An Interdisciplinary Analytical Method for Reading Facades; Case Study of Village Squares of Kyrenia, North Cyprus

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ABSTRACT

Today, globalisation and technologic developments and their outcomes combined with demographic, economic and social developments cause significant changes in the built environment that is formed of complex structures. Facades that are one of the important elements of the built structures are affected from these changes. Based on the formal characteristics, facades reflect technologic, socio-economic, environmental and historical characteristics of the period they were built in. Proportional relationship between individual facades of buildings and their relationship with various other elements such as open plots, roads, solid and void spaces, building facade create the two dimensional code and language of the built environment. Decoding and reading of the elements of built environment with complex structure consisted of various architectural spaces, facades and elements, which are necessary for the continuity of complex structure. In this regard, facades play an important role to sustain the continuity of the formal formation. From this point fort, analytical proportional relations of the built environment with complex structure through facades are shaped in regard to decoding and language reading. There is a necessity to decode the proportional relations of units, which are the smallest elements of facades, thoroughly to conduct analytical reading to ascertain the language of facades that have their own complex characteristics. There is a need for multiple disciplines, apart from architecture, in order to conduct this analysis based on the analytical proportional relationships since dual relationships are not adequate to a thorough reading. In this sense, development of a method with contribution of multiple disciplines for analytical reading forms the main idea of this study.

In the study, it is deemed appropriate to choose the disciplines that guide two-dimensional analytical reading, has unit within and enables serial reading. These disciplines are agreed to be mathematics, linguistics and music.

The study is based on two-dimensional formal analytical reading with the help of different disciplines and evaluation of proportional relations of facades. In this regard, an analytical reading method is developed for the interpretation of facade with the help of mathematics, linguistics and music disciplines. In that sense, this study is mainly based on the development of an analytical method through an exploratory approach and exploratory research methodology is used. Conceptual contributions of linguistics, mathematics and music disciplines are researched in the study. In the light of these disciplines, the code, architectural language and analytical formation of the facade is discussed with reference to linguistics and mathematics disciplines whereas emotional and visual meaning and interpretation is discussed with reference to music discipline. In this context, the study addresses an interdisciplinary approach for analytical reading and interpretation of the facade in order to ascertain the architectural language.

Keywords: Facade, Square, Linguistics, Mathematics, Music, Architecture, Analytical Reading Method, Facade Reading.

ÖZ

Kompleks yapıya sahip olan yapısal çevre günümüzde küreselleşme, teknolojik gelişimler ve bunların ortaya koyduğu sonuçlar doğrultusunda, demografik, ekonomik, toplumsal gelişmeler ile birleştiğinde, önemli değişimler yaşamaktadır. Kompleks yapının önemli bir elemanı olan cepheler de bu değişimlerden etkilenmektedir. Cepheler, biçimsel özelliklerine bağlı olarak, inşa edildiği dönemin teknolojik, sosyo-ekonomik, çevresel ve tarihsel özellikleri gibi belli bir birikimi yansıtmaktadır. Binaların bireysel cepheleri ve diğer (yollar, açık alanlar, parklar, yeşil alanlar) gibi elemanları arasındaki oransal ilişki, yapısal çevrenin iki boyutlu şifresini ve dilini oluşturmaktadır. Kompleks yapının sürekliliğinin sağlanması için, birçok farklı mimari yapı, cephe ve elemandan oluşan kompleks bir yapıya sahip olan yapısal çevrenin mevcut elemanlarının, şifrelerinin çözümlenmesi ve okumalarının yapılması bir gerekliliktir. Bu bağlamda, özellikle biçimsel açıdan devamlılığın sağlanabilmesi için cephelere büyük görevler düşmektedir. Bu noktadan hareketle çalışma, cephelerin aracılığıyla kompleks yapıya sahip olan yapısal çevrenin analitik oransal ilişkilerinin, şifresinin çözümlenmesi ve dilinin okunması bağlamında şekillenmektedir. Yapısal çevrenin kompleks yapısı içerisinde, kendi kompleks özelliklerini barındıran cephelerin dilinin ortaya çıkartılmasına yönelik analitik okumanın gerçekleştirilebilmesi için, cephenin içinde barındırdığı en küçük parçası olan birimlerin oransal ilişkisine kadar derinlemesine çözümlenmesi gerekliliği ortaya çıkmaktadır. Bu çözümlemenin analitik oransal ilişkilere bağlı yapılabilmesi için de mimarlık dışında, farkli disiplinlerin de katkı koyması gerekmektedir. Bu bağlamda, okumanın analitik olarak yapılabilmesi için farklı disiplinlerin katkısı ile bir metodun geliştirilmesi, çalışmanın ana kurgusunu oluşturmaktadır.

Çalışmada, iki boyutlu analitik okumaya yön verecek, kendi içinde birimleri olan ve bir dizim şekinde okumaya imkan sağlayacak disiplinlerin seçilmesi uygun görülmüştür. Bu disiplinlerin ise mathematik, dilbilim ve müzik olmasına karar verilmiştir. Çalışma, cephelerin oransal ilişkisinin değerlendirilmesi ve farklı disiplinlerin yardımıyla iki boyutlu, biçimsel analitik okumaya dayanmaktadır. Bu bağlamda da cepheyi yorumlamada, matematik, dilbilim ve müzik disiplinlerinin yardımıyla bir analitik okuma metodu geliştirilmiştir. Buna bağlı olarakda, araştırmada analitik olarak farklı bulgular kullanılarak yeni bir metod geliştirilmiştir ve çalışmada keşfedici araştırma metodu kullanılmıştır. Çalışmada; dilbilim, mathematik ve müzik disiplinlerinin kavramsal katkıları araştırılmıştır. Bu disiplinlerin ışığında da cephenin şifresi, mimari dili, analitik oluşumu dilbilim ve mathematik disiplinlerine; duygusal, işitsel anlamı, yorumu ise müzik disiplinine bağlı olarak tartışılmıştır. Bu kapsamda, çalışmada mimari dilin ortaya çıkarılmasına yönelik geliştirilen analitik okuma ise meydan cepheleri aracılığı ile ele alınmıştır.

Anahtar Kelimeler: Cephe, Meydan, Dilbilim, Mathematik, Müzik, Mimarlık, Analitik Okuma Metodu, Cephe Okuması

To My Family

And

Princess Serap Naz

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Chapter 1

INTRODUCTION

1.1 Introduction and Problem Definition

The formal and proportional relations of facades forming the visual dimension of an architectural artifact, direct the two-dimensional reading and the perception of the complex structure of built environment. A great responsibility is allocated on formal characters of facades forming the built environment during the perception of the environment. Therefore, the evaluation of architecture in terms of facade is an important database for scientific contribution to the profession. At the same time, facades are the basic tools that transfer historic quality of the built environment beside the characteristics and image of the street or the urban quarter to the future generations. Recently deterioration or addition to the building facades and functional changes are observed as a result of technological improvements or socio-economic changes. Along with those changes on the facades, original characteristics are deteriorated and facades have lost their basic qualities as the main tools to transfer the unique data to the future generations. In this sense, there is a necessity for a research on facade, in terms of its form and language that should be ascertained in order to ensure the continuity of built environment. From this point forth, cantilever levels, parcel dimensions (width-depth), heights of buildings, facade orders (solid-void proportions, cantilevers, entrance, balconies, porch, eaves, fence, openings) and ground floor facade elements (one within another) are considered as the input in order to ascertain the types and language of facades.

Squares, one of the most important elements of the built environment, are elements defined by buildings, hence, mainly perceived through facades. From this viewpoint, negative changes on the facades that surround and define a square, destructions, and new housing projects, affect the square concept and perception in a negative manner. In this context, it is a necessity to ascertain the image, type and language of facades to ensure the continuity of squares as defined spaces.

Accordingly, in the field of architectural research, materials used on facades, colours and texture, solid and void proportions, eaves, cantilevers, balconies, band mouldings, openings (doors-windows), oriels, number of floors, forms, features and locations of the windows and the entrances, horizontal and vertical bands, roof layout and lighting equipments and fences were the points of concern that has been carried out until now (Tugnett and Roberston, 1987, Özdemir, Tavşan, Özgen, Sağsöz, 2008, Friedman, 2007, Sağsöz, Tuluk, Özgen, 2006, Ayyıldız, 2014, Dikmen, 2014, Eminağaoğlu, Çevik, 2015, Belakehal, Boussora, Farhi, Sriti, 2015) besides the ones that were focused on analysis of space, square facade types, image and language. Alongside to this, it is found that there are such typological studies as classification or taxonomy of facts or individuals in typology. In typology studies, "conceptual process is conducted where elements consist of special types and are divided into sections in indexes in the direction of the aim of the person conducting the study and measures set" (Adams and Adams, 1991, p.91).

In this conceptual process, identification of types in the plan or facade scale ascertains the existing forms of languages of spaces with complex structures, its relation to types, general characteristics and the image. An analysis is conducted regarding the formal language of facades in the sense of decoding (vocabulary determination) but no explanation is made on the determined formation (grammar-syntax). Therefore, there is a need of contribution from different disciplines to determine grammar-syntax formation and interdisciplinary studies developed.

Evaluation of built environment in architectural researches, with complex structures composed of different elements, interdisciplinary approaches are developed with the contribution of disciplines such as sociology, psychology, philosophy, economy, engineering, mathematics, music and linguistics by establishing dual relations (Ankerl and Ankerl, 2013, Jones, 2011, Akın,1987, Button,2006, Alexander, 2002, Wilson, 1988, Klingmann, 2006, Odgers,Vicar and Kite (Ed.) 2015,Schlaich, 1991, Margolius, 2002, Salu,2011, Salingaros, 1995, Padovan, 1999, Vitruvius, 1960, Wittkower, 1971, Scholfield, 1958, Chomsky, 1976, Stiny and Mitchell, 1978, Saussure, 2001, Bandur, 2001, Wallin, Merker and Brown (Ed.), 2001, Sterken, 2007). Those studies mainly put forward the dual relations with an interdisciplinary evaluation approach.

At this stage, architecture discipline is associated to linguistics discipline and the determination of the grammar-syntax formation process could be involved. Typological research based on architecture discipline is an important evaluation means on the analysis of facade whereas interpretation based on linguistics discipline is used in the reading process. As stated before, proportional relations, in other words analytical determination in facade analysis, has an important role in terms of decoding, image, character and language. Studies based on linguistics explain proportional relations conceptually, however it is seen that proportional relations of elements in interpretation are not addressed thoroughly.

Based on this discussion, the problem of the study is shaped as follows: Facades with complex structures located in the built environment are important elements reflecting the two-dimensional characteristics of the built environment. A research on the subject and identification of architectural language is necessary for the continuity of facades. Research based on typology and linguistics in the identification process of architectural language defines the types and characters of these facades, decodes them conceptually and enable reading but does not include efficient analytical data. Within the scope of these findings, it is propounded that facades should be researched more thoroughly with different disciplines based on proportional relations analytically. In this context, it has propounded the necessity that facades should undergo a thorough analytical research/reading to enable facade sustainability and reflect the character and the image properly.

1.2 Hypothesis, Aims and Objectives

Related with the idea of how this can be done has emerged in terms of analytical reading and creating a language to analyse the aggregation of proportional relations thoroughly. Framework for the hypothesis is created based on the following:

- Linguistic, Mathematics, Music can be used to develop a new approach to the analysis of facades.

The aims and objectives of this study are identified in line with the hypothesis of this study. In this regard, the main aim of the study is;

- To develop an interdisciplinary analytical reading method with linguistics, mathematics and music disciplines to ascertain the language of facades, and to test its practicality.

Accordingly, the objectives of this study are as follows:

- To find out the related disciplines, with “unit” within, in order to read facades in index to analyse analytical formation based on proportional relations.

- To find out the relationship of linguistics-architecture, mathematics-architecture, music-architecture

- To find out contribution of linguistics, mathematics and music to the analytical reading of facades.

- To develop an analytical reading, developed in the process to ascertain the language, by analysing two-dimensional formal relations between facade elements.

- To find out the analytical formation of the facades based on proportional relations and make analytical reading

- To test the developed method at the determined facades of squares in a selected case area.

1.3 Limitations of the Research

Based on interdisciplinary context of the thesis, Linguistics-Mathematics-Music disciplines are chosen. The reason why these disciplines are chosen is that they have not direct connection with the built environment. At the same time, it is deemed appropriate to choose a discipline that may guide two-dimensional analytical reading, has units within and enables serial reading. In this respect, the basic concepts (units) and the sub concepts of these disciplines that have connection with architecture discipline form the conceptual framework of the method.

In the development of the method, based on conceptual framework, the focus is on squares that are important elements of the built environment in reflecting urban character and identity. The reason why squares are selected as built environment elements is that a square is surrounded by buildings and architectural elements (square facades) and it becomes a defined space and square perception occurs. In this regard, structures are formed as a result of continuous building line; their height-width proportion besides solid-void proportions possess significant role in squares' characteristics hence building facades are included as the main scope of the study in terms of two-dimensional aspects.

As a case study, the village squares of Kyrenia in Cyprus are selected as the limitation of the study. The reasons can be listed as; the new housing is seen rarely; there are only a few destroyed buildings besides existence of buildings that sustain original facades from their original period of construction; square facades maintain their identities and characters that have lost originality slightly are considered under the study to reflect the original architectural language.

1.4 Structure and Methodology of the Research

The thesis is composed of eight chapters. In the first chapter, problem statement, hypothesis, objectives, aims, limitations and structure of the study were determined. In the second chapter, the methodology is explained in detail due to the fact that the thesis is a method development research. In the third chapter, disciplines (linguistics, mathematics and music) that will contribute to the method development are studied. At this point, bilateral relations between disciplines and architecture discipline besides relation between four disciplines are formed by "Rankscale Method". In the fourth chapter, different analysis methods used in architecture and related with linguistics and mathematics disciplines are studied. In the fifth chapter, characteristics of squares used in method development are examined. In the sixth chapter of the thesis, development of analytical reading method of facades (LMMA) is given in detail. In the seventh chapter, the developed method is tested on Kyrenia Village Squares that is selected as the case study area and results are determined as per the area. Method, the potential use of method in other areas and its unique contribution to science is discussed in the last chapter of the thesis.

Within the above based structure, this study is mainly based on the development of an analytical method through an exploratory approach, its methodology is determined as exploratory research and discussed in detail in the following chapter thoroughly.

Chapter 2

METHODOLOGY OF THE RESEARCH: EXPLORATORY RESEARCH

This study is an exploratory research. A new subject in connection with this, an exploratory sequential mixed method is used in this research. “An exploratory sequential mixed method is a mixed method strategy that involves a two-phase project in which the researcher first collects qualitative data and then follows up or builds on this database with a second quantitative data collection and analysis” (Creswell, 2014, p.291). In line with this, the methodology of the research consists of four main stages;

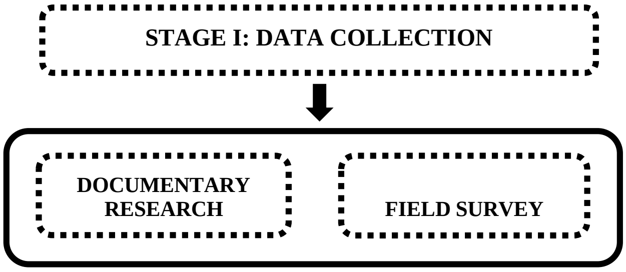
- Data Collection
- Method Formation
- Method Testing
- Interpretation of the Results

Each stage is explained in detail below.

2.1 Stage I: Data Collection

The data collection part of the study is based on two parts: a documentary research and a field survey. The first part of the study is derived from a documentary research. The second part of the study is derived from a field survey (See, Table 1).

Table 1: Data Collection Formation



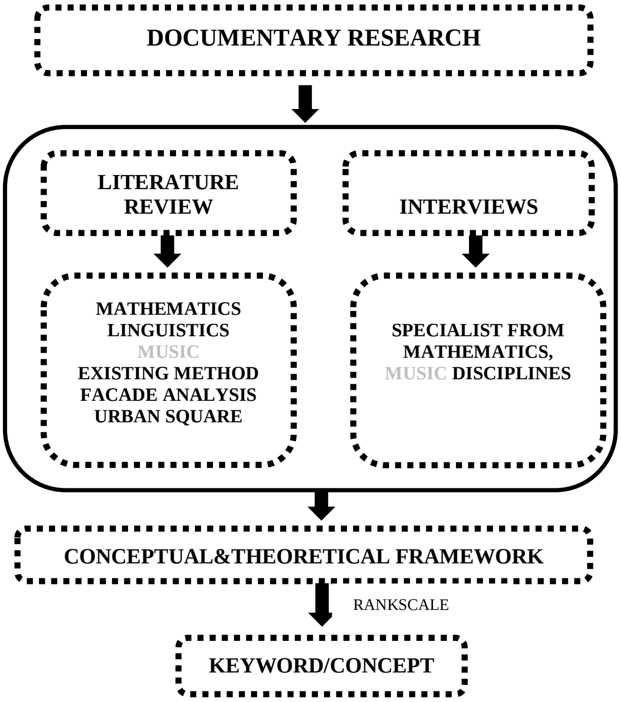
2.1.1 Documentary Research

Based on stage I, the first part of the study is derived from the literature review and from interviews.

The literature review of the study attained from the collected books, papers, thesis, web and journals that were examined. The literature review is conducted based on the key concepts "linguistics", "mathematics", "music", "facade reading methods", "existing analysis methods related with these disciplines" and "urban squares".

In interviews that were held with individuals who conduct their studies on selected disciplines, which are the second part of this section, the aim is to make the relations between mathematics, linguistics and music disciplines and architecture discipline clearer. In this regard, an interview is made with mathematics academician Assistant Professor Dr. Mustafa Rıza, who conducts studies in mathematics discipline to clarify the relation between mathematics and architecture in Eastern Mediterrenean University, Faculty of Art and Sciences, Department of Physics. Furthermore, interview is made with a music teacher and conductor, Erkan Dağlı, who is a part-time lecturer at the Eastern Mediterranean University, Department of Music Teaching who conducts studies in music discipline, to create a relationship between music and architecture. Any interview for linguistics discipline was not made as information obtained from literature review was adequate for providing/understanding the relation between linguistics and architecture (See, Table 2).

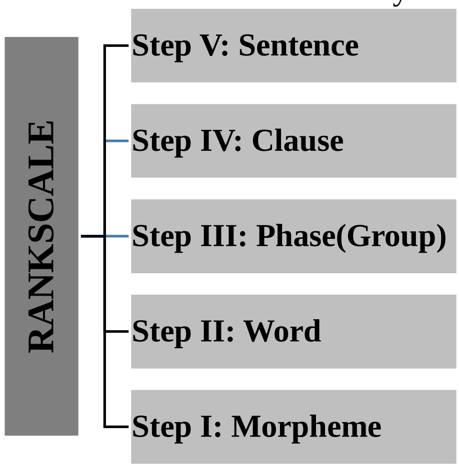
Table 2: Documentary Research Formation



Based on the literature review and interviews, it is found out that disciplines have bilateral relations with architecture. In this regard, Rankscale method is used in stage of establishing a relation between disciplines. “Rankscale” is a method that was used in linguistics discipline. “Rankscale” is borrowed from Halliday, who states: “A rank grammar defines a point of origin for structures and systems, so that the assignment of any item to given rank, as also the assignment of the structures and systems themselves, become an important step in generalization” (O’toole, 1994, p.281). In this sense, units that form the steps of grammatical “Rankscale” are given ranks. The term “rank” is used to name the hierarchical relation among the units which are recognized to range in a fixed order on the rank scale, an order that allows people to speak of a unit as being “next below” in another rank (AL-Muttalibi, Yousif, 2013, p.138). In line with this, there is a unit in Rankscale and a rank is given for each. Based on the research conducted by Morley, Rankscale method is described as the following:

> "A unit is defined as a stretch of language which itself carries grammatical patterns or which operates in grammatical patterns. The sentence is seen as the largest of the four units carrying grammatical patterns: sentence, clause, phrase and word, and the morpheme is the smallest of the four units operating in grammatical patterns: clause, phrase, word and morpheme (See, Table 3). There after each of the units is described in terms of its relationship with the other units. All five units are arranged hierarchically, from the largest down to the smallest, on a scale of rank. Each unit except the largest is defined by its function in the structure of the unit next above, and conversely each unit except the smallest is described as being composed of one or more units of the rank below" (Morley, 2000, p.25).

Table 3: Use of Rankscale Method Based the Morley`s Approach



This evaluation system is interpreted and used in the thesis of Yürekli and Dağlı for defining the relation between linguistics and architecture (Yürekli, 1980 and Dağlı, 1993). Renaissance art theorist, Alberti and O'toole used similar systems for their paintings (O'toole, 1994, p.281). In this study, the method, which a relationship between linguistics and architecture is established, is approached and developed within the scope of the study. In relation to this, the method is used in forming bilateral relations between mathematics-architecture and music-architecture disciplines and quadruple relations of these four disciplines. As a result of this part, conceptual and theoretical framework of the study is identified. In this respect, keywords and concepts of relevant disciplines are determined by this method.

2.1.2 Field Survey

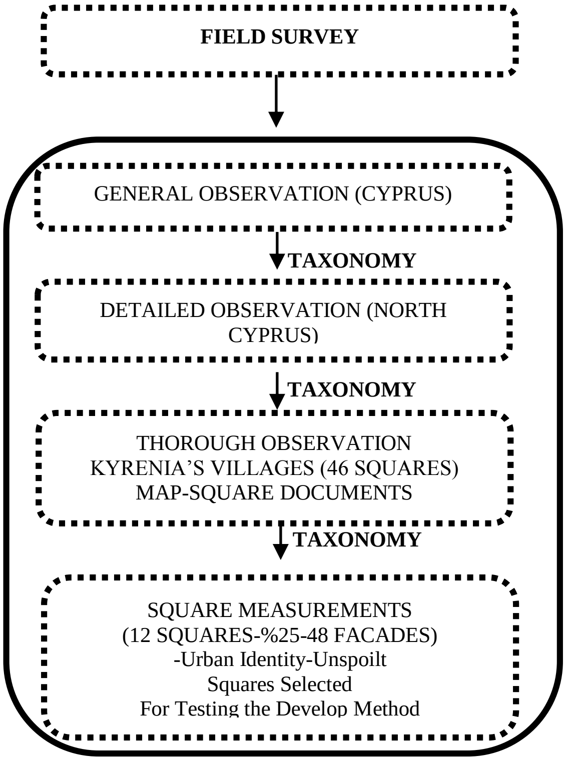
The second part of the data collection is the field survey. The field survey stage help to determine the appropriate case area in order to test the developed analytical reading method.

The field survey was started in 2005 and finalized by 2015. The field survey was conducted based on the following steps:

- At first, all squares of Cyprus were planned to be examined. Within the scope of this observation, all squares within the island were visited and photographed. However, as a result of the political problems, it was not possible to have an access to the site plans of squares located in the South. In this sense,
- Through on obligatory taxonomy which was held to identify the field of study and it was decided to focus only on the Northern part of island.
- In that regard, the site plans of city and village squares located in the North of the island were taken from the City Planning Department, Land Registry Office and Municipalities of relevant cities and villages. The site plans were reviewed in accordance with the photos and detailed observations were made. According to the outcome of this review, it is seen that many buildings around squares are mostly demolished due to developments throughout the island, especially in cities, and the new housing does not reflect original character. Accordingly, another taxonomy was held. Based on this taxonomy, Village Squares in Kyrenia are included in the scope of the study as they have the least destroyed facades and facades that reflect the typology and urban identity of the period they were built in.

- A thorough observation was made in the region where there are 46 squares and it was identified with taxonomy that there are 12 squares that are destroyed and demolished the least, that there are only a few new housing and maintain the original urban identity. 12 squares are equal to 25% of all squares in Kyrenia Villages. These 12 squares were examined and measured in detail. Site plans were redrawn and facades were drawn in accordance with the current measurements (See, Table 4).

Table 4: Field Survey Formation



2.2 Stage II: Method Formation

The second stage of the research methodology is method formation. As a result of literature review and interviews, the conceptual and theoretical framework are formed. Accordingly, conceptual and theoretical framework of the study, the keywords used in architecture-linguistics-mathematics-music disciplines are determined. Then, these keywords are re-evaluated based on the "Rankscale" method and the quadruple relations of these three disciplines, which consist of analysable units, are revealed. “Research instruments-keywords” are identified through filtering method based on these quadruple relations.

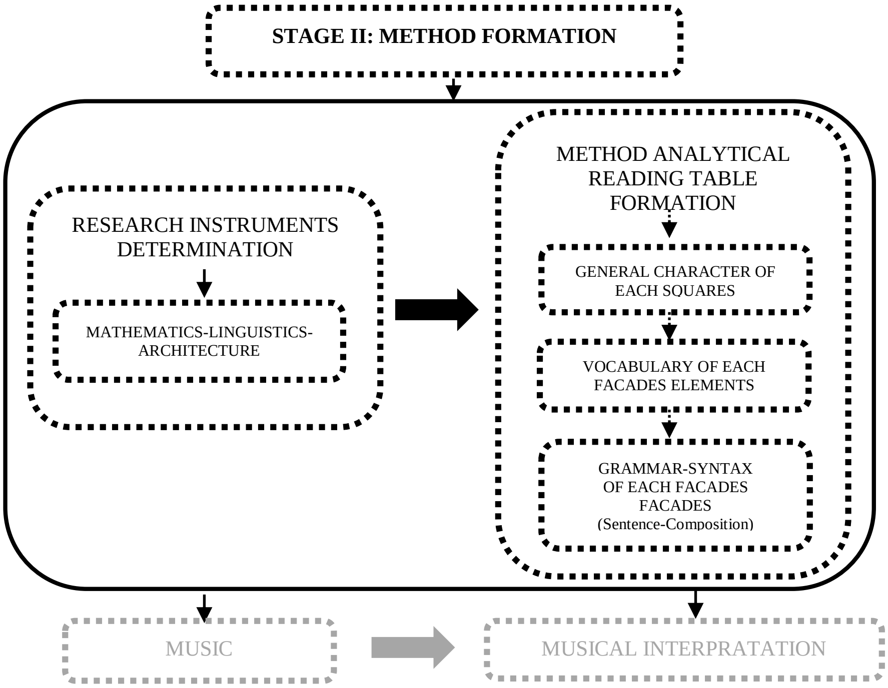
Then, based on research instruments, interdisciplinary analytical reading method are developed to ascertain the architectural language of facades. In this part, analytical reading tables are prepared to determine vocabulary, grammar/syntax, and sentence formations of each facade and compositions of square facades. These tables are filled with the selected square facades and include drawings of the maps, taken photos, facades drawing, and codes.

In this regard, in the first part, general characteristics of squares (vocabulary), in other words formal, functional formations, building functions and buildings facade elements are identified in this part analytical reading tables.

In the second part, elements of four facades located in square is decoding, reading and the vocabulary of facades is ascertained.

In the third part, a square consisting of four different facades is approached clock-wise, grammar and syntax of four facades and sentence grammar based on these were ascertained. Then the grammar formation of all facades and composition based on syntax is ascertained. Detailed descriptions of the steps and further detailed formations of the method are explained in Chapter 6.

Table 5: Method Formation

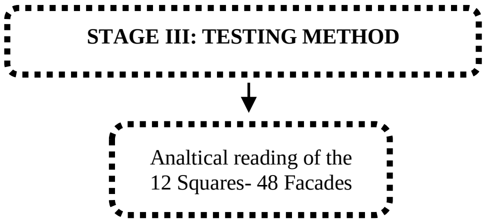


2.3 Stage III: Method Testing

The outcomes are identified in the third stage by “method testing stage” on the basis of sample area. At this stage, it is aimed to ascertain the language of facades based on analytical reading and to meet the deficiencies of the method. In this regard, three stages addressed in 2.2 in the method developed, are applied on facades of 12 selected squares. Based on analytical reading, analytical reading tables are re-reviewed and method is finalized (See Table 6).

In method testing stage, it is observed that facades can be interpreted with music discipline. In this sense, music discipline is included in the context based on the current methodology by going back to the theory of the study. In connection with this, findings are also interpreted with music discipline at this stage. In other words, music discipline is an outcome of the method. In this respect, music discipline is expressed differently than other disciplines in formation process of the method and is shown in Table 8. At this stage, it is referred back to the theory and relation is firstly established with architecture discipline. Then, music interpretation tools are determined in the last stage of method formation process. In Chapter 6, a detailed explanation in order to understand how facades can be interpreted with music discipline is given.

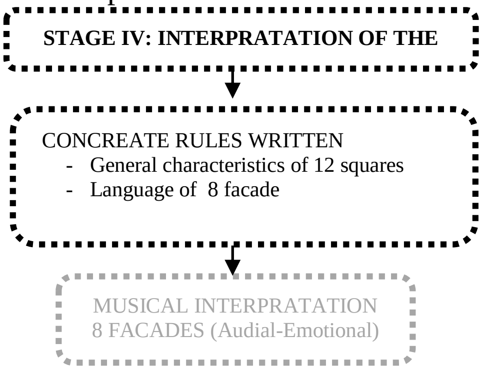
Table 6: Method Testing Formation



2.4 Stage IV: Interpratation of the Results

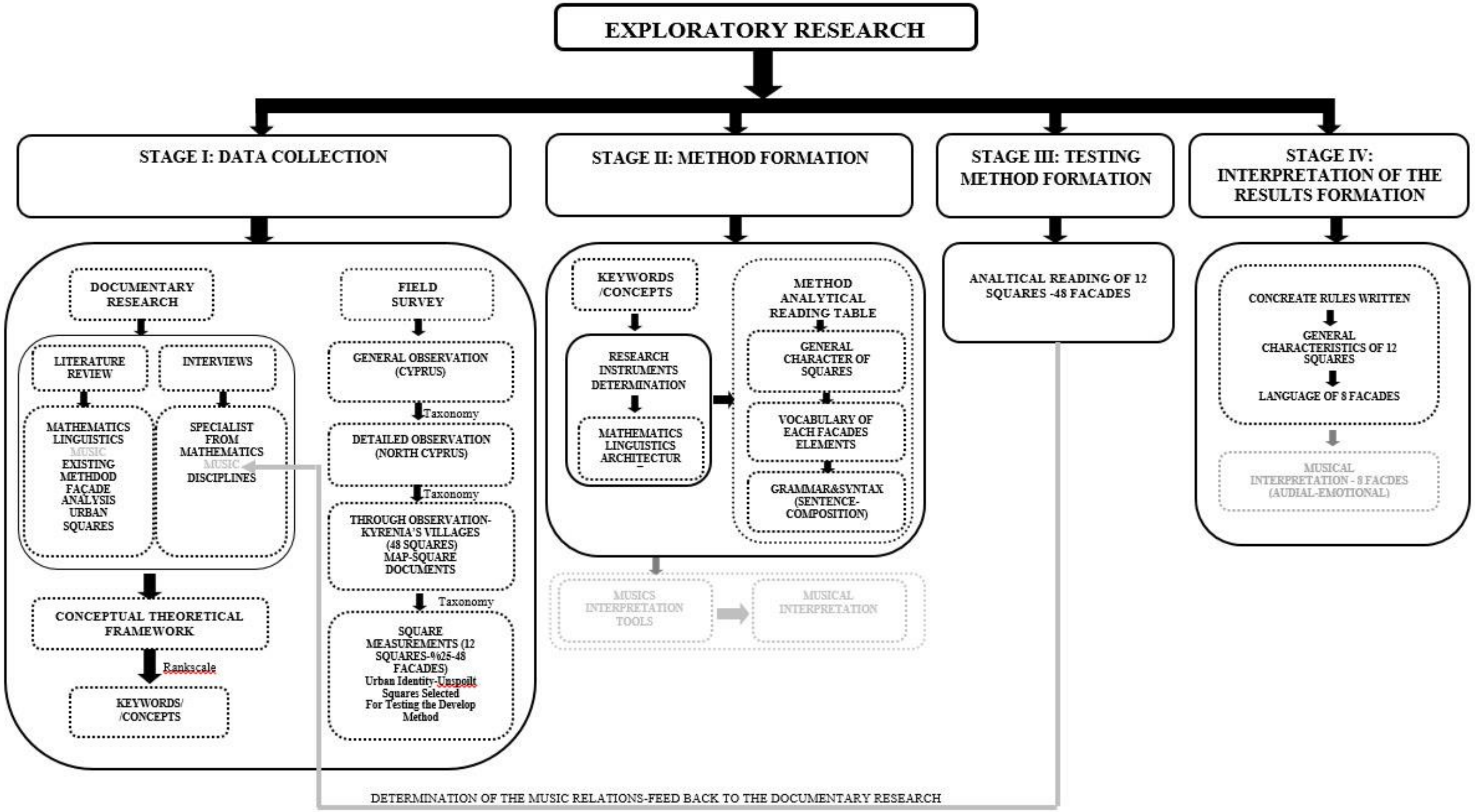
Taxonomy is conducted to determine the results of analytical reading in consequence of method testing stage. Based on this taxonomy, 8 square facades are chosen from 48 facades located in 12 squares that preserve the elements of the period it was built in, reflect architectural identity and is subject to new housing and changed the least. Based on these 12 squares, general characteristics and selected 8 facade languages are determined. In relation to this, data collected from analytical reading are evaluated and concrete rules are written. Audial-emotional interpretation based on music discipline is interpreted through 8 facades (See, Table 7). After stages of rule determination and interpretation with music discipline, the results of field of the study based on the method are evaluated.

Table 7: Interpratation of the Results Formation



In summary, the methodology of the thesis consists of four stages. There is a consecutive order of stages that feedback each other in the method development (See Table 8).

Table 8: Methodology of the Thesis



Chapter 3

INTEGRATION OF THE DISCIPLINES

This study includes an integration of the three disciplines with the architecture, which is not focused in the former researches. In that framework, the architectural dual relations were evaluated in the first place. In this regard, Rankscale is used as it is stated in the methodology of the thesis. Based on the method, concepts and sub-concepts are determined in this chapter in order to establish a bilateral relationship between these disciplines. Then, a quadruple relation between disciplines (linguistics-architecture-mathematics-music) was formed by Rankscale method followed.

3.1 Linguistics and Architecture

The first discipline under this study is linguistics. In relation with semiotics and linguistics as well as correspondence of their subjects, the relation between architecture-linguistics-semiotics is assessed under the same subject. The connection between these scientific fields is that "both of them works towards significance and signification" (Çiçek, 2014, p.38). As indicated by Köktürk and Eyri, another connection between these two is that "linguistics is a part of semiotics; the duty of linguistic is to reflect how a language become a specific sequence within semiotic facts" (Köktürk and Eyri, 2013, p.128).

This study discusses the definition of linguistics that will be taken into consideration from the architectural perspective. Therefore, this study argues the definition of language as the main element of linguistics in the first place, then the parts of linguistics discipline, and later how linguistics and architecture disciplines relate with each other in various and which phases.

3.1.1 Linguistics and Language

The origin of linguistics discipline, which has an old history, goes back to the first half of the 19^{th}Century (1833) (Kristeva, 1981, p.10 and Çiçek, 2014, p. 210). The discipline of linguistics may be defined as a scientific field examining the language evolution, notably “scientific study of human language” (Hayes, et.al, 2001; André, 1960; Halliday and Webster, 2006, Greenberg, 1948 and Wikipedia, 2015). Linguistics assesses the language from a scientific aspect and also examines and identifies the right or wrong uses in a specific language, which are the certain rules of a language (Tümer, 1982, p. 22). Therefore, linguistics is a discipline, which performs scientific studies on language analyses and explains the form, meaning, context of language (André, 1960).

Language is the main element of linguistics, which has the oral and written system and creates the communication between human beings (Stiny et al., 1978). According to Mc Kim, a language is constituted of a sequence of rules using symbols to describe more comprehensive meanings (Schmitt, 1988, p. 90). Chomsky defined language as “….Language is the mirror of mind. A world of mutual feeling built with human mind” (Chomsky, 1976, p.4). Language includes society, culture and policies. Lefebvre noted that “While language devalues itself, on the other hand it generates the values” (Lefebvre, 1998). The mind uses the language as a communication tool. However, language goes beyond being a communication tool. Language has a quality of being a tool for the explanation of mind (Heidegger, 2008, p.41-53). Language, is used for the expression of a thought, to experience feelings and consists of language elements for communication. Winograci defines the language units as vocabulary, syntax, semantics, context and style (Schmitt, 1988, p.90).

Language is the most effective tool of human communication (Sönmez, Yücel, Uluoğlu, 2009, p.59); thus, studies without language or use of linguistics cannot be considered as complete. Ferdinand de Saussure, who is the Modern linguistics avant-garde, said that linguistics investigates every kind of communication and includes all social sciences within (Stiny et al., 1978). In summary, the relation of various disciplines and linguistics are continuously argued and deficiencies that exist in various disciplines are thought to be eliminated through linguistics. Meanwhile, these studies are also, conducted in architecture discipline.

3.1.2 Subtopics of Linguistics and Relation to Architecture

Linguistics is known as the signifying system. It is produced from the signs (Stiny et al., 1978). The linguistic sign (a key word) is made of the union of a concept and an image. A more common way to define a linguistic sign is "that a sign is the combination of a signifier and a signified". Saussure says that the sound image is the signifier and the concept is the signified. A word can also be thought as signifier and the thing that it represents as signified. The Sign has two main characteristics: Vocabulary and Grammar (Stiny et al., 1978). Moreover, vocabulary and grammar represent the sub-topics of linguistics.

Apart from grammar and vocabulary, there are other subjects under linguistics. In this study, architecture's relation to linguistics is focused on the subjects, which are related with architecture and affected by the formation of the method. The subjects taken into consideration are vocabulary, grammar, the rules of vocabulary and grammar

(Signifying System Rules).

3.1.2.1 Vocabulary

Vocabulary is defined as all the words found in a language or all the words that are used in a type of language (Longman Active Study Language, 2006, p.831). "In vocabulary, there is nothing in either the thing or the word that makes the two go together; no natural, intrinsic, or logical relation between a particular image and a concept. This is the fact that there are different words in different languages" (Stiny et al., 1978). This part explained the general concepts of the vocabulary formation.

Like the vocabulary of a language, elements and symbols used in different disciplines create the vocabulary of that discipline. Therefore, vocabulary, as mentioned by Henke (1990), is used as the terminology of architecture (Henke, 1990).

3.1.2.2 Grammar

Noam Chomsky (1976) has proposed that linguistics theory and theory of Universal Grammar are an innate property of the human mind. Grammar, in general sense, is account of competence. It describes and attempts to account for the ability of a speaker to understand arbitrary sentences of his language and produce an appropriate sentence on a given occasion (Allen and Buren, 1971). It is the structure of language. In language, structuralists, like Saussure, stated that the units are words (or, actually, the 31 phonemes, which make all the sounds of words in English) and the rules are the forms of grammar, which order words (Klages, 2011). In different languages grammar rules are different, as are the words, but the structure is still the same in all languages: words are put together within a grammatical system to make a meaning (Stiny et al., 1978). Grammar in architecture is based on the review and analysis as well as determination of the rules of a language. Grammar of architectural language is determined by using systematic analysis method. It is possible to generate different variations with the same architectural language (Çolakoğlu, Özkaraduman, Torus, 2005).

3.1.2.3 Vocabulary and Grammar Rules (Signifying System Rules)

Everything in the signifying system is based on the relations that can occur between the units within the system. These relations mainly consist of relations of differences. These are the rules that may connect units together of time-linearity whereas syntactical and associative meaning is important (Stiny et.al., 1978). Generally, these are the combinations of vocabulary and grammar rules (signifying system rules).

Signs are stored in the memories of human beings such as in associative groups but not in syntagmatic links (Klages, 2011). Sign is the existence of signifier in time.

According to Saussure, the most important kind of relation between units in a signifying system is syntagmatic relation. This is basically a linear relation. Two words cannot be said or written at one time; one must be said or written first and then the next should be in a linear fashion; and generally the words must be written in a straight line. This shows that language operates in a linear sequence, and that all the elements of a particular sequence form a chain (Siscar, 1999).

An example for this might be the word order in English, which governs meaning. "The word order, the position of a word in a chain of signification contributes to the meaning. Word order in English has a particular structure: subject-verb-object. Combinations or relations formed by position within a chain (like where a word is in a sentence) are called syntagms" (Klages, 2011).

Thus, the signs that are taken into consideration from the terminology aspect under architecture, express forms, elements and grammar rules that are the rules of bringing these together to create the syntagms.

3.1.3 Relationship between Linguistics and Architecture

Many researchers underline that there is a strong parallelism between the paradigm structure of language and architectural design (Schmitt, 1988, p.90). Starting from the 1960s, the theorists of architecture have used the linguistics and communication notions and bring up the questions of "What kind of message is generated via architecture?" "Can this message be shared?" "What does society understand from architecture?" (Yücel, 2005 and Sönmez, Yücel, Uluoğlu, 2009, p.59-60). The theorists of architecture have started to use the terminology of linguistics in different scales of architecture like city or building. As indicated by Sönmez, Yücel, Uluoğlu (2009), language is an important factor for the formation of urban image in the minds of society. Urban codes continue their existence with the used language within the living spaces (i.e physical environment, buildings) producing their own characteristic texts. The study on urban discourse stands in the intersection of linguistics, sociology and architecture (Sönmez, Yücel, Uluoğlu, 2009, p.59).

There are various researcher who works on the linguistics and architecture relations. This study focused on the basis of research by Noam Chomsky and Chirostopher Alexander. Christopher Alexander, one of the architectural designers and researchers, stressed that architecture, in its own entire context, generate its peculiar pattern language based on the language theories of Chomsky (Çolakoğlu, 2005). The language approach of Chomsky and associated language-architecture approach developed by Alexander are explained in Table 9 on the basis of research by Çolakoğlu; "Designing and Understanding an Architectural Language”. The aim of this study is to establish a relation between architecture and language.

Table 9: Comparison of the Relation between Language and Architecture by Chomksy and Alexander (Çolakoğlu, 2005).

	Chomsky (1957)	Alexander (1977)
LANGUAGE	**-Natural Language** **-Repetition of limited sounds**	**-Design/Shape Language** **- Repetition of Pattern**
SENTENCE/DESIGN	**-Limited Sound Order** **-Infinite Sentence Formation**	**-Limited Pattern/Shape** **-Infinite Building Formation**
GRAMMAR	**-Formal Sentences** **-Infinite Number of Sentence Formation through Rules** **-Transformation-Derivation Rules**	**-Formal Repetition of Pattern** **-Infinite Number of buildings through rules** **-Pattern Transformation-derivation Rule**

The link by Çolakoğlu based on the approaches of Chomsky (1957) and Alexander (1977) are categorized in three main groups as language, sentence/design and grammar. Chomsky (1957) argued that “Natural language is the repetition of limited sounds” whereas according to Alexander, “Design language is the repetition of patterns”. Regarding the sentence structure in language, Chomsky (1957) stated that “Limited number of sounds allows infinite number of sentence formation with limited number of sound sequence”; Alexander (1977), for the architectural equivalence of this statement, noted that “It is possible to create infinite number of designs with the repetition of limited number of shape/pattern”. In regard to aspects of grammar, Chomsky (1957) underlined that “Grammar is comprised of absolute, formal sentences. It is possible to create infinite number of sentences and sentences that can be combined and are possible to be transformed, derived from the same sentence with transformation rules”. According to Alexander (1977), “Through the formal repetition of patterns, it is possible to create infinite number of usual combinations with limited number of combinations. It is also possible to derive and transform into the current with pattern transformation rules” (Çolakoğlu, 2005).

According to Çağdaş, “Language is characterized by defining the initial shape, vocabulary elements, shape rules and spatial relationships between shapes” (Çağdaş, 1996a). Thus, architecture generates its own language on the basis of geometric shapes, dictionary elements of architecture, shape rules and their inter-relations. Consequently, concepts of architecture and linguistics may be directly linked.

Yürekli (1980) developed a terminological approach in linguistics and architecture. “The rank scale” system given in the studies of researchers is the basis of method formation under this study as underlined in the section 2.2. In documentary research section, “Rankscale” is especially powerful in relationships between architecture and linguistics, yet it explains the hierarchical order of linguistics (Yürekli, 1980 and Dağlı, 1993). The relationships between the language elements and the architectural elements can be seen in Table 10 that is developed by Yürekli`s. According to Table 10, voice vibrations in linguistics and building elements form the architectural design. The formal sequence of word groups in linguistics generates sentences and building parts and elements generate building in architecture. As the text forms sentences, the building in architecture forms architectural compositions

Table 10: Yürekli`s Rankscale (Dağlı, 1993)

Linguistics		Architecture
Text	→	Architectural Composition
Sentence	→	Building
Word Group	→	Building Part
Word	→	Space
Voice Vibration	→	Building Element

Based on Yürekli's Rankscale, in this study a revised version of Yürekli's Rankscale is developed on shown in Table 11. In table 11, words (units) in linguistics and building elements form the architectural design. The formal sequence of word groups in linguistics generates sentences and building facades and elements generate building in architecture. As the composition forms sentences and paragraphs, the building and other elements such as roads, open land, spaces in built environments forms environment composed of buildings and spaces in betweeen. According to these explanations and evaluations, it can be said that linguistics includes architecture as a respective.

Table 11: The relationships between the language elements and the architectural elements developed by the author based on Yürekli's Rankscale.

Linguistics		Architecture
Composition	→	Environment Composed of Buildings and Spaces in Betweeen
Paragraph	→	Building
Sentence	→	Building Facade
Group of Word	→	Group of Building Elements
Words(Units)	→	Building Elements

3.2 Mathematics and Architecture

In order to understand what kind of relationship mathematics has with architecture, in general, was carried out by understanding first how it evolve and what kind of links it has with architecture discipline; There is a brief review through its chronological development that was presented in Appendix A. Therefore; this part does not state historical evolution but mentions its characteristics and its relationship with architecture discipline.

3.2.1 Definition of Mathematics

The members of Pythagorean School first used the term “mathematics” in 550 B.C. It was then introduced to written literature through Plato in 380 B.C. Until those years, geometry, as it has a meaning of measurement, or synonyms, in other old languages, were used instead of the term of mathematics (Ülger, 2005, p.8).

Many famous mathematicians aimed to define the meaning of mathematics. According to Boyer, “mathematics is a science of number and magnitude, an old fashioned definition” (Boyer, 1968, p.1). Different philosophers have defined mathematics in different ways. According to Courant, Robbins and Stewart (1996), Mathematics is an expression of the human mind reflecting the active, contemplative reason, and the desire for aesthetic perfection. Its basic elements are logic and intuition, analysis and construction, generality and individuality (Courant, Robbins and Stewart, 1996, p.1). According to Boyer (1968), mathematics is an outgrowth of thought that originally centred in the concepts of number, magnitude and form (Boyer, 1968, p.1).

Aristotle, a famous philosopher who worked on the discipline of mathematics, defined mathematics as "the science of quantity", and this definition prevailed until the

18thCentury (Franklin, 2009, p.104). Plato defined that the highest form of pure though is in mathematics (Brickhouse and Smith, 2015). While Russell noted that many definitions might be put into mathematics, he defined it as “All mathematics is symbolic logic” (Russell, 1903, p.5). As indicated above, mathematics is known as the science of quantitative numbers and lengths.

Mathematics has a comprehensive content including logic, perception, analysis, building, aesthetical perfection, and it provides a visual and countable communication through symbols and geometrical forms.

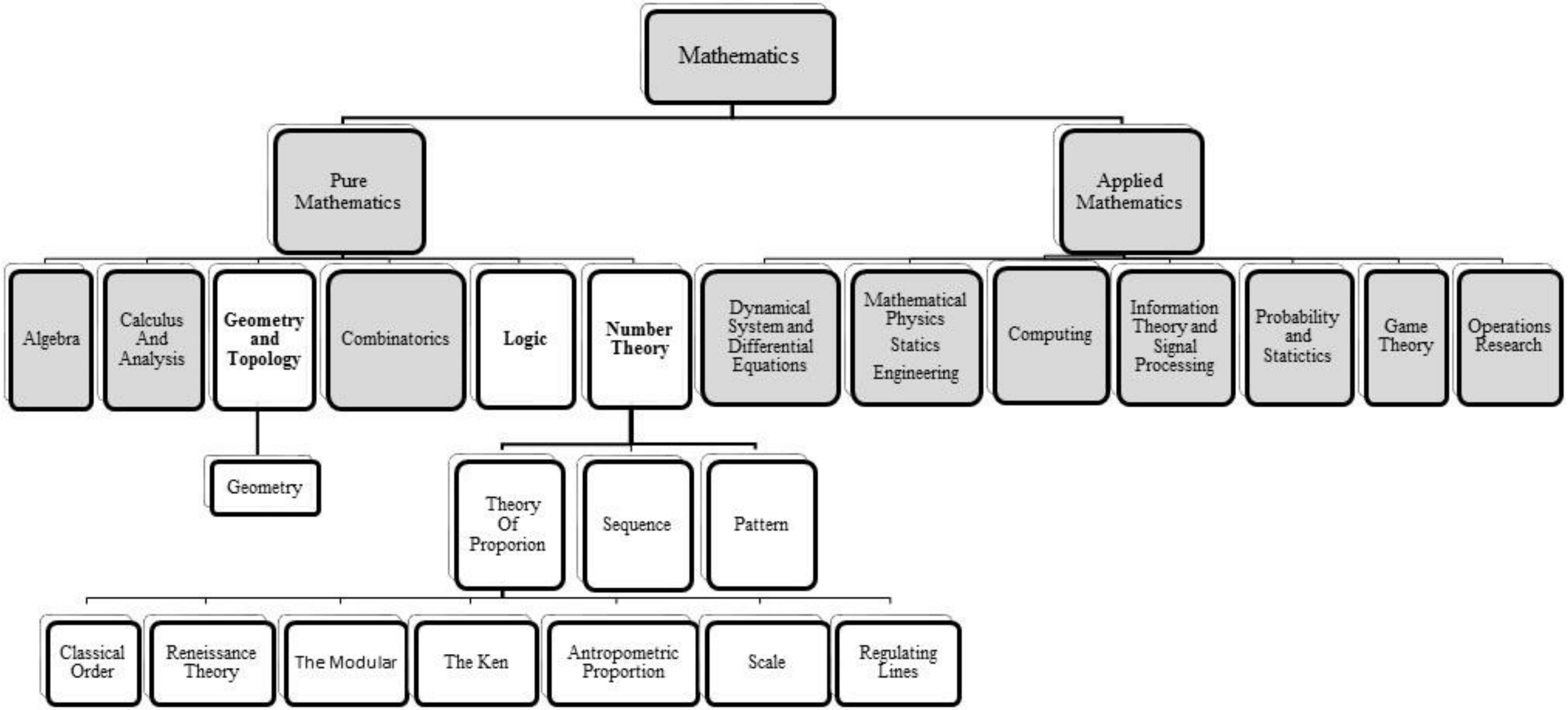
3.2.2 Subtopics of Mathematics and Its Relation with Architecture

The development of Mathematics discipline is still ongoing. As emphasized in the study chronological evaluation of mathematics (See Appendix A). Many architects, who are also mathematicians, refer to the power and importance of the relationship between them. In addition, it is observed that the subtopics of mathematics are used in relation to architecture. Depending on the results observed during the historical evolution of the discipline of architecture and mathematics (See Appendix A), the sub-topics of mathematics are included in the scope of study in detail.

The subjects of Mathematics are divided into subtopics in itself. Accordingly, they are divided into two main groups. Pure mathematics and applied mathematics. The first part, pure mathematics, mainly represents the part up to the 20th century in historical development. The second part represents 20th century and later.

The categorization of the topics based on the information gathered from interview made with Assist. Prof. Dr. Mustafa Rıza which was explained in 2.1.1 documentary research section. (See, Table 12). In connection to Table 12, the subheadings Geometry & Topology and Number Theory are emphasized. In geometry, taken as a branch; the reading of the forms, rules used for ordering systems, there is an emphasis on general structure besides its relationship with architecture. In Number theory, proportion & sequence and subheadings of pattern are discussed and thoroughly reviewed in relation to architecture.

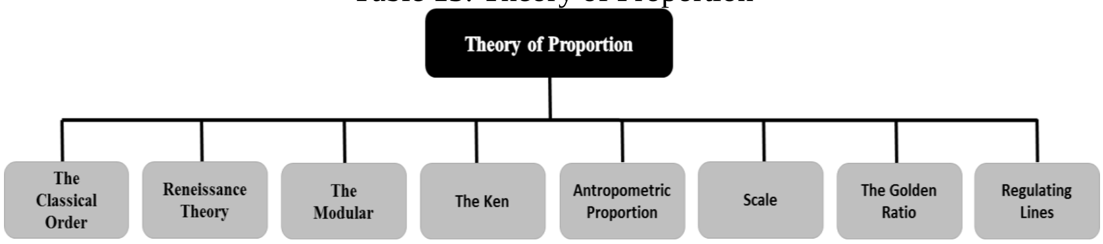
Table 12: Relation of Architecture to Subtopics (Rıza, 2015)



3.2.2.1 Theory of Proportions

The theory of proportion used intensively in the historical period is categorized under seven subtopics according to the clustering conducted by Ching in architecture: In the study, “Regulating Lines” (Le Corbusier, 1971) is added into the seven sub-topics and were explained under this part. (See, Table. 13)

Table 13: Theory of Proportion



3.2.2.1.1 The Classical order

The classical order is represented in the proportioning of elements of the columns. The layout proportions of columns under classical order system are determined. There are two groupings; measurements by Vitruvius and Vignola. Vitruvius studied actual examples of the orders and presented his “ideal” proportions for each in his treatise. The columns grouped by Vitruvius in terms of their proportions are named as Pycnostyle, Systyle, Eustyle, Diastyle, Araeostyle (Ching, 2007, p.320). As it can be seen from Figure 1 accordingly, the structure of void and height of columns argued by Vitruvius are given on the basis of their base diameters. In this framework, the voids of columns are identified as, Pycnostyle; void 1.5D - height 10D; Systyle; void 2D-height $9\frac{1}{2}$D -, Eustyle; void 2-$\frac{1}{4}$D height $9\frac{1}{2}$D, Diastyle; void $8\frac{1}{2}$D - height 3D, and void 4D heights 8D in Araeostyle type (See, Figure 1).

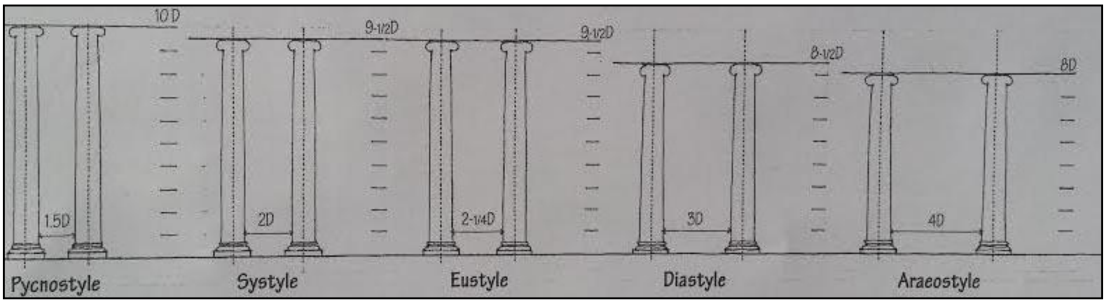


Figure 1: Vitruvius Column Types (Ching, 2007, p.320)

According to Vitruvius, these styles are used in many temples. For example; Pycnostyle is used in The Temple of Venus Genetrix in the Forum Caesar (See, Figure. 2), Systye; The Temple of Equestrian Fortune, Eustyle; Pantheon, Diastyle; The Temple of Apollo and Diana, Araeostyle; The Temple of Ceres and Pompey's, Temple of Hercules (Tumbull, 2007).

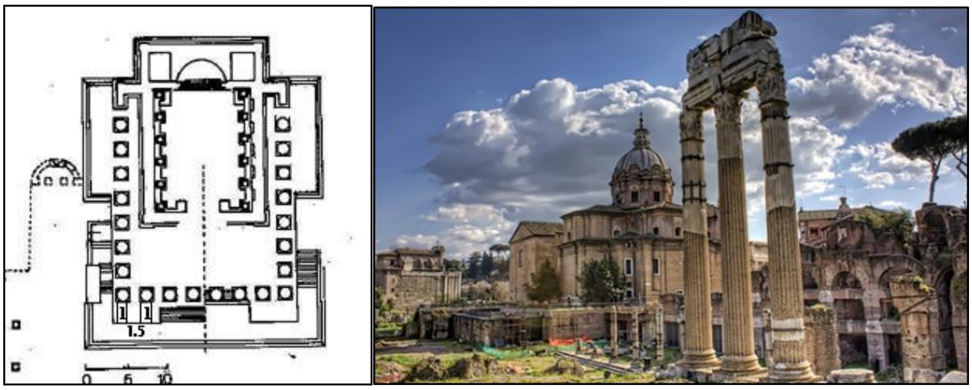


Figure 2: The Temple of Venus Genetrix that Pycnostyle Column Type was Used in the Forum of Caesar in Rome (URL 1 and URL 2)

Giacomo Barozzi da Vignola studied classic order in his "The Five Orders of Architecture" (Vernd, 2003, P.845) that reviewed these rules on column types and proposed proportions for the five different column types given in Figure 3. Three of these, are used in Greek period as Doric, Ionic and Corinthian, and two are used in Tuscan and Composite column types by Romans.

The basic unit of dimensions is the diameter of the column and the measure unit is always the same as the 'module'. From this module, they are derived from the dimension of the shaft, the capital, as well as the pedestal below and entablature above, down to the smallest detail (Ching, 2007, p.320)

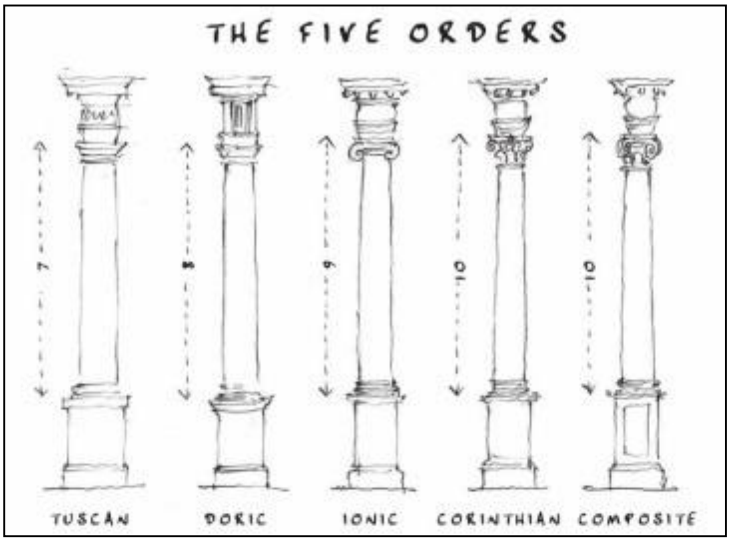


Figure 3: Column Types Reviewed by Vignola (URL 3)

Under the proportions system developed by Vignola, the height of the entablature is one-fourth the height of the column while the pedestal base is one-third the height of the column. In Tuscan order, it has a proportion of 1:7 which means that the height of columns is seven times the lower diameter of the columns shaft. Doric order as: 1:8, Inonic as: 1:9, Corinthian and Composite as: 1:10 (Baker, 2008, p.53-58). These types of columns are used in many different buildings. For instance; Tuscan order; The Temple of Jupiter Optimus Maximus, in Rome, (Thomas, et. al., 2012) Ionic order; The Temple of Athena Nike in Athens, Corinthian Order; The Temple of the Sybil, in Rome (Schulman, 2015), Composite Order; Temple of Cares and Proerpine (Penny cyclopaedia, 1843,1858, p. 94,) and Doric order; Sanctuary of Aphaia Temple (See, Figure. 4).

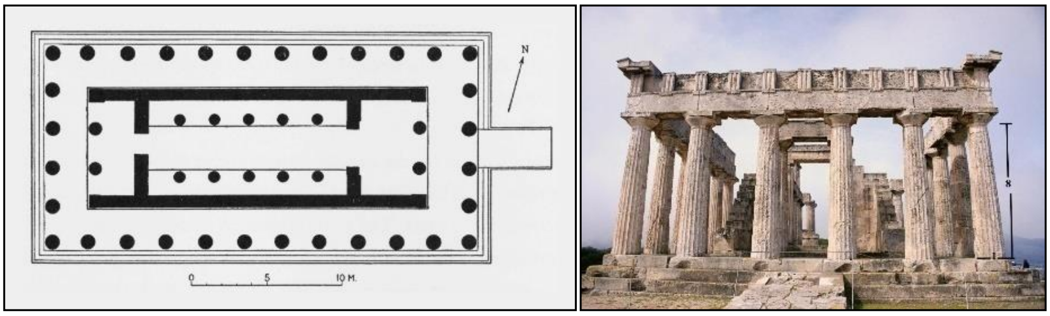


Figure 4: Doric order, Sanctuary of Aphaia Temple, (513 BC- 500 BC) (URL 4 and URL 5)

3.2.2.1.2 Renaissance Theory

Renaissance theory defines the proportion theory of that time. Evaluating architecture as a mathematical science, which acquires the challenge of spatial units, and undertaking the effort to capture the universal harmony of architectural space, are two of the most important actions of Renaissance period (Roth, 2000).

During the Renaissance, proportion was used a lot. Mathematical and musical proportions used in this period, were interlaced. It can be said that a part of the used proportion systems were based on Pythagoras' "musical harmony" theory (Perker, 2009, p.592).

They believed that buildings should have a supreme order. Renaissance architects focused on to the proportion system that exist in the musical harmony theory. These series of proportions manifested themselves not only in the dimensions of a room or facade, but also in the interlocking proportions of a sequence of spaces or an entire plan (Smith, 2014).

The effects of Pythagoras and Plato's proportion (See Appendix B1) approaches on architecture and proportions are observed on the structures of two of the most famous architects in the period; Andrea Palladio and Leon Battista Alberti (Ching, 2007 and Perker, 2009). Andrea Palladio (1508-1550) was the most influential architect of the Italian Renaissance (Ching, 2007, p.315). Palladio developed his own proportions depending on these proportions. “There are seven types of room that are the most beautiful and well-proportioned and turn out better: they can be made circular, square (1:1), or their length will equal the diagonal of the square of the width (5:4**)**, or a square plus a third (4:3); or a square plus a half (3:2), or a square and two thirds (5:3), or double square (2:1).” (Palladio, 1997, p.57) (See, Figure. 5).

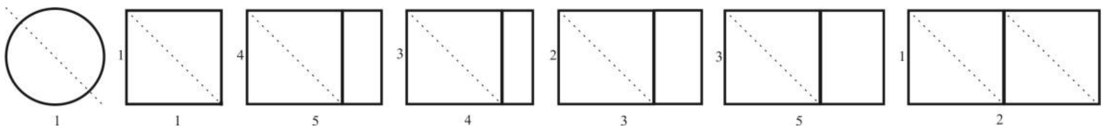


Figure 5: Palladio’s Room Proportions (URL 6)

On the Drayton Hall building plan, which was created with the use proportion system applied to the rooms by Palladio, it is observed that four of the rectangular room types are used together (See, Figure. 6).

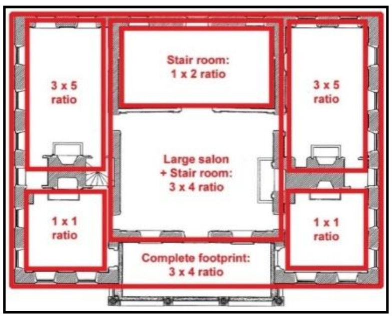


Figure 6: The Floor Plan of Drayton Hall, Charleston, South Carolina, 1747–1752, (URL 7)

During this period, Palladio made three different suggestions on the layout of the third dimension and to determine the room heights based on Pythagoras’ theory. The purpose of this suggestion is for the room heights to be proportional with the width and length of the room (Ching, 2007, p.299). Therefore, he developed a proportion system according to the width, height and depth proportions of places; the arithmetic mean (c-b/b-a=c/c that is 4-3/3-2=4/4), the geometric mean (c-b/b-a=c/b that is 9-6/6-4=9/64), the harmonic mean (c-b/b-a=c/a that is 12-8/8-6=12/6) (See, Figure. 7).

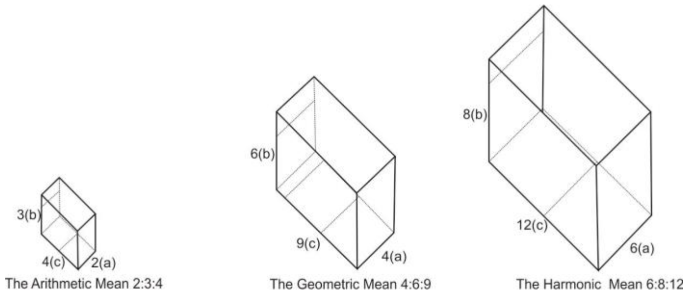


Figure 7: Palladio, Arithmetic Mean, Geometric Mean and Harmonic Mean (URL 8)

Palladio has many buildings, which were designed depending on the proportions he had developed. Namely, these are Palaza Chierizati, Italy (1550), Villa Emo, Italy (1559), Villa Capra (or Villa Rotunda), Italy (1552-1567) (Perker, 2009, Palladio, 1997, Ching, 2007, Radulescu, 2015). It is observed that Palladio's square (1:1) proportions and rectangle (1:2) proportions are used on the building plan. (See, Figure. 8)

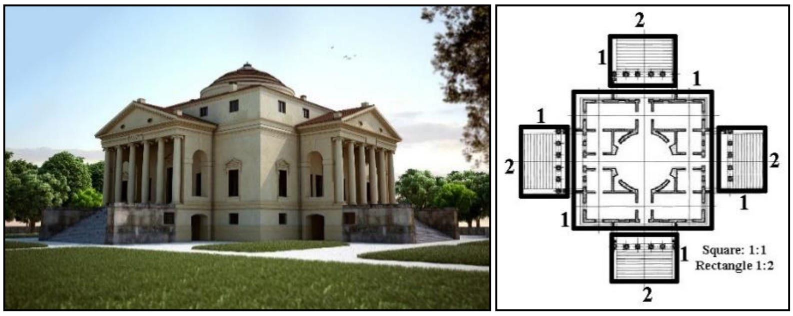


Figure 8: Villa Capra (or Villa Rotunda) by Palladio, Vicenza, Italy (1552-67)
Photos (URL 9) and Plan (Perker, 2009, p.596 and URL 10)

During this period, another architect who used this system was Leon Battista Alberti, as mentioned above. Alberti also had his own interpretations of these proportions.

Accordingly, he developed new architectural concepts, including proportional systems (Naredi-Rainer, 1995, p. 163-172 and Pereira, 2011, p. 374). Proportion system, which was developed by Alberti, was developed in relation to music. Accordingly, the relationship between music and architecture is explained thoroughly in Appendix B. Buildings which were built by Alberti during this period are, Sant'Andrea, Mantua, Italy(1472-90) and Cathedral Tempio Malalestino, Italy(1450) and Luca Fancelli building which was completed in accordance with the original plan after his death (Perken, 2009). The existing facade of Church of Santa Maria Novella, whose construction was completed in the mid-14th century, was redesigned by Alberti between the years of 1456 and 1470. The facade is very important as it has various proportional and geometric relationships. On this building of Alberti, as seen in Figure 9, proportions such as 1:1, 1:2, 1:3, 2:3, 3:4 are used (Wittkower, 1971, Berkay, 2007, Gökberk, 1993 and Perker, 2009).

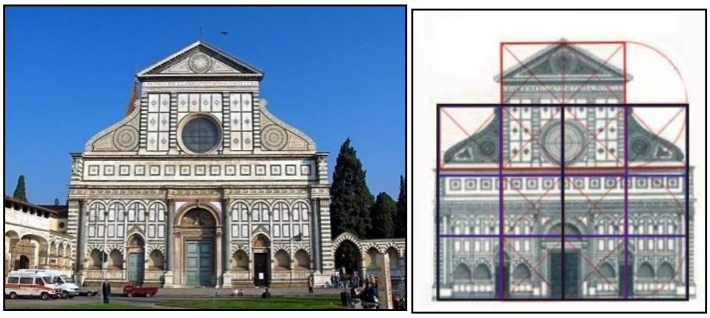


Figure 9: Santa Maria Novella Elevation (URL 11) and Proportion on Elevation (URL 12)

3.2.2.1.3 The Modulor

The Modulor is the system of proportions established by Le Corbusier on the basis of anthropometric measurements. These proportions are in accordance with the human body measurements between 27-226 cm.

Le Corbusier chose to use Modulor units and standardization. In the book “Modulor”, he pointed out that the goal of “standardization” is to find principles that can be used as rules. “Standards” are the rules that govern the various aspects of an object (Le Corbusier, 1968, p. 60 and Hsu&Shis, 2006, p.79). Modular was developed as a visual bridge between two incompatible scales, the metric system and the imperial system. Le Corbusier’s Modular is based on the height of an English man (Standing Man) with his arm raised. Le Corbusier used this theory to discover the mathematical proportions in human body and to use this information to affect function and appearance in architecture (Öztürk, 2010). This is a dimensional rule that uses multiples of the Golden Mean, f = 1.618, anchored on the height of the "standard man" at 6ft (183cm) (Meiss, 1991).

Le Corbusier rationalizes Modulor by answering the question “Where does 1, 75 m (height) come from?” as “from the subtotal of 108.2 cm navel height and 66.8 cm is golden proportion”. This is a hierarchical description. In Fibonacci sequence which is a network, (1, 1, 2, 3, 5, 8, 13, 21…) sequence is an example to Fibonacci sequence (Şentürk, 2008, p.105-106).

Geometric sequence, which forms the Modulor, was developed in relation with Fibonacci sequence is seen in Figure 10.

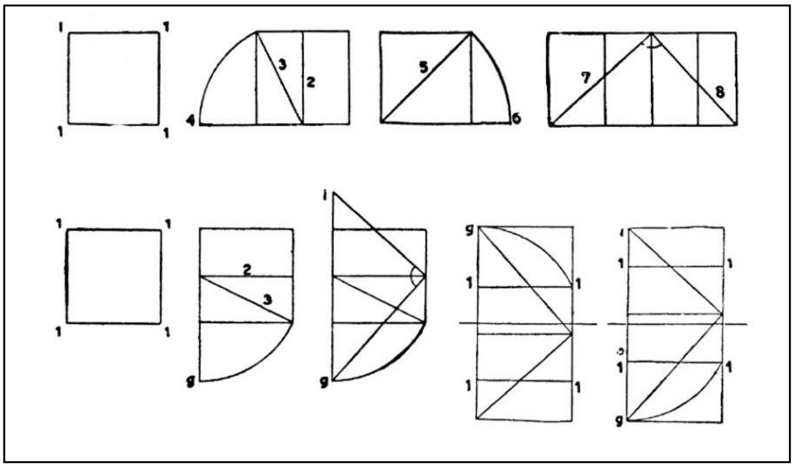


Figure 10: Geometric Sequence, which Forms Modulor (Modulor 1&2, Le Corbusier 1980, p. 37-40 and Şentürk, 2008, p.106)

In The Modulor, what Le Corbusier wanted to do was to put a standing body into a vertical shape, just like putting a body into a casket. Modulor's story is framing and geometric, starts from square, and ends in body (Şentürk, 2008, p.106). In Figure 11, Le Corbusier's Modulor approach is seen on the standing man.

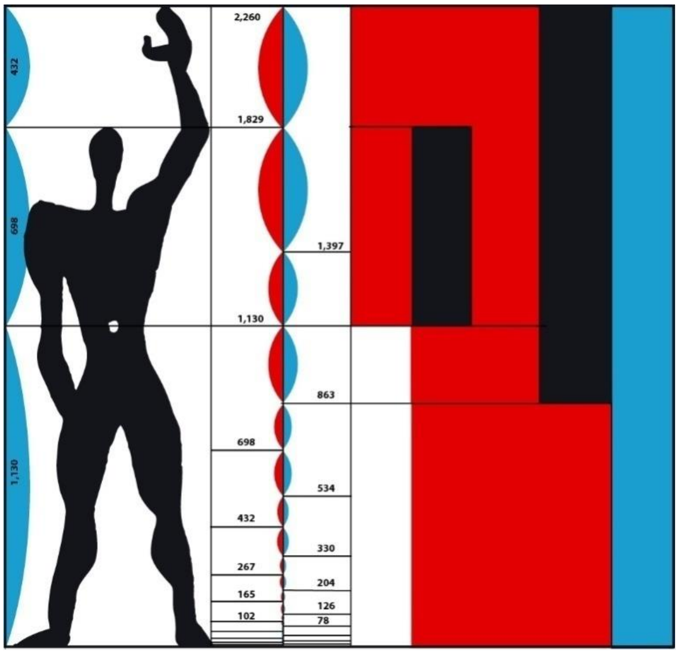


Figure 11: Le Corbusier, Modulor Man (URL 13)

As seen in Figure 11, Le Corbusier shows the proportions in two different colours.

From a blue series of numbers (Golden Section of the total height) and a red series (height of the navel) results a sequence of measures from 27 cm to 226 cm (and then much more) in steps of 27 and 16 (see, Figure. 12-13) (Frings, 2002). He rounded these numbers while using on buildings design.

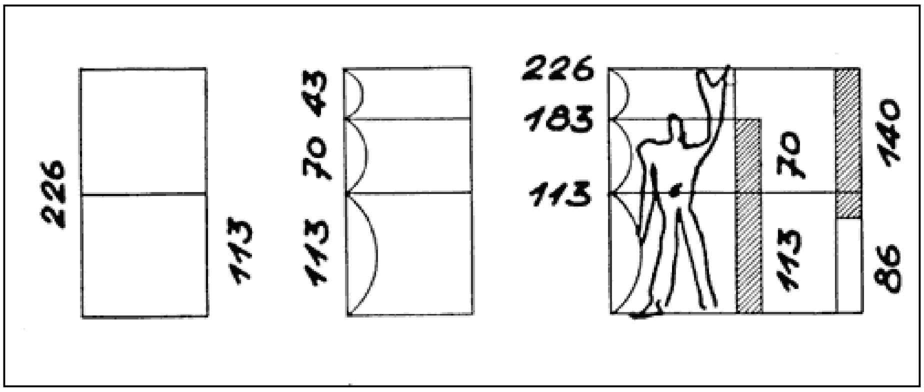


Figure 12: Le Corbusier’s Proportions Developed Based on the Human Body (Frings, 2002)

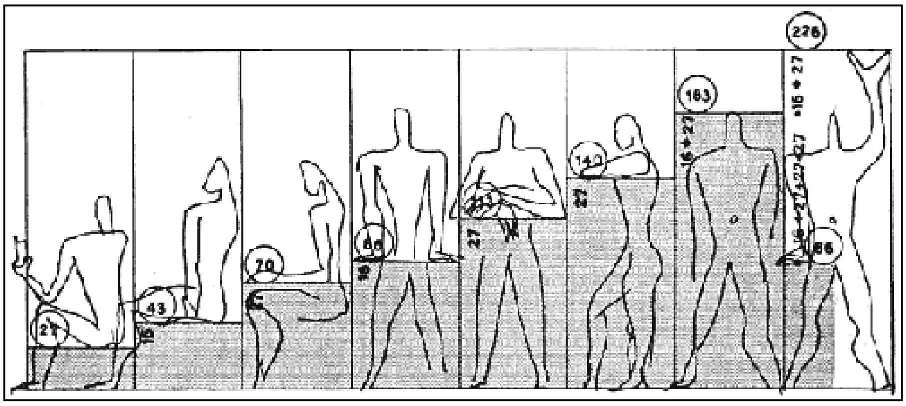


Figure 13: Le Corbusier’s Proportions Developed Based on the Human Body (Frings, 2002)

In the role of the navel as origin of the red series, Le Corbusier alludes to the tradition of the similar Vitruvian (See Section 3.2.2.1.1 The Classical Order) and the related approaches about the harmonies in the anthropocentric cosmos, are shown in a summing figure in the second book Modulor 2 (Frings, 2002) (See, Figure. 11).

Accordingly, the proportions seen in Figure 12-13 are transferred into space organization as; “27 cm. which defines the height of the arm chair while sitting; 43 cm defines the height of the chair; 70 cm defines the height of the table; 86 cm defines the height of the countertop; 113 cm defines the height of the bar; 140 cm defines the height of the armchair horizontal arm; 183 cm defines the human height; 226 cm is human height with arm lifted up (Radulescu, 2015). Relating the human body to Modulor, it enabled a “co-ordination” at every level from town planning to furniture” (Loach, 1998 and Martin, 2010). Correspondingly, these proportions are used in the design of buildings, interior spaces and facades. The drawing in Figure 14 shows the use of this system in the interior spaces.

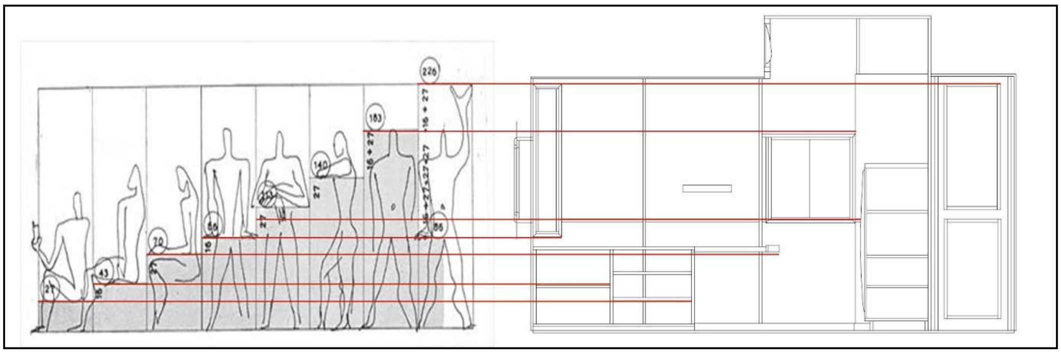


Figure 14: Interior Design Formed with Le Corbusier’s Proportions Developed Based on the Human Body (URL 14)

As mentioned by Le Corbusier, this proportion is rarely used by other architects (Le Corbusier, 1968). Le Corbusier used this system on many buildings. As mentioned by him, the most important one among them is the Unitéd’Habitation in Marseille (1945–52) a proportional demonstration of his Modulor system (See, Figure. 15). He used 15 measures of Modular to bring human scale and standard module of 226m (Modular Man’s Dimensions) to this huge building, which are 140 m’s long, 24 m’s wide and 70 m’s high (Radulescu, 2015).

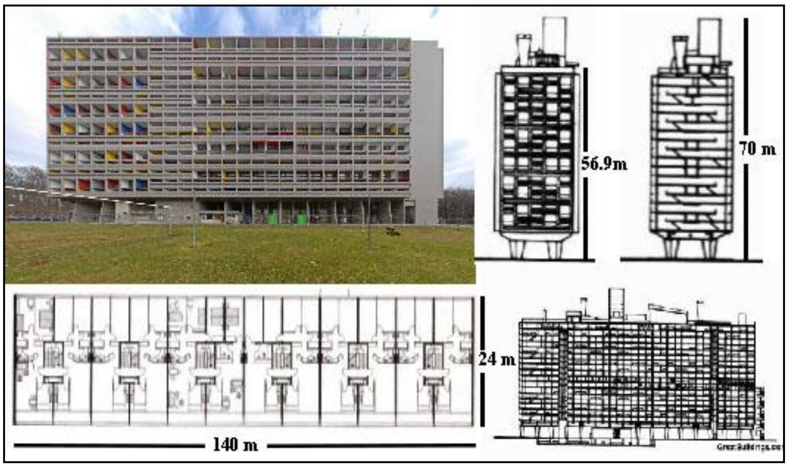


Figure 15: Unite d'Habitation Residential Block in Marseilles, Le Corbusier (URL 15)

3.2.2.1.4 The Ken

"Ken", a measurement unit, emerged in the second half of Japan Middle Age. Ken module, which was first used to show the spaces between columns, is used in house design (Ching, 2007, p.306).

Together with Ken, another module, the *tatami* (or the traditional Japanese floor mat), also had an impact on the design of Japanese spaces. A small side of a tatami is equal to the size(s) of ken and two kens are equal to the length of a tatami. The Japanese interior spaces are formed according to ken modules and the placement of tatamis. The number of tatamis is the indicator for the size of a room. (Radulescu, 2015). A ken module has the proportion of 1:2 and may form room layouts through the combination in different rotations of the rectangles (1:2) (see, Figure. 16) (Ching, 2007, p.307).

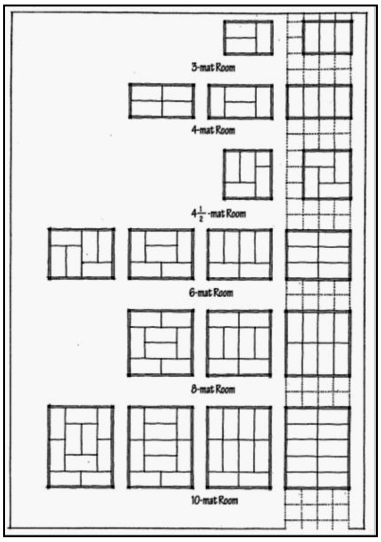


Figure 16: Traditional Japanese House and the Use of Ken Modules (Ching, 2007, p.307)

This system organizes the design in Japanese houses and agglutinative consecutive sequence of rooms from space to space (Ching, 2007) (See, Figure. 17-18).

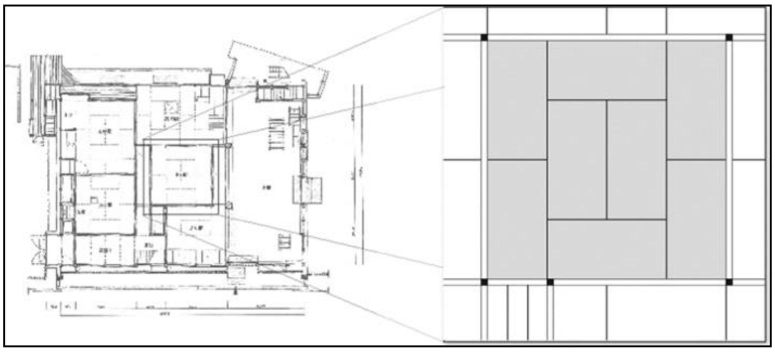


Figure 17: Traditional Japanese House and the Use of Ken Modules (URL 16)

Figure 18: Consecutive Order in Typical Japanese House (Radulescu, 2015)

3.2.2.1.5 Antropometric Proportion

Anthropometric proportion is based on the sizes and proportions of human body. The size and proportion of human body have an impact on the proportion of things such as tools we use, user work on, height and distance of things that we need to reach, sizes of furniture that we use to sit, work, eat and sleep (Ching, 2007, p.310). For example, the plan of Frederik's Hospital in Copenhagen, designed by Danish architect Nicolai Eigtvet, is formed by taking the hospital bed as the module (3x6 feet- 90x180 cm), which was placed in 180 cm (length of bed module) apart from other beds (Radulescu, 2015) (See. Figure 19).

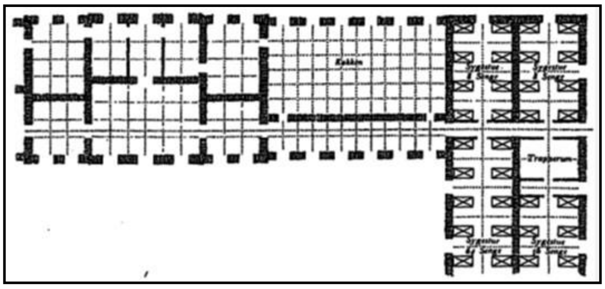


Figure 19: Frederik‘s Hospital in Copenhagen, Designed by Danish Architect Nicolai Eigtved (Radulescu, 2015)

3.2.2.1.6 Scale

Scale, which fixed proportion is used to determine the measurement and size, is a system identified in accordance with the size of a building compared with an average human dimension (Roth, 2000, p.99 and Ching, 2007, p.285).

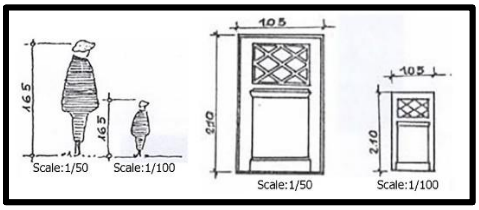


Figure 20: Scale in Architectural Drawings (URL 17)

Scale is categorized and assessed in two groups as Mechanical and Visual. Mechanical scale is the size and proportion of an object in accordance with generally acceptable standard or scale (Ching, 2007, p.313-314). In terms of architectural representation, scale is used to identify the proportion that determines the relation between the drawing and representation of drawing. For instance, the scale of an architectural drawing determines the size of building in the drawing compared with an actual object. Visual scale is the size or proportion of an element compared with the known or estimated other elements (Ching, 2007, p.313-314).

3.2.2.1.7 Golden Proportion (Golden Section - Golden Rectangle- Golden Mean) in Architecture

Golden proportion is a widely used proportion throughout the history in relation to architecture. Other names frequently used for or closely related to the golden proportion are; divine proportion, golden section (Latin: sectioaurea), Golden Rectangle or Golden mean (Crasmareanu and Hretcanu, 2008). It is denoted by the Greek letter “phi (Φ)”.

The explanations of the Golden Mean typically commence with a brief description of the Fibonacci sequence (Ostwald, 2000). Fibonacci sequence is the fact that if we add any two numbers in the sequence, we obtain the next term (Fischler, 2001).

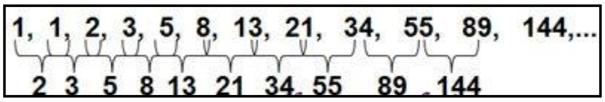


Figure 21: Fibonacci Sequence (URL 18)

The golden section proportion can be defined geometrically as a division of a segment into what Euclid termed “the mean and extreme proportion” (Ching, 2007). An equally simple definition, which is often paraphrased in various texts, is as follows. If the line AB is divided by a point C such that the proportion of the whole line AB to the longer segment, AC is equal to the proportion of the longer segment, AC to the smaller segment CB, then the proportion AB : AC (and also AC : CB) is known as the Golden Mean or Golden section (φ or phi). The Golden Mean is approximately equal to (1+√5)/2, or 1.618. (Oswald, 2000). (See, Figure. 22)

Figure 22: AB: AC (and also AC: CB) is Known as the Golden Mean or Golden Section (φ or phi). (Abbasoğlu Ermiyagil, 2015)

Golden proportion, in the form of golden rectangle, golden spiral, is used in different periods such as Egyptian, Renaissance, Islamic, Greek and Modern Architecture (See Appendix A).

In this framework, Golden rectangle is a rectangle with golden proportions on side proportions (AB: AC=AC: CB=1.618 (see, Figure. 23) and generally seen in building masses. Another characteristic of golden rectangle is that when a square is taken out within, the remaining rectangle still has a golden proportion and the side lengths of squares within are equal to the Fibonacci numbers (1,1,2,3,5,8,13,21) (see, Figure. 23) (Kimberling, 2002). By drawing an arch, each of the squares with a golden spiral is generated (see, Figure. 23) (Carafoli, 2009, p.246).

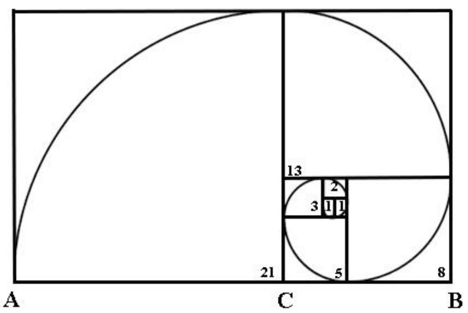


Figure 23: Golden Rectangle and Golden Spiral (URL 19)

Today it is still observed through different researches that golden proportion is used in facade and plans of buildings in architecture. In that perspective, the research conducted by Boussora and Mazouzis one of that revealing the use of golden proportion in Kaironuan Mosque (Boussora and Mazouz, 2004). Boussora and Mazouz emphasized this in “The use of the golden section in the Great Mosque at Kairouan” published in 2004 (Boussora and Mazouz, 2004). This article mentions that golden section can be tested on buildings in different systems besides two methods for analysis are examined in this study. Despite of different methods regarding this issue, the two methods by Boussora and Mazouz are dwelled upon since it is the newest study within this scope.

The first method consists of the division of a line into a golden section (see Figure. 24). This “starts by drawing a segment AB; then a rectangle with length AB; and width AB/2 is drawn. Then; a diagonal is drawn from A to the opposite corner D. Afterwards, the width BD is subtracted from the diagonal by drawing an arc, which has this width as its radius. The diagonal is then divided into two segments resulting from the intersection of this arc with the diagonal. The last step is to rotate the longer segment of this diagonal onto the adjacent long side, AB. The intersection point C subdivides this side so that the proportion is: AC: CB:: AB:AC=1:Φ:1:Φ^2::1:1:Φ” (Boussora and

Mazouz, 2004, p.11).

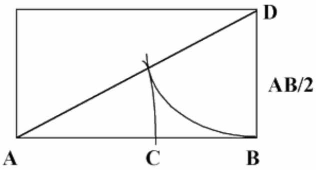


Figure 24: Construction of the Golden Section by Division (Boussora and Mazouz, 2004, pp.11)

Second method consists of generating a golden rectangle from a square (March, 2001). It has four steps; "as the first step is to draw a square having AB as a side then to divide AB in half after then to draw a diagonal from the middle of the side AB to the opposite corner and finally to swing this diagonal until it cuts the line AB at C. The golden rectangle generated will have AC as its length and its width will be equal to AB following the same method; a golden section progression will be obtained across the entire line AB. We will then have: AC:AB::AB:BC::BC:CD::BD:BC::Φ=1.618" (Boussora and Mazouz, 2004, p.12).

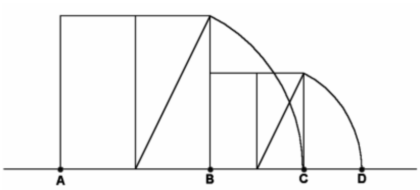


Figure 25: Construction of the Golden Section by Extension (Boussora and Mazouz, 2004, p.12)

3.2.2.1.8 Regulating Lines

If the diagonals of two different rectangles are parallel or perpendicular, it means that these two rectangles have similar proportions and the diagonals and lines that these elements are aligned are called Regulating Lines (Ching, 2007, p.290) (See, Figure. 26).

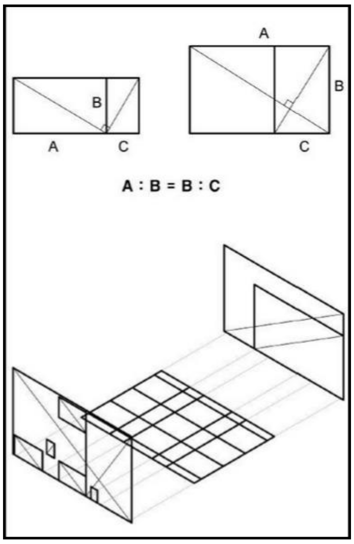


Figure 26: Formation of Regulating Lines (URL 20)

Regulating Lines is a satisfaction of a spiritual order, which leads to the pursuit of the indigenous and harmonious relations (Le Corbusier, 2007, p.75). Le Corbusier described these lines as a "necessity for order … a guarantee against wilfulness …a means to an end…" (Le Corbusier, 1971, p.60). He proposed that the regulating lines of forms (or the geometrical laws of any particular form) should be the basis for subsequent action. Once these geometrical laws are understood and the lines are drawn, various axes can be traced and the properties of forms (whether they are linear, or centroid, static or dynamic) can be detected (Baker, 1996, p.45).

The use of regulating lines to define the measurements for building elements such as "doors, windows, panels etc." can be exemplified with Le Corbusier (Le Corbusier, 2007, p.80 and Martin, 2010).

Le Corbusier used "Regulating lines", in many of his buildings. Villas Roche and Villa Garches are the most famous among them. In Figure 27, Villa Roches is shown with its regulating lines.

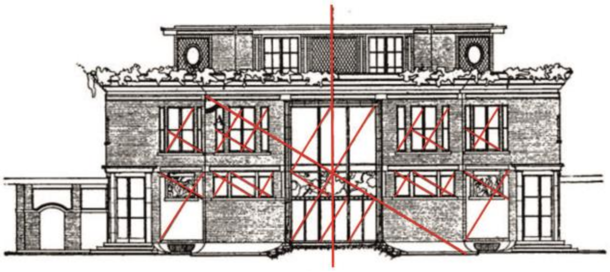


Figure 27: Villas La Roche, Le Corbusier (URL 21)

Regulating lines are used on the two facades of Villa Garches. Vertically used regulating lines are shown in Figure 28. As seen in Figure 28, the proportional sequences that describe the primary rectangular boundary of the villa are transverse sequence, 2:1:2:1:2; to arrange the formal elements of the two facades (Hildner, 1998).

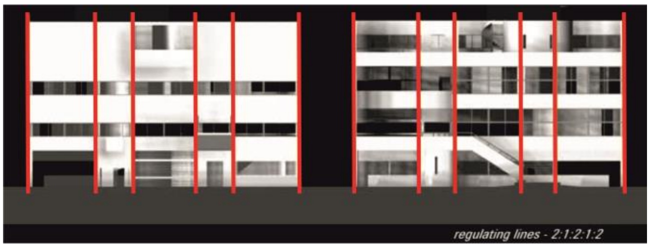


Figure 28: Regulating Lines on the Villa Garches, Le Corbusier (URL 22)

The subtle coordination of the pattern and the regulating lines show a detail at the garden facade. The inclination of the reeling of the stair to the garden had to have exactly the same inclination like the major diagonal line and the beginning of the reeling had to be in line with the pattern. To ensure this condition, Le Corbusier heightened the base of the stair (Wild, 1998).

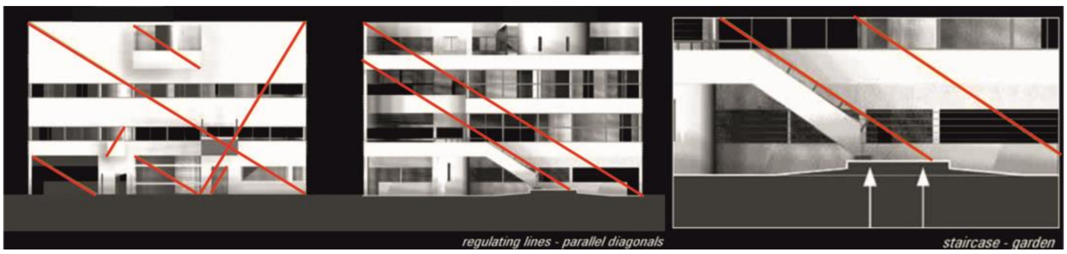


Figure 29: Regulating Lines on the Villa Garches (URL 23)

3.2.2.2 Mathematical Sequences in Architecture

"A sequence of numbers is a set of numbers arranged in some particular order, as when we count "1, 2, 3, 4, 5…." arrangements of this kind either of numbers, or days of the week, or students' position in an exam, or described in English using ordinal numbers, i.e. 'first', 'second' etc., and a thinking of a numerical sequence, we simply label the numbers in this ordinal fashion. Such activities occur very early in our mathematical development; indeed they begin with counting and number rhymes and games" (Hirst, 1995, p.106). The concept of sequences is also used in mathematics as index. Generally, an index is a number or other symbol that indicates the location of a variable in a list or array of numbers or other mathematical objects. This type of index is usually written as a subscript to the variable (Borowski and Borwein, 2002). According to different resources, sequences, as a significant subject of mathematics, are used in various areas. The best known sequence is the Fibonacci and DNA sequence. For example, Alfonso Architects have designed a church in Tampa, Florida using the Fibonacci sequence to generate the proportions (Warmann, 2010).

Figure 30: Church in Tampa, Florida, Designed by Alfonso Architects (URL 24)

Sequences are also observed in the Fibonocci' series, music and architecture and may be delivered through graphs. In architecture, sequences are found in shape grammar studies. In architecture, sequences are used for the writing of formations rules (Rıza, 2015).

3.2.2.3 Mathematical Pattern in Architecture

The concept of a pattern also extends to the solution of space where solutions to similar problems are related and define a single template that repeats with some variation every time such problem is solved. The underlying idea is to reuse information; either in repeating a unit to generate a two-dimensional tiling design, or in reusing the general solution to a class of differential equations (Salingaros, 2001).

In this perspective, the pattern is a group of two-dimensional or three-dimensional elements in an order and repetition. From the architectural aspect or on a building basis, the order of openings is even in a pattern. There are many examples from history until today such as historical floor tiles, wall tiles, and various mosque and building window layouts, decorations, authentic motifs… (Köseoğlu, 2015). For example, pattern of windows are used on the two facades of the new Academy of Fine Arts and Art Museum in Arts Campus at Umeå University, Sweden (See Figure 31).

Figure 31: The new Academy of Fine Arts and Art Museum in Arts Campus at Umeå University (URL 25)

There are many written references regarding the emphasis of relation between patterns and architecture, and definition of architectural language, pattern language at the urban and spatial scale. The most significant and known among such is the book written in 1977 by Alexander, Ishikawa, Silverstein which his associates called it “A Pattern Language Towns-Buildings-Construction”. An effort to define patterns in solution space is conducted by collecting architectural and urban solutions into the research (Alexandre et. al., 1977). The approach of “mapping” is used to make patterns meaningful in mathematics and ensure their interpretation; and a set of patterns (numbers-elements) are grouped and matched into rational statements (Rıza, 2015).

3.2.2.4 Geometry in Architecture

As stated by Reichenbach, geometry is established as a closed and complete system, the concepts and relations of which are accepted to correlate well with physical space (Reichenbach, 1958). As the basic necessity is formed around a rational, universal, objective ground, mathematics and geometry are seen to be the most essential references both for architectural theories and architectural practice (Koç, 2008).

In that respect, architecture has been using proportional systems and geometry to create specific forms or restrict the created forms throughout history. The aim of using such system is to ensure a harmony between the elements of building and create a unit feeling through “the principle of what making beautiful” (Timuçin, 1993). In this framework, starting from the Middle Age, there have been a strong grasp of geometry, which enabled them to construct the great cathedrals according to mathematical principles (Salingaros, 2001). Modern architecture continues to use geometry. For instance, one of the architects, who used geometry in architecture, is Frank Lloyd Wright. Wright used geometry as a formative idea with the concepts of plane and solid geometry determining the built form (Keane and Keane, 2005, p.52). Figure 32 shows the Krause house in Kirkwood, Missouri, 1952 plan and elevation designed by Wright who used the basic geometry.

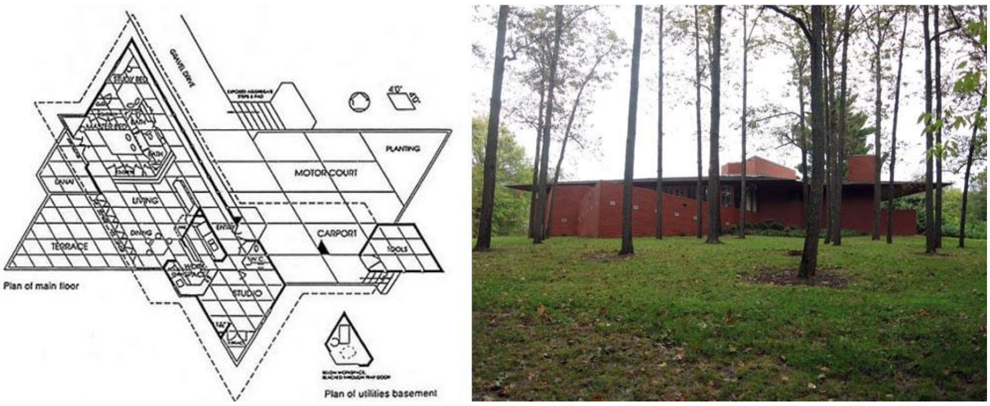


Figure 32: Frank Llyod Wright, Krause House in Kirkwood, Missouri, 1952 Plan (URL 26) and Elevation (URL 27)

3.3.3 Relationship between Mathematics and Architecture

The relation between mathematics and architecture is a long lasting subject in architectural tradition (Padovan, 1999). Although architecture's use of mathematical entities and equations is accepted to date back to Babylonian or Egyptian settings by some mathematicians (Kline, 1953). In this study, the historical outline of architecture's relation with mathematics is focused on starting with Greeks since a theoretical background was first given by them. Vitruvius's theory of proportion in his "Ten Books on Architecture" is taken for granted as the initial attempt in theorization of architecture has a relation with mathematics (Padovan, 1999).

Mathematics is a discipline that is formed of numbers, proportions and intervals. However, the belief in mathematically ruled design is accepted to have its initial realization and reflection in architecture in the built examples of Greek temples (Vitruvius, 1960).

In this study, the relations between Mathematics and architecture are established in relation to the Rankscale method that has and the study is focused on the related concepts and sub-concepts of the Mathematics, which affect the method formations in detail.

The relationship between mathematical concepts and architectural elements can be seen in Table 14 that is developed by the author based on Yürekli's Rankscale. According to Table 14, units/number/sign/patterns, which are the smallest elements of mathematics discipline, are used in the first stage. In this stage, architectural elements which can be defined as geometric forms are mapped with the use of intervals and proportions. Units, numbers, patterns and geometric forms can be used in identification of facade elements used in architecture discipline with the use of proportions and intervals. In this stage, proportions used in mathematics disciplines are of crucial importance since they enable the identification of geometric forms used in architecture. A relationship is established between two disciplines based on these concepts.

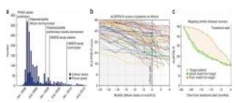
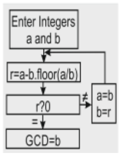
In the second stage, set/sequence concepts used in mathematics discipline are mapped with element groups used in architecture. At this point, types determined as per the proportions of elements in the first stage are grouped. This grouping is the internal grouping of elements with same functions. At this point, determination of grouping of elements, sequence (door sequence type, window sequence type, etc.) and sets (door set type, window set type, etc.) are formed with the help of set/sequence concepts used in mathematics discipline.

In the third stage, facade elements with different functions on the same facade can be mapped with mapping method used in mathematics discipline. "The approach of “mapping” is used to make patterns meaningful in mathematics and ensure their interpretation; and a set of patterns (numbers-elements) are grouped and matched into rational statements (Rıza, 2015)”. In this regard, mapping method and sequences formed by the use of this method dominate the formation of aggregation of elements with different types in architectural facade formations. Building facades in architecture are formed by mapping/sequence concepts used in mathematics discipline.

In the fourth stage, algorithms used in mathematics discipline have formed. “An algorithm which is a well-defined computational procedure that takes some value, or set of values as input and produce some value or set of values as output. An algorithm is thus a sequence of computational steps that transform the input into the output” (German, Leiserson, Rivest, Stein, 2003). As a result of mapping with the selection of algorithm, the input directs the evaluation of sequences and the result. In this respect, architectural elements in architecture discipline, facade elements determined and facades formed are considered as input. The input is aggregated and buildings are formed as output.

In the last stage, outcome is obtained as a result of algorithms and environment composed of buildings and spaces in between is formed in architecture with aggregation of all elements. In line with this, the relationship between mathematics concepts and architectural elements can be seen on Table 14 that is developed by Rankscale method.

Table 14: Relationship between Concepts and Sub-Concepts of Mathematics and Architecture

Mathematics	Architecture
Results GCD=5 x=12/5 	Environment Composed of Buildings and Spaces in Between
Algorithm  -2x+5=3x-7 x=? -2x+2x+5=3x+2x-7 5=5x-7 5+7=5x-7+7 1/5*12=1/5*5x x=12/5	Building
Mapping/Sequences 2, 4, 6 → 1, 3, 5 Sequences=2,1,4,3, 6,5	Building Facade
Sets/Sequences A= 2,4,6,8,10 B= 1,3,5,7,9 2 4 6 8 10 Even Numbers 1 3 5 7 9 Odd Numbers	Group of Building Elements
Elements (Number/Sign/ Unit/Pattern) (Geometric Form/Proportion/Interval)	Building Elements

At the first stage, the tools/concepts used in mathematics discipline is taken as the main instruments relatively with the developed rankscale table. With the help of the determined tools architectural elements are coded. In the second and third stages;

Sequential composition of the coded elements are developed. In the fourth stage; developed sequences are taken as inputs in order to achieve outputs. At the last stage overall results are determined in accordance with the achieved outputs.

3.3 Music and Architecture

The third discipline under the scope of this study is music. The definition of music, its evolution and relation with architecture is examined in three phases. The first phase is concentrated on the characteristics of music discipline and how it is related with architecture. The second phase is related with the historical development of music and its intersection throughout its development (Appendix B). The last phase deals with the main elements of music discipline and its relation to architecture.

The discipline of music is explained differently in dictionaries and researches of various philosophers and scientists. One of the explanations noted that “music is the universal language; we are told the language of emotion” (Alperson, 1987, p.3). According to Sakar, music is “the art of delivering emotions and ideas through voices” (Sakar, 2009, p.338). As for Babacan, music is a vital tool for expressing the emotions such as joy, sadness etc.; knowing different cultures and making social and cultural communication as well as it is a cultural resource and a scientific domain (Babacan, 2011). The dictionary meaning of music is “an art of sound in time that expresses ideas and emotions’ insignificant forms through the elements of rhythm, melody, harmony, and colour” (Music, 2015). According to this explanation, music has a universal language for the expression of emotions, ideas and it is an art where sounds are used in the formation of these expressions. Through the sounds used in music, it becomes a scientific art, yet art is important in expressing the cultures and it can be delivered differently in different cultures. Music uses elements as rhythm, colour, harmony and melody aims to transfer emotions. Therefore, music becomes a communication tool and provides communication through the use of elements within (sound, melody, rhythm, harmony etc.).

Music and architecture have several characteristics in common throughout the history; thus, these links have always reaffirmed that music and architecture are analogous art forms that only diverge in their object of study.

In the 18th century, the German philosopher Johann Wolfgang von Goethe, and Friedrich von Schelling (1775-1854) described architecture as “frozen music” (Variego, 2011 and Hasol, 2008). From the statements of these scientists, it is possible to interpret that there are structural similarities between architecture and music. In this context, the perception is that architecture reflects the static state of harmonies in music. It is a known fact that the notes and rhythms in music have continuity. This movement of proportions, rhythms, and notes is realized in the form of a stable design product.

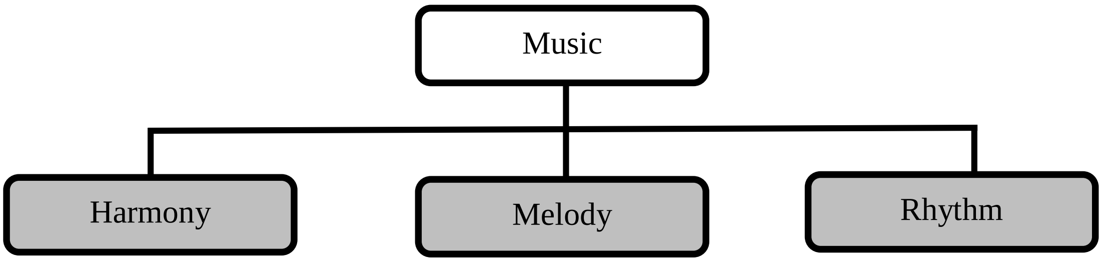
The study conducted by Beirharz explains the relation between music and architecture as follows: “To design a space in architecture and in music are both three dimensional practices. While music operates predominantly in the dimensions of pitch/register, duration/rhythm and time, architectural design primarily determines the three geometric dimensions. Furthermore, parameters of condition such as colour, dynamic intensity (music) and texture are applied to both disciplines and restrictions are also moderate in stochastic design processes – performability, construction materials, building regulations, gravity, cost, etc.” (Beilharz, 2003).

Music and architecture are similar in terms of their units (elements) and characteristics. The units in both disciplines can be transferred to other disciplines as well. Thus, shape (contour), geometry, proportion and sequence are characteristics in architecture from extra-musical practice or scientific disciplines applied to generative systems by complexist and composers (Beilharz, 2003). Like architecture, music relies on mathematical proportions (Symonds, 2004). The use of proportions in the nature such as measurements of the human body or musical interval in the expression of harmony in the universe became very common in the field of art and architecture (Wittkower, 1971). Jay Kappraff provides an overview of the way in which musical proportions are used to shape architectural form (Oswald and Williams, 2015, p.16). Radoslav Zuk describes a relevant proportional system derived from consonant musical intervals and traces its evolution. Zuk argues that for such proportional relationships between architecture and music to be meaningful, they must incorporate the three-dimensional properties of architecture, as well as the more common two-dimensional relationships found in plans and elevations (Oswald and Williams, 2015, p.16).

3.3.1 Main Elements of Music and Relation with Architecture Discipline

The main elements of music are rhythm, melody and harmony (Megeb, 2007). Two of these musical elements (rhythm-harmony) are seen often, and it is found that there is a direct link with architecture. Thus, these main elements are included in this study. Melody, which does not have a direct relation with architecture, is confronted as a subtitle formed by rhythm and harmony. Table 15 underlines the musical elements given under this section.

Table 15: Musical Elements



3.3.1.1 Musical Harmony in Architecture

Vitruvius, who conducted the first and in-depth researches concerning architecture, considers the harmony as a repetition of a module where parts of building have an interrelation in simple numeric proportions. This idea is originated from the human body (Altan, 1993, p.75-76). Harmony in music is a musical pattern generating the consecutive link of accords (the simultaneous playing at least two sounds) (Megep, 2007). There is a harmony in the essence of both approaches. The harmony created by the aural movement of sounds in music is the harmony aimed to be provided through the repetition of visual architectural elements and their inter-relations.

In order to generate a harmony, "musical proportion formed by the musical intervals is used and architects aim to reflect this to the building formations. The proportions became architectural rules for orchestrating a building's individual measures and harmonizing the parts with the whole" (Fletcher, 2000, p.73-85).

It is stressed under the section describing the historical development of music (See, Appendix B), the musical harmonic proportions used in architecture are; 1:1(square unit), 1:2(octave-double sequare), 1:3(doubled sesquialtertia-triple), 2:3(fifth-sesquilalteria fifth diapente), 3:4(fourth-sesqutertia fourths diastessaron), 4:9(ninth-sesquialtera doubled), 9:16(sesquialtertia doubled), 3:8(doubled sesquitertia), 1:4

(quadruple), 5:4(third), 4:3, 5:3(sixth), and numbers used in musical consonance in spatial proportions and proportions in their designs (Fletcher, 2000, p.73-85). For example, in Villa Garches by Le Corbusier can be a good example. 1:2 and 2:3 proportions are used in the plan and facade organizations (see, Figure. 33).

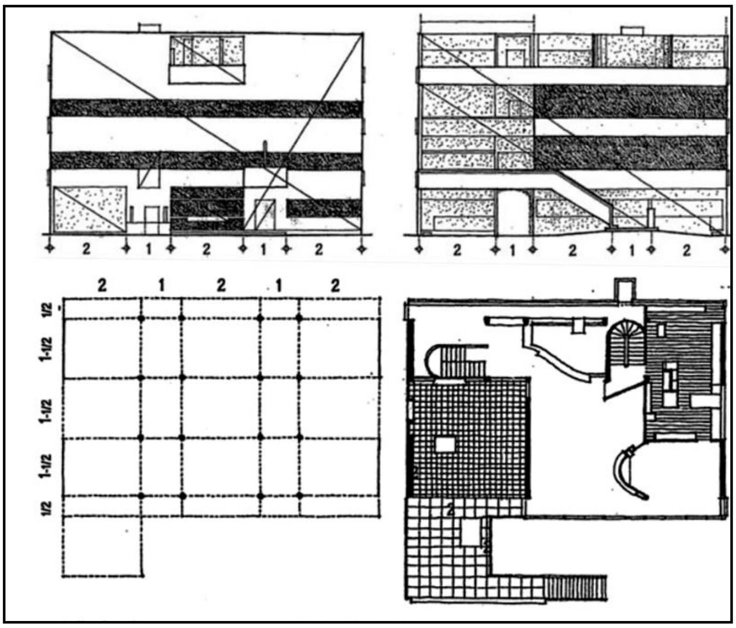


Figure 33: Harmony on Le Corbusier Villa Garches Building (URL 28)

3.3.1.2 Musical Rhythm in Architecture

Rhythm used in music means dividing a musical work into equal or in different sections within a known time period. Rhythm beats follow each other in the way to form an order. These beats are shown with notes in music (Megeb, 2007, p.6). The interpretation of rhythm in architecture can be seen in the interview conducted by Henriksen that was published in MSW Board of Architects. As can be seen from Figure 34, this publication reviews on the basis of a housing development are designed by Valjakka in 1985. The housing is arranged into an A BBB C rhythm where 'A' is a grouping of four repeating units to balance the bulk of 'C' (Henriksen, 1996). This emphasizes the meaning relation of rhythm in both disciplines.

Figure 34: Housing Designed by Eero Valjakka, 1995 (Henriksen, 1996)

Xenakis used the music rhythm and tried to reflect these to the Le Corbusier's building facade (Sterken, 2007). Xenakis created a musical rhythm on the building facade of Monastery of the Le Tourette through the repetition of patterns formed in accordance with the width of windows (McEwen, 2009).

However, "this remained valid until he had withdrawn himself from the notion of rhythm and began to utilise densities" (Sterken 2007). "This created undulations rather than rhythm and sliding between time bases rather than strict delineation. In this way, it began to increase the complexity of the work and when layered created a more complex polyphony, which was untied from its musical heritage, and more closely linked to physics" (Sterken 2007 and McEwen, 2009).

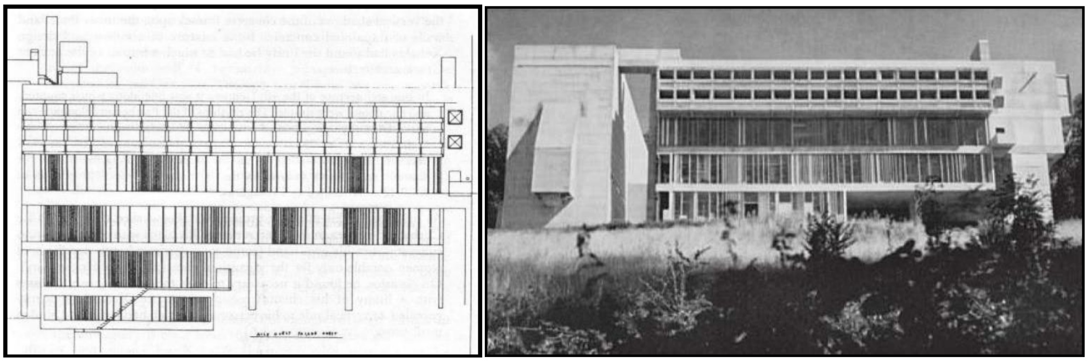


Figure 35: La Tourette Rhitmic Pattern on Drawing (McEwen, 2009) and Photo (Sterken 2007)

Caxia Forum building by Herzog & De Meuron covered in Jenck's study is an example for the use of rhythm in architecture. In this building, strong horizontal contrasts divide the collage into three basic voices or four or five melodies. Rusted cast-iron crowns the top, the middle is brick, and the bottom is a black, voided ground floor, which amounts to a violent Beethoven silence. The basic A/b bay rhythm unifies the volumes and blank windows vertically, and the volumes at the top amplify this vertical emphasis (Jencks, 2013). In Figure 36, A/b rhythm is shown on the block. The building has a rhythm, which gives a perception as if the facade is compatible vertically. While the building horizontally gives some basic melodic lines, vertical reading reveals both harmony and dissonance. As it is possible to see this on the building, the rhythm of AbAbAbAbAboccurs through the repetition of these basic harmonies (see, Figure. 36) (Jencks, 2013).

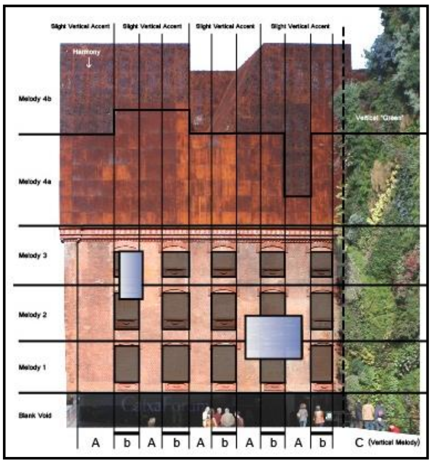


Figure 36: Herzog & De Meuron's Caixa Forum, Madrid, 2003-2008. (Jencks, 2013)

3.3.2 Interpretation of Musical Signs and Concepts in Architecture

The evolution of music discipline throughout its history is strongly connected to architecture discipline. Therefore, written sources are studied and relevant evolution periods are examined under the scope of this research (See, Appendix B). The relation between music and architecture in accordance with main elements of music harmony, rhythm and the signs that formed music used these two disciplines relations. In that regards, the locations of musical signs, emotional reflections of these signs are transferred to architecture and interpreted in Xeannis& Le Corbusier and Daniel Libeskind and Peter Cook studies.

Le Corbusier, developed his own musical proportion system. He used proportion system of Leon Batista Alberti while developing this musical proportion system. In this proportion system, used the Modulor (Kappraff, 2015, p.569). He used the golden section in his work of Modulor and given several references to the music as well (Sterken, 2007). The Modulor was “a tool of linear or optical measures, similar to musical script” (Le Corbusier, 2004, p.17 and Cohen, 2014). In that respect, Le Corbusier worked with a significant architect, musician and researcher Iannis Xenakis for his Modulor approach. Xenakis experimented similar numerical proportions in musical composition (Sterken, 2007). Xenakis developed rhythmic patterns through binding numeric proportions in his musical compositions and used the relevant pattern on the facade of the Monastery of La Tourette (Sterken, 2007, p.34). The pattern formation and transfer on facade of the Monastery of La Tourette buildings is reviewed in terms of expression of musical elements.

Libeskind performed his works by identifying architecture with anatol music. Mases & Aaron by Arnold Schoenberg are performed in Jewish Museum. Moreover, Libeskind believed in the definition of Kurt W. Foster as (Libeskind, 1991) “spatial music, a kaleidoscopic collection of lines and symbols that represent the same double axial structure of sounds; melody and/or chords, horizontal and/or vertical structure, regulated by the common principle of liberal variation” and reflected this in this

Chamber works. In this project, “architect has a vision for the application of the philosophical effect of a certain musical symphony, which he transferred to actual lines and led him to successful design. If we follow one string of architect‘s thoughts in putting his own ideas of museum’s design, we shall find that the main idea which was created due to Arnold Schoenberg‘s, Moses & Aaron an allegorical opera whose subject is according to the writer and pianist Charles Rosen” (Dewidar, El Gohary, Aly and Salama, 2015 and Tzonis&Lefaivre, 2003). Therefore, he put a zigzag line to imitate the formation of melodies and the sequence of raising waves in the unfinished opera (Tzonis and Lefaivre, 2003). He was particularly interested in the sudden break of the music in the third act of the operetta, after two acts of fairly complex music, the music abruptly stops in the second act, allowing the silence to act as a figural element just as the music. Libeskind says that the unwritten third act is actually one of silence, allowing sounds from the audience to come into play. Whether Schoenberg actually intended that it is highly questionable, but his contemporary John Cage "composed" 4'33" based on that idea; not letting the musicians play their instruments for 4 and a half minutes, allowing the sounds from the audience to compose itself into the piece. Libeskind says that his "void" spaces within the museum are placed to achieve the same effect; a disorienting phase to allow the visitor to become a participant in a space allowing contemplation and reflection (Riad, 2009, p.89).

Peter Cook, who established a relation between music and architecture, applied the musical formations to the urban scale and architectural scale in his approach. For example, Peter Cook tried to interpret the formation that combines notes on stave and supporting markings regarding the visual correlation of architecture and music elements. (Capanna, 2009)

According to this approach, Ernest Bloch's concert for violin into composition of the plan of an ideal city takes part on a stave. In this adaptation, Cook shows the notes that are located on stave become towers, the stave becomes a street, and the supporting markings become walls (Cook, 1993 and Capanna 2009). The notes on the stave represent the planimetric position of tall cylindrical skyscrapers while the musical lines (stave) are the urban highways of the "great march" (Cook, 1985 and Capanna 2009)

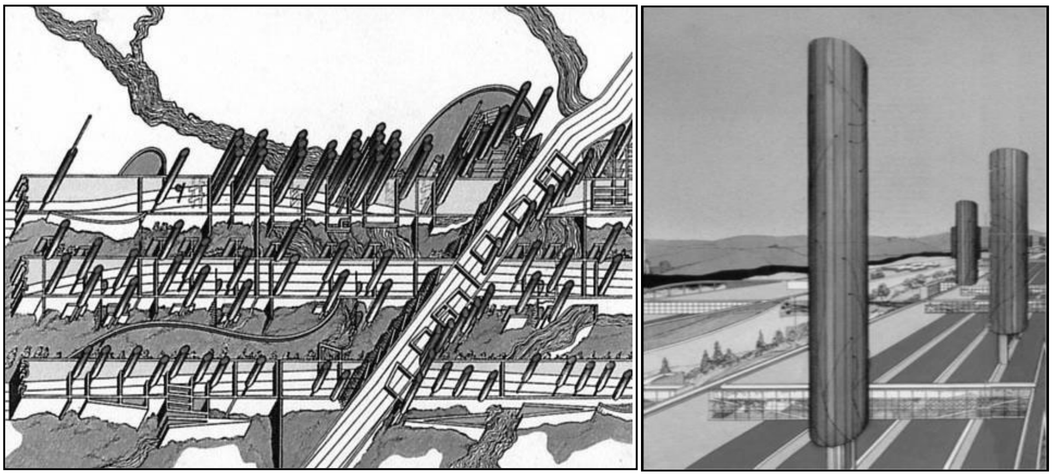


Figure 37: Bloch City with Towers Arranged on Musical Staffs and Street View of Block City (Cook, 1985 and Capanna 2009)

Figure 38: The Measures of the Concerto by Bloch that Provided the Layout for Peter Cook's Bloch City (Cook, 1985 and Capanna 2009)

Another work done by Peter Cook is the concrete reality of Steven Holl's construction in Texas that interprets the continuous and discontinuous tonal properties of the horizontal and vertical structures (Capanna, 2009, p.265). In this work, Cook interprets

the increases of voices on buildings. In accordance with that, he transfers improvement notes on the stave related with the tones, (p: piano-soft, mp: mezzo piano - medium soft, mf: mezzoforte-medium loud, f: forte-loud, ff: fortissimo-very loud, and <: crescendo-gradually getting louder, fff: fortississimo –very very loud) rests between notes in the structure as it can be seen from the stave by using the supporting marks.
In this work of Peter Cook, he used The Texas Stretto House which he condenses the temporal and spatial scansion of one of Bèla Bartòk's most singular concerts, "Music for String Instruments, Percussions and Celesta" (Bartòk 1937 and Capanna, 2009) (see, Figure. 37-38). Bèla Bartòk's most singular concerts that he used focused on a specific parts consist of different sentence/term/period and motifs of the, "Music for String Instruments, Percussions and Celesta" (Capanna, 2009, p.266). The parts he took corresponds to the chapters in music.

He correlates the interpretation of facades with the music intervals, the "distances" between one note and another – corresponding to the measure of the geometric relationships that run between the rectangles set in the windows. He stressed out that on both the ground and upper floors, 21+13 feet musical scales are used and those scales are the rates used in the series of Fibonacci. (Capanna, 2009, p.266).

He correlates the roof formations and heights of the buildings with the concept of note and numbers of Fibonacci and he interpreted them on the stave. As the stave changes, it can be seen that sounds, which increase, reflect the height of the buildings in architecture. Related with the tones, Mark of pp, which is used at the expressions of the nuances, means Pianissimo (very low) (see, Figure. 39) and increase line (<) means the voice at that point will increase (Megeb, 2007). He defines this formation as:

"The 89 measures in the first movement are divided in two golden segments: from the gradual crescendo, from the pianissimo in the beginning of the composition reaches the fortissimo apex at the end of bar 55, to the diminuendo which leads to pianissimo after the last 34 bars, to the more internal subdivision in golden measures of the timbered pushing and releasing the soft pedal, executed in decreasing progression; bars 34-21, 21-13, 13-8.4" (Capanna, 2009, p.266).

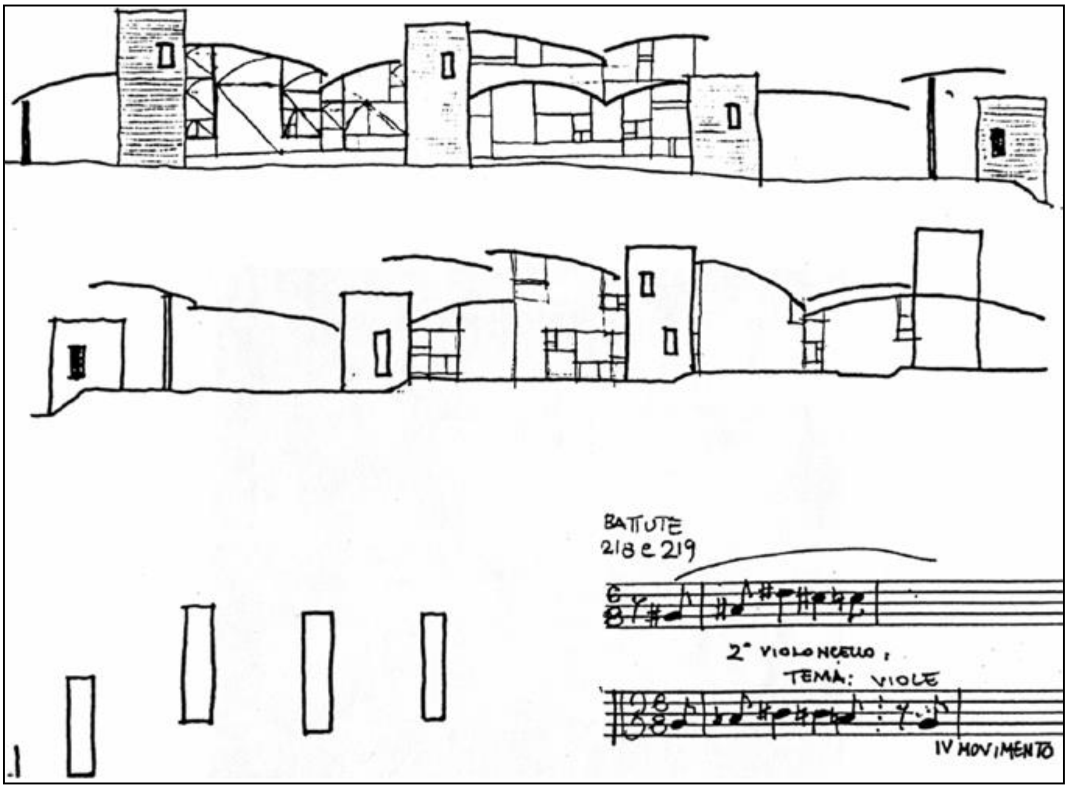


Figure 39: Comparison of Bartòk's Specular Composition and Holl's Stretto House (Capanna, 2009)

Consequently, in the light of these developments, harmony and rhythm, as the main elements of music, are used in similar and different forms within architecture. Rhythm and harmony covered by two disciplines are formed by the combination of signs (units-note) within. Thus, the rhythm and melody formation in music is realized by the combination of note, motif, sentence/period/term and chapters. Moreover, these concepts form composition (song) too. Architecture, on the other hand, uses its own elements and shapes to form architectural compositions.

Table 16: Terminological Relation between Music-Architecture

Music		Architecture
Composition (Song)	→	Environment Composed of Buildings and Spaces in Between
Chapter	→	Building
Sentence/Term/Period	→	Building Facade
Motif	→	Group of Building Elements
Note/Signs/Units	→	Building Element

Although there are different explanations for the concepts comprising rhythm and harmony, they can be explained in such definitions: A note is a sign to indicate the sounds and their periods (Megeb, 2007, p.8). Motif is comprised of a couple of notes including a rhythmic pattern that generates motif and is easily defined (Say, 2002, p.354). A sentence is the smallest part of a song arising from motif, creating a melodic, harmonic and rhythmic movement (Say, 2002, p.115). The part of a song generally comprised of eight scales and covering two musical sentences is called period (Say, 2002, p.164). Chapter is the combination of sentence, term and periods. The composition is transformation of all melodies into songs (Erkan Dağlı, personal communication, 12 August 2015). Nuance shows the strength or lightness on sounds during the performance of a song. The terms are shown in terms of abbreviations on notes. Tones are the rules of the sounds to formations of the songs (Megeb, 2007, p.25). These are located inside the motifs, sentence/period/term and chapters to form composition (song). All these terms make sense from their location on stave. Stave is the form composed of five parallel horizontal lines with four equal spaces, and used in order to write notes (Megeb, 2007, p.8).The sentence in music is the combination of melody and period while motif is the combination of notes with organizing signs.

3.4 Quadruple Intersection of the Disciplines; Linguistic & Mathematic & Music & Architecture

There is a lot of information about the dual interactions of linguistics-architecture, mathematics-architecture, and the music-architecture within the historical process until today. According to existing dual relationship between the architecture and the other mentioned disciplines, this thesis tried to find out strong relationships amongst four different disciplines.

Accordingly, firstly keywords and concepts between the three disciplines which was used related to the subject mentioned in the previous parts are identified. In line with this, dual relations of these disciplines linguistics –architecture (Table 11), mathematics-architecture (Table 14), and music-architecture (Table 16) are established.

In this stage, keywords and concepts used in the four disciplines are aggregated based on Rankscale method. In this regard, relations of the four disciplines are clarified to form the inputs of the method in Table 17.

Table 17: Linguistic, Architecture, Mathematics and Music Rankscale Keywords and Concepts relations

Rankscale	Steps	Linguistics	Architecture	Mathematic	Music
	Step V	**Composition** John and Bill are two school friends. They are play a game read a book together............ ....John thinks that Bill is read the book. But, John did not buy the books.	**Environment Composed of Buildings and Spaces in Between**	**Result** GCD=5 x=12/5 URL 5	**Composition (Songs)**
	Step IV	**Paragraph** John thinks that Bill is read the book. But, John did not buy the books.	**Building**	**Algorithm** -2x+5=3x-7 x=? -2x+2x+5=3x+2x-7 5=5x-7 5+7=5x-7+7 1/5*12=1/5*5x x=12/5	**Chapter**
	Step III	**Sentence** John thinks that Bill is read the book.	**Building Facade**	**Mapping- Sequences** 2 4 6 — 1 3 5 Sequences=2,1,4,3, 6,5	**Sentence/Term/Period**
	Step II	**Group of Word** John Bill (Subjects) Read Think Angry (Verbs)	**Group of Building Elements** Doors Windows	**Sets-Sequences** A={2,4,6,8,10} B={1,3,5,7,9} Even Numbers Odd Numbers	**Motif**
	Step I	**Words /Units** (Book, John, Bill)	**Building Elements (Units)**	**Elements** (Numbers/Signs/ Units/Geometric Forms/Proportions/Intervals) (1,2,3,) (-,*,/,+) , (a,b,c,d)	**Note/ Signs/Units**

Therefore, until the formation of composition from the smallest part of the Rankscale is used in linguistics, this quadruple relation is formed in the shape of improvement approach incrementally (See Table 17).

In this regard, the first step includes the smallest modules of four disciplines such as word in linguistics, notes in music, and elements in mathematics match with the building elements of the architecture. At the second step, group of words in linguistics, motif in music, sets and sequences in mathematics are used in the same expression of building elements of the architecture. At the third step, sentence in linguistics is formed in equivalent sentence/term/ period in music, mapping in mathematics and building facades in architecture comes. The fourth step includes paragraph in linguistics, chapters in music, algorithm in mathematics matches with all components of the building in architecture. At the fifth step, the composition is formed with the combination of sentences in linguistics, composition (song) is formed with the combination of chapters in music, results of algorithm are identified (numbers, graphs etc.) and the environment composed of buildings and spaces in between in architecture.

Consequently, concepts and sub concepts used in linguistics, mathematics and music disciplines are determined as a result of the researches conducted and the relations between concepts used in these disciplines and concepts used in architecture discipline are associated based on the Rankscale method. As a result of sources studied, it is seen that various sub concepts of different disciplines are used in the formation process. In this regard, taxonomy, main concepts and sub concepts have provided input for the development of analytical reading method. (See, Table 18).

Table 18: Linguistics, Mathematics, Musics, Concepts and Sub-Concepts

Disciplines	**Concepts**	**Sub-Concepts**			
Linguistics	**Words /Signs Elements /Unit**	Vocabulary			
	Group of Words	Vocabulary			
	Sentence	Grammar- Vocabulary and Grammar Rules- Syntax			
	Paragraph	Grammar- Vocabulary and Grammar Rules -Syntax			
	Composition	Grammar- Vocabulary and Grammar Rules- Syntax			
Mathematics	**Number Sign Units Pattern**	Propotion Intervals Geometry	Palladio's	Room Proportion:	1:1
					5:4
					4:3
					3:2
					5:3
					1:2
			Alberti 's	Proportions	2:3
					4:3
					5:4
					8:5
					5:3
					3:4
					2:3
					9:5
					15:8
					3:2
					3:18
					1:4
					9:16
					4:9
					1:1
					1:3
			Serlio's	Proportion	1:2:3
			Golden Proportion	Golden Mean	1.618
				Fibonacci Number/Sequence	1,1,2,3,5,8,13,21
	Sets/ Sequences	Each Unit/Elements Set-Sequence			Door: {D1(1:1), D2 (1:1.5) ,D3 (1:2) … } Window:{I1(1:1), I2 (1:1,5) , I3(1:2) ….} Height: {H1 (0-200) ,H2 (201-400) ,H3(401-600)}
	Mapping/ Sequence	Group of unit/Elements Sequence on Each Building Facade			BF1=D1+I1+H5…… BF2=D2+I3+H1…..etc.
	Algorithmn	Formation Diagram(Input-Output) (Environment Composed of Buildings and Spaces in Between)			Algorithmn 1= D2+I3+H1…..etc. Algorithmn 2= D2+I3+H1…..etc.
	Results	Squares			R= F1+F2+F3+F4
Music	**Note/Signs/ Units**	Staff, Rest, Scale, Tones, Rhythmn, Nuance			
	Motif	Melody Harmony Rhythmn	Musical Harmonic Proportions	Square Unit	1:1
	Sentence Term Period	Melody Harmony Rhythmn		Octave(Double Square)	1:2
	Chapter	Melody Harmony Rhythmn		Double Sesquilaterta Triple	1:3
	Composition Songs	Melody Harmony Rhythmn		Fifth-Sesquilatertia, Fifth Diapente	2:3
				Fourth Sesqutertia Fourths Diastessaron	3:4
				Ninth Sesquialtertia Doubled	4.3:9
				Sesquialtertia Doubled	9:16
				Double Sesquiltertia	3:8
				Quadruple	1:4
				Third	5:4
				Diatesseron Fourth	4:3
				Sixth	5:3

Chapter 4

DIFFERENT ANALYSIS METHODS USED IN ARCHITECTURE

In this study, it is focused on different analysis methods, which are used in architecture and related with the formations of the method which has been developed by the author. These methods are related with mathematics and linguistics, which are used in analysis of architecture. Besides, author searched for the musical analysis methods, however did not find any methods, which are directly related with architecture. Music has an interpretable approach and its analysis is conducted in accordance with the above mentioned determinations of the relationships between architecture and music.

In that regard related with the mathematics it is founded out that the space syntax and BÇS-FIS–Fuzzy Inference System one the main models that are used in analysis of architecture. Main interest of space syntax is the relation between human beings and their inhabited spaces. It is believed that distinctive characteristics of societies exist within spatial systems, and their knowledge is conveyed through space itself, and through the organization of spaces (Dursun and Saglamer, 2003, Dursun, 2007). Space syntax's aim is to analyze the space settlements along with the use of transportation, and social configurations. (Hillier and Hanson, 1987, p. 197-199, Hillier, Hanson and Peponis 1987, pp. 217-231). There are different computer aided analysis methods used in the space syntax analysis method. Those are; Convex Map and Axial Map (Gündoğdu, 2014), Visibility Graph and Deptmap Analysis (O'Sullivan and Turner, 2001, Turner, 2001, Turner et.al. 2001, Hillier, 2003), Justified Access Graph (Cansu, 2008).

One of the other methods related with the mathematics and used in architectural analysis is BÇS-FIS–Fuzzy Inference System, The model proposed by Arabacıoğlu different than other space analysis software and models, presents a new point of view to the tools of space analysis moving from the reality of fuzzy inference systems fits to the fuzzy structure of perception period of the space and spaces are not always defined in a clear and net borders. It can be used for all spaces, which do not have certain dimensions because of the suitability of the flexible space determinations proposed model considers that perception of space is a process, which works under the effect of all senses and take into account the space elements in terms of all senses. Besides the area that space analysis will be done is not calculated only at the plan level also for its points on the third dimension; it does not limit with two dimensions (Arabacıoğlu, 2008). As a result of literature survey it has been revealed that, both of these methods focused on the two dimensional horizontal formation of space organizations and they are not focused on the analysis of two dimensional vertical planar formation of the spaces. In that regard, since these models would not directly input the developed method, they are not discussed in detail.

As a today, method in regard to linguistics researches, shape grammar and pattern language, are the commonly used methods. These methods are d found directly related with the purpose of this study. The so-called two methods are discussed in detail in this chapter section 4.1.

In addition to these methods, typological analysis used in architecture discipline (abstraction, generalization, and grouping) and facade analysis that are used in architecture disciplines provide data to analytical reading methods and are discussed in section 4.2 and 4.3.

4.1 Analysis Methods Related to Linguistics

Shape grammar and pattern language, are found as a search method in regard to linguistics that are being used today. Accordingly, these two methods are reviewed in this section.

4.1.1 Shape Grammar

Shape Grammar is a logic that is used for the method languages formations. Shape grammar is the formal analysis method, which is developed and related with the forms. Amongst several definitions of shape grammars, the selected one defines it as – shape as primitive and have rules, which are shape specific (Stiny and Gibs, 1971).

Shape grammar that develops together with the architectural language is formed based on elements used in architecture. Shape grammar is used by solution of initial shapes that take place in architectural language and identification of step by step shape rules and spatial relationships between shapes and rules (Çağdaş, 1996b and Knight 2000). As it can be understood from the explanations, this method determines the language in architecture based on the formal relation between the architectural elements and rules. Shape grammars are both descriptive and generative. The rules of a shape grammar generate or compute designs, and the rules themselves are descriptions of the forms of the generated designs (Knight, 2000 and Figueiredo, Costa, Duarte,Krüger, 2013).

In figure 40, two simple rules of shape formations are explained. A shape grammar comprises “shape rules” for vocabulary elements (A, B). The initial shape “A” is transformed to “B” to define a new spatial relationship. Spatial relations define formal compositions of elements within the principles of “Euclidian transformations like translation, rotation, scale, mirror or finite composition of these” (Stiny, 1976).

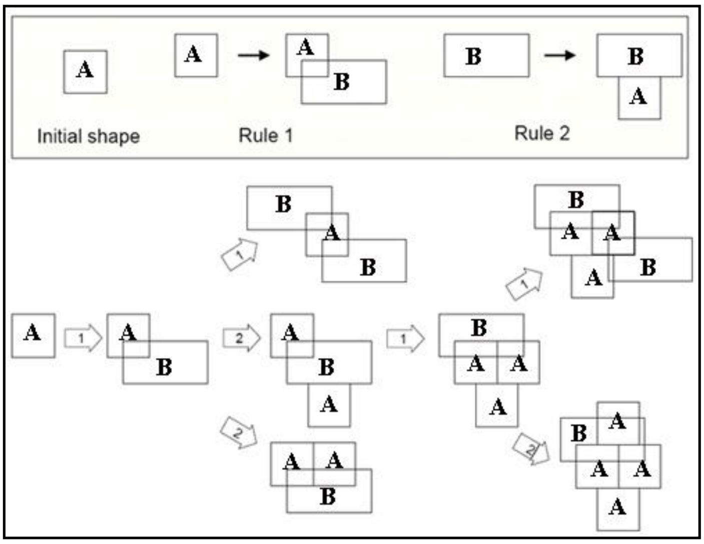


Figure 40: A simple Two-Rule Shape Grammar (URL 29)

Shape grammars generate languages of architectural design. Rule-based formalisms that encode syntactical knowledge of architectural designs are studied in many research projects about shape grammars. These grammars are derived from a given corpus of designs that include traditional Chinese lattice designs (Stiny, 1977), Palladian villa plans (Stiny and Mitchell, 1978), Moghul gardens (Stiny and Mitchell, 1980), Hepplewhite chair-back designs (Knight, 1980), Japanese tearoom plans (Knight, 1981), the architecture of Guisseppe Terragni (Flemming, 1981), bungalows of Buffalo (Downing and Flemming, 1981), the prairie houses of Frank Lloyd Wright (Koning and Eizenberg, 1981), Greek vase motifs (Knight, 1986), Queen Anne houses (Flemming, 1987), Ndebele homesteads (Herber, *et al,* 1994), and row-houses (Çağdaş, 1996b). The common point in all these studies is to regenerate the patterns of the products, which belong to various languages of designs in a generative approach. In this regard, analysis done over the Palladian Villa designs is given in figure 41 as an example.

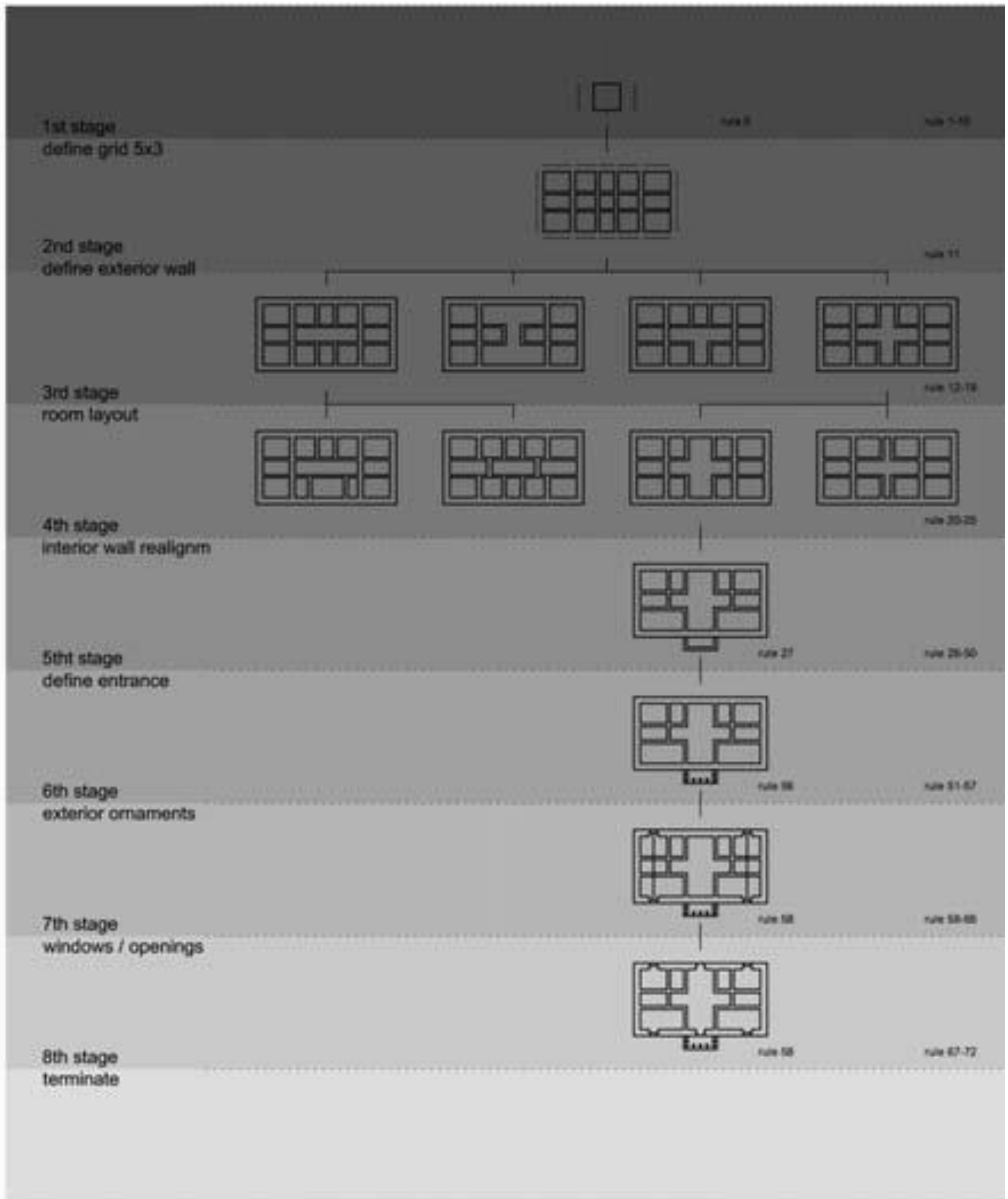


Figure 41: Stiny and Mitchell Palladian Villa Shape Grammar Analysis (Benrós, Hanna and Duarte, 2012)

These languages emerged as examples of vernacular architecture, neo-classical architecture, traditional garden designs, and furniture designs as well as the individual designs of some well-known architects (Çağdaş, 1996a).

4.1.2 Pattern Language

A pattern Language is a term coined by architect Christopher Alexander, and is a structured method by collecting architectural and urban solutions. Some experts claim that ordinary people of ordinary intelligence can also use it successfully to solve very large and complex design problems (Alexander et.al, 1977). Alexander used Noam Chomsky's approaches which he interpreted English language formation formally and produced rules about it in his book "Syntactic Structures (1957)". In line with Chomsky's approach, Alexander tried to form a pattern language in architecture (Çolakoğlu, 2005).

Like all languages, a pattern language has elements and these elements are vocabulary, syntax and grammar (Beckers, 2015). The elements of this language are entities called patterns. Each pattern describes a problem, which occurs over and over again in the environment, and then describes the core of the solution to that problem, in such a way that you can use this solution a million times over, without ever doing it the same way twice (Alexander, 1977).

Besides archetypal element that are defined with the pattern language, which was developed as a fictional method by Alexander and others, it is targeted to create meaningful spaces, facades and surfaces by bringing all those element together. Archetypal elements mean the patterns, which take place in the pattern language, define the definitions of the elements to be used in the design and provides opportunities to develop the shapes to be used according to the culture, group or mass, which creates the design and thus the solutions in different ways (Güney, 2007, p.3).

Thus, pattern language can be interpreted as a language, which is obtained by the organization of elements that creates the whole of an architectural work in a specific system. Method, as a result of combination and composition of bearings at the facade of a building, solid&void, materials and colours create the pattern language peculiar to that facade and space (Türeyen, 2010).

For instance, in the structure of Solid 11, New Dutch Building Mix-use Development (McManus, 2014) designed by Tony Fretton in 2012 in Amsterdam, there is a combination of solid&void windows and balconies at the facade of the building according to a specific system and the composition acquired as a result of this formation make the pattern language on the facade, as it can be seen in figure 42.

Figure 42: Pattern Languages on the Front (URL 30) and Right View (URL 31) of the, Solid 11, New Dutch Building

4.2 Typological Analysis

Typological analysis is an approach that allows researchers to read, understand, and then learn from existsting environment. Typology is the name given to the studies, which is done for separation of the objects into types according to their physical or other features (Güney 2007, p.3). Typology covers the system of types that helps an evidence or research which has a limited relation on a fact.

Concept of type in typology studies is a system that is developed based on the type where it is the starting point of an abstraction, a rule. An architecture can find the unknown by using a type, can change the use of it, can differ it by changing the scale or merge different types to create new things (Dağlı, 1993).

Abstraction, generalization and the classification are the previous steps of the typological analysis method. First step is to make abstraction, generalization and then the classification to form the type catalogue results of the process.

4.2.1 Abstraction and Generalization

Humans practice the action of abstraction to make incidents and facts in the environment they live are understandable. In general meaning, abstraction is a method, a tool used to reach concrete and perceive the concrete whole in its parts and the relations between each other (Nezor, 2011).

Action of abstraction, which has significant place in the discipline of architecture, must be executed in a conscious way for an architect to make genuine designs and make creative envisions regarding the structured or physical environment. Abstraction is also a fact envisaged to make the generalization on the whole.

At the same time, it can be said that all abstractions are formed on the generalizations and acceptations. Accordingly, Bergson stated that "To make generalizations, humans make the abstractions first, for the abstractions can know to make the generalization (Ana Britanica, 1988, Dağlı, 1993).

For instance, in architecture, types of a typology study that are formed by windows, doors etc. are determined as general element types and then types are abstracted in themselves. Humans can make a complicated environment in a systematic and understandable shape by straining it from a scientific base filter with the assistance of abstraction or generalization and put all the elements which form the environment into a classification (Dağlı, 1993) (See, Figure. 43).

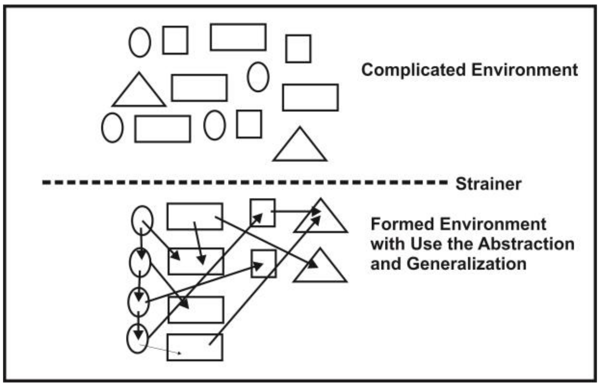


Figure 43: Formed Environment with the Use of Abstraction and Generalization (Dağlı, 1993)

4.2.2 Classifications

After abstraction approach, objects are separated from each other by classification and then, small details of the object are eliminated and important characteristics of the objects are classified under the same topic. In line with this classification, the process takes places by matching the generalized term with the signs and the transferred. When it is focused on the general meaning of abstractions and classifications, it is not possible to cope with the complicated world without them (Erkman, 1987).

According to the above-mentioned explanations, it can be noticed that humans can use abstractions and classifications as the examined strainer then classify the built environment components, and understandable (regular) formations of the built environment can be formed. In this regard, an example of classification, as it can be seen from combining different types of windows based on their formal structure,is formed in figure 44 grouping.

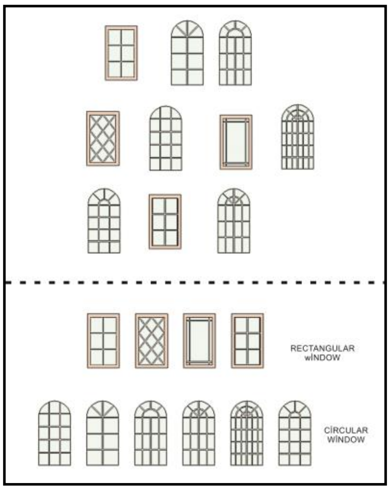


Figure 44: Classification of the Windows (URL 32)

4.3 Facade Analysis

One of the important elements of the built environment, facades are the first and most impacting connection between humans and the built environment. The outer shell of a building, is not only a reflection of the architectural character of a region (Askari and Dola, 2009), but also a representation of local cultural, social, climatic, political and economic circumstances (Aziz and Shugair, 2014). In that respect, analysis of facades has crucial importance in explaining different local, cultural, social, climatic, political and economic circumstances of the area.

The study of the facade is frequently based on the description of its components as concrete, named objects and characteristics (number of floors, forms, features and locations of the windows and entrances, horizontal and vertical bands, materials and colors) as well as on their compositional arrangements (symmetry, hierarchy…) (Özdemir, Tavşan, Özgen, Sağsöz, Kars, 2008, Friedman, 2007, Sağsöz, Tuluk, Özgen, 2006, Tugnett and Roberston, 1987, Belakehal, Boussora, Farhi, Sriti, 2015). Briefly, facades are analysed based on semantics, visuality and functions in the study. In respect to the aim of the thesis, studies relevant to the characteristics of facades are examined under this section. In this regard, facade analysis that are conducted by typological/morphological and visual perception will be discussed.

Typology and morphology studies are conducted to ascertain the main features of urban space geometry and qualities. The main hypothesis of these studies include the existence of such space elements as squares and streets (means of access) that form the urban form and examination of their relations (Ünver, 2016). Typological facade analysis are made by the identification and grouping of different elements on facades. In this respect, elements on facades are grouped and examined as the following in different studies: Elements such as oriels (one-floor, multi-storey, triangle and polygonal oriel), balcony, porch, iron balcony railing, iron window grill, wooden balcony railing, wooden shutter, wooden window screen, oriel roof, roof layout, material, structure, floor and entrances, door and window layout, (Ayyıldız, 2014, p.1574, Eminağaoğlu, Çevik, 2015, Dikmen, 2014) are examined and grouped and their typological features are determined. Language, architectural characteristics and identity structures of facades can be interpreted in the end of typological analysis.

Facade analysis studies, where building heights, parcel structure, parcel dimension, volume, structure layout, street patterns, street width analysis are examined based on parcels like city blocks or block- based structures, are analysis developed as per morphological features (Ünlü, 2006).

In this regard, analysis are made based on the proportions of parcel dimensions, building heights and street widths (Yıldız, Öztürk, Kerestecioğlu, 2011). Proportion is described as a whole of mathematical relations between pattern and space dimensions (Ching, 2007, 313).

Analysis made based on the volume, landscape, scale, rhythm and harmonisation of facades are analysis where visual perception technique is used to ascertain visual features (Ünlü, 2006). In this respect, the characteristic proportions of the windows, their positions in the wall, and their relationships with solid areas tend to give a sense of coherence in architecture. Therefore, common scales, materials, textures, and openings are considered to be the effective parameters in shaping the architectural facades (Whang, 1998) and going into more detail regarding these considerations, the solid to void proportion is an important aspect. Openings in facades not only play a role in the enrichment of the appearance and the amenity of a building, but also provide connection with outdoor spaces, but are one of the major environmental considerations in the design process (Aziz, Shugair, 2014). This solid to void proportion is governed by a variety of complex factors such as privacy, visual continuity and connectivity (Reda, 2013, Wang & Hien, 2006). Askari&Dola (2009) explains that architectural style, shape, decoration, and material are respectively the most important visual elements in presenting facades (Baper and Hassan, 2012). Visual analysis technique is developed by the analysis of molar motion and solid-void structure (Yıldız, Öztükr, Kerestecioğlu, 2011) with structures that are aggregated in various forms in urban patterns and voids, streets, squares and garden that are limited by these and decoding of unique geometrics of constituents and diverse concepts of proportion/scale, balance, rhythm, harmony, unity and integrity in structure scale (Aydınlı, 1992).

Consequently, the development of method consists of different disciplines and different method logic. In that respect, shape grammar and the pattern language has guided the formation of element library based on decoding main facade elements according to their types and conducting analytical reading based on element regression and determination of the rules of facades. Besides, typological analysis approaches for the abstraction, generalizations and the classification parts are used to determine the types of facade elements and classifications in the methods. Abstracting, grouping and classifying methods are based on grammar-syntax form ascertained due to decoding, grouping and regression of elements. Facade analysis method is used to determine which facade elements are selected for analysis and how they can be analysed. Facade analysis methods and pattern language methods are used to classify the types, decode and group facade elements like the procedure followed in the pattern language method (See, Table 19).

Table 19: Analysis Method Table

Existed Methods		**Characteristics**	**Elected**	**Reelected**
Analysis Method Related with Mathematics	Space Syntax	▪ Both of these methods focused on the two dimensional horizontal formation of space organizations		▪ They are not focused on the analysis of two dimensional vertical planar formation of spaces.
	BÇS-FIS–Fuzzy Inference System			
Analysis Method Related with Linguistics	Shape Grammar	▪ "Shape grammar is used by solution of initial shapes that take place in architectural language and identification of step by step shape rules and spatial relationships between shapes and rules" (Çağdaş, 1996b and Knight 2000).	▪ Shape grammar has guided the formation of element library based on decoding main facade elements according to their types and conducting analytical reading based on element regression and determined the rules of facades.	
	Pattern Language	▪ "Pattern language can be interpreted as a language, which is obtained by the organization of elements that creates the whole of an architectural work in a specific system. Method, as a result of combination and composition of bearings at the facade of a building, solid&void, materials and colours create the pattern language peculiar to that facade and space" (Türeyen, 2010).	▪ Has guided the formation of element library based on decoding main facade elements according to their types and conducting analytical reading based on element regression	
Typological Analysis	Abstraction and Generalization	▪ "In general meaning, abstraction is a method, a tool used to reach concrete and perceive the concrete whole in its parts and the relations between each other" (Nezor, 2011). ▪"To make generalizations, humans make the abstractions first, for the abstractions can know to make the generalization" (Ana Britanica, 1988, Dağlı, 1993).	▪ To determine the facade elements types and classifications in the methods ▪ Abstracting, grouping and classifying methods are based on grammar-syntax form ascertained due to decoding, grouping and regression of elements	
	Classification	▪ Objects are separated from each other by classification and then, small details of the object are eliminated and important characteristics of the objects are classified under the same topic.		
Facade Analysis		▪ Facade analysis are made by the identification and grouping of different elements on facades. In this respect, elements on facades are grouped and examined ▪Language, architectural characteristics and identity structures of facades can be interpreted in the end of these analysis.	▪ Facade analysis method are used to determine which facade elements selected for analysis and how they can be analysis. ▪ Facade analysis methods are used to classify the types, decode and group facade elements.	

Chapter 5

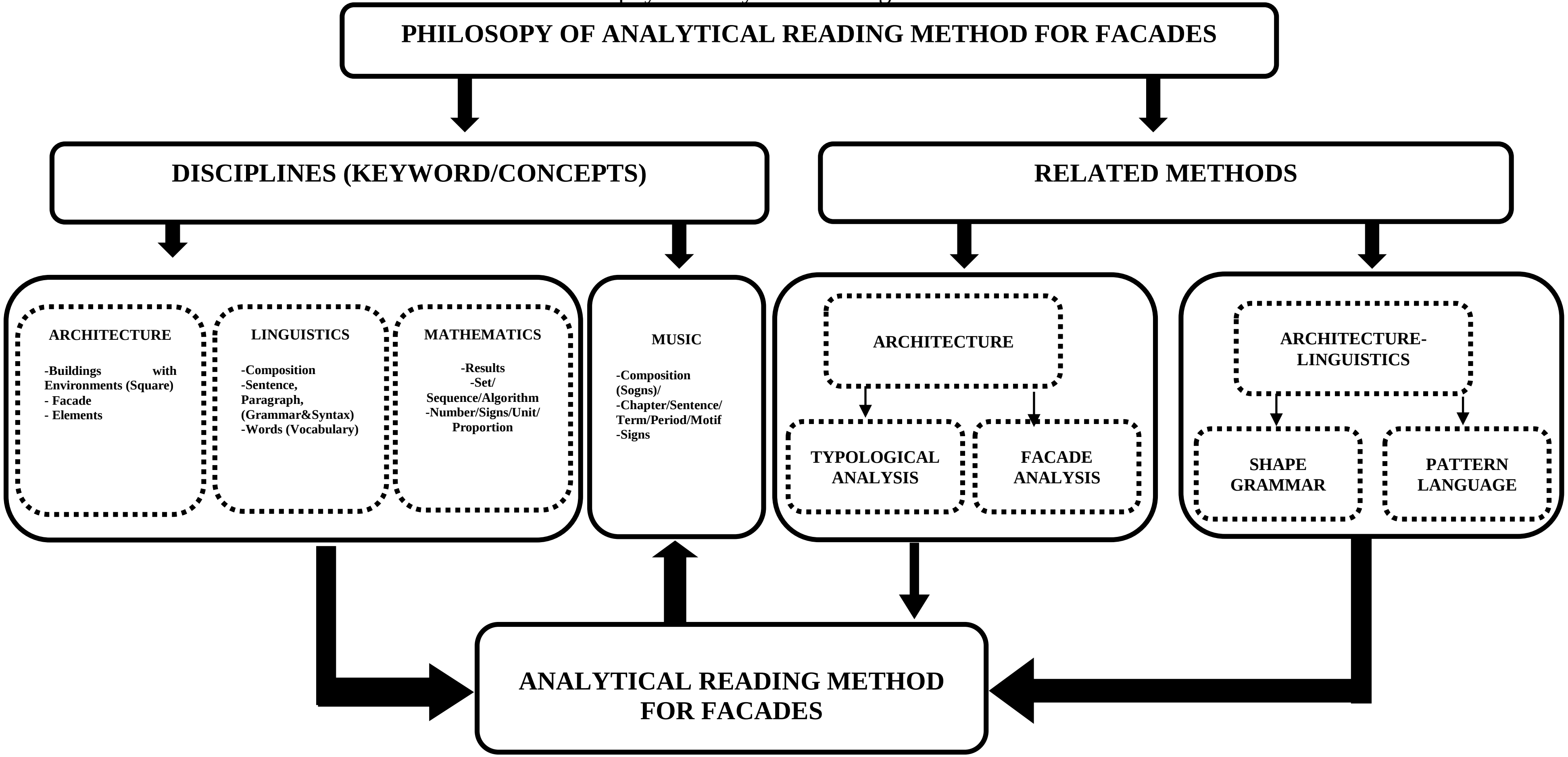
DEVELOPMENT OF AN INTERDISCIPLINARY ANALYTICAL METHOD FOR READING FACADES

5.1 Philosophy of the Analytical Reading Method for Facades

A conceptual relation between architecture, linguistics, mathematics and music disciplines is formed under conceptual and theoretical framework (Chapter III Integration of the disciplines) of the research to develop an interdisciplinary analytical reading to ascertain the language of facades with complex structures. In this regard, concepts and sub-concepts of architecture, linguistics and mathematics disciplines were determined based on the Rankscale method to provide data for the method. While all other disciplines are used in formation of the method, the music discipline is ascertained after the formation of the method in testing stage and feedback is receive as an interpretation tool. Therefore, it is seen that there is a relation between music, architecture, linguistics and mathematics disciplines. In this sense, it is interpreted that music discipline is not a data but an outcome of method in the determination of the philosophy of method.

In addition to these, shape grammar, pattern language methods, typological analysis used in architecture discipline (abstraction, generalization, and grouping) and facade analysis methods that are used in architecture discipline associated with linguistics discipline, provide data to decode and read the facade elements (Table 20).

Table 20: Philosophy of Analytical Reading Method for Facades



As it is seen on Table 20, concepts of architecture, mathematics and linguistics disciplines determined based on Rankscale method, play an important role in method formation and guide the formation of research instruments.

In this regard, concepts and sub-concepts used in linguistics discipline provide data for the determination of relations between elements (grammar-syntax) and analytical reading in the process of facade decoding (vocabulary determination). Concepts used in mathematics discipline provide data for decoding facade elements (grammar-syntax) in vocabulary determination and analytical reading based on sequences. ***Method*** is developed by the concepts used in architecture discipline. In this sense, facades are discussed and method formation is guided by square facades.

In addition to the conceptual frame, current facade analysis methods used in architecture discipline and pattern language methods used in linguistics discipline have shaped the facade decoding. In this sense, current facade analysis methods and pattern language methods are used to classify the types, decode and group facade elements like the procedure followed in the pattern language method. Shape grammar method, related to both architecture and linguistics disciplines, has guided the formation of element library based on decoding main facade elements according to their types and conducting analytical reading based on element regression. Typological analysis and abstractions, grouping and classifying methods become an important factor in analytical reading of facades. Facade analysis methods developed through facades have directed how to decode and read specific elements to ascertain the two dimensional language of existing facades.

Abstracting, grouping and classifying methods are also the starting points of the shape grammars. These are based on grammar-syntax form ascertained due to decoding, grouping and regression of elements. Development of analytical reading method is affected as a result of all the above-mentioned logics, approaches and the combination of the data. In this regard, in the direction of data clarified in philosophy section based on the theory, the context and process of the method is explained in the next section.

In the next section, this analytical method that is developed based on Linguistics, Mathematics and Architecture disciplines and interprets facades with music discipline, will be used as the LMMA method.

5.2 Formation and Process of L-M-M-A Analytical Reading Method

The method used to ascertain the facade language is an interdisciplinary (linguistics-mathematics-music) two-dimensional analytical reading developed by facade squares. The methodology chapter of the thesis (Section 2.1 Documentary Research) is formed conceptually with the use of Rankscale method to identify the relation between four disciplines to develop this method. The determination of research instruments that provide data for analytical reading in respect to three disciplines excluding music discipline will be discussed in 5.2.1 and in 5.2.2 under Development and Process of the Method based on Research Instruments. As stated in introduction (Chapter I) and section where method philosophy (Chapter 5-Section 5.1) is explained, the reason why music discipline is not included is that it can be used for the interpretation of the outcome of the method.

5.2.1 Determination of Research Instruments

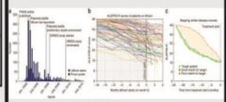
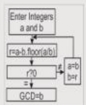
In this section, main concepts and sub-concepts of linguistics, mathematics and architecture disciplines that provide data for the method are determined. In this regard, research method instruments are determined based on the main and sub concepts of linguistics, mathematics and architecture disciplines excluding music discipline and use of concepts in specific steps are explained in Table 21. From this point of view, research instruments are determined in five steps based on Rankscale method (Table 21).These steps are as follows;

- Step I: In the first step, the smallest units of facade elements, which are road, open land, window types, door types, porch, solid/void relations, building height, building width, building height-width relations, are decoded with an analytical decomposition on all facades with the help of mathematics discipline based on proportions, dimensions and intervals. Vocabulary is determined with this decomposition (Table 21, Step I).
- Step II: In the second step, the vocabulary, where each element is grouped based on types within, is formed by sets used in mathematics discipline and sequence concepts. In this regard, separate vocabulary for elements and element dictionary (library) is determined (Table 21, Step II).
- Step III: In the third step, building elements used in formation of building facades and collection of these units based on specific rules are determined. In other words, grammar-syntax of the buildings are determined in this step. The step following the formation of building grammar is determination of decomposition of building elements and facade elements, in other words facade formation of buildings (sentences-building sequences). In this step, building elements to be used with other building elements are determined and matching is made based on mapping used in mathematics discipline (Table 21, Step III).
- Step IV: The step following the formation of building facades is that each facade (sentence) is aggregated with square elements and paragraphs in

linguistics discipline are interpreted as facades in architecture discipline. In this step, sequence concept, such as algorithms used in mathematics discipline (according to the route), and the sequence of facade decoding are determined (Table 21, Step IV).

- Step V: In the last step, squares determined to develop this method are aggregated and a composition based on linguistics discipline is determined for square facades consisting of more than one facade whereas the result is determined based on mathematics discipline (Table 21, Step V).

Table 21: Research Instruments Determined Based on Keywords and Concepts

Rank scale / Steps	Linguistics	Architecture	Mathematic
Step V	**Composition** John and Bill are two school friends. They are play a game read a book together........... ....John thinks that Bill is read the book. But, John did not buy the books.	**Environment Composed of Buildings and Spaces in Between** 	**Result** GCD=5 x=12/5  URL 5
Step IV	**Paragraph** John thinks that Bill is read the book. But, John did not buy the books.	**Building** 	**Algorithm**  -2x+5=3x-7 x=? -2x+2x+5=3x+2x-7 5=5x-7 5+7=5x-7+7 1/5*12=1/5*5x x=12/5
Step III	**Sentence** John thinks that Bill is read the book.	**Building Facade**	**Mapping- Sequences** 2 — 1, 4 — 3, 6 — 5 Sequences=2,1,4,3, 6,5
Step II	**Group of Word** John, Bill (Subjects) Read, Think, Angry (Verbs)	**Group of Building Elements** Doors, Windows	**Sets-Sequences** A={2,4,6,8,10} B={1,3,5,7,9} 2 4 6 8 10 (Even Numbers) 1 3 5 7 9 (Odd Numbers)
Step I	**Words** (Book, John, Bill)	**Building Elements**	**Elements (Number/Sign/Unit)** (1,2,3,) (-,*,/,+) , (a,b,c,d)

Filtration →

Research Instruments	
Square All Facades - Composition	
Architecture	Squares
Mathematics	Results
Linguistics	Paragraph I+Paragraph II......=Compositon
Each Square Facade- Paragraph & Algorithm Determinations	
Architecture	One of Square Facades
Mathematics	Algorithm (Formation Diagram of the Facades)
Linguistics	Sentences+Facade Elements=Paragraph
Each Building Facade- Grammar&Syntax-Sentence Determinations	
Architecture	Sequence writing based on aggregation (grammar formation) of vocabulary (elements) of each building is grouped within
Mathematics	Mapping Each Buildings Sequences
Linguistics	Grammar-Syntax-Sentences- Signifying Rules
Each Facade Element - Vocabulary Determinations	
Architecture	Vocabulary of each building is grouped within (Door Types, Window Types......etc.)
Mathematics	Sets&Sequences of Each Vocabulary Elements
Linguistics	Group of Words
Facade Elements - Vocabulary Determinations	
Architecture	Elements (Doors, Window,......etc.)
Mathematics	Unit-Pattern (Proportion-Intervals-Dimensions)
Linguistics	Words, Letters

5.2.2 Development and Process of the Method based on Research Instruments

Analytical reading method is developed based on research instruments. In this regard, the formation, methodology and process of the method is formed by square facades. The method consists of two main stages. In the first stage (Table 22-A), the method is developed whereas in the second stage (Table 22-B) the method is tested and results are determined based on the selected square facades.

In the first stage A1, the vocabulary of the squares and the vocabulary of the facades elements are determined.

In Stage A1 Phase A1.1, the vocabulary for general characteristics of squares is determined. In this sense, it is the section where the spaces that squares are located, the formal and functional structure of the square and building and element functions are decoded and read. In this section, the vocabulary is set based on the general characteristics of the square.

In Stage A1 Phase A1.2, building and facade elements are decoded according to proportions; This section provides information on the description of each facade in reference to building porch, building/elements height, building/elements mass (width), building/elements height/width, solid/void relation in vertical and horizontal direction, golden proportion usage, and is decoded. Vocabulary is set based on this decoding. The vocabulary of elements and buildings are determined in regard to mathematics discipline and dimensions, space and proportional relations.

In the second stage A2, grammar & syntax formations of squares and facade elements are determined and architectural languages of the facades are formed in connection with these formations.

In Stage A2 Phase A2.1, facade elements (vocabulary) are added to building facades (sentences) and facade and paragraph formation, are determined by reading facade sequence (See, Table 22 Phase A2.1).

In Stage A2 Phase A2.2, facades (paragraphs) located around the square are aggregated and two-dimensional analytical reading of facades are formed (See, Table 22 Phase A2.2).

In stage A3, analytical reading for two-dimensional composition of the square is conducted. (See, Table 22 Stage A3).

In stage B, the method is tested (Table 22-B). In Stage B1, the method is applied to 48 facades of 12 selected squares and analytical reading is conducted.

In this stage, it is observed that there is a relation between paragraphs, which are ascertained based on grammar formation, and music discipline and by going back, music discipline is included in the context. A relation is formed based on terminological Rankscale method and its interpretation based on the method is determined.

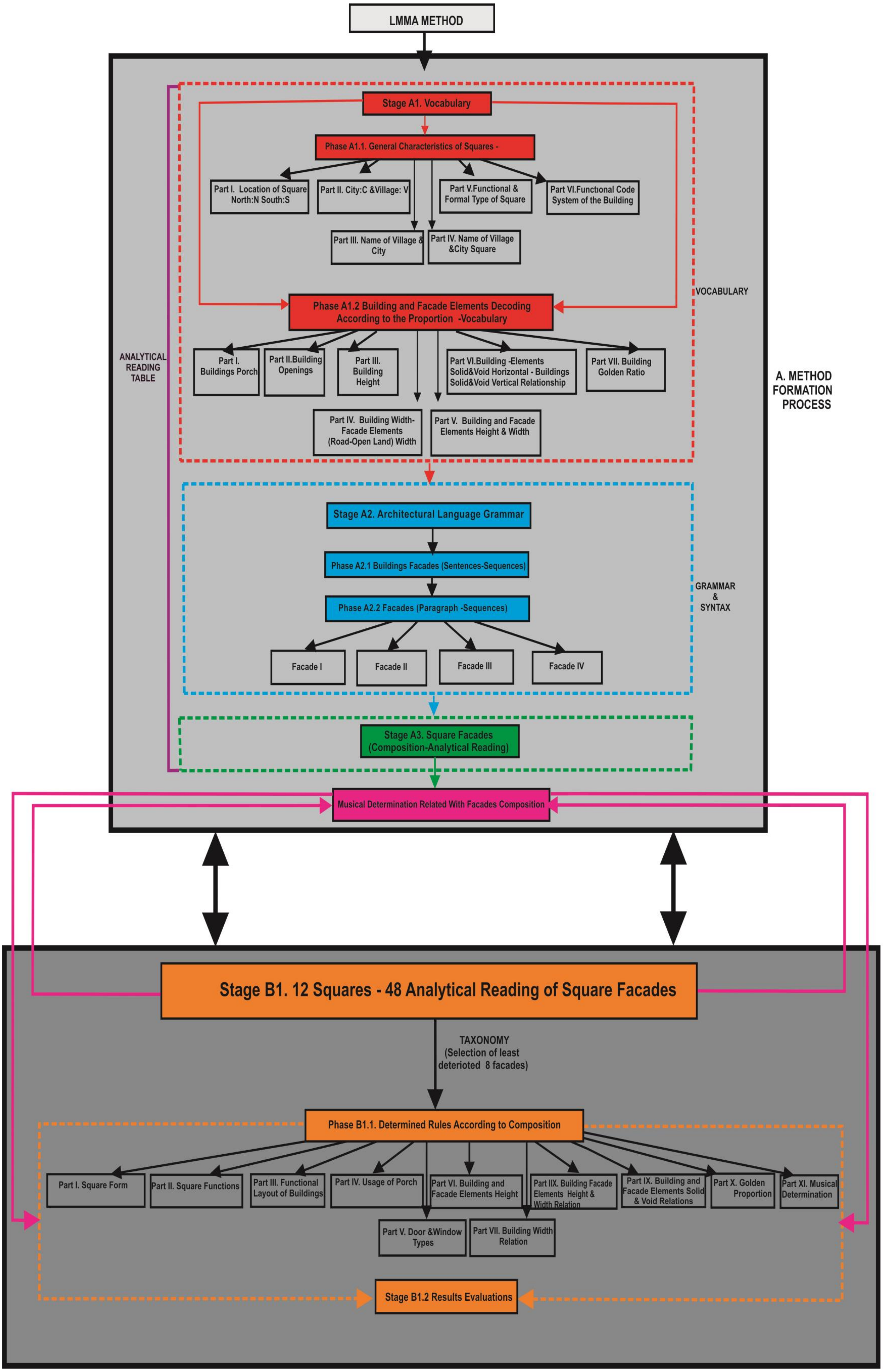
In the stage B1, which the method is tested, the results of general characteristics of 12 squares are determined.

Before, stage B1.1, a taxonomy was conducted through 48 facades and 8 facades, which deteriorated the least, had new buildings the least and maintained architectural identity, are selected.

In the stage B1 phase B1.1, the results of (Square Forms- Square Functions conducted through 12 squares) and grammar-syntax obtained in the end of analytical reading of facades, are written through these facades based the formation stages of the method (Functional Layout of the Buildings-Usage of the Porch-Buildings Openings (Doors and Window Types)-Building /Elements Width Relation-Building/Elements Height Relation-Building/Elements Height &Width Relations-Building/Elements Solid& Void Relation (Horizontal and Vertical)-Golden Proportion-Musical Interpretation) related with the taxonomy of 8 facades.

In the stage B1 phase B1.2, results are evaluated.

Table 22: Formation and Process of LMMA Method



As a result, the methodology and process of the method is formed based on research instruments within the context of conceptual relations. Formation of analytical reading tables in the next chapter, which is developed for analytical reading of facades based on the method, includes the section until musical determination in the first section and is shown in Table 23, is explained step by step.

5.2.2.1 Process of the LMMA Analytical Reading Tables

Formation of Analytical Reading Tables consists of three main steps. In the first step, vocabulary based on general characteristics is determined. In this regard, it includes the map showing the location of the village selected, the map showing the location of square in the village, land-use map of the square and facade silhouettes of the square. Additionally, elements with different functions that form the square with formal and functional structure of the square are decoded.

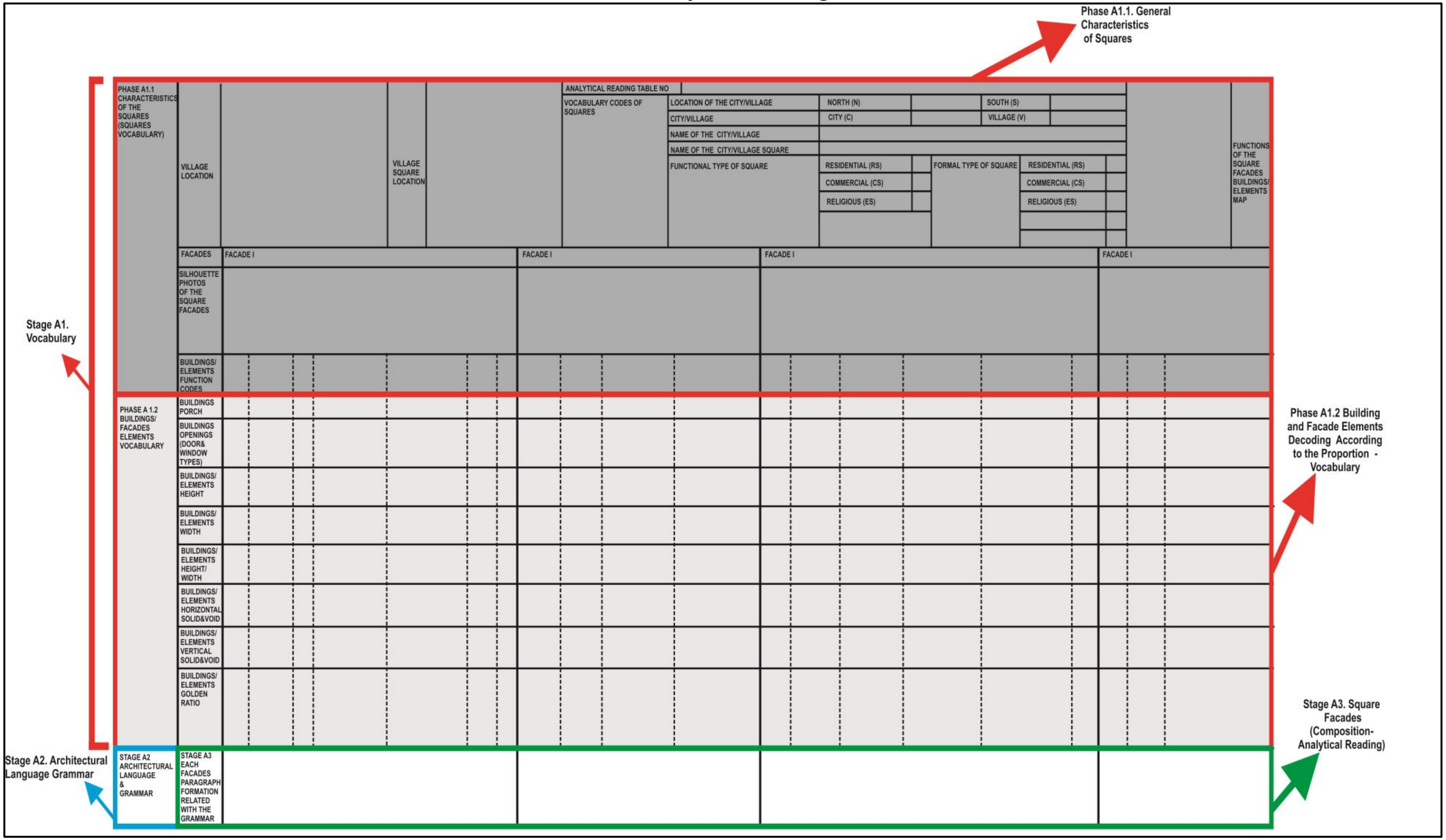
In the second step, the vocabulary is determined based on the proportional relation of facade elements located around the square. From this viewpoint, elements that form facades under the names of buildings porch usage, building opening (window& door), building and facades elements height, building and facades elements width, building and facade elements height/width relation, solid /void relation and golden proportion usage are decoded.

In the last step, the vocabulary is aggregated with grammar structure and sentences, paragraphs and compositions of facades are formed. At this stage, as it can be seen in Table 23, squares selected in testing process within the context of analytical reading tables are decoded and analytical reading data is collected. In this sense, vocabulary of facades are determined by horizontal readings (See Table 23-Phase A1.1-A1.2).

Paragraphs of facades forming squares according to grammar-syntax formation of elements located in facades are determined separately with vertical reading. Two-dimensional analytical reading of square composition is conducted by horizontal reading of four squares (See Table 23-Phase A2). Architectural language is ascertained based on this analytical reading.

A coding system is developed to conduct vocabulary decoding in the first and second sections of analytical reading tables formed in this section. In this regard, analytical reading tables are filled. The coding system developed for this purpose is explained in the next chapter.

Table 23: Analytical Reading Table



5.2.2.1.1 Development of Coding System

In this method, squares and each element forming squares are represented with special characters according to the developed code system. In this regard, a coding system in three steps is developed which is explained in formation of analytical reading tables.

5.2.2.1.1.1 Phase A1.1: Vocabulary of the Squares

In the first section of coding system based on the first step, squares are decoded and coded according to their characteristic features. In this regard, coding system developed in Phase A1.1 consists of six parts and is as follows;

- **First part** of the table shows location of the square as North: N and South: S.
- **Second part** of the table determines whether the square is located in the City: C or Village: V
- **Third part** of the code system represents the selected City or the name of the Village. The letter used symbolizes the first letter of the villages or cities. If the same letter is previously used for other villages or cities square codes, then the first two letters next to village or city codes are used. Some examples of the coded cities and villages; Kyrenia: K, Akdeniz: A, Karşıyaka: KA….etc.
- **Fourth part** of the code system represents the specific names of the selected squares. It was seen in the analysis phase that squares in villages do not have special names and there are more than one squares. Accordingly, squares are determined by adding numbers next to the name codes to have more understanding. For instance; Akdeniz Square: AS1, AS2.., Koruçam Square: KS1, KS2, Karşıyaka Square: KA1, KA2 ….etc.)
- **Fifth part** of the table is categorized with the formal and functional code system. According to some urban designers or architects, squares can be classified as forms and the functions. This part of the analysis has accepted these clarifications and

codes of the squares. In this coding system, initial letters of the form types and function types of the squares are used and coding system is formed. Since the initial letters of Residential and Religious squares are the same, initial of Residential but second letter of Religious is used for coding. Namely, squares are divided into three groups according to the functions and coded as Residential Square (RS), Commercial Square (CS) and Religious Square (ES). Squares are divided into five groups due to their forms. Accordingly, initial letters of those five groups are used for coding and the coding system is as follows; Circle Square (CS), Rectangle Square (RS), Triangle Square (TS), Amorphous Square (AS) and Square Square (SS).

- **Sixth part** of the table represents the buildings, elements and functional organizations around the squares. Accordingly, building types and elements surrounding the squares that are divided into three main groups are coded as Residential (R1, R2..), Non-Residential (NR) and Road (R). Housing which is the group used as residential is coded as House (H1, H2…), and the ones used as non-residential are coded as Leisure (L1, L2…), Office (OF1, OF2..), Retail(R1, R2…), Community Service (C1,C2..), Open Land (O1,O2…). (See, table 24)

Table 24: Vocabulary of the Squares

Phase A1.1:Characteristics of Squares (Squares Vocabulary)						
Square Codes	Part I.	Location of the City/Village	North	N	South	S
	Part II.	Village/City	Village	V	City	C
	Part III.	Name of the Village/City	Kyrenia Akdeniz Karşıyaka	K A KA		
	Part IV.	Name of the Village/City Square	Akdeniz Square Çamlıbel Square Karşıyaka Square	AS1/AS2..... ÇS1/ÇS2.... KS1/KS2....		
	Part V.	Functional Types of Square	Residential Square	RS		
			Commercial Square	CS		
			Religious Square	ES		
		Formal Types of Square	Circle Square	IS		
			Rectangle Square	GS		
			Triangle Square	TS		
			Amorphous Square	AS		
			Square Squar	SS		
Square Buildings and Elements Functions	Part VI.	Functional Code System of Buildings and Elements				
		Residential (R)	House: H	RH1/RH2		
		Non- Residential (NR)	Leisure : L	NRL1/NRL2/NRL3/......		
			Office : OF	NROF1/NROF2/NROF3/....		
			Retail: R	NRR1/NRR2/NRR3/......		
			Community Services: C	NRC1/NRC2/NRC3/......		
			Open Land: O	NRO1/NRO2/NRO3/.....		
		Road (Yol) : (R)	-----------	R		

5.2.1.1.1.2 Phase A1.2: Coding System of Buildings and Facade Elements According to Proportional Relations

Coding system in this section, which is the second step of analytical reading tables, is where building and facade elements are decoded and coded based on mathematical proportions, intervals and dimensions. In this sense, coding consists of seven parts and is coded under these titles; Porch code system, building opening (window& door) code system, building and facade elements height code system, building and facades elements width code system, buildings and facade elements height/ width relation code system, solid /void relation, golden proportion usage code system. Based on these titles, coding is developed as the following (Table 25);

- **First part:** Porches' usage of the building is coded. Then, porches of buildings are coded with upper case letters and first letter of the word Porch (P).
- **Second part:** Congregation code system of the building openings (doors/windows) refers to the type of the windows and doors on building facades in selected case squares. In cases where there are garden doors in the

border of open lands in formation of facades, the door of garden wall is coded the same way. Then, windows are coded with an (I). First letter of windows, W, is used for width and not to mix the composition with second letter, which is used in here. Accordingly; (I1: 1/1- I2: 1/1.5 – I3: 1/2….) is represented. Doors are coded with D and represented as (D1: 1/1- D2: 1/1.5 – D3: 1/2….).

- **Third part:** It is formed from the height of buildings and facade elements which refer to the occurring and coding of building heights around the squares. In cases where there are garden walls in the border of open lands in formation of facades, the height of garden wall is coded the same way. Heights of buildings are coded with upper case letters. Coding of the buildings height is done according to the results of work done for the heights of the buildings as (H1: 0-200 cm, H2:201-300 cm…).
- **Fourth part:** It is formed from the mass (width) of buildings and facade elements which refer to the occurring and coding of building and elements widths around the squares. Widths of elements and buildings are coded with upper case letters. Width coding of the buildings and elements that surround the square is done according to the widths obtained as a result of the search for the widths of buildings and elements as (W1: 0-200 cm, W2:201-300 cm,…)
- **Fifth part:** The height/width proportion code of buildings and facade elements, which refers to the smallest module, is used for height and width of the buildings facades. In cases where there are garden walls or garden doors in the border of open lands in formation of facades, the height-width relation is coded the same way. Height & Width of buildings are coded with upper case letters (HW1, HW2….etc.). Building height & width coding is done according to the proportions obtained from the heights and widths of the buildings as

(HW1: 1/1, HW2: 1/1.5, HW3: 1/2….)

- **Sixth part:** The coding system of the solid/void horizontal refers to the smallest unit used for building facades or facade elements in linear formation. The smallest unit of the building is coded as (solid=0.5x:0-100 cm, 1x:101-200 cm or void=u:0-100 cm, 1u:101-200 cm). Solid/void composition of buildings is coded with lower case letters (x-u and y-z) where x-u symbolizes the linear direction. X (x) denotes the solid part and the w denotes the void parts. In the vertical direction of the buildings, y symbolizes the solid parts and the z symbolizes the void parts of the buildings. After the determination of linear dimensions of the solid/void sequences of the building facades, the codes that refer to the number of solid/void parts are derived. Unlike the codes mentioned above, these sequences involve numbers. In the last part of the same part of the codes, the coding system of the solid/void vertical is established in reference to the smallest unit used for building facades or facade elements in vertical formation. In cases where there are garden walls or garden doors in the border of open lands in formation of facades, vertical solid/void coding of the garden wall is done in the same way. The smallest unit of buildings or facade elements is coded as vertical (0.5y:0-100 cm, y:101-200 cm and 0.5z:0-100 cm, z: 101-200 cm). After the determination of vertical dimensions of the solid/void index of the building facades, the codes that refer to solid/void parts are derived. Unlike the former system, this sequence is coded with numbers. The author abstracted determination after the indexes are formed in relation to vertical, horizontal and solid & void. In that step, the first number symbolizes the movement numbers, the second number symbolizes the type of the sequences (2.1x, 2.2x, 1.1x, 1.10x, in horizontal indexes abstraction and 2.1y, 2.2y, 4.10y in vertical indexes abstraction). The abstraction logic of the vertical and horizontal indexes is connected with the same logic.

- **Seventh part:** Golden proportions are searched on ***building facades*** and in cases where there are garden walls in the border of open lands in formation of facades, it is left for the use of golden proportion on the garden wall. In "The use of golden section in the Great Mosque at Kairouan" (Boussora and Mazouz, 2004) published by Boussora and Mazouz in 2004, they mentioned that the golden proportion can be searched for the building facades with two different methods. Golden proportion is searched according to the first method given in the theoretical part of the thesis. "The width of the building facade is taken as AB according to this method; then a rectangle with length AB and width AB/2 is drawn. Next, a diagonal line is drawn from A to the opposite corner D. Then the width BD is subtracted from the diagonal by drawing an arc, which has this width as its radius. The diagonal is then divided into two segments resulting from the intersection of this arc with the diagonal. The last step is to rotate the longer segment of this diagonal onto the long adjacent side, AB. The intersection point C subdivides this side so that the proportion is: AC:CB::AB:AC=1:Φ:1:Φ2::1:1:Φ" (Boussora and Mazouz,2004, p.11).

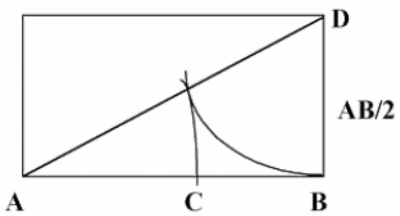
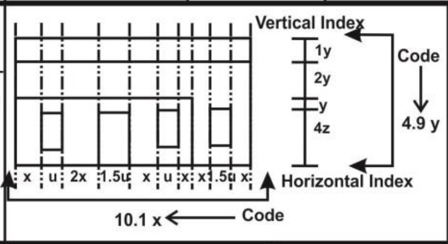
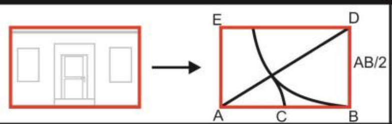
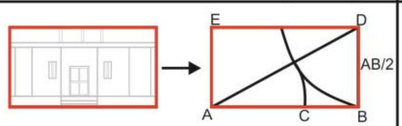


Figure 45: Construction of the Golden Section by Division (Boussora and Mazouz, 2004, pp.11)

According to this analysis, proportions of AC:CB::AB:AC are calculated as it is seen in Table 25 and those proportions if they are around the golden proportion (1.618). The results accepted as golden proportion are used in this building facade or facade elements of squares. Golden proportions found on the facade of buildings or facade elements of squares is symbolized as E (Exist) but if no Golden proportion is found on the facade of buildings or facade elements of squares, it is symbolized as A (Absent).

Table 25: Coding System of Buildings and Facade Elements According to Proportional Relations

Phase A1.2: Buildings Code System According to the Mathematical Proportion-Vocabulary of the Architectural Languages					
Building/Facade Elements Codes			Height		Code
	Part I.	Code System of the Building Porch	Porch		P
			No Porch		....
	Part II.	Code System of the Building Door & Window Type	Window Type I	A / A	I1
			Door Type I	A / A	D1
	Part III.	Code System of the Buildings and Facade Elements Height	0-200 cm		H1
			201-400 cm		H2
			.....	.....	.....
	Part IV.	Code System of the Buildings and Facade Elements Mass (Width)	0-200 cm		W1
			201-400 cm		W2
			.....	.....	.....
	Part V.	Code System of the Buildings and Facade Elements Height & Width	Height/Width I	A / A	HW1
			Height/Width II	A / 1.5A	HW2
			.....	.....	.....
	Part VI.	Code System of the Buildings and Facade Elements Solid/Void Horizontal& Vertical) (Horizontal Code System: Solid 0.5x=0-100 cm, 1x=101-200cm.....Void 0.5u=0-100 cm, 1u=101-200cm.....- Vertical Code System: Solid 0.5y=0-100 cm, 1y=101-200cm.....Void 0.5z=0-100 cm, 1z=101-200cm.....)			10.1x 4.9y
	Part VI.		AB/AC=AC/CB =1.618 567/283=283/284 2.00=0.99	Buildings and Buildings Elements Golden Proportion Exist (E) or Absent (A)	A
			AB/AC=AC/CB =1.618 925/573=573/352 1.61=1.62		E

All codes ascertained based on the coding system developed for the decoding process of the vocabulary and used in analytical reading tables are included in Appendix C (Legend Table).

5.2.3 Musical Interpretations of Facades

5.2.3.1 Determination of Interpratation Tools based on Music Discipline

Music discipline is approached as the visual and emotional interpretation of visual dimension of analytical reading within this study. As stated in introduction, interviews are held with different people, who conduct studies in the field of music, to make interpretations on music discipline. A music teacher and conductor, Erkan Dağlı, who is a part-time lecturer at the Eastern Mediterranean University, Department of Music Teaching, has made great contributions to the formation of this section.

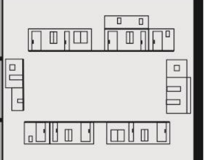
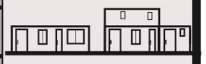
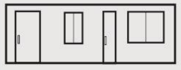
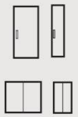
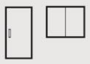
Concepts and signs used in music should be determined in terms of how they provide data to interpret visual perception aurally. In this regard, it is found out that there is a conceptual discipline in relation to the consequence of the section where the theory is explained based on Rankscale method. At this stage, concepts and sub-concepts of music discipline are determined with the same method used in other disciplines to provide data for the method through sub-concepts. In this sense, sub-concepts, which are used in music, used in interpretation of specific facades are demonstrated in Table 26. As it can be seen in Table 26, regression of concepts and sub-concepts used in music discipline is formed in five different steps based on Rankscale method. In this regard, five different steps formed of concepts and sub-concepts used in music discipline are used as the following in facade interpretation:

- In the first step, elements used in facades are matched with signs used on staff. The aural interpretation of visual elements is started.
- In the second step, signs are aggregated and themes are formed based on the

relation between elements.

- In the third step, melodies and sentences based on melodies formed in relation to rhythmic and harmonic structures of building facades are determined.
- In the fourth step, sections are formed in relation to location of different elements, solid and void and duration of solid and void proportions of facades.
- In the last part, formation of square composition, which is formed of different sections and facades, is expressed by aggregation of chapters written on more than one staff.

Table 26: Interpretation Tools Determined Based on Music Discipline

Steps	Linguistic-Mathematics- Architecture-Research Instruments			Music-Interpretation Tools
Step V	**Square All Facades - Composition**			**Composition (Songs)**
	Architecture	Squares		Chapter I+Chapter II+......=Composition 
	Mathematics	Results		
	Linguistics	Paragraph I+Paragraph II......=Compositon		
Step IV	**Each Square Facade- Paragraph & Algorith Determinations**			**Chapter**
	Architecture	One of Square Facades		 Sentence+Term+Period=Chapter
	Mathematics	Algotithm (Formation Diagram of the Facades)		
	Linguistics	Sentences+Facade Elements=Paragraph		
Step III	**Each Building Facade- Grammar&Syntax-Sentence Determinations**			**Sentence/Term/Period**
	Architecture	Sequence writing based on aggregation (grammar formation) of vocabulary (elements) of each building is grouped within		 At least two motifs comes together which has the hamonic, melodic and rhythmic concepts One staff+Sings=Sentence+Term+Period
	Mathematics	Mapping Each Buildings Sequences		
	Linguistics	Grammar-Syntax-Sentences- Signifying Rules		
Step II	**Each Facades Elements - Vocabulary Determinations**			**Motif**
	Architecture	Vocabulary of each building is grouped within (Door Types, Window Types......etc.)		 Harmony- Melody
	Mathematics	Sets&Sequences of Each Vocabulary Elements		
	Linguistics	Group of Words		
Step I	**Facade Element - Vocabulary Determinations**			**Signs**
	Architecture	Elements (Doors, Window,......etc.)		 Notes - Staff - Rest - Scale - Tones- Rhytm - Nuance(p:piano/p: piano-soft, mp: mezzo piano - medium soft, mf: mezzoforte-medium loud, f: forte - loud, ff: fortissimo-very loud, and crescendo-gradually getting louder, fff: fortissisimo –very very loud
	Mathematics	Unit-Pattern (Ratio-Proportion-Intervals-Dimensions)		
	Linguistics	Words, Letters		

5.2.3.2 Facade Interpretation as per Interpratation Tools determined based on Music Discipline

As stated in the previous chapter of this study, the relation of dimension to music discipline is ascertained in the analytical reading process. In this sense, it is observed that facades, which are the data for analytical reading process, can establish a relation based on solid and void formations.

In regard to solid and void formations, it is stated that rhythmicity is formed by the aggregation of building and facade elements proportionally and that facades can be interpreted with music discipline by abstracting these elements.

In this sense, the choice of notes in music discipline is dependent on the person who compose music. At this stage, the musician thought to reflect the moves and rhythms in facades in an audial way and chose to use basic notes and signs. In this regard, the interpretation of music discipline is formed in three steps:

In the first step facade elements, buildings, roads and open lands are abstracted and the movement, rhythm, between elements is revealed. At this point, musical context through the composition of a square is demonstrated to make the interpretation of musical context understandable (Table 27, Step I).

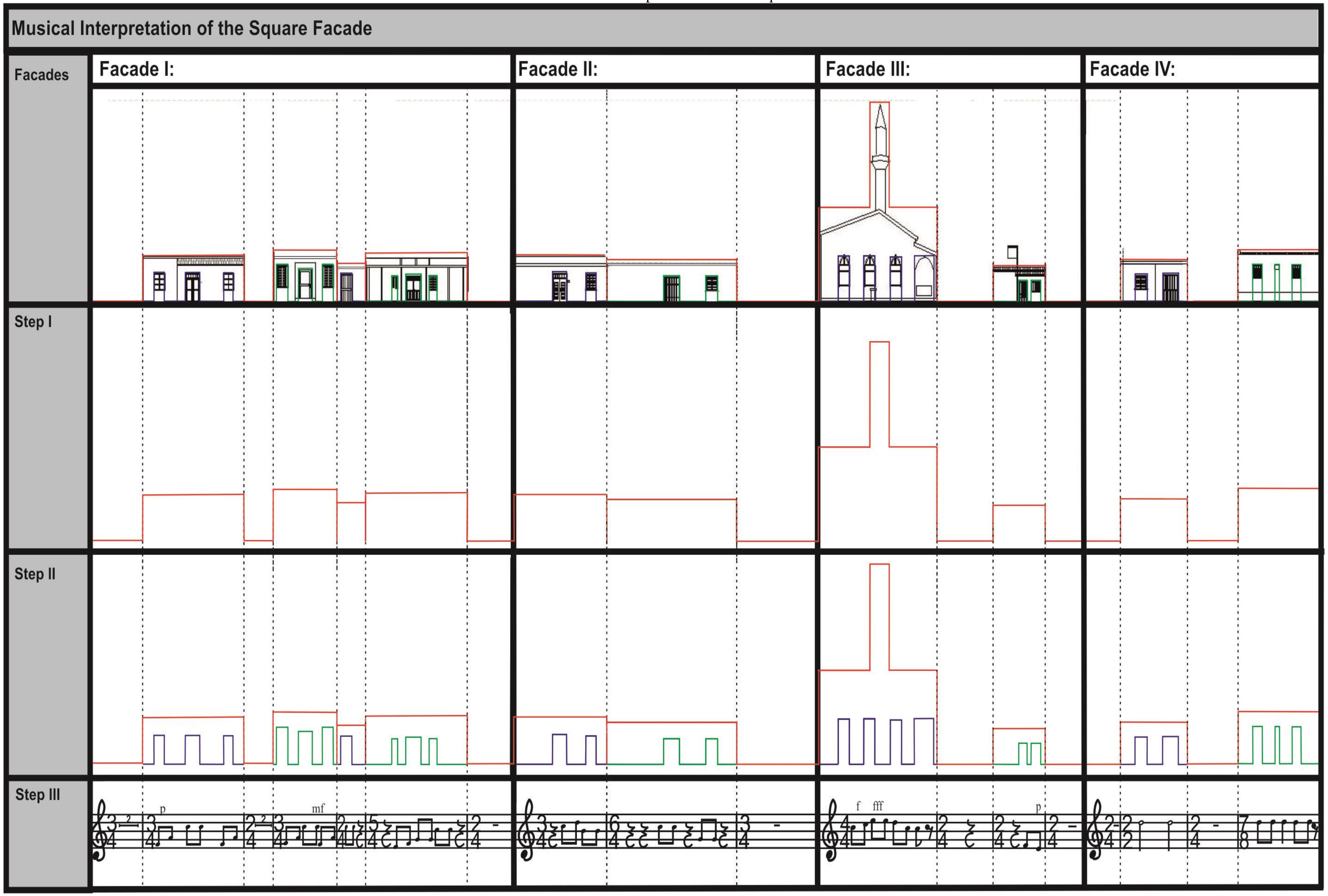
In the second step, elements located on building facades are abstracted and rhythmic structure of all facade elements are determined (Table 27, Step II).

As a result of these abstractions, signs in music discipline are used. The audial, emotional interpretation of visual formation of facades is made by the emphasis of facade movements, width and height of elements and musical notes, scale, nuance and rests (Table 27, Step III).

In this regard, a regression is made based on the location, width and height in interpretation of facade elements. The width and height of elements used in facades, low and high notes in music selected, nuance used in expression of rules in audial dimension of music interpret the formation aurally with the use of scale. In this regard, the advantage of nuance expressions (p: piano-soft, mp: mezzo piano - medium soft, mf: mezzo forte-medium loud, f: forte - loud ff: fortissimo-very loud, and crescendo-gradually getting louder, fff: fortississimo –very very loud) is taken and these expressions reflect the height of the buildings or building elements which affect the tones of music in the songs. Scales are used in the duration of width expression of building elements and element numbers are expressed with rest periods.

In the sequel, melodies are determined based on the solid and void proportions of building facades with the use of notes and signs. In the process of melody determination, void part of the building is expressed by notes whereas solid part is expressed with rests. In this sense, each building is interpreted as a sentence that has its own melody. These sentences consist of small but meaningful themes and have rhythmic, harmonic and melodic structure within. With regression of these sentences, sections are formed by regression of roads with open plots, which are other facade elements of buildings formed of different melodies, and each facade is interpreted. In the process of section formation, open lands and roads are symbolized as the silence parts but their scales are different than the void parts of buildings. Songs (composition) are formed with regression of more than one chapter. In this sense, square facade interpretation in consequence of analytical reading based on music discipline is made in the context.

Table 27: Musical Interpratations of the Square Facades



Chapter 6

APPLICATION AND TESTING OF THE INTERDISCIPLINARY ANALYTICAL READING METHOD ON FACADES

In this chapter, the method, which is developed to ascertain the architectural language based on analytical reading of square facades, is tested on Kyrenia Village Squares and results are obtained: The deficiencies in this method, developed based on this field work, will meet with feedback received in the testing process. From this viewpoint, this chapter consists of four sections. Functions of squares(6.1.1) is explained in the first section and forms of squares(6.1.2) in the second stage, the reason behind the selection of squares and their location in the third section (6.2). Analytical reading regarding the area and results are discussed in the fourth section (6.3). In the last section (6.4), general results obtained through the method are evaluated.

6.1 Overview of Squares

6.1.1 Functions of the Squares

As it can be seen from their historical development as well their use in different types in many different researches, facades are given different functional definitions until today. In one of the researches, it is stated that “Public spaces are to give symbolic content and meaning to the city by providing gathering places, paths, transitions between public and private domains, and areas for discourse and interaction” (Trancik, 1986).

On the other hand, as stated by Gibberd, "the square in the town will form the chief meeting place for the inhabitants, the place towards which they will naturally gravitate when something is going on it will be the place in which they take most pride, and it will be the place on which they expend most money, through and care" (Gibberd, 1959).

Onal (1994) and Yeozior, Capeluto and Shaviv (2006) expressed that squares have different functions within the functional groupings in accordance with the researches they conducted. The squares are the natural settings for the major religious and civic buildings for sculpture and fountains; They are spaces around which residential housing is arranged; They are the focal points for the entertainment and gathering of people; Usually, they are the shopping areas in the city; They can be seen to augment a host of urban activities some of the common forms being trade, information, recreation, protection, religion; Some of them are clearly the result of democratic usage, other suggest military; Purpose and monumentality of government (Onal, 1994 and Yeozior, Capeluto, Shaviv, 2006).

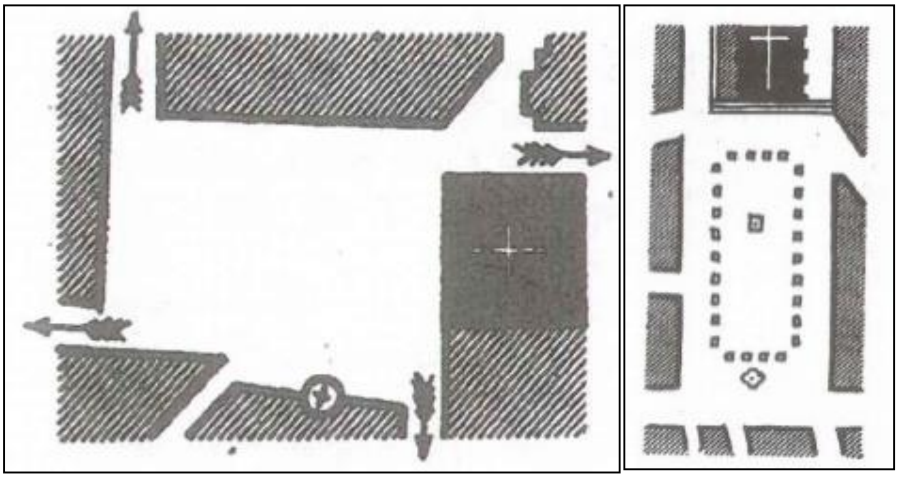
The buildings around the square and the elements of the facades are very important in the square. They affect the silhouette of the city/village square (Moughtin, 2003). In that respect, the most successful city squares, although they may have a dominant function for which each is known and by which they may be classified, are often those that sustain activity through the diversity of uses in the surrounding buildings (Moughtin, 2003). Six different types are determined according to functional classification of squares (Freederick Gibberd's approaches) (Carmona et al., 2003) that are;

- Commercial-squares or market places,

- Religious squares or parvis (church square),
- Administrative squares or public spaces,
- Residential squares,
- Quay Squares,
- Educational Squares

6.1.2 Forms of the Squares

There are different approaches regarding the grouping of Square Forms. Namely, Rob Krier's approach was a morphological structuring based on geometric patterns whereas both Sitte and Zucker focused on the aesthetic affects. Sitte argues that the squares should be in proportion to their major buildings in which he identified 'deep' and 'wide' types, depending on whether the main buildings were short or tall and narrow (See Figure. 46).



Wide Type Squares Deep Type Square
Figure 46: Camillo Sitte's Principles (Carmona et al., 2003).

Apart from the Camillo Sitte's theories, Rob Krier(1988) restated that the square typology is divided into three main geometrical shapes as squares, triangles, circles and derivatives of those (see, Figure. 47).

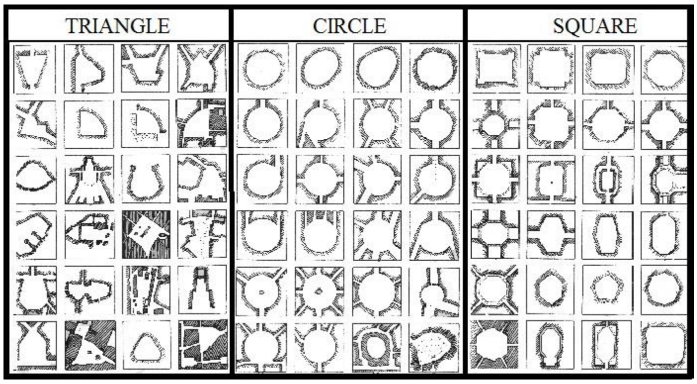


Figure 47: Derivatives of Geometrical Forms of The Squares (Sertkaya, 2011, p.44)

These basic shapes can be regular or irregular; they can be twisted, divided, added, penetrated, overlapped, alienated (see, Figure. 48). On the other hand, squares can be closed and open according to the streets openings, which are opened to the square (Carmona et al., 2003).

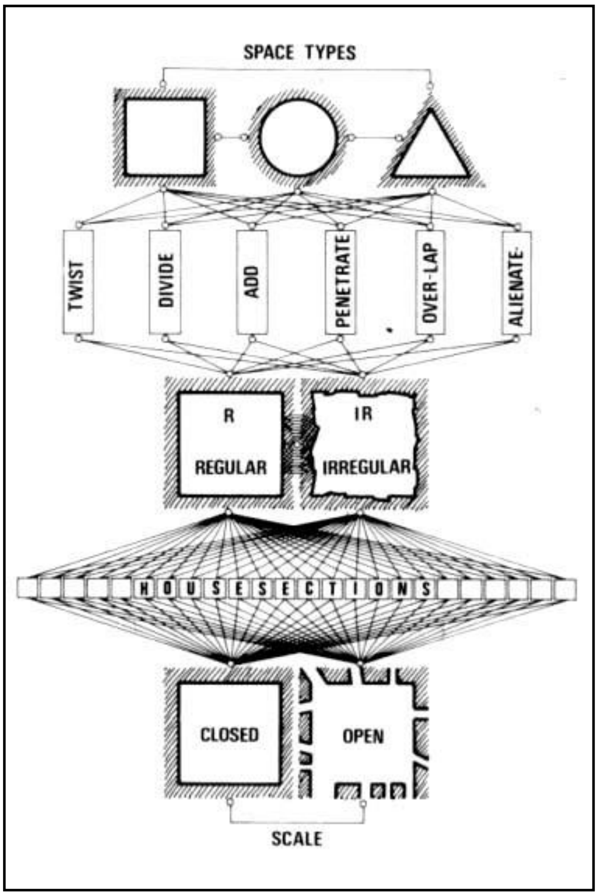


Figure 48: Rob Krier's Typology of Urban Squares (Krier, 1979, p.8)

One classification of squares belongs to Paul Zucker who distinguished five archetypal forms based on the common characteristics shown in the spatial organization of squares.

- The closed square where space is self-contained;
- The dominated square where the space is directed towards a major building;
- The nuclear square where the space is formed around a centre;
- The Grouped Square where spatial units are combined to form larger compositions;
- The Amorphous Square where the space is unlimited and irregular (Moughtin, 2003) (See, Figure. 49).

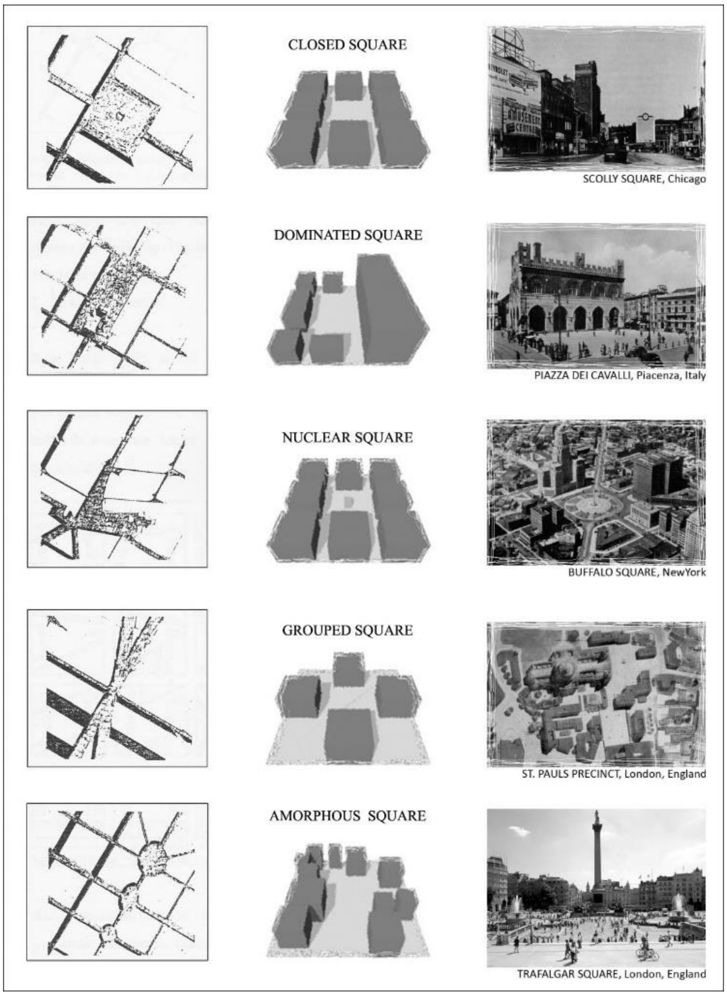


Figure 49: Paul Zucker’s Typology of Urban Squares (URL 34)

In Street and Square, the grouping made by Cliff Moughtin (2003) was the types that Zucker did the grouping as "closed" square and "dominated" square and they were the same types with "deep" and "wide" squares of Sitte that are brought together as variants of the same type under the heading "enclosed". The enclosed square is square closed by architectures on three sides, usually has a simple geometrical volume such as square, rectangular, or circle (Moallem, 2014, p. 47).

Koskof who conducted studies regarding the formal structure of the squares classified the squares as triangle, trapezoid, rectangular, L shape, and circle-ellipse and semi-circle according to the forms of squares (See, figure. 50) (Özdirlik, 2000).

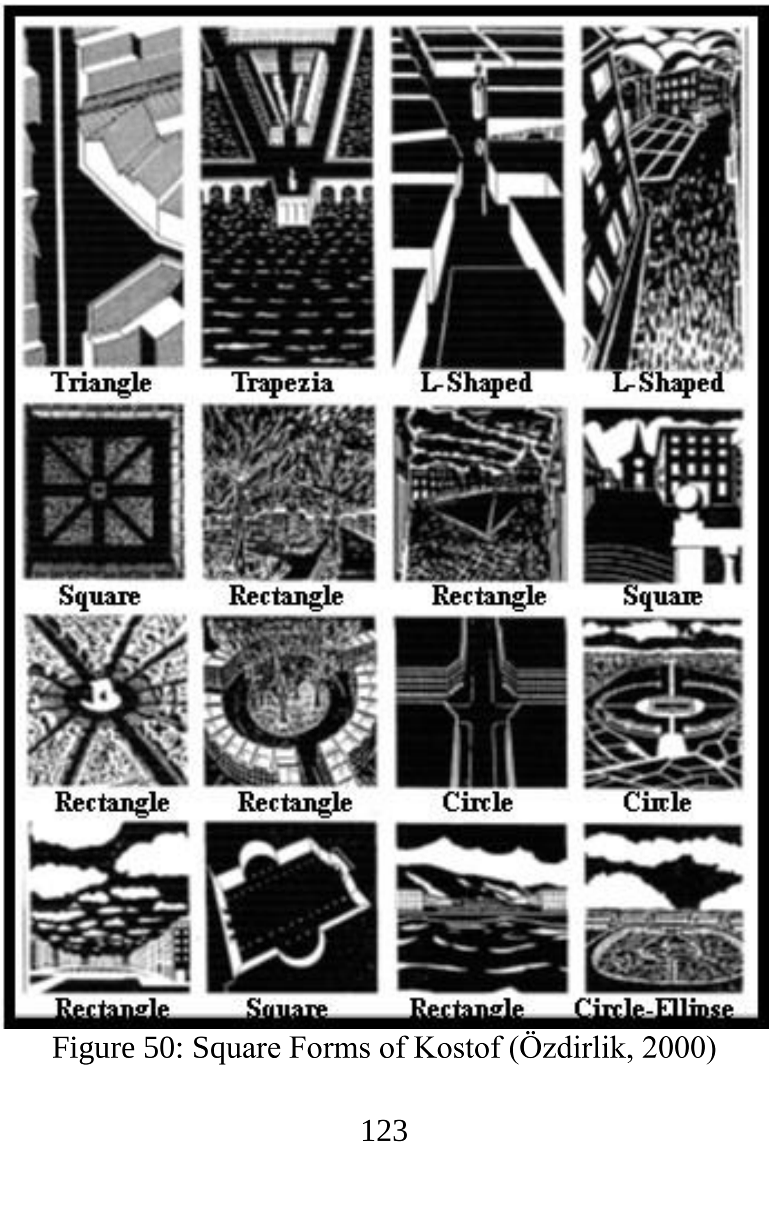
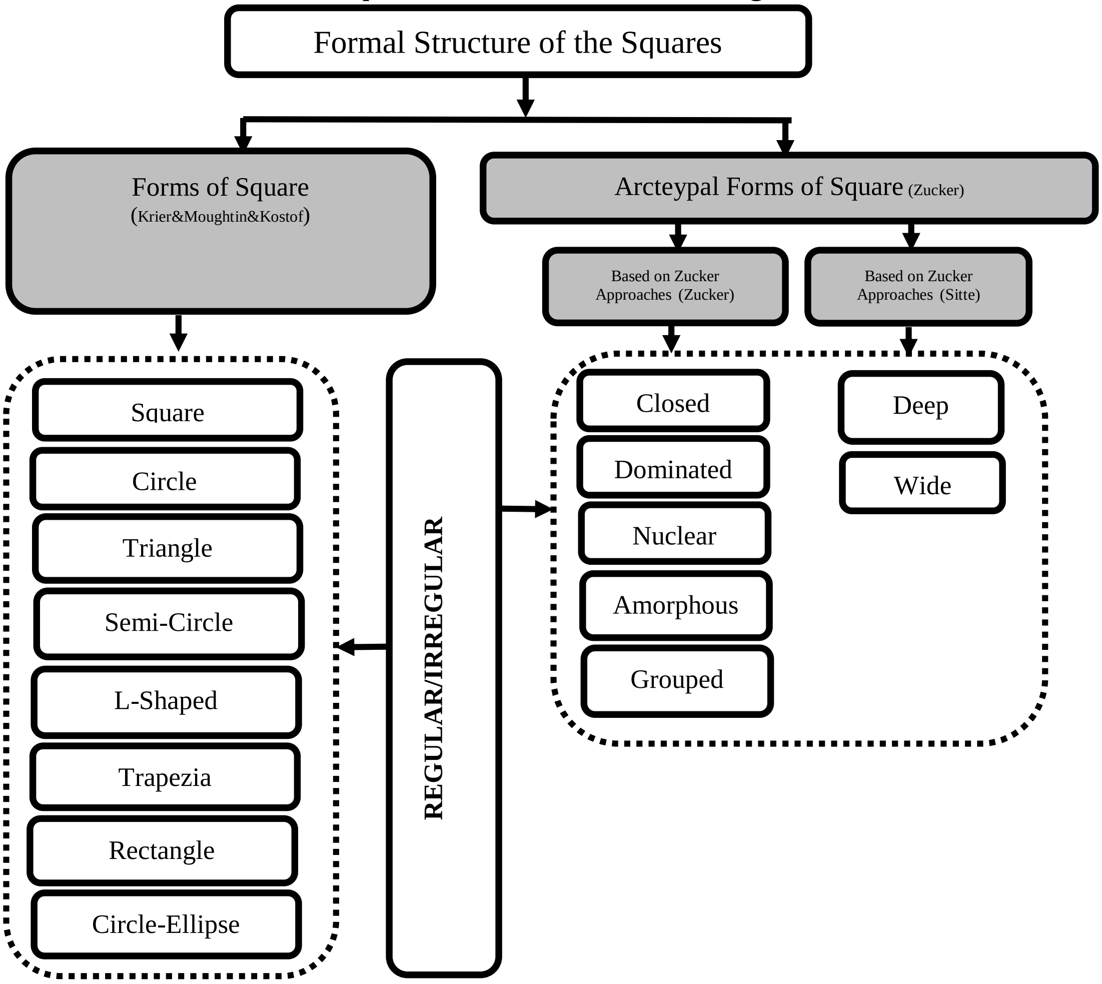


Figure 50: Square Forms of Kostof (Özdirlik, 2000)

Consequently, the formal structure of the squares is found out to have different classifications in relation to urban researcher approaches (see, table. 28).

Table 28: Square Classifications According to Form



6.2 Selection Criteria for the Location of Case Study Area

There are five different cities and several villages in North Cyprus. This study is limited with squares in Kyrenia villages. There are 46 villages, which are located within the city boundaries of Kyrenia district. After the observation of all Kyrenia villages, squares are (46 Squares) found to form 25% of the squares in Kyrenia villages (12 squares), which maintained their originality selected for the testing method.

6.2.1 Location of Kyrenia, North Cyprus

Cyprus is the third largest island in the Mediterranean Sea after Sicily and Sardinia covering an area of 3,572 square miles (Spilling, 2000). The island is situated in the North East corner of the Mediterranean Sea. It is about 40 miles from the coast of Turkey to North, 60 miles from Syria to East, 250 miles from Egypt to South and 300 miles from the Greek islands to West (Keshishian, 1985).

Figure 51: Cyprus Map (URL 35)

Cyprus is divided into two different parts (North and South) since 1974. After this division, Turks lived in the North and Greeks lived in the South part of the island. There are five different cities and several villages in North Cyprus. Kyrenia (Girne in Turkish) is the third largest city amongst 5 cities in North Cyprus. In Figure 51, Location of Kyrenia City is shown on the map. It is one of the coastal cities in Northern Cyprus. It is located on the north coast of the island.

6.2.2 Selected Squares in Kyrenia Villages

According to governmental records, there are 46 villages, which are connected to Kyrenia District. This study is focused on the 12 village squares, which are 25% of all Kyrenia village squares and believed to be adequate in number to explain the general characteristics of all squares in Cyprus. Thus, this square selection is based on the characteristics of the squares that maintained their originality and general characteristics of Cyprus squares' facade identity. These villages are Akdeniz, Tepebaşı, Çamlıbel, Çatalköy, Esentepe, Hisarköy, Karmi, Karşıyaka, Koruçam, Ozanköy, Şirinevler, Zeytinlik. The selected village names are written in red on the map (See, Figure. 52).

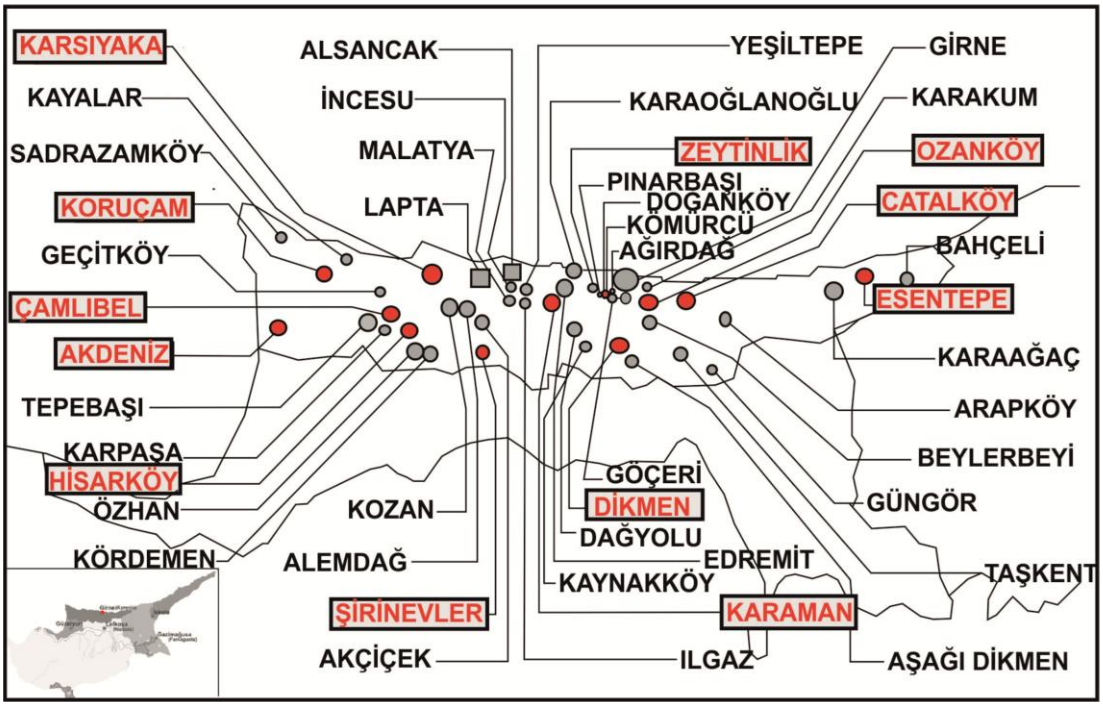


Figure 52: Kyrenia Regional Map Showing Kyrenia City and Village Locations

6.3 Analytical Reading of Facades at Kyrenia Village Squares

Analytical reading of 12 selected squares is made through 48 facades of these squares. In this regard, four facades that form squares are decoded according to analytical reading tables and thus analytical reading of squares (Appendix E) is conducted (See Chapter 6, Table 22). Following this stage, analytical reading of each facade of selected squares is aggregated and explained as seen in (Appendix F).

In analytical reading of selected square facades, it is seen that some facades are subject to deterioration and degradation. In this sense, it is found out that there is a necessity for taxonomy for results to reflect the original language. From this point of view, analytical reading is conducted for 48 square facades of 12 squares to determine the rules of square facades and 8 facades of 12 squares, which have maintained the elements of the period they were built in, have new structures the least and have undergone a change the least, are selected. Abstract rules are determined based on these eight facades.

6.3.1 Determination of Rules According to the Method

Functional and formal rules of the squares are written in relation to 12 squares, which are selected for the testing method. Abstract rules are determined through the 8 selected square facades based on the taxonomy conducted. Then, the facade rules of the squares are determined and interpretation is made through these facades based on the music discipline. In this regard, these rules are structured under different titles as the following;

Part I: 12 ***squares*** that are evaluated and abstract rules are written.

- Functional Rules of Squares,
- Formal Rules of Squares,

Part II: Abstract rule determination of 8 ***facades*** ascertained based on the taxonomy conducted.

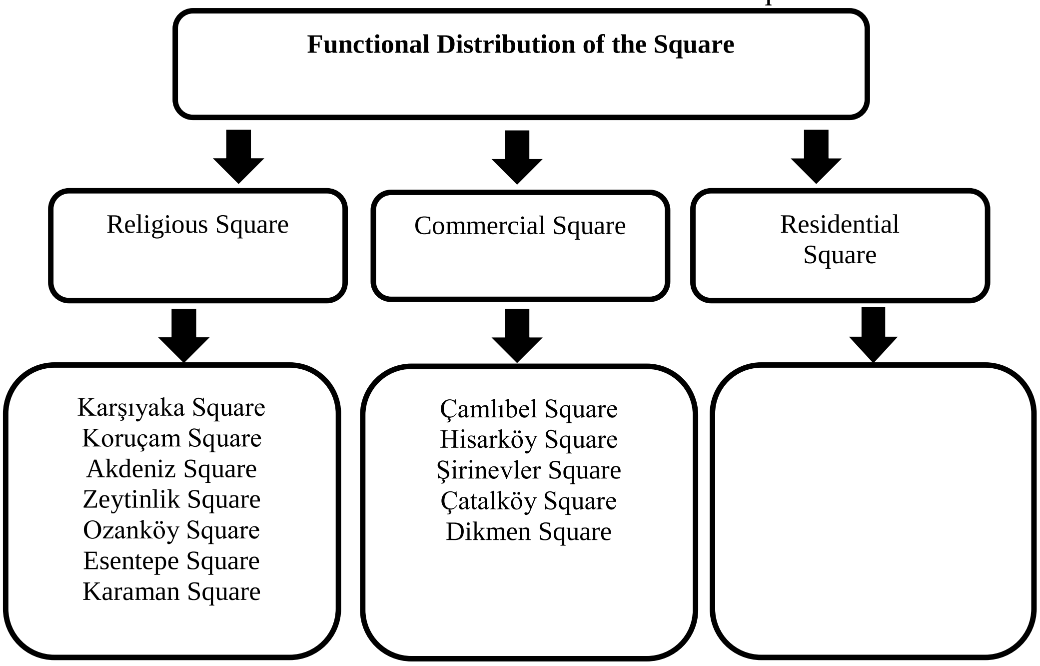
- Functional Facade Formation of the Square,
- Porch usage of the buildings,
- Building Openings (Door and Window Types)
- Height Rules of Buildings and Facade Elements
- Buildings and Facade Elements of Squares Widths Rules,
- Height-width rules of the buildings and facade elements,

- Solid-Void Rules of Buildings and Facade Elements, both vertical and horizontal indexes,
- Golden Proportion on the Buildings and Facade Elements of Squares
- Musical interpretation of squares facades

6.3.1.1 Functional Rules of Squares

As mentioned in the theoretical chapter, squares can functionally be separated into three main groups. These three main groups are Religious, Commercial and Residential. In this section, the rules are determined according to these groups. Consequently, out of 12 squares that have been evaluated, 59% (7) of the squares are determined as religious squares and 41% (5) of the squares are found as commercial squares. It is observed that the residential squares are not found in this kind of squares. The functional distribution of these squares according to the villages is shown in Table 29.

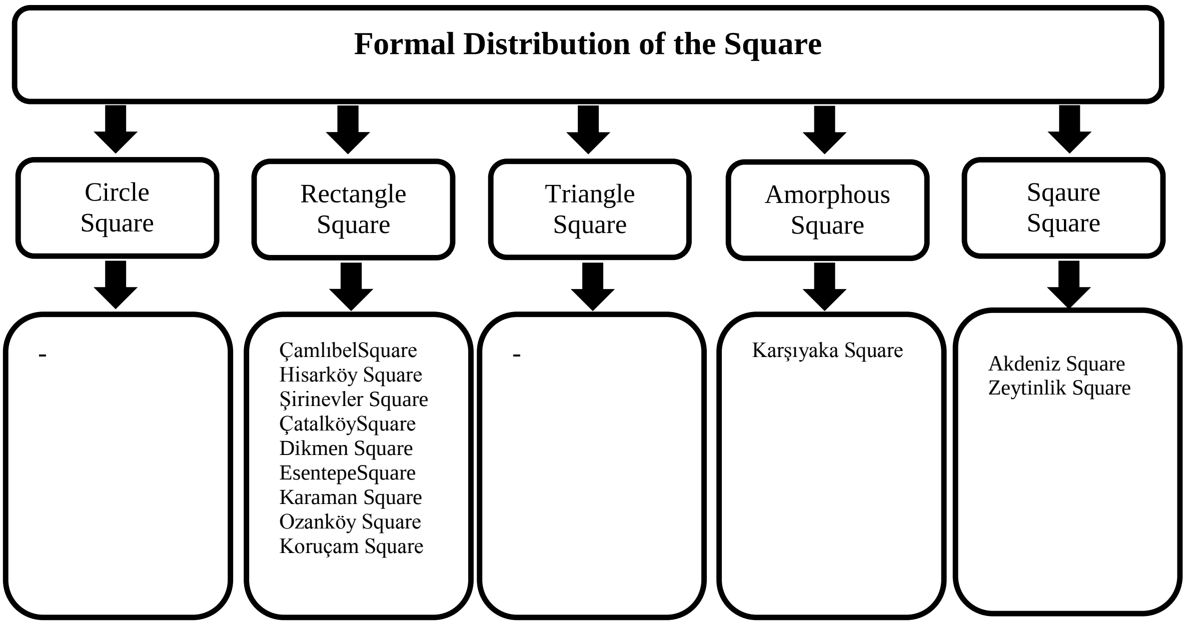
Table 29: Functional Distribution of the Evaluated Squares



6.3.1.2 Formal Rules of Squares

According to the LMMA method, as mentioned in the theoretical section, the formal formation of the squares is divided into five main groups. These five main groups are Circle Squares, Rectangle Squares, Triangle Squares and Amorphous Squares and the evaluation is screened according to these groups. As a result of formal formations evaluation of the squares, it is achieved that %75 (9) of the squares have rectangle form, %16.5 (2) have square form and the %8.5 (1) have amorphous form. Formal structure distribution, which villages have, can be seen in Table 30 in details.

Table 30: Formal Distribution of the Squares



6.3.1.3 Functional Facade Formation of the Square

According to the LMMA Method, elements that create the square can be grouped as Roads, Residential House, Non Residential Leisure (NRL), Non Residential Office (NROF), Non Residential Retail (NRR), Non Residential Community Services (NRC) and Non Residential Open Land (NRO). Therefore, results related with the functions of the elements around the squares are as follows;

1. Non- Residential leisure, retail and residential functions are situated on the ground floor of the buildings. Some buildings, which have residential functions on the first floor, are situated.

2. Based on the functional facade formations during the analysis, eight different types of facades in the Kyrenia Village Squares are determined. As a result of the analysis conducted, it can be seen that the parts of the squares, that have been least spoiled and made additions, are the facades. The features of these facades reflect the most frequent characteristic formation. As a result of this, according to Table 31, functional formation of the facades is formed in this way;

Facade I: Non Residential Retail Buildings (Market, Shops-NRR), Road (R) are situated respectively on the right side of the Non- Residential Community Buildings (Church/Mosque/Depots), Road (R).

Facade II: Non Residential Open Land (NRO) – Residential House (RH) - Road (R) – Residential House (RH) – Non Residential Open Land (NRO) – Non-Residential Leisure (Restaurant, Coffee Shop, Coffee Kiosk; (NRL) are situated respectively on the right side of the Road (R)

Facade III: Residential House (RH) – Non Residential Open Land (NRO) – Residential House (RH) – Non Residential Retail (Market, Shops-(NRR) – Non-Residential Leisure (NRL) are situated on the right side of the Road (R).

Facade IV: There are two two-storey buildings on the right side of the residential House (RH). Both of the buildings involve a Non Residential Retail (NRR) on the ground floor and a Residential House (RH) on the first floor.

Facade V: Residential House (RH) – Residential House (RH) are situated respectively on the right side of the Road (R).

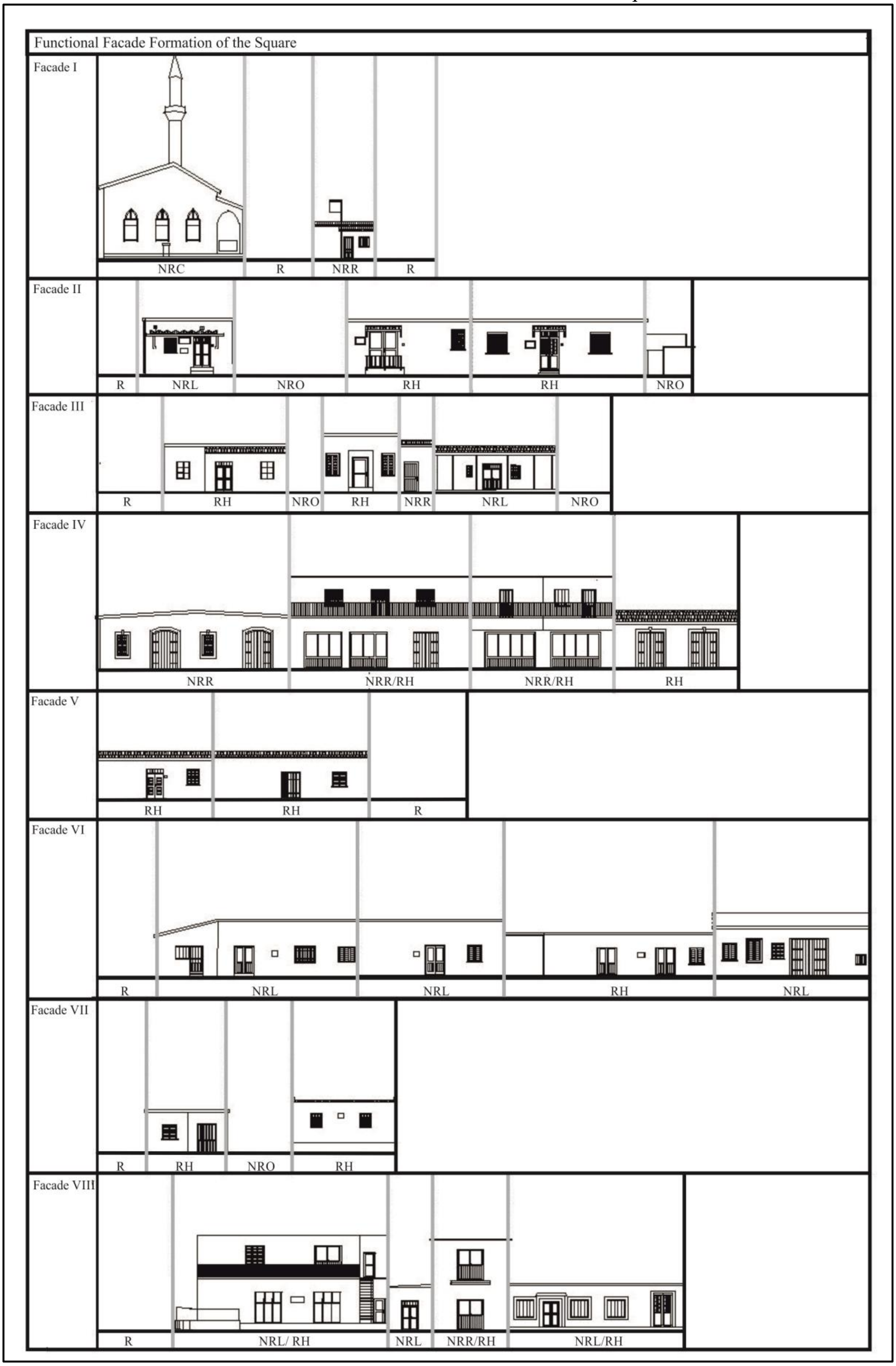
Facade VI: Non-Residential Leisure (NRL) – Non-Residential Leisure (NRL) –

Residential House (RH) –Non-Residential Leisure (NRL) are situated respectively on the right side of the Residential House (RH).

Facade VII: Residential House (RH) – Non Residential Open Land (NRO) – Residential House (RH) are situated respectively on the right side of the Road (R).

Facade VIII: On the right side of the Road (R) Non-Residential Leisure (NRL) is situated on the ground floor, and Residential House (RH) – Non Residential Leisure (NRL) are situated respectively on the first floor – Non-Residential Retail (NRR) is situated on the groin floor / Residential House (RH) – Non-Residential Leisure (NRL) are situated respectively on the first floor / Residential House (RH) is situated on the first floor (See, Table 31).

Table 31: Functional Facade Formation of the Square



6.3.1.4 Porch Usage of the Buildings

The rules of the porch usage are determined by LMMA Method evaluations. These rules are as summarized below;

1. Every building, which is located both on the right and on the left side of the road, has a porch.
2. The buildings, that face the front facade of the square, involves (Residential House (RH) – Non Residential Leisure (NRL) –Non-Residential Retail (NRR) porch.
3. Front side of the buildings has a porch, which has double floors.
4. Buildings that their facades are not placed towards the square do not have a porch in the garden.

6.3.1.5 Building Openings (Door and Window Types)

The developed method, based on the functional layout, determined the types of windows and doors that are used on the buildings facades around the squares.

1. On residential building facades, three different window types; I1,I2,I3 and two different door types; D3,D2 combinations are used. Same window and door types are used in different combinations and with numbers on the other facades. According to this, the most common sequence that takes place on the facades of the squares is; D3I2, I1D3I1, I2D3I2, D2D2, I1D2I1, D3I1I1D3, D2D2I11, I2I2, D1, I1DID3.

2. On Non-Residential Retail buildings, two different window types; I1, I3 and four different door types; D3, D2, D1, D8 and their combinations are used. The most common sequence is; D3, D1D1D2, D1D2D1, I3D2I3D2, D8D8, D3I1 and DI.

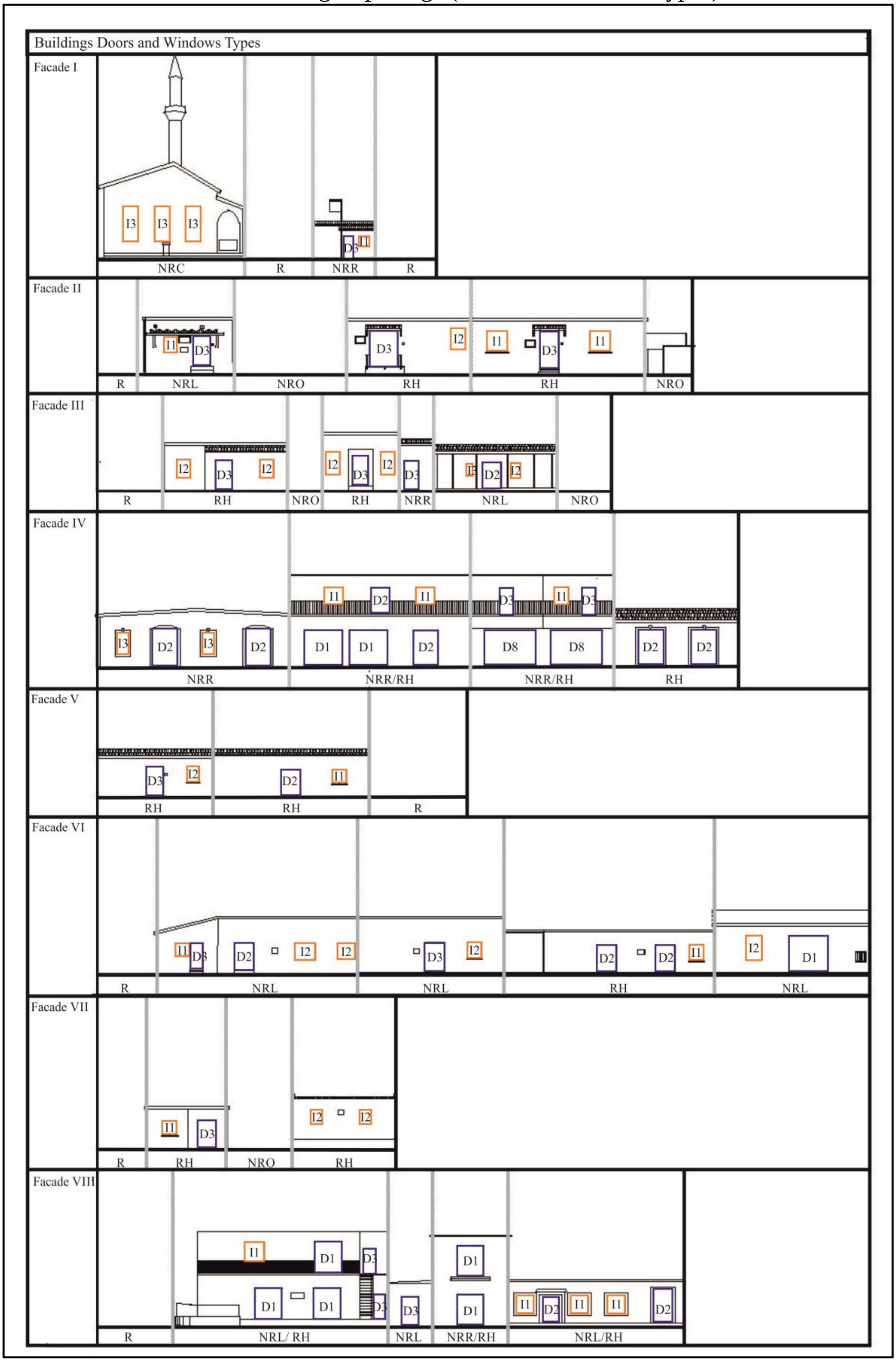
3. On Non Residential leisure buildings, three different window types; I1, I2, I3 and four different door types; D3, D2, D1, D8 are used. Same as the residential, there is the use of same window and door types with different combinations. According to this,

the most common sequence is; I3D2I2, I1D3, D2I2I2, D3I2, I1D3D2I2I2, I2D1, D3, D1D1, I1D2I1I1D2.

4. On Non-Residential community services, there is only I3 type windows. The sequence in the mosques is; I3I3I3.

5. The window types that have a proportion of I1(1:1)-I2(1:3)-I3(1:2) and the door types have a proportion of D1(1:1)-D2(1.5:1)-D3(1:2)-D8(1:1.5). Palladio's 1:1, 1:2 (See, Appendix A1) -1:3 and Alberti's 2:1-1:1.5(See, Appendix B1), are the proportions found in mathematics and music section used by Palladio and musical harmonic proportions (1:1-Square Unit, 1:2-Octave, Double Square, 1:3-Double Sesquilateral, 1:1.5-Fifth Sesquilateria, Fifth Diapente) (According to the analysis made, it is found out that these proportions are used here. All of these types, which are stated in regard to the functional layout, can be seen on the table below: Table 32.

Table 32: Buildings Openings (Door and Window Types)



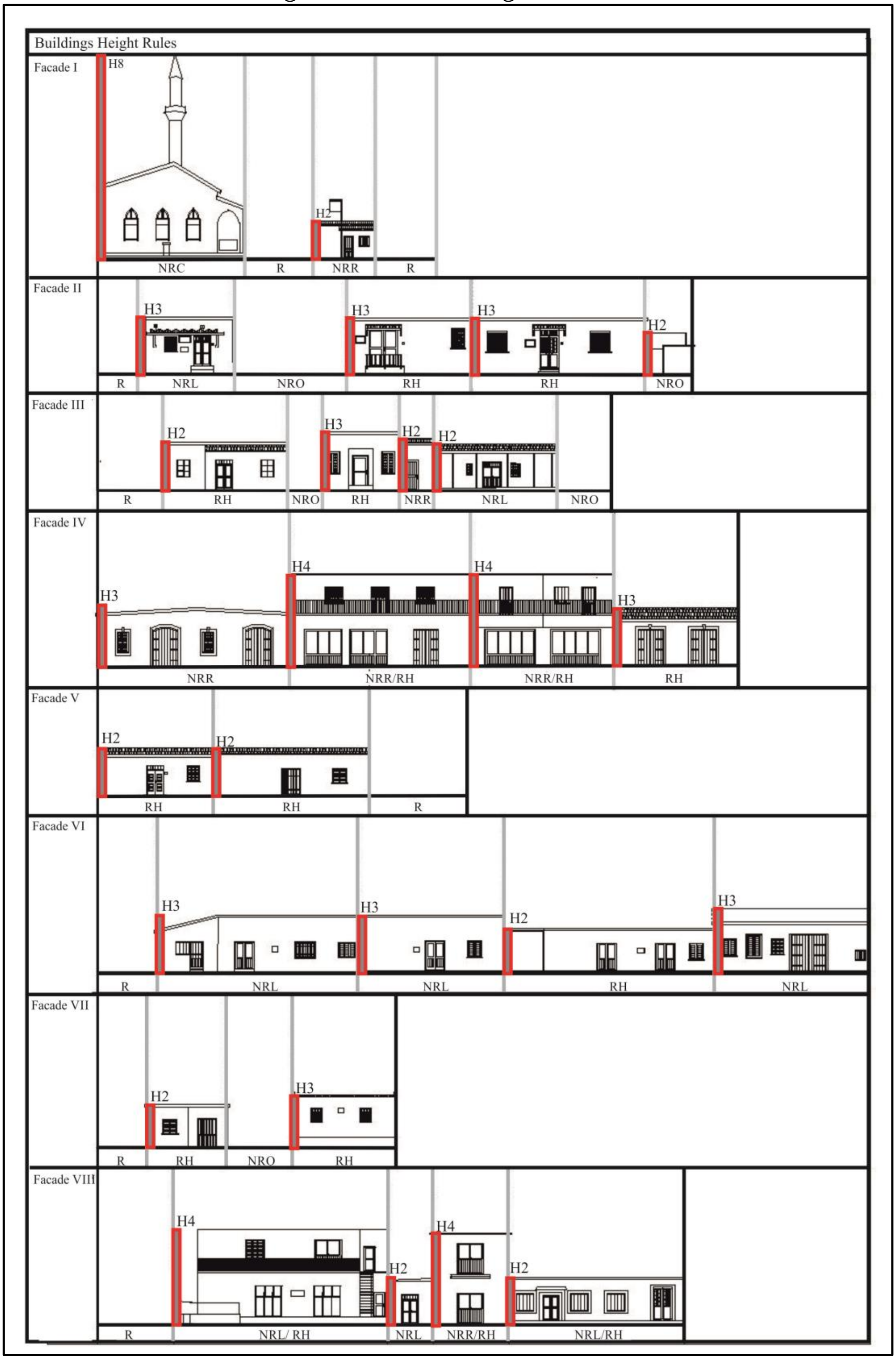
6.3.1.6 Height Rules of Buildings and Facade Elements

Height difference of buildings and facade elements are determined in the LMMA Method and written in line with the square functional layout location. Height rules of buildings are as follows;

1. There are one and two floor buildings around the square.
2. Height of single storey residential houses differs between H2 (201-400cm) and H3 (401-600cm)
3. Height of single storey leisure differs between H2 (201-400cm) and H3 (401-600cm).
4. Height of non-residential retails buildings differs between H2 (201-400cm) and H3 (401-600cm).
5. At Non Residential community building, it is determined as H8 (1401-1600) for mosques.
6. At two storey buildings, the height of the building at Non Residential Retail/ Residential Houses or Non Residential Leisure/ Residential Houses is H4 (601-800 cm).
7. Eight different facades that form the square are searched where there are garden walls in the border of non-residential open lands in formation of facades, the height of the garden wall is H2 (201-400cm). Height of different buildings and facade elements can be seen in the table below.
8. When heights are used to bring facades together, proportions are determined in facades as I. 4:1, facade II 1:1:1:2, facade III 1:2:1:1, facade IV 1:2:2:1, facade V, 1:1, facade VI 2:2:1:2, facade VII 1:2, and facade VIII 2:1:2:1. Accordingly, when facades come together by repeating the proportions of 1:1and 1:2 used by the Alberti (See, Appendix B1) and Palladio (See, Appendix A1, B1),

facades are formed vertically. These proportions identified as the musical harmonic proportions (1:1-Square Unit, 1:2-Octave).

Table 33: Height Rules of Buildings and Facade Elements



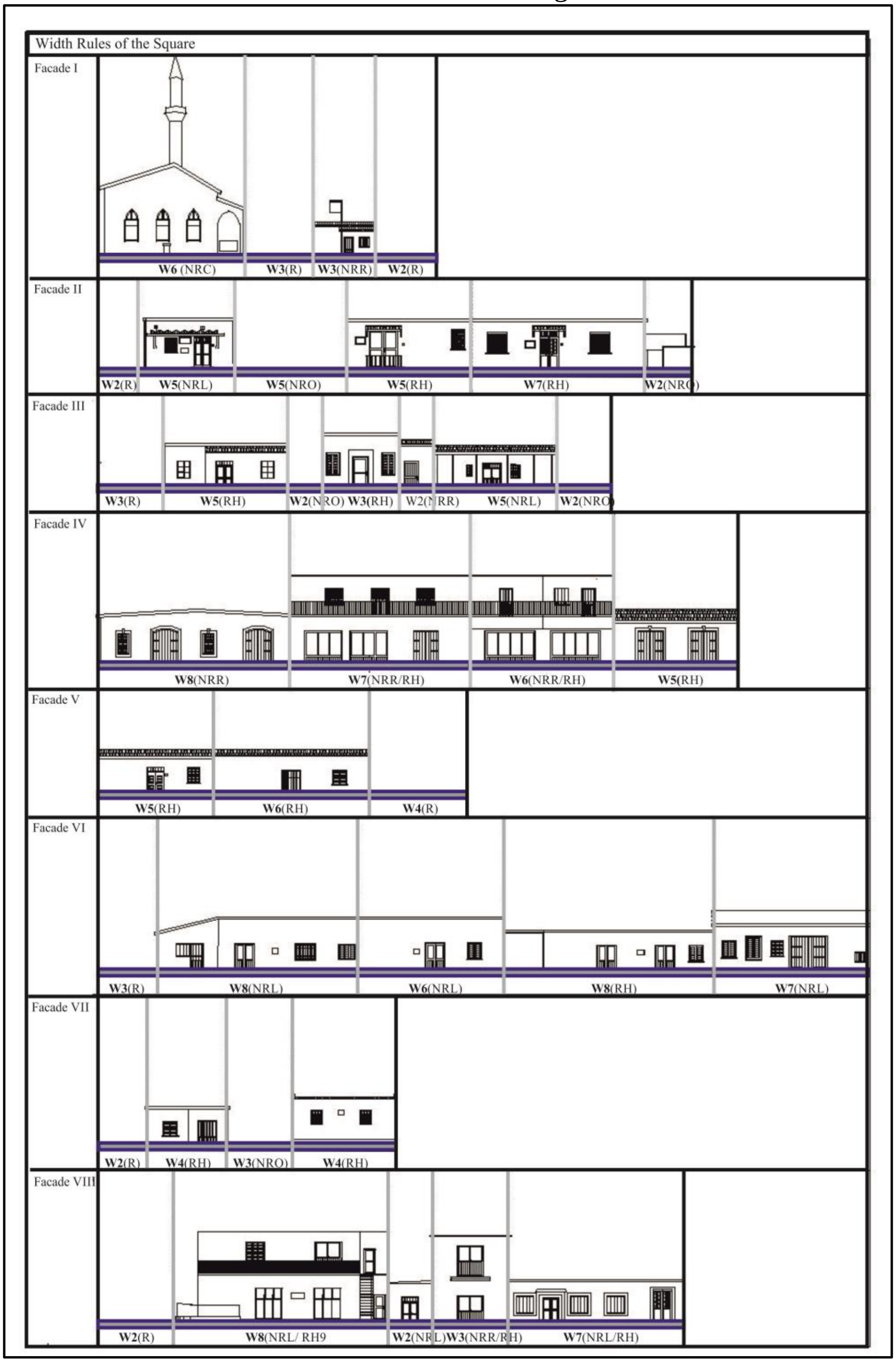
6.3.1.7 Buildings and Facade Elements of Squares Widths Rules

Width difference of buildings and facade elements are determined in the LMMA method and written in line with the square functional layout location. Buildings and facade elements of squares width rules are as follows;

1. Width of residential houses differs as W3 (401-600 cm) – W4 (601-800 cm) - W5 (801-1000 cm) - W6 (1001-1200 cm) - W7 (1201-1400 cm) - W8 (1401-1600 cm).
2. Width of Non Residential retails differs as W2 (201-400 cm) – W3 (401-600 cm) -W6 (1001-1200 cm) - W7 (1201-1400 cm) - W8 (1401-1600 cm).
3. Width of Non Residential leisure differs as W2 (201-400 cm) - W5 (801-1000 cm) - W6 (1001-1200 cm) - W7 (1201-1400 cm) - W8 (1401-1600 cm).
4. Width of Non Residential community buildings for mosques is determined as W6 (1001-1200 cm).
5. Width of Non Residential open lands differs as W2 (201-400 cm) – W3 (401-600 cm) and W5 (801-1000 cm)
6. Width used for the roads differs between W2 (201-400 cm) – W3 (401-600 cm) and W4 (601-800 cm). Distribution of width of buildings and elements can be seen in Table 34.
7. The aggregation of buildings and elements based on the width have the following proportions in those facades stated; facade I: 3:1.5:1.5:1, facade II :1:2.5:2.5:2.5:3.5:1, facade III: 1.5:2.5:1:1.5:1:2.5:1, facade IV: 1.6:1.4:1.2:1, facade V: 1.25:1.5:1, facade VI: 1:2.6:2:2.6:2.3, facade VII: 1:2:1.5:2, facade VIII: 1:4:1:1.5:3.5 . In this regard, the aggregation of the proportions of 1:1, 1:2 , 1:1.5 and 1:4 used by Alberti (See, Appendix B1) and Palladio(See, Appendix A1, B1) is observed to be repeated at specific points horizontally and

this repetition form facades. These proportions identified as the musical harmonic proportions (1:1-Square Unit, 1:2-Octave, Double Square, 1:3-Double Sesquilateral, 1:4-Quadruple).

Table 34: Widths Rules of Buildings and Facade Elements



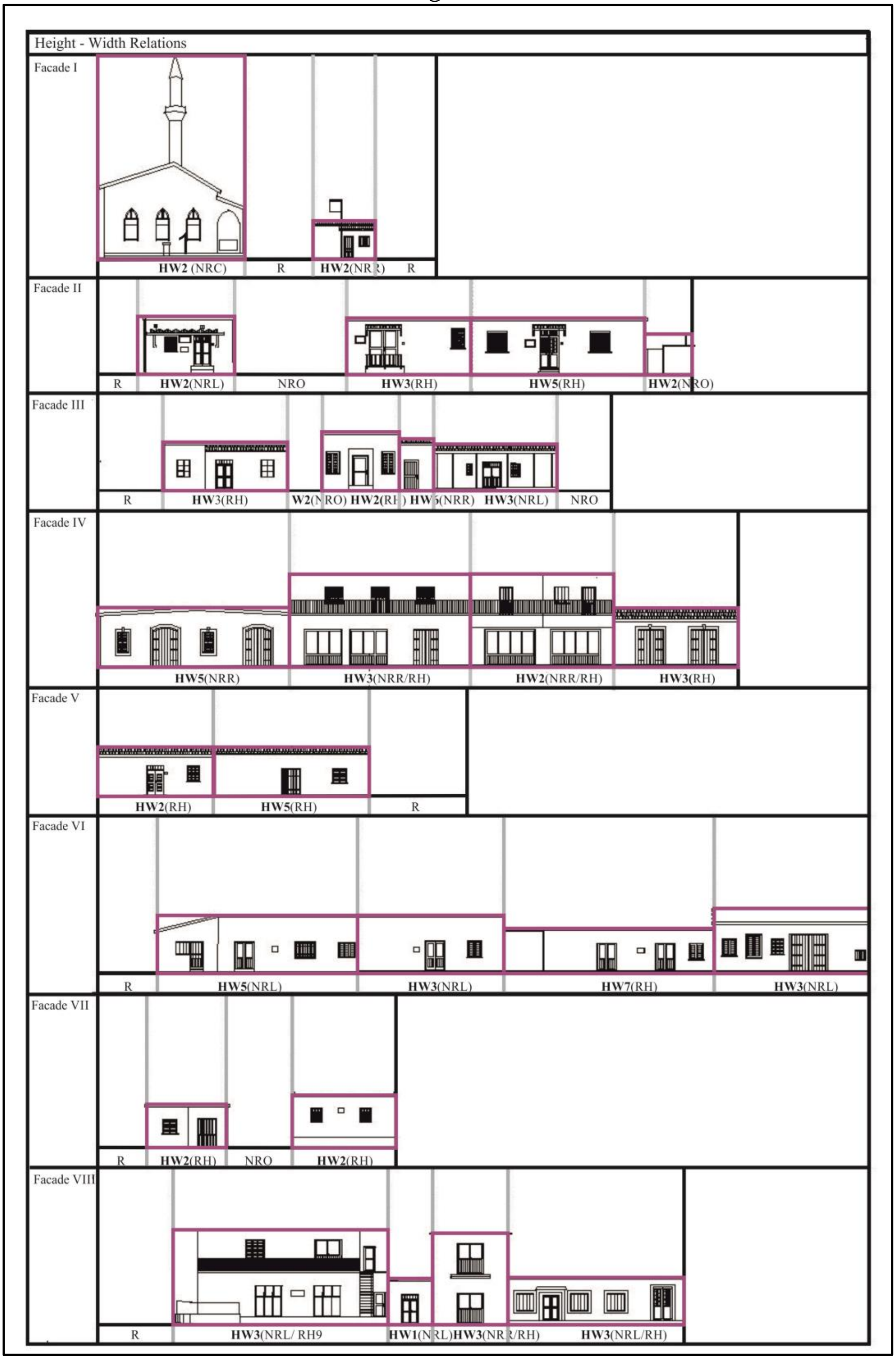
6.3.1.8 Height and Width Rules of Buildings and Facade Elements

Height and width proportions of buildings and facade elements change in accordance with the function of the buildings and facade elements. In Table 35, building heights to width proportions related with the selected facade of the squares are explained. Height and width rules of buildings and facade elements, which are written according to the functions around the squares, are;

1. At Residential Houses Proportions of Height- Width differ as HW2(1:1.5)–HW3(1:2) –HW5(1:3), HW7(1:5).
2. At Non-Residential Retails Proportions of Height- Width change as HW2 – HW3 –HW5 – HW6.
3. At Non-Residential Leisure proportions of Height- Width are determined as HW1– HW2–HW3–HW5.
4. At Non-Residential Community Buildings proportions of Height- Width are determined as HW2 in mosques.
5. In a case where Non-Residential Open Land has a garden wall or garden gate, proportions differ as HW2 –HW3.
6. In two-storey structures which have NNR on the ground floor and RH on the first floor, proportion of height width is HW2-HW3, in structures which have NRL on the ground floor and RH on the first floor, height width proportion is used as HW3. In Table 35, height width proportions on the facades, which are repeated the most, are demonstrated.
7. In this regard, the height-width relations of the buildings, proportions of HW2 (1:1.5)–HW3(1:2)–HW5(1:3), HW7(1:5), HW6(1.5:1), HW1(1:1) are found. Accordingly, it is found out that proportions of 1:1 (Square Unit), 1:2 (octave), 1:1.5 (Fifthh Sesquilatertia-Fifth Diapente) and 1:3 (double sesquilateral) used

by Alberti (See, Appendix B1) and Palladio (See, Appendix A1, B1) are used in the height-width proportions of the building facades.

Table 35: Height -Width Rules



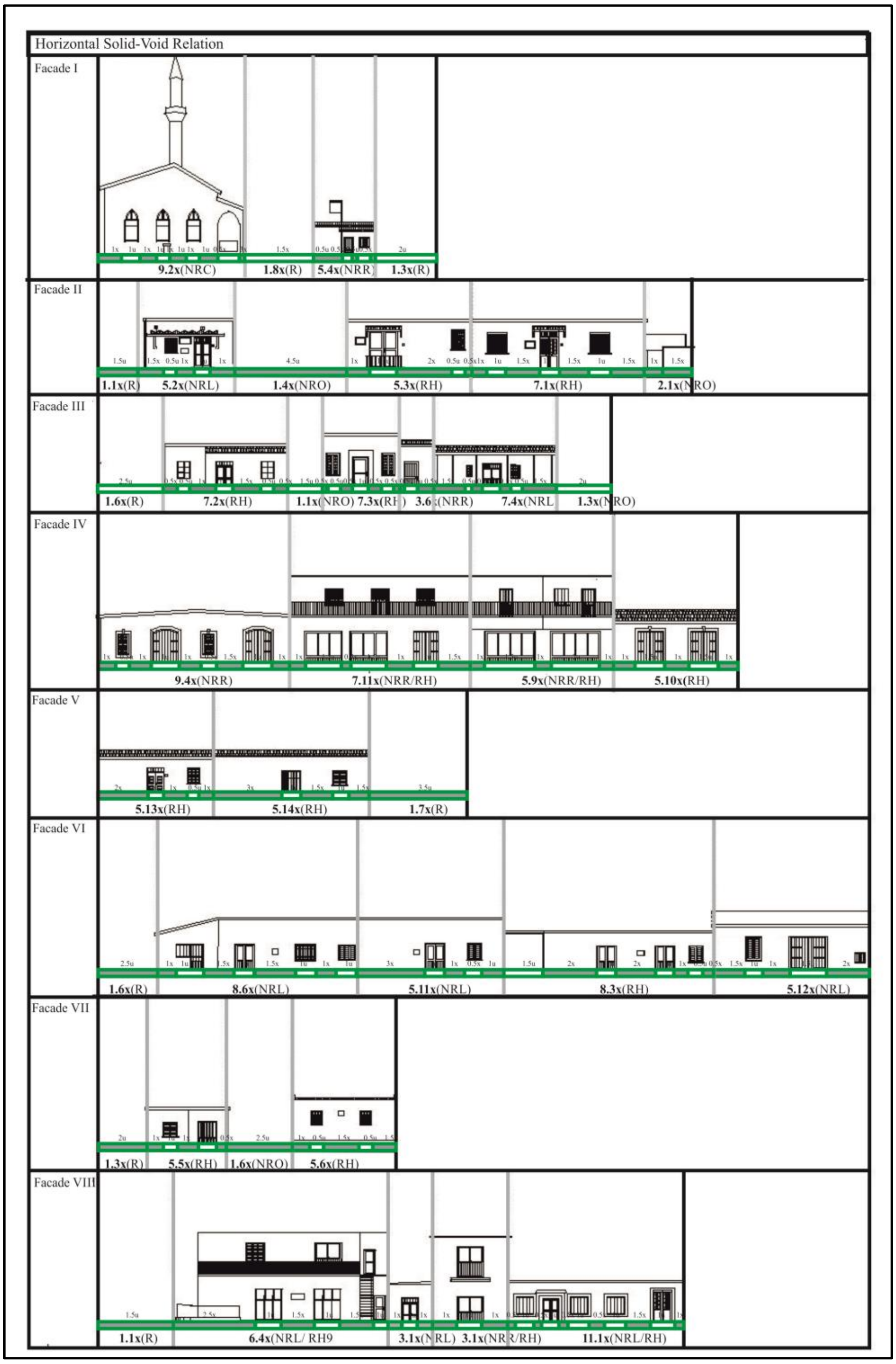
6.3.1.9 Solid-Void Rules of Buildings and Facade Elements

Solid-void rules of buildings and facade elements are formed by the assessment of repetition and combinations of different units. Generally, units used vary between 0-100 and 101-200 cm. Solid and Void Rules are analysed horizontally and vertically on the buildings and facade elements of squares and the rules are determined based on functions. Depending on the horizontal solid/void rules, it can be seen from the Legend Table- Appendix C that much different kind of sequence is obtained. Ones with the most characteristic properties are determined and repetition count forms sequences. Based on this, horizontal solid void relation rules are as follows:

1. At Residential Houses, horizontal solid void distribution and the types that are used differ as 5.3x, 5.5x, 5.6x, 5.10x, 5.13x, 5.14x, 7.1x, 7.2x, 7.3x, 7.4x
2. At Non-Residential retails, horizontal solid void distribution and the types that are used differ as 5.4x, 3.6x, 9.4x, 7.11x, 5.9x, 3.1x
3. At Non-Residential Leisure horizontal solid void distribution and the types that are used are 3.1x, 6.4x, 11.1x, 5.11x, 8.6x, 5.12x, 5.2x.
4. At Non-Residential Community buildings, horizontal solid-void sequence type is 9.2x in mosques.
5. At Non-Residential open lands, horizontal solid void sequence types differs as 1.3x, 1.4x, 1.1x, 1.6x, 1.16x or 1.12x.
6. Sequences that came up at the roads are determined as 1.8x, 1.3x, 1.1x, 1.6x or 1.7x.
7. According to the sequences, as a result of analysis done, over declinations are seen in the Legend stated in Appendix C of the horizontal solid/void relations of the buildings. It is determined that proportions of 1:1(Square Unit), 2:1(Octave), 1:2(Octave), 3:1 (Double Sesquialteral), 2:3(Fifth Sesquilatertia-

Fifth Diapente), 3:2, 3:4 (Fourths Sesquitertia –Fourth diatessaron) used by Alberti (See, , Appendix B1), Serlio (Appendix B1) and Palladio (See, Appendix A1, B1) are used and facades are formed with the repetition of those proportions according to the width of facade.

Table 36: Horizontal Solid&Void Rules



Accordingly, vertical solid void rules are formed from the common types as a result of an analysis done for all squares. In Table 37, transitions of those common types is given on the facades of the buildings. Rules of vertical solid void according to functions are given below as;

1. At residential houses, vertical solid void distribution and types used are as 2.1y-2.3y-3.3y-3.4y-3.5y-3.6y
2. At non-residential houses, vertical solid void distribution and types differ as 2.1y-2.2y-2.3y-3.2y-3.3y-3.4y-3.6y
3. At non-residential leisure, vertical solid void distribution and types differ as 2.3y-2.5y-3.2y-3.3y-3.14y
4. Vertical solid void distribution at non-residential community buildings shows difference in churches. Accordingly, vertical solid void distribution in mosques is determined as 6.1y.
5. In case of existence of a garden wall or use of a garden gate at non-residential open lands, proportions differ as 1.2y or 2.1y.
6. At the buildings, which are two-storeys and have NRR on the ground floor and RH on the first floor, vertical solid void distribution and types used are determined as 4.3y, 4.4y, 5.1y, and 5.5y.; at the buildings that have NR1 on the ground floor and RH on the first floor it is used as 5.7y or 4.4y.
7. In the sequence, as a result of analysis done, over declinations takes place in the Legend given in Appendix C of the vertical solid void relations of the buildings. It is determined that proportions of 1:1(Square Unit), 2:1(Octave), 1:2(Octave), 3:1 (Double Sesquialteral), 2:3(Fifth Sesquilatertia-Fifth Diapente), 3:2, 3:4 (Fourths Sesquitertia –Fourth diatessaron) used by Alberti (See, Appendix B1), Serlio (See, Appendix B1) and Palladio (See, Appendix

A1,B1) are used and facades are formed with the repetition of those proportions according the height of facade.

Table 37: Vertical Solid&Void Rules

6.3.1.10 Golden Proportion on the Buildings Facade and Garden Walls

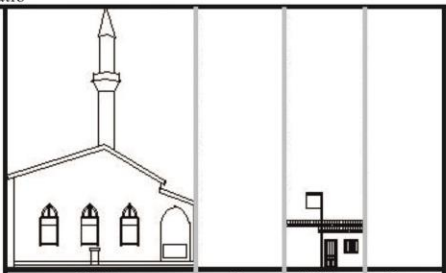
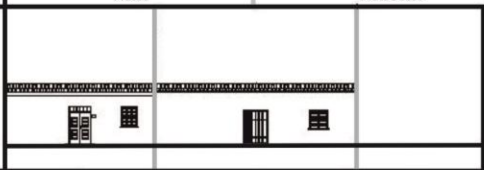
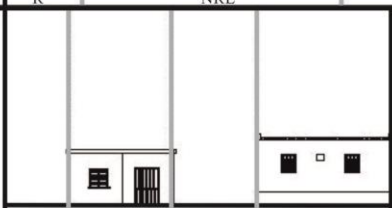
In this thesis, golden proportion is searched on the building facades and where there are garden walls in the border of open lands in formation of facades based on Boussora and Mazouz's golden proportion analysis method, which is explained in the theoretical part and the Development of Coding System section of the thesis (See Table 38). In connection to this method, all of the buildings and elements around the squares are analysed and determined whether the golden proportion are used or not on the facade of buildings and garden walls in the border of open lands. Accordingly, the use of distribution of facade types where golden proportion is used is commonly seen (See, Table.38).

In general, rules of Golden proportion rules are as follow:

1. Golden proportion is almost used in all of the single storey residential houses.
2. Eight different facades that form the square are searched and at least on one building facade, which is residential retail, leisure or has residential functions golden proportion is used.
3. In squares facades searched in two storey buildings, golden proportion is only used in one of them. Generally, golden proportion is not used in two-storey buildings.
4. Eight different facades that form the square are searched where there are garden walls in the border of open lands in formation of facades, golden proportion is only used in one of them
5. Width-height proportions of all the buildings where golden proportion exists have the proportion of 8:5(minor-major sixth) that is mentioned in theoretical part.


Golden Ratio
Facade I
A R E R
Facade II
R E NRO E A E
Facade III
R A NRO A A E NRO
Facade IV
A A A E
Facade V
E A R
Facade VI
R A E A A
Facade VII
R E NRO A
Facade VIII
R E A A A

Table 38: Golden Proportion on the Buildings Facade and Garden Walls

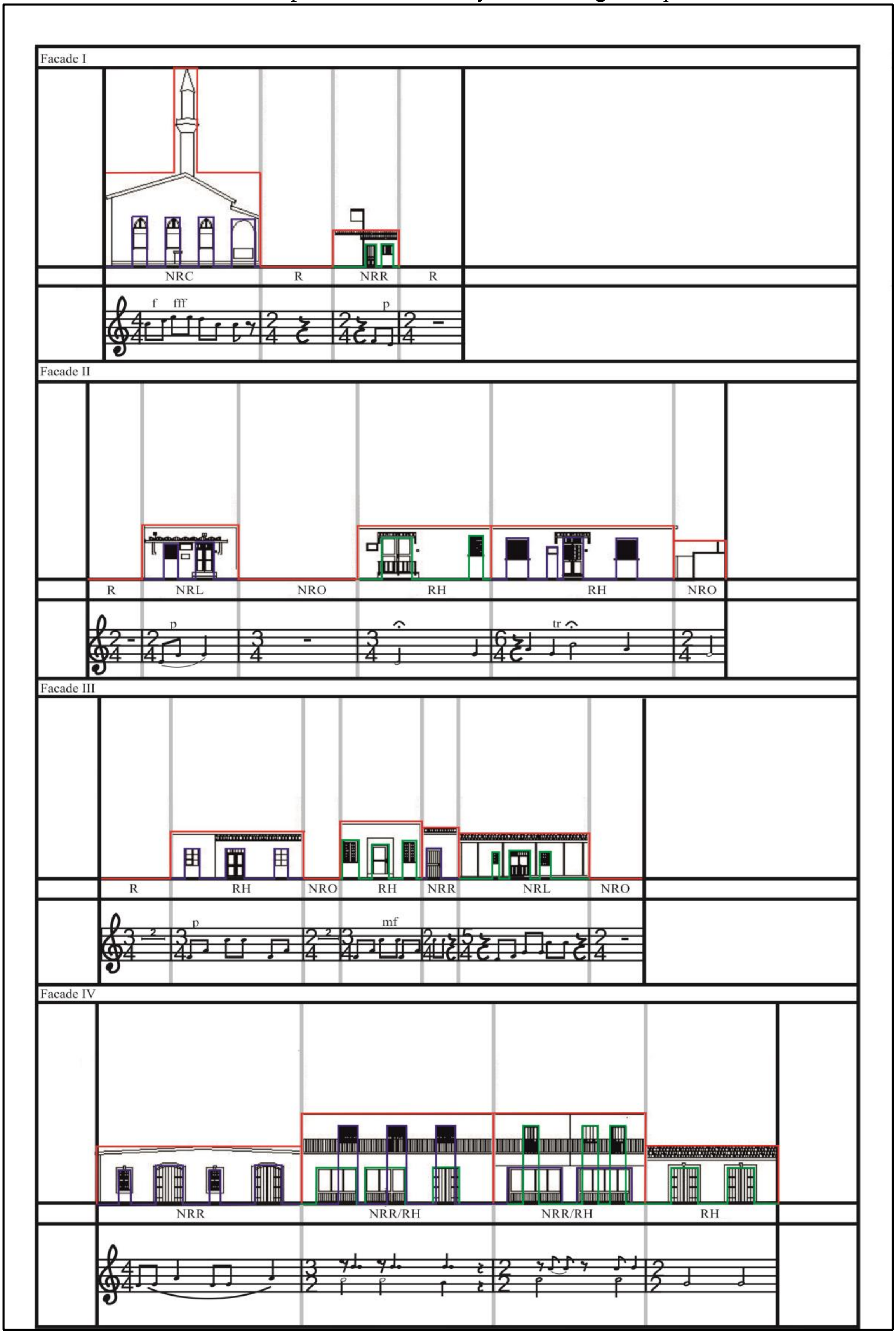
Golden Ratio		
Facade I		NRC, R, NRR, R
Facade II		R, RH, NRO, RH, RH, NRO
Facade III		R, RH, NRO, RH, NRR, NRL, NRO
Facade IV		NRR, NRR/RH, NRR/RH, RH
Facade V		
Facade VI		R, NRL, NRL, RH, NRL
Facade VII		R, RH, NRO, RH
Facade VIII		R, NRL/ RH, NRL, NRR/RH, NRL/RH

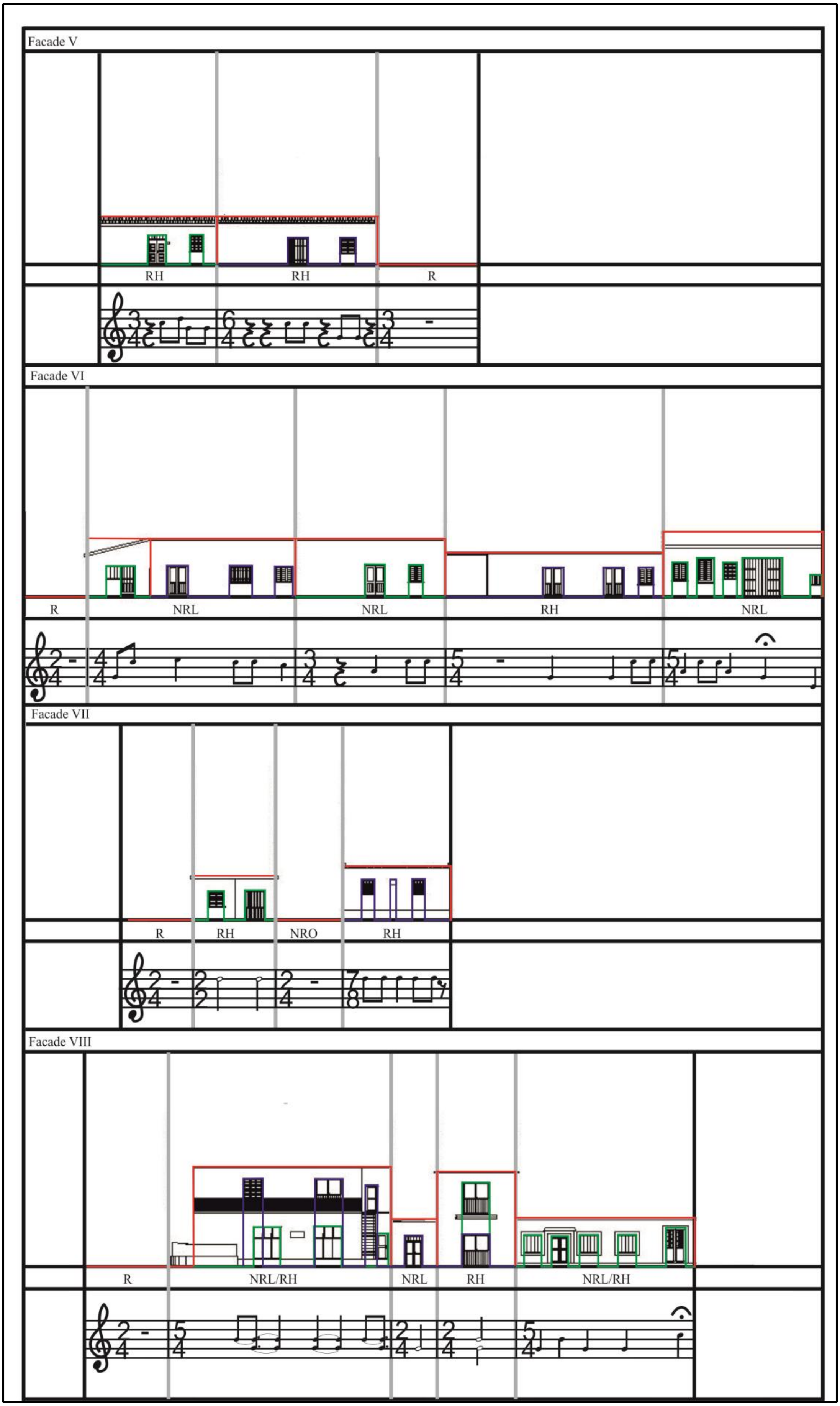
6.3.1.11 Musical Interpretations of the Kyrenia Village's Squares Facades

As mentioned above, the advantage of signs used in music discipline are taken. Therefore, the emphasis on facade movements is made by emotional and audial interpretation of visual formation of facades through the height and width of elements, notes, scales, nuances and rests used in music (Table 28, Step III).

Based on the interpretation system developed for the method, each building is interpreted as a sentence that has its own melody with elements within. In this regard, five different melodies of residential facades, three different melodies of non-residential retail facades, two different melodies of non-residential community service facades and four different melodies related with the non residential leisure facades are determined in eight facades. Sections are formed by aggregating sentences with other elements. All these melodies and facade elements (open land-road that are elements expressed with rests in music) come together and the visual formation of Kyrenia Village squares is interpreted as the audial section of a song (See, Table 39). In this regard, eight sections (facades) used in formation of squares is approached as invariant elements. Squares formed by aggregation of these sections are interpreted as different songs in case of a change in sections.

Table 39: Musical Interpretations of the Kyrenia Village's Square Facades




Facade V
RH
RH
R
Facade VI
R
NRL
NRL
RH
NRL
Facade VII
R
RH
NRO
RH
Facade VIII
R
NRL/RH
NRL
RH
NRL/RH

6.4 Evaluation Results of the Examined Area

Based on the developed analytical reading method, the architectural language rules of squares under the first two titles and the language rules of facades that are important elements in formation of two-dimensional squares are determined above under eight different titles and the music of facades are interpreted. In this regard, LMMA Method, applied for facades to maintain their current character, is used to test current conditions of square facades and to collect and evaluate analytical data from the square facades in order to understand the two dimensional formation of the squares.

In this regard, the architectural language of current facades is ascertained by decoding the proportional relations of elements used in formation of two-dimensional square facades. According to the decoding and readings based on the method used in Kyrenia Village squares, architectural language rules of facades are written for each square. In this sense, architectural language rules are determined under the titles of porch usage of buildings; building openings (window & door), building and facades elements height, building and facades elements width, height/ width relation of building and facade elements, solid /void relation, golden proportion usage; as a result of analytical reading conducted based on proportional relations between formal and functional formation of the square and facade elements located around the square. In the last stage, emotional and audial interpretation of current facades is made based on music discipline. In this regard, the aggregation of elements, formation of eight facades, emotional and audial interpretation of the visual aspect is demonstrated (Table 40-48).

In this regard, general square functions and forms of Kyrenia Village squares ascertained based on these rules are as the following:

- Functionally, 59% of squares are religious and 41% are commercial. (See, Table. 48).
- Based on their formal structure, 75% of squares is rectangle, 16.5% is square and 8, 5% is amorphous. (See, Table. 48).

Findings based on the analytical reading of facades that form Kyrenia Village squares:

- All buildings that are located on the facades and face the front facade of the square have porches. (See, Table. 48).
- The use of window openings used in facades based on functions are as follows: 60% of residential buildings is I1 (see, tables 41,42,44,46,48) whereas 40% is I2 (see, tables 45,46,48), 33% of Non-Residential retail buildings is I1 (see, tables 43,48), whereas 67% is I3 (see, tables 42,43,48), , 83% of Non-residential leisure buildings is I1 (see, tables 40,41,42,45,47,48), whereas 17% is I2 (see, tables 42,45,48), 100% of Non-Residential Community buildings is I3 (see, tables 40,48), which is the most repeated type and proportion of elements.
- The use of door openings used in facades based on functions are as follows: 12, 5% of residential buildings is D1 (see, tables 43,48), whereas 37.5% is D2 (see, tables 44,45,48), and 50% is D3 (see, tables 41,42,44,46,48), 30% of Non-Residential Retail buildings is D1 (see, tables 43,47,48), whereas 30% is D2 (see, tables 42, 48), 20% is D3 (see, tables 41,42,43,48), and 20% is D8 (see, tables 43,48), 30% of Non-Residential Leisure buildings is D1 (see, tables 45,47,48), whereas 20% and 50% are D3 (see, tables 40,42,45,47,48), which is the most repeated type and proportion of elements.
- Findings based on the heights of one-storey buildings with different functions

- used in facades are as follows: 45% of residential buildings is H2 (see, tables 40,41,44,45,46,48), whereas 55% is H3 (see, tables 41,43,46,48),, 6% of Non-Residential Retail buildings is H2 (see, tables 42,48), whereas 33% is H3 (see, tables 43,48), 67% of Non-Residential Leisure buildings is H2 (see, tables 40,41,42,47,48), whereas 33% is H3 (see, tables 45,48), and 100% of Non-Community buildings is H8 (see, tables 40,48), which is the most repeated type and proportion of elements. 100% of two-storey Non-Residential Retail/Residential House and Non-Residential Leisure/Residential House buildings is H4 (see, tables 43,47,48), which is the most repeated type and proportion of storey height.
- Findings based on the width of the mass of buildings and elements with different functions used in facades are as follows: A ratio of 18% in residential buildings is observed in W4 (see, tables 46,48), type whereas 18% is W8 (see, tables 45,48), 28% is W5 (see, tables 41,42,44,48), 18% is W6 (see, tables 43,44,48), 18% is W7 (see, tables 41,48), 25% of Non-Residential Retail buildings is W2 (see, tables 42, 48), whereas 25% is W3 (see, tables 46,48), and 50% is W8 (see, tables 45,48), 14% of Non-Residential Leisure buildings is W2 (see, tables 41, 48), whereas 43% is W5 (see, tables 41,43,48), 29% is W7 (see, tables 43,45,47,48), and 14% is W8 (see, tables 43,45,47,48), 100% of Non-Residential Community buildings is W6 (see, tables 40,48), 50% of Roads is W2 (see, tables 46,47,48), whereas 37.5% is W3 (see, tables 45,48), and 12.5% is W4 (see, tables 40,44,48), 60% of Non-Residential Open Lands is W2 (see, tables 41,42,48), whereas 20% is W3 (see, tables 42,46,48), and 20% is W5 (see, tables 41,48).

- Findings based on the width and height of the mass of buildings and elements with different functions used in facades are as follows: A ratio of 44% in residential buildings is observed in HW2 (see, tables 42,44,45,46,48), type whereas 22% is HW3 (see, tables 41,42,43,48), 34% is HW5 (see, tables 41,44,48), 33% of Non-Residential Retail buildings is HW2 (see, tables 43,48), whereas 67% is HW5 (see, tables 43,48), 17% of Non-Residential Leisure buildings is HW1 (see, tables 47,48), whereas 50% is HW2 (see, tables 40,41,48), and 33% is HW3 (see, tables 42,45,47,48), 100% of Non-Residential Community buildings is HW2 (see, tables 40,48), 75% of two-storey Non-Residential Retail/Residential House and Non-Residential Leisure/Residential House buildings is HW3 (see, tables 47,48), whereas 25% is HW2 (see, tables 43,48). If Non-Residential Open Lands have garden walls, they have the proportion of 100% and HW2 (see, tables 41, 48).
- Findings of buildings and elements with different functions used in facades based on horizontal solid-void relations on solid-void section numbers are as follows: five section type (5.3x, 5.5x, 5.6x,5.10x, 5.13x, 5.14x) (see, tables 41, 43,44,46,48) is used in 67% of residential buildings, whereas seven section type (7.1x, 7.3x) (see, tables 42,48) is used in 22% and eight section type (8.3x) (see, tables 45,48) is used in 11%, five section type (5.4x,5.10x) (see, tables 43,47,48) is used in 33% of Non-Residential Retail buildings whereas three section type (3.1x, 3.6x) (see, tables 42,48) is used in %33, seven section type (7.11x) (see, tables 43,48) is used in 22% and nine section type (9.4x) (see, tables 43,48) is used in 22%, three section type (3.1x,3.6x) (see, tables 41,47,48) is used in 14% of Non- Residential Leisure buildings whereas five section type (5.4x, 5.12x) (see, tables 40,45,48) is used in 59%, six section

type (6.4x)(see, tables 47,48) is used in 14%, eleven section type (11.1x) (see, tables 47,48) is used in 14%, nine section type (9.2x) (see, tables 40,48) is used in 100% of Non-Residential Community buildings, one section type (1.3x, 1.1x, 1.6x,1.7x,1.8x) (see, tables 40,42,44,45,46,47,48) is used in 100% of Roads, two section type (2.1x) (see, table 41) is used 100% in cases where there is garden wall and garden door in Non-Residential Open Lands, one of the one section types (1.1x,1.3x,1.6x,1.4x) (see, tables 41,42,46,48) is used 100% in cases where there is no garden wall and garden door in Non-Residential Open Lands. Based on reading results, it is determined that road with proportions of 1.3x, 1.6x and 1.1x are the most repeated types (see, table 48).

- Findings of buildings and elements with different functions used in facades based on vertical solid-void relations on solid-void section numbers are as follows: three section type (3.3y, 3.4y, 3.6y)(see, tables 41,42,46,48) is used in 66% of Residential buildings whereas two section type (2.1y, 2.3y)(see, tables 43,44,45,48) is used in 44%, two section type (2.3y, 2.2y)(see, tables 42,48) is used in 67% of Non-Residential Retail buildings whereas three section type (3.6y,3.3y)(see, tables 43,45,48) is used in 33%, two section type (2.3y,2.1y)(see, tables 40,45,48) is used in 67% of Non- Residential Leisure buildings, nine section type (9.2y)(see, tables 40,48) is used in 100% of Non-Residential Community buildings, one section type (1.5y)(see, tables 41,48) is used in 100% of Non-Residential Open Lands in cases where there is garden wall and garden door, four section type (4.3y and 4.4y)(see, tables 40,43,47,48) is used in 100% of two-storey Non Residential Retail/Residential House and five section type (5.7y) is used in 100% of Non-Residential

Leisure/Residential House buildings. The type is determined as (4.3y)(see, tables 40,43,47,48) in two-storey Non-Residential Retail/Residential House buildings. No repeated type is determined in other buildings. - Based on the use of golden proportion in facades; golden proportion is used in 55% of Residential buildings, 50% of Non-Residential buildings, 33% of Non-Residential Leisure buildings and 25% of two-storey Non Residential Retail/Residential House buildings. No golden proportion is determined in other buildings (see, table. 48).

- The analysis results have shown that proportions of Alberti, Palladio and Serlio are still used. In this regard, Alberti's I1(1:1)-I2(1:1.5)-I3(1:2) and Palladio's 1:2 1:3 proportions are used in window types. Alberti's 2:1-1:1.5 proportion of D1(1:1)-D2(1.5:1)-D3(1:2)-D8(1:1.5). 1:1 and Palladio's 1:2, 1:3 and Alberti's 2:1-1:1.5 are used in door types, which are the proportions found in mathematics sections used by Palladio and music sections (musical harmonic proportions) 1:1-Square Unit, 1:2-Octave, Double Square, 1:3-Double Sesquilateral, 1:1.5-Fifth Sesquilateria, Fifth Diapente. In building heights, when facades come together by repeating the proportions of 1:1 and 1:2 used by the Alberti and Palladio, facades are formed vertically. These proportions also identified as the musical harmonic proportions (1:1-Square Unit, 1:2-Octave). In regard to buildings and elements width, the aggregation of the proportions of 1:1, 1:2, 1:1.5 and 1:4 used by Alberti and Palladio is observed to be repeated at specific points horizontally and this repetition form facades. These proportions identified as the musical harmonic proportions (1:1-Square Unit, 1:2-Octave, Double Square, 1:1.5-Fifth Sesquilateria, Fifth Diapente and 1:4-Quadruple). Height-width relations of the buildings, found out that proportions of 1:1 (square unit), 1:2 (octave), 1:1.5 (Fifth Sesquilateria, Fifth Diapente) and 1:3 (double sesquialteria), used by Alberti and Palladio, are founded. According to the sequences, over declinations are seen in the Legend stated in Appendix C of the horizontal and vertical solid void relations of the buildings as a result of analysis done. It is determined that proportions of 1:1(Square Unit), 2:1(Octave), 1:2(Octave), 3:1 (Double Sesquialteral), 2:3(Fifth Sesquilatertia-Fifth Diapente), 3:2, 3:4 (Fourths Sesquitertia –Fourth diatessaron) used by Alberti, Serlio and Palladio are used and facades are formed with the repetition of those proportions according to the width of facade. In the sequence, over declinations takes place in the Legend given in Appendix C of the vertical solid-void relations of the buildings as a result of analysis done. It is determined that proportions of 1:1(Square Unit), 2:1(Octave), 1:2(Octave), 3:1 (Double Sesquialteral), 2:3(Fifth Sesquilatertia-Fifth Diapente), 3:2, 3:4 (Fourths Sesquitertia –Fourth diatessaron) used by Alberti, Serlio and Palladio are used and facades are formed with the repetition of those proportions according the height of facade (see, table 49).

When the outcomes obtained by analytical reading done based on LMMA method that is tested on facades of Kyrenia Village squares are considered, the following proposals can be made to maintain the current character in new housings that will be built in existing facades:

- It is identified that square types of the region are religious and commercial squares. Based on this, facade I can be used on a square facade when a Religious square will be formed by use of existing facade schemes in new squares. At least one facade can be formed either by facade 3, 4 or 8 in formation of a commercial square.

- Square and rectangular square forms are used the most in formation of square forms. Facade schemes, which will be selected in formation of new squares, can be selected in this regard.
- Rule schemes of different facade elements in each facade is ascertained. Necessary functions can be selected and produced as per the size of the new square where different facade schemes may be built.
- Buildings, which will be added or built newly, may develop schemes that are suitable to new living standards and take these building facades as a reference or an existing one can be selected and used.
- Front facades of all buildings can be enabled to face the square and have porch
- Interpretation developed based on music discipline can be used in cases where new squares are formed by existing facade schemes. With abstraction of different schemes based on same functional features, different chapters (facades) and squares (composition songs) can be formed with a change in sentences that include existing melodies.

As a result of the analytical reading developed within the scope of this study, two-dimensional analytical rule vocabulary of facades is formed based on these rules. Different facade types with same characters can be built based on the determined rule vocabulary. It is determined that facades of Kyrenia Village squares have lost their originality due to changing living conditions. Therefore, this method can contribute to the maintenance of current characteristics of square facades. LMMA method, developed based on mathematics and linguistics discipline, can be used as a reference for the newly constructed squares in North Cyprus or it may be a reference for structures, which will be newly built in existing squares, to maintain their existing character. Also, new square facades may be interpreted by the current formation through music discipline. Analytical results of existing characters can be determined in this stage by LMMA method and squares can maintain their original characters analytically. Consequently, by observations and classical methods conducted, it is said that the identity is preserved. However, these details are clearly proved with a study by analytical reading method (LMMA).

Table 40: Formation of Facades I and Musical Interpretation

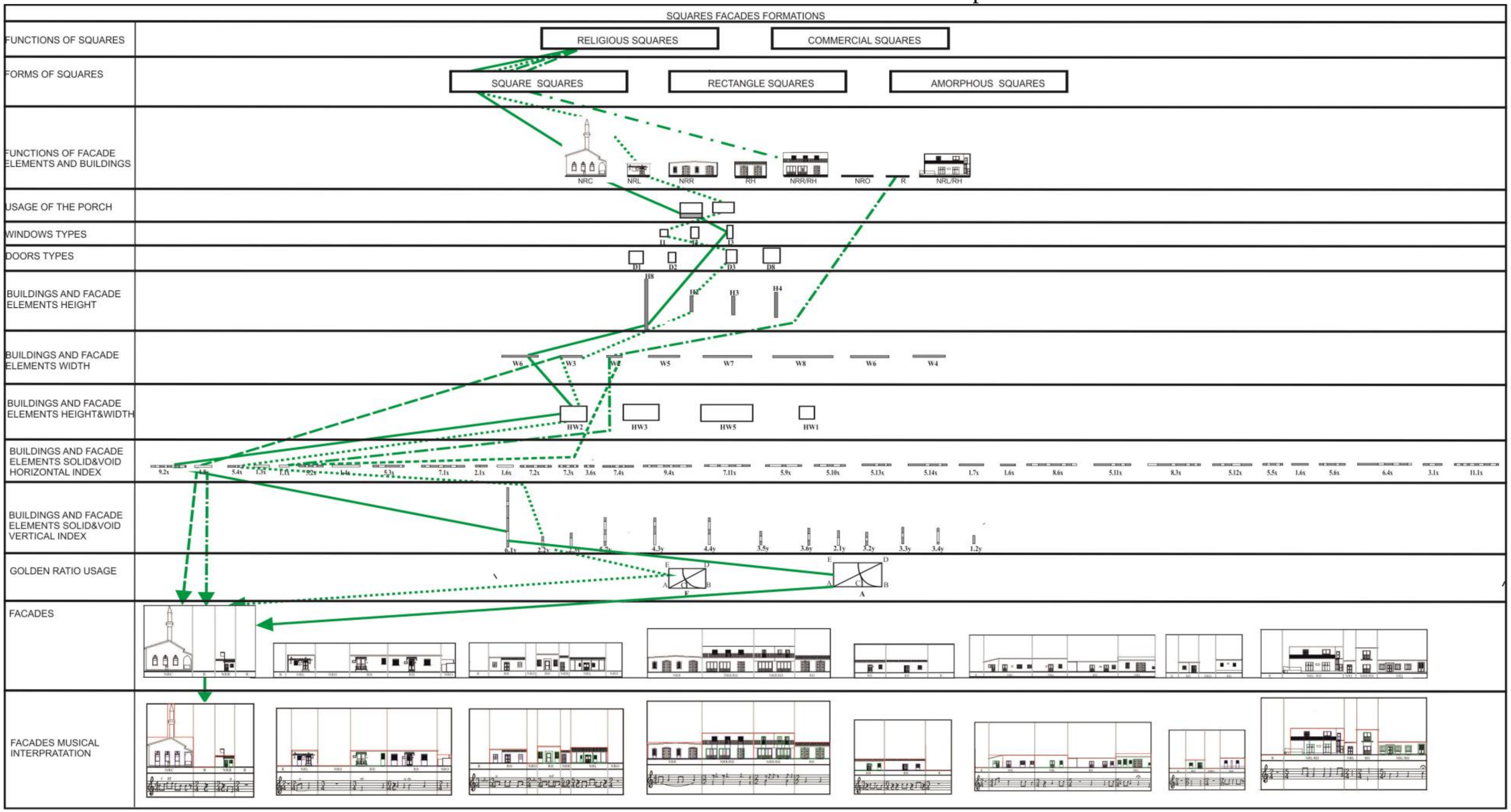


Table 41: Formation of Facades II and Musical Interpretation

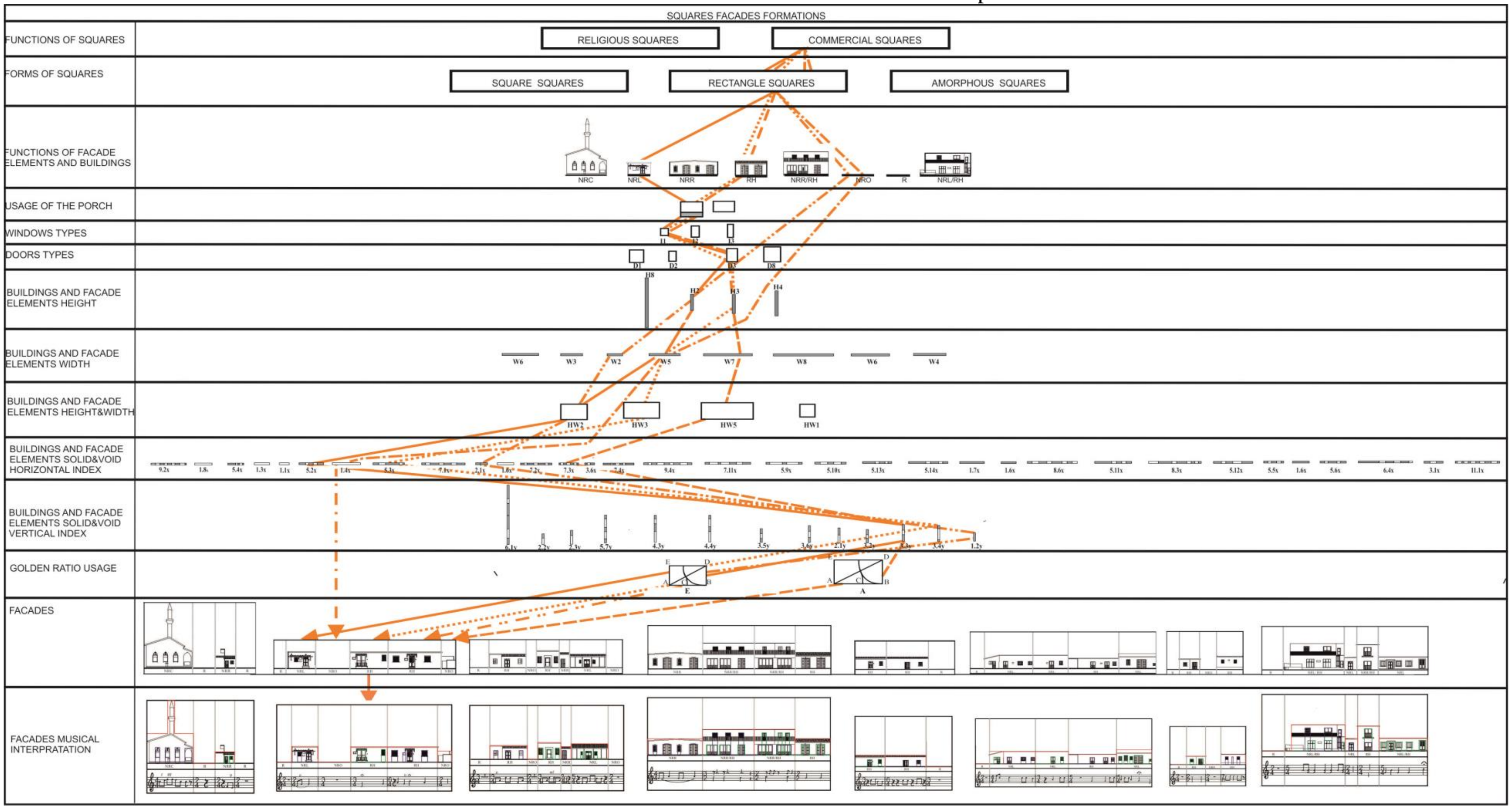


Table 42: Formation of Facades III and Musical Interpretation

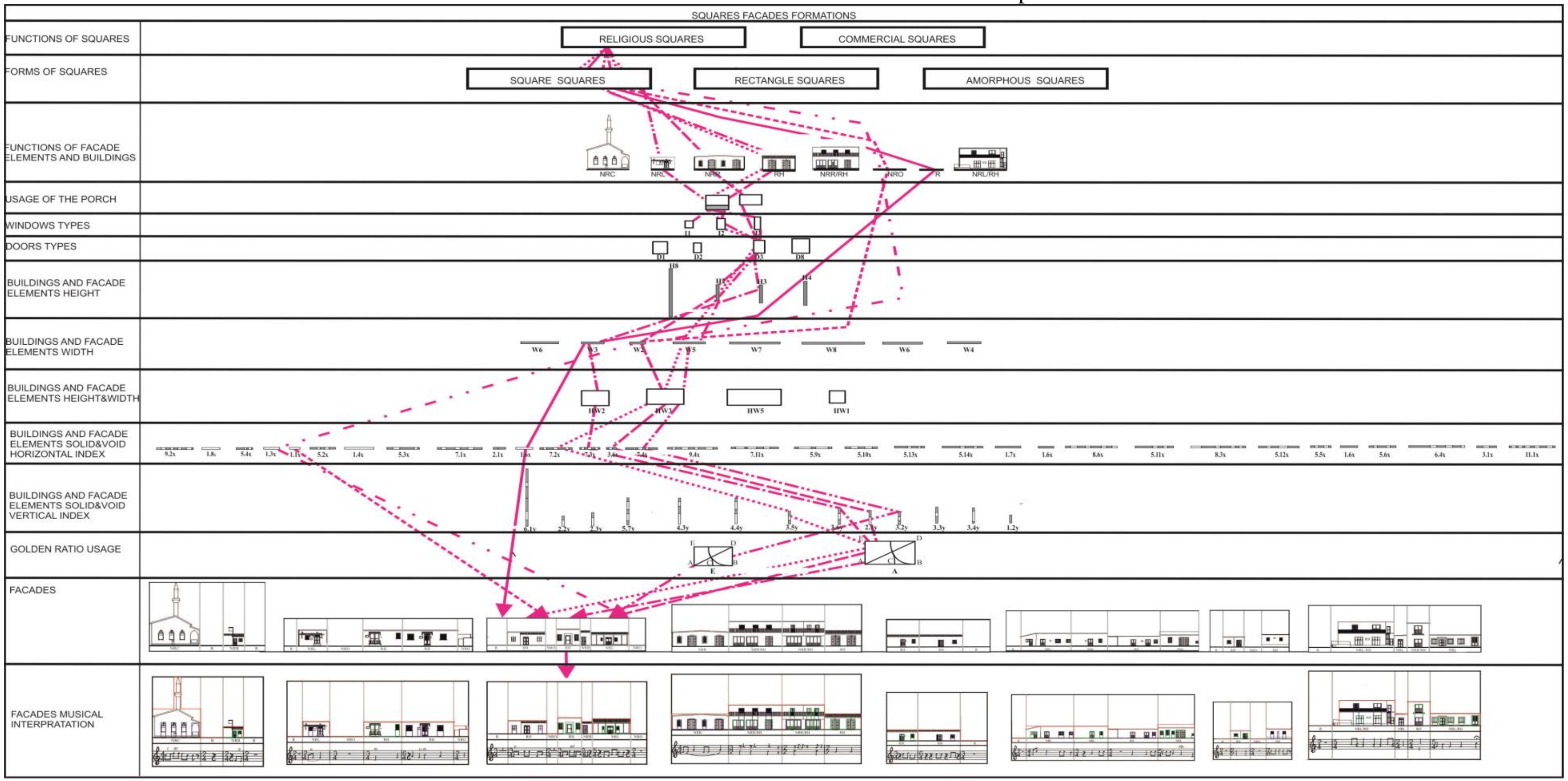


Table 43: Formation of Facades IV and Musical Interpretation

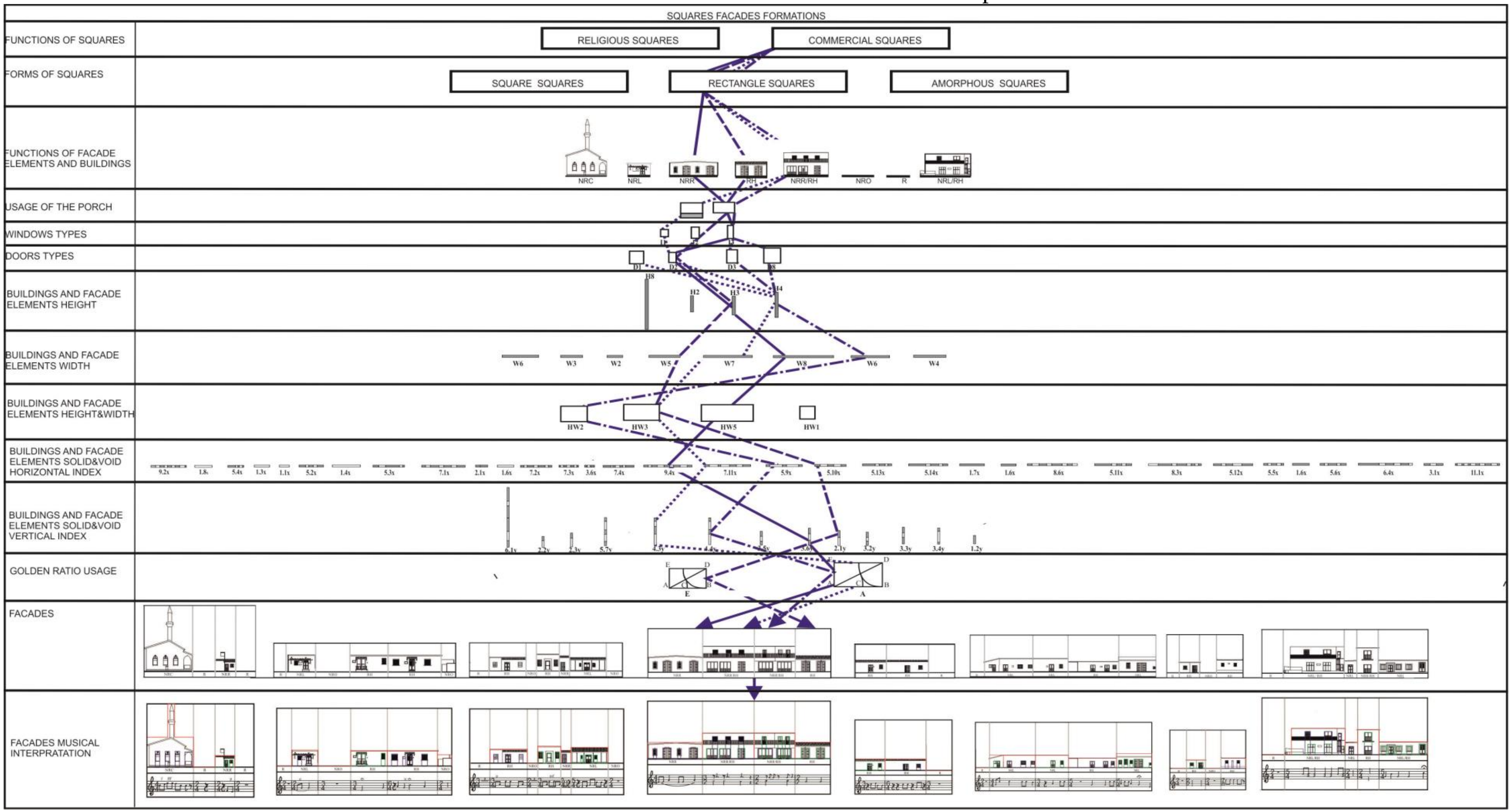


Table 44: Formation of Facade V and Musical Interpretations

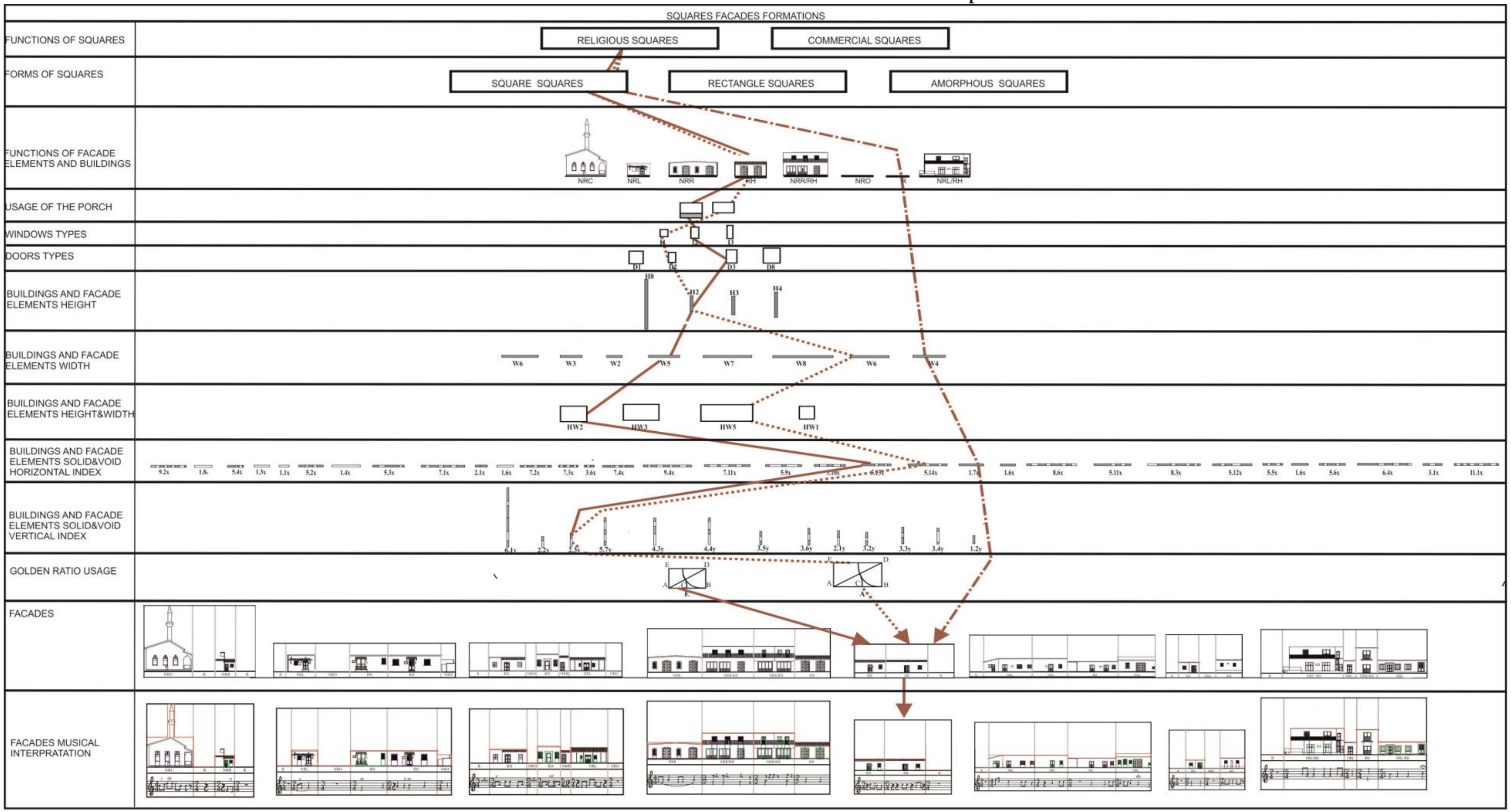


Table 45: Formation of Facades VI and Musical Interpretation

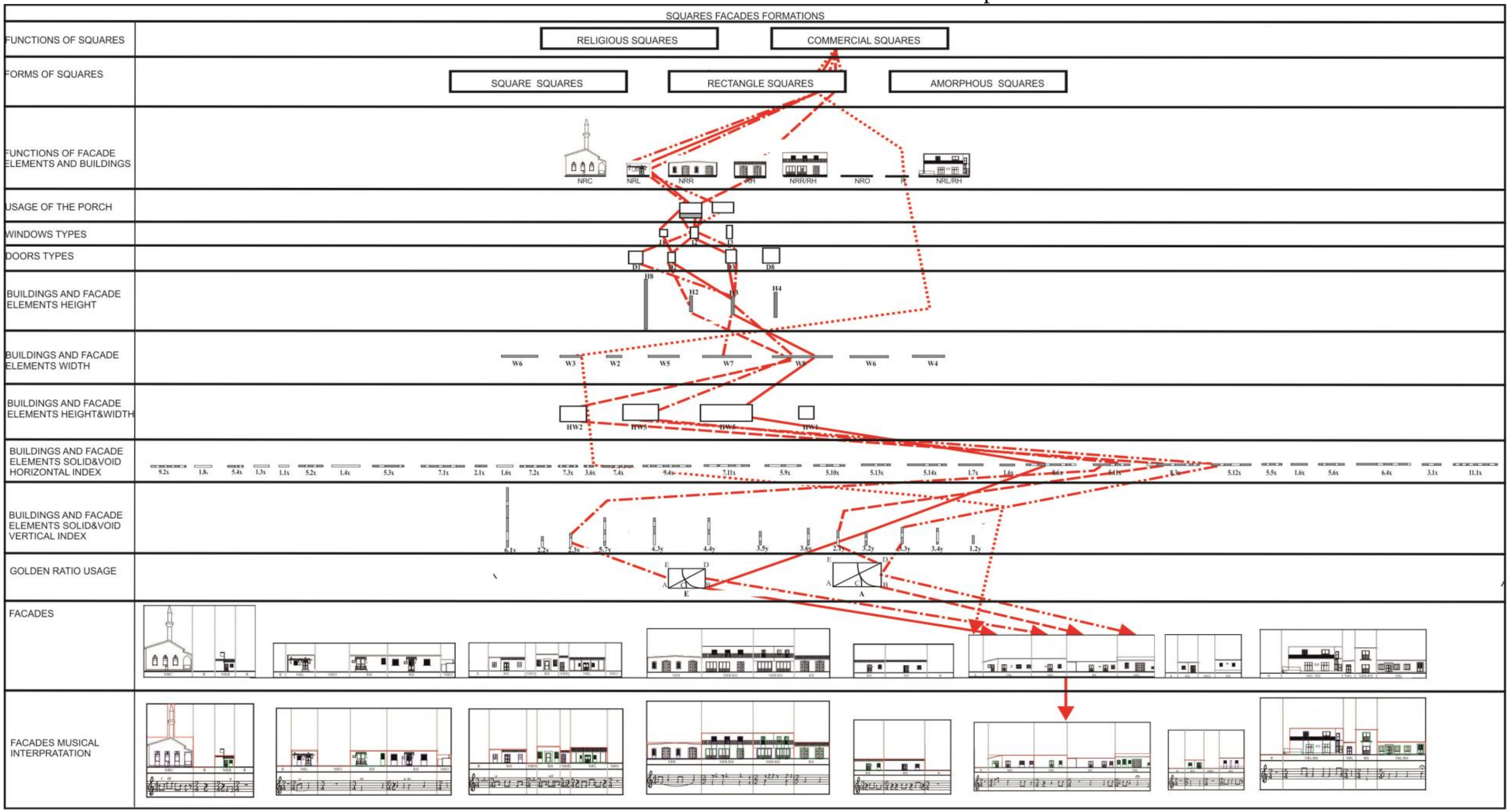


Table 46: Formation of Facades VII and Musical Interpretation

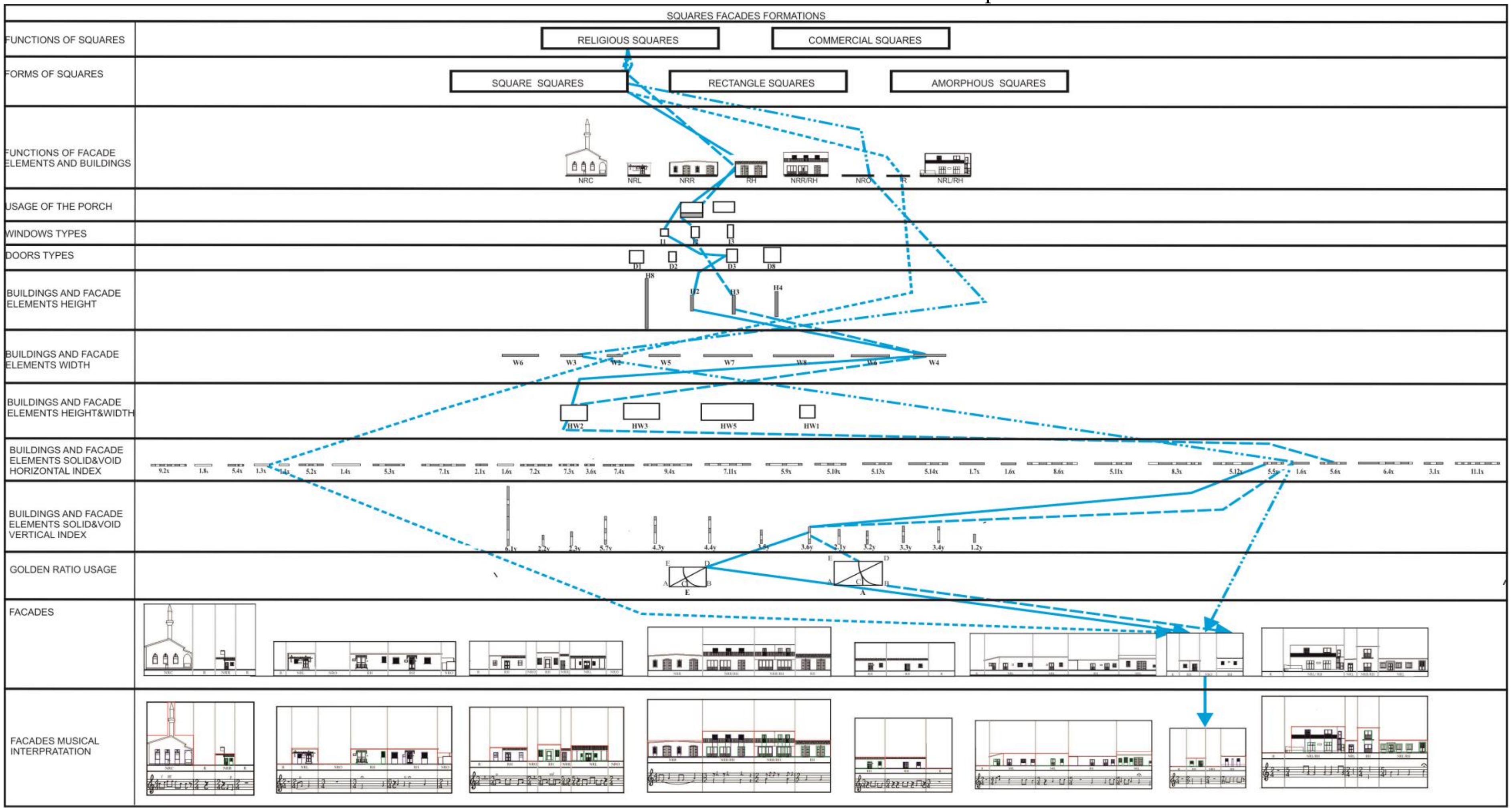


Table 47: Formation of Facades VIII and Musical Interpretation

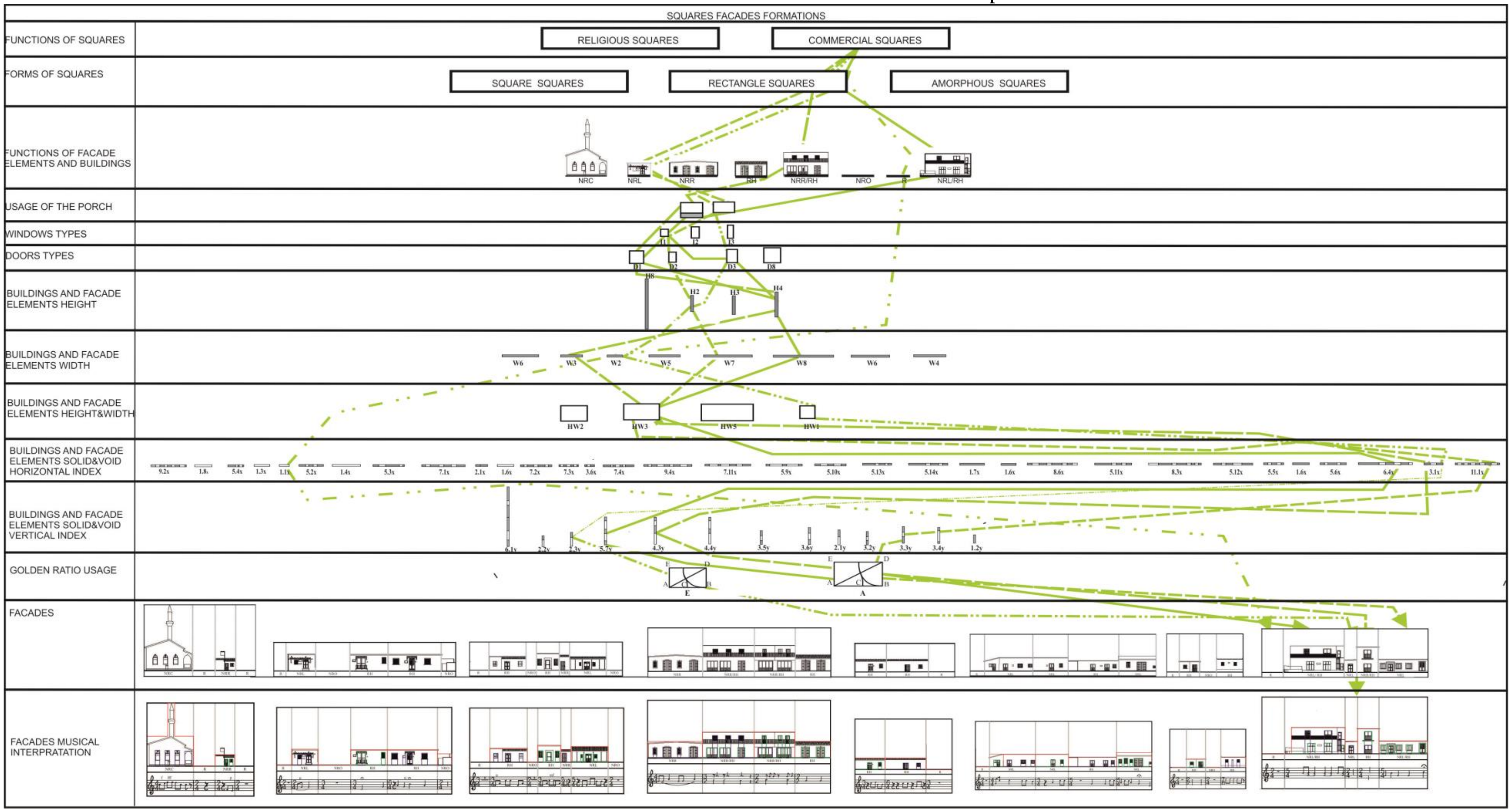


Table 48: Formation of Eight Facades and Musical Interpretation

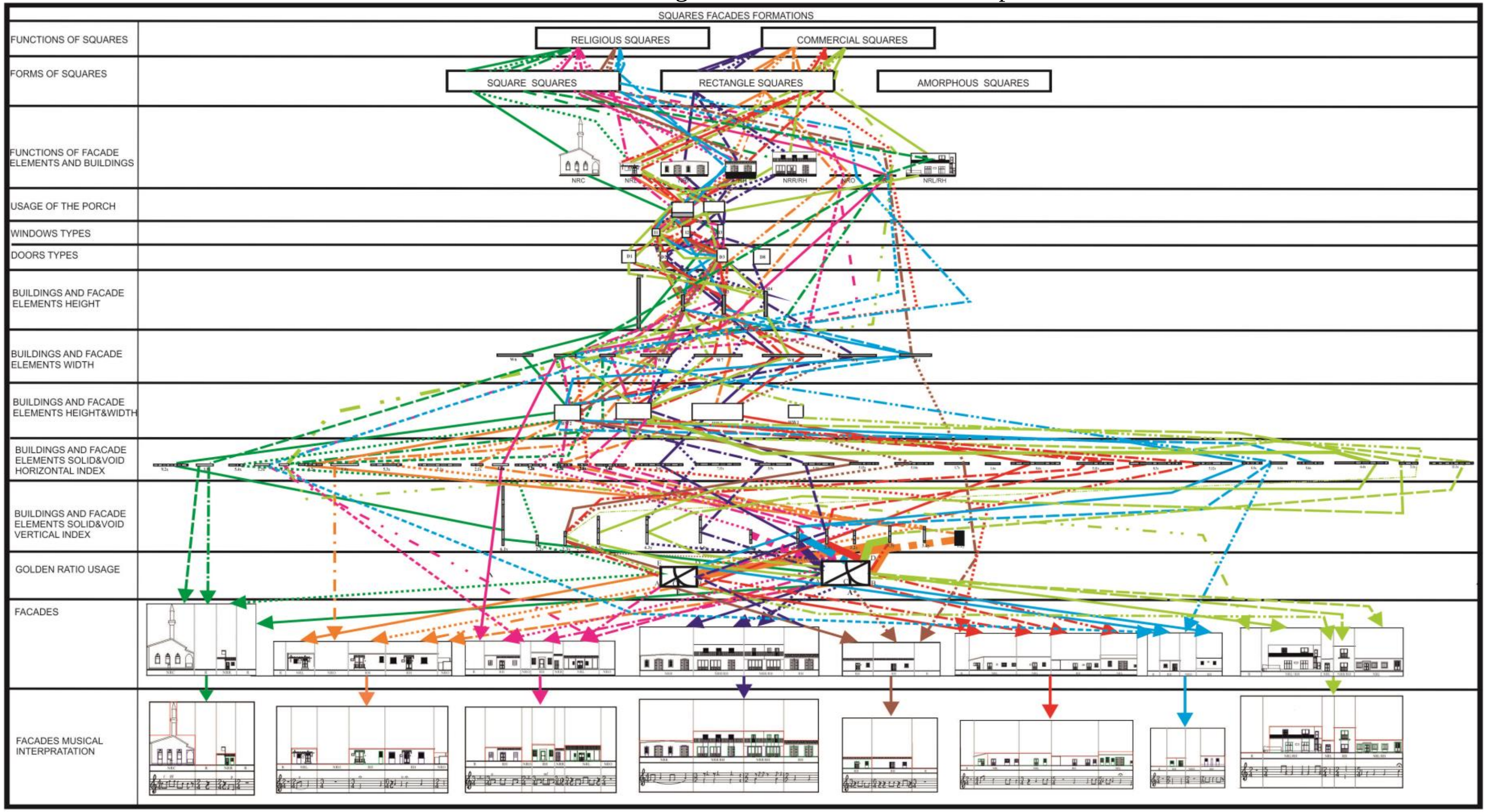


Table 49: Analytical Reading Findings

Disciplines	Concepts	Sub-Concepts			Findings	
Linguistics	**Words /Signs Elements/Unit**	Vocabulary				See, Appendix C
	Group of Words	Vocabulary				
	Sentence	Grammar- Vocabulary and Grammar Rules- Syntax				See, Tables 41-49
	Paragraph	Grammar- Vocabulary and Grammar Rules- Syntax				
	Composition	Grammar- Vocabulary and Grammar Rules- Syntax				
Mathematic	**Number Sign Units Pattern**	Propotion Geometry	Palladio's Proportions	1:1	√	Windows (See, Chapter 6, Section, 6.5.1.5) Doors (See, Chapter 6, Section, 6.5..1.5) Heights (See, Chapter 6, Section, 6.5.1.6) Widths (See, Chapter 6, Section, 6.5.1.7) Height-Widths (See, Chapter 6, Section, 6.5..1.8) Solid-Void Rules (See Chapter 6, Section, 6.5.1.9) See, Appendix C, Part B
				5:4		
				4:3	√	See, Appendix C, Part B
				3:2	√	Doors (See, Chapter 6, Section, 6.5..1.5) See, Appendix C, Part B
				5:3		
				2:1-1:2	√	Windows (See, Chapter 6, Section, 6.5.1.5) Doors (See, Chapter 6, Section, 6.5.1.5) Heights (See, Chapter 6, Section, 6.5.1.6) Widths (See, Chapter 6, Section, 6.5,1.7) Height-Widths (See Chapter 6, Section, 6.5.1.8) Solid-Void Rules (See, Chapter 6, Section, 6.5..1.9) See Appendix C, Part B
			Alberti's Proportions	2.3	√	Doors (See, Chapter 6, Section, 6.5.1.5) Widths (See Chapter 6, Section, 6.5..1.7) Height-Widths (See, ,Chapter 6, Section, 6.5.1.8) Solid-Void Rules (See, Chapter 6, Section, 6.5..1.9 See, Appendix C, Part B
				4:3	√	See, Appendix C, Part B
				5:4		
				8:5	√	See Chapter 6, Section, 6.5..1.10) See, Appendix C, Part B
				5:3		
				3.4	√	Solid-Void Rules (See, Chapter 6, Section, 6.5..1.9 See, Appendix C, Part B
				2.3	√	See, Appendix C, Part B
				9.5		
				15.8		
				3:2	√	Doors (See, Chapter 6, Section, 6.5.1.5) Solid-Void Rules (See, Chapter 6, Section, 6.5..1.9)

				1:2	√	Windows (See, Chapter 6 Section, 6.5.1.5) Doors (See, Chapter 6, Section, 6.5.1.5) Heights (See, Chapter 6, Section, 6.5.1.6) Widths (See, Chapter 6, Section, 6.5.1.7) Height-Widths (See, Chapter 6, Section, 6.5.1.8) Solid-Void Rules (See, Chapter 6, Section, 6.5.1.9)
				3:18		
				1:4	√	Widths (See, Chapter 6, Section, 6.5..1.7) Height-Widths (See, Chapter 6, Section, 6.5.1.8)
				9:16		
				4:9	√	See, Appendix C, Part B
				1:1	√	Windows (See Chapter 6, Section 6.5.1.5) Doors (See Chapter 6, Section 6.5.1.5) Heights (See Chapter 6, Section 6.5..1.6) Widths (See Chapter 6, Section 6.5..1.7) Height-Widths See, Chapter 6, Section, 6.5.1.8) Solid-Void Rules (See, Chapter 6, Section, 6.5.1.9
				1:3	√	Windows (See Chapter 6, Section, 6.5..1.5) Widths (See Chapter 6, Section, 6.5.1.7) Height-Widths (See Chapter 6, Section, 6.5.1.8) Solid-Void Rules (See Chapter 6, Section, 6.5.1.9)
			Serlio's Proportion	1:2:3	√	Solid-Void Rules (See, Chapter 6, Section, 6.5.1.9) See Appendix D, Part B
			Golden Proportion	1.618	√	See, Chapter 6, Section,6.5.1.10)
			Fibonacci Number/ Sequence	1,1,2,3,5,8,13,21		
		Intervals			√	See, Appendix C, Part A ,Part C
	Sets/Sequences	EachUnit/Elements		**Windows:**		See, Chapter 6, Section 6.5.1.5
				{I3,I3,I3,I1}		
				{I1,I2,I1,I1,I1}		
				{I2,I2,I2,I2,I3,I2}		
				{I3,I3,I1,I1,I1}		
				{I2,I1}		
				{I1,I2,I2,I2,I1,I2}		
				{I1,I2,I2}		
				{I1,I1,I1,I}		
				Doors		See, Chapter 6, Section, 6.5.1.5
				{D3}		
				{D3,D3,D3}		
				{D3,D3,D3,D2}		
				{D2,D2,D1,D1,D2,D2,D3,D3,D8,D8,D2,D2}		
				{D3,D2}		
				{D6,D2,D3,D2,D2,D2,D1}		
				{D1,D1,D1,D3,D3,D3,D1,D1,D2,D2}		
				Heights:		See, Chapter 6, Section, 6.5.1.6
				{H8,H2}		
				{H3,H3,H3,H2}		
				{H2,H3,H2,H2}		
				{H3,H4,H4,H3}		
				{H2,H2}		
				{H3,H3,H2,H3}		
				{H2,H3}		
				{H4,H2,H4,H2}		

			Width	See Chapter 6, Section 6.5.1.7
			{W6,W3,W3,W2}	
			{W2,W5,W5,W5,W5,W7,W2}	
			{W3,W5,W2,W3,W2,W5,W2}	
			{W8,W7,W6,W5}	
			{W5,W6,W4}	
			{W3,W8,W6,W8,W7}	
			{W2,W4,W3,W4}	
			{W2,W8,W2,W3,W7}	
			Height&Width	See Chapter 6, Section 6.5.1.8
			{HW2,HW2}	
			{HW2,HW3,HW5,HW2}	
			{HW3,HW2,HW5,HW3}	
			{HW5,HW3,HW2,HW3}	
			{HW2,HW5}	
			{HW5,HW3,HW7,HW3}	
			{HW2,HW2}	
			{HW3,HW1,HW3,HW3}	
			HorizontalSolid&Void	See, Chapter 6, Section, 6.5.1.9
			{9.2x,1.8x,5.4x,1.3x}	
			{1.1x,5.2x,1.4x,5.3x,7.1x,2.1x}	
			{1.6x,7.2x,1.1x,7.3x,3.6x,7.4x,1.3x}	
			{9.4x,7.11x,5.9x,5.10x}	
			{5.13x,5.14x,1.7x}	
			{1.6x,8.6x,5.11x,8.3x,5.12x}	
			{1.3x,5.5x,1.6x,5.6x}	
			{1.1x,6.4x,3.1x,3.1x,11.1x}	
			Vertical Solid&Void	See, Chapter 6, Section, 6.5.1.9
			{6.1y,2.2y}	
			{3.3y,3.4y,3.3y,1.2y}	
			{3.5y,3.6y,2.1y,3.2y}	
			{3.6y,4.3y,4.4y,2.1y}	
			{2.3y,2.3y}	
			{3.2y,2.3,2.1,3.3y}	
			{3.6y,3.3y}	
			{5.7y,2.3y,4.3y,3.3y}	
	Mapping/ Sequence	Group of unit/ Elements Sequence Formation Diagram (Input-Output)	Functional	See, Chapter 6, Tables 41-49
			{NRC,I3,I3,I3,H8,W6,HW2,9.2x,6.1y}	
			{R,W3,1.8x}	
			{NRR,H2,D3,HW2,5.4x,2.2y}	
			{R,W2,1.3x}	
			{R,W2,1.1x}	
			{NRL,H3,W5,HW2,5.2x,3.3y}	
			{NRO,W5,1.4x }	
			{RH,H3,W5,HW3,5.3x,3.4y}	
			{RH,H3,W7,HW5,7.1x,3.3y}	
			{NRO,H2,W2,HW2,2.1x,1.2y}	
			{R,W3,1.6x}	
			{RH,H2,W5,HW3,7.2x,3.5y}	
			{NRO,W2,1.1.x }	
			{RH,H3,W3,HW2,7.3x,3.6y}	
			{NRR,H2,W2,HW5,3.6x,2.1y}	
			{NRL,H2,W5,HW3,7.4x,3.2y}	
			{NRO,W2,1.3x }	
			{NRR,H3,W8,HW5,9.4x,3.6y}	
			{NRR/RH,H4,W7,HW3,7.11x,4.3y}	
			{NRR/RH,H4,W6,HW2,5.9x,4.4y}	
			{RH,H3,W5,HW3,5.10x,2.1y}	
			{RH,H2,W5,HW2,5.3x,2.3y}	
			{RH,H2,W6,HW5,5.14x,2,3y}	
			{R,W4,1.7x}	
			{R,W3,1.6x}	
			{NRL,H3,W8,HW5,8.6x,3.2y}	
			{NRL,H3,W6,HW3,5.11x,2.3y}	
			{RH,H2,W8,HW7,8.3x,2.1y}	
			{NRL,H3,W7,HW3,5.12x,3.3y}	
			{R,W2,1.3x}	
			{RH,H2,W4,HW2,5.5x,3.6y}	
			{NRO,W3,1.6x}	
			{RH,H3,W40,HW2,5.6x,3.3y}	
			{R,W2,1.1x}	

				{NRL/RH,H4,W8,HW3,6.4x,5.7y}			
				{NRL,H2,W2,HW1,3.1x,2.3y}			
				{NRR/RH,H4,W3,HW3,3.1x,4.3y}			
				{NRL/RH,H2,W7,HW3,11.1x,3.3y}			
	Algorithmn			**Algorithmn I** ={NRC,I3,I3,I3,H8,W6,HW2,9.2x,6.1y}+{R, W3,1.8x}+{NRR,H2,D3,HW2,5.4x,2.2y}+{R, W2,1.3x}			See, Chapter 6, Tables 41-49 See, Apendix E
				Algorithmn II ={R,W2,1.1x}+{NRL,H3,W5,HW2,5.2x,3.3y}{NRO,W5,1.4x}+{RH,H3,W5,HW3,5.3x,3.4y}6+{RH,H3,W7,HW5,7.1x,3.3y}+{NRO,H2,W2,HW2,2.1x,1.2y}			
				Algorithmn III {R,W3,1.6x}+{RH,H2,W5,HW3,7.2x,3.5y}+{NRO,W2,1.1.x}{RH,H3,W3,HW2,7.3x,3.6y}+{NRR,H2,W2, HW5,3.6x,2.1y}{NRL,H2,W5,HW3,7.4x,3.2y}9{NRO,W2,1.3x }			
				Algorithmn IV {NRR,H3,W8,HW5,9.4x,3.6y}+{NRR/RH, H4,W7,HW3,7.11x,4.3y}+{NRR/RH,H4,W6, HW2,5.9x,4.4y}+{RH,H3,W5,HW3,5.10x,2.1y}			
				Algorithmn V {RH,H2,W5,HW2,5.3x,2.3y}+{RH,H2, W6,HW5,5.14x,2,3y}+{R,W4,1.7x}			
				Algorithmn VI= {R,W3,1.6x}+{NRL,H3,W8,HW5,8.6x, 3.2y}+{NRL,H3,W6,HW3,5.11x,2.3y}+{RH,H2,W8,HW7,8.3x,2.1y}+{NRL,H3,W7,HW3,5.12x,3.3y}			
				Algorithmn VII {R,W2,1.3x}+{RH,H2,W4,HW2,5.5x, 3.6y}+{NRO,W3,1.6x}+{RH,H3,W40,HW2,5.6x,3.3y}			
				Algorithmn VIII {R,W2,1.1x}+{NRL/RH,H4,W8, HW3,6.4x,5.7y}+{NRL,H2,W2,HW1,3.1x,2.3y}+{NRR/RH,H4,W3,HW3,3.1x,4.3y}+{NRL/RH,H2,W7,HW3,11.1x,3.3y}			
	Results			R (Square) = A1 (Facade)+A2 (Facade)+A3 (Facade)+A4 (Facade)			See, Apendix D
				R (Square) = A2 (Facade)+A3 (Facade)+A4 (Facade)+ A1 (Facade)+			
				R (Square) = A2 (Facade)+A3 (Facade)+A4 (Facade)+ A1 (Facade)			
				R (Square) = A3 (Facade)+A2 (Facade)+ A4 (Facade)+ A1 (Facade).....etc.			
Music	**Note/Signs/ Units**	Staff, Rest, Scale, Tones, Rhythmn, Nuance					
	Motif	Melody Harmony Rhythmn	Musical Harmonic Proportions	Square Unit	1:1	√	Windows (See, Chapter 6, Section, 6.5.1.5) Widths (See, Chapter 6, Section, 6.5.1.7) Height-Widths (See, Chapter 6, Section 6.5.1..8) Doors (See Chapter 6, Section 6.5.1.5) Widths (See Chapter 6, Section 6.5.1.7)
	SentenceTerm Period	Melody Harmony Rhythmn		Octave (Double Square)	1:2	√	Windows (See, Chapter 6, Section, 6.5.1.5) Widths (See, Chapter 6, Section, 6.5.1.7) Height-Widths (See, Chapter 6, Section 6.5.1..8) Doors (See Chapter 6, Section 6.5.1.5) Widths (See Chapter 6, Section 6.5.1.7) Height-Widths (See Chapter 6, Section 6.5.1.8) Solid-Void Rules (See Chapter 6, Section 6.5.1.9
	Chapter	Melody Harmony Rhythmn		Double Sesquilateral	1:3	√	Windows (See, Chapter 6, Section, 6.5.1.5) Widths (See, Chapter 6, Section, 6.5.1.7)

							Height-Widths (See, Chapter 6, Section 6.5.1..8)
	Composition/ Songs	Melody Harmony Rhythmn		Fifth-Sesquilatertia, Fifth Diapente	2:3	√	Doors (See Chapter 6, Section 6.5.1.5) Widths (See Chapter 6, Section 6.5.1.7) Height-Widths (See Chapter 6, Section 6.5.1.8) Solid-Void Rules (See Chapter 6, Section 6.5.1.9
				Fourth Sesqutertia Fourths Diastessaron	3:4	√	Solid-Void Rules (See Chapter 6, Section 6.5.1.9)
				Ninth Sesquialtertia Doubled	4:9		
				Sesquialtertia Doubled	9:16		
				Double Sesquiltertia	3:8		
				Quadruple	1:4	√	Widths (See Chapter 6, Section 6.2.1.3) Height-Widths (See Chapter 6, Section 6.5.1.8)
				Third	5:4		
				Diatesseron Fourth	4:3		
				Sixth	5:3		

Consequently, as a result of the application and testing of the analytical reading method, it has been founded out that relatively with the linguistic discipline facades can be individualy decoded. Individual decodings enable the determination of vocabulary and grammar formations related with the proportions and intervals. This method is an analytical tool, which revealed that the existed proportions and intervals continued on facades (See, Table 49). Due to these determinations, it could be seen that this is a pure ontological approach. In that respect, related with the ontological approach it is an abstract method that gives possibility to achieve serial readings of facades. Thus, it enables possibility to make generalizations and achieve the formation rules. Furthermore, these results give a possibility to determine the identity and help to provide the continuity of identity and character of the facade.

Chapter 7

CONCLUSION

This study was focused mainly on the development of an interdisciplinary reading method for analytical reading of facades based on the aim of the study. LMMA method is created with the use of mathematics, linguistics, general characteristics of squares alongside the existing methods used in these disciplines as the input of the method. In this regard, concepts used in mathematics discipline based on the hypothesis of the thesis, have contributed to proportional decoding of existing elements in analytical reading of facades. In the theory section, sub-headings of mathematics are regarded as sub concepts of theory of proportion, geometry, pattern and sequences in analytical development phase of this method and are used in the method. Linguistics discipline have made great contribution to ascertain the existing vocabulary in facade readings and to read facades based on grammar rules. In this context, vocabulary, which is one of the sub concepts used in linguistics, is formed by coding sign/numbers, proportion, intervals, geometric forms and patterns used in mathematics discipline. Grammar, which is the second sub concept, has contributed to the method in the rule formation phase of facades based on mapping, sets, sequences and algorithm concepts used in mathematics discipline.

Music discipline is used for the interpretation of facades. In this regard, their own tools are created with the help of Rankscale method and facades were interpreted. Harmony, rhythm and melody, which are sub concepts used in music discipline, are formed with the help of note, motif, sentence/term/period, chapter, compositions (songs) concepts that are the main concepts for the interpretation of facade movements, though facades were interpreted. In this sense, music discipline is not a discipline that contributes the formation of method but is a discipline that was used in audial and emotional interpretation of facades examined within the method. In this regard, it is an outcome of the method. Consequently, it is ascertained that facade analysis can be made within the scope of this method with the contribution of mathematics and linguistics disciplines based on the hypothesis of the thesis. It is identified that music discipline can be an interpretation tool and contribute at this point.

LMMA method is a method developed to maintain the sustainability of existing facades by identifying their image and character. Two-dimensional analytical reading of facades is revealed by the LMMA method. The method is developed through square facades and tested on Kyrenia Square facades. On the selection of fieldwork, it was stated that facades of Kyrenia Village Squares have identities and are exposed to deterioration due to changes. As it was stated in the results that were obtained in the testing phase, identities of facades are proved as a result of analytical reading. Consequently, there is a proof that Kyrenia village squares have special characteristics, and rules for the formations. With this method, the formation rules of different facade elements that is composing the facade was achieved. Also, it has been revealed that within the detected formation rules- according to the determination of the needed functions- various facade schemes could be produced according to the size of the square. These rules could be used both for new additions to the existing facades or to the new buildings by taking existing facades as the references in line with the current conditions or by taking directly the existing schemes and applying them.

Another important outcome obtained in the testing phase of the method is that golden proportions and proportions of Alberti and Palladio, which were defined in the theory part under mathematics, musics discipline, are used on facades and facades of buildings.

As a result of LMMA method, the interpretation system developed based on music discipline can be used for interpretations made in regard to music discipline in cases where schemes for new squares will be created by existing facade schemes. In this sense, with isolation of different schemes with same functional features, different chapters (facades) and squares (composition-songs) can be formed by changing the place of sentences that include existing melodies. Based on this system, such urban spaces as streets and boulevards that consist of facades can be developed by additions or adaptions in interpretation system and facades of different spaces can be interpreted.

LMMA method can be applied to square facades in different countries. The language can be formed by two-dimensional analytical reading of square facades. Consequently, formation rules of square facades can be determined. In this sense, it is claimed that architects and urban designers can use the method for the formation of new squares or it is an analysis method that can be used in revitalization and conservation projects on the existing facades.

Another significant outcome of the method is that it provides the chance to control and direct the physical development of the areas for new additions.

LMMA method is a method developed through existing square facades. However, it can be used in two-dimensional analytical reading of street and boulevards that have different urban spaces composed of facade composition and determines the existing characteristics.

LMMA method is a method that has development potential. From this point of view, the method can be used in its existing or developed form in different researches. In this regard, issues that are brought up to discussion on how the research, which is limited to specific acceptance, can be developed and used in prospective studies may be listed as the following:

- In the testing phase of LMMA method, no help is received from any computer program, analysis were made on drawings based on legends developed and analytical reading tables are ascertained. In this sense, it is found out that LMMA method is not a practical method. In that respect, this method can be used as a base for a user-friendly computer program that may have practicality in the future.

- Researchers who conduct environmental analysis would have the opportunity to form their own analytical readings related to mathematics and linguistics disciplines by using the basic concept of LMMA method at several levels from a single building to an urban scale. Additionally, it would provide the opportunity to create archive material on the identity of specific places for specific points in time.

- Instead of architecture, LMMA method can also be used in other fields, which are formed from different surface (plane) with the combination of more than one unit according to the base of the mathematical unit, linguistic construction and could be interpreted by the music discipline.

- LMMA is an interdisciplinary method with special characteristics that could be used and developed further for different surfaces of the defined spaces or objects at various scales such as interior space, outdoor spaces, buildings or objects that has precise (well defined) limits (start and end).

- With addition of space syntax analysis to LMMA method, understanding the potential of settlement idea to aggregate people apart from formal characteristics of physical composition of squares may be developed intentionally.

Consequently, LMMA method does not intend to answer any questions of the examined area (squares) in the history of architecture and does not claim to contribute to the history of the buildings around the squares. It aims to specify a method related to four different disciplines, and the related methods stated above and language of facades are ascertained by two-dimensional analytical reading. In this respect, the developed method is an interdisciplinary and two-dimensional reading method. With contribution of interdisciplinary method to existing identity studies by different disciplines, a different point of view is created and it is ascertained that language, identity and image can be determined by analytical reading. In this regard, it is proved that identity and image can be evaluated and interpreted with different disciplines, instead of one discipline, on deteriorations and changes in the built environment due to technological developments.

REFERENCES

Adams, E. W., & Adams, W. Y. (1991). *Archeological Typology and Practical Reality: A Dialectical Approach to Artifact Classification and Sorting*, Cambridge University Pres, Cambridge.

Akın, Ö. (1987). *Psychology of Architectural Design (Architecture & Design Science),* London: Pion Ltd.

Alexander, C. (2002). *The Nature of Order: An Essay on the Art of Building and the Nature of the Universe*, Book 1 - The Phenomenon of Life (Center for Environmental Structure, Vol. 9, California: Center for Environmental Structure.

Alexander, C., Ishikawa, S., & Silverstein, M. (1977). *A Pattern Language: Towns, Buildings, Construction*, New York: Oxford University Press.

Allen, J. P. B., & Buren, P. V. (1971).*Chomsky: Selected Article*. New York: Oxford University Press, 7.

AL-Muttalibi, A. Y., & Yousif, N. A. (2013). The Grammatical Phenomenon of Rankshift in Systemic Grammar, *Al-Mansour Journal Issue*, 19, 135-157, (2016, March 25). Retrieved from http://www.muc.edu.iq/mucj/19/J19/pdf

Alperson, P. (1987). *What is Music?:An Introduction to the Philosophy of Music.* New York: Penn State Press.

Altan. İ. (1993). Mimarlıkta Mekan Kavramı, *İstanbul Üniversitesi Psikoloji Çalışmaları Dergisi*, 19(1), 78-88.

Ana Britanica (1988). *Genel Kültür Ansiklopedisi Yayıncılık A.Ş. and Encyclopedia Britannic Inc. İşbirliği*, İstanbul, 7, 267.

André, M. (1960). *Elements of General Linguistics*. Tr. Elisabeth Palmer (Studies in General Linguistics, vol. i.). London: Faber. p. 15.

Ankerl, G., & Ankerl G. (2013). *Experimental Sociology of Architecture: A Guide to Theory, Research and Literature (Contributions to the Sociology of Language)*, Berlin: De Gruyter Mouton.

Arabacıoğlu, B. C. (2008). İç Mimari Tasarım Sürecinde Bulanık Çıkarım Sistemi Temelli Mekân Analizi, *1. Ulusal İç Mimarlık Sempozyumu, Mimar Sinan Güzel Sanatlar Üniversitesi*, Oditoryum, Fındıklı, İstanbul, 306-323.

Askari, A. H. & Dola, K. B. (2009). Influence of Building Facade Visual Elements on Its Historical Image: Case of Kuala Lumpur City, Malaysia. *Journal of Design and Built Environment*, 5, 49–59.

Aydınlı, S. (1992). *Mimarlıkta Görsel Analiz*, İTÜ Mimarlık Fakültesi.

Ayyıldız, S. (2014). *İzmit Geleneksel Konutlarının Tipolojisi*, International Symposium on Ghazi Akça Koca&History of Kocaeli, 02-04 May 2014, Kocaeli, (2016, March 27) Retrieved from www.kocaelitarihisempozyumu.

com/bildiriler.html

Aziz D. A., & Shuqair, H. I. (2014). Amman's Facades Lost between Identity and Veracity; Factors Impacting Facades' Design, *Arts and Design Studies,* 26, 20-24.

Babacan, E. (2014). AGSL Öğrencilerinin Müzik Kavramına İlişkin Algıları: Metafor Analizi, *Eğitim ve Öğretim Araştırmaları Dergisi*, 3 (1), 124-132.

Baker, G. H. (1996). *Design Strategies in Architecture: An Approach to the Analysis of Form*, 2nd edn, London: Spon.

Baker, W. T. (2008). *Architectural Excellence in a Diverse World Culture*. Mulgrave, Vic: Images Pub.

Bandur, M. (2001). Aesthetics *of Total Serialism, Contemporary Research from Music to Architecture*. Basel: Birkhauser.

Baper, Y. B., & Hassan, A. S. (2012). Factors Affecting the Continuity of Architectural IdentityArchitectural Identity, *American Transactions on Engineering & Applied Sciences*, 1(3), 227-236.

Bartòk, B. (1937). *Music for String Instruments, Percussion and Celesta (score). Series:* Philarmonia, Universal Edition, No. 201.

Beckers. K. (2015). *Pattern and Security Requirements: Engineering-Based*

Establishment of Security Standards, Springer: Cham.

Beilharz, K. (2003). Designing Sounds and Spaces: Interdisciplinary Rules &Proportions in Generative Stochastic Music and Architecture. In N. Cross & E. Edmonds (Eds.), *Expertise in Design - Design Thinking Research* (pp. 3-21), UTS Sydney: Creativity and Cognition Studios Press.

Belakehal, A., Boussora K., Farhi A., Sriti L. (2015). *A Morphological Analysis of the French Colonial Architecture in Algeria: the Facades of Biskra*, Courrier du Savoir, N°20, Université Mohamed Khider – Biskra, Algérie, 153-166, (2015, June 22). Retrieved from http://revues.univ-biskra.dz/index.php/cds/article/viewFile/1458/1381.

Benrós, D., Hanna, S. & Duarte, J. P. (2012). A generic shape grammar for the Palladian Villa, Malagueira House and Prairie House, *in Design Computing and Cognition DCC'12.*, In J.S. Gero (Ed.), 321-340, Springer.

Berkay, F. (2007). *Bursa, Mimarlık ve Sosyal Hayat*, Doktora Dersi Yayınlanmamış, Ders Notları 11.

Borowski, E. J., & Borwein, J. M. (2002). *Collins Dictionary of Mathematics*, second edition, London: Harper Collins Publishers.

Boussora, K., & Mazouz, S. (2004). The Use of the Golden Section in the Great Mosque at Kairouan, *Nexus Network Journal*, 6(1), 7-16.

Boyer, C. B. (1968). *A History of Mathematics*, United States of America: John Wiley&Sons, Inc.

Brickhouse, T., & Smith, N. D. (2015). Plato (427—347 B.C.E.), *IEP Internet Enciplopedia of Philosopy*, *Peer Rewiewed Academic Resource*, (June 25, 2015). Retrieved from http://www.iep.utm.edu/plato/.

Button, A. D. (2006). *The Architecture Happiness*, Toronto: McClelland& Stewart.

Cansu. S., (2008). *Eski Ankara Bağ Evleri ile Günümüz Villalarının Mekân Konfigurasyonu Karşılaştırması*, Unpublished Master Thesis, Gazi Üniversitesi Fen Bilimleri Enstitüsü, Ankara.

Çağdaş, G. (1996a). A Shape Grammar: The language of traditional Turkish houses, *Environment and Planning B*, 23(4), 443-464. doi: 10.1068/b230443

Çağdaş, G. (1996b). A Shape Grammar Method for Designing Row-Houses, *Design Studies*, 17(1), 35–51.

Capanna, A. (2009). Music and Architecture: A Cross between Inspiration and Method. *Nexus Network Journal*. 11(2), 257-265. Doi: 10.1007/978-3-76438976-5_8

Carafoli, E. (2009). Scientific and Artistic Creativity: In Search of Unifying Analogies In E. Carafoli, G.A. Danieli & G. O. Longo (Eds.) *The Two Cultures: Shared*

Problems, 239-264. Milan: Springer-Verlag Mailand.

Carmona, M., Heath, T., Oc, T. & Tiesdell, S.(2003). *Public Places- Urban Spaces: the Dimensions of Urban Design*. Oxford: Jordan Hill.

Ching, F. D. K. (2007). *Architecture--Form, Space, & Order.* Hoboken, N.J: John Wiley & Sons.

Chomsky, N. (1957). *Syntactic Structure*, The Hague/Pars: Mouton.

Chomsky, N. (1976). *Reflection on Language*. U.SA: Pantheon Books.

Cohen, J. L. (2014). Le Corbusier's Modulor and the Debate on Proportion in France, Architectural Histories is the international, blind peer-reviewed scholarly, Journal *of the EAHN*, 2(1), (2015, June 22). Retrieved from http://journal.eahn.org/articles/10.5334/ah.by/.

Çiçek, M. (2014). Are Linguistic Principles Applicable to Visual Signs? *The Journal Of International Social Research*, 7(32), 38-51.

Çolakoğlu, B. (2005). *Bir Mimari Dili Anlayarak Tasarlamak*, (2015, January 11). Retrieved from http://www.bot.yildiz.edu.tr/_sites/mardin/gtt.htm.

Çolakoğlu, B., Özkaraduman, T. & Torus, B. (2005). *Analitik Gramer Çalışmaları* (2015, May 30). Retrieved from http://www.bot.yildiz.edu.tr/_sites/mardin gtmt.htm

Cook, P. (1985). Le laboratoire d'image. *Techniques & Architecture,* 358, 96-101.

Cook, P. (1993). *Six Conversations. Architectural Monographs, 28,* Oxford, United Kingdom, Inch`s Books.

Courant, R., Robbins, H., & Stewart, I. (1996). *What is Mathematics?: An Elementar Approach to Ideas and Methods*, Corby: Oxford University Press.

Crasmareanu, M., & Hretcanu, C. (2008). *Chaos, Solitons& Fractals.* Elena Elseviar Ltd., 38(5), 1229-1238.

Creswell, J. W. (2014). *Research design: Qualitative, Quantitative, and Mixed Methods Approaches*, Fourth Edition, Los Angeles: Sage.

Dağlı, U. U. (1993). *Mağusa Surlar içi Mahallesi Evlerinin Tipolojik Analizine Bağlı Olarak Geliştirilmiş Bir Uzman Sistem Methodi*. Unpublished PhD Thesis, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Fakültesi, İstanbul.

Dewidar, K. M., El-Gohary, A. F., Ally, M. N., & Salama H. A. (2015). *Mutual Realtion Role between Music and Architecture in Design*, (2015, June 22). Retrieved from https://www.academia.edu/667434/MUTUAL_RELATION_BETWEEN_MUSIC_AND_ARCHITECTURE.

Dikmen, C. B. (2014). Reading of Traditional House Texture through Street and Facades: Ottoman-Turkish Town, Göynük, Gazi University Journal of

Science (GUJ*Sci) Part B: Art, Humanities, Design and Planning,* 2(3), 101-117.

Downing, F., & Flemming, U. (1981). The Bungalows of Buffalo, *Environment and Planning B: Planning and Design*, 8, 269-293.

Dursun, P. & Saglamer, G. (2003). Spatial Analysis of Different Home Environments in the City of Trabzon", J. Hanson (Ed.), *Proceedings, 4th International Space Syntax Symposium,* University Collage London, 17-19.

Dursun, P. (2007). Space Syntax in Architectural Design, *6th International Space Syntax Symposium*, İstanbul, 12-17 June 2007, ITU Faculty of Architecture.

Eminağaoğlu, Z. & Çevik, S. (2015). Facade Typologies of the Rural Housing-The Case of Artvin, *International Refereed Journal of Design and Architecture*, 5, 76-98.

Erkman, F. (1987). *Göstergebilime Giriş.* İstanbul: Alan Yayıncılık.

Figueiredo B., Costa, E. C. E., Duarte, J. P., & Krüger, M. (2013). Digital Temples: a Shape Grammar to generate sacred buildings according to Alberti's theory, 3-4-5 April, 2013, *Future Traditions, Rethinking Traditions and Envisioning The Future in Architecture Through the Use OF Digital Technologies,* Faculty of Architecture, University of Porto, Portugal, (2016, January 30). Retrieved from https://repositorium.sdum.uminho.pt/bitstream/1822/34780/1/ecaade2013r_004.content.pdf

Fischler, R. H. (2001). Proportions in the Architecture Curriculum, *Nexus Network Journal*, 3(3), pp.163-188.

Flemming, U. (1981). The secret of Casa Guiliani Frigerio, *Environment and Planning B: Planning and Design*, 8, pp. 87-96

Flemming, U. (1987). More than the sum of parts: the Grammar of Queen Anne Houses, *Environment and Planning B: Planning and Design*, 14, 323-350.

Fletcher, R. (2000). Golden Proportions in a Great House: Palladio's Villa Emo, in Kim Williams (Ed.), *Nexus III: Architecture and Mathematics*, Pisa: Pacini Editore, 73-85.

Franklink, J. (2009). Aristotelian Realism, in A. Irvine (Ed.) Chapter in *the Philosophy of Mathematics, Handbook of the Philosophy of Science series,* (pp. 101-153) , North-Holland: Elsevier.

Friedman, A. (2007). A methodology for the preservation of the architectural heritage of Senneville, Quebec, Canada, *Journal of Urban Design*, (12) 3, pp. 359-373.

Frings, M. (2002). The Golden Section in Architectural Theory, *Nexus Network Journal*, 4(1), 9-32, (2015, August 23). Retrieved from http://www.marcus-frings.de/text-nnj.htm

German, T. H., Leiserson, C. H., Rivest, R. L., & Stein, C. (2003), *Introduction to Algorithmn*, Cambridge, Massachusetts: The Mit Press.

Gibberd, F. (1959). *Town Design*, London: The Architectural Press.

Gökberk, M. (1993). *Felsefe Tarihi*, İstanbul: Remzi Kitabevi.

Greenberg, J. (1948). Linguistics and Ethnology, *Southwestern Journal of Anthropology*, 4, 140–47.

Gündoğdu, M. (2014). Mekan Dizimi Analiz Yöntemi ve Araştırma Konuları (Space Syntax and Researching Issues), *Art Sanat*, 2, 251-274.

Güney, Y. İ. (2007). Mimarlık kuramlarında tip ve tipoloji kavramları, *Balıkesir Üniversitesi Fen Bilimleri Enstitüsü Dergisi*, 9(1), pp. 3-18, (2015, June 9). Retrieved from http://fbe.balikesir.edu.tr/dergi/20071/BAUFBE2007-1.pdf

Halliday, M. A. K., & Webster, J. (2006). *On Language and Linguistics*Continuum International Publishing Group. p. vii.

Hasol, D. (2008). Mimarlığı Tanımlamak, *Yapı,* 316, 46-48.

Hayes, B. Curtiss, S., Szabolcsi A., Stowell T., Stabler, S., Sportiche, D., Koopman H., Keating P., Munro, P., Hyams N., & Steriade D. (2001). *Linguistics. An Introduction to Linguistic Theory*. V. A Fromkin, (Ed.) Oxford: Wiley-Blackwell.

Heidegger, M. (2008). *Düşüncenin Çağırdığı "Düşünmek ne demektir?",* (Trans.Ahmet Aydoğan) İstanbul: Say Yayınları.7

Henke, S. L. (1990). Enumeration&Evaluation of Systematically Generated Architectural Compositions, Environment and Palnning B., Planning and Design, 17, 304.

Henriksen, J. (1996). *An Investigation of Rhythm and Repetition in Architectural Theory and Precedent*, (2015, June 15). Retrieved from http://www.arkitek.org/files/repetitionRhythmSmall.pdf

Herber, T., Sanders, I., & Millis, G. (1994). African Shape Grammar:a Language of Linear Ndebele Homesteads, *Environment and Planning B: Planning and Design*, 21, 453–476.

Hildner, J. (1998). *Remembering the Mathematics of the Ideal Villa*, 86th ACSA Annual Meeting Proceedings, Constructing Identity, Craig Barton (Ed.), University of Virginia, pp. 388-395, (2015, August 21). Retrieved from, http://apps.acsaarch.org/resources/proceedings/uploads/streamfile.aspx?path=ACSA.AM.86&name=ACSA.AM.86.81.pdf

Hillier, B. & Hanson, J. (1987). Introduction a Second Paradigm, Architecture et Comstavement. *Architecture and Behaviour* 3(3), 197-199.

Hillier, B., Hanson, J., & Peponis, J. (1987). Syntactic Analysis of Settlements, *Architecture et Comportement/Architecture and Behaviour*, 3 (3). pp. 217-231.

Hillier, B. (2003). The architectures of seeing and going: or, are cities shaped by bodies or minds? And is there a syntax of spatial cognition?, *4th International*

Space Syntax Symposium, London.

Hirst, K. H. (1995). *Number, Sequences and Series,* Oxford, UK: Butterworth-Heinemann.

Hsu, C. C., & Shih, C. M. (2006). A Typological Housing Design: The Case Study of Quartier Fruges in Pessac by Le Corbusier, *Journal of Asian Architecture and Building Engineering*, 82, 75-82. (August 23, 2015). Retrieved from, https://www.jstage.jst.go.jp/article/jaabe/5/1/5_1_75/_pdf

Jencks, C. (2013). *Architecture Becomes Music*, Retrieved August 28, 2015, From http://www.architectural-review.com/essays/architecture-becomes-music/8647050.article.

Jones, P. (2011). *The Sociology of Architecture: Constructing Identities,* 1st Edition, Uk: Liverpool University Press.

Kappraff, J. (2015). Chapter 37 Musical Proportions at the Basis of Systems Of Architectural Proportion both Ancient and Modern. In M. J. Ostwald and K. Williams (Eds.), *Architecture and Mathematics from Antiquity to the Future Volume I: Antiquity to the 1500s*, pp.549-566, Switzerland: Springer International Publishing.

Keane, M., & Keane, L. (2005). The Geometry of Wright, *Nexus Network Journal*, 7(1), 48-57.

Keshishian, K. (1985). *Famagusta Town and District-Cyprus*, Limassol: Famagusta Chamber of Commerce &Industry.

Kimberling, C. (2002). Path-counting and fibonacci numbers. *Fibonacci Quarterly*, 40(4), 328–338.

Klages, M. (2011). *Ferdinand de Saussure*, (2015, May 30). Retrieved from. http://www.colorado.edu/English/ENGL2012Klages/saussure.html.

Kline, M. (1953). *Mathematics in Western Culture*. New York: Oxford University Press.

Klingmann, A. (2006). *Brandscapes: Architecture in the Experience Economy,* Cambridge, MA: MIT Press.

Knight, T. W. (1986). Transformations of the Meander Motif on Greek Geometric Pottery, *Design Computing*, 1, 29-67.

Knight, T. W. (2000). *Shape Grammars in Education and Practice: History and Prospects. Shape Grammars in Education and Practice: History and Prospects*. (2013, February 23). Retrieved from http://www.mit. edu/~tknight/IJDC/.

Knight, T. W. (1980). The Generation of Hepplewhite-Style Chair-Back Designs, *Environment and Planning B: Planning and Design*, 7(2), 227-238.

Knight, T. W. (1981). Languages of Designs: From Known to New, *Environment and Planning B: Planning and Design*, 8(2), 213-238.

Koç, B. (2008). *Forms Numbers to Digits: On the Changing Role of Mathematics in Architecture*, Unpublished Master Thesis, The Graduate School of Natural and Applied Sciences of Mıddle East Technical University, Department of Architecture, Ankara.

Köktürk, Ş. & Eyri, S. (2013). Dilbilim ve Göstergebilim: Ferdınand De Saussure ve Göstergebilimi Anlamak, *SAÜ Fen Edebiyat Dergisi*, 15(2), 123-136.

Koning, H. & Eizenberg, J. (1981). The Language of the Prairie: Frank Lloyd Wright's Prairie houses, *Environment and Planning B: Planning and Design*, 8, 295-323

Köseoğlu, K. (2015). *Pattern Yani Örüntü*. (2015, August 12). Retrieved from http://www.tasarimgunlukleri.com/2015/05/07/patern-yani-oruntu/

Krier, R. (1979). *Urban Space*. New York: Rizzoli, 17.

Krier, R. (1988). *Architectural Composition*, Academy Editions, London, 122-131.

Kristeva, J. (1981). *Le Langage*, CET Inconnuune Innitiation à La Lin Guistique Paris: Editions du Seuil, p.10.

Le Corbusier. (1971). Towards a New Architecture: Guiding Principles. In *Programs and Manifestos on 20th-century Architecture*, by Ulrich

Conrads (Eds.), (Trans. Michael Bullock), pp. 59-62. Cambridge, Mass.: The MIT Press.

Le Corbusier. (1968). *The Modulor*, London: The MIT Press.

Le Corbusier. (1980). *The Modulor 1&2.* (Trans. Peter de Francia, Anna Bostock). Cambridge. Massachusetts: Harvard University Press.

Le Corbusier. (2004). *The Modulor: A Harmonious Measure to the Human Scale, Universally Applicable to Architecture and Mechanics*, Trans. Peter de Franci and Anna Bostock, First published in two volumes in 1954 and 1958, Basel & Boston: Birkhäuser.

Le Corbusier. (2007). *Toward an Architecture*, intro. Jean-Louis Cohen, (Trans. J. Goodman.), Los Angeles: Getty Research Institute.

Lefebvre, H. (1998). *Modern Dünyada Gündelik Hayat*, İstanbul: Metis Yayınları.

Libeskind, D. (1991). *Countersign*, London: Academy Editions.

Loach, J. (1998). Le Corbusier and the Creative Use of Mathematics, *The British Journal for the History of Science*, 31(2), p.204.

March, L. (2001). Palladio's Villa Emo: The Golden Proportion Hypothesis Rebutted, Nexus Network Journal, 3(2), 58-104, (2015, August 21). Retrieved from, http://www.nexusjournal.com/March.html

Margolius, I. (2002). *Architects + Engineers = Structures: A book that celebrates well-known designers Paxton, Torroja, Nervi, Saarinen, Buckminster Fuller, Le Corbusier, Niemeyer, Arup, Hunt and Foster, and the lesser-known such as Polivka, Glickman, Kornacker, Cardozo, Zetlin and Strasky.* Chichester, West Sussex: Wiley-Academy.

Martin, M. A. (2010). The *Origin of the Lecorbusier*, (2015, August 21). Retrieved from, http://miguelmartindesign.com/blog/the-origins-of-le-corbusier%E2%80%99s-modulor

McEwen, H. (2009). A discussion of Xenakis and Varese, Metaphor and Smile, Music and Architecture, *South African Journal of Art History (SAJAH)*, 24(3), 34–44. (2015, June 12). Retrieved from http://issuu.com/hughmcewen/docs/a_discussion_of_xenakis_and_varese

McManus, D. (2014). *Solid 11 Amsterdam, Stadgenoot Projectontwikkeling, Building, Project, Photo, Design, (*2015, June 9). Retrieved from *http://www.e-architect.co.uk/amsterdam/solid-11*

Megeb (Meslekî Eğitim ve Öğretim Sisteminin Güçlendirilmesi Projesi). (2007). *Müzik Aletleri Yapımı Alanı, Müzik İşaretleri*, T.C. Millî Eğitim Bakanlığı, Ankara.

Meiss, P. (1991), *Elements of Architecture*, London: E&FN Spon.

Moallem, S. (2014). *Investigation of the Success Level of Namik Kemal Square as a*

Public Open Space, Unpublished Maste Thesis, Master of Science in Urban Design, Eastern Mediterranean University, Gazimağusa, North Cyprus.

Morley, D. G. (2000), *Syntax in Functional Grammar: An Introduction to Lexicogrammar in Systemic Linguistics*, London and New York: Continuum.

Moughtin C., (2003), *Urban Design; Street and Square*, Oxford, London. Butterworth-Heinemann Ltd.

Music (n.d.)., (2015, August 18). Retrieved from http://dictionary.reference. com/ browse/music

Naredi-Rainer, P. V. (1995). Architektur*& Harmonie, Zahl, Maß und Proportion in der abendländischen Baukunst*. 5th ed. Cologne: DuMont.

Nezor, S. (2011), *Mimarlık Eğitimi ve Soyutlama*, Unpublished Master Thesis, Karadeniz Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Trabzon.

O'Sullivan, D., & Turner, A. (2001). Visibility Graphs and Landscape Visibility Analysis. *International Journal of Geographical Information Science*. 15(3), 221-237.

O'toole, M. (1994). *The Language of Displayed Art*, Great Britain: Associated University Press.

Odgers, J., Vicar, M. M. and Kite, M. (Eds), (2015). *Economy and Architecture*, Routledge London and NewYork, Taylor and Francais Group.

Onal, S. (1994). *Functional and Physical Analysis of Squares- Public Meeting Spaces- In the Seljuk and Ottoman Cities in Turkey*, University of Nottingham, Unpublished Phd Thesis, Nottingham.

Oswald, M. J. (2000), Under Siege: The Golden Mean in Architecture, *Nexus Network Journal*, 2, 75-81.

Oswald, M. J., & Williams K. (2015). Relationships Between Architecture and Mathematics, In M. J. Ostwald and K.Williams (Eds.) *Architecture and Mathematics from Antiquity to the Future Volume I: Antiquity to the 1500s.* (pp.1-25). Switzerland: Birkhäuser Basel, Springer International Publishing.

Özdemir İ. M., Tavşan C., Özgen S., Sağsöz A., & Kars F. B. (2008) The elements of forming traditional Turkish cities: Examination of houses and streets in historical city of Erzurum, *Building and Environment*, 43, 963-982.

Özdirlik, B. (2000). *Kentsel Açık Alan/Mekânlar ve Sistemler Üzerine Bir Araştırma*, Unpublished Master Thesisi, MSGSÜ, Fen Bilimleri Enstitüsü, İstanbul.

Öztürk, D. (2010). *Beden ve Mimarlık*, (2015, August 23), Retrieved from, http://v3.arkitera.com/h50592-beden-ve-mimarlik.html

Padovan, R. (1999). *Proportion – Science, Philosophy, Architecture*, E&FN Spon: London and New York.

Palladio, A. (1997). *The Four Books of Architecture*, in Book II, Chapter XVI, (Trans. by Robert Tavenor and Richard Schofield), Cambridge:MIT Press.

Penny Cyclopedia, (1843-1858), London: Charles Knight 8: Co.

Pereira, A. N. (2011), Renaissance in Goa: Proportional Systems in Two Churches of the Sixteenth Century, *Nexus Network Journal*, 13(2), 373-396.

Perker, Z. S. (2009). Mimarlığın Felsefe ile İlişkisinin Rönesans, 17. ve 18. Yüzyıl Yapı Örnekleri Üzerinden İrdelenmesi,*e-Journal of New World Sciences Academy* 4(4), 1A0056, 589-600, (2015, August 11). Retrieved from file:///C:/Users/Windows%208.1/Downloads/5000067130-5000149449-1-PB%20(2).pdf

Radulescu, M. (2015). *Proportion and Scale,* (2015, May 14). Retrieved from https://moodle.unitec.ac.nz/pluginfile.php/414025/mod_folder/content/0/Readings/ProportionProportionMeasure.pdf?forcedownload=1

Reda, C. M. (2012), Interpretation of de Saharan facade, from Traditional to Contemporary, Case of individual houses of the Bechar town-Algeria, 1st *International Conference on Architecture and Urban Design(1-ICAUD) Proceedings*, 19-21 April 2012, Epoka University, Department of Architecture.

Reichenbach, H. (1958). *The Philosophy of Space and Time*, Trans: Maria Reichenbach and John Freund, New York: Dover Publications.

Riad, M. (2009). *Architecture: Music, City, and Culture.* (2015, June 15), Retrieved From http://drum.lib.umd.edu/bitstream/handle/1903/9640/Riad_umd_0117N _10690.pdf?sequence=1&isAllowed=y

Roth, L. M. (2000), *Mimarlığın Öyküsü*, (Çev. Ergün Akça), İstanbul, Kabalcı Yayınevi.

Russell, B. (1903). *The Principles of Mathematics,* Cambridge: Cambridge University Press.

Sağsöz, A., Tuluk, O. I., & Özgen, S. (2006). Influences of different ages and cultures on each other from architctural point of view : Examination of historical buildings in Trabzon / Turkiye, *Building and Environment*, 41, 45-59.

Sakar, M. H. (2009). Popular Music and Music Education, *The Journal of International Social Research, 2(8), 385-393,* (2015, August 18). Retrieved from http://www.sosyalarastirmalar.com/cilt2/sayi8pdf/sakar_mumtazhakan .pdf

Salingaros N. A. (1995). The Law of Architecture from Physicist's Perspective *Physics Essays*, 8, pp.638-643.

Salingaros, N. (2001). Architecture, Patterns, and Mathematics, *Nexus Network Journal*, 3(1), pp. 75-85. (2015, June 9). Retrieved from http://www.emis.de/ journals/NNJ/Salingaros.html

Salu, Y. (2011). *Physics for Architect*, Create Space Independent Publishing Platform.

Saussure, F. (2001). *Cours de linguistique generate (Course in General Linguistics),* (Trans. Prof. Dr. Berke Vardar), İstanbul: Multilingual Yayınları.

Say, A. (2002). *Müzik Sözlüğü*, Ankara: Müzik Ansiklopedisi Yayınları.

Schlaich, J. (1991). *Practices Which Integrate Architecture and Engineering, In Bridging the Gap: Rethinking the Relationship of Architect and Engineer*, New York: Van Nostrand Reinhold.

Schmitt, G. (1988) Microcomputer Aided Design For Architect and Designers, New York, A.B.D.: John Wiley&Sons.

Scholfıeld, P. H. (1958). *The Theory of Proportion in Architecture*. Cambridge, University Press, New York.

Schulman, B. R. (2015). *Ionic Order*. (2015, June 29). Retrieved from http://www. cmhpf.org/kids/dictionary/classicalorders.html

Şentürk, L. (2008). Le Corbusier: Oransal Izgara'dan Modulor'a, *Journal of Eng&Arch.Fac. Eskişehir Osmangazi University*, XXI/2, 101-108. (2015, June 2). Retrieved from from, http://mmfdergi.ogu.edu.tr/mmfdrg/2008-2/8.pdf

Sertkaya, İ. (2011). Kent Meydanlari: Adana 5 Ocak Meydani Örneği Üzerine Bir İrdeleme, Çukurova Üniversitesi Fen Bilimleri Enstitüsü, Unpublished Master Thesis, Mimarlik Anabilim Dalı, Adana.

Siscar, P. C. (1999). *Saussure's Relation with Literature*, (2015, June 13). Retrieved from, http://mural.uv.es/pacasis/relat.html.

Smith, C. A. (2014). *Proportion: Defining Harmony and Order in Architecture*, (2015, May 9). Retrieved from http://www.casarc.com/proportion-defining-harmony-and-order-in-architecture.

Sönmez, F. U., Yücel, A., & Uluoğlu, B. (2009). Effect of Popular Culture on the Form Urban Discourse, *İTÜ Dergisi A: Mimarlık, Planlama, Tasarım*, 8(1), 55-66.

Sterken, S. (2007). Music as an Art of Space: Interactions between Music and Architecture in the work of Iannis Xenakis. In M.W. Muecke and M. S. Zach (Eds.), *Essays on the Intersection of Music and Architecture* (pp. 21-51). Ames: Culicidae Architectural Press.

Spilling, M. (2000). *Culture of the World Cyprus*, New York: Times Publishing Group.

Stiny, G. (1977). Ice-ray: a note on Chinese lattice designs, *Environment and Planning B: Planning and Design*, 4, 89-98.

Stiny, G., & Gips, J. (1971). Shape Grammars and the Generatıve Specıficatıon 'of Painting and Sculpture, *IFIP Congress 1971 in Area 7*, Sciences and Humanities: Methods and Applications for the Arts.

Stiny, G., & Mitchell, W. J. (1978). The Palladian Grammer. *Environment and Planning B: Planning and Design*, 5, p. 5.

Stiny, G., & Mitchell, W. J. (1980). The Grammar of paradise: On the generation of Mughal gardens. *Environment and Planning B: Planning and Design*, 7, 209-226.

Stiny, G. (1976). Two exercises in formal composition, *Environment and Planning B: Planning and Design* 3, pp. 187-210.

Symonds, J. A. (2004). *Sketches and Studies in Italy and Greece,* (2015, June 6). Retrieved from, file:///C:/Users/Windows%208.1/Downloads/stusk.pdf

Thomas, M. L., Meyes, G. E., Berry, I. E. M. E. (Ed.). (2012). *Monumentality in Etruscan and Early Roman Architecture: Ideology and Innovation*, Austin: University of Texas Press, 75.

Timuçin, A. (1993). *Estetik*. İstanbul: İnsancil Yayınları.

Trancik, R. (1986). Finding Lost Space: Theories of Urban Design, New York: Van Nostrand Reinhold.

Tugnett A., & Roberston M. (1987). *Making Townscape. A Contextual Approach to Building in an Urban Setting*, London, Mitchell.

Tumbull, D. (2007). *Vitrivius Architecture*. (2015, June 9). Retrieved from http://www.bostonleadershipbuilders.com/vitruvius/book03.htm#canon_note

Turner, A. (2001). Depthmap, *Proceedings of 3rd International Space Syntax Symposium*, Atlanta, 31, 1-9.

Turner, A., Doxa, M., O'Sullivan, D., & Penn, A. (2001). From Isovists to Visibility Graphs: a Methodology for the Analysis of Architectural Space. *Environment and Planning B: Planning and Design*, 28(1), 103-121.

Tümer, G.(1982). *Mimarlık Edebiyat* İlişkileri *Üzerine Bir Deneme*, İzmir: Matbaa Kavram.

Türeyen, M. N. (2010). *Mimari Kişilik ve Kimlik*, İstanbul: Tasarım Yayın Grubu.

Tzonis A., & Lefaive, L. (1992), *Architecture in Europe, Memory and Invention since 1968*, New York: Rizzoli.

Ülger, A. (2005). *Matematiğin Kısa Bir Tarihi, Bilim, Eğitim ve Düşünce Dergisi, Üniversite ve Toplum*, January 2005, 5/1, (2015, June 17). Retrieved from http://www.universite-toplum.org/text.php3?id=221.

Ünlü, T. (2006). Kentsel Mekanda Değisimin Yönetilmesi, *Orta Doğu Teknik Üniversitesi Mimarlık Fakültesi Dergisi*, 23:2, pp. 63-92.

Ünver, H. (2016). Kentsel Morfolojinin Geleneksel Bir Sokak Dokusunu Şekillendirmesi: Kurşunlu Cami Sokak, Düzce Üniversitesi Bilim ve Teknoloji

Dergisi, 4, 127-143.

Variego, J. E. (2011). *Architecture in Motion: A Method for Music Composition*, Unpublished Phd Thesis, University of Florida, Ann Arcbor, Florida, United States.

Vernd, E. (2003). *Architectural Theory: From the Renaissance to the Present*, Italy: Taschen.

Vitruvius, P. (1960). *The Ten Books On Architecture,* (Trans. Morris Hicky Morgan), New York: Dover Publications.

Vocabulary, (2006). In Longman Active Study Dictionary (6th edition), New Delphi: Pearson Education Limited.

Wallin, N. L., Merker, B., & Brown, S. (Eds.) (2001). *The Origins of Music*. Cambridge, MA: MIT press.

Warmann, C. (2010). Tampa Covenant Church by Alfonso Architects, Dezeen Magazine, (2015, June 21). Retrieved from http://www.dezeen.com/2010/11/22/tampa-covenant-church-by-alfonso-architects/.

Wang, L., & Hien, W. N. (2006). The impact of facade designs: Orientations, window to wall proportions and shading devices on indoor environment for naturally ventilated residential buildings in Singapore, *PLEA 2006, 23rd International*

Conference on Passive and Low Energy Architecture, Conference Proceedings, 6-8 September, 2006, Geneva, Switzerland.

Whang, H. J. (1998). *The Role of Complexity and Order in Determining Aesthetic Preference in Architectural Forms*, Unpublished PHD, Texas A&M University, Texas.

Wikipedia, (2015). *Linguistics,* (2015, August 5). Retrieved from https://en.wikipedia.org/wiki/Linguistics

Wild, C. (1998). *Villa Stein a Digital Analysis*, (2015, August 21). Retrieved from http://www.christianwild.de/villagarche/13.htm.

Wilson, C. St. J. (1994). *Architectural Reflections: Studies in the Philosophy and Practice of Architecture*, Oxford: Butterworth-Heinemann.

Wittkower, R. (1971). *Architectural Principles in the Age of Humanism*. New York: Norton.

Yeozior, A., Capeluto G. I., & Shaviv E. (2006) Design Guidelines for Appropriate Insolation of urban spaces, Renewel energy, 31, 1011-1023.

Yıldız, S., Öztürk Kerestecioğlu, F. (2011). Architectural Identity in Changing Historical Areas: The Street Facades in Talimhane, Megaron, 6(3), pp. 193-209.

Yücel, A. (2005). *Mimarlıkta Dil ve Anlam, Felsefeden Mimarlığa Bakışlar Dizisi 1*, ,İstanbul: TMMOB, Mimarlar Odası İstanbul Büyükkent Şubesi Yayınları.

Yürekli, H. (1980). *İnsan Davranışları ve Çevre İlişkilerine Bağlı Olarak Çevrenin Korunması ve Geliştirilmesi İçin Bir Metod Önerisi*, Unpublished Phd Thesis, İstanbul Teknik Üniversitesi, Fen Bilimleri Enstitüsü, Mimarlık Fakültesi İstanbul.

Zucker, P. (1959). *Town and Square: Forum the Agora to the Village Green*, New York: Columbia University Press.

Pictures URL

URL 1: http://www.vitruvius.be/boek3h3.htm

URL 2: http://akhscaesar.wikispaces.com/Temple+of+Venus+Genetrix

URL 3:
http://laurentdesouza.weebly.com/uploads/2/4/0/6/24068847/1384200724.jpg

URL 4: http://www.angelfire.com/art/archictecture/college/aphaiaplan.jpg

URL 5: http://classconnection.s3.amazonaws.com/1711/flashcards/273361/jpg
/aegina.jpg

URL 6: https://happyarchitectureblog.files.wordpress.com/2010/06/d1.jpg

URL 7: https://draytonhall.files.wordpress.com/2011/08/carl-gable-article-fig-1.jpg

URL 8: https://happyarchitectureblog.files.wordpress.com/2010/06/d2.jpg

URL 9: http://www.studiocrema.com/eng/img/tred13.jpg

URL 10: http://jaymelong.blogspot.com/2010/10/chapter-6-proportion-and-scale_1266.html

URL 11: https://upload.wikimedia.org/wikipedia/commons/c/c3/Santa_Maria_Novella.jpg

URL 12: http://image.slidesharecdn.com/lecture2middleagesrenaissance-140912061326-phpapp02/95/lecture-2-middle-ages-renaissance-22-638.jpg?cb=1411632520

URL 13: http://www.neermanfernand.com/images/corbu.jpg

URL 14: http://4.bp.blogspot.com/-hWIDBIcDcqo/UMUIEPqC81I/AAAAAAAAAQ4/lvjeGd8OntA/s1600/Modulor+Section+C.jpg

URL 15: https://classconnection.s3.amazonaws.com/583/flashcards/403583/png/unite_d'_habitation1336010467572.png

URL 16: https://s-media-cache-ak0.pinimg.com/736x/31/77/ee/3177eea360c7527c8dd678bed5383996.jpg

URL 17: http://www.deu.edu.tr/userweb/okan.fistikoglu/dosyalar/MuhCizDN.pdf

URL 18: http://www.matematikogretmenleri.net/wp-content/uploads/fibonacci.jpg

URL 19:http://www.basit.biz/wp-content/uploads/2015/01/ALTIN-ORAN.png

URL 20: capture141330723922449.jpg

URL 21: https://lylyldz.files.wordpress.com/2013/10/lecorbusier.jpg

URL 22: http://www.christianwild.de/villagarche/13.htm.

URL 23: http://www.christianwild.de/villagarche/13.htm.

URL 24: http://www.archdaily.com/86741/tampa-covenant-church-alfonso-architects/5012e1e028ba0d0658000344-tampa-covenant-church-alfonso-architects-photo

URL 25: http://inhabitat.com/swedens-umea-university-architecture-academy-punctuated-with-pixelated-windows/umea-ed01/

URL 26: https://oldworldnewgirl.files.wordpress.com/2012/03/kraus-21.jpg

URL 27: https://oldworldnewgirl.files.wordpress.com/2012/03/kraus6.jpg

URL 28:
https://moodle.unitec.ac.nz/pluginfile.php/414025/mod_folder/content/0/Readings/ProportionProportionMeasure.pdf?forcedownload=1

URL 29: http://www.engineering.leeds.ac.uk/dssg/objectives.htm

URL 30:http://www.e-architect.co.uk/images/jpgs/amsterdam/solid_11_amsterdam_r210612_p2.jpg

URL 31: http://www.e-architect.co.uk/images/jpgs/amsterdam/solid_11_amsterdam_r210612_p4.jpg

URL 32:http://www.davidmaudlin.com/ArchiCAD/DigitalArchitecture/ResLib/ResLib08W/ResLib08wGrilleTypes.gif

URL 34: http://www.designlaboratory.com

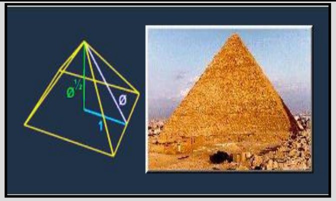
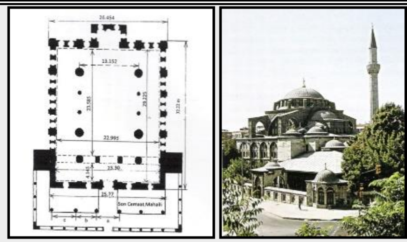
URL 35: http://alpha.redeemer.ca/~dkoyzis/cyprus_files/cy-map.gi

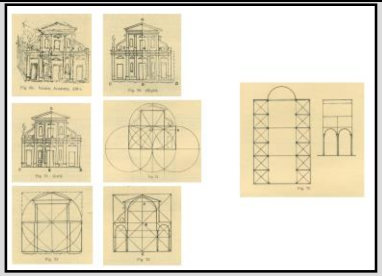
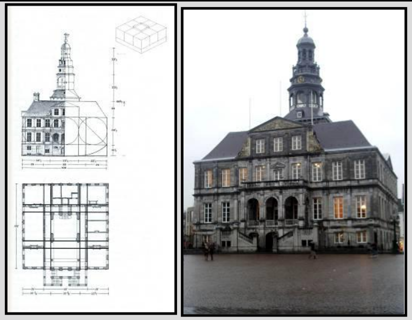
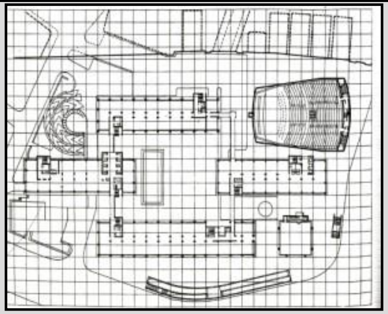
APPENDICES

Appendix A: Relation of Mathematics to Architecture throughout the Historical Evolution

Mathematics discipline with a comprehensive content has been developing its relation with architecture in various civilizations from its chronological beginning until today. During this development phase, there has been a long-term evolution in the relationship between mathematics-architecture as noted by Padavon “The relation between mathematics and architecture has been a long lasting subject in architectural tradition” (Padovan, 1999).The chronological development of mathematics and relation with architecture is delivered under Table 46. As seen on the Table 46, which was created with the help of the examined sources (Ülger, 2005, Kline, 1953, Peet, 1923,Glanville 1927, Clagett 1999, Arpat 2009, Griffith 1897, Hermoso et.al., 2014 p.294, Rossi 2004, Badawy 1965, Kaplan, 2015, Hidden, 2014, Lubicz, 1998, Lubicz 1957, Boyer, 1968, Vitruvius, 1960, Wikipedia, 2015a, Wesenberg, 1983, Frings, 2002, Browne, 1989, Hill 1990, Manuel and Santiago, 1988, Pappas, 1989, Mersberg and Audrey, 1998, Yağcı, 2005, NAF, 2009, INTI, 2015, , Mainstone 1988, Dold-Samplonius, 1992, 1999, Hogendijk, 1996, Özdural, 1990, 1998, 2000, Grünbaum and Shephard, 1987,Akhtaruzzaman and Shafie, 2011, Jason, 2006, Sağdıç, 2015, p. 95-106, Morris, 1953, Dorn, 1989, Fricelli 1993, Maré, 2012, Pedretti, 1978, Di Teodoro, 2015, Ottenheym, 1999, Jonge & Ottenheym, 2007, Vidler, 1990, Kruft, 1994, Copplestone, 1963, Wikipedia, 2015c, Thurley, 1999, Daye, 2004, Gruson, 2008,Wikipedia, 2015d, Ottenheym, 2014, Tavernor, 2015, McKitterick, 1995, Wikipedia, 2015e, O’Connor and Robertson, 2002, Goudeau, 2015, Gervereau, 2000, More, 1997,Pekol, 2011, Solomonovich, 2010, Coxeter, 1998, Schreuder, 2014, Ching, 2007, Kumar, 2002, Shaded, Dirie, McMillan and Robidoux, 2012, Flora, 2007, Hildner, 1998, Junichi, 1993, Roth, 2000, Ambrose and Harris, 2007, Elwall, 1996, English, 2005, Savaşır and Tuğrul 2014, Mandelbrot, 1982, Ediz and Çağdaş, 2005, Çağdaş, 1994, Taylor, 2003)

Table 50: Historical Development of Mathematics in Relation with Architecture

Period	Mathematical Subjects in Architecture	Building Types in Architecture using Mathematics	Designers	Prominent Buildings
Egptian Mathematics	Golden Proportion & Sectio Geometry	Monuments Pyramid Temples Tombs		 Giza Pyramid and Golden Proportion Use, Egypt (URL 40)
Greek **Mathematics**	Golden Proportion & Rectangle Geometry Pattern	City Planning Historic Buildings Temples Pyramid	Vitrivius Thales Ikitinos Kallikrates Karpion	 Parthenon and Golden Proportion Use (URL 41)
Islamic **Mathematics**	Golden Proportion Geometry Pattern Gematria	Mosque Turbe (Mousoleum) Tile Ornament Art	Isidoros Anthemios Mimar Sinan	 Kılıç Ali Pasha Mosque Ground Floor Plan (Based on Actual Measurements) and the Mosque photos, which Used the Golden Proportion in Plan (Arpat, 2009).

Reneissance **Mathematics**	Proportion Geometry Symmetry Golden Complex Numbers Cartesian(Grid)	City Planning Public Buildings Churches Cathedral Palace Fortification Castle Pavilion Garden Art	Leonardo Da Vinci Andrea Palladio Alberti Pier Francesco Clementio Michalengelo Auguste Perret	 Drawings of Leonardo Da Vinci Using Mathematics (Pedretti, 1962, p. 131–135 and Di Teodoro
The Scientific **Revolution (17^{th}** **and 18^{th})**	Golden Proportion Geometry Pattern	City Planning Public Building Monuments Churches Fortification Villa Land Surveying	Nicolaus Goldmann Pieter Post Jacob Lois Philips Vingbooms La Hire Wren Robert Hooke Robert Owen Vladimir Shukov Tommaso Campanella Claude-Nicolas Ledoux Vincenzo Scamozzi	 Maastricht, Town Hall, Designed by Pieter Post 1656 (Ottenheym, 2014)
Modern **Mathematics** **(19^{th}, 20^{th} and 21^{th}** **)**	Golden Proportion Geometry Pattern Euclidian Non-Euclidian (Hyperboloid- Parabolic- Elliptic-Fractal)	City Planning Public Building Churches Cathedral Symbolic Building Houses Villa Art	Frechman Drach American Wilks Poleni Escher Buckminster Fuller Gerrit Rietveld Peter Einseman Zaha Hadid Frank Ghery Le Corbusier Gaudi Emö Goldfinger Villard de Honnecourt Oscar Niemeyer Jan Boguslawski	 Grid Plan on top of Metro Central Heights Original Plan (Hiscock and Dunnett, 2000)

Appendix A1: Summary of Mathematics and Architecture Relationships throughout the History

According to the relationship between mathematics and architecture started in Egyptian period, proportion based on geometric forms was used in Egyptian period. In proportions, evolved from four different triangle proportions, the golden proportion / rectangle was used. In addition, proportion of triangle was used on square and rectangle (8:5). Human body dimensions were transferred into buildings in relation with 1:2/1:4/1:8 proportions of triangles.

The use of proportions continued in Greek period. The most significant use in this period was golden proportion / golden rectangle used in temple designs. Another significant improvement in this period was the use of Grid on Modulor-Cartesian city plans.

During Indian period, Mandala system and Vastru-Shastra design principles were used. This system was the grid system and according to this, the settlement of temples and cities were properly applied into grids. The system was formed according to human body's settlement in a sitting posture in the space. According to this posture, creating functional settlement into 8x8 or 9x9 divided spaces formed buildings. Accordingly, it is revealed that proportions were used as patterns forming the gaps between grids.

During Islamic period, the use of mathematics and geometry continued. Proportion use in this period was transferred into architecture as golden proportion and rectangle. Different from other periods, geometry played an efficient role not only on buildings but also on decorations. In this period, the relation among mathematics, geometry and proportions continued.

The most important improvement of the Renaissance was the transfer of the musical harmonic proportions into architecture. Alberti (2:1,3:2,4:3,5:4,8:5,5:3,9:5,15:8) and Palladio (1:1,5:4,4:3,3:2,5:3,2:1) used these proportions on space locations and facades. Palladio also suggested the proportions, arithmetic (c-b/b-a=c/c that is 12-9/9-6=12/12), geometric (c-b/b-a=c/b that is 9-6/6-4=9/6) and harmonic (c-b/b-a=c/a that is 12-8/8-6=12/6) about the room heights. Again in this period, Palladio used at least two geometric shapes that has the same proportions together (double cube) and created symmetrical designs.

Another important scientist, Leonardo Da Vinci, used the golden proportion in his perspective drawings and designs. The transfer of grid system into city plans continued during this period. The golden proportion was used in architecture as reflection of musical harmony on architecture, grid system, and symmetry. Different from other periods, mathematics was used on architectural sketches.

Palladio's proportions were still used during Scientific Revolution (17th-18th). 8:5 proportion stands out in Renaissance period and the golden proportion was transferred into architecture in relation to this proportion. There was the use of double cubic designs with the effect of Palladio. Along with 8:5 proportions, 1:2, 2:3, 3:4 proportions and cubic designs with 30x30 proportion were used. Repetitive proportions with basic forms are also observed on this period's designs, such as; 1:1:1:1….or 1:1:1:1:2:1:1:1:1… The use of grid systems on city plans continued during the period, but different from the other periods, circular form stands out as a geometry used in city plans. In this period, unlike other periods, grid system was used on buildings.

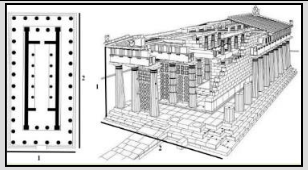
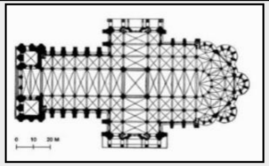
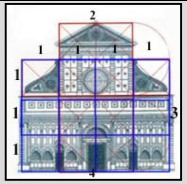
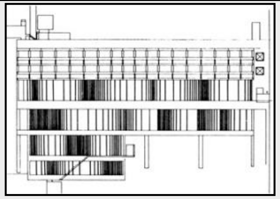
Modern Mathematics (19th-20th-21th) is the period when Euclidian and Non-Euclidian geometries were used in architecture. Starting from the use of Cartesian, basic geometries were used initially. Accordingly, with the start of De Stiil movement, basic geometries were transferred into architectural structures. Then, Le Corbusier's regulating lines; (anthropometric) and the use of golden proportion were transferred into architecture. The golden proportion is used on facade designs as 1:1.75, 1:2, 2:3, 1: $\sqrt{2}$. The golden proportion stands out in symbolic buildings. The transfer of non-Euclidian into architecture is observed in this period and accordingly hyperboloid - parabolic multiple sized structures start to stand out. Fractal geometries are used as well.

Appendix B: The Relationship between Music with Architecture throughout the History

The origins of this discipline that has a long historical background may have been in existence for at least 55,000 years and the first music may have been invented in Africa and then evolved to become a fundamental constituent of human life (Wallin et. al., 2001 and Krause, 2012). As a very old discipline, the evolution of music discipline throughout its history is strongly related with architecture discipline. Therefore, written sources were inspected and relevant evolution periods were examined under the scope of this research. The table 47 shows the relationship between architecture and music throughout the history (Sterken, 2007, Altan, 1993, Ching, 2007, Brent, 2015a, Kappraff 2006, Thayer, 2002, Jencks, 2013,Winko, 2015, Mitrovic, 2004 ,Scholfield, 1958, Wittkower 1971, Kappraff, 2015, Leopold, 2005, Padovan, 1999, Brent, 2015b, Pereira, 2011, Fletcher, 2000, Winko, 2015, Jarzombek, Prakash, Ching, 2010, Fischler, 2001, Kılıçaslan and Tezgel, 2012, Rasmussen, 1994, Yılmaz, 2012, Archithought, 2011, Le Corbusier, 2004, Cohen, 2014, Capanna, 2001, 2009, Evans, 1995, Özcan, 2013, Xenakis, 2008, Osborne, 2009, Bandur, 2001, Libeskind, 1991,1999, 1992, 2000, Maden and Şengel, 2009, Dewidar, El Gohary, Aly and Salama, 2015, Tzonis & Lefaivre, 2003,Riad, 2009)

.

Table 50: Historical Development of Architecture In Relation With Music

Period	**Subjects of Music**	**Buildings with Using Music**	**Designers and Musicians**	**Prominents Buildings**
Greek Music	Harmonic Proportion Musical Composition Number Theory	Temples Theather	Iktinos Kallikrates	 Plan and Elevation Proportion of the Temple of Aphaia 1:2(Octave), Greece, ca 500-490 BCE (URL 42)
Gothic Music	Cosmic Harmony Musical Proportion Rhythmn Musical Scale Consonance	Cathedral	Peter of Montereau Jean de Chelles Jean Baptiste Antoine Lassus	 Plan of Chartres Cathedral (1:2 octave -1:1) (URL 43)
Reneissance Music (Baroque Music)	Musical Proportion Harmonic Proportion Rhythmn Musical Scale Consanance Musical Proportion Symmetry	Churches Cathedral Villa Palace	Andrea Palladio Alberti Serlio Brunelleschi	 The Church of Santa Maria Novella (1:2-2:3-:3:4), Leon Batista Alberti, Firenze, Italy (URL 44)
Music During the 20th Century	Numerical Proportion Proportion Harmony Glissandro	Churches Cathedral Villa Museum Pyramids Monuments Public Building	LE Corbusier Iannis Xenakis Eric Mendelson Daniel Libeskind Otto Barning Bernard Tschumi Georgiadias Theoder Fischler Bella Bartok Ernest Bloch Herman Von Helmholz Peter Cook	 Couvent de St Marie de la Tourette: West elevation with undulating 'musical' screening of glass designed by Xenakis using Le Corbusier's Modulor system (URL 45)

Appendix B1: Summary of the Relationship between Music and Architecture throughout the History

The historical development of architecture related with music was started with Greek period. The number theory was matched with musical composition and implemented as use of proportion in architecture. The proportions such as 1:2, 2:3, 4:4, 1:1 and their multiples 9:18, 18:27 generated from the length of a vibrating chord, which is a Pythagorean approach.

During the Gothic period, cosmic harmonies stood out on the basis of seeking spiritual order. Therefore, the rise and fall in music were reflected on the facades by using musical scales, rhythms by the repetition of consonances (i.e.: Ab, Ab, Ab, A…) and harmonic proportions.

Pythagorean numbers were developed and transferred to architecture during Renaissance. Alberti, Palladio and Serlio, among the architects of period, reinterpreted their geometrical proportions in accordance with the intervals and meters in music and used in their designs. There are Alberti's proportions (1:1,2:3,1:2,4:9,9:16,1:3,3:18,1:4), Serlio's proportions (1:2:3) and Palladio's proportions (1:1,5:4,4:3,3:2,5:3,2:1) in architecture. Brunelleschi also reflected the musical intervals used by Dufay on his motet into architecture, which are 6:4/2:3.

In the 20th Century, Alberti, together with Le Corbusier Xenakis, reflected the proportions determined on the basis of golden proportion and human proportions in accordance with the Modulor musical system. As a second significant development, Metasis, interpreted glissandi in architecture on the basis of Fibonacci and golden section. The rhythmic improvements formed the hyperboloid and paraboloid structure. Herman Vol Helmolz found out that the musical notes on a sequence similar to Pythagorean system might be applied on the facade of Cathedrals on the basis of interval proportions, and that they might generate a harmony. Libeskind performed his works by identifying architecture with anatol music. Mases & Aaron by Arnold Schoenberg were performed in Jewish Museum.

Consequently, in the light of these developments, harmony and rhythm, as the main elements of music, were used in similar and different forms within architecture. Therefore, the relation between musical elements and architecture will be elaborated in the next section; harmony and rhythm formation in architecture will be discussed. When harmony and rhythm are formed in accordance with the historical developments, the use of proportions of different signs and sounds and intervals in music generates the formation. Thus, the next section discusses this issue in detail and data that will be the input of method formation are generated.

Appendix A-B: References

Akhtaruzzaman M. and Shafie A. A. (2011), Geometrical Substantiation of Phi, the Golden Ratio and the Baroque of Nature, Architecture, *Design and Engineering International Journal of Arts,* 1(1), 1-22.

Akyılmaz, O. (2005). *Esnek Hesaplama Yöntemlerinin Jeodezide Uygulamaları*, Unpublished Phd Thesis, İTU Fen Bilimleri Enstitüsü, İstanbul.

Altan. İ, (1993). Mimarlıkta Mekan Kavramı, İstanbul Üniversitesi Psikoloji Çalışmaları Dergisi, 19(1), pp. 78-88.

Ambrose, G. & Harris, P. (2007), *The Layout Book*, Singapore: Ava Publishing SA.

Architought (2011), *Third Tought between Music and Architecture*, Retrieved June 22, 2015, from https://archithought.wordpress.com/2011/02/28/between-music-and-architecture/

Arpat, A. (2009). Kiliç Ali Paşa Camisinin Tasarımında Altın Oran, (The Golden Proportion in The Design of Kılıç Ali Pasha Mosque). *Yapı Dergisi: Mimarlık, Kültür, Sanat,* Yapı Endüstri Merkezi Yayınları, İstanbul,329,52-54.

Badawy, A. (1965). *Ancient Egyptian Architectural Design. A Study of the Harmonic System*, Near Eastern Studies, 4, Berkeley: University of California Press.

Bandur, M. (2001). *Aesthetics of Total Serialism, Contemporary Research from Music to Architecture*. Basel: Birkhauser.

Boyer, C. B. (1968). *A History of Mathematics*, United States of America: John Wiley&Sons, Inc.

Brent, J. B. (2015a), Harmony and Proportion, Pythagoras: Music and Space, Retrieved March 25, 2015, from http://www.aboutscotland.com/harmony/prop.html

Brent, J. B. (2015b), Harmony and Proportion, Alberti: Architectural Proportion, Retrieved March 25, 2015, from http://www.aboutscotland.com/harmony/prop2.html

Browne, M. W. (1989). lmpossible Foran of Matter Takes Spottight in Study of Solids, *New York Times,* Semtember 5.

Çağdaş, G. (1994). Fraktal Geometri ve Bilgisayar Destekli Mimari Tasarimdaki Rolü, *CAD+ Bilgisayar Destekli Tasarım ve Ötesi*, 23, 28-31.

Capanna, A. (2001). Iannis Xenakis Architect of Light and Sound, *Nexus Network Journal*, 3(2), 19-26. http://www.nexusjournal.com/Capanna-en.html

Capanna, A. (2009). Music and Architecture: A Cross between Inspiration and Method. *Nexus Network Journal*. 11(2), 257-265.

Ching, F. D. K. (2007) *Architecture--Form, Space, & Order.* Hoboken, N.J: John Wiley & Sons.

Clagett, M. (1999). *Ancient Egyptian Science A Source Book.* Volume 3: Ancient Egyptian Mathematics. Memoirs of the American Philosopy Society 232, Philadelphia: American Philosophical Society.

Cohen, J.L. (2014). Le Corbusier’s Modulor and the Debate on Proportion in France, Architectural Histories is the international, blind peer-reviewed scholarly, *Journal of the EAHN*, 2(1), Retrieved June 22, 2015, from http://journal.eahn.org/articles/10.5334/ah.by/

Conroy, D. R.(2001). The Secret is to Follow Your Nose: Route Path Selection and Angularity. *3rd International Space Syntax Symposium*. Atlanta.

Copplestone, T. (1963). *World Architecture: An Illustrated History from Earliest Times*, London: Paul Hamlyn.

Coxeter, H.S.M. (1998), *Non-Euclidean Geometry*, United States of America: Mathematical Association of America sixth edition (incorporated).

Daye, A. (2004). The Banqueting House, Whitehall: A Site Specific to Dance, *Historical Dance*, 4(1), p.8.

Dewidar, K. M., El-Gohary, A. F., Ally, M. N., Salama H. A. (2015), *Mutual Realtion Role Between Music and Architecture in Design*, Retrieved June 22, 2015, from https://www.academia.edu/667434/MUTUAL_RELATION_BETWEEN_MUSIC_AND_ARCHITECTURE

Di Teodoro, F. (2015). Leonardo da Vinci: The Proportions of the Drawings of Sacred Buildings in Ms. B, Institut de France, *Architectural Histories*, 3(1): 1, 1-10. Retrieved September 9, 2015, fromhttp://journal.eahn.org/articles/10.5334/ah.cf/

Dold-Samplonius, Y. (1992), Practical Arabic Mathematics: Measuring the Muqarnas by al-K¯ash¯ı, *Centaurus,* 35, 93–242.

Dold-Samplonius, Y. (1999), *How al-Kāshī Measures the Muqarnas: A Second Look, in Mathematische Probleme im Mittelalter*, ed. Menso, Folkerts, Wiesbaden, Harrassowitz Verlag, 57–90.

Dorn. H, (1989). Leonardo da Vinci: Engineer and Arcitect by Paolo Galuzzi, Book Review, Isis, 80(3), 22-4.

Ediz, Ö., Çağdaş, G. (2005). Mimari Tasarımda Fraktal Kurguya Dayalı Üretken Bir Yaklaşım, İtüdergisi/a Mimarlık, Planlama, Tasarım, 4(1), pp.71-83, Retrieved, August 11, 2015, from,http://kutuphane.dogus.edu.tr/makale/13037005/2005/cilt4/sayi1/M0005462.pf.

Elwall, R. (1996). *Ernő Goldfinger*. London: Academy Editions, p.17.

English, E. C. (2005). Vladimir Shukhov and the Invention of Hyperboloid Structures, *Metropolis & Beyond: Proceedings of the 2005 Structures Congress and* the 2005 Forensic Engineering Symposium, April 20.24, 2005, New York, pp.1-9.

Evans, R. (1995). *The Projective Cast: Architecture and its Three Geometries*, Cambridge: The MIT Press.

Fischler, R. H. (2001). Proportions in the Architecture Curriculum, *Nexus Network Journal*, 3(3), pp.163-188.

Fletcher, R. (2000). Golden Proportions in a Great House: Palladio's Villa Emo, in Kim Williams (Ed.), *Nexus III: Architecture and Mathematics*, Pisa: Pacini Editore, 73-85.

Flora, S. (2007), *Corbusier in Detail*, Verlag:Architectural Press.

Fricelli, D. (1993), *Leonardo da Vinci*, in R.J.van Vynckt (ed.), *International Dictionary of Architects and Architecture 1*. (pp. 508-11). Detroit: St. James Press.

Frings, M. (2002). The Golden Section in Architectural Theory, *Nexus Network Journal*, 4(1), 9-32, Retrieved August 23, 2015, from, http://www.marcus-frings.de/text-nnj.htm

Gervereau, L. (2000). Symbolic Collapse: Utopia Challenges by Its Representations, Schaer, Roland (edi) in *Utopia: the Search for Ideal Society on the Western World*, New York: New York Public Library.

Glanville, S. R. K. (1927). The Mathematical leather roll in the British museum, *Journal of Egyptian Archaeology*, 13, 232–238.

Goudeau, J. (2015). The Matrix Regained: Reflections on the Use of the Grid in the Architectural Theories of Nicolaus Goldmann and Jean-Nicolas-Louis Durand. *Architectural Histories*, 3(1):9, 1-17, Retrieved August 21, 2015, from http://journal.eahn.org/articles/10.5334/ah.cl/.

Griffith, F.L. (1897). Notes on Egyptian Weights and Measures, *Proceedings Of The Society of Biblical Archaeology*, 14, 437-438.

Grünbaum, B., Shephard, G.C. (1987). *Tillings and Patterns*, W. H. Freeman and Company: New York.

Gruson, L. (2008). Claude Nicolas Ledoux, Visionary Architecture and Social Utopia. *International Conference of Territorial Intelligence*, Oct 2008, Besancon, France. pp. 299-307 Retrieved August 17, 2015, from https://halshs.archives-ouvertes.fr/hal 00767259/document

Hermoso, J. A. M, Hermoso, F.M., Tubi'o, F.P.M. and Serrano, A.J. (2014). Geometry and Proportions in the Funeral Chapel of Sarenput II, *Nexus Network Journal*, 17(1), 287-309.

Hidden, L. (2014). *Sacred Geometry*, Retrieved May 15, 2015, fromhttp://www.lahilden.com/index.php?categoryid=6&p2_articleid=141

Hildner, J. (1998). *Remembering the Mathematics of the Ideal Villa*, 86th ACSA Annual Meeting Proceedings, Constructing Identity, Craig Barton (Ed.), University of Virginia, pp. 388-395, (2015, August 21). Retrieved from, http://apps.acsaarch.org/resources/proceedings/uploads/streamfile.aspx?path=ACSA.AM.86&name=ACSA.AM.86.81.pdf

Hill, F. S. (1990), *Computer Graphics*, New York: Macmillan.

Hogendijk, J. P.(1996). Een Workshop Over Iraanse Mozaieken, *Nieuwe Wiskrant*,16 38–42.

INTI (International New Town Institute, (2015). *Olynthos, Greece, Europe*, Retrieved September 12, 2015, from http://www.newtowninstitute.org/newtowndata/newtown.php?newtownId=1490

Jarzombek, M. M., Prakash, V. & Ching, F.D.K. (2010). A Global History of Architecture, New Jersey: John Wiley and Sons.

Jason, E. (2006). *Mirrors of the Unseen: Journeys in Iran*, Macmillan: St. Martin's Press.

Jencks, C. (2013). *Architecture Becomes Music,* Retrieved August 28, 2015, From http://www.architectural-review.com/essays/architecture-becomes-music/8647050.article

Jonge, K. D., Ottenheym, K. A. (2007). *Unity and Discontinuity. Architectural*

Relationships between the Southern and Northern Low Countries 1530–1700, Turnhout: Brepols Publishers.

Junichi, S. (1993), Study on the Golden Ratio in the Works of Mies Van Der Rohe: On the Golden Ratio in the Plans of House with Three Courts and ITT Chapel, *Journal of Architecture, Planning and Environmental Engineering,* 453, 153-158.

Kaplan, F. C. (2015). *A Golden Idea*, Retrieved May 30, 2015, from http://kaplanpicturemaker.com/tips__info/golden_rectangle.

Kappraff J. (2006), *Anne Bulckens' Analysis of the Proportions of the Parthenon and its Meanings*, Retrieved August 28, 2015, from http://www.trinitas.ru/rus/doc/0000/006a/00001002.htm

Kappraff, J. (2015). Chapter 37 Musical Proportions at the Basis of Systems of Architectural Proportion both Ancient and Modern, In Michael J. Ostwald and Kim Williams (Ed.), *Architecture and Mathematics from Antiquity to the Future Volume I: Antiquity to the 1500s*, pp.549-566, Switzerland: Springer International Publishing.

Kılıçaslan, H. &Tezgel, I.E. (2012). Architecture and Music in the Baroque Period, *Procedia Social and Behavioral Sciences*, 51, 635-640.

Kline, M. (1953). *Mathematics in Western Culture*. New York: Oxford University Press.

Krause, B. (2012). *The Great Animal Orchestra: Finding the Origins of Music in the World's Wild Places*, Little Brown/Hachette: New York.

Kruft, H.W. (1994). A History of Architectural Theory: From Vitruvius to the Present. New York: Princeton Architectural Press.

Kumar, V. (2002). *Vastushastra,* New Dawn: Sterling.

Le Corbusier. (2004). *The Modulor: A Harmonious Measure to the Human Scale, Universally Applicable to Architecture and Mechanics*, Trans. Peter de Franci and Anna Bostock, First published in two volumes in 1954 and 1958, Basel & Boston: Birkhäuser.

Leopold, C. (2005). Experiments on Relations between Geometry, Architecture and Music, *Journal for Geometryand Graphics*, 9, 169-176.

Libeskind, D. (1991) *Countersign*, London: Academy Editions.

Libeskind, D. (1992) *Erweiterung des Berlin Museums mit der Abteilung Jüdisches*

Museum, Extension to the Berlin Museum with Jewish Museum Department, ed. K. Feireiss, Berlin:Ernst and Sohn.

Libeskind, D. (1999) Jewish Museum Berlin, *G+B Arts International*, Berlin.

Libeskind, D. (2000*). The Space of Encounter*, New York: Universe Publishing.

Lubicz, S. R.A. (1957,1998). *Le Temple de l'Homme*, *Apet du Sud à Louqsor* Paris: Caract`eres, English translation titled *The Temple of Man: Apet of The South at Luxor*, Rochester: Vermont: Inner Traditions.

Lubicz, S. R.A. (1998). *The Temple of Man: Apet of the South at Luxor*. Rochester, United State: Inner Traditions.

Maden, F. & Şengel D. (2009). Kırılan Temsiliyet: Libeskind'de Bellek, Tarih ve Mimarlik, *Metu Journal of the Faculty of Architecture*, (JFA), 26(1), 49-70.

Mainstone, R. D. J. (1988). Hagia Sophia, New York: Thames and Hudson.

Mandelbrot, B. B., (1982). The fractal geometry *of nature*, New York: W.H. Freeman And Company.

Manuel, G. and Santiago, A. (1988). An Unexpected Appearance of the Golden Ratio, The College Mathematics Journal, 19, 168-170.

Maré, E. A. (2012). Leonardo da Vinci's Architectural Designs as Thought Experiments: The Sources and Influence of his Ideas, *SAJAH*, 27(1), 53-82.

McKitterick, D. (1995). *The Making of the Wren Library: Trinity College, Cambridge*, UK: Cambridge University Press

Mersbergen, V., Audrey, M. (1998). Rhetorical Prototypes in Architecture: Measuring the Acropolis, *Philosophical Polemic Communication Quarterly*, 46(2), 194-213.

Mitrovic, B. (2004). *Learning from Palladio*. New York: W.W. Norton & Company

More, T. (1997). *Utopia*, New York: Dover.

Morris, K. (1953). *Mathematics in Western Culture*, Oxford University Press.

NAF (The Nobel Architecture Foundation), (2009). *Mathematics and Architecture*, Retrieved September 13, 2015, from http://www.thenoblearchitect.com/images/Mathematics_and_architecture.pdf

O'Connor, J., Robertson, E.F. (2002). *Mathematics and Architecture*, Retrieved September 19, 2015, fromhttp://www-history.mcs.st-and.ac.uk/HistTopics/Architecture.html

Osborne, A. (2009), *Keyboard Connections*, Authorhouse, United State of America, Bloomington Indiana: Autorhouse.

Ottenheym, K. (2014). Proportional Design Systems in Seventeenth-Century Holland, *Architectural Histories*, 2(1): 10, pp. 1-14.

Ottenheym, K.A., (1999). Classicism in the Northern Netherlands in the Seventeenth Century, in: Guido Beltramini and Howard BURNS (*eds.), Palladio and Northern Europe. Books, Travellers,Architects* (pp. 150-167). Milan: Skira.

Özcan, Z. (2013). Intersection of Architecture and Music as *Gesamtkunstwerk* in Iannis Xenakis's Selected Works, Unpublished Master Thesis, to the Graduate School of Social Sciences of Middle East Technical University, Department of History of Architecture, Ankara.

Özdural, A. (1990), Alpay O¨ zdural, Giyaseddin Jemshid el-Ka¯sh¯ı and Stalactites, *Middle East Technical University Journal of the Faculty of Architecture,* 1031–49.

Özdural, A. (1998), A Mathematical Sonata for Architecture: Omar Khayyam and the Friday Mosque of Isfahan, *Technology and Culture*, 39, 699–715.

Özdural, A. (2000). Mathematics and Arts: Connections between Theory and Practice in the Medieval Islamic World, *Historia Mathematica*, 27, pp. 171–201.

Padovan, R. (1999). *Proportion – Science, Philosophy, Architecture*, E&FN Spon: London and New York.

Pappas, T. (1989). *The Joy of Mathematics*. San Carlos, CA.: Wide World Publishing.

Pedretti, C. (1962). *A Chronology of Leonardo da Vinci's Architectural Studies after 1500*. Geneva: Droz.

Pedretti, C. (1978). *Leonardo Architetto,* Milan: Electa.

Peet, T. E. (1923). *The Rhind Mathematical Papyrus, British Museum 10057 and 10058. Introduction, Transcription, Translation and Commentary,* London:The University Press of Liverpool limited and Hodder& Stoughton Limited.

Pekol, B. (2011).*Mimaride Oran ve Geometri Kullanımının Mimarlık Tarihi İçindeki Aktarımları ve Kentsel Bağlamda Etkileri*, Retrieved December 14, 2014, fromhttp://www.banupekol.com/blog/2011/08/26/mimaride-oran-ve-geometri-kullaniminin-mimarlik-tarihi-icindeki-aktarimlari-ve-kentsel-baglamda-etkileri/.

Pereira, A. N. (2011), Renaissance in Goa: Proportional Systems in Two Churches of the Sixteenth Century, *Nexus Network Journal*, 13(2), 373-396.

Rasmussen, S. E. (1994). *Yaşanan Mimari*, Birinci Basım(Trans.) Ömer Erduran, İstanbul: Remzi Kitabevi.

Riad, M. (2009). *Architecture: Music, City, and Culture,* Retrieved June 15, 2015, fromhttp://drum.lib.umd.edu/bitstream/handle/1903/9640/Riad_umd_0117N_10690.pdf?sequence=1&isAllowed=y

Rossi, C. (2004). *Architecture and Mathematics in Ancient Egypt*, Cambridge: Cambridge University Press.

Roth, L.M. (2000), *Mimarlığın Öyküsü*, (Çev. Ergün Akça), İstanbul, Kabalcı Yayınevi.

Sağdıç, Z.(2015), Ottoman Architecture: Relationships Between Architectural Design and Mathematics in Sinan's Works, in In Michael J. Ostwald and Kim Williams (Ed.) *Architecture and Mathematics from Antiquity to the Future Volume II: Antiquity to the 1500s.* (pp.1-25). Switzerland: Birkhäuser Basel, Springer International Publishing.

Saussure, F. (2001). Cours de linguistique generate (Course in General Linguistics), (Trans. Prof. Dr. Berke Vardar), İstanbul: Multilingual Yayınları.

Savaşır, K. & Tuğrul, F. (2014). Uzay Kafes Sistemlerle Yaratılabilecek Üst Örtülerin Yüzey Geometrilerinin İncelenmesi: Heydar Aliyev Merkezi Örneği, *7. Ulusal Çatı & Cephe Sempozyumu*, 3 - 4 Nisan 2014, Yıldız Teknik Üniversitesi Beşiktaş – İstanbul, Retrieved September 12, 2015, from,http://www.catider.org.tr/pdf/sempozyum7/31_%20Bildiri%20savasir.pdf

Scholfield, P.H. (1958). *The Theory of Proportion in Architecture*. Cambridge, University Press, New York.

Schreuder, D.A., (2014), *Vision and Visual Perception the Concious Base of Seeing*, United States of America: Archway Publishing.

Shaded, N., Dirie, A., McMillan, J., Robidoux, M. (2012), *Petit Cabanon Le Corbusier*, Retrieved September 12, 2015, from, http://petitcabannon.blogspot.com.cy/2012/12/cabanon-compostion.html

Solomonovich M. (2010), *Euclidean Geometry: A First Course*, New York, Bloomington: Iuniverse Inc., p.14.

Fuzzy Logic (2010), Stanford Encyclopedia of Philosophy, Retrieved August 28, 2015, from http://plato.stanford.edu/entries/logic-fuzzy/

Sterken, S. (2007). Music as an Art of Space: Interactions between Music and

Architecture in the work of Iannis Xenakis. In Mikesch W. Muecke and Miriam S. Zach (Eds.), *Essays on the Intersection of Music and Architecture* (pp. 21-51). Ames: Culicidae Architectural Press.

Tavernor, R. (2015). Measure, Metre, Irony: Reuniting Pure Mathematics with, Architecture, *In* Williams, Kim, Ostwald, Michael J. (Eds.), *Architecture and Mathematics from Antiquity to the Future Volume I: Antiquity to the 1500s*. (pp.245 259). Switzerland: Birkhäuser Basel, Springer International Publishing

Taylor, M. (2003). *Surface Consciousness*, West Sussex: Wiley-Academy.

Thayer, W. P. (2002). *Marcus Vitruvius Pollio: de Architectura, Book V*, Retrieved August 28, 2015, from http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Vitruvius/5*.html#note:acoustic_jars,

Thurley, S. (1999). *Whitehall Palace: An Architectural History of the Royal Apartments 1240–1690*, New Haven: Yale University Press.

Tzonis A., Lefaive, L. (1992), *Architecture in Europe, Memory and Invention since 1968*, New York: Rizzoli.

Ülger, A. (2005). *Matematiğin Kısa Bir Tarihi, Bilim, Eğitim ve Düşünce Dergisi, Üniversite ve Toplum*, January 2005, 5/1, Retrieved May 29, 2015, from http://www.universite-toplum.org/text.php3?id=221

Vidler, A. (1990). *Claude-Nicolas Ledoux*, Cambridge, MA: MIT Press.

Vitruvius, P. (1960). *The Ten Books On Architecture,* (Trans. Morris Hicky Morgan), New York: Dover Publications.

Wallin, N. L., Merker, B., and Brown, S. (Eds.) (2001). *The Origins of Music*. Cambridge, MA: MIT press.

Wesenberg, B. (1983). *Beiträge zur Rekonstruktion griechischer Architektur nach literarischen Quellen*. Berlin: Gebr. Mann Verlag (Mitteilungen des Deutschen Archäologischen Instituts, Abt. Athen., 9. Beih.

Wikipedia, (2015a). *Thales*, Retrieved June 13, 2015, from https://en.wikipedia.org/wiki/Thales

Wikipedia, (2015c), *Palladian architecture*, Retrieved August 11, 2015, from https://en.wikipedia.org/wiki/Palladian_architecture

Wikipedia, (2015d), *Claude Nicolas Ledoux,* Retrieved August 18, 2015, from https://en.wikipedia.org/wiki/Claude_Nicolas_Ledoux

Wikipedia, (2015e), *Christopher Wren,* Retrieved August 18, 2015, from

https://en.wikipedia.org/wiki/Christopher_Wren
Winko, U., (2015). *Architecture and Music*, Retrieved March 18, 2015, from http://www.see-this-sound.at/print/75
Wittkower, R. (1971). *Architectural Principles in the Age of Humanism*. New York: Norton.
Xenakis, I. (2008). *Music and Architecture*, Edited by Sharon Kanach., Hillsdale, NY: Pendragon Press.
Yağcı, M. (2005). Altın Oran, *Matematik Dünyası*, 14 (3), 52-59.
Yılmaz, N. (2012). Mekanda Müzik ve İnsan, *Müzik-Bilim Dergisi*, 1, 44-56.

Appendix Picture URL

URL 40: http://jwilson.coe.uga.edu/emat6680/parveen/ancient_egypt.htm
URL 41: http://kaplanpicturemaker.com/tips__info/golden_rectangle
URL 42: https://classconnection.s3.amazonaws.com/686/flashcards/769686/jpg/picture271319467192873.jpg
URL 43: http://www.sacred-destinations.com/france/chartres-cathedral/photos/Chartres_Plan
URL 44: http://image.slidesharecdn.com/lecture2middleagesrenaissance-140912061326-phpapp02/95/lecture-2-middle-ages-renaissance-22-638.jpg?cb=1411632520
URL 45: http://www.inderscience.com/jdr/backfiles/articles/issue2004.02/Figuren_Art_2/Art2_Fig16.jpg

Appendix C: Legend of the Analytical ReadingTables

CODE OF SQUARE	LOCATION OF SQUARE	NORTH	N	SOUTH	S	VILLAGE	V	CITY / C
	NAME OF VILLAGE/CITY	HİSARKOY /ESENTEPE/KARMİ..	H/E/K..	NAME OF SQUARE		HİSARKOY SQUARE/ESENTEPE SQUARE/KARMİ SQUARE....	HS/ES/KS....	NUMBER OF SQUARE / 1,2,3.....
	FUNCTIONAL TYPES OF SQUARE	RESIDENTIAL SQUARE COMMERCIAL SQUARE RELIGIOUS SQUARE	RS CS ES	FORMAL TYPES OF SQUARE		CIRCLE SQUARE RECTANGLE SQUARE TRIANGLE SQUARE AMORPHOUS SQUARE SQUARE SQUARE	IS GS TS AS SS	ONE SQUARE CODE / NVHHS1CSRS

CODE OF BUILDING	FUNCTIONAL CODES OF BUILDING&ELEMENTS	Residential HOUSE	R H1/H2/H3.....	NR1/NR2/NR3.....	Non-Residential LEISURE OFFICE RETAIL COMMUNITY SERVICES OPENLAND	NR L1,L2,.... OF1,OF2,.... R1,R2,.... C1,C2,.... O1,O2....	NRL1/NRL2/... NROF1/NROF2/... NRR1/NRR2/.... NRC1/NRC2/... NRO1/NRO2/....
						ROAD	R
	PORCH CODES OF BUILDINGS	PORCH EXIST	P		PORCH ABSENT	-	

PART A INTERVALS

HEIGHT CODES OF BUILDINGS (CM)	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14	H15	H16	H17
	0-200	201-400	401-600	601-800	801-1000	1001-1200	1201-1400	1401-1600	1601-1800	1801-2000	2001-2200	2201-2400	2401-2600	2601-2800	2801-3000	3001-3200	3201-3400
WIDTH CODES OF BUILDINGS (CM)	W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17
	0-200	201-400	401-600	601-800	801-1000	1001-1200	1201-1400	1401-1600	1601-1800	1801-2000	2001-2200	2201-2400	2401-2600	2601-2800	2801-3000	3001-3200	3201-3400

PART B PROPORTIONS

HEIGHT& WIDTH CODES OF BUILDINGS		HW1	HW2	HW3	HW4	HW5	HW6	HW7	HW8	HW9	HW10
CODES OF BUILDING OPENNING	CODES OF DOORS	D1	D2	D3	D4	D5	D6	D7	D8	D9	
	CODES OF WINDOWS	I1	I2	I3	I4	I5	I6	I7	I8	I9	I10	I11

PART C INTERVALS

CODES OF BUILDING SOLID&VOID															
CODES OF HORIZONTAL SOLID&VOID	SOLID	0.5x	1x	1.5x	2x	2.5x	3x	3.5x	4x	4.5x	5x	5.5x	6x	6.5x
		0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300
	VOID	0.5u	1u	1.5u	2u	2.5u	3u	3.5u	4u	4.5u	5u	5.5u	6xu	6.5u
		0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300
CODES OF VERTICAL SOLID&VOID	SOLID	0.5y	1y	1.5y	2y	2.5y	3y	3.5y	4y	4.5y	5y	5.5y	6y	6.5y
		0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300
	VOID	0.5w	1w	1.5w	2w	2.5w	3w	3.5w	4w	4.5w	5w	5.5w	6w	6.5w
		0-100	101-200	201-300	301-400	401-500	501-600	601-700	701-800	801-900	901-1000	1001-1100	1101-1200	1201-1300

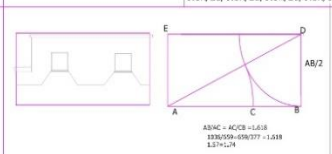
CODES OF BUILDING SOLID&VOID HORIZONTAL INDEX ABSTRACTION — CODES OF HORIZONTAL SOLID&VOID

1.5 u	1.1x
4x	1.2x
2 u	1.3x
4.5 u	1.4x
2.5 x	1.5x
2.5 u	1.6x
3.5 u	1.7x
3 u	1.8x
4 u	1.9x
8.5 u	1.10x
0.5 u	1.11x
5.5 u	1.12x
5 u	1.13x
10.5 u	1.14x
1 u	1.15x
7 u	1.16x
1x/1.5x	2.1x
1x/1u/0.5x	3.1x
2.5x/1u/2.5x	3.2x
1.5x/1u/2.5x	3.3x
1.5x/0.5u/1x	3.4x
2x/1u/2x	3.5x
0.5x/1.5u/0.5x	3.6x
0.5x/1u/2x	3.7x
0.5x/1u/1x	3.8x
1x/0.5u/1x/1x	4.1x
1x/1.5x/1u/1x	4.2x
1x/1u/1x/0.5u	4.3x
1x/1u/1x/1u/1.5x	5.1x
1.5x/0.5u/1x/1u/1x	5.2x
1x/1.5u/2x/0.5u/0.5x	5.3x
1.5x/0.5u/0.5x/0.5u/0.5x	5.4x
1x/1u/1x/1u/0.5x	5.5x
1x/0.5u/1.5x/0.5u/1.5x	5.6x
2x/0.5u/1.5x/0.5u/0.5x	5.7x
0.5x/0.5u/1x/1u/1x	5.8x
1x/1.5u/1x/2u/1x	5.9x
1x/1.5u/1x/1.5u/1x	5.10x
0.5x/0.5u/0.5x/0.5u/0.5x	5.11x
3x/1u/1x/0.5x/1u	5.12x
1.5x/1u/1x/1.5u/2x	5.13x
3x/1u/1.5x/1u/1.5x	5.14x
2x/1u/1x/0.5u/1.5x	5.15x
0.5x/1u/0.5x/2u/0.5x	5.16x
1.5x/1.5u/1.5x/3u/0.5x	5.17x
0.5x/1u/0.5x/1u/1.5x	5.18x
1x/0.5u/0.5x/1u/1.5x	5.19x
0.5x/0.5u/1x/0.5u/1.5x	5.20x
0.5x/1u/1x/1u/1x	5.21x
2.5x/1u/1x/1u/0.5x	5.22x
1x/1x/1u/2x/1u/1x	6.1x
2x/1u/1.5x/1x/0.5u/1.5x	6.2x
1x/1.5u/0.5x/1.5u/1x/1u	6.3x
2.5x/1u/1.5x/1u/1.5x/1u	6.4x
0.5x/3x/1x/5.5x/0.5x/1.5x	6.5x
1.5x/1.5u/1.5x/3u/0.5x/3x	6.6x
1x/1u/1.5x/1u/1.5x/1u/1.5x	7.1x
0.5x/0.5u/1x/1u/1.5x/0.5u/0.5x	7.2x
0.5x/0.5u/0.5x/1u/0.5x/0.5u/0.5x	7.3x
1.5x/0.5u/0.5x/1u/0.5x/0.5u/1.5x	7.4x
1x/0.5u/0.5x/1u/1x/0.5u/1.5x	7.5x
1x/1u/0.5x/1u/1x/1u/1x	7.6x
0.5x/1u/1x/0.5u/1x/0.5u/0.5x	7.7x
1x/1u/0.5x/0.5u/1x/1u/0.5x	7.8x
0.5x/1.5u/0.5x/1.5u/0.5x/2u/0.5x	7.9x
0.5x/0.5u/1.5x/1u/0.5x/0.5u/1x	7.10x
1x/0.5u/1x/0.5u/1x/0.5u/1x	7.11x
1.5x/1u/0.5x/1u/0.5x/1u/1x	7.12x
1x/1.5u/0.5x/1.5u/1x/1u/1.5x	7.13x
1x/0.5u/1x/1x/0.5u/0.5x/0.5u/1x	8.1x
1u/1.5x/0.5u/1x/0.5u/0.5x/0.5u/0.5x	8.2x
1.5u/2u/1u/2x/1u/1x/0.5u/0.5x	8.3x
1u/1x/1u/0.5x/1.5u/0.5x/1.5u/0.5x	8.4x
1.5x/1u/1.5x/1u/1.5x/1u/0.5x/1u	8.5x
1x/1u/1.5x/1u/1.5x/1u/1x/1u	8.6x
1x/1u/1x/1u/1x/1u/1x/0.5u/2x	9.1x
1x/1u/1x/1u/1x/0.5u/1x/1u/0.5u	9.2x
1x/1u/1x/1u/1x/1u/1x/1u/1x	9.3x
1x/0.5u/1x/1u/1x/0.5u/1.5x/1u/1x	9.4x
0.5x/1.5u/1x/1u/1x/1u/1x/1u/0.5x	9.5x
1x/0.5u/1.5x/1u/1.5x/1u/1x/1u/0.5x	9.6x
1.5x/1u/0.5x/1u/0.5x/1u/0.5x/1u/0.5x	9.7x
0.5x/1.5u/0.5x/1.5u/0.5x/2u/0.5x/2u/0.5x	9.8x
1x/1u/1.5u/1x/1u/1x/1x/1.5u/1x	10.1x
0.5x/1u/0.5u/1u/0.5x/1u/0.5x/1u/0.5x/1u/0.5x	11.1x
0.5x/0.5x/2u/0.5x/2u/0.5x/2u/0.5x/1.5u/0.5x/0.5x	11.2x
1x/1u/0.5x/0.5u/0.5x/1u/0.5x/0.5u/0.5x/1u/1x	11.3x
2x/0.5u/1.5x/0.5u/1x/0.5u/0.5x/0.5u/0.5x/0.5u/1x/0.5u/0.5x	13.1x
1x/0.5u/1x/1u/1x/1u/0.5x/1u/1x/1u/1.5x/0.5u/2x	13.2x
1x/1u/2x/1u/2.5x/1u/1x/1u/1.5x/1u/0.5x/0.5u/1x	13.3x
2x/0.5u/0.5x/0.5u/0.5x/0.5u/0.5x/0.5u/0.5x/0.5u/0.5x/0.5u/0.5x/0.5u/0.5x	15.1x
0.5x/2u/0.5x/2u/0.5x/2u/0.5x/0.5u/0.5x/1.5u/0.5x/1.5u/0.5x/1u/0.5x/1u/0.5x/1u/0.5x	18.1x

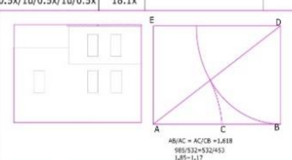
CODES OF BUILDING SOLID&VOID VERTICAL INDEX ABSTRACTION

1 z	1.1y
2y	1.2y
3y	1.3y
1.5y	1.4y
4y	1.5y
2.5y	1.6y
0.5y/1.5z	2.1y
0.5y/1z	2.2y
1y/1.5z	2.3y
1y/1z	2.4y
1y/1z/1.5y	3.1y
1y/0.5z/1y	3.2y
1y/1z/1y	3.3y
0.5y/2z/0.5y	3.4y
1y/1z/0.5y	3.5y
0.5y/1z/1y	3.6y
0.5y/1z/2y	3.7y
0.5y/1z/1.5y	3.8y
0.5y/1y/1z	3.9y
0.5y/0.5y/1.5z	3.10y
1y/0.5z/2.5y	3.11y
4.5y/1z/1.5y	3.12y
0.5y/1.5z/0.5y	3.13y
1.5y/1.5z/1.5y	3.14y
1y/1z/1y/1y	4.1y
1y/0.5z/0.5z/1.5y	4.2y
0.5y/1z/1y/1.5y	4.3y
0.5y/1z/1.5y/2z	4.4y
0.5y/1z/1.5y/1.5z	4.5y
1y/1z/0.5y/0.5y	4.6y
1y/0.5y/1z/0.5z	4.7y
1y/1z/0.5y/1.5z	4.8y
1y/1.5z/0.5y/0.5z	4.9y
1y/2y/1y/4z	4.10y
0.5y/1.5z/1y/1.5z	4.11y
1.5y/0.5y/1z/1.5y	4.12y
4y/1y/1z/0.5y	4.13y
1.5y/1z/1y/2y	4.14y
0.5y/1z/0.5y/1z/1y	5.1y
0.5y/1.5z/1.5y/0.5z/1z	5.2y
0.5y/0.5y/1z/0.5y/1.5z	5.3y
4y/0.5z/0.5y/1.5z/1y	5.4y
1y/1z/0.5y/1.5z/0.5y	5.5y
3y/0.5z/1y/1z/3y	5.6y
0.5y/1z/1y/1.5z/0.5y	5.7y
1y/1z/1y/1z/1y	5.8y
2y/1z/1.5y/1z/0.5y	5.9y
0.5y/0.5z/0.5y/0.5z/1.5y	5.10y
1.5y/1z/3y/1z/0.5y	5.11y
1.5y/1z/2y/2y/1.5z/1y	6.1y
0.5y/1z/1y/0.5y/0.5z/0.5y	6.2y
1y/1z/0.5y/1z/1.5y/1.5z/2.5y	7.1y
0.5y/1z/1y/0.5z/1y/0.5z/1y	7.2y

CODES OF BUILDING AND GARDEN WALL GOLDEN RATIO



EXIST GOLDEN RATIO E



ABSENT GOLDEN RATIO A

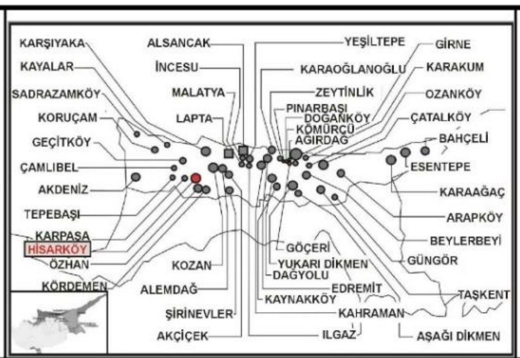
Appendix D: Analytical Reading Tables

Appendix D1: Analytical Reading Table No:1- Hisarköy Square

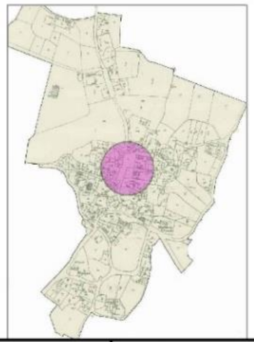
STEP I

CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)

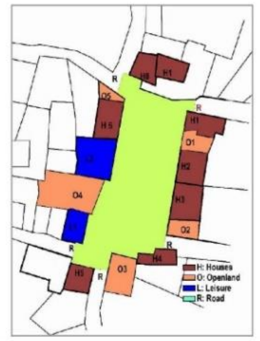
VILLAGE LOCATION



VILLAGE SQUARES LOCATION



INVENTORY SHEET NO	01				
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)	
	CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)	
	NAME OF CITY/VILLAGE	HISARKOY			
	NAME OF CITY/VILLAGE SQUARE	HISARKOY SQUARE			
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS)		FORMAL TYPE OF SQUARE	CIRCLE (IS)
		COMMERCIAL (CS)	✓		RECTANGLE (GS) ✓
		RELIGIOUS (ES)			TRIANGLE (TS)
					AMORPHOUS (AS)
					SQUARE (SS)



FUNCTION OF THE BUILDINGS

FACADES NO	FACADES I	FACADES II	FACADES III	FACADES IV

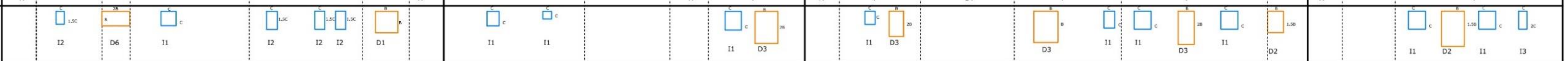
SILHOUETTE PHOTOS

STEP II

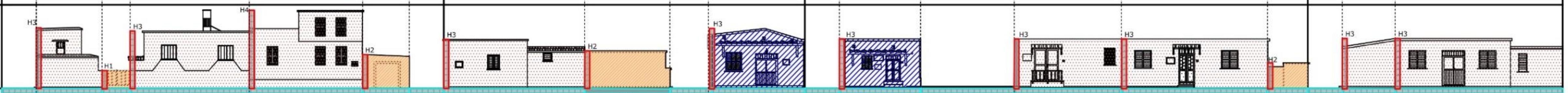
BUILDINGS AND ELEMENTS VOCABULARY

BUILDING CODE	R	H1	O1	H2	H3	O2	R	H4	O3	R	L1	R	L2	O4	H5	H6	O5	R	H7	H8
BUILDING PORCH	R	-	-	-	-	-	R	-	-	R	P	R	P	O4	P	P	-	R	-	P

BUILDING OPENNING

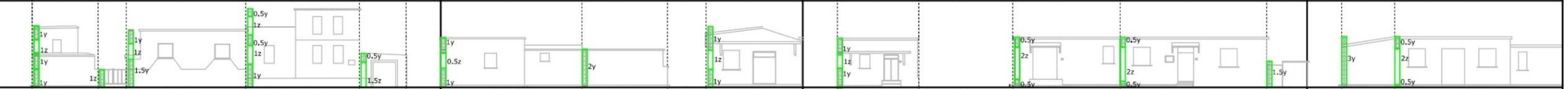


BUILDING HEIGHT



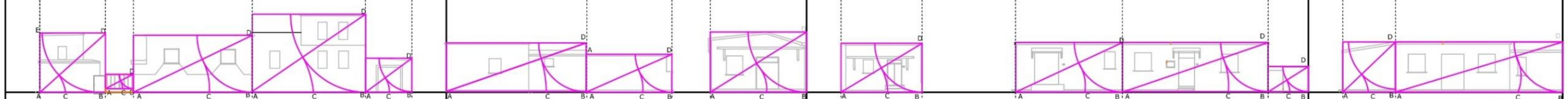
BUILDING WIDTH	W2	W3	W2	W5	W5	W3	W2	W7	W4	W2	W5	W2	W5	W5	W5	W7	W2	W2	W3	W8
HEIGHT&WIDTH	R	HW1	HW3	HW3	HW2	HW2	R	HW5	HW3	R	HW2	R	HW2	O4	HW3	HW5	HW2	R	HW1	HW5
BUILDING HORIZONTAL SOLID&VOID	1.1x	4.1x	1.1x	6.1x	8.1x	3.1x	1.1x	6.2x	1.2x	1.3x	5.1x	1.1x	5.2x	1.4x	5.3x	7.1x	2.1x	1.1x	1.5x	9.1x

BUILDING VERTICAL SOLID&VOID



	R	H1	O1	H2	H3	O2	R	H4	O3	R	L1	R	L2	O4	H5	H6	O5	R	H7	H8
BUILDING VERTICAL SOLID&VOID	-	4.1y	1.1y	3.1y	5.1y	2.1y	-	3.2y	1.2y	-	3.3y	-	3.3y	-	3.4y	3.4y	1.2y	-	1.3y	3.4y

BUILDING GOLDEN RATIO



	H1	O1	H2	H3	O2	H4	O3	L1	L2	H5	H6	O5	H7	H8
Ratio	AB/AC=AC/CB = 1.618 574.5/222= 222/352.5 2.58=0.62	AB/AC= AC/CB =1.618 240/148= 148/92 =1,618	AB/AC = AC/CB =1.618 1036/659=659/377 =1.618 1.57=1.74	AB/AC = AC/CB =1.618 985/532=532/453 1.85=1.17	AB/AC = AC/CB =1,618 400/206 = 206/194 =1.94=1.06	AB/AC = AC/CB =1.618 1225/870=870/355 1.40 = 2.45	AB/AC = AC/CB =1.618 798/492= 492/ 306 1.62=1.60	AB/AC = AC/CB =1.618 808/490= 490/318 1.64=1.54	AB/AC = AC/CB =1.618 674/424= 424/250 1.58=1.69	AB/AC = AC/CB =1.618 931/602= 602/349 1.57=1.72	AB/AC = AC/CB =1.618 1270/921= 921/349 1.37=2.63	AB/AC= AC/CB =1.618 323/198= 198/125 =1.63=1.58	AB/AC = AC/CB =1.618 460/222= 222/238 2.07=0.93	AB/AC = AC/CB =1.618 1457/1099= 1099/358 1.3=3.06

R	A	E	E	A	A	R	A	E	R	E	R	E	O4	E	A	E	R	A	E

STEP III

GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

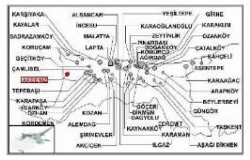
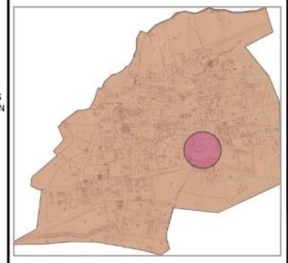
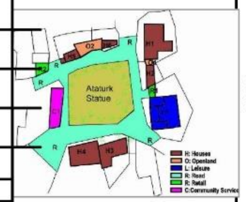
FACADES I:
NVHHS1CSRS-R-W2-1.1x-
NVHHS1CSRS-RH1---I2-H3-W3-HW1-4.1x-4.1y-A-
NVHHS1CSRS-NRO1-D6-H1-W2-HW3-1.1x-1.1y-E- NVHHS1CSRS-RH2---I1-H3-W3-HW3-6.1x-3.1y-E-
NVHHS1CSRS-RH3---I2I2I2-H4-W5-HW2-8.1x-5.1y-A-NVHHS1CSRS-NRO2-D1-H2-W3-HW2-3.1x-2.1y-A- NVHHS1CSRS-R-W2-1.1x

FACADES II:
NVHHS1CSRS-RH4---I1I1-H3-W7-HW5-6.2x-3.2y-A-
NVHHS1CSRS-NRO3-H2-W4-HW3-1.2x-1.2y-E-
NVHHS1CSRS-R-W2-1.3x-
NVHHS1CSRS-NRL1-P-I1D3-H3-W5-HW2-5.1x-3.3y-E-

FACADES III:
NVHHS1CSRS-R-W2-1.1x-NVHHS1CSRS-NRL2-P-I1D3-H3-W5-HW2-5.1x-3.3y-E-
NVHHS1CSRS-NRO4-W5-1.4x- NVHHS1CSRS-RH5-P-D3I1-H3-W5-HW3-5.3x-3.4y-E-
NVHHS1CSRS-RH6-P-I1D3I1-H3-W7-HW5-7.1x-3.4y-A-
NVHHS1CSRS-NRO5-D2--H2-W2-HW2-2.1x-1.2y-E

FACADES IV:
NVHHS1CSRS-R-W2-1.1x-
NVHHS1CSRS-RH7----H3-W3-HW1-1.5x-1.3y-A-
NVHHS1CSRS-RH8-P-I1D2I1I3-H3-W8-HW5-9.1x-3.4y-E

Appendix D2: Analytical Reading Table No:2 -Akdeniz Square

STEP I CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)	VILLAGE LOCATION		VILLAGE SQUARES LOCATION		INVENTORY SHEET NO 02		FUNCTION OF THE BUILDINGS 

INVENTORY SHEET NO 02

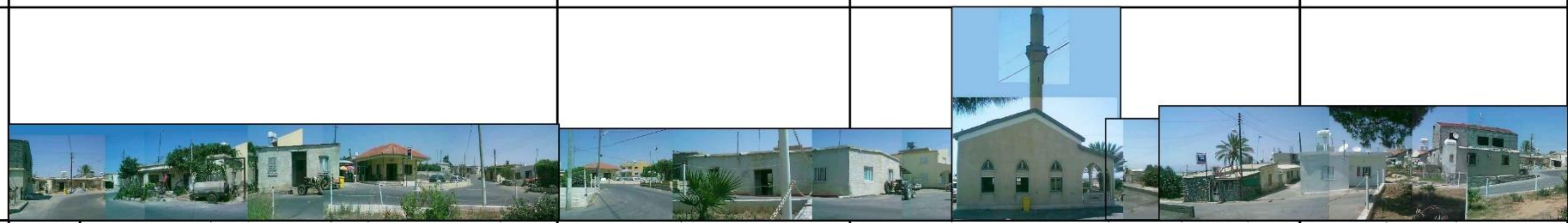
VOCABULARY CODES OF SQUARE

LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)	
CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)	
NAME OF CITY/VILLAGE	AKDENİZ			
NAME OF CITY/VILLAGE SQUARE	AKDENİZ SQUARE			

FUNCTIONAL TYPE OF SQUARE			FORMAL TYPE OF SQUARE	
	RESIDENTIAL (RS)			CIRCLE (IS)
	COMMERCIAL (CS)			RECTANGLE (GS)
	RELIGIOUS (ES)	✓		TRIANGLE (TS)
				AMORPHOUS (AS)
				SQUARE (SS) ✓

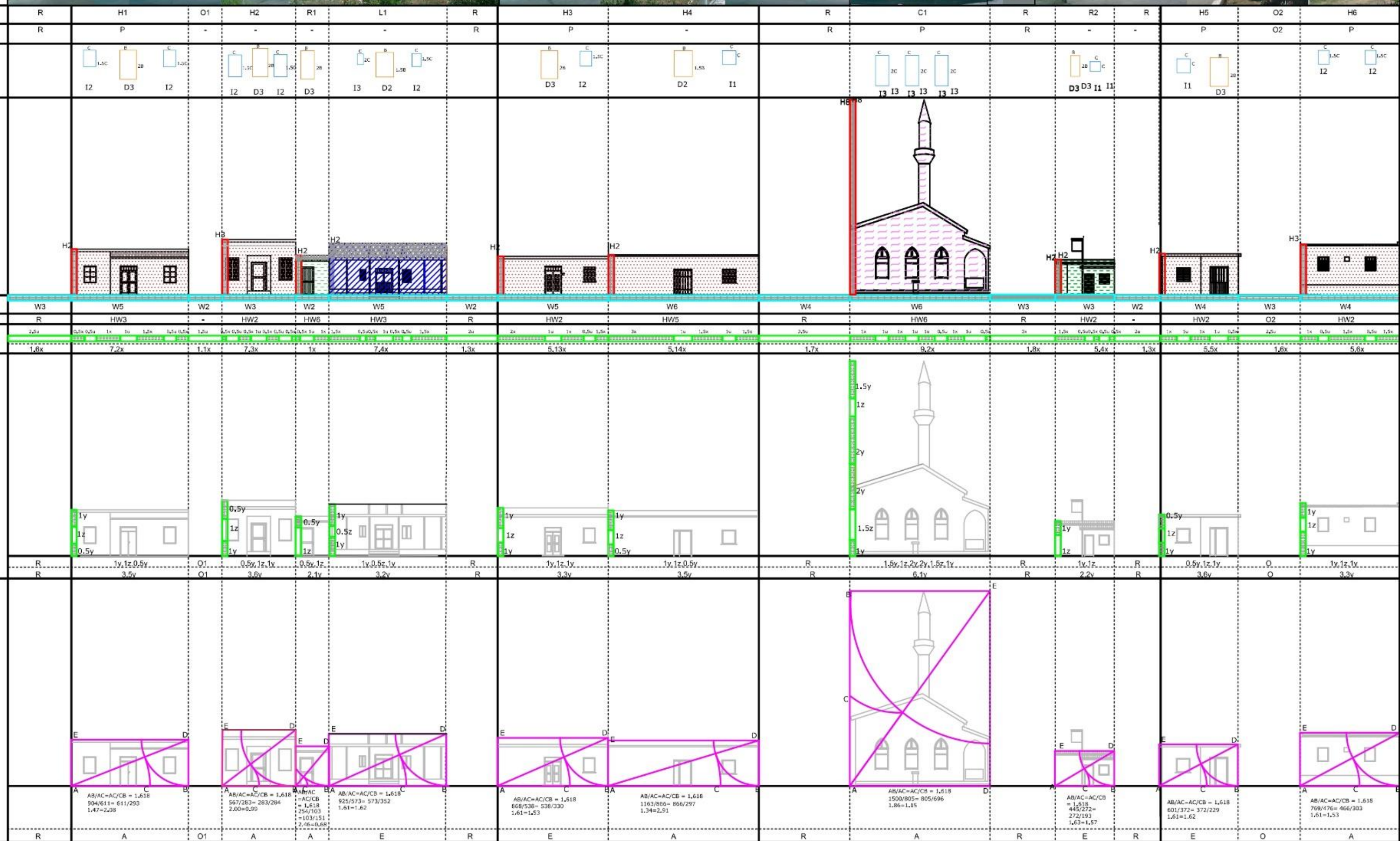
FACADES NO: FACADES I | FACADES II | FACADES III | FACADES IV

SILHOUETTE PHOTOS



STEP II
BUILDINGS AND ELEMENTS VOCABULARY

BUILDING CODE
BUILDING PORCH
BUILDING OPENNING
BUILDING HEIGHT
BUILDING WIDTH
HEIGHT&WIDTH
BUILDING HORIZONTAL SOLID&VOID
BUILDING VERTICAL SOLID&VOID
BUILDING GOLDEN RATIO

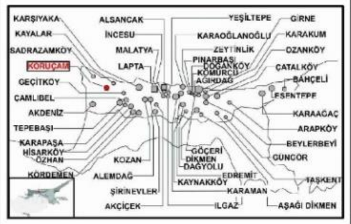
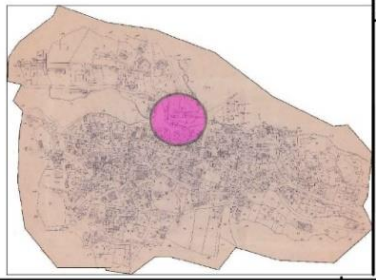


STEP III
GRAMMAR FORMATION

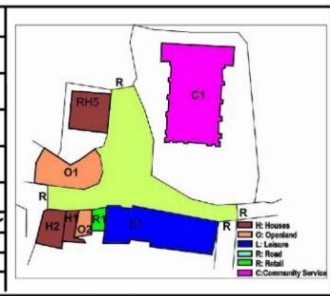
EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

FACADES I	FACADES II	FACADES III	FACADES IV
NVAAS1ESSS-R-W3-1.6x- NVAAS1ESSS-RH1-P-I2D3I2-H2-W5-HW3-7.2x-3.5y-A-NVAAS1ESSS-NRO1-W2-1.1x- NVAAS1ESSS-RH2---I2D3I2-H3-W3-HW2-7.3x-3.6y-A-NVAAS1ESSS-NRR1---D3-H2-W2-HW6-1.1x-2.1y-A- NVAAS1ESSS-NRL1---I3D2I2-H2-W5-HW3-7.4x-3.2y-E- NVAAS1ESSS-R-W2-1.3x-	NVAAS1ESSS-RH3-P-I2D3-H2-W5-HW2-5.13x-3.3y-E- NVAAS1ESSS-RH4-P-I2D2-H2-W6-HW5-5.14x-3.5y-A-	NVAAS1ESSS-R-W4-1.7x- NVAAS1ESSS-NRC1-P-I3I3I3-H8-W6-HW6-9.2x-6.1y-A- NVAAS1ESSS-R-W3-1.8x- NVAAS1ESSS-NRR2---D3I1-H2-W3-HW2-5.4x-2.2y-E- NVAAS1ESSS-R-W2-1.3x	NVAAS1ESSS-RH5-P-I2D3-H2-W4-HW5-5.5x-3.6y-E- NVAAS1ESSS-NRO1-W3-1.6x- NVAAS1ESSS-RH6-P-I2D2-H3-W4-HW2-5.6x-3.3y-A

Appendix D3: Analytical Reading Table No:3-Koruçam Square

STEP I CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)	VILLAGE LOCATION		VILLAGE SQUARES LOCATION	

INVENTORY SHEET NO	03				
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)	
	CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)	
	NAME OF CITY/VILLAGE	KORUÇAM			
	NAME OF CITY/VILLAGE SQUARE	KORUÇAM SQUARE			
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS) COMMERCIAL (CS) RELIGIOUS (ES) ✓	FORMAL TYPE OF SQUARE	CIRCLE (IS) RECTANGLE (GS) ✓ TRIANGLE (TS) AMORPHOUS (AS) SQUARE (SS)	



FUNCTION OF THE BUILDINGS

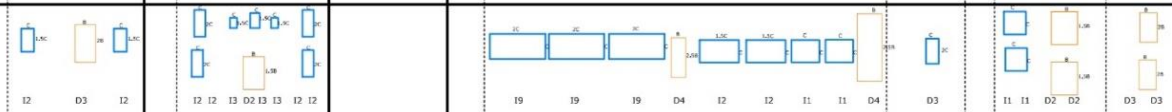
FACADES — FACADE I — FACADE II — FACADE III — FACADE IV

STEP II

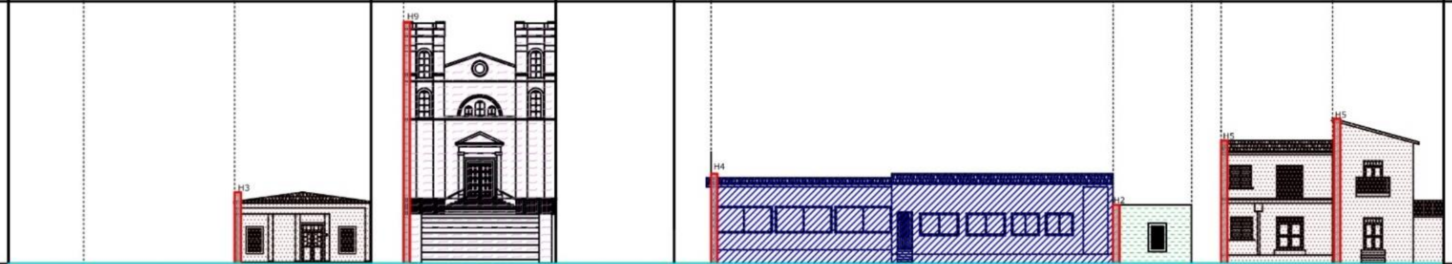
BUILDINGS AND ELEMENTS VOCABULARY

	FACADE I			FACADE II		FACADE III	FACADE IV				
BUILDING CODE	R	O1	H1	R	C1	R	R	L1	R1	O2	H2	H3
BUILDING PORCH	R	O1	P	R	P	R	R	L1	R1	O2	P	P

BUILDING OPENNING



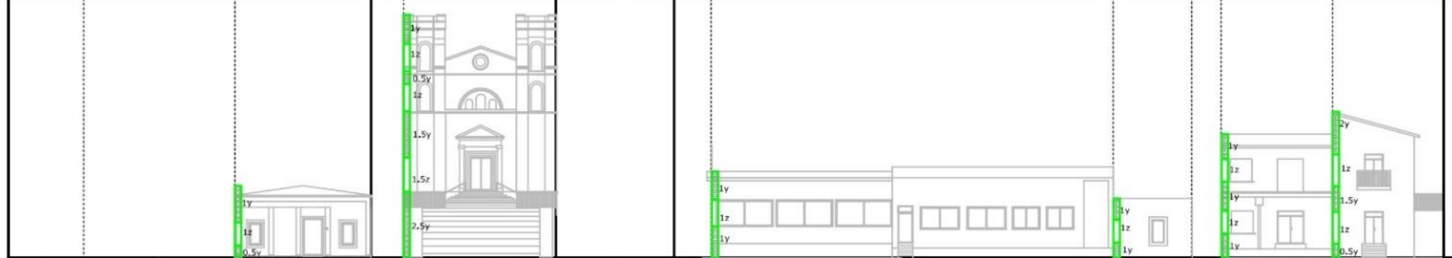
BUILDING HEIGHT



BUILDING WIDTH / HEIGHT&WIDTH / BUILDING HORIZONTAL SOLID&VOID

BUILDING WIDTH	W3	W6	W5	W3	W6	W4	W2	W14	W3	W2	W4	W4
HEIGHT&WIDTH	R	O1	HW3	R	HW6	R	R	HW9	HW2	O2	HW6	HW6
BUILDING HORIZONTAL SOLID&VOID	1.8x	1.12x	7.10x	1.3x	3.2x	1.9x	1.1x	18.1x	3.4x	1.1x	5.8x	3.3x

BUILDING VERTICAL SOLID&VOID



R	O1	1y,1z,0.5y	R	1y,1z,0.5y,1z,1.5y,1.5z,2.5y	R	R	1y,1z,1y	1y,1z,1y	O2	1y,1z,1y,1z,1y	2y,1z,1.5y,1z,0.5y
R	O1	3.6y	R	7.1y	R	R	3.3y	3.3y	O2	5.8y	5.9y

BUILDING GOLDEN RATIO

		AB/AC=AC/CB = 1.618 927/574= 574/353 1.61=1.62		AB/AC=AC/CB = 1.618 1601/973= 973/628 1.64=1.54			AB/AC=AC/CB = 1.618 612/2174= 2174/1562 0.28=1.39	AB/AC=AC/CB = 1.618 399/248= 248/151 1.6=1.61		AB/AC=AC/CB = 1.618 836/280= 280/556 2.9=0.5	AB/AC=AC/CB = 1.618
EACH FACADES R	O1	E	R	E	R	R	A	E	O2	A	A

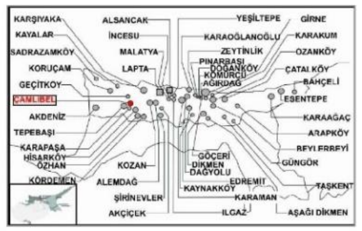
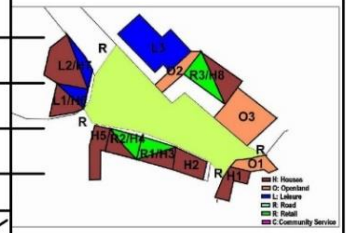
STEP III

GRAMMAR FORMATION

SPREADSHEETS SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

FACADE I	FACADE II	FACADE III	FACADE IV
NVKKS1ESRS-R-W3-1.8x- NVKKS1ESRS-NRO1-W6-1.12x -NVRRS1ESAS-RH1-P-I2I2D3-H3-W5-HW3-7.10x-3.6y-E-	NVKKS1ESRS-R-W3 -1.3x- NVKKS1ESRS-NRC1-P-I2I2I2I3I3I3I3D2-H9-W6-HW6-3.2x-7.14y-E-	NVKKS1 ESRS-R-W4-1.9x	NVKKS1ESRS-R-W2-1.1x- NVKKS1ESRS-NRL1---I9I9I9D4D4I2I2I1I1-H4-W14-HW9-18.1x-3.3y-E- NVKKS1ESRS-NRR1---D3-H2-W3-HW2-3.4x-3.3y-A-NVKKS1ESRS-NRO2-W2-1.1x NVKKS1ESRS-RH2-P-I1I1D2D2-H5-W4-HW6-5.8x-5.8y-A- NVKKS1ESRS-RH3-P-D3D3-H5-W4-HW6-3.3x-5.9y-A-

Appendix D4: Analytical Reading Table No:4- Çamlıbel Square

STEP I						
CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)	VILLAGE LOCATION		VILLAGE SQUARES LOCATION		INVENTORY SHEET NO 04	FUNCTION OF THE BUILDINGS 

VOCABULARY CODES OF SQUARE						
LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)			
CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)			
NAME OF CITY/VILLAGE	ÇAMLIBEL					
NAME OF CITY/VILLAGE SQUARE	ÇAMLIBEL SQUARE					
FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS)		FORMAL TYPE OF SQUARE	CIRCLE (IS)		
	COMMERCIAL (CS)	✓		RECTANGLE (GS)	✓	
	RELIGIOUS (ES)			TRIANGLE (TS)		
				AMORPHOUS (AS)		
				SQUARE (SS)		

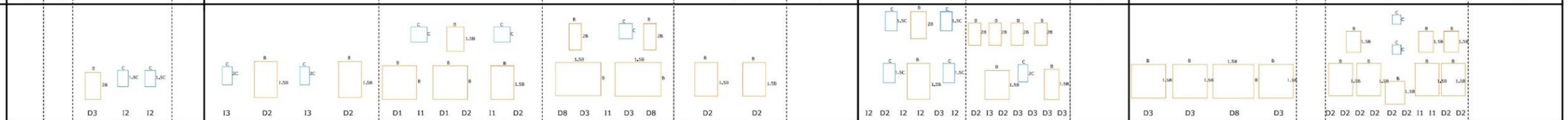
FACADES NO: FACADES I — FACADES II — FACADES III — FACADES IV

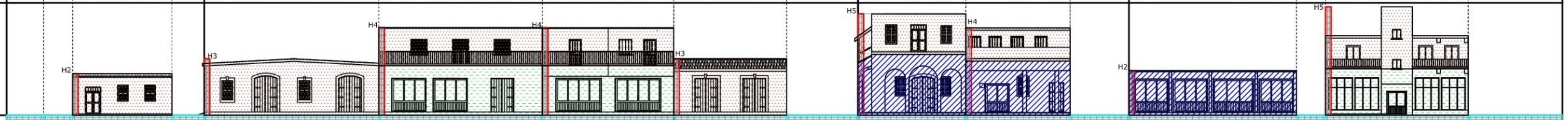
SILHOUETTE PHOTOS

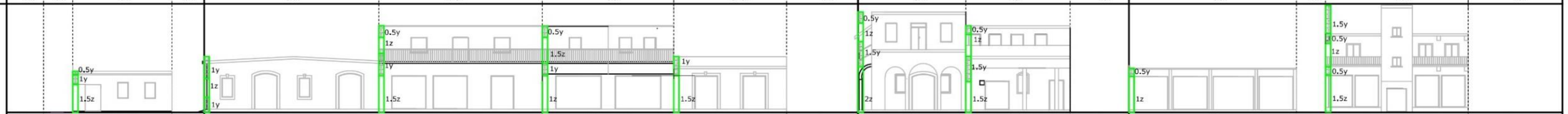
	Facades I				Facades II					Facades III			Facades IV			
BUILDING CODE	R	O1	H1	R	H2	R1/H3	R2/H4	H5	R	L1/H6	L2/H7	R	L3	O2	R3/H8	O 3

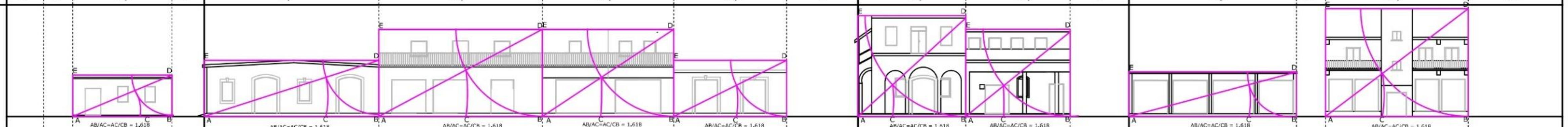
STEP II — BUILDINGS AND ELEMENTS VOCABULARY

BUILDING PORCH	R	O1	-	R	-	-	-	P	R	P	P	R	P	O2	P	O 3
BUILDING OPENNING			D3 I2 I2		I3 D2 I3 D2	D1 I1 D1 D2 I1 D2	D8 D3 I1 D3 D8	D2 D2		I2 D2 I2 I2 D3 I2	D2 I3 D2 D3 D3 D3		D3 D3 D8 D3		D2 D2 D2 D2 D2 D2 I1 I1 D2 D2	
BUILDING HEIGHT			H2		H3	H4	H4	H3		H5	H4		H2		H5	
BUILDING WIDTH	W2	W2	W5	W2	W8	W7	W6	W5	W3	W5	W5	W3	W7	W2	W6	W4
HEIGHT&WIDTH	R	O1	HW2	R	HW5	HW3	HW2	HW3	R	HW1	HW1	R	HW6	O2	HW2	O 3
BUILDING HORIZONTAL SOLID&VOID	1.1x	1.1x	7.7x	1.1x	9.4x	7.13x	5.9x	5.10x	1.7x	8.1x	7.8x	1.8x	9.8x	1.1x	11.1x	1.9x
BUILDING VERTICAL SOLID&VOID	R	O1	0.5y,1y,1.5z	R	1y,1z,1y	0.5y,1z,1y,1.5z	0.5y,1.5z,1y,1z	1y,1.5z	R	0.5y,1z,1.5y,2z	0.5y,1z,1.5y,1.5z	R	0.5y,1z	O2	1.5y,0.5y,1z,0.5y,1.5z	O 3
	R	O1	3.8y	R	3.3y	4.3y	4.4y	2.3y	R	4.4y	4.5y	R	2.1y	O2	5.5y	O 3
BUILDING GOLDEN RATIO			AB/AC=AC/CB = 1.618 802/544= 544/258 1.48=2.10		AB/AC=AC/CB = 1.618 1413/1035= 1035/378 1.36=2.73	AB/AC=AC/CB = 1.618 1325/769= 769/556 1.7=1.38	AB/AC=AC/CB = 1.618 1063/573= 573490 1.85=1.16	AB/AC=AC/CB = 1.618 924/572= 572/342 1.61=1.67		AB/AC=AC/CB = 1.618 873/279= 279/594 3.12=0.46	AB/AC=AC/CB = 1.618 844/364= 364/480 2.31=0.75		AB/AC=AC/CB = 1.618 1356/1005= 1005/351 1.34=2.86		AB/AC=AC/CB = 1.618 1155/575= 575/580 2=0.87	
	R	O1	A	R	A	A	A	E	R	A	A	R	A	O2	A	O 3









STEP III — GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

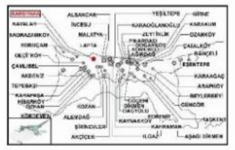
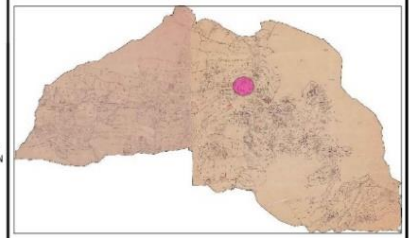
Facades I:
NVCCS1CSRS-R-W2-1.1x-
NVCCS1CSRS-NRO1-W2-1.1x-
NVCCS1CSRS-RH1---D3I2I2
-H2-W5-HW2-7.7x-3.8y-A-
NVCCS1CSRS-R-W2-1.1x-

Facades II:
NVCCS1CSRS-RH2---I3D2I3D2-H3-W8-HW5-9.4x-3.3y-A-
NVCCS1CSRS-NRR1/RH3---D1I1D1D2I1D2-H4-W7-HW3-7.13x-4.3y-A-
NVCCS1CSRS-NRR2/RH4---D8D8D3D3I1-H4-W6-HW2-5.9x-4.4y-A-
NVCCS1CSRS-RH5-P-D2D2-H3-W5-HW3-5.10x-2.3y-E-
NVCCS1CSRS-R-W3-1.7x

Facades III:
NVCCS1CSRS-NRL1/RH6-P-I2I2I2I2D3D2-H5
-W5-HW1-8.1x-4.4y-A-NVCCS1CSRS-NRL2/RH7-
P-D3D3D3D3D2D2I3-H4-W5-HW1-7.8x-4.5y-A-
NVCCS1CSRS-R-W3-1.6x

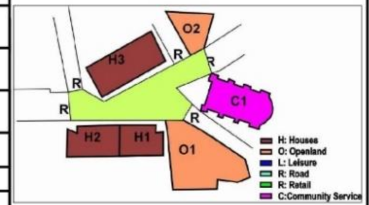
Facades IV:
NVCCS1CSRS-NRL3-P-D2D2D2D2-H2-W7-HW6-9.8x-2.1y-A-
NVCCS1CSRS-NRO2-W2-1.1x-
NVCCS1CSRS-NRR3/RH8-P-I1I1D2D2D2D2D2D2D2D2-H5-W6-HW2-11.1x-5.5y-A-
NVCCS1CSRS-NRO3-W4-1.9x

Appendix D5: Analytical Reading Table No:5- Karşıyaka Square

STEP I CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)	VILLAGE LOCATION 	VILLAGE SQUARES LOCATION 

INVENTORY SHEET NO	05			
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N) ✓	SOUTH(S)	
	CITY/VILLAGES	VILLAGES (V) ✓	CITY (C)	
	NAME OF CITY/VILLAGE	KARŞIYAKA		
	NAME OF CITY/VILLAGE SQUARE	KARŞIYAKA SQUARE		
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS) COMMERCIAL (CS) RELIGIOUS (ES) ✓	FORMAL TYPE OF SQUARE	CIRCLE (IS) RECTANGLE (GS) TRIANGLE (TS) AMORPHOUS (AS) ✓ SQUARE (SS)

FUNCTION OF THE BUILDINGS



FACADES — FACADES I — FACADES II — FACADES III — FACADES IV

SILHOUETTE PHOTOS

STEP II

BUILDINGS AND ELEMENTS VOCABULARY

	FACADES I			FACADES II			FACADES III				FACADES IV
BUILDING CODE	R	C1	R	O1	H1	H2	R	O2	H3	R	03
BUILDING PORCH	R	P	R	O1	P	P	R	O2	P	R	03
BUILDING OPENNING		I3 I3 D2 D9			D2 D2 D1 D2	I1 I1 D1			I3 D2 D2 D5 D3 I2 I2		

BUILDING HEIGHT

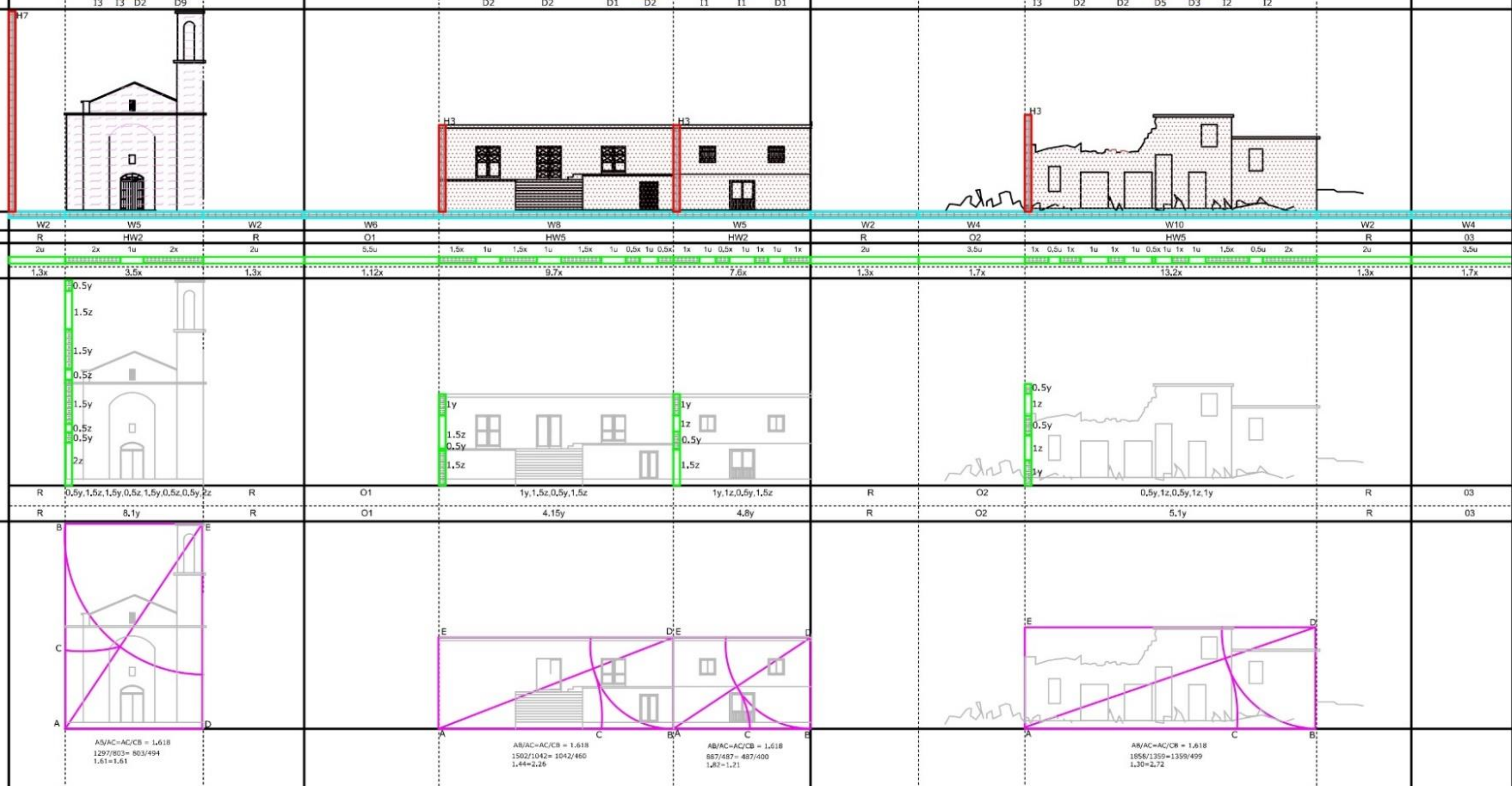
BUILDING WIDTH

HEIGHT&WIDTH

BUILDING HORIZONTAL SOLID&VOID

BUILDING VERTICAL SOLID&VOID

BUILDING GOLDEN RATIO



R	E	R	O1	A	A	R	O2	A	R	03

STEP III

GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

FACADES I	FACADES II	FACADES III	FACADES IV
NVKAKAS1ESAS-R-W3-1.3x- NVKAKAS1ESAS-NRC1--P-I3I3D9D2-H7-W5-HW2-3.5x-8.1y-E- NVKAKAS1ESAS-R-W2-1.3x	NVKAKAS1ESAS-NRO1-W6-1.12x- NVKAKAS1ESAS-RH1-P-D2D2D2D1-H3-W8-HW5-9.7x-4.15y-A- NVKAKAS1ESAS-RH2-P-I1I1D1-H3-W5-HW2-7.6x-4.8y-A	NVKAKAS1ESAS-R-W2-1.3x- NVKAKAS1CSRS-NRR2-P-I1D3D3D1-H3-W6-HW3-9.3x-3.3y-A- NVKAKAS1CSRS-R-W3-1.6x- NVKAKAS1ESAS-NRO1-W4-1.7x- NVKAKAS1ESAS-RH3-P-I2I2I3D2D2D5D3-H3-W10-HW5-13.2x-5.1y-A- NVKAKAS1CSRS-R-W2-1.3x	NVKAKAS1ESAS-NRO3-W4-1.7x

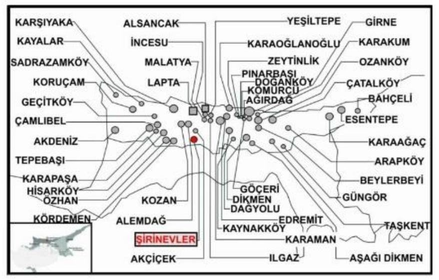
Appendix D6: Analytical Reading Table No:6- Şirinevler Square

INVENTORY SHEET NO	06				
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)	
	CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)	
	NAME OF CITY/VILLAGE	ŞİRİNEVLER			
	NAME OF CITY/VILLAGE SQUARE	ŞİRİNEVLER SQUARE			
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS)		FORMAL TYPE OF SQUARE	CIRCLE (IS)
		COMMERCIAL (CS)	✓		RECTANGLE (GS) ✓
		RELIGIOUS (ES)			TRIANGLE (TS)
					AMORPHOUS (AS)
					SQUARE (SS)

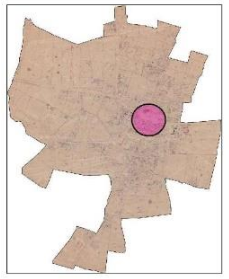
STEP I

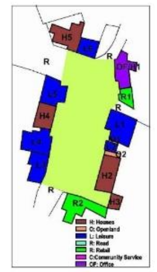
CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)

VILLAGE LOCATION



VILLAGE SQUARES LOCATION





FUNCTION OF THE BUILDINGS

FACADES: FACADES I | FACADES II | FACADES III | FACADES IV

SILHOUETTE PHOTOS

STEP II

BUILDINGS AND ELEMENTS VOCABULARY

BUILDING CODE: R | OF1/H1 | R1 | R | L1 | O1 | L2 | O2 | H2 | H3 | R2 | R | L3 | L4 | H4 | L5 | R | H5 | L6

BUILDING PORCH: R | P | P | R | P | O1 | P | O2 | P | P | P | R | P | P | P | P | R | P | P

BUILDING OPENNING

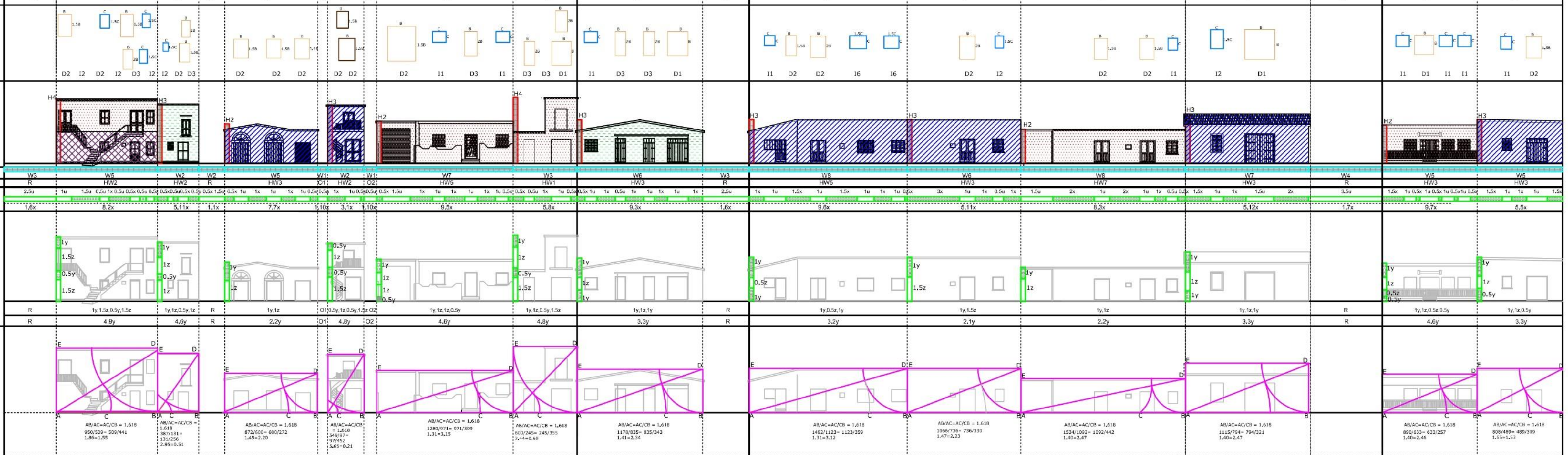
BUILDING HEIGHT

HEIGHT&WIDTH

BUILDING HORIZONTAL SOLID&VOID

BUILDING VERTICAL SOLID&VOID

BUILDING GOLDEN RATIO



R | A | A | R | A | O1 | A | O2 | A | A | A | R | A | A | A | A | R | A | E

STEP III

GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

NVSSS1CSRS-R-W3-1.6x- NVSSS1CSRS-NROF1/RH1-P-D2I2D2I2D3I2-H4-W5-HW2-8.2x-4.9y-A-
NVSSS1CSRS-NRR1-P-I2D2D3-H3-W2-HW2-5.11x-4.6y-A-
NVSSS1CSRS-R-W2-1.1x-NVSSS1CSRS-NRL1-P-D2D2D2-H2-W5-HW3-7.7x-2.2y-A-
NVSSS1CSRS-NRO1-W1-1.10x- NVSSS1CSRS-NRL2-P-D2D2-H3-W2-HW2-3.1x-4.8y-A-
NVSSS1CSRS-NRO1-W1-1.10x-NVSSS1CSRS-RH2-P-D2I1D3I1-H2-W7-HW5-9.5x-4.6y-A-
NVSSS1CSRS-RH3-P-D3D3D1-H3-W6-HW3-5.8x-4.8y-A-

NVSSS1CSRS-NRR2-P-I1D3D3D1-H3-W6-HW3-9.3x-3.3y-A-
NVSSS1CSRS-R-W3-1.6x-

NVSSS1CSRS-NRL3-P-I1D2D2I6I6-H3-W8-HW5-9.6x-3.2y-A-NVSSS1CSRS-NRL4-P-D2I2-H3-W8-HW3-5.11x-2.1y-A-
NVSSS1CSRS-RH4-P-D2D2I1-H2-W8-HW7-8.3x-2.2y-A-NVSSS1CSRS-NRL5-P-I2D1-H3-W7-HW3-5.12x-3.3y-A-
NVSSS1CSRS-R-W4-1.7x-

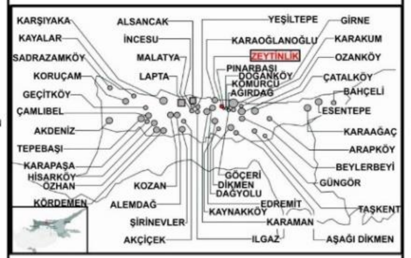
NVSSS1CSRS-RH5-P-I1D1I1I1-H2-W5-HW3-9.3x-4.6y-A-
NVSSS1CSRS-NRL6-P-I1D2-H3-W5-HW3-5.5x-3.3y-E

Appendix D7: Analytical Reading Table No:7- Zeyinlik Square

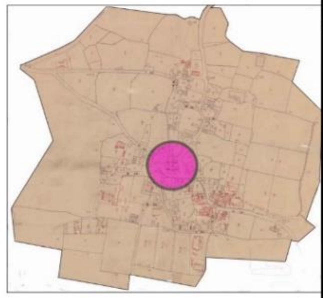
STEP I

CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)

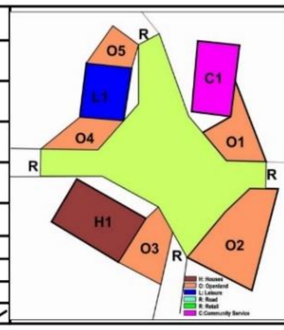
VILLAGE LOCATION



VILLAGE SQUARES LOCATION



INVENTORY SHEET NO	07					
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)		
	CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)		
	NAME OF CITY/VILLAGE	ZEYTİNLİK				
	NAME OF CITY/VILLAGE SQUARE	ZEYTİNLİK SQUARE				
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS)		FORMAL TYPE OF SQUARE	CIRCLE (IS)	
		COMMERCIAL (CS)			RECTANGLE (GS)	
		RELIGIOUS (ES)	✓		TRIANGLE (TS)	
					AMORPHOUS (AS)	
					SQUARE (SS)	✓



FUNCTION OF THE BUILDINGS

FACADES

FACADE I

FACADE II

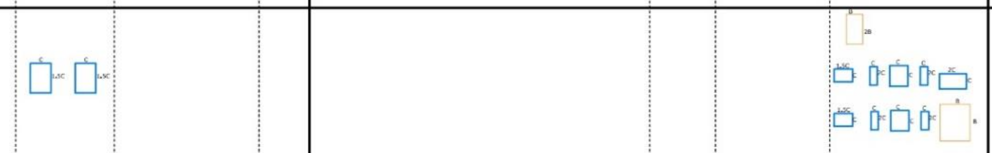
FACADE III

FACADE IV

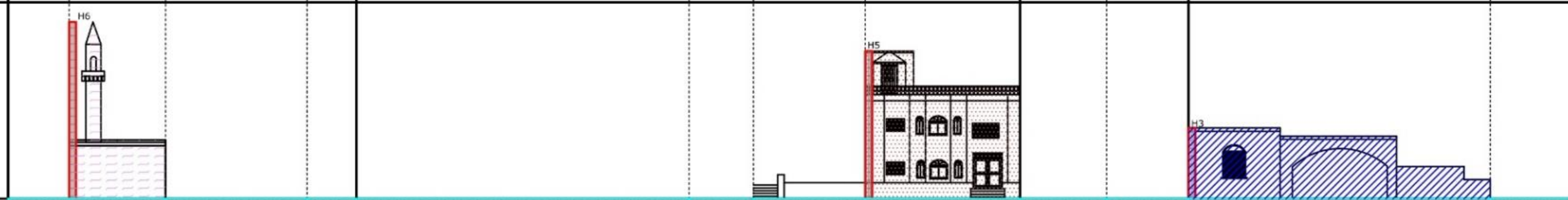
STEP II

BUILDINGS AND ELEMENTS VOCABULARY

	Facade I				Facade II				Facade III		Facade IV	
BUILDING CODE	R	C1	O1	R	O2	R	O3	H1	R	O4	L1	O5
BUILDING PORCH	R	P	O1	R	O2	R	O3	P	R	O4	P	O5
BUILDING OPENNING		I2 I2						I6 I6 I3 I4 I4 I4 I4 I1 I1 D1 D2			I1	



BUILDING HEIGHT

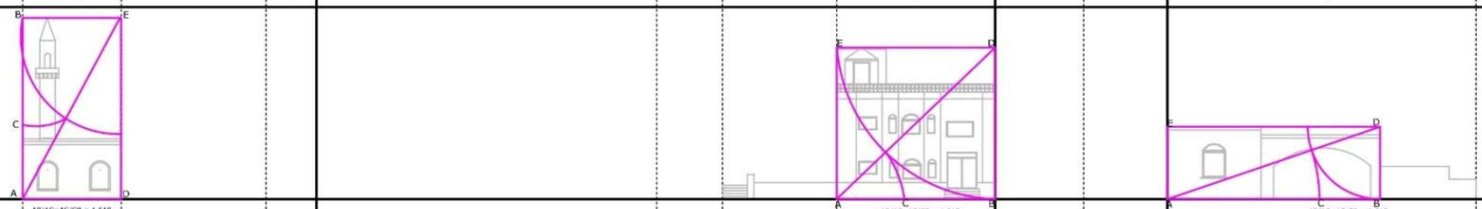


	Facade I				Facade II				Facade III		Facade IV	
BUILDING WIDTH	W2	W3	W5	W2	W1	W2	W4	W5	W3	W3	W10	W5
HEIGHT&WIDTH	R	HW10	O1	R	O2	R	O3	HW2	R	O4	HW5	O5
BUILDING HORIZONTAL SOLID&VOID												

BUILDING VERTICAL SOLID&VOID

	Facade I				Facade II				Facade III		Facade IV	
	R	1,5y,1z,3y,1z,0,5y	O1	R	O2	R	O3	0,5y,1z,1y,0,5z,1y,0,5z,1y	R	O4	1y,1z,1y	O5
	R	5,11y	O1	R	O2	R	O3	7,2y	R	O4	3,3y	O5

BUILDING GOLDEN RATIO



	Facade I				Facade II				Facade III		Facade IV	
		AB/AC=AC/CB = 1,618 1100/669=669/430 1,64=1,55						AB/AC=AC/CB = 1,618 956/408=548/408 2,34=1,34			AB/AC=AC/CB = 1,618 1294/923=923/371 1,40=2,48	
	R	E	O1	R	O2	R	O3	A	R	O4	L1	O5

STEP III

GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

Facade I	Facade II	Facade III	Facade IV
NVZZS1ESSS-R-W2-1.3x- NVZZS1ESSS-NRC1--P-I2I2-H6-W3-HW10-5.11x-5.11y-E- NVZZS1ESSS-NRO1-W5-1.4x- NVZZS1ESSS-R-W2-1.3x	NVZZS1ESSS-NRO2-W11-1.14x- NVZZS1ESSS-R-W2-1.3x- NVZZS1ESSS-NRO3-W4-1.7x- NVZZS1ESSS-RH1-P-I6I6I3I4I4I4I4I1I1D1D2-H5-W5-HW2-11.3x-7.2y-A	NVZZS1ESSS-R-W3-1.8x- NVZZS1ESSS-NRO4-W3-1.8x	NVZZS1ESSS-NRL1-P-I1-H3-W10-HW5-6.6x-3.3y-A- NVZZS1ESSS-NRO5-W5-1.4x

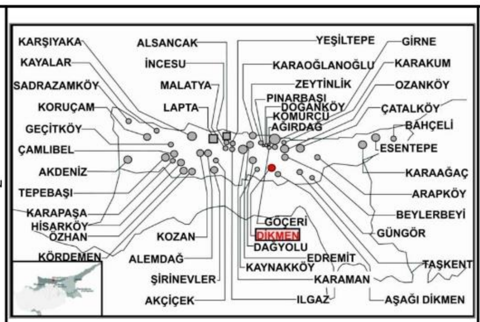
Appendix D8: Analytical Reading Table No:8- Dikmen Square

INVENTORY SHEET NO	08		
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N) ✓	SOUTH(S)
	CITY/VILLAGES	VILLAGES (V) ✓	CITY (C)
	NAME OF CITY/VILLAGE	DIKMEN	
	NAME OF CITY/VILLAGE SQUARE	DIKMEN SQUARE	
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS) COMMERCIAL (CS) ✓ RELIGIOUS (ES)	FORMAL TYPE OF SQUARE: CIRCLE (IS) RECTANGLE (GS) ✓ TRIANGLE (TS) AMORPHOUS (AS) SQUARE (SS)

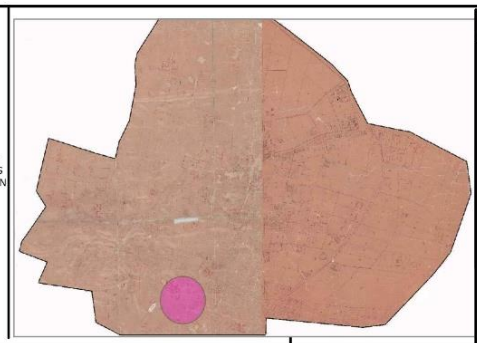
STEP I

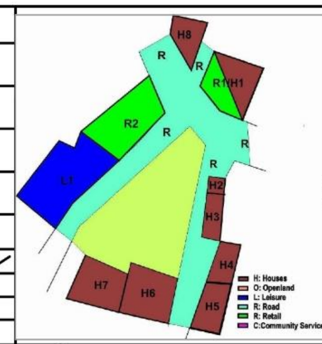
CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)

VILLAGE LOCATION



VILLAGE SQUARES LOCATION





FUNCTION OF THE BUILDINGS

FACADES: FACADE I, FACADE II, FACADE III, FACADE IV

SILHOUETTE PHOTOS

STEP II

BUILDINGS AND ELEMENTS VOCABULARY

BUILDING CODE / BUILDING PORCH / BUILDING OPENNING / BUILDING HEIGHT / BUILDING WIDTH / HEIGHT&WIDTH / BUILDING HORIZONTAL SOLID&VOID / BUILDING VERTICAL SOLID&VOID / BUILDING GOLDEN RATIO

STEP III GRAMMAR FORMATION	EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

FACADE I:

NVDDS1CSRS-R-W2-1.1x-
NVDDS1CSRS-NRR1/RH1-P-III3D2D3-H5-W4-HW1-5.19x-5.1y-A

FACADE II:

NVDDS1CSRS-R-W2-1.1x-
NVDDS1CSRS-RH2---II-H2-W3-HW3-3.4x-3.3y-A-
NVDDS1CSRS-RH3---IID3-H2-W3-HW3-5.11x-2.3y-E-
NVDDS1CSRS-RH4---D2D3-H2-W4-HW3-5.5x-3.3y-E-
NVDDS1CSRS-RH5---I1I1-H2-W3-HW3-5.5x-3.3y-E

FACADE III:

NVDDS1CSRS-R-W2-1.1x-
NVDDS1CSRS-RH6---I3I3I3-H2-W4-HW3-7.11x-3.13y-A-
NVDDS1CSRS-RH7---I1I1-H2-W3-HW1-5.11x-3.3y-A-
NVDDS1CSRS-R-W2-1.1x

FACADE IV:

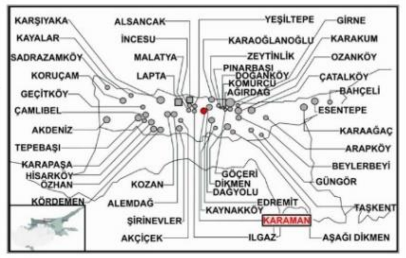
NVDDS1CSRS-NRL1---I2I2I2I3D2D5-H4-W13-HW9-3.13x-3.14y-A-
NVDDS1CSRS-NRR2-P-D10I11D1-H3-W11-HW7-6.5x-3.4y-A-
NVDDS1CSRS-R-W2-1.1x-
NVDDS1CSRS-RH7---I1D2-H2-W3-HW3-5.5x-3.5y-E-

Appendix D9: Analytical Reading Table No:9- Karaman Square

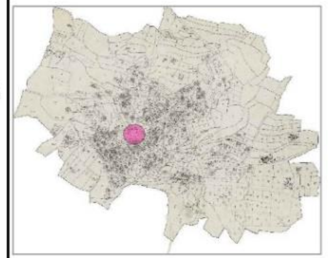
STEP I

CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)

VILLAGE LOCATION

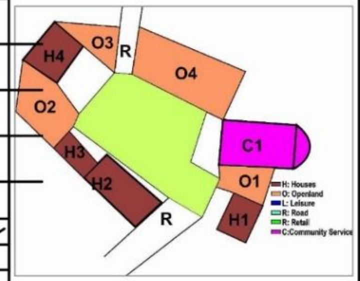


VILLAGE SQUARES LOCATION



INVENTORY SHEET NO	09			
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)
	CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)
	NAME OF CITY/VILLAGE	KARAMAN		
	NAME OF CITY/VILLAGE SQUARE	KARAMAN SQUARE		

FUNCTIONAL TYPE OF SQUARE			FORMAL TYPE OF SQUARE		
	RESIDENTIAL (RS)			CIRCLE (IS)	
	COMMERCIAL (CS)			RECTANGLE (GS)	✓
	RELIGIOUS (ES)	✓		TRIANGLE (TS)	
				AMORPHOUS (AS)	
				SQUARE (SS)	



FUNCTION OF THE BUILDING

FACADES NO | FACADES I | FACADES III | FACADES IV

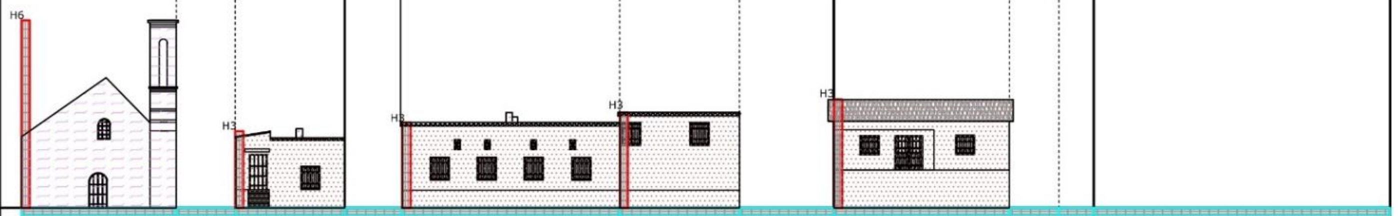
SILHOUETTE PHOTOS

STEP II

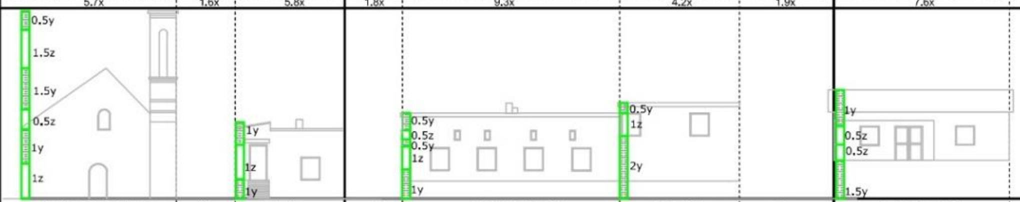
BUILDINGS AND ELEMENTS VOCABULARY

BUILDING CODE	NRC1	O1	H1	R	H2	H3	O2	H4	O3	R	O4
BUILDING PORCH	P	O1	P	R	-	-	-	P	-	R	-
BUILDING OPENNING	D3 I2 D7		D3 I1		I2 I2 I2 I2 I1 I1 I1 I1	I1 I1		I1 D2 I1			
BUILDING WIDTH	W5	W3	W3	W3	W6	W4	W4	W5	W3	W2	W8
HEIGHT&WIDTH	HW6	O1	HW3	R	HW4	HW2	O2	HW3	O3	R	O4
BUILDING HORIZONTAL SOLID&VOID	5.7x	1.6x	5.8x	1.8x	9.3x	4.2x	1.9x	7.6x	1.8x	1.1x	1.10x
BUILDING VERTICAL SOLID&VOID	0.5y,1.5y,1.5y,0.5z,1y,1z	O1	1y,1z,1y	R	0.5y,0.5z,0.5y,1z,1y	0.5y,1z,2y	O2	1y,0.5z,0.5z,1.5y	O3	R	O4
	5.2y	O1	3.3y	R	5.3y	3.7y	O2	4.2y	O3	R	O4
BUILDING GOLDEN RATIO	A	O1	A	R	E	A	O2	A	O3	R	O4

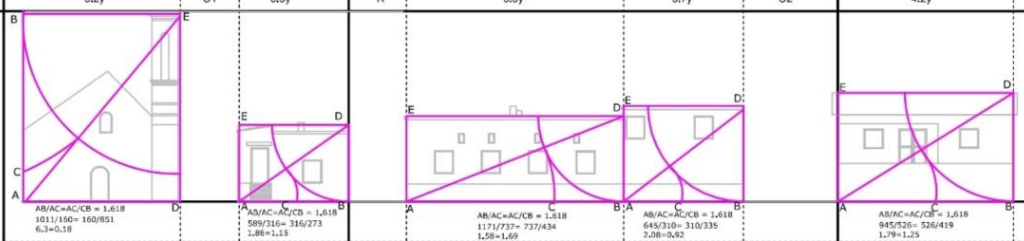
BUILDING HEIGHT



BUILDING VERTICAL SOLID&VOID



BUILDING GOLDEN RATIO



STEP III

GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

NVKKS1ESRS-NRC1-P-D3I2D7-H6-W5-HW6-5.7x-5.2y-A-
NVKKS1ESRS-NRO1-W3-1.6x-
NVKKS1ESRS-RH1-P-D3I1-H3-W3-HW5-5.8x-3.3y-A-

NVKKS1ESRS-R-W3-1.8x-
NVKKS1ESRS-RH2---I1I2I1I2I1I2I1I2-H3-W6-HW2-9.3x-5.3y-E-NVKKS1ESRS-RH3---I1I1-H3-W4-HW2-4.2x-3.7y-A-
NVKKS1ESRS-NRO2-W4-1.9x-

NVKKS1ESRS-RH4-P-I1D2I1-H3-W5-HW3-7.6x-4.2y-A-
NVKKS1ESRS-NRO3-W4-1.8x-
NVKKS1ESRS-R-W2-1.1x-NVKKS1ESRS-NRO4-W8-1.10x-

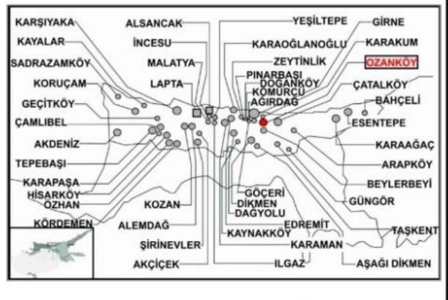
NVKKS1ESRS-NRO4-W8-1.10x

Appendix D10: Analytical Reading Table No:10- Ozanköy Square

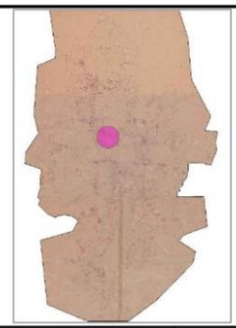
STEP I

CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)

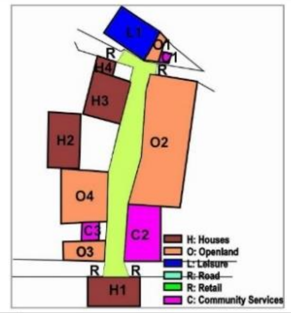
VILLAGE LOCATION



VILLAGE SQUARES LOCATION



INVENTORY SHEET NO	10				
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)	
	CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)	
	NAME OF CITY/VILLAGE	OZANKOY			
	NAME OF CITY/VILLAGE SQUARE	OZANKOY SQUARE			
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS)		FORMAL TYPE OF SQUARE	CIRCLE (IS)
		COMMERCIAL (CS)			RECTANGLE (GS) ✓
		RELIGIOUS (ES) ✓			TRIANGLE (TS)
					AMORPHOUS (AS)
					SQUARE (SS)



FUNCTION OF THE BUILDINGS

STEP II

BUILDINGS AND ELEMENTS VOCABULARY

FACADES: FACADEI, FACADEII, FACADEIII, FACADE IV

SILHOUETTE PHOTOS

BUILDING CODE

BUILDING PORCH

BUILDING OPENING

BUILDING HEIGHT

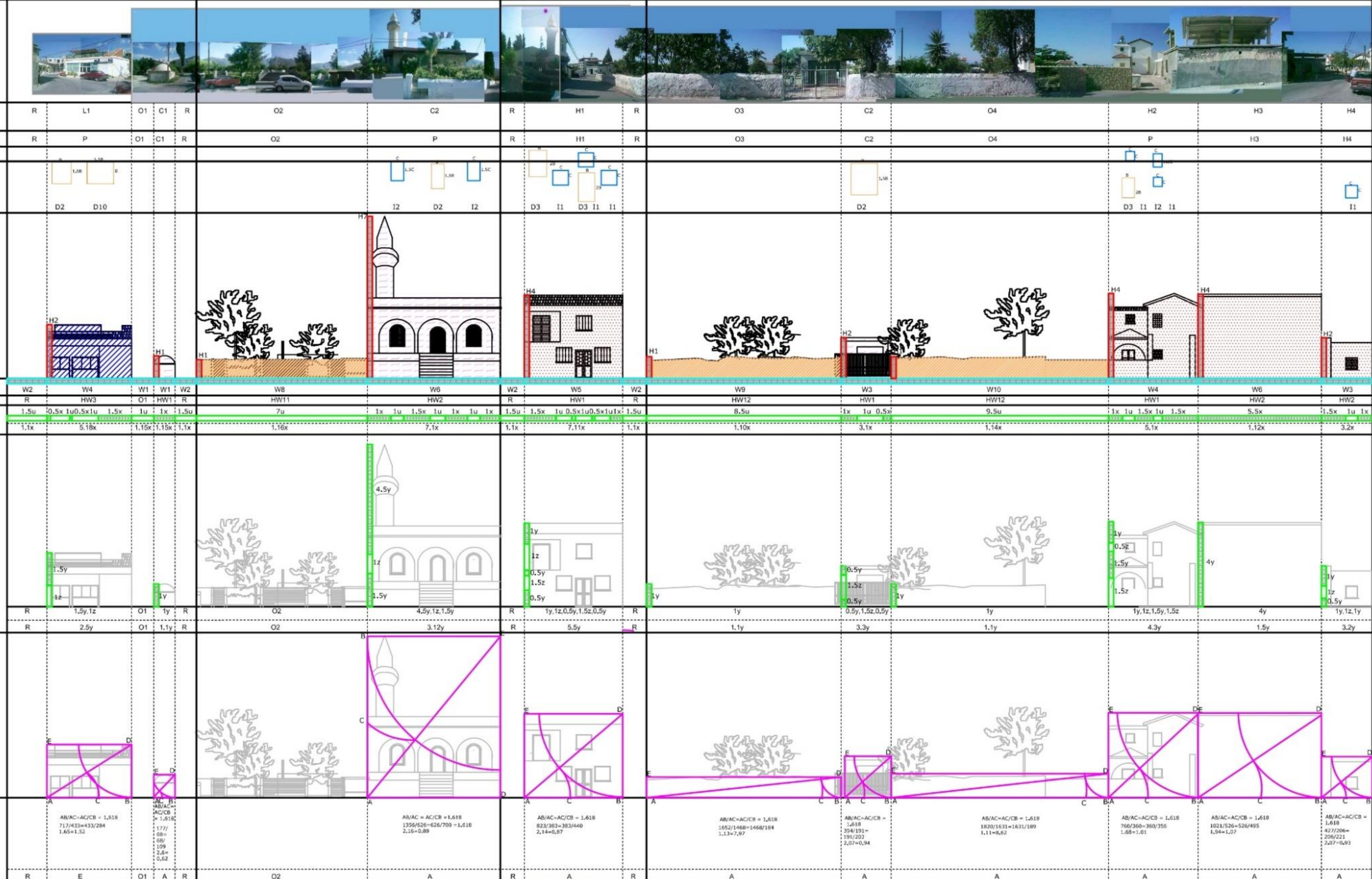
BUILDING WIDTH

HEIGHT&WIDTH

BUILDING HORIZONTAL SOLID&VOID

BUILDING VERTICAL SOLID&VOID

BUILDING GOLDEN RATIO



STEP III

GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

FACADEI:
NVOOS1ESRS-R-W2-1.1x-
NVOOS1ESRS-NRL1-P-D2D10-H2-W4-HW3-5.18x-2.5y-E-
NVOOS1ESRS-NRO1-W1-1.5x
NVOOS1ESRS-NRC1-----H1-W1-HW1-1.5x-1.1y-A-NVOOS1ESRS-R-W2-1.1x-

FACADEII:
NVOOS1ESRS-NRO2-H1-W8-HW11-1.16x-1.1y-
NVOOS1ESRS-NRC2-P-I2I2D2-H7-W6-HW2-7.1x-3.12y-A-

FACADEIII:
NVOOS1ESRS-R-W2-1.1x-NVOOS1ESRS-RH1-P-I1I1I1D3D3-H4-W5-HW1-7.11x-5.5y-A-
NVOOS1ESRS-R-W2-1.1x

FACADE IV:
NVOOS1ESRS-NRO3-H1-W9-HW12-1.10x-1.1y-A-
NVOOS1ESRS-NRC3---D2-H2-W3-HW1-3.1x-3.3y-A-
NVOOS1ESRS-NRO4-H1-W4-HW12-1.14x-1.1y-A-
NVOOS1ESRS-RH2-P-D3I1I1I2-H4-W4-HW1-5.1x-4.3y-A-
NVOOS1ESRS-RH3-----H4-W6-HW2-1.12x-1.5y-A-
NVOOS1ESRS-RH4---I1-H2-W3-HW2-3.2x-3.2y-A-

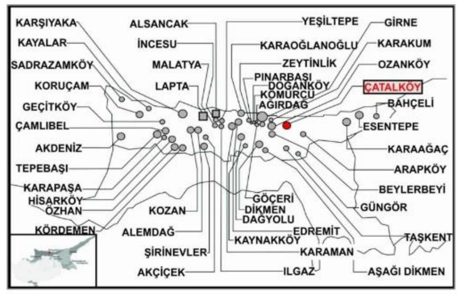
Appendix D11: Analytical Reading Table No:11- Çatalköy Square

INVENTORY SHEET NO	11				
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)	
	CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)	
	NAME OF CITY/VILLAGE	CATALKOY			
	NAME OF CITY/VILLAGE SQUARE	CATALKOY SQUARE			
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS)	FORMAL TYPE OF SQUARE	CIRCLE (IS)	
		COMMERCIAL (CS) ✓		RECTANGLE (GS)	✓
		RELIGIOUS (ES)		TRIANGLE (TS)	
				AMORPHOUS (AS)	
				SQUARE (SS)	

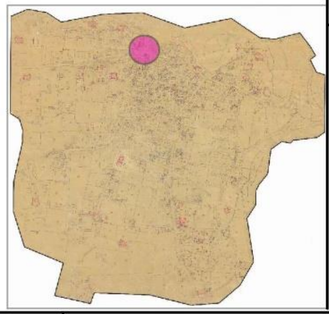
STEP I

CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)

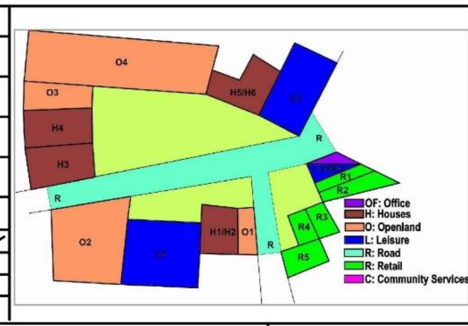
VILLAGE LOCATION



VILLAGE SQUARES LOCATION



FUNCTION OF THE BUILDINGS



FACADES: FACADE I, FACADE II, FACADE III, FACADE IV

SILHOUETTE PHOTOS

STEP II

BUILDINGS AND ELEMENTS VOCABULARY

BUILDING CODE / BUILDING PORCH / BUILDING OPENNING / BUILDING HEIGHT / BUILDING WIDTH / HEIGHT&WIDTH / BUILDING HORIZONTAL SOLID&VOID / BUILDING VERTICAL SOLID&VOID / BUILDING GOLDEN RATIO

STEP III

GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

NVCCS1CSRS-R-W2-1.1x-
NVCCS1CSRS-NRL1/NROF1-P-I2D3-H5-W4-HW2
-5.21x-4.14y-A-
NVCCS1CSRS-NRR1---I1-H3-W3-HW1-3.1x-3.3y-A-
NVCCS1CSRS-NRR2-P-D2-H3-W3-HW2-3.6x-2.3y-A-
NVCCS1CSRS-NRR3---D4-H2-W2-HW1-3.1x-2.1y-A-
NVCCS1CSRS-NRR4-P-D2-H2-W2-HW1-3.1x-2.3y-A-

NVCCS1CSRS-NRR5-P-D1-H2-W3-HW2-3.1x-2.2y-A-
NVCCS1CSRS-R-W2-1.1x-
NVCCS1CSRS-NRO1-W2-1.1x-
NVCCS1CSRS-RH1/RH2-P-I9I1I2D2-H4-W3-HW6-3.7x-5.2y-A-
NVCCS1CSRRS-NRL2-P-I2D2D10D2I2-H3-W7-HW3-7.9x-3.1y-E-
NVCCS1CSRS-NRO2-W3-1.8x

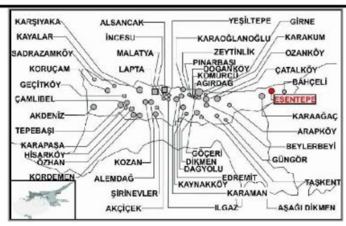
NVCCS1CSRS-R-W2-1.1x-
NVCCS1CSAS-RH3---I1-H2-W2-HW2
-3.8x-3.3y-A-NVCCS1CSAS-RH4---
I1I1I1-H2-W4-HW3-5.11x-3.6y-E-
NVCCS1CSAS-NRO3-W3-1.6x

NVCCS1CSRS-NRO4-W11-1.14x-
NVCCS1CSAS-RH5/RH6---I1I1I6I6-H4-W5-HW2-5.21x-5.3y-E-
NVCCS1CSAS-NRL3-P-I1I1I1I1-H3-W4-HW2-5.20x-5.10y-A

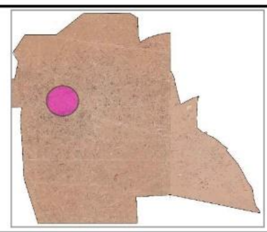
Appendix D12: Analytical Reading Table No:12- Esentepe Square

STEP I
CHARACTERISTICS OF THE SQUARES (SQUARES VOCABULARY)

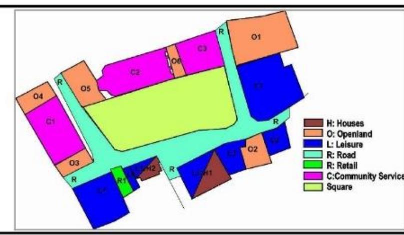
VILLAGE LOCATION



VILLAGE SQUARES LOCATION



INVENTORY SHEET NO	12					
VOCABULARY CODES OF SQUARE	LOCATION OF THE CITY/VILLAGES	NORTH (N)	✓	SOUTH(S)		
	CITY/VILLAGES	VILLAGES (V)	✓	CITY (C)		
	NAME OF CITY/VILLAGE	ESENTEPE				
	NAME OF CITY/VILLAGE SQUARE	ESENTEPE SQUARE				
	FUNCTIONAL TYPE OF SQUARE	RESIDENTIAL (RS)		FORMAL TYPE OF SQUARE	CIRCLE (IS)	
		COMMERCIAL (CS)			RECTANGLE (GS)	✓
		RELIGIOUS (ES)	✓		TRIANGLE (TS)	
					AMORPHOUS (AS)	
					SQUARE (SS)	

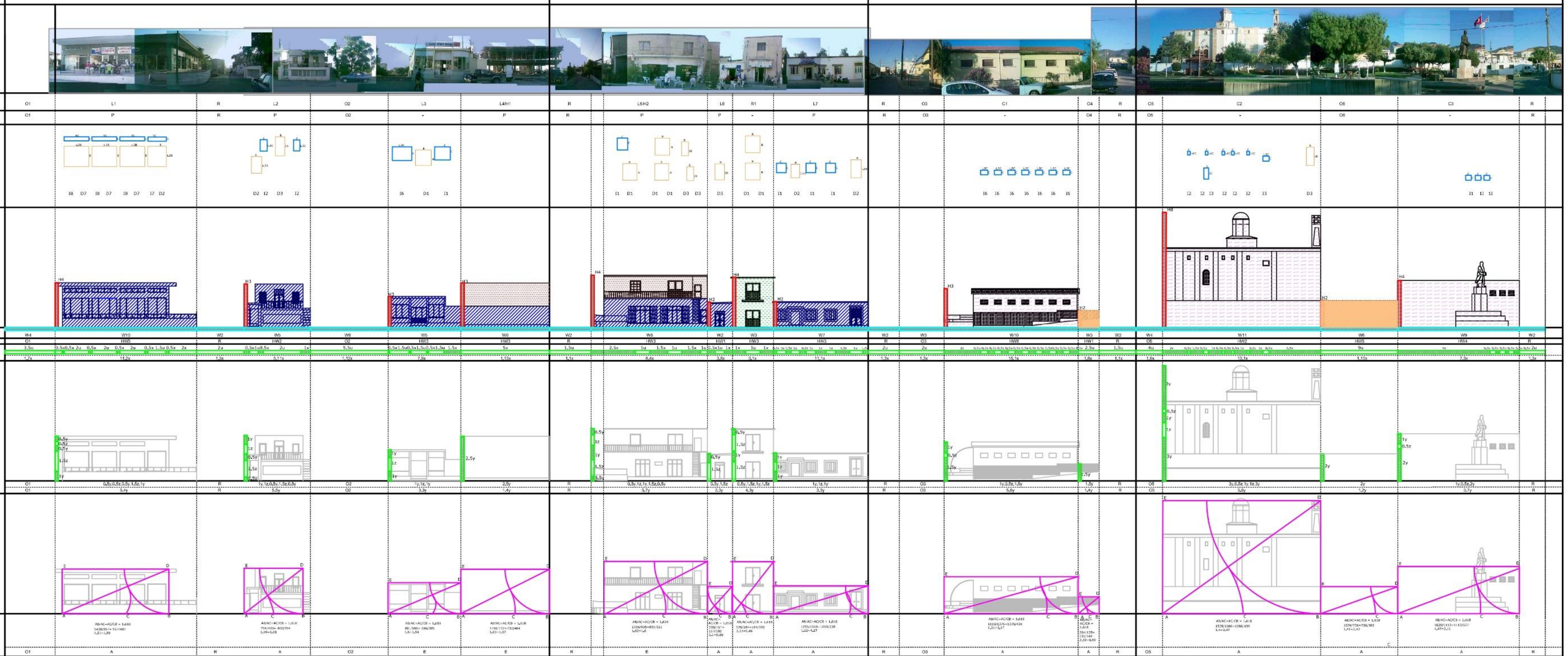


FUNCTION OF THE BUILDINGS

FACADES: FACADE I, FACADE II, FACADE III, FACADE IV

STEP II
BUILDINGS AND ELEMENTS VOCABULARY

SILHOUETTE PHOTOS; BUILDING CODE; BUILDING PORCH; BUILDING OPENNING; BUILDING HEIGHT; BUILDING WIDTH; HEIGHT&WIDTH; BUILDING HORIZONTAL SOLID&VOID; BUILDING VERTICAL SOLID&VOID; BUILDING GOLDEN RATIO



STEP III
GRAMMAR FORMATION

EACH FACADES (PARAGRAPH-SEQUENCES DETERMINATIONS RELATED WITH THE GRAMMAR FORMATION)

NVEES1RSRS-NRL2-P-D2I2D3I2-H3-W5-HW2-5.11x-5.5y-A-
NVEES1RSRS-NRO2-W6-1.12x-NVEES1RSRS-NRL3---I6D1I6-H3-W5-HW3-7.9x-3.3y-E-
NVEES1RSRS-NRL3/RH1-----H3-W6-HW3-1.13x-1.4y-E-
NVEES1RSRS-R-W7-1.1x-NVEES1RSRS-NRO1-W4-1.7x-
NVEES1RSRS-NRL1-P-I8D7I8D7I8D7I7D2-H4-W10-HW5-11.2x-5.4y-A-

NVEES1RSRS-R-W2-1.3x
NVEES1RSRS-NRL5/RH2-P-I1D1D1D1D3D3-H4-W8-HW3-6.4x-5.7y-E-
NVEES1RSRS-NRL6-P-D3-H2-W2-HW1-5.8x-2.3y-A-
NVEES1RSRS-NRR1---D1D1-H4-W3-HW3-3.1x-4.3y-A-
NVEES1RSRS-NRL7-P-I1D2I1I1D2-H2-W7-HW3-11.1x-3.3y-A

NVEES1RSRS-R-W2-1.3x-NVEES1RSRS-NRO3-W3-1.3x-
NVEES1RSRS-NRC1---I6I6I6I6I6I6I6-H3-W10-HW8-15.1x-3.11y-A-
NVEES1RSRS-NRO4-H2-W3-HW1-1.6x-1.4y-A-
NVEES1RSRS-R-W2-1.1x

NVEES1RSRS-NRO5-W4-HW5-1.9x-
NVEES1RSRS-NRC2---I2I2I3I2I2I2I3D3-H8-W11-HW2-13.1x-5.6y-A-
NVEES1RSRS-NRO6-H2-W6-HW5-1.10x-1.2y-A-
NVEES1RSRS-NRC3---I2I1I1-H4-W9-HW4-7.3x-3.9y-A
NVEES1RSRS-R-W2-1.3x

Appendix E: Analytical Reading of Selected 12 Squares- 48 Facades

	INVENTORY SHEET NO	FACADES NO	FACADES I	FACADES II	FACADES III	FACADES IV
	01	HISARKOY SQUARE	NVHHS1CSRS-R-W2-1.1x- NVHHS1CSRS-RH1---I2-H3-W3-HW1-4.1x-4.1y-A- NVHHS1CSRS-NRO1-D6-H1-W2-HW3-1.1x- 1.1y-E- NVHHS1CSRS-RH2---I1-H3-W3-HW3-6.1x-3.1y-E- NVHHS1CSRS-RH3---I2I2I2-H4-W5-HW2-8.1x-5.1y-A-NVHHS1CSRS-NRO2-D1- H2-W3-HW2-3.1x-2.1y-A- NVHHS1CSRS-R-W2-1.1x	NVHHS1CSRS-RH4---I1I1-H3-W7-HW5-6.2x-3.2y-A- NVHHS1CSRS-NRO3-H2-W4-HW3-1.2x-1.2y-E- NVHHS1CSRS-R-W2-1.3x- NVHHS1CSRS-NRL1-P-I1D3-H3-W5-HW2-5.1x-3.3y-E-	NVHHS1CSRS-R-W2-1.1x- NVHHS1CSRS-NRL2-P-I1D3-H3-W5-HW2-5.1x-3.3y-E- NVHHS1CSRS-NRO4-W5-1.4x- NVHHS1CSRS-RH5-P-D3I1-H3-W5-HW3-5.3x-3.4y-E- NVHHS1CSRS-RH6-P-I1D3I1-H3-W7-HW5-7.1x-3.4y-A- NVHHS1CSRS-NRO5-D2--H2-W2-HW2-2.1x-1.2y-E	NVHHS1CSRS-R-W2-1.1x- NVHHS1CSRS-RH7----H3-W3-HW1-1.5x-1.3y-A- NVHHS1CSRS-RH8-P-I1D2I1I3-H3-W8-HW5-9.1x-3.4y-E
	02	AKDENIZ SQUARE	NVAAS1ESSS-R-W3-1.6x- NVAAS1ESSS-RH1-P-I2D3I2-H2-W5-HW3-7.2x-3.5y-A- NVAAS1ESSS-NRO1-W2-1.1x- NVAAS1ESSS-RH2---I2D3I2-H3-W3-HW2-7.3x-3.6y-A- NVAAS1ESSS-NRR1---D3-H2-W2-HW6-1.1x-2.1y-A- NVAAS1ESSS-NRL1---I3D2I2-H2-W5-HW3-7.4x-3.2y-E- NVAAS1ESSS-R-W2-1.3x-	NVAAS1ESSS-RH3-P-I2D3-H2-W5-HW2-5.13x-3.3y-E- NVAAS1ESSS-RH4-P-I2D2-H2-W6-HW5-5.14x-3.5y-A-	NVAAS1ESSS-R-W4-1.7x- NVAAS1ESSS-NRC1-P-I3I3I3-H8-W6-HW6-9.2x-6.1y-A- NVAAS1ESSS-R-W3-1.8x- NVAAS1ESSS-NRR2---D3I1-H2-W3-HW2-5.4x-2.2y-E- NVAAS1ESSS-R-W2-1.3x	NVAAS1ESSS-RH5-P-I2D3-H2-W4-HW5-5.5x-3.6y-E- NVAAS1ESSS-NRO1-W3-1.6x- NVAAS1ESSS-RH6-P-I2D2-H3-W4-HW2-5.6x-3.3y-A
	03	KORUÇAM SQUARE	NVKKS1ESRS-R-W3-1.8x- NVKKS1ESRS-NRO1-W6-1.12x -NVRRS1ESAS-RH1-P-I2I2D3-H3-W5-HW3-7.10x-3.6y-E-	NVKKS1ESRS-R-W3-1.3x- NVKKS1ESRS-NRC1-P-I2I2I2I3I3I3I3D2-H9-W6-HW6-3.2x-7.14y-E-	NVKKS1ESRS-R-W4-1.9x	NVKKS1ESRS-R-W2-1.1x- NVKKS1ESRS-NRL1---I9I9I9D4D4I2I2I1I1-H4-W14-HW9-18.1x-3.3y-E- NVKKS1ESRS-NRR1---D3-H2-W3-HW2-3.4x-3.3y-A-NVKKS1ESRS-NRO2-W2-1.1x NVKKS1ESRS-RH2-P-I1I1D2D2-H5-W4-HW6-5.8x-5.8y-A- NVKKS1ESRS-RH3-P-D3D3-H5-W4-HW6-3.3x-5.9y-A-
	04	ÇAMLIBEL SQUARE	NVCCS1CSRS-R-W2-1.1x- NVCCS1CSRS-NRO1-W2-1.1x- NVCCS1CSRS-RH1---D3I2I2-H2-W5-HW2-7.7x-3.8y-A- NVCCS1CSRS-R-W2-1.1x-	NVCCS1CSRS-RH2---I3D2I3D2-H3-W8-HW5-9.4x-3.3y-A- NVCCS1CSRS-NRR1/RH3---D1I1D1D2I1D2-H4-W7-HW3-7.13x-4.3y-A- NVCCS1CSRS-NRR2/RH4---D8D8D3D3I1-H4-W6-HW2-5.9x-4.4y-A- NVCCS1CSRS-RH5-P-D2D2-H3-W5-HW3-5.10x-2.3y-E- NVCCS1CSRS-R-W3-1.7x	NVCCS1CSRS-NRL1/RH6-P-I2I2I2I2D3D2-H5-W5-HW1-8.1x-4.4y-A- NVCCS1CSRS-NRL2/RH7-P-D3D3D3D3D2D2I3-H4-W5-HW1-7.8x-4.5y-A- NVCCS1CSRS-R-W3-1.6x	NVCCS1CSRS-NRL3-P-D2D2D2D2-H2-W7-HW6-9.8x-2.1y-A- NVCCS1CSRS-NRO2-W2-1.1x- NVCCS1CSRS-NRR3/RH8-P-I1I1D2D2D2D2D2D2D2D2-H5-W6-HW2-11.1x-5.5y-A- NVCCS1CSRS-NRO3-W4-1.9x
ANALYTICAL READINGS OF THE KYRENIAS VILLAGES SQUARE FACADES	05	KARŞIYAKA SQUARE	NVKAKAS1ESAS-R-W3-1.3x- NVKAKAS1ESAS-NRC1--P-I3I3D9D2-H7-W5-HW2-3.5x-8.1y-E- NVKAKAS1ESAS-R-W2-1.3x	NVKAKAS1ESAS-NRO1-W6-1.12x- NVKAKAS1ESAS-RH1-P-D2D2D2D1-H3-W8-HW5-9.7x-4.15y-A- NVKAKAS1ESAS-RH2-P-I1I1D1-H3-W5-HW2-7.6x-4.8y-A	NVKAKAS1ESAS-R-W2-1.3x- NVKAKAS1CSRS-NRR2-P-I1D3D3D1-H3-W6-HW3-9.3x-3.3y-A- NVKAKAS1CSRS-R-W3-1.6x- NVKAKAS1ESAS-NRO1-W4-1.7x- NVKAKAS1ESAS-RH3-P-I2I2I3D2D2D5D3-H3-W10-HW5-13.2x-5.1y-A- NVKAKAS1CSRS-R-W2-1.3x	NVKAKAS1ESAS-NRO3-W4-1.7x
	06	SİRİNEVLER SQUARE	NVSSS1CSRS-R-W3-1.6x- NVSSS1CSRS-NROF1/RH1-P-D2I2D2I2D3I2-H4-W5-HW2-8.2x-4.9y-A- NVSSS1CSRS-NRR1-P-I2D2D3-H3-W2-HW2-5.11x-4.6y-A- NVSSS1CSRS-R-W2-1.1x- NVSSS1CSRS-NRL1-P-D2D2D2-H2-W5-HW3-7.7x-2.2y-A- NVSSS1CSRS-NRO1-W1-1.10x- NVSSS1CSRS-NRL2-P-D2D2-H3-W2-HW2-3.1x-4.8y-A- NVSSS1CSRS-NRO1-W1-1.10x- NVSSS1CSRS-RH2-P-D2I1D3I1-H2-W7-HW5-9.5x-4.6y-A- NVSSS1CSRS-RH3-P-D3D3D1-H3-W6-HW3-5.8x-4.8y-A-	NVSSS1CSRS-NRR2-P-I1D3D3D1-H3-W6-HW3-9.3x-3.3y-A- NVSSS1CSRS-R-W3-1.6x	NVSSS1CSRS-NRL3-P-I1D2D2I6I6-H3-W8-HW5-9.6x-3.2y-A- NVSSS1CSRS-NRL4-P-D2I2-H3-W8-HW3-5.11x-2.1y-A- NVSSS1CSRS-RH4-P-D2D2I1-H2-W8-HW7-8.3x-2.2y-A- NVSSS1CSRS-NRL5-P-I2D1-H3-W7-HW3-5.12x-3.3y-A- NVSSS1CSRS-R-W4-1.7x-	NVSSS1CSRS-RH5-P-I1D1I1I1-H2-W5-HW3-9.3x-4.6y-A- NVSSS1CSRS-NRL6-P-I1D2-H3-W5-HW3-5.5x-3.3y-E
	07	ZEYTINLIK SQUARE	NVZZS1ESSS-R-W2-1.3x- NVZZS1ESSS-NRC1--P-I2I2-H6-W3-HW10-5.11x-5.11y-E- NVZZS1ESSS-NRO1-W5-1.4x- NVZZS1ESSS-R-W2-1.3x	NVZZS1ESSS-NRO2-W11-1.14x- NVZZS1ESSS-R-W2-1.3x- NVZZS1ESSS-NRO3-W4-1.7x- NVZZS1ESSS-RH1-P-I6I6I3I4I4I4I4I1I1D1D2-H5-W5-HW2-11.3x-7.2y-A	NVZZS1ESSS-R-W3-1.8x-NVZZS1ESSS-NRO4-W3-1.8x	NVZZS1ESSS-NRL1-P-I1-H3-W10-HW5-6.6x-3.3y-A-NVZZS1ESSS-NRO5-W5-1.4x-
	08	DIKMEN SQUARE	NVDDS1CSRS-R-W2-1.1x- NVDDS1CSRS-NRR1/RH1-P-III3D2D3-H5-W4-HW1-5.19x-5.1y-A	NVDDS1CSRS-R-W2-1.1x- NVDDS1CSRS-RH2---II-H2-W3-HW3-3.4x-3.3y-A- NVDDS1CSRS-RH3---IID3-H2-W3-HW3-5.11x-2.3y-E- NVDDS1CSRS-RH4---D2D3-H2-W4-HW3-5.5x-3.3y-E- NVDDS1CSRS-RH5---I1I1-H2-W3-HW3-5.5x-3.3y-E	NVDDS1CSRS-R-W2-1.1x- NVDDS1CSRS-RH6---I3I3I3-H2-W4-HW3-7.11x-3.13y-A- NVDDS1CSRS-RH7---I1I1-H2-W3-HW1-5.11x-3.3y-A- NVDDS1CSRS-R-W2-1.1x	NVDDS1CSRS-NRL1---I2I2I2I3D2D5-H4-W13-HW9-3.13x-3.14y-A- NVDDS1CSRS-NRR2-P-D10I11D1-H3-W11-HW7-6.5x-3.4y-A- NVDDS1CSRS-R-W2-1.1x- NVDDS1CSRS-RH7---I1D2-H2-W3-HW3-5.5x-3.5y-E-
	09	KARAMAN SQUARE	NVKKS1ESRS-NRC1-P-D3I2D7-H6-W5-HW6-5.7x-5.2y-A- NVKKS1ESRS-NRO1-W3-1.6x- NVKKS1ESRS-RH1-P-D3I1-H3-W3-HW5-5.8x-3.3y-A-	NVKKS1ESRS-R-W3-1.8x- NVKKS1ESRS-RH2---I1I2I1I2I1I2I1I2-H3-W6-HW2-9.3x-5.3y-E- NVKKS1ESRS-RH3---I1I1-H3-W4-HW2-4.2x-3.7y-A- NVKKS1ESRS-NRO2-W4-1.9x-	NVKKS1ESRS-RH4-P-I1D2I1-H3-W5-HW3-7.6x-4.2y-A- NVKKS1ESRS-NRO3-W4-1.8xNVKKS1ESRS-R-W2-1.1x- NVKKS1ESRS-NRO4-W8-1.10x-	NVKKS1ESRS-NRO4-W8-1.10x
	10	OZANKOY SQUARE	NVOOS1ESRS-R-W2-1.1x- NVOOS1ESRS-NRL1-P-D2D10-H2-W4-HW3-5.18x-2.5y-E- NVOOS1ESRS-NRO1-W1-1.5x NVOOS1ESRS-NRC1-----H1-W1-HW1-1.5x-1.1y-A- NVOOS1ESRS-R-W2-1.1x-	NVOOS1ESRS-NRO2-H1-W8-HW11-1.16x-1.1y- NVOOS1ESRS-NRC2-P-I2I2D2-H7-W6-HW2-7.1x-3.12y-A-	NVOOS1ESRS-R-W2-1.1x- NVOOS1ESRS-RH1-P-I1I1I1D3D3-H4-W5-HW1-7.11x-5.5y-A- NVOOS1ESRS-R-W2-1.1x	NVOOS1ESRS-NRO3-H1-W9-HW12-1.10x-1.1y-A NVOOS1ESRS-NRC3---D2-H2-W3-HW1-3.1x-3.3y-A- NVOOS1ESRS-NRO4-H1-W4-HW12-1.14x-1.1y-A NVOOS1ESRS-RH2-P-D3I1I1I2-H4-W4-HW1-5.1x-4.3y-A- NVOOS1ESRS-RH3-----H4-W6-HW2-1.12x-1.5y-A- NVOOS1ESRS-RH4---I1-H2-W3-HW2-3.2x-3.2y-A-
	11	ÇATALKÖY SQUARE	NVCCS1CSAS-R-W2-1.1x- NVCCS1CSAS-NRL1/NROF1-P-I2D3-H5-W4-HW2-5.21x-4.14y-A- NVCCS1CSAS-NRR1---I1-H3-W3-HW1-3.1x-3.3y-A- NVCCS1CSAS-NRR2-P-D2-H3-W3-HW2-3.6x-2.3y-A- NVCCS1CSAS-NRR3---D4-H2-W2-HW1-3.1x-2.1y-A- NVCCS1CSAS-NRR4-P-D2-H2-W2-HW1-3.1x-2.3y-A-	NVCCS1CSAS-NRR5-P-D1-H2-W3-HW2-3.1x-2.2y-A- NVCCS1CSAS-R-W2-1.1x- NVCCS1CSRS-NRO1-W2-1.1x- NVCCS1CSAS-RH1/RH2-P-I9I1I2D2-H4-W3-HW6-3.7x-5.2y-A- NVCCS1CSRAS-NRL2-P-I2D2D10D2I2-H3-W7-HW3-7.9x-3.1y-E- NVCCS1CSAS-NRO2-W3-1.8x	NVCCS1CSRS-R-W2-1.1x- NVCCS1CSAS-RH3---I1-H2-W2-HW2-3.8x-3.3y-A- NVCCS1CSAS-RH4---I1I1I1-H2-W4-HW3-5.11x-3.6y-E- NVCCS1CSAS-NRO3-W3-1.6x	NVCCS1CSRS-NRO4-W11-1.14x- NVCCS1CSAS-RH5/RH6---I1I1I6I6-H4-W5-HW2-5.21x-5.3y-E- NVCCS1CSAS-NRL3-P-I1I1I1I1-H3-W4-HW2-5.20x-5.10y-A
	12	ESENTEPE SQUARE	NVEES1RSRS-NRO1-W4-1.7x- NVEES1RSRS-NRL1-P-I8D7I8D7I8D7I7D2-H4-W10-HW5-11.2x-5.4y-A- NVEES1RSRS-R-W2-1.3x-NVEES1RSRS-NRL2-P-D2I2D3I2-H3-W[illegible] NVEES1RSRS-NRO2-W6-1.12x- NVEES1RSRS-NRL3---I6D1I6-H3-W5-HW3-7.9x-3.3y-E- NVEES1RSRS-NRL3/RH1-----H3-W6-HW3-1.13x-1.4y-E-	NVEES1RSRS-R-W7-1.1x- NVEES1RSRS-NRL5/RH2-P-I1D1D1D1D3D3-H4-W8-HW3-6.4x-5.7y-E- [illegible]-D3-H2-W2-HW1-5.8x-2.3y-A- NVEES1RSRS-NRR1---D1D1-H4-W3-HW3-3.1x-4.3y-A- NVEES1RSRS-NRL7-P-I1D2I1I1D2-H2-W7-HW3-11.1x-3.3y-A	NVEES1RSRS-R-W2-1.3x-NVEES1RSRS-NRO3-W3-1.3x- NVEES1RSRS-NRC1---I6I6I6I6I6I6I6-H3-W10-HW8-15.1x-3.11y-A- NVEES1RSRS-NRO4-H2-W3-HW1-1.6x-1.4y-A- NVEES1RSRS-R-W2-1.1x	NVEES1RSRS-NRO5-W4-HW5-1.9x- NVEES1RSRS-NRC2---I2I2I3I2I2I2I3D3-H8-W11-HW2-13.1x-5.6y-A- NVEES1RSRS-NRO6-H2-W6-HW5-1.10x-1.2y-A- NVEES1RSRS-NRC3---I2I1I1-H4-W9-HW4-7.3x-3.9y-A NVEES1RSRS-R-W2-1.3x