support historical architectural building layouts.

In the seventh chapter of the thesis; case study bath structures were examined according to qualitative methodology for defining the masonry walls and damage - collapse analysis.

In the eight chapter of the thesis; the conclusion which formed by the “science of art” was examined. The conclusion formed with two methodological approaches which were:

- Qualitative methods for evaluating the bath’s masonry walls
- Damage and collapse analysis of case study bath structures, were applied to the case studies.

The conclusion was organized according to the light of the results from the methods. The possible answers of the thesis question and their compliance with assumptions of the research were examined. The discussion of the thesis consisted in two parts. In the first part the data’s which were gained from the masonry qualitative analysis was semitized. In second part the data’s from the collapse analysis of the case study bath structures was analyzed. With the two results of the analysis and the historical inputs that researched in the previous chapters of the thesis were the bases for the possible answer of the thesis question.