A COMPUTATIONAL ARCHITECTURE METHODOLOGY FOR DESIGN IN TRADITIONAL TISSUE:
The Case of Kalkan

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ABSTRACT

A COMPUTATIONAL ARCHITECTURE METHODOLOGY FOR DESIGN IN TRADITIONAL TISSUE: The Case of Kalkan

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This study targets to address the problem of 'new building in a traditional setting', utilizing computational design tools. The intention is to provide a methodology for analysis of architectural features of a traditional tissue and moreover propose computational design strategies utilizing algorithms for processing analytical data serving new building design. In the introduction part, this goal is exposed as well as a critic discussion based on a conservationist perspective for contemporary examples of computational design.

Contemporary digital tools and methods employed in the field of architecture are discussed with a focus on algorithmic approaches, followed by a brief history for utilization of computational tools and digital design philosophy in the following chapter. Moreover organic architecture is discussed as a complex entity composed of integral elements and their relations, as well as the designer's new position, confronted with such complex systems and equipped with computational tools. In parallel, digital-organics is introduced as a term referring for the methodology proposed in this thesis, namely an approach for revealing the tissue to its fragments, uncovering parameters working in its composition.

Third chapter presents general characteristics and architectural history of Kalkan Historical Town Centre, as the case of this dissertation, and the following two chapters demonstrate the analysis methods exercised on Kalkan. Three overlapping levels of analysis have been designed; basic architectural analysis, comparisons and relations between fragments, and detailed analysis on a set of selected buildings, respectively.

Finally, Chapter 6 exposes not only the discussion of the results, but also the constitution and improvement of the rule sets, the core expressions to be converted to algorithms. These rule sets intend to reveal the design logic of the organic tissue in Kalkan, in the form of variables and constraints to work for new building design as a decision support system.

Keywords: algorithmic design, computational design, digital-organics, conservation, Kalkan, traditional architecture, Lycia

ÖZ

GELENEKSEL DOKUDA TASARIMA YÖNELİK BİR HESAPLAMALI MİMARİ TASARIM METODOLOJİSİ
Kalkan Örneği

Karabağ, Kutay
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Bu çalışma 'geleneksel dokuda yeni yapı tasarımı' problemine hesaplamalı tasarım araçlarını kullananan bir yaklaşım ortaya koymayı amaçlamaktadır. Bu çerçevede geleneksel dokunun mimari niteliklerinin analizi için bir metodoloji önerilmekte, analiz sonucu olan verinin yeni yapı tasarımına yönelik olarak işlenmesi için algoritmalardan faydalanılan hesaplamalı tasarım sratejileri tartışılmaktadır. Bu amaç, çağdaş hesaplamalı tasarım örneklerinin koruma perspektifinden değerlendirilmesi temelinde geliştirilen tartışmayla, giriş bölümünde ifade edilmektedir.

Sonraki bölümde, mimarlık alanında kulanılan dijital araç ve metodlar, algoritmik yaklaşımlar temelinde tartışılmakta, tasarımda hesaplamalı araçların ve dijital felsefenin kullanılması kronolojik olarak kısaca incelenmektedir. Ayrıca, organik mimarlık başlığı da, organik terimini form dışında birbiriyle ilişkili parametrelerin oluşturduğu bir karmaşık yapıya referanslı olarak ele alıp, bu karmaşık yapı karşısında hesaplamalı tasarım araçları ile donanmış tasarımcının yeni pozisyonu da kısaca değerlendirilmektedir. Bu minvalde, "dijital-organik" terimi, bu çalışmada önerilen yönteme, yani geleneksel dokuyu parçalarına ayrıştıran ve parçaların ilişkilerinden yola çıkarak sistemi oluşturan tasarım mantığını açığa çıkarmayı hedefleyen yaklaşıma referans vermektedir.

Üçüncü bölümde, Kalkan Geleneksel Kent Merkezi'nin genel karakteristiği ve mimari tarihi, bu tezin alan çalışması kapsamında sunulmaktadır. Dördüncü ve beşinci bölümlerde, analiz metodları geliştirilmekte ve Kent Merkezi'ndeki yapılar üzerindeki sonuçları değerlendirilmektedir. Üç farklı ama birbirleriyle çakışan analiz katmanı önerilmektedir. Bu katmanlar; temel mimari niteliklerin analizi, dokuyu oluşturan elemanlar arasındaki kıyaslamalar ve ilişkiler, ve seçilmiş yapılar çerçevesinde detaylı analizler olarak sıralanmaktadır.

Son bölümde, elde edilen sonuçlar üzerinde geliştirilen tartışma, yeni yapı tasarım algoritmalarının ana unsurları olarak kural grupları ortaya çıkarmaktadır. Bu kurallar, Kalkan'daki organik dokunun tasarım mantığını, değişkenler ve kısıtlamalar şeklinde ifade etmekte ve böylece yeni bina tasarımına yönelik ilişkisel ve algoritmik bir karar-destek sisteminin altyapısını oluşturmaktadır.

Anahtar Sözcükler: algoritmik tasarım, hesaplamalı tasarım, dijital-organik, koruma, Kalkan, geleneksel mimarlık, Likya, mimari analiz

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CHAPTER 1

INTRODUCTION

> *"What needs to be articulated, regardless of the format of the man-machine relationship, is the goal of humanism through machines. ... The concern is to avoid dehumanizing a process whose aim is definitely humanization."*[1]

In 1969, when Nicholas Negroponte have published his book titled "The Intelligent Machine", his idea was to shed light on the future of early studies for developing a computer-aided design system. He offers theoretical discussions and literary techniques that can direct the studies for the development of an intelligent machine, which is *learning, understanding, associating courses with goals, self-improving and ethical*[2], namely humanizing (or *avoiding dehumanization* of) the process. The complexity of operation, the various scales and domains of information that has to be grasped, the layered structure of problems that has to be solved in relation to each other and the indispensible humanity of the end-product are the reasons laying behind the predilection of 'architectural design' as the field to make the computer assisting. In other words, it is possible to claim that if can design an architectural assistant computer, in the sense that Negroponte discusses, that means many aspects of artificial intelligence have been solved. This complicated mission was hard, but at the same time providing opportunities for the provocation of correct questions for developing the machine intelligence.

At that time, people like Negroponte were working on machines with limited capabilities such as displaying rough line perspectives, producing primitive plan

[1] Negroponte, Nicholas. *The Architecture Machine: Towards a More Human Environment*. Cambridge, Mass.: MIT Press, 1970, p. 7.
[2] Negroponte, 1970, p. 1.

schemes or offering mass-volume studies of standard cubes. However Negroponte's expectations were much advanced, imagining a computer assistant instead what we know as CAD (computer aided design). Unfortunately, after 40 years architects still do not have such assistants.

However, CAD systems have developed in parallel with the advancements of computer technologies, in some ways through his path of 'artificial intelligence', and in some others through opportunities provided by visualization potential of computers. Today, empowered by the strong computation power, particular examples of architectural design demonstrate a serious divergence from the works of the whole past, basically in regards to architectural space, design logic and form. The computed organic forms and significantly varying design logic of architecture are not only beginning to be more popular in the practice and theory of architecture, but also these examples begin to demonstrate the 'other'[3] architectures. This 'otherness' both depends on the physical characteristics such as formal articulation, volumetric organization and smart materials, to name a few, and strongly on the ambiguous composition of the design that seems to be the expression of a certain part of human mind which have never demonstrated itself this clear before the association of computation power, as well.

Utilizing current computing technology in the design process basically improves the production and creative abilities with the help of complex computations. Through the careful and conscious use of these tools, digital architects are provided the chance of copying organic models, producing varieties of complex forms or designing relations and producing parameters instead of the object itself.

[3] Terzidis, Kostas. *Algorithmic Architecture.* Oxford: Elsevier Ltd, 2006, pp. 15-35.
Idea of 'otherness' which will be elaborated in various parts of this thesis is shaped under the light of this chapter, Terzidis discusses the 'otherness' in detail. He deals with the working principles of human mind and computer, so that their relation and interaction, as putting the concept of 'algorithm' in the key position for this interaction. He perceives algorithm as the expression and solution of a problem at the same time. This otherness, for him, is not something contradictory and limiting, but complementary and organizing. Hence he perceives the contribution of computer by means of algorithmic architecture to architectural design, as something associating the design logic of human mind, uncovering the potential of the re-discovery of existing forces, memories, or intuitive powers, all the things that can be assumed as existing in human mind or genes philosophically.

1.1 Various Approaches on Utilization of Digital Tools in Architecture

Computer powered design tools, on the one hand alter the practice and representation of architectural design, and on the other, technology transforms the manufacturing and operation opportunities for the physical forms that contemporary architecture asks for. For some theorists and designers, being more decisive and stunning than this two-way development, it is possible to talk about a principal transformation on the design logic of architecture. In its broadest sense, new design logic is shaped by the contemporary developments on the other fields of science, and the innovative effect of computers on our culture as well. In other words, architectural design logic is being nourished directly from the concepts in other disciplines.

> *"The new sciences of complexity -- fractals, nonlinear dynamics, the new cosmology, self-organizing systems - have brought about the change in perspective. We have moved from a mechanistic view of the universe to one that is self-organizing at all levels, from the atom to the galaxy. Illuminated by the computer, this new world view is paralleled by changes now occurring in architecture."*[4]

In the above quotation, Charles Jencks notes the relation of complexity theories and highlights the change in design logic in architecture triggered by the flashing developments in digital technologies in 70s. For some, today, scientifically and theoretically supported by the employment of mathematical tools such as non-Euclidean geometries, differential equations, splines and NURBS curves, this is a paradigm shift in architecture, which has found its early field of application in architectural form, through the computer for enabling visualization and actualization of this domain of complex mathematics. The logic behind the appearance of this new formal repertoire lays on the integration of computational tools, such as algorithms, in design logic its broadest sense.

> *"A paradigm shift is defined as a gradual change in the collective way of thinking. It is the change of basic assumptions, values, goals, beliefs, expectations, theories and knowledge . It is about*

[4] Jencks, Charles, "The New Paradigm in Architecture – Theory", in *The Architectural Review*, February 2003.

transformation, transcendence, advancement, evolution and transition. While paradigm shift is closely related to scientific advancements, its true effect is in the collective realization that a new theory or model requires understanding traditional concepts in new ways, rejecting old assumptions, and replacing them with new. ... Traditionally, the dominant paradigm for discussing and producing architecture has been that of human intuition and ingenuity. For the first time perhaps, a paradigm shift is being formulated that outweighs previous ones.[5] *Algorithmic design employs methods and devices that have no precedent. If architecture is to embark into the alien world of algorithmic form, its design methods should also incorporate computational processes."*[6]

This change in the design logic and formal repertoire of architecture is not recognized as deep and powerful to be defined as a paradigm shift for some others. Instead, term 'digital design is utilized for indicating the employment of digital methods and tools in a very broad approach.

"Any architecture strategically utilizes any computing digital media in the process of its architectural design - from the design concept, through the early design stage, design development, detail design, and construction planning; until the actual construction - as long as the computing digital media is used in any (or ideally, all) of these stages, to create important results in the architecture's function, form, mass, space or architectural theory, such architecture could generally be defined as Digital Architecture."[7]

On the other hand, Kevin Klinger deals the topic with a critical approach for the sake of signifying the diversity of digitally created architectures and architecture employing digital logic in the design process;

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[5] Original footnote: *"Peter Eisenmann referred to the idea of an electronic paradigm shift in architecture in 1992. He wrote: "During the fifty years since the Second World War, a paradigm shift has taken place that should have profoundly affected architecture: this was the shift from the mechanical paradigm to the electronic one. This change can be simply understood by comparing the impact of the role of the human subject on such primary models of reproduction as the photograph and the fax; the photograph within the mechanical paradigm, the fax within the electronic one."*

[6] Terzidis, 2006, p. 59.

[7] Liu, Yu-Tung. *Developing Digital Architecture*. Berlin: Birkhäuser, 2003, p. 7.

"What is digital architecture? Architectural ideas have found new forms of digital representations, as information reconfigures into digital visualizations, and projects evolve further as digital fabrications. However, using digital technology doesn't necessarily constitute creating digital architecture. Ideas are still scrutinized by the author(s). Thus, a responsibility for a critical dimension still falls upon the author(s). Any new categorizations o architecture must connect equally with the critical as well as the technological skill base of the authors. Just as there is a difference between building and architecture, there is also a distinct difference between digitally generated projects and digital architecture."[8]

Peter Zellner, the author of one of the earliest books illustrating projects utilizing digital tools in architecture, describes the influence of digitalization in architecture as follows:

"Architecture is recasting itself, becoming in part an experimental investigation of topological geometries, partly a computational orchestration of robotic material production and partly a generative, kinematic sculpting of space."[9]

Kostas Terzidis approaches the word digital in relation to design with a more conceptual and distinguishing approach:

"Digital, in the true sense of the meaning, is about the reduction of a process into discrete patterns and the articulation of these patterns into new entities to be used by a computer. Digital is an achievement of the collective organizational properties of computers not the intrinsic nature of the appearance of their products. In other words, digital is a process, not a product."[10]

As the digital tools and methods are integrated into architectural design and practice, or architectural processes transform theoretical and philosophical aspects of digitalization in their own field, architecture becomes digitalized. It will not be

[8] Klinger, Kevin R., "Digital Technology and Architecture – Whitepaper", eds. Bermudez , Julio, and Klinger, Kevin R., submitted to ACADIA, 2003, p. 4.
[9] Zellner, Peter. *Hybrid Space, New Forms in Digital Architecture*. New York: Rizzoli, 1999.
[10] Terzidis, 2006, p. 39.

discussed here, if this is a paradigm shift or not, though this is a transformation on the design logic of architecture, utilizing computation as the associative means.

> *"Ultimately digital architecture will disappear because it will have become part of daily practice. The adjective 'digital' will be so commonplace for all architecture that it needs no longer to be applied to make a distinction. Perhaps, in a while, we will be able to see a playful and meaningful architecture that is more transparent about its own origins and rationale: a computable architecture."*[11]

As a digital tool, computational design will be discussed in the next chapter with some references to the methodology developed in this study.

1.2 Problem Definition

In this part, computational architecture in relation to organics and nature will be discussed briefly, followed by the questioning of its relation to traditional architectural tissue with a similar perspective.

1.2.1 Digital Tools in Architecture in Relation with Nature and Organics

Utilization of digital tools and methods in architecture can be recognized as the contemporary futurist approach in architecture. By borrowing theoretical frameworks of domains such as, digital thinking, chaos and complexity theories, non-Euclidean geometries, topology, quantum physics, modern biology, evolution genetics, generic algorithms, nanotechnology, information technology, thermodynamics, swarm modelling, responsive systems, and field theory, new space perception and production ways are introduced. Most of these fields or sciences depend on recently developed concepts or theories, in relation with both the computer power enabling complex calculations, or the technological aspects which is the 'new' in its nature. In parallel with Mies van der Rohe so called declaration on the relation of architecture and its cultural context as "*Architecture depends upon its time*.", synchronously with the advancement in computing power and its

[11] Achten, Henri., "Digital Architecture: Pathways to a Computable Architecture", in Liu, Yu-Tung. *Developing Digital Architecture*. Berlin: Birkhäuser, 2003, p. 40.

employment in all fields, architecture have begun to manifest a computational character.

Likewise, most of the recent examples of architecture under the influence of digitalization, demonstrate an alien character in their formal configuration. Using analogies from biology and genetics, architecture, as well as many other research fields, employs biomimetics[12], for understanding integral structure of organisms in nature. The concept of organics in architecture and its various ramifications will be discussed briefly in the next chapter, however, basically this approach can be briefly described as analysing organic forms, revealing the principles and relations that constitute them, and through algorithms converting them into design input. This approach have introduced as organic forms, developed on the computer through the utilization of computation power and software techniques. For the significant alteration on the design logic, as briefly discussed in the previous part, it can be claimed that these organic forms produced on computer illustrate an alien character, at least to the physical environment, whereas the relation with the nature is also open to questioning. Zeynep Mennan describes these forms, based on complex mathematics as *'non-standard architectures'*, reasoning primarily on the design logic, and the formal potential of computational power provided in the hands of designers.[13]

1.2.2 Digital Tools in Architecture in Relation with Traditional Tissue

> *"the existential purpose of building (architecture) is therefore to make a site become a place, that is, to uncover the meanings potentially present in the environment."*[14]

[12] Biomimetics or biomimicracy is the science dealing with the technologies to understand and imitate the natural organisms, in order to find solutions for scientific problems. For more information in biomimetics and architecture the below resources can be examined:
Animal Architecture. Karl von Frisch. 1974. Animal Architecture. Jennifer Owings Dewey. 1991. Design and Nature II. Ed M. W. Collins et. Al. 2004. Bio mimicry: Innovation Inspired by Nature. Janine Benyus. 1997. On Growth and Form: The Complete Revised Edition. D'Arcy Wentworth Thompson. 1992. Buckminster Fuller's Universe. Lloyd Steven Sieden. 1989. Emergence: The Connected Lives of Ants Brains, Cities, and Software. Steven
Johnson. 2001.

[13] Mennan, Zeynep. "The Question of Non Standard Form", in *METU Journal of Faculty of Architecture*, volume 2, 2008, Ankara: METU Publications. pp. 171-183.

[14] Norberg-Schulz, Christian. *Genius loci: towards a phenomenology of architecture.* New York: Rizzoli, 1980.

These words of Christian Norberg-Schulz, briefly summarizes what architecture does for a phenomenological approach. What makes something place is, for Norberg-Schulz, is both reading and expressing the potentially existing forces or meanings of a space. This is in its essence, what turns a space to a place, namely a concentrated enclosure, with meanings and symbolisms for Norberg-Schulz.

This thesis is not intended to discuss the subject with a phenomenological perspective, however it is believed that this basic approach is useful to remember the primary principles of architecture and design of a space.

Approaching from this viewpoint, there seems to be a gap with the existing architectural theories in the way that recent examples of computational architecture reads and converts this potential existence. In the following lines, it will be illustrated how this gap occurs in the light of current architectural theories focusing on the discipline of conservation, and try to develop ways in order to fill that gap through the utilization of computational tools.

If simply new building design is considered, many examples of computational architecture employ certain methods of analysis about its environment, or biomimetic methods on an organism, in order to uncover the design logic of its features and convert this logic to the field of architectural design. Computational tools are utilized for both analysing the subject matter and also in processing this data and converting it into form or expressing with a computation-based formal vocabulary.

On the other hand, there are some examples, if not few, such as Birgül Çolakoğlu and her colleagues' shape grammar studies on vernacular architecture[15], operating these digital methods on the physical man-made environment, to analyse and express its design logic. If the biomimetics is defined as "*the abstraction of good*

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[15] Çolakoğlu, Birgül, *Design by Grammar: An algorithmic Design in an Architectural Context,* Ph.D. dissertation, submitted to MIT, Department of Architecture, 2001.
Çolakoğlu, Birgül*, "An Informal Shape Grammars for Interpolations of Traditional Bosnian Hayat Houses in a Contemporary Context"*, paper presented in Generative Art Conference, December 11-14, 2002, Milano Polytechnic University. (Generative Art, http://www.generativeart.com/on/cic/papersGA2002/15.pdf, last visited on October 2010)
Furthermore, information on her and colleagues' studies on traditional Mardin tissue and new building design through utilization of shape grammar are available online on Yıldız Teknik Universitesi, http://www.bot.yildiz.edu.tr/_sites/mardin/index.htm, last visited on October 2010.

design from nature"[16], computational design methods can also be used for understanding and expressing the design logic of traditional tissue.

1.2.3 Thesis Statement

Recent theories on computational architecture fail to analyse and discuss its relations with the traditional architectural practice. Hasan-Uddin Khan refers Buckminster Fuller, who can be said to demonstrate the early examples of organic forms in his modern architecture, drawing attention to this problem; "*On the other hand, it is also dangerous to "invent the future" (one of Buckminster Fuller's phrases) without reference to the traditions of the past.*"[17]

Approaching the subject, from the perspective of conservation discipline in regard to traditional tissue, building new in the traditional tissue is a topic for various approaches and debates going mostly for the last century, some of which will be discussed in the next chapter.

This study targets this gap between the utmost contemporary tools of computation and traditional tissue in the way that conservation discipline approaches it. For this, this study will be trying to find ways of structuring strong relationships with the analysis methods of conservation discipline when approaching to a traditional tissue and algorithmic design strategies of computational approach in architecture. With an analogy to biomimetics, it seeks to develop the methods for analysis and expression of the traditional setting, similar to ones of natural organisms, through computational methods. By this way, it searches for a response to 'new design in traditional setting' problem.

Buildings have to utilize information from their surrounding environment, in order to absorb its character. Or in other words, simply it is not possible for a design product to be accepted as successful unless it has no connection or reference to its context. Since one of the strongest references that computational design employs is the organic structures and forms, proper tools and search methods for analysis of the traditional tissue can be and has to be developed. If a building design or a traditional

[16] quoted from the web site of Centre for Biomimetics at the University of Reading, http://www.reading.ac.uk/biomim/home.htm.

[17] Khan, Hasan-Uddin, in Powell, Robert (ed.). *Criticism in Architecture*., Singapore: Concept Media/The Aga Khan Award for Architecture, 1989, p. 57

setting resembles to the evolution of form of organisms in nature in some ways, then local conditions have to modify species and variations. Richard England, an architect working in Malta, defines this approach through his regionalist architectural perspective and referring to Paul Ricouer; "*It was Paul Ricouer who said, "the problem is not simply to repeat the past but rather to take root in it, in order to ceaselessly invent the future." Drawing both from the end memory data banks an expression of architecture should vary according to place, just as fruit varies according to soil in which its seeds planted."*[18]

Thus, it is necessary to include various information on the traditional setting of design in the data set that will be processed through computational methods shaping the outcome form. It is intended that, by this way, it is possible to talk about a computational design product, which is not alien. Or even though the product seems alien, a design process including the analysis and process of the physical form of the traditional setting can provide a satisfactory methodology for uncovering values of traditional tissue. The alien forms or structures produced through the utilization of algorithmic design techniques and computational tools, can be connected to the context, as not only nature, but as well as the architecture. In this way, it can be possible to read the implications and reflections of the traditional and historical values in relation to the built environment, on the designed form and space. In better words, the design input for computational architecture, if it is presumed as a discourse, ignores or disregards or minimizes, the historical analysis and the traditional values of the environment.

> *"The man-made parts of the environment are first of all "settlements" of different scale, from houses and farms to villages and towns, and secondly "paths" which connect these settlements, as well as various elements which transform nature into a "cultural landscape". If the settlements are organically related with their environment, it implies that they serve as foci where the environmental character is condensed and "explained". Thus Heidegger says: "The single houses, the villages and*

[18] England, Richard, in Powell, Robert (ed.). *Criticism in Architecture*., Singapore: Concept Media/The Aga Khan Award for Architecture, 1989, p. 72.

the towns are works of building which within and around themselves gather the multi-farious in-between."[19]

This study searches for a theoretical approach on how computational architecture provides some responses for a new way of 'reference to a locality', or in other words, how a building can be in relation with its "cultural landscape" as Norberg-Schulz defines, through the methodology and technology employed by computation. For this research, this study proposes a methodology for analysing the structure of the traditional tissue in order to provide rules that make up the tissue, as to be utilized in new building design through computation.

1.2.4 Scope and Methodology

In this introduction, basic issues of computational design with an approach focusing on the methodologies, phenomenal aspects and theoretical stand point have been discussed. Subsequently, thesis argument and hypothesis for developing a regionalist or traditionalist approach for the computational design; which appears to be standing on, both some recent theories mainly depending on other fields of science, and also design projects experimenting the methodology of application for these theories.

This hypothesis briefly states recent examples of computational design to be limited in the ways and means for connecting itself with its environment. Namely, contemporary examples of architecture utilizing digital tools focus on the recent theories in various fields and sciences to adapt, employs the utmost current computation technology in design and production processes of space, and finally establishes strong connections with the organics in nature, in the ways it creates existence, shapes the forms, varies and modifies its components. Through this process, role of randomness in these complex relations of numberless parameters increases directly with the increase of the available computation power. However on the other hand, it fails making a satisfactory analysis of the traditional tissue as an integral and valuable component of the environment, and as a critical factor defining and modifying parameters and relations acting on a space. Throughout this thesis, a methodology for understanding the design logic of the traditional tissue through a

[19] Norberg-Schulz, 1980, p. 10.

conservation perspective and expressing this logic in new building design through the use of algorithms will be developed.

It has to be highlighted that, this study aims to demonstrate some conceptual results under the influence and guidance of problem definition stated above. The goal here is not to offer a finished architectural project or a working script of algorithms in this sense, but instead firstly to develop the methodology of analysis and secondly, to apply some computational design strategies for interpreting and abstracting the results, namely converting the heritage information into data for processing, and finally reaching some results as expressions which can be converted to design algorithms that work in an acceptable level of coherence and unity of design. It intends to provoke a computational analysis and design strategy for a man-made organic tissue, on which a further discussion can be hold. In better words, this study aims to produce experimental design results on a conceptual level. For the sake of the scale and scope of this study, these results will be parts or components of a whole, testing and illustrating its own strategy of algorithmic approach employing conservation data.

In the next chapter, the history of computational design and employment of algorithms in design will be discussed, in parallel with a brief discussion about the concept of 'organic architecture', for understanding how computational design can be utilized in analysing an organic system to its elements and understanding the design logic behind the organic structure of the system, or in other words, relations that make these elements into a form. Moreover, various strategies for utilizing digital tools in the architectural design will be introduced briefly. In the second part, methodologies for data-driven form production, parametric design and employment of various design input in the computational design will be discussed in their dissimilar aspects varying from the traditional architectural practice. These discussions will provide the framework for developing this study's own methodology for dealing with the topic of 'new building in traditional setting'.

Through these discussions, this thesis intends to utilize analysis methods developed by the conservation discipline for a detailed analysis of a traditional setting. The third chapter proposes the case study of this work, and general approach to this case study will be designed in this part, expressing the methodology of the analysis, determining factors and the exceptions about the approach, basically from

conservation perspective. Beginning with the third chapter, all the analysis and interpretation of the outcome will be based on discussions in the second chapter, supplementing the theoretical framework of computational design methodology from the perspective of a conservation/restoration architect. For concretizing the methodology, extended architectural analysis will be exercised on the traditional setting of Kalkan town, a small settlement in southwest of Turkey. Furthermore, a project site have been selected as being the virtual the application field of algorithms for new design based on these analyses. The detailed information on Kalkan town and the project site will be introduced and discussed in the third chapter.

In parallel, the methodology of the analysis including the building information sheets utilized for gathering information will be introduced in Chapter 4.1. The particular assumptions and exceptions in regard to the analytical technique will be discussed in this part, where it will be more convenient for the sake of detail level and continuity of the text.

Basic analysis based on the methods of conservation will be displayed in Chapter 4.2. These are the basic analyses aiming to approach the traditional tissue from a perspective based on conservation discipline.

In the fifth chapter, further analyses will be designed exposed in 2 primary sections, beginning with evaluation of the 1st level analyses. These further analyses intend to illustrate the relational connections between the architectural elements of the traditional tissue. In the 2nd Level analysis, the results of the first group of analysis will be compared with each other and parameters affecting the design logic of the tissue will be the subject of investigation. The 1st and 2nd level analyses are utilized on the entire Historical Town Centre of Kalkan, as its current situation, including the traditional and modern buildings. On the other hand, the 3rd Level analysis carried on a domain of selected examples, the outcome of the previous groups will be discussed and interpretations will be proposed as relations and parametric variables in order to provide the basis of the design algorithms. The methodology will be elaborated for applying a parametric design approach on a conceptual level.

In the final chapter, the goal is to concretize the above analysis as algorithms. A Restoration and conservation study begins with a detailed survey and analysis of

the traditional tissue in the required scale. This work aims to reveal all the possible information in the scope of this thesis, about the selected traditional domain, the qualities, techniques, and various parameters affected/affecting the subject. Presuming the similarities between the graphical representation of this analysis and the variation/modification/evolution studies of form in digital architecture, as an inspiration on the conceptual level, not only for the complexity and level of detail, but also, its character as a set of data to be processed; parametric design principles for a new building in a traditional setting will be cultivated.

1.2.5 Domain of the study and information sources

Existing academic and professional studies on Kalkan will be employed as the information sources for analysis of architectural and urban features. This includes past academic works, documentation about conservation projects, and furthermore architectural surveys by various practicing offices, independent family archives including author's family archive as well, all of which will be utilized for creating a data set which to be used to process under parametric operations. Furthermore a survey of all the buildings have been completed for this study and its methodology will be represented in Chapter 4.1.1.

The primary information sources on Kalkan can be numbered as follows;

1. Conservation and Development Plan for Kalkan Historical Town Centre, project report, and related study documents of plan authors, namely Fon Architecture Ltd.

   This have been used a general base for most parts of the study. It not only provides a general plan for the whole area, furthermore basic information and the most basic categorization on the buildings.
2. Archives of Antalya Regional Council for Conservation of Cultural and Natural Heritage for Conservation of Historical and Natural Heritage

   Some survey and measured drawings prepared in relation with restoration projects, as well as some images displaying the old forms of the buildings have been documented in the Archives of the Council.
3. Project and document archives of Kalkan Municipality

   The Municipality Archive provided most of the restoration projects and measured drawings in relation, as well as some historical images.

4. Project Archives of architectural offices that have designed professional projects in Historical Town Centre

   Uslu Insaat, and Zehra Senaltindag have shared some of their projects in relation to the traditional tissue in Historical Town Centre.
5. Author's own architectural design projects and surveys

   Restoration projects and measured drawings of 4 registered buildings, and simple surveys for 6 more buildings before this study had been realised.
6. Personal family archives

   Şeref Karabağ Family archive have shared their photographs, which have been a collection of local family archives for this study. Furthermore local photo shops and Kalkan-Der have also shared some historical images.
7. Published and unpublished academic works – thesis and research papers

   The only thesis about Kalkan is prepared by Manolya Tokalı in 1987.[20] Furthermore there are some more unpublished academic papers that are cited where necessary.
8. Verbal statements of local people

   Some local characters knowing, remembering and sharing extensive memories had been very helpful for picturing the past life and sometime the locations, forms and functions of the buildings as well.

Through these sources, extensive information about the original forms, functions and locations of the traditional buildings have been provided. Furthermore it is possible to have an idea about the social life and life patterns of the past. However for an extensive study to understand the tissue in general, the relations between the elements of the tissue and the various elements of the tissue that is repeating as a pattern or being displayed in a certain frequency, a database covering a basic set of information for each building in the tissue is required. This database had to be measurable, processable and convertible to other versions or data forms, for it will be the base in producing algorithms at the end part of this study.

In order to structure this database, a survey study had been realised and the results are recorded. All the photographs used in this study, unless referenced with a footnote, belong to author's own image archive.

[20] Tokalı, Manolya, *A touristic settlement evaluated trough the values of vernacular architecture of Kalkan*. Masters thesis, METU, Dept. Of Architecture, Ankara, 1987.

1.2.6 Assumptions and Exceptions

The domain of this study will be limited for the explicit traditional architectural tissue of Kalkan. For keeping this work in scale, the variations other than this explicit and primary architectural character will be neglected. The contemporary building activity out of Historical Town Centre is also accepted as completely out of the scope of this study for hoping clear and acceptable results.

Additionally, cultural issues, demographics, economics and social structure of the population which are normally indispensible parts of the historical heritage will be neglected for a certain level for this study targets to understand the mathematics of the architectural tissue and transform this information to a relational digital system.

CHAPTER 2

DEVELOPING A COMPUTATIONAL DESIGN METHODOLOGY; DIGITAL-ORGANICS an overview and analysis proposals

2.1 History of Computational Design and Algorithms

Negroponte was offering the contribution of computation as an assistant architect or associate architect concept[21], which was a complimentary to the human mind. Kostas Terzidis, sharing this viewpoint, develops the associate concept insisting on the 'otherness' character. It is the 'other' associate for Terzidis, demonstrating different results produced through different methods or in Antonie Picon's words;

> *"In other words, the otherness that Terzidis attributes to the machine is also present in ourselves, in the apparent opposition between the creative impulse and the set of rules that enable us to control it."*[22]

The 'otherness' character of computational design lies on the concept of algorithm, or the *'the set of rules that enable us to control it'*.

As Kostas Terzidis states in his book Algorithmic Architecture, the word algorithm comes for the name of an Arabic mathematician named Al-Khwarizmi, with the modern meaning as "*a procedure for addressing a problem in a finite number of steps using logical if-then-else operators.*"[23]

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[21] Negroponte, Nicholas, "Towards a Humanism through Machines", in *Architectural Design*, September 1969, pp. 511-512.
[22] Picon, Antoine, Foreword, in Terzidis, Kostas, *Algorithmic Architecture.* Oxford: Elsevier Ltd, 2006, p. ix.
[23] Terzidis, 2006, p. xii.

2.1.1 Early computation machines

An algorithm, defines the problem by integrating it to its pieces, in an explicit and communicable manner. Before the machine age, algorithms were employed for solving or understanding mathematical and logical problems. With the invention machines, and afterwards computers, algorithms became indispensible way of communicating with the machines, or simply the instructions sets in a language legible and operatable for a machine, the so-called machine language. As the sets of instructions get more complex, programming languages were designed for easier communication of algorithms.

Through the use of complex algorithms, vast computation capability of computers were employed for various tasks or complex systems are modelled on computers, which are impossible to comprehend by the human mind. These problems, however, not only become defined, but also operatable when broken into pieces and communicated through a language.

In fact utilization of computation on the field of architecture is probably very old, that architecture has always been in close relation with mathematics and engineering. However, before the invention of computer, it has been impossible to employ complex mathematics into architecture through hand calculations. Architectures Non Standard, an exhibition designed and curated by Frederic Migayrou and Zeynep Mennan in 2003, clearly illustrates examples of modern avant-garde aiming a research on alien organic forms and computational approaches in the early 20th century.[24] Curvelinearity, non-Euclidean geometries, topology, animation, dynamic form, and similar concepts were topics for experimental research for artists and architects of modern avant-garde, including some very famous names incorporated with the international style. However they were lacking the tools of high computation and visualization power to process complex and differential data. Moreover, actualization of such organic and continuous forms as architectural space demands a new production technology, distinct from the mass-standardization of the modernist period. These concepts were known until Leibniz and Newton, yet not utilized practically before the introduction of computers.

[24] Migayrou, Frédéric and Zeynep Mennan (eds.). *Architectures Non Standard*. Paris: Centre Pompidou, 2003.

Antoni Gaudi, as an exception, have tried to use NURBS curves and complex forms in the beginning of the century and in order to achieve this goal, he had created astonishing models where weight and control points of the curves are arranged by means of real weight bags. By changing the weights of each small control point of a curve, he succeeded in modelling differential equations and plotting their forms through the ropes that weight bags give shape. Lars Spuybroek, leader of NOX Architectural Studio, entitles Gaudi as the first computer architect;

> *"... In his studies, the floor plan of that church was on the ceiling of his studio. By suspending chains from that floor plan and interconnecting them he was not just calculating the form of their curves, but also a form that could be implemented in masonry. This makes Gaudi the first computer architect."*[25]

Figure 1 - The original model of hanging bags for controlling the curvature of forms used by Antoni Gaudi[26]

Accepted as the first computer for some, the Turing Machine was developed as a model in 1936, reading the instructions, realizing the operations and providing the results. following significant steps can be named as Jon von Neumann's copying

[25] Spuybroek, Lars, http://www.vividvormgeving.nl/vormgeverpagina/spuybroeknrc.htm, 02nd.01.2006, 00:17. This interview with Lars Spuybroek was done by Arjen Mulder and Maaike Post for their book called 'Book for the electronic arts', published by de balie/V2_Organisation (2000).
[26] Gaudi Museum, Barcelona, author's own image archive, 2009.

machine 1940s and British mathematician John Conway's Game of Life, a cellular automaton where cells are defined their status in relation to the status of the neighbours through a simple set of rules. These are the fascination sources for contemporary designers, displaying how complex structures can be produced based on simple rules and computation.[27]

In the early 60s, first experimental studies were realized in MIT for engaging computers with architecture, followed by the development of software titled Sketchpad by Ivan Sutherland. This engagement was in the middle of debates in the architectural circles, hence projects and studies on this engagement were discussed in a meeting titled "Architecture and the Computer", as quoted from Altino Joao Magalhaes Rocha:

> *"This gathering was one of the first public forums to bring together architects, computer scientists, planners and economists inquiring into the possibilities of the use of computers in their fields. Architects, who had so enthusiastically contributed to the construction of the modernist spirit in the UK in the 30s, were now, 30 years later in the USA, discussing the role of computers within architecture. Walter Gropious, Serge Chermayeff, Christopher Alexander and the computer scientist Marvin Minsky, from MIT, were among a distinguished panel of speakers."*[28]

After this early engagement of computer and architecture, the developments can be considered in 2 separate categories, the growing market of architectural practice for visual representation and production technologies, and mostly on theoretical level, scientific works on opportunities of computation in relation with the design logic. The developments in the first category were more rapid, yet works in the second category could only gained progress after the employment of affective personal computers in 1990s, because of the large number of constraints which have to be processed synchronously or relative to each other in an architectural design problem.

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[27] Rocker, Ingeborg M., "When Code Matters", ed. Silver, Mike, *Architectural Design Programming Cultures: Art and Architecture in the Age of Software.* Vol. 76, no 4, 2006, p. 21.

[28] Altino Joao Magalhaes Rocha, Architecture Theory 1960-1980, Emergence of a computational Perspective. Ph. D. Thesis, MIT, 2004, p.91.

An important field of research in this second category had been space allocation studies, proposing solutions for the given architectural programme and constraints defining the relation of spaces. These computer applications were not satisfactory, since the outcome lacks various parameters such as aesthetics, style and integrity.

A further application of computation on design had been the application of heuristic and adaptive procedures, leading to systems that roughly learn through experience. A common example for these systems is chess software, which continuously nourish its database with plays that win and plays that loose.

In 1980s shape grammars and fractals have prepared the theoretical background for first generative systems, utilizing computation in design. Shape Grammars, first introduced by George Stiny and James gips in 1971[29], have found computational counterparts in midst of 1980s.[30] As a form-based design research, shape grammar approaches form as a shape outcome of basic shapes and rules performing operations on these shapes. through the use of computation, shape grammars are utilized to generate designs based on the defined rule sets.

In 1986, so called CAD software AutoCAD by Autodesk was on the market, providing one of the early examples of scripting capability. The software utilizes a C based scripting language named LISP, for providing the users script code for creating shapes and other elements of an architectural drawing, as a design algorithm. Although the software became popular with its other features and tools, it was offering algorithmic design opportunity beginning from very early versions.

Today, it seems that the two paths of development of utilization of computation in design, meet providing vast opportunities for the designers. Currently computational power offers both vast visual opportunities and production techniques for organic forms, yet at the same time, it provides design tools based on parameters and algorithms for producing these forms. Furthermore today, computer hardware and software are equipped with tools incorporating relational systems, whose elements are connected through relations and parameters to each other.

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[29] Stiny, G. and Gips, J., *Shape grammars and the generative specification of painting and sculpture*. IFIP Congress 1971. North Holland Publishing, 1971.

[30] Stiny, George, "Computing with Form and Meaning in Architecture", *Journal of Architectural Education*, v. 39, 1985.

One of the primary modes of utilization of computation today can be defined as the formal approach where algorithms are used for producing highly organic forms, which were not possible to be produced before. On the other hand, a second mode can be described as the design of systems or relations that will shape the form, instead of the form itself. Through the use of complex algorithms, the level of complexity of design reaches to a point where the designer has to come out a step further, as the designer of algorithms, or relations and rules between the elements of a system. These relations shape the form of the outcome, in some cases producing numberless solutions to the problem.

2.1.2 Contemporary Approaches to Computational Design

There is not a complete and satisfactory theory of computational design yet, however there are theorists that construct, propose and discuss various concepts in relation. Yehuda Kalay, Kostas Terzidis, Branko Kolarevic, Nikos Salingaros and Rivka Oxman can be listed to name a few, whom will be referred for illuminating the ideas through this study. On the other hand, there are many contemporary architects as well, who deal with a personal approach on digital architecture producing examples built already. In the following parts, major aspects on computational design and practice in architecture will be briefly introduced.

One of the most significant of the transformations in design logic begins with designers looking deep into the sciences in order to find ways to adapt, at first, terminology and immediately following, various theories and methodologies in the field of design. Digitalization provides the tools of expression and application of these transformations. In other words, architects associate themselves with other fields of knowledge, and then turn back to the design problem for adapting the scientific theories, where they utilize technically computer and in relation with it, philosophically the way that computer works.

Digitalization, not as a science, but moreover as an outcome of scientific philosophy, have produced a medium, based on the phenomena proposed by the extensive use of computers and digital tools. Through the tools of this digital medium it is possible to read the implications of coding and the way computer works. For example ‘copy/paste’ became a concept and focus of many debates. People have started to think with ‘if…then’ clauses, at least in a more concrete way

than before. Such examples can be read as cultural implications of mathematical coding, that the logic of coding echoes its implications in various components of daily life. Immediately after the primitive but effective 'copy/paste', concepts like animation, variation and multiplication have found themselves a position in computational design discourse, not as the commands on the software, but as concepts deliberately put into operation in design.

Though architecture is always in close relation with various sciences and their theories through all the architectural history, this time utilization of digital tools provide a medium for structuring more integral relationships. Quantum physics, chaos and complexity theories, system theory, field theory, information theory and game theory can be named as examples of significant external references that found themselves the appropriate tools for contributing the design logic through computation. Quantum physics demonstrate model to understand particles and their relation to each other, as a system of relations, that design employs its logic for organizing spaces as a 'system of relations'. In parallel, modern chaos and complexity theories provide the reference point for form generation and understanding forms as the product of a parametric system of relations.[31] As a design strategy, 'swarm architecture', utilizes complexity theories and differential equations to understand the relational rules working between the members of a swarm, such as birds or bees. This analysis constitutes the basics of a set of rules for designing algorithms to produce series of forms or objects connected each other through similar parametric relations. Through the careful utilization of field theory, designers employ concepts such as 'blob' and 'field' for treating the architectural space and other components as not static entities, but instead, fields and forces.

With a broader approach, the most imposing field in relation with the utilization of computation in architecture is advanced mathematics with various particular focuses. Although the discussions are very old about some modern concepts of non-Euclidean space, utilization of computer power in calculations and visualizations have provided architects opportunities of computation, as an indispensible part of the design logic, even as an contributor to the design. Topology, n-dimensional geometries, NURBS curves, splines, differential equations

[31] Worringer, Wilhelm, "Abstraction and empathy", Meridian Books, 1967. Author uses this term for seeing all the forms as a unity in time and space, as the evolutions or variations of eachother.

are some of the mathematical concepts that are in use of contemporary architects for designing digital architectures as relation systems and parametric products.

> *"In the topological space, geometry is represented not by implicit equations, but by parametric functions, which describe a range of possibilities (Piegl and Tiller 1997). The shape of a NURBS curve or surface is controlled by manipulating the location of control points, weights, and knots. NURBS make the heterogeneous, yet coherent forms of the topological space computationally possible. By changing the location of control points, weights, and knots, any number of different curves and surfaces could be produced."*[32]

Furthermore current digital technology endows architects with customization of production technologies. Instead of mass-standardization, today it is possible to speak about a mass-customization, namely an architect frees himself from the pre-designed sizes, shapes and even materials of architectural products. It is usually economically the same to produce something in custom physical characteristics instead of something defined as a standard before. CAD/CAMM systems are operating as printer/cutter/morpher for any material available.

Through all the rich discussions on various applications of digital tools in architecture, a critic is always developed for being so animate and mobile in theory, but still utilizing the same material existence of static and kinetic quality in the architectural final product. However there are two basic issues challenging this critic. Molecular biology and nanotechnology work together for expanding the capabilities of architectural products. In parallel with theory, the material science of architecture turns its face to the nature, replicating and improving the natural materials such as a skin or a spider net, through biomimetic researches. Employing custom production technologies various materials can be conjoined together for a single project to satisfy the requirements of the design.

> *"The meaning of the term 'organic architecture', which draws its inspiration mostly from biology, keeps evolving with increasing knowledge of nature combined with foreseeable technologies. As new technologies emerge, architecture becomes more organic in its scope*

[32] Kolarevic, Branko. *Architecture in the Digital Age: Design and Manufacturing*, London: Spoon Press, 2003, p. 2.

intent and realisation. The upper limit to this sort of biomimicracy would be biology itself. Buildings would grow, respond, adapt and recycle, they would self-assemble and self-organise, they would remember and be self-aware, they would evolve, they would reproduce and die."[33]

Furthermore, it is possible to see the examples of smart materials, displaying conditional behaviours or responses to the effects, through the analysis and design in the molecular level, as a chameleon skin. This flexibility of material behaviour can also be augmented with continuous data transfer through various parts of the material, other materials or central control systems that can organize material behaviours for custom requirements. Relational behaviours are possible to be designed between materials, such as "if a part is blue, make the other part dark". Another application of smart materials is durability and efficiency control systems, where the system continuously updates information of material behaviour.

Finally, through the employment of smart custom materials and excessive real-time computation power, early examples of responsive systems are on the way. In this way, architectural space becomes a responding machine in various experimental studies. Mobility, modification of physical qualities and various interaction options are all on the domain of research of responsive systems.

2.2 Organic Architecture

Organic refers to living organisms and their characteristics, as well as nature, in a broad sense, as a big living organism. When such word with an extensive meaning comes together with architecture, various approaches and understandings are possible. In parallel, as a context, organic has always been an inspiration source for architects through the history. The most popular meaning attributed to organic architecture is based on a formal approach, referring to the formal qualities and characteristics of living organisms and nature, mostly perceived as curvilinear edges and topological surfaces opposing rectilinear edges and plain surfaces.

It can be argued that, the term is also utilized for explaining structures, forms and layouts, organization or constituting rules of which are not clearly legible or

[33] Lalvani, Haresh, "Genomic Architecture", in Gans, Deborah and Kuz, Zehra, *The Organic Approach to Architecture*, West Sussex: John Wiley and Sons, 2003, p 116.

apparent, in the context of architecture. Shell structures in nature and pattern formations such as honeycomb or spider net can be considered in this sense. Similarly, man-made physical environment is also described as organic in cases where its organization rules are difficult to grasp, as a traditional architectural setting of a town.

The word organic also represents to a level of complexity, referring to both variations argued above. In both cases, design logic of the form is complex. It is difficult to separate the whole into its integral parts and analyse the relations of these parts, or the rules that constitute the object. Living organisms, through their complex lifecycles, develop these forms under various inner and outer parameters. Similarly, a traditional tissue have been formed throughout the years and under the influence of infinite number of relations between the actors of the setting, such as man, natural forces and the physical objects.

Organic form, when perceived in this sense, is the result of infinite number of relations between the infinite numbers of parameters. Form is inseparable from the parameters which make it up, nor it is constant, since one of the parameters is changed it whole constitution is changed. However it also preserves its identity at the same time, when some of the parameters are altered.

Hence an organic form, as the outcome of an organic structure, possess pluralism on the element level, and at the same time a singularity as a whole. It is the function of its elements and set of relations between these elements. Each element has its own identity and defined set of relations with other elements. Through the numberless repetition of these relations, not for a single element and a single rule, but for many elements and many rules, organic form is made up.

Deborah Gans quotes a passage from Goethe's famous Italian Journey, describing the crowd in a street when something worth seeing happens, from a formal perspective. People, independent and seemingly unconnected elements of the crowd, quickly set up a crater shape around the happening scene. Some get on higher places, some extend their head through the holes they can, making up a circular formed whole, elements of which are able to see the focus. Each individual demonstrates a certain level of tolerance and a certain level of discipline, when compared to their previous positions. The passage ends with the following

statement: "... *Now this many headed, many minded fickle, blundering monster sees itself united in one assembly, welded into one mass, a single body animated by a single spirit.*"[34]

In Goethe's approach to form, it is possible to observe pluralism and dynamism clearly. For this understanding, form is a result of many parameters acting in no relation to each other. It is a single organism, established by various acting agents without any common objective. And furthermore, Goethe as a botanist defines organic form as something evolving in its life cycle as a dynamic entity. If a static form is observed, it is the instantaneous section of a form under evolution through infinite parameters.

Ahmet Omurtag, a researcher working on computational neuroscience, explains the relation of the parts with the whole in the sense of Darwinian evolution theory;

> *"Although bases on chance mutations, the long-term dynamics of evolution and the formation and modification of species proceed with a necessity of their own. Evolution by natural selection, Darwin said, 'depends on what we call spontaneous or accidental variability. Let an architect be compelled to build an edifice with uncut stones, fallen from a precipice. the shape of each fragment may be called accidental.'*[35] *This is because although 'the shape of each has been determined by natural laws. ... there is no relation between these laws and the purpose of each fragment is used by the builder.' Similarly, Darwin continues, 'the variations of each creature are determined by fixed and immutable laws; but these bear no relation to the living structure which is slowly built up through the power of selection."*[36]

Following the above statements, organic form is neither constant nor permanent. As the outcome of complex relations, it is also a function of time and under continuous evolution. Like a living organism or a traditional tissue, the integral elements are continuously in activity, shaping up the whole form.

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[34] Gans, Deborah, Introdcution: "Goethe's Fish", in Gans, Deborah and Kuz, Zehra, *The Organic Approach to Architecture*, West Sussex: John Wiley and Sons, 2003, p vii.
[35] original footnote: Charles Darwin, *The Origin of the Species.* Bantam (New York), 1999, p 40.
[36] Omurtag, Ahmet, "What is an Organism?", in Gans, Deborah and Kuz, Zehra, *The Organic Approach to Architecture*, West Sussex: John Wiley and Sons, 2003, p 51.

"The organic, not as imitative of nature but as analogous to it, constituting a whole whose parts are mutually dependent or intrinsically related - an approach disqualified in the early 20th Century - may in fact be terribly appropriate now. the inherent meaning, the complexity and the historical application of the term have the potential to relate the current/contemporary cultural wilderness. With the promise of environmental symbiosis, the ideas of the organic are re-emerging in the concurrent context of ecology, infrastructure and electronic technologies of perception and communication."[37]

For an organic form, there is no ground-zero point. It is always under a mutation, so there always open information channels or connection nodes for an organics structure. If the subject is architecture, it is never building in the middle of nowhere, but there are always guiding principles and determined ways of relations of the whole, which the fragments connect themselves through. Similar to the living organisms, the organic tissue in architecture gets more and more complicated in time.

2.3 Digital-organics

Understanding organic form in this way, as the representation of an instantaneous section of a continuity, a frozen state of a complex system of parametric relations, traditional tissue or any architectural tissue formed in time through series of events and acting parameters can be defined as organic architecture.

Organics, as a term when used for describing form and when used for describing structure or organization can mean different meanings, but motivated through the same referral. In this sense, assuming an organic structure is also an organic form in its totality, the terminology will be utilized in the rest of this study. However, apart from the discussions in Chapter 2.2 and 2.3, for the rest of this study, it has to be remembered that organics is not used for form in the architectural sense, but mostly for the structure - and form in relation it – of the traditional tissue, as a

[37] Kuz, Zehra, "Provocation", in Gans, Deborah and Kuz, Zehra, *The Organic Approach to Architecture*, West Sussex: John Wiley and Sons, 2003, p xxiii.

result of organic processes that had constituted it. Thus the word organic is used in a holistic sense for the rest of this study.

For analysing a structure, a complex organism or a traditional tissue, in order to understand its integral elements and interior relations, a level of abstraction is required. Without an abstraction, it is an impossible or meaningless and at the same time infinite process of analysis. However, with a certain hypothesis about the form or certain characteristics of the form, case-based filtrations have to be developed in the analysis process. Conservation discipline offers methods to analyse such tissue in order to understand its elements and their relations to each other. Furthermore these principles are utilized for uncovering the values of architectural tissue as well as the new principles for building in or around the tissue, which will be discussed briefly in the next chapter.

Utilizing the above approach to organic architecture and the analysis methods provided by conservation discipline, it is possible to understand the integral elements and relations with a certain level of abstraction. Through the use of algorithms, as instruction sets for shaping the elements and relations, as a differential parametric system based on the conservation analysis, it is possible to digitally produce new form under the influence of the same principles of analysed organic form. Or in other words, algorithmic procedures can be utilized for converting the principles of organic form into digitally produced new organic form; namely 'digital-organics'.

It is important to highlight that this concept is not related primarily with the forms themselves, but the relations of the integral elements that make up the whole entity. Form, on the elementary level is the input for rules or relations that make up the system. And on the upper level, it is the instant representation of the organic entity, the output of the rules or relations that make up the system. In both states, it is neither the essence nor the target of the process.

This process does not intend to replicate what it looks at either nature or an architectural tissue, but instead uncovers the design logic and utilizes the same logic in the new design. New design is open to interpretations of the results of analysis, as well as new parameters or new relations defined as the contribution of the designers. this is the new role of the designer, to grasp the structure of the system on the analysis, and manage the parameters according to his/her own subjective design

perspective. Architect operates as an information analyser and a guide on a higher level for directing the process by defining and playing with the parameters of the equations creating the architectural design. Form becomes a function of relations designed by designer through the employment of digital-organics.

It can be argued that, designer is taken out to a certain extent in any organic architecture, such as traditional tissue. The designer of each building or any other element included in the entire tissue, is not considered significant, but instead the character of the tissue as a whole, the identity it holds through the combination of small fragments is worth considering. For an organic structure, not the designers or designs of each fragment primarily the determinant parameter, but in parallel with them general principles establishing the relations between fragments are also definitive on the character of the whole. So designer of the fragments is already taken out to a certain extent for an organic whole. Furthermore in digital-organics, the designer starts his/her task standing on an outer extent, staring at the whole and trying to understand and design the relations between fragments at least as much as the individual character of the fragments.

2.3.1 Algorithmic design

Computer works basically following the procedures of data processing. In order to process data, at first information has to be converted into data, which becomes the design input when the architectural design is considered. Again turning to the basic level, machine applies the procedures which are defined before as a set of rules. And finally it expresses the results of the operation in the given medium of interaction.

When production of form is considered, as an architectural concept, the whole process of form making/creating is under the influence of digital tools and computation power. Through the use of algorithms and parametric design approaches, it seems that the process is transformed to something like ‘form selecting’ or ‘form finding’. Applying the machine logic abstracted above, design becomes an innovative mode of data-driven processes. Form is no more something that is static and definite, but rather, thanks for the contribution of complexity theories, new geometries and animation technologies, it is dynamic and continuous.

"Physical form, according to D'Arcy Thompson, is the resolution at one instant of time of many forces that are governed by rates of change. In the urban context the complexity of these forces often surpasses human comprehension. A machine, meanwhile, could procreate forms that respond to many hereto un-manageable dynamics. Such a colleague would not be an omen of professional retirement but rather a tickler of the architect's imagination, presenting alternatives of form possibly not visualized or not visualizable by the human designer."[38]

For mentioning about algorithmic design, algorithms shaping the design are required. Designer defines the rules and subjects of operations, and codifies these rules and subjects in the form of algorithms. This approach requires a hybrid design approach, where the results are not exactly projected before outlined by the algorithm. Algorithm is something that is designed by the designer itself, it is an interface between the designer and the computation, converting the issues of design to simple instruction sets for the machine. However it not only a translator, but it has a certain hidden power of emergent design, based on the computation.

"What makes algorithmic logic so problematic for architects is that they have maintained an ethos of artistic sensibility and intuitive playfulness in their practice. In contrast, because of its mechanistic nature, an algorithm is perceived as a non-human creation and therefore is considered distant and remote. Traditionally, the dominant mode for discussing creativity in architecture has always been that of intuition an talent, where stylistic ideas are pervaded by an individual, a "star", or a group of talented partners within the practice. In contrast, an algorithm is a procedure, the result of which is not necessarily credited to its creator. Algorithms are understood as abstract and universal mathematical operations that can be applied to almost any kind or any quantity of elements. For instance, an algorithm in computational geometry is not about the person who invented it, but rather about its efficiency, speed and generality. Consequently, the use of algorithms to

[38] Lynn, Greg. *Animate Form*. Princeton: Princeton Architectural Press, 1998.

address formal problems is regarded suspiciously by some[39] *as an attempt to overlook human identity and creativity and give credit instead to a an anonymous, mechanistic and automated procedure. In any case, algorithms are encapsulations or processes or systems of processes that allow one to leap and adventure into the world of the unknown, whether natural or artificial. they are not the end product, but rather a vehicle for exploration. what distinguishes these processes from common problem-solving is that their behaviour is often non-predictable and that frequently they produce patterns of through and results that amaze even their own creators."*[40]

Randomness as a concept utilized for the first time efficiently in architecture, by defining the parameters and relations, as limiting declarations, and letting the forms develop as it is in nature. Moreover concepts such as, variation, modification and evolution of genetics and biology enter into the architectural discourse through digital-organics, in the way that rules of chaotic order of organic is analysed, processed and actualized in architectural design.

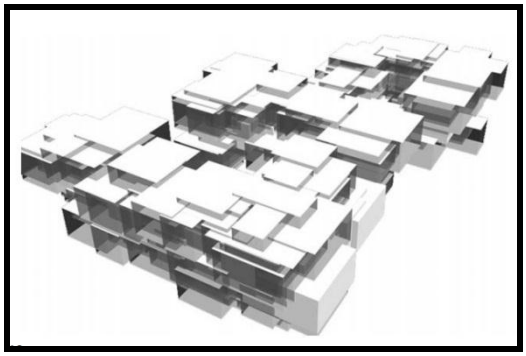

Figure 2 - Example for "*design by code*"[41]

2.3.2 Parametric design

Employing computer as a tool for both expressing and solving the design problem introduces a new way of design practice for architecture. This is a standpoint transforming the architect's role into something more close to computer

[39] original footnote: Gregg Lynn reveals that "because of the stigma and fear of releasing control of the design process to software, few architects have attempted to use the computer as a schematic, organizing and generative medium for design." See Lynn, G., *Animate Form.* New York: Princeton Architectural Press, 1999, p. 19.
[40] Terzidis, 2006, p. 57.
[41] Ibid., p. 88.

programmer or a system designer. Architect's new role is not to design the form or the space, but to design the general parameters, rules, operation modes and constraints of the algorithm that will create the architectural product.

> *"In parametric design, it is the parameters of a particular design that are declared, not its shape. By assigning different values to the parameters, different objects or configurations can be easily created. Equations can be used to describe the relationships between objects, thus defining an associative geometry, i.e., the "constituent geometry that is mutually linked" (Burry 1999). That way, interdependencies between objects can be established, and objects' behaviour under transformations defined. As observed by Burry (1999), "the ability to define, determine and reconfigure geometrical relationships is of particular value."*[42]

In a parametric design, the author or the designer is not solely the human architect himself. The computer or the generating algorithm also proves a creative contribution in this process. Parameters are the tools for altering the outcome design. Or in other words, parameters are the manipulation keys for adjusting the rules or relations of the system. Although its contribution is directed by the architect, it provides a sort of expansion for designing mind. Hence the design process becomes to be a hybrid design.

Such a process is not a definite one, where you can alter the parameters of the algorithm which will create variations/modifications on the end-product. This makes the form continuous and dynamic, contradicting with the Euclidean approach for a fixed form designed according to the design input and the author's talent. Instead, the designer's subject becomes a more rational system of relations, where the creating algorithm stands as a continuous and flexible operation itself.

2.3.3 Form under the influence of Computation

In this part, form, as the outcome of computational design will be discussed. Complexity theory offers a hypothesis that the real activity or 'life' takes place in the

[42] Kolarevic, 2003, p. 4

in-between states of matter. Theoretical biologist Stuart Kaufmann explains as follows:

> *"The wonderful possibility … is that on many fronts, life evolves toward a regime that is poised between order and chaos. The evocative phrase that points to this working hypothesis is this: life exists at the edge of chaos."*[43]

He states that, one of these in-between states is somewhere about liquid state of water, since ice is too ordered and the gaseous is too chaotic. "*The edge of chaos*" is an active state between order and chaos. His ideas recalls a very basic principle in chemistry, the Le Chatelier's principle, which is defined as follows in The Columbia Electronic Encyclopaedia, *"Le Châtelier's principle, chemical principle that states that if a system in equilibrium is disturbed by changes in determining factors, such as temperature, pressure, and concentration of components, the system will tend to shift its equilibrium position so as to counteract the effect of the disturbance."* [44]

Combining these two ideas, it is possible to say that life occurs in the in-between states of a system, where one is not in equilibrium, but a constant activity "to counteract the effect of the disturbance" through the equilibrium. The disturbance never stops, since it is a complex system of multiple agents in interaction. So in this state, the system gains a continuous dynamism, an activity of continuous motion through the equilibrium, but never equilibrium. Any activity, so the forms themselves, come into being in this state of constant activity and transformation.

Such an activity in a system funds a continuous mode of exchange of energy or information. Turning back to the chemical metaphor, system constantly acts and reacts, crating and using energy. Forms in a complex system continuously transfer energy or information to each other, as long as they are in an interactive state. Mark Taylor stresses that, words 'movement' and 'moment' come from the same root in Latin; 'momentum'.[45] Moment holds a movement potential and movement occurs in

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[43] Kaufmann, Stuart, *At Home in the Universe: The Search for the Laws of Self-Organization and Complexit*y. New York: Oxford University Press, 1995, p. 32.

[44] The Columbia Electronic Encyclopedia, 6th ed., Columbia University Press, 2005. 05.01.2005, 01:51.

[45] Taylor, Mark C., *The moment of complexity: emerging network culture*. Chicago: The University of Chicago Press, 2001, p. 23.

a moment. This argument puts notions of time and motion in a critical condition in the complexity theory. Interrelations between these two notions are so strong and multiple, that their effects on forms cannot be denied. These two concepts are continuous fluid forces, not acting together, but acting blending into each other and evolving the other. Form can be assumed under the effects of this couple force, which are the self of the whole activity in a complex system.

Thus making a comparison between space defined in Cartesian coordinates and space defined through the tools of differential mathematics; Cartesian space is presumed to be a passive container of agents and events resulting from the inter-relations of these agents. Cartesian space is in a neutral equilibrium state in this sense, and opposing with it, space of vectors and energy transformation is an active one. It is a continuously active space, near to the point of equilibrium, just on the edge line of equilibrium and not equilibrium, but never equilibrium. It is like a man standing on the rope and trying to stay in balance, but never in balance, moving forwards and backwards continuously.

This kind of an energy transfer and continuous activity of multiple agents make the complex systems holistic. The details cannot be neglected in order to understand the system. The whole cannot be reduced to its fragments or components. Ray Kurzweil cites one of the most accepted theories about the origin of the universe, where he uses the word 'emergence' for process of formation of light, for it is the result of a very tiny, conventionally neglectable advantage. For the theory, the universe has 10 billion and 1 protons for each 10 billion antiprotons, and the confrontation of these resulted with the emergence of light.[46] Any slight advantage or distinction may be important and create an unpredictable result in a complex system.

In modern chaos and complexity theories, irreducible character of complex systems is critical. Through this statement, it is possible to conclude that it is not the way to examine the pieces in order to understand a complex system. The proposal of complexity in its place is the investigation of the system as a differential whole. In a complex mathematical system forms can be defined with differential equations where each curvature is defined with parameters that are affected by the other

[46] Kurzweil, Raymond, "*Chapter One: The Law of Time and Chaos*" in *The Age of Spiritual Machines*. New York: Penguin Books, 2000, p. 10.

curvatures, opposing Euclidean geometry where each element is statically determined independent from the external factors. Concept of mathematical differentially is key factor for developing abstraction methods on investigation of complex systems.

This is why splines and NURBS curves are important for understanding the forms, re-considered under the light of modern chaos and complexity theories. Below quotation is from Greg Lynn, where he compares an Euclidean curve with it's, in a way, correspondent constructed with spline geometry. The degree of the curve depends on the number of its parameters and has no maximum limit in getting more complex. Lynn states the substitution of splines instead of lines and describes splines as follows;

> *"Unlike lines, splines are vectors defined with direction. These vectors are suspended from lines with hanging weights similar to the geometry of a catenoidal curve. Yet unlike a catenoidal curve, a spline can accommodate weights and gravities directed in free space. ... Although the control vertices, hulls and weights are defined in a point-based. Cartesian space, the splines are not defined as points but flows. The spline curve is unlike a line or radius in that its shape is not reducible to exact coordinates. The spline curve flows as a stream between a constellation of weighted control vertices and any position along this continuous series can only be defined relative to its position in the sequence."*[47]

New digital vocabulary of forms employ complex curvatures of varying degrees for creating forms, resulting in forms holding some kind of a dynamic information. This information is inherited in the curvature, in the mathematical composition and geometrical existence of the form itself. Even a simple vector holds the information of direction and magnitude as a level further than a simple line. What's more is it holds the information in relation to the other forms that it is in interaction with. The differential composition of the form holds the information of the relational effects of the other forms. Below statement by Jean Molino can be read as an interpretation of factors generating the composition of the form, as

[47] Lynn, 1998, pp. 21-22.

explained in the previous lines. *"Nothing explains the genesis of forms, nothing, that is, except forms themselves and their encounters with other forms."* [48]

The information that a form carries is dynamic, under continuous evolution by other forms. The weights and distances, namely the parameters of the differentiality is a parameter in this interactive communication. It is just like a computer – that again proves why computers are necessary to work with complex geometry – which incessantly calculates the result of a certain operation with given new parameters. The computer knows the rules of the operation, but the parameters are emerging through the interaction of other forms. If the results of the operations accomplished by the computer were plotted by certain intervals of time, the result would be a complex curve of the degree of interchanging parameters. For a spontaneous time on the graph, the complex curve holds both the information from its previous state (vectorial information), and the information for the next state, additionally the similar information for the other interacting forms, with a precision due to the definition of the relations.

Actually, Greg Lynn gives an example very similar to this curve-machine calculating new data continuously.[49] He brings up the relational process of a dog chasing a Frisbee. At the initial time, dog does not know any of the necessary information about the flight of the Frisbee such as direction, velocity, weight, wind and gravity. However, after the Frisbee is launched, the dog begins to perform successive operations using any vectorial information he acquires about both the Frisbee and itself.[50] In each new operation, he uses more accurate or updated data added on the previous data. In each step of new time, the weight of the past positions increase and the graph of the differential curve become more explicit. And finally, two distinct differential curves of various degrees meet at a point, unless any new external parameter alters the curve. To cite from Lynn;

"The path of the dog will inevitably be described by a curved line. The inflections of this curved line indicate the velocities, directions and

[48] Molino, Jean, "Introduction", in Focillon, Henry, *The Life of Forms in Art.* New York: Zone Books, 1992, p. 14.
[49] Lynn, 1998, pp. 23-24.
[50] It is not clearly known what dog performs in this situation, since we do not know how his brain and bodily actions work in this sense. I am not insisting about the dog performing certain operations or making calculations. My intention here is to express that the dog gathers information through its senses and somehow processes that information resulting with an action of a complex curvature.

timing of each of the imbricated vectors. This situation cannot be described by a straight line with endpoints because, mathematically, it is a differential equation with more than two interacting components. … Curvature is mode of integrating complex interacting entities into a continuous form."[51]

The capacity and ability of form holding extensive information and transferring it to the other forms, proves its continuity in time. The complex curvature of the dog's path running after the Frisbee can be extended infinitely on both points of, capture time and initial time as well. The degree of the complexity of the curvature depends on its definition or literally, dog's skill, here. It is necessary to note that, such a form holding various levels of information, and opens to interactions by other forms, clearly opposes Euclid's fifth postulate of indeformability of figures in movement. Such a form can continuously be deformed as seen in the differential curvatures.

Working on the continuity of forms, Scottish biologist D'Arcy Thompson have gained reputation as one of the pioneer figures of modern chaos and complexity theories with his famous work "On Growth and Form".[52] He compared the morphology of the form of some animals, insects and plants, by utilizing deformable grids, on which he plotted the forms of his objects. Through these analyses, Thompson have realized a certain relation, or in better words, continuation between forms of nature. His work figured out curvilinear lines when the deformations of the deformable grids are plotted. Going one step further, Thompson had been able to analyse certain forces acting on the forms of nature, through the continuity relations, he had observed, between certain creatures. Gregg Lynn explains what can be concluded as his contribution to the modern chaos and complexity theories in following lines:

"Rather than thinking of deformation as a subset of the pure, the term deformation can be understood as a system of regulation and order that proceeds through the integration and resolution of multiple interacting forces and fields."[53]

[51] Lynn, 1998, pp. 24.
[52] Thompson, D'Arcy Wentworth, *On Growth and Form*. New York: Dover Publications Inc., 1992.
[53] Lynn, 1998, p. 26.

As the interaction between the forms does not stop, which is impossible in the terms of complexity defining space as an active and dynamic entity, every form is certainly continuous. Looking from this perspective, architectural form could no more be designed in the conventional way, since it is impossible to design the form, which is a continuity in time. Instead some tactics are being developed in order to produce form, as an integral element of new vocabulary. Instead of designing form, some designers prefer the term ‘selecting form’. In this sense, designer is aware of the continuous wholeness of form, as understood in the chaos and complexity theories. This awareness is a potential for analysing, understanding and reflecting the information inherited in the form itself.

CHAPTER 3

DESIGNING 'NEW' IN THE TRADITIONAL SETTING - THE CASE OF 'KALKAN TOWN'

In this chapter, an overview of the conservation approach about a traditional setting will be proposed. Through a brief history, it is aimed to illustrate the development of the idea of conservation of the tissue as a whole instead of a single architectural monument. Hence in modern conservation, the aim becomes to conserve the whole culture and setting produced or producing the result heritage.

In the second part of the chapter, Kalkan town will be in the focus as a traditional tissue case. This part will not only provide extensive information about the town and the environment, but also offer some basic analysis for understanding the characteristics of traditional architectural tissue of the town, in order to establish the basis of the conservation data that will be processed in the following chapters of this study.

3.1 New Building in Traditional Setting as a Conservation Problem

Understanding urban form and culture as a continuity, the new building is comprehended as the last step in the process of building activity. Through this understanding, modern conservation approaches to this concept as a conservation problem. Furthermore what it defines as a deterioration or loss of identity in the historical settlement completely depends on the quality of the new building activity. Namely the level new building connects itself with the surrounding, is the determining factor of the success of the conservation of the traditional tissue.

For such a conservation approach, the crucial point is to determine the values of the traditional tissue that are both generating the quality and also address the potential nodes for continuity. Hence these values must be the final aim for the analysis to reveal.

3.1.1 Short history on new building on traditional setting

First conservation ideas were focused on single buildings. The first document to address the issue of new buildings was the Athens Charter[54]. The third article of the 1931 declaration recommends the special treatment about the surrounding of the historical buildings, revealing that the buildings has strong ties with their surroundings and this is an integral part of what is being 'preserved'.[55] In Venice Charter[56] in 1964, the subject of the conservation activity have been expanded to the conservation of urban qualities and values, hence the urban architectural tissue.[57]

Yet 1967 ICOMOS meeting was the first to approach the problem with an integral understanding. The document recommends a perception of the city as a whole and provides some rules for new buildings in ancient settlements.[58] Afterwards, in 1969 meeting the concept of 'integrated conservation' was declared, At this point it is possible to see the approach understanding the traditional tissue as a basis for the new building.[59]

These meetings were followed with the new ones and concept of integrated conservation has been more popular. In many countries, legislative arrangements have been applied for conservation of the tissues and settlements as well as directives for building new in these historical settings. Consequently, detailed interdisciplinary analysis of the features and values of the historical settlements have

[54] Athens Charter – The Athens Charter for the Restoration of Historic Monuments Adopted at the First International Congress of Architects and Technicians of Historic Monuments, Athens, 1931. (ICOMOS, http://www.icomos.org/docs/athens_charter.html, last visited in October 2010)
[55] Erder, Cevat., *Tarihi Çevre Bilinci-Tarihi Yapılar ve Çevrelerinin Değerlendirilmesi Gelişiminde Örnekleme*, Ankara: ODTÜ, Mimarlık Fakültesi, 1975, p. 277.
[56] Venice Charter - International Charter For The Conservation And Restoration Of Monuments And Sites (*The Venice Charter- 1964*), IInd International Congress of Architects and Technicians of Historic Monuments, Venice, 1964. (ICOMOS, http://www.international.icomos.org/charters/venice_e.htm, last visited in October 2010)
[57] Erder, 1975, p. 289.
[58] Horler, Miklos, "Modern Architecture and Ancient Monuments", *Monumentum*, v.11, 1975, p. 7-25.
[59] Madran, Emre., Özgönül, Nimet, Eds., *International Documents Regarding the Preservation of Cultural and Natural Heritage*, Ankara, METU, Faculty of Architecture Press, 1999, p. 105.

been very crucial in recent past, for developing strategies on new building activity in traditional tissue.

Today as a general assumption, it can be accepted that good architecture cannot be realized without any reference or sensitivity about its context. The new building in traditional setting problem mainly stands on this issue. However, there are various approaches for new building design in traditional setting, varying in the ways to refer to the traditional setting. Some approach the traditional setting as a complex entity and analyse it into its architectural fragments and interpret these fragments to be utilized in the new design, which will have a certain way reference to the traditional setting. This methodology aims to reveal the code of the system, namely a general protocol of relations between the elements and features. The interpretation of the traditional elements and their utilization in new design depends on designer's own approach.

On the other hand, this is not the only way and exercise, since there are other approaches utilizing other methodologies instead of revealing the code. Keeping this in mind, this study does not claim that this is the only way and the correct way to understand the traditional setting and designing new in reference to the traditional setting. But instead, it tries to utilize this methodology of revealing the code of the setting and transforming it to new design principles, through a level of interpretation and computation design tools.

3.1.2 Approaching the problem

The basic perspective of this thesis primarily consists of approaching Kalkan Town as a traditional setting, an architectural heritage and an example of organic architecture or an organic layout formed through various parameters acting on each other in time. Examining its structure and interrelations between its fragments, as important as, if not more, the individual qualities and features of the buildings themselves, Kalkan town displays an organic tissue composed of various elements. Through a basic examination of these elements, instead of defining an archetype of Kalkan residential architecture with certain architectural features, it is preferred to approach it as an architectural style which can be observed on various buildings. The current form of the Town is composed of not only single buildings displaying typical

architectural features, but also cross-relations of them with each other and their surroundings.

Hence this organic tissue is defined as a relational system within this approach. In order to reveal the logic that makes up the tissue as it is, the analysis is designed in 3 phases, based on the basic analytical methods of conservation. The 1st level analysis intends to reveal the basic architectural features of the components of organic tissue, defined in the scope of this study. In this part, data in relation to the whole tissue as well as architectural data on the single buildings, as the elements of the system, will be analysed with the employment of perioding and comparison techniques where necessary. Outcome of each analysis will be discussed and abstracted to a certain level with the consideration of further analysis utilizing these abstractions.

In the next chapter, 2nd and 3rd level analysis will be demonstrated, basically to uncover the relations between architectural features of single elements. This further level analysis will employ the results of the 1st level analysis as data input and research for the relations of various elements in each other, through logical and typical projections in some cases, and arbitrary searches of seemingly unrelated elements in some others.

2nd and 3rd level analysis will be based on defining the differential logic of the system. The relations between the integral elements of the system will be analysed with intention of algorithmic design procedures in mind. Outcome produced through these analyses will constitute the base of algorithms for new building design in the tissue. This approach embraces relations as well as architectural elements, if not more, as the basic constituting parameters of the organic tissue, making them more deterministic on the form of the tissue, than the techniques, materials and the period of the architectural elements themselves.

Similar to the digital-organics approach, described in the previous chapter, traditional architectural tissue in Kalkan Historical Town Centre is presumed as an organic structure made up of elements and relations. Uncovering these features is the key for understanding the design logic and values of the tissue. Through the outcome of these analyses, the design logic of the tissue will be defined on architectural elements and relations, which is applicable for the new designs as well. These

features of the traditional tissue will be defined through algorithms in the final part, in order to settle the basement for an algorithmic design procedure addressing 'new building design in a traditional setting' problem.

The designed algorithms will be targeting a differential system, proposing new building volumes, composed of through similar orders and relations of the traditional tissue in Kalkan. In order to understand the design logic and produce level by level complex analysis, a certain level of abstraction and interpretation of the outcome of the analysis, with an intention of the final algorithms and moreover with an intention in relation to the perceived character of the whole tissue is required. The role of the designer comes forward at that point, with the abstraction and interpretation preferences and reasoning. the designer stands on the seat for deciding the analysis types, the abstraction of the results and manages the conversion process of analysis results to algorithms, where a certain level of interpretation is required as the contribution of the designer. This is the new standpoint of the designer, instead of designing the elements itself, designing the algorithms in relation to the input data, character of the entire setting and the anticipated outcome, in parallel with the discussions in the previous chapter about the role of the designer in the computation architecture.

Furthermore, it is possible to discuss the contribution of other parameters in this computational design process. First of all, the designer has the ability to propose new experimental opportunities that are not existent in the organic tissue but deduced form the analysis itself. A combination of forms, which are not combined before, or application of design logic but in a way not applied before in the tissue can provide examples foot his type of contribution, dependent on the choices and approach of the designer.

Secondly, the system is open to emergent results since it is algorithmic design with no certain projections on the outcome. This comes as the natural characteristic of the randomness existing in computational and algorithmic approach. However, the constraints of the system as well as the relational structure guarantees that somehow the emergent forms produced within the system will be based on the architectural features of the traditional tissue.

Finally, utilization of new material and techniques for outcome of the system will provide an opportunity of contribution to the traditional tissue. The material constraints are usually assumed to be out of the scope of this thesis, which retains its approach on the conceptual level. Furthermore the study will be completed with the design of algorithms and that their application is still not considered in the scope of this thesis. However the system has the opportunity to experiment the utilization of new materials with the building forms produced through this methodology.

3.2 Kalkan Town - General Characteristics

This study targets to understand the relations between the architectural features of a traditional setting, through detailed and defined analysis. These analyses will be employed in order to produce the rule sets for structuring a relational design-support system for 'new building in a traditional setting' problem in the following chapters. Since this is a methodology development proposal, the traditional tissue, namely the data set for analysis had to be, on one hand small and easy to handle, and displaying a certain level of complexity in its own setting, on the other hand.

Figure 3 - Satellite view displaying Kalkan Bay and near surrounding[60]

Thus, as a traditional setting, namely Kalkan, a small town in south-western Anatolia, have been selected, as well as a definite project site, namely the Sub-Conservation Area No:1 on the south-eastern shore of the town. Town is basically

[60] Image source: Google Earth 19th July 2009 satellite photo

settled around the largest on the east, of the three small bays located in the large Kalkan Bay. Small town of Kalkan, as shortly dealt in the introduction, displays a clear and explicit architectural character, partly unspoilt and suitable for the scale of this study. Architecture of Kalkan, mainly displays the features of Mediterranean style, similar to settlements on the Mediterranean and Aegean Coast of Turkey and Greece and even the Western areas, though it has some distinctive features reasoning from the steep topography and the socio-economic components of life.

3.2.1 Location and Access

Kalkan Town is located on the shore of Teke Peninsula in the Mediterranean Region of Turkey. This area was known as Lycia in the history. Archaeologist Timuçin Aygen defines the Lycian land as the south of the line joining Antalya, Elmalı and Fethiye, similar to George Ewart Bean's definiton as the south of the line from Köyceğiz to Antalya.[61]

Lycia had been a federation of independent city states in antiquity and become a district in Roman Empire afterwards. At that time, Lycian Federation has been outshined through its civilization, one of the important aspects of which was the road system. Today these paths connecting the cities area touristic focus. Furthermore Lycian Federation has demonstrated a certain improvement in trade and sea transport.

Until the antiquity the region's most important access was through the sea. Kalkan Bay is one of the natural harbours in Lycian shore, and an important one with the fresh water source. After 1960's, the area has been connected with the road network.

[61] Aygen, Timuçin. "History of Lycia" in *Kalkan & Lycia,* Serim, Osman, ed., Antalya: Kalkan Foundation Press, 1994, p. 4.
Bean, George E., *Lycian Turkey: An Archeological Guide.* London: Benn, 1978.

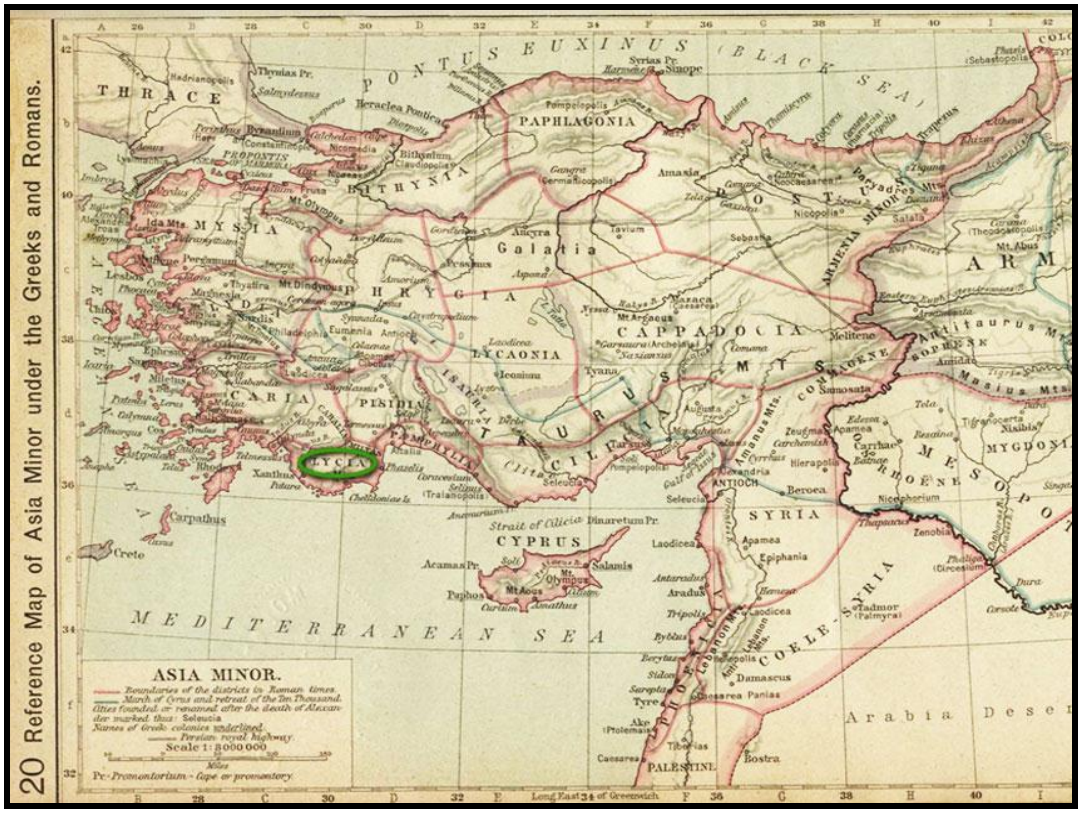

Figure 4 - Reference map of Asia Minor under the Greeks and Romans. The map displays the main region and settlement names for Greek and Roman origin before the Turks have entered the scene[62]

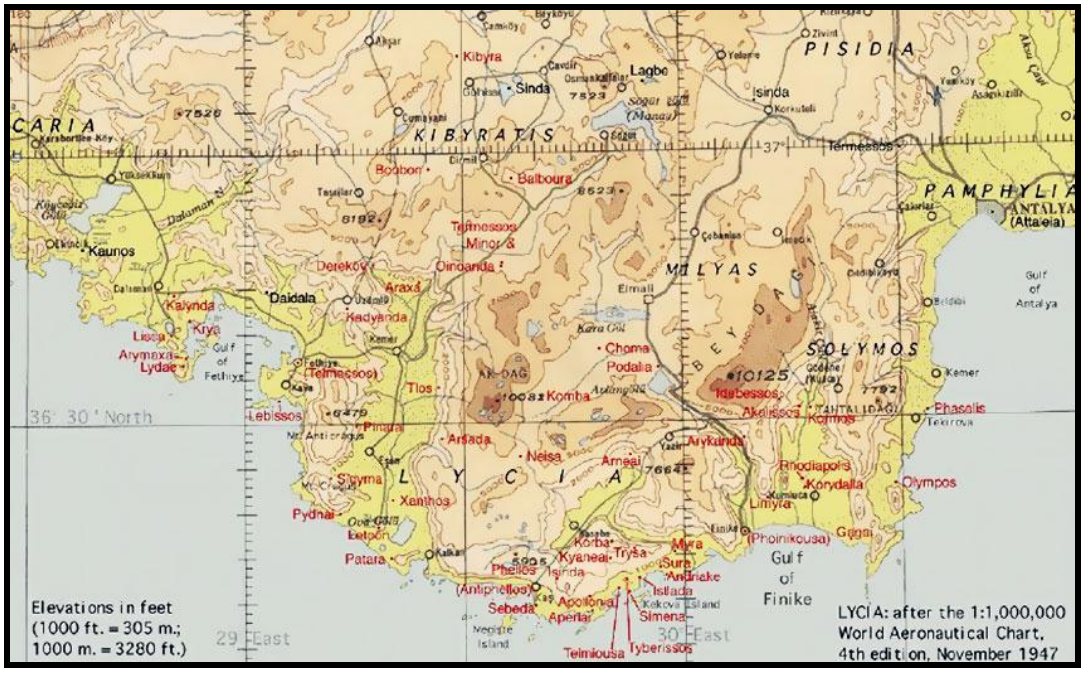

Figure 5 - Aeronautical map of Lycia (not in scale) [63]

[62] Image source: Shepherd, William Robert. *Historical Atlas,* New York: Barnes and Noble, 1964, p. 20.

Today there is a comparatively good network of roads in the whole Lycian land. Kalkan Town is connected to the main settlements through these roads, namely 2.5 hours drive to Antalya city centre and 1 hour drive to Fethiye city centre. Bus services are available to these centres throughout the day, as well as Istanbul and Ankara at every night.

Access from airway is possible through Dalaman and Antalya airports, 126 km and 210 km distance to Kalkan respectively. There is a small marina in Kalkan, with a capacity of 60-70 small boats around 18-24 meters long.

Figure 6 - Aerial photography of Teke Peninsula and Antalya Gulf[64]

[63] Image source: S. Coast and Geodetic Survey. World Aeronautical Chart . and AAF Aeronautical Chart. Washington, DC: C&GS, 1944-1959, 253 sheets (incomplete), index. Scale 1:1,000,000. The older sheets, the AAF Aeronautical Chart, were published by the Army Map Service. G3201s P6 1,000 U5 - http://www.eko-natura.com/images/outdoor/hike-sail/LYCIA-map-big.jpg, last visited in October 2010

[64] Image Source: Images courtesy of the Image Science & Analysis Laboratory, NASA Johnson Space Centre. http://www.lycianturkey.com/images/sw_turk1.jpg, Last visited in October 2010.

3.2.2 Notes on Lycian History and Characteristics

The general history of the Lycian region goes back to B.C. 1400.[65] Timuçin Aygen tells that 'Luwis', the ancestors of Lycian people were the inhabitants of this area before the Hittites appear in Anatolia. On the Egyptian and Hittite tablets, early Lycians were recalled as "Lucas", and mentioned as the allies of Hittites in Cadesh War and also the allies of Trojans against Akas.

Between B.C. 200-100 the Lycian Confederation is established and seems to be the most successful period of Lycian Civilization. On A.D. 41 Roman Emperor Claudius conquered some of the Lycian cities. Around A.D 300-600 Lycian cities started to lose their importance as the Byzantines gained importance. This has been followed by the Arab attacks turning cities into villages. And finally in parallel with the appearance of Turks in Anatolia around A.D. 1000-1100, we see the disappearance of Lycian from the history.[66]

Lycian people demonstrate a considerable level of development on art, architecture, trade and social life, but lacking in military skills. There are great architectural products in Lycian cities, such as the monumental graves, theatres almost in every city and waterways and road network. The Nereid Monuments of Xanthos have been accepted as the utmost point of Lycian monumental grave architecture.

> *"The Nereids Monument (and other relics) taken to England by Charles Fellows in 1842 and now exhibited in The British Museum is believed to have served as a model for the construction of the Mausoleum of Halicarnassus, one of the Seven Wonders of the Ancient World."*[67]

[65] Aygen, 1994, p. 4.
[66] Notes for introducing a short history of Lycian land are abstracted from 2 sources: Aygen, 1994, p. 4-6. and Bean, 1978.
[67] Aygen, 1994, p. 6.
Author's note: The only existing complete remains of the Mausoleum are also exhibited in the British Museum.

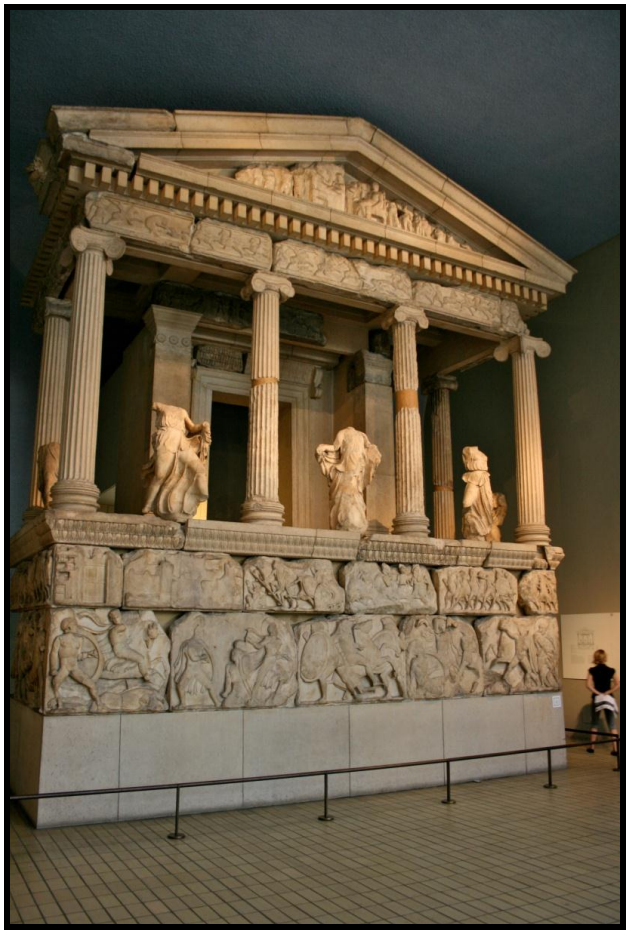

Figure 7 - Nereid Monument, Reconstruction of the East Facade in British Museum[68]

Another important feature to be highlighted in this short part on Lycia will be the democratic representative system of the Lycian League, which is accepted as the earliest forms of democracy, where they employed a complete parliamentary system of city-states bound together including the election mechanisms. Baron de Montesquieu's research on Lycia Federation is highlighted in the documents and discussions of US Constitution Law;

> *"The cities of Lycia contributed to the expenses of the state, according to the proportion of suffrages. The provinces of the United Netherlands cannot follow this proportion; they must be directed by that of their power.*
>
> *In Lycia the judges and town magistrates were elected by the common council, and according to the proportion already mentioned. In*

[68] Image Source: Wikipedia, http://upload.wikimedia.org/wikipedia/commons/9/9b/Nereid_Monument,_British_Museum.jpg, last visited in October 2010.

the republic of Holland they are not chosen by the common council, but each town names its magistrates. Were I to give a model of an excellent confederate republic, I should pitch upon that of Lycia."[69]

Finally the below quotation from George Ewart Bean on Lycian people will complete the painting in brief.

"Among the various races of Anatolia, the Lycians always held a distinctive place. Locked away in their mountainous country, they had a fierce love of freedom and independence, and resisted strongly all attempts at outside domination; they were the last in Asia Minor to be incorporated as a province in the Roman Empire. They had a language of their own which is still imperfectly understood, written in characters many of which are peculiar to it. They had an instinct for union and federation, and formed a Lycian nation when elsewhere the Greek world was made up of individual city-states perpetually at enmity with one another."[70]

3.2.3 History and Social Life of Kalkan

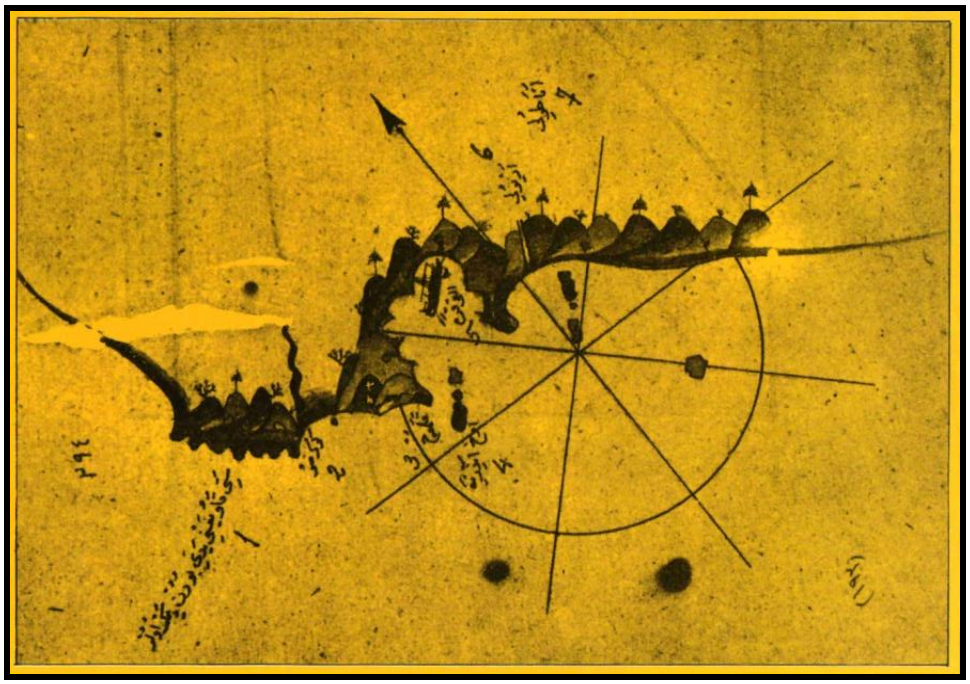

Figure 8 - Map drawing displaying Kalkan Bay and fresh water source in Kitab-i Bahriyye

[69] Baron de Montesquieu, M. de Secondat, trans. Nugent, Thomas, *The Spirit of Laws,* BiblioBazaar, 2010, (org: 1748, org trans.: 1750), p. 246.
[70] Bean, 1978.

In opposite, modern Kalkan town is a very recent settlement. The first information about the Bay and particularly the clean water source was seen on the navigation book by Piri Reis, written in 16th century.[71] Ottoman Fleet Commander also states that the names "*Aliki-Kara*" or "*Alki-Kaara*" were used for the Bay at that time. Charles Fellows, in his visit to Lycian shores in 1840, informs us that "*Kalamaki*" is used as the name of the settlement by modern Greeks and describes the settlement as a "*Greek trading village*"[72] On a Turkish local's diary dating back to the early years of the 20th century, current name 'Kalkan' is used[73], however, the exact origin or the transformation of the current name is not clear in any resource. It is also known that another Turkish name, 'İskele' was used in the 20th century.[74]

The settlement of the town is about 150-200 years old and there are various theories about the first settlement, however it must have been related with the fresh water source. After its first institution, the town had grown quickly, utilizing the advantage of being a unique natural harbour on a long sea trade route.[75] The oldest record about the settlement is the date on the church bell which is carved as 1897.[76]

The population of Kalkan was a mixture of local Turks and Greeks originated from the island of Meis[77], probably mostly Greek in the early days of the settlement. Durdali Karasan, the second major of the Town, tells in his memories that 70% of the population was Greeks in the early 1920s.[78] In 1924, Christian population have been transferred back to Greece.[79] However the style of Christian builders is explicit on the traditional Kalkan buildings.

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[71] Pirî REİS, *Kitabı Bahriye* , Ankara: Türk Tarih Kurumu Yayınları, 2002.

[72] Fellows, Charles, "Delta of the Xanthus", in ed. Seyhu, Melis H., *Lycia Through the Eyes of the European Travellers,* Kofisa: Geneva, 2003. p. 122.
Fellows provide the meaning of Kalamaki in Greek as *"reed bay"*, however he also points out that no reeds are grown in this geography and climate. However small amount of reeds can be found in other parts of the Lycian region.

[73] Karabağ, Şeref, ed., *Memories of a Turkish Prisoner of War: Memories of Dürdali Karasan*, unpublished memories, Şeref Karabağ Archive, 2009.

[74] Karabağ, Şeref. "Interview with Şeref Karabağ" in *Kalkan & Lycia,* Serim, Osman, ed., Antalya: Kalkan Foundation Press, 1994, p. 19.
'İskele' stands for dock or pier in Turkish. It was probably used by the people living around, particularly in the near mountain villages, as Kalkan is their port for transportation of any kind.

[75] Ibid., p. 18.

[76] The church bell stands in the Storage of Kalkan Municipality.

[77] known as Castellerizo, or Kastelorizo in some sources particularly in Greek and Western.

[78] Karabağ, 2009.

[79] Karabağ, 1994, p. 19.

Some of the Greeks transferred from Kalkan in 1924, have gone to Meis, some others Athens and another branch to Australia. It is said that, the neighbourhood titled 'Kalamaki' in the south of Athens, near Alimos, is the area that branch going from Kalkan had settled.

The Municipality was founded in the Town in 1928, after Greeks have been transferred abroad. In 1936, municipalities were closed in 'nahiye'[80] status towns, so as Kalkan Municipality.

Becoming to be a primary trade centre between the mountain villages and various abroad locations on Lycian Peninsula, the town have developed in the first quarter of the 19th century. In the Ottoman Period the town had been an important trading post and an exporting harbour with the Customs Office as well.[81] Since there is no land road connection, a considerable part of the exporting goods of Teke Peninsula, or the Lycian Region, have been transferred through Kalkan Harbour.[82] At that time, the Town was equipped with a Town Hall and 'Nahiye' Administration Office, a Customs Office, a Court Office, a Jail House, and an Inhabitants Registration Office as the administrative structure.

Figure 9 - View from Square on the Coast looking to Atatürk Sculpture, building on plot 228/39 and p 229/39[83]

[80] 'Nahiye' is an administrative settlement unit used in Ottoman Empire and early Turkish Republic.
[81] Karabağ, 2009.
[82] Karabağ, 2009. / Statements of the locals
[83] Şeref Karabağ Kalkan Photograph Archive, estimated image date: 1930s – 1940s

Figure 10 - View from northeast of plot 415/48 (park today) looking to building on plot 228/7.[84]

Figure 11 - Old Photograph from Northwest of the Town[85]

[84] Şeref Karabağ Kalkan Photograph Archive, estimated image date: 1940s – 1950s

[85] Şeref Karabağ Kalkan Photograph Archive, estimated image date: 1930s. This photograph was provided by Veli Karagül.

Figure 12 - Old Photograph from west of the town seeing the rear elevation of Mustafa Kocakaya Mosque and southern elevations of various residential buildings[86]

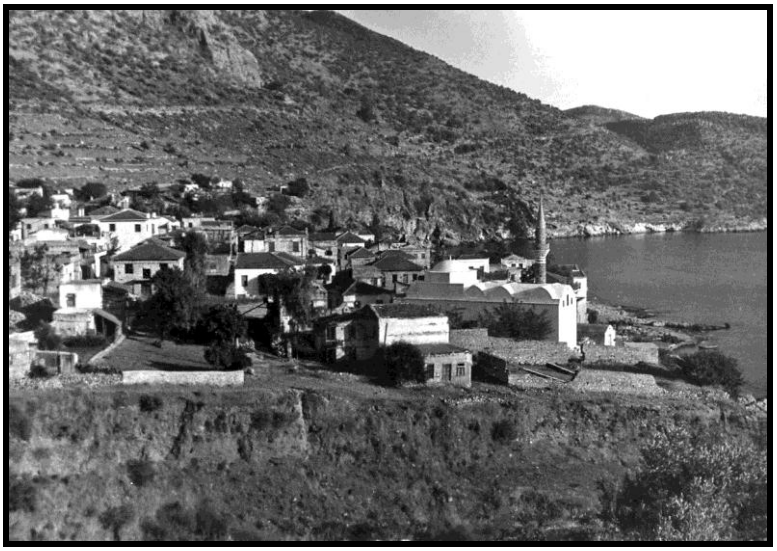


Figure 13 - Old Photograph from northwest of the town seeing side elevations of of various residential buildings[87]

Figure 14 - Old Photograph from west/southwest of the town seeing Town Hall Building and Custom's Office on the shore, as well as various buildings[88]

[86] Şeref Karabağ Kalkan Photograph Archive, estimated image date: 1970s
[87] Şeref Karabağ Kalkan Photograph Archive, estimated image date: 1970s

The maritime trade activity had begun to fade away in 1950's mainly because of the development of Turkish road network, and after 1960 the town had begun to shrink in size quickly down to a ghost town. Other than the adventurous tourists that have started to be seen in the town in 1970's, year 1984, namely the completion of the asphalt road from Fethiye, can be accepted as the beginning of a serious tourism activity which have initiated a second growing period of the town.[89]

In 1974 the Municipality have been opened again, taking the advantage of the new law providing Municipality for settlements with population size over 2.000. Based on the statements of the locals, it is known that still at the time, the population was under 2.000 and citizens living in some mountain villages have come to Kalkan for the population count and with their contribution the town succeeded for the Municipality, which is still operational.

3.2.4 Geography and Climate

Kalkan is located at the deepest point of a large bay, on a natural half-bowl like topography facing the Mediterranean. There is a continuous slope going up from the sea to the mountains on every part of the bowl-like structure formed by hard rock. On the outer extensions of the historical town centre, the slope makes it very difficult or impossible so settle, as a natural boundary. Topography is very steep in some parts, offering valleys and hills in an irregular formation.

The area has a "*typical Mediterranean climate with hot dry summers and warm wet winters, ... as the reason for a non-stop agricultural season*" through whole year.[90] There are about 300 days of sunshine throughout a year. The main plantation is the classical marquis of the Mediterranean and the olive trees, some as old as hundreds of years.

> *"It can be seen that climate played an important role in the formation of Kalkan in that the streets and passages are open to the sea and the houses sited in such a way as to benefit from the summer breezes. Balconies, planted terraces and courtyards were formed to create cooler and more comfortable areas for use in the hot summer*

[88] Şeref Karabağ Kalkan Photograph Archive, estimated image date: 1960s
[89] Karabağ, 1994, p. 21.
[90] Serim, Osman, ed., "Climate" in *Kalkan & Lycia,* Antalya: Kalkan Foundation Press, 1994, p. 8.

months while small windows, tightly shuttered in the noonday sun, ensured a modicum of comfort in the darkened interiors."[91]

The breeze coming from the sea, but still low on the moisture level, comforts the settlement even in hot days of summer. Usually the wind changes its direction throughout the day, beginning from the southeast in the early morning, ending on the southwest in the evening.

3.3 Architecture and Planning in Kalkan

3.3.1 Modern Kalkan

Current Kalkan can be considered as 2 sections; the Historical Centre and the outer parts as new Kalkan. The town had been expanded out of the Historical Centre after 1980 and particularly in the last 10-15 years. Today it became a large town, reaching to population numbers around 15.000 in tourism seasons.

The development had been under control for the Historical Town Centre. In opposition, last 15 years had been a land production process for the developing tourism sector and the 'abroad home' desire of particularly English people. For this duality basically, modern architecture of the outer parts of Historical Centre demonstrates a distinct character and totally out of scope of this study. This study presumes the Historical Centre as its domain of information, in order to understand the logic of the architectural relations that make up the organic establishment of unique Kalkan architectural tissue, whereas the outer parts are evaluated not as a part, nor as a continuation of this organic tissue.

[91] Gökçe, Fuat, Dr. "*A Look at Old Kalkan*", in *Kalkan & Lycia,* Serim, Osman, ed., Antalya: Kalkan Foundation Press, 1994, p. 37.

Figure 15 - Master Plan of Kalkan Town in 2000 - the orange area indicates the Historical Town Centre and the other parts with road network indicate mostly the modern built-up areas. [92]

The Historical Town Centre is about 66 acres of land and mostly the whole of the old Kalkan settlement. 38 registered buildings stand in this part of the Town, mostly residential and commercial, built at the same period, namely between 1900 and 1940. Nearly half of these buildings have been restored and only half of these restorations can be accepted to be successful, since the other buildings had been demolished in the name of 'restoration' in the last 20 years. The rest of the registered buildings are under conservation.

[92] Kalkan Municipality Archive

Figure 16 - Conservation & Development Plan for Kalkan Historical Town Centre, the approved revision in 1996[93]

Furthermore, the historical town centre, is under conservation until 1992, the declaration of 'Conservation & Development Plan for Kalkan Historical Town Centre'. It is possible to say that, the town centre is partially resisting the smashing pressure of tourism and business rant. The natural conservation areas around the historical centre have been under the attack of a dense building activity, as well as the planned settlement areas. The continuous and uncontrolled building activities have changed the general townscape and carried the small town into a higher form of modern settlement. However, historical town centre is still displaying certain architectural and urban qualities.

[93] Kalkan Municipality Archive

Kalkan Town have been developed fast in the last 20 years and further in acceleration in the last 10 years, particularly under the effect of developing tourism and associated construction sectors. Although a low-density master plan is operated for the whole construction areas of the town, construction activity increases indispensably, due to basically inadequate supervision on the outer parts of Historical Town Centre. However strict conditions of the Conservation and Development Plan and the efforts of Antalya Regional Council for Conservation of Cultural and Natural Heritage support the resistance of the town centre.

3.3.2 Traditional Architecture in Kalkan

> *"The old Kalkan buildings are usually two stories high but in some cases, where the road is particularly steep, there may be mezzanine. It will be noticed that the windows and balconies of the upper floors are oriented towards the sea to take advantage of any breeze. ...*
>
> *The ground floors of the houses are generally used as shops or storage space and upper floors surround and accommodate the residents' living area. The rooms on the upper floor surround a hallway and the main living room always has a sea view.*
>
> *Kalkan architecture possesses a very decorative element manifested in the sills placed between the floor levels and on the top of windows; plasters and pseudo column capitals enhance the corners of the buildings; dentiles and cornices embellish the eyes while adorned pediments complete the facades"*[94]

Before the analysis, the above descriptions are quoted from Dr. Fuat Gökçe, conservation architect and one of the authors of Conservation & Development Plan for Kalkan Historical Town Centre, in order to draw the general picture of characteristics of traditional architecture in Kalkan. However it is necessary to keep in mind that, these are brief and generalized descriptions with many exceptions existing. For discussing these characteristics and providing more detailed information where necessary, at first, mezzanine floors were employed by the merchants living in Kalkan. They are fairly low height floors not proper for living

[94] Gökçe, 1994, pp. 38-41.

spaces. These merchants were usually connected with merchants in Rhodes, Cyprus or other trading posts. They were sending products such as sesame, charcoal, silk, cotton, grain, grapes, wine, olive oil, cedar and pine coming from the settlements on the mountains, and importing particularly every kind of manufactured goods and textiles. These mezzanine floors were functioning as the storage spaces of the merchant. The ground floor was employed as the office, the mezzanine as the storage and the first floor as the residential space, all the activity on the same building.

Figure 17 - Southwest and southeast elevation drawings of traditional building on plot 187/5, with a mezzannine floor.[95]

Another note can be the resemblance of this architectural typology with the examples in island of Meis. Not only this mezzanine floor, but also many other features of traditional buildings such as the pediment and the 2-ways pitched roof, Fuat Gökçe describes this similarity by highlighting that similar size plans and volumes can be observed in Meis, where probably the original settlers of Kalkan had come from.

The traditional buildings are usually rectangular in plan with a few exceptions and made up of stone load bearing walls as the vertical structural system integrated with timber beams as the horizontal structural system. In most cases, the interior separation walls are made of bagdadi system, namely a wooden lath wall surface on both sides and infill material of stone and brick in between.

[95] The drawing is cited from Restoration Project Report for plot 187, approved by Antalya Regional Council for Conservation of Cultural and Natural Heritage in 22nd November 2002. These two elevation drawings belong to 2. period restitution proposal by the authors of the project, Sinan Kadilar and Tufan Gokkoca. The original report and the project can be found in Kalkan Municipality Archive.

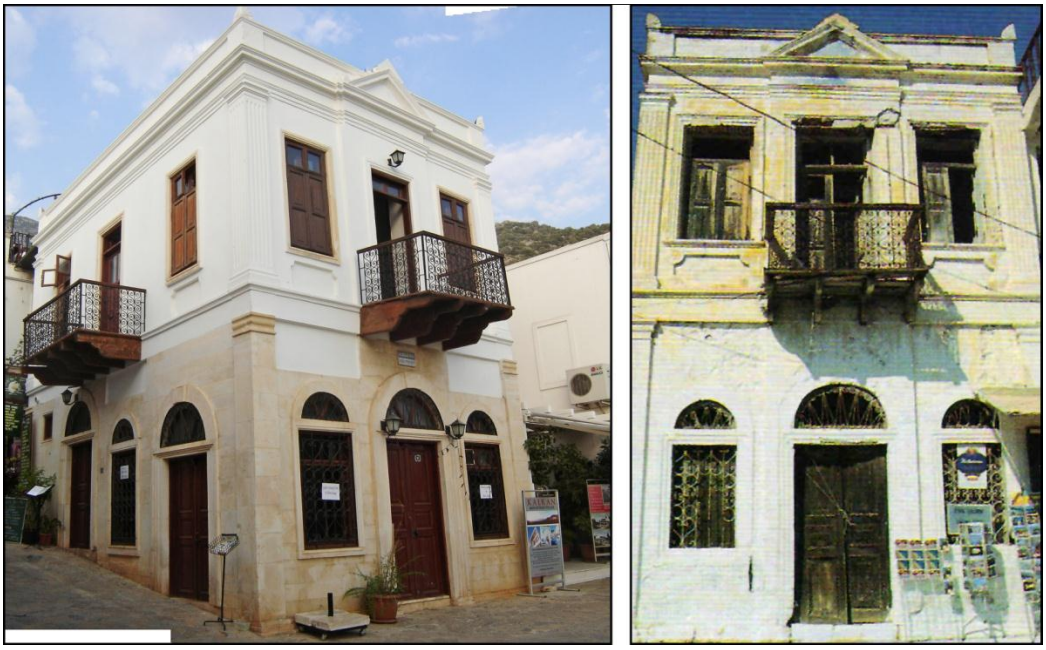


Figure 18 - After and before restoration images of building on plot 236/32. The building was utilized as the Residence of Town Governor (Nahiye Müdürlüğü Konutu), for some time when Kalkan was a 'nahiye' in Turkish administrative settlement categorization.[96]

There are various types of commercial and residential space utilization for the buildings in the traditional tissue. These variations and their frequency will be analysed in detail in the following parts of this study, as well as the structural features of the traditional buildings.

As Gökçe indicates, the orientation towards the sea for utilizing both the view and the breeze is a significant feature for the shaping of the organic tissue in Historical Town Centre of Kalkan. Orientation towards the sea as a preference is not only valid for the primary living space, but also for the primary open space such as a balcony or terrace, which sometimes becomes the primary living space, particularly in spring and summer. There are examples that this orientation requirement for living space or the open space creates problems in relation to building size, plot location and surrounding buildings. Since this requirement is strong in terms of the life style and climatic conditions in Kalkan, there are interesting and unique solutions in some of the buildings, such as this bridging balcony utilized between 2 separate plots; 196/11 and 427/50. Not only balconies are varied on many parameters, but also terraces on various levels, courtyards, gardens and any logical

[96] before restoration photo: Serim, 1994, pp. 38-41.

and possible open spaces are tested and employed in the traditional tissue in Kalkan, in order to benefit from the breeze and the view.

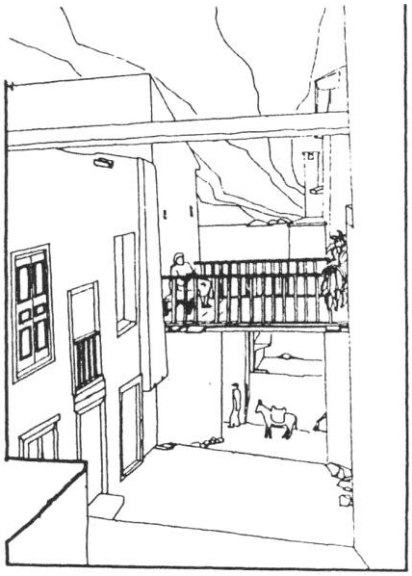


Figure 19 - A Unique Open Space Example, Wooden Balcony Bridging over the Street to the Walls of Facing Building[97]

The decorations in detail, are out of scope of this study, however a clear antique-style effect in relation to Lycian architecture, is legible on the decorations in Kalkan, particularly on pediment and building body edge and corner treatments.

Figure 20 - Decoration Examples. On left northwest elevation of building on plot 183/17, before restoration, on the right corner elaboration of building on plot 329/6 and interior ceiling decoration in building on plot196/51.

[97] Tokalı, 1987, p. 38.

3.3.3 Architectural History and Conservation Activities

There are no antique ruins in Kalkan, however Lycian land is full of architectural examples of Lycian Federation in about 60 settlements on the peninsula. Traces of Lycian architecture are still can be seen in the traditional architectural decoration in Kalkan and similar towns.

Dr. Fuat Gökçe perceives the local architecture of Kalkan, demonstrating the reflections of not only architectural but also cultural traditions beginning with Lycia:

> *"Kalkan has undergone many changes and today enjoys a rich history and cultural heritage which is clearly reflected in the traditional buildings to be seen in the heart of the community. Climatic conditions, local geography and the availability of building materials melded with the needs of yesterday's inhabitants have directly affected the distinctive Kalkan style."*[98]

The most of building stock in the Historical Centre is dating back to the beginning of the century, not considering few, if not more than one, special examples such as Mustafa Kocakaya Mosque (plot 259/55), and the undated foundations utilized for newer buildings. This perioding will be suggested for the buildings in Kalkan, in better words expanding the classification by Manolya Tokalı.[99] The traditional buildings in Kalkan, all of them being in the Historical Centre except Mustafa Kocakaya Primary School, can be accepted as architectural period when examples of traditional architecture known today were mostly built up, namely between 1900-1948. Most of the traditional buildings have been built before 1948 earthquake. After 1948 earthquake, some of the buildings were collapsed in the town and prefabricated new buildings were provided to the inhabitants. Staying in the scope of this study, it can be deduced that after 1948, as a symbolic date referring to earthquake, until 1980s the general setting of Kalkan architectural tissue had not changed much, with no particular new buildings except few examples of featureless modern residential buildings affordable for the poor settlement.

As understood from the verbal statements of locals, after road connections were built in 1950s, Kalkan have started to shrink in size, and no new particular

[98] Gökçe, 1994, pp. 35-36.
[99] Tokalı, 1987, p. 28.

buildings were built in that period. Instead some of the buildings were started to be abandoned and even demolished. After 1970-80, a new development period starts as due tourism.

Consequently, this study will presume 1948-70 period as a single period to show the traditional character of Historical Town Centre. According to locals and old photographs, most of the registered traditional buildings were existing and living at that period. For these reasons, some of the following analysis such as 'Land Use' assume 1948-1970 period as the symbolic coherent display of the traditional tissue.

It is known that these buildings have been built in relation to older buildings, either on the combination of other demolished buildings employing their foundations, or by combining small buildings. This is clear both on the traces on the foundation stones or even sometimes from the building masses, but also the statements of the locals. However tracing these indications and searching for information about the previous buildings is not in the scope of this thesis.

Table 1 - Social and architecturel perioding proposals for Kalkan Town

Period	Social and historical categorization	Architectural categorization
18??-1900	Foundation period	little known about architecture
1900-1924	1st developing period	traditional architecture is formed (as known currently)
1924-1948	Social re-organization period after the population exchange	
1948-1970	Tranquillity period	modern architecture - usually low-quality - no particular changes in the tissue
1970-1980	Tourism beginning slowly	
1980-2010	2nd developing period - construction and tourism society	massive alterations in the tissue based on tourism architecture

As a modern settlement in Kalkan, the first planning activity was the 1984 Master Plan which covers about 100 ha., 65 ha. of which is the Historical Town Centre. 1984 Plan was updated and extended 2 years later than its approval. 1986 Revision was covering about 210 ha. area, disregarding the conservation approach and respectful attitude towards natural borders. Furthermore, it is interesting to note that, 1984 Plan projects for a population of 6.000. In contrast, 1986 Revision was

based on a population of 20.000. In 1992, based on the original approach of 1984 Master Plan, Kalkan Municipality have published Conservation & Development Plan for Kalkan Historical Town Centre, declaring the historical town centre as a conservation area and announcing the basic principles and restrictions for building activity in this area. This plan has increased the few number of registered buildings in the town and has created a conservation framework which is still in use, despite some revisions in time.

In 1993, a revision for synchronizing the arrangements with the 'Revisions about the Law about Shores' has been approved, following a new plan extension in 1994 for 96 ha. land. This extension has provided new land production opportunities for the developing town.

In 1996, Development and Conservation Plan was revised and updated. There is also another revision of the Plan in 2005; however this study considers 1996 revision as the final developed version in parallel with the original plan's basic intentions in this study for the reasons briefly explained below.[100]

3.3.4 Conservation and Development Plan for Kalkan Historical Town Centre

The domain of information for the following analysis will be limited by this conservation area, Historical Town Centre of Kalkan, which have been partially surveyed and studied for various academic and professional reasons, as well as the Plan[101]. The plan had been revised in 2004, however 1996 Revision had been considered as the main information domain for this study. 2004 Revision had been realized by new and unconnected authors, the sufficiency of the qualities and experience on conservation architecture of which is open to discussions. Moreover, 2004 Revision plan seems not to display a coherent approach for updating the plan according to contemporary developments and recently occurring requirements, but instead displays a partial approach in order to legitimize some defacto applications as point-decisions. Hence this study is based on 1994 Plan and its first Revision realized in 1996 by the original authors of the plan.

[100] This information mostly depends on the official records of Kalkan Municipality.
[101] In order not to disrupt the fluency of the text, from this part on in this study 'The Plan' will be standing for 'Conservation and Development Plan for Historical Town Centre of Kalkan'.

Figure 21 - Kalkan Historical Town Centre Satellite View (Summer 2009)[102]

The domain of information for the following analysis will be limited by this conservation area, Historical Town Centre of Kalkan, which had been partially surveyed and studied for various academic and professional reasons, as well as the Plan. The plan had been revised in 2004, however 1996 Revision had been considered as the main information domain for this study. 2004 Revision had been realized by new and unconnected authors, the sufficiency of the qualities and experience on conservation architecture of which is open to discussions. Moreover, 2004 Revision plan seems not to display a coherent approach for updating the plan according to contemporary developments and recently occurring requirements, but instead displays a partial approach in order to legitimize some defacto applications as point-decisions. Hence this study is based on 1994 Plan and its first Revision realized in 1996 by the original authors of the plan.

[102] Google Earth 19th July 2009 satellite photo

Kalkan Historical Town Centre Conservation Area covers approximately 66.000 m2. All the plots in this area have been studied and categorized in 4 main groups by designers. 38 plots are offered as registered or registration-necessary buildings, namely the plots that have to be conserved or restored properly. About half of these buildings are currently restored, however most of these restorations are not acceptable according to proper restoration principles and rules. 14 plots are grouped as traditional buildings that will be rehabilitated, 100 plots as open to new building activity under the limitations and building codes of the Plan and finally 59 plots are defined as new buildings that needs rehabilitation.

Table 2 - Building and plot categories defined by Conservation and Development Plan for the Historical Town Centre of Kalkan

The Plan's categorization	Interpreted categorization terminology proposed for expressing also the current situation in 2010	Codes employed in the analysis drawings	Number of buildings
Traditional Buildings to be rehabilitated	Traditional Buildings to be rehabilitated / had already restored or repaired	T-Rhb	14
Traditional Buildings to be under Conservation	Registered and/or Restored Traditional Buildings	T-Rg	38
New buildings to be rehabilitated	New buildings to be rehabilitated / had already repaired	N-Rhb	59
New buildings / plots	Plots open to New building activity / New buildings	N	100

Drawing 1 displays 1996 revision of Conservation and Development Plan for Historical Town Centre of Kalkan, coloured according to building categories by the author. This plan also denotes the plot numbers and plot groups and will be used as the referance drawing for the plot numbers provided in this study.

Drawing 1 - Building Status for 1996 Revision of Development & Conservation Plan for the Historical Town Centre of Kalkan

Building codes and conditions for each of these categories are briefly as follows indicated on 1996 Revision of The Plan:

1. T-Rhb Traditional Buildings to be Rehabilitated:

The unqualified additions will be removed. Alterations are allowed unless altering the building mass and elevation characters. New additions will only be allowed, if they are indicated on the plan.

2. T-Rg Traditional Buildings to be under Conservation

No alterations on elevation character, no additional floors are allowed. All of the wooden elements will be conserved. Service additions for rehabilitating the life conditions will be allowed, unless they are not be perceived from the Street. Unqualified additions will be removed and similar size renewal will be allowed.

3. N-Rhb New Buildings to be Rehabilitated

Any plan alteration is available with the condition to offer an elevation arrangement properly fitting with the surrounding tissue.

4. N New Buildings / Plots

The allowed size and locations are indicated on the Plan. For plots larger than 200 m2, new proposals are available, depending on the approval of Kalkan Municipality and Antalya Regional Council for Conservation of Cultural and Natural Heritage.

Maximum height is 6.5 meters and the levelling points are indicated on the Plan. For high slopes, the building is divided into two as a gradual building. Harmony with the surrounding tissue and employing the local materials are advised. For windows 1/2 Ratio will be employed with a maximum 80 cm short edge. For balconies 1/3 of the elevation width is allowed. For elevations larger than 10 m and lacking a pediment, more than one balcony is allowed.

Hidden 2-ways pitched roof is allowed as the roof system. Terrace opportunities are indicated on The Plan drawing. Unless terrace is proposed on

the plan, roof terraces smaller than 1/3 of the total building base area are allowed. Only a single basement floor is allowed for the new buildings.[103]

If The Plan will be examined in more detail, it will be noted that a large plot on the northern part as well as the shore as a whole area, are reserved as two special project areas. Similarly, the south-eastern land standing on the high cliff behind the beach is reserved as the Conservation Sub Area No:1, with limited building allowance and suitable for criteria that will be defined in the future. Being approximately 8.000 m2 on surface, the area has to be handled in special care for two reasons; firstly its critical location in Kalkan silhouette and secondly, the geographical structure of the area where large amount of soil with a slope rests on a very high cliff on the shore. According to geological reports, the construction activity on the area has to offer special design solutions geologically.

The Plan, as a drawing, has been used as the base for all the following analysis, combined with the cadastral map provided by Kalkan Municipality. For the Historical Town Centre there are no identification groups for plots, hence the plots have been grouped and group numbers have been assigned to them, in order to simplify finding out the plots. Plot group numbers are indicated in brownish grey colour and large font size on or around the plot groups. The plot numbers will be utilized with the plot group numbers in the rest of this study, as 100/5 where 100 is the plot number and 5 stands for the group that plot 100 belongs to.

3.4 Project Site

3.4.1 Location and Selection Criteria

The site chosen as the project site is the land defined as Sub-Conservation Area No:1 on The Plan. The land has a special status. The area lies at the south-eastern corner of Kalkan Historical Town Centre, and bordered by strict natural obstacles; namely the waterway on west, shore on the south and steep rocky hills on the north and east. The site has a moderate slope down through the sea, and a great

[103] All the information is derived from Conservation and Development Plan for Kalkan Historical Town Centre. Archives of Kalkan Municipality and Fon Architecture Ltd.

view in every location. However there is a high rock cliff reaching to 20 m height on the coast.

The site possesses similar natural qualities and features as Kalkan Historical Town Centre. It is possible to observe the similar level of slope and the similar rocky soil structure on the site. Moreover, the land is isolated in a way from the rant-based building activities structurally and visually as well, which is an advantage for defining the conceptual borders of the study. And finally, the scale is perfect for working in the scope of this project.

On the north-western line the site is surrounded by Historical Town Centre and the waterway stands as the edge between these two areas. On the north and northeast directions, the site leans upon very steep slopes and finally the highway to Kaş. The southern boundary is the most definite one, as being a line formed of natural rock cliffs lying about 50-100 meters inside the shore. The cliffs are about 7 to 20 meters varying in height from the shore level, and there is a serious slope on the site, approximately 20%, arranged as simple terraces on some parts.

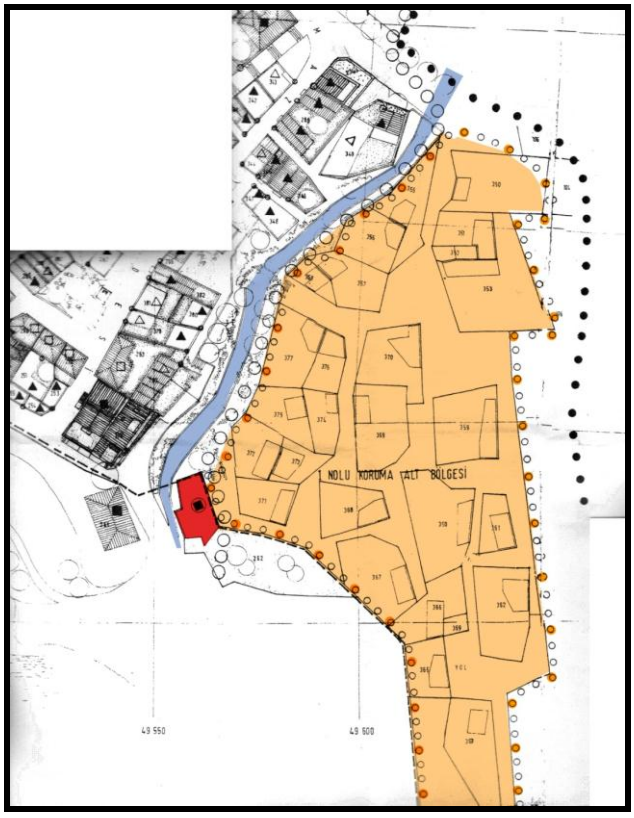


Figure 22 - Kalkan Historical Town Centre Sub-Conservation Area No: 1[104]

[104] Kalkan Municipality Archive

There are 26 building plots on the site, and habitation is conditionally allowed. The owners will have to satisfy geological precautions and offer integral designs that will be approved through Antalya Regional Council for Conservation of Cultural and Natural Heritage.[105] Small buildings owned by the low-income families were existing on most of current plots, according to the statements of locals and the study documents of The Plan, however all of them were demolished. Only plans of some of the buildings are legible through their foundation walls or basement ruins. Moreover, one of the most interesting buildings of Kalkan, 'Lami Ünal House' stands just at the banks of the waterway near the shore, mostly in ruins. (plot 262/15)

Lami Ünal House is a large residential building primarily made up of stone and wood, and stands just at the banks of waterway, on an interesting position. The building had undergone many alterations and probably expanded space by space, usually converting outdoor spaces such as courtyards into indoor spaces. The most of the building elements are demolished and basically what can be seen is only the stone walls and deteriorated wooden elements in ruins, probably because of the deterioration by the dense moisture emanating from the water.

The land possesses certain qualities, such as its positive relation with the sea and the unspoilt character. Furthermore, since the land is just on the lower parts of the slope, it is visually isolated from most of the outer contemporary settlements of Kalkan. The waterway functions as an interface between Historical Town Centre and the project site, both differentiating as a boundary, but also confronting as a bridge. Additionally the site is large enough to find space for certain building relations and urban qualities.

[105] in Turkish: Antalya Tabiat ve Kültür Varlıklarını Koruma Bölge Kurulu

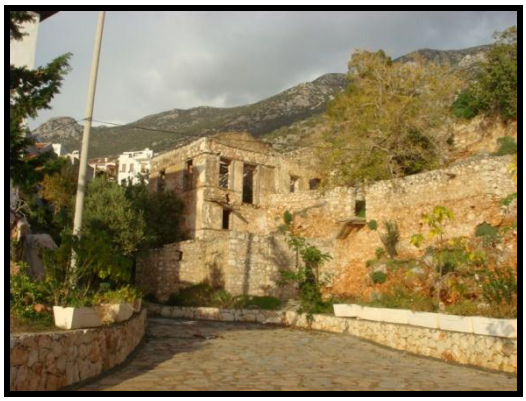


Figure 23 - Lami Ünal House from southwest

Figure 24 - Lami Ünal House from northwest

Figure 25 - Lami Ünal House from east (plot 262/15)

3.4.2 Assumptions on project site

For staying in the conceptual scope of this study, some factors about legal issues or ownership requirements will be neglected. This study will not be dealing with the structure and arrangement of the plots, however it will certainly be considering the basic guiding principles of The Plan for new building activity. However, this study, being an experimental and conceptual project criticizing the requirements and criteria of the concept of 'building new in a traditional setting', has the potential to define its own criteria and develop its own rules for the sake of the discussion.

A further architectural quality the project site proposes is the few ruins on the site. These ruins, although belonging to modern building initiatives either cancelled by the Court after The Plan is approved or left as they are for economic reasons,

mostly represent for the traditional buildings existing in their places. These traditional buildings were usually small low income residential stone buildings.[106] This study will accept these ruins as the initial point for the algorithmic design and will try to utilize them based on the conclusions of the following analysis.

[106] This information basically depends on the study documents of Development and Conservation Plan for Historical Town Centre of Kalkan. Additionally, the authors of The Plan approve that they have made the surveys for the ruins of the traditional buildings and they were indicated on The Plan as new building contours.

CHAPTER 4

BASIC ANALYSIS OF ARCHITECTURAL FEATURES OF KALKAN HISTORICAL TOWN CENTRE

4.1 Methodology of the Analysis

In this part of the study, a simple method based on conservation notions for the analysis of the primary architectural features and qualities of the buildings in Kalkan Historical Town Centre will be proposed. Analyses have been designed in 3 levels. the first group of analysis intends to picture the general characteristics of Historical Town Centre of Kalkan and will be demonstrated in the following sections of this chapter. Some of these analyses demonstrate information in relation to social status as well as architectural features, such as land use and road network analysis. These analyses sets were designed with versions displaying the status in the past for comparison opportunities. The analysis drawings provide visual representation of the outcome as well as providing location based information for understanding the structure of the organic tissue better. Further analysis express more architectural results, measuring the existence situations and frequencies of certain architectural elements, materials and their sizes in some cases. All these analyses will be supported with statistics information on tables and charts.

In order to obtain this information, in addition to all the information sources listed in Chapter 1.3.1., each building in the Historical Town Centre was recorded on a building information sheet through a basic survey, explained in detail in the following section. For documentation purposes each building is also photographed, as well as the collection of old photographs obtained from the information sources mentioned above.

On the next chapter further level analysis will be demonstrated, following the evaluation of the results of the previous analysis. In the first part of the 5th Chapter, 2nd Level Analyses stands for mostly revealing the relations between various fragments of the system, such as the frequencies of certain elements or ratios in a defined group of buildings based on the outcome of the first level analysis.

The second part of Chapter 5, 3rd Level Analysis will be expressed, in a distinctive form than the previous ones. For these analyses a group of buildings were selected according to the criteria defined in Chapter 5.3.1, for more concrete demonstration. Further analysis which will lead to the formation of the rules sets making up the system will be exercised on this selected group of buildings through digital models. All the selected buildings were mass modelled in 3-dimensions digitally for this part of the study. To be used as the basis of algorithm design, all the required spaces in relation to a building, such as open spaces, projections, or the space between two buildings are modelled as 3-dimensional primitive geometries, which can be utilized as a dynamic data set providing dimension and ratio information. Various data sets through these models will be illustrated on a comparative basis in Chapter 5.2.

These analyses aim to provide basic information in order to grasp the mechanisms and logic of the traditional architectural tissue in Historical Town Centre of Kalkan. The below classification of the analysis provide a selected set of issues required by primarily an architectural and urban research, neglecting certain subsets or intersecting sets explained above. This analysis will be the input for the following chapter, illustrating the process algorithms and displaying the results.

4.1.1 Survey and Building Information Sheet

The survey mainly aims to record the primary architectural features of the buildings. Firstly, the most significant and usable architectural features were determined to be operated in the database. These features can be grouped as follows:

a. the identity information
b. land use
c. basic sizes
d. primary building body form and relation with the slope

e. plan and facade typologies
f. conservation and alteration status
g. structural systems
h. materials and finishings
i. architectural elements and decoration

On the second stage, a preliminary design study had been realised for determining the categories and sub-categories for checking the existence of features or making a measurement on each of these categories. In this stage one of the most important factors had been the capability of potential data to be processed and interpreted when necessary. After understanding the available options and categorizations for the above titles, the results had been filtered for abstraction of the results, leading to the design of a survey sheet, seen below. Details of each of these categories and the abstraction level employed will be explained in each analysis sub-chapter.

This survey had been employed for the current buildings and the current situations as well. For some buildings, known issues about their original situation will be evaluated in the next phases in more detail.

Any information that was impossible to observe for some reason, have been researched from the images and the locals themselves. Hence any information, cannot be revealed on the physical form of the building or the obtained information, have been checked by verbal information of local inhabitants. Furthermore each building was photographed at the current situation and recorded as a part of this database.

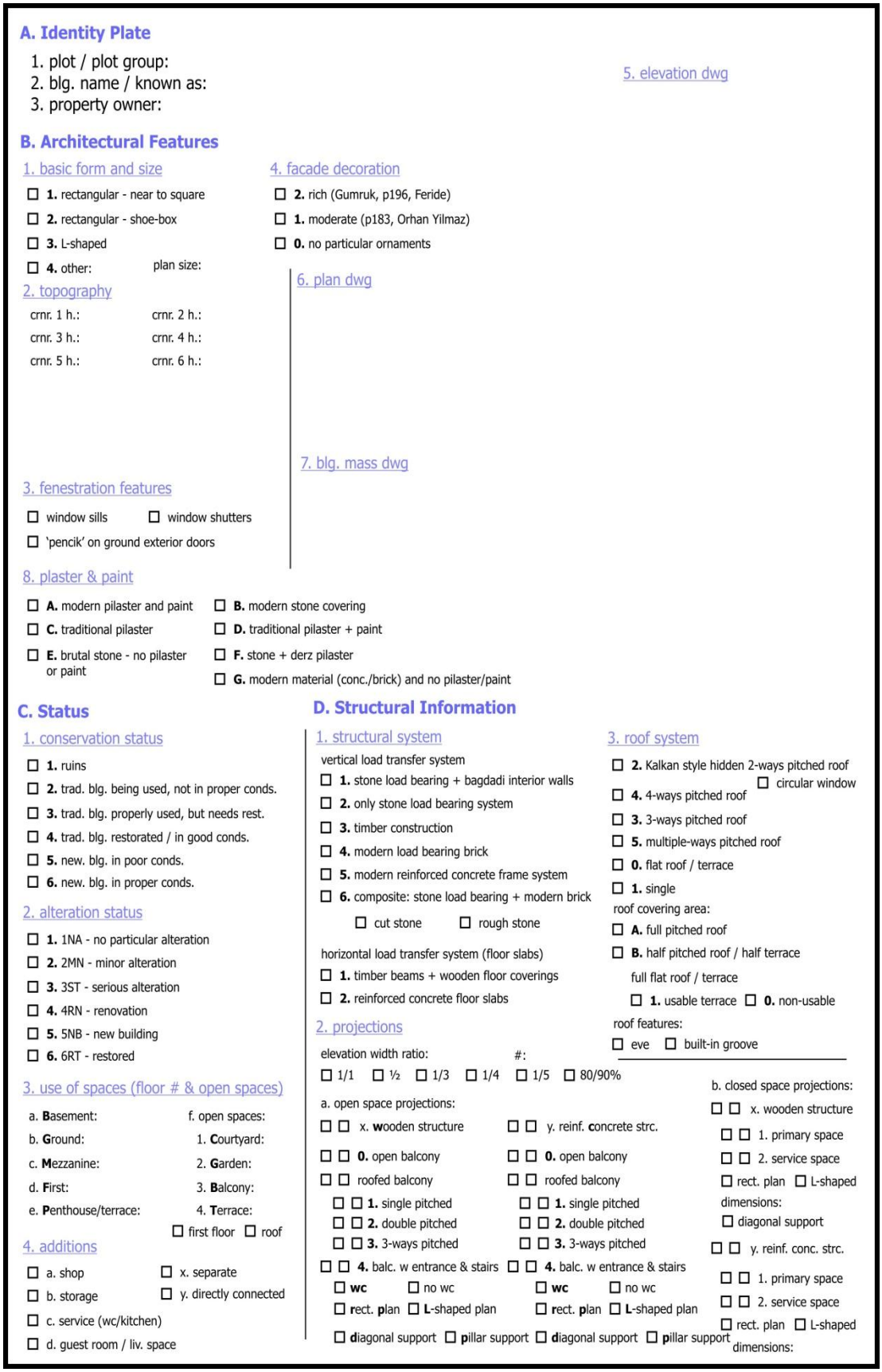


Figure 26 - The Building Data Sheet utilized for Survey of buildings in Kalkan Historical Town Centre

4.2 1st Level Analyses

4.2.1 Land Use for 1948 - 1970 Period / Analysis

Below drawing aims to display the land use for 1948-70 period, aiming to provide a general idea about the social status of the town. Most of the information about the past land use of residential and commercial buildings depend on the cross-checked verbal information obtained from local inhabitants. The few governmental and public buildings were already documented in the records of Municipality.[107]

This Land Use analysis is combined with a Floor Count analysis, since the determination of land use mostly occurs together with a floor count on the statements of local inhabitant. The buildings are either remembered as "double floor house of Mr...", or "first floor coffee shop, upper floor residence" by locals. On the other hand, this information has also been converted to a single analysis drawing displaying the built-up for 1948-70 period in Chapter 4.2.6.

Since this drawing depends mostly on the statements of the locals, it is not a fully scientific data, but intends to picture the general status of land use in that period. It will be used for a comparison material with the current land use, displaying the differences on functional patterns and open space/built-up space relations.

Plots are on the other hand, mostly the same, with some exceptions which are combined or divided, but still legible. Notwithstanding, the area staying on southeast, if you divide the land with a line as Ataturk Caddesi, had been changed completely. Some part of the sea is filled and levelled to the old coast, carrying the coast line approximately 20 meters forward to the sea. The buildings on this part of Ataturk Street were demolished and the topography of the area had also been reshaped. Since the cadastral map has the old plots, they were correctly indicated on the drawing. However the buildings on them depends on the statements of local inhabitants, checked with the photographs, thus providing results, speculative to some level.

[107] Cadastral Map of Kalkan, Kalkan Municipality Archive.

Drawing 2 - Land Use & Number of Floors Analysis for 1948-1970 Period

Further Notes for legend of analysis:

a. Commercial function, have been categorized on 4 sub-categories, for the functional meaning, utilization density and cultural meanings are all considered to be distinct, both in 1948-70 land use and current status as well.

   i. Retail: Any kind of small shops - mostly general stores run by the merchants selling a large variety of goods in 1948-70 period.

   ii. Depot/Storage: explained in article (d) below.

   iii. Office: office spaces such as a maritime ticket agency, which is very rare functional category for 1948-70 Kalkan.

   iv. Coffee shop/restaurant/bar: All these types of functions, where people come together and spent time by eating and/or drinking.

b. For most of the buildings, the basement floors are not considered, unless the basement floor is employed as a ground floor on most elevations of the buildings. These dark basement floors existing in some buildings, usually served as storage spaces rarely connected to the upper floor through an inside staircase. From the design approach, these spaces are more likely the mandatory solution for the slope instead of a primary space requirement.

c. In a number of traditional residential buildings in Kalkan, a half-floor or a low mezzanine floor was employed. When this is the case, the buildings are considered to be in the category of CR/Rs-2., commercial ground floor and residential upper floor.

d. The storage space indicated as CD on the analysis is a working commercial space rather than only a storage area. Some of the merchants in Kalkan, selling products like timber and charcoal, work in another space as an office for purchase operations or a shop for also selling other small bodied products. When this is the case, the depot is a retail space as well for large bodied products, such as timber and charcoal. It is usually serving actively for most of the work hours, instead of being a rarely used space.

e. Article CR/Rs-fr refers to horizontally separated buildings without any distinction to the floor number. There are few examples and these buildings were usually either 2 stories, or 2 stories and basement, or gradual buildings. in 2

stories Usually the retail space is owned by the family living in the residential part of the building. In most cases, front elevation looks to the north and the higher part of the slope. In this case the retail is either single storey on the ground or offers a basement storage space as well. The residential space looking to south, on the other hand, offers a ground floor and a first floor adjacent to the retail space on the other side.

f. DA stands for completely desolate or abandoned buildings in 1948-70 analysis drawings. According to local inhabitants these buildings were usually in at least half-ruin conditions, and usually lacking of floor slabs or a protective roof in that period.

4.2.2 Land Use for 2010 / Analysis

Current land use situation is demonstrated on the following drawings, separated for floors distinctively, depending on the real survey information. Hence, these drawings are single-floor land use analysis and do not content information about floor numbers of the buildings.

However all possible floors are not taken into consideration in this analysis. Basement floors, unless they are not like a ground floor, are not taken into consideration. Most of the basement floors turned to be, or even many cases of recent buildings, designed to be, ground floors. In this sense, if the basement both architecturally, and also functionally work like ground floor, and perceived as a floor on the building elevation, then it is assumed to be a ground floor and considered in the Ground Floor Land Use Analysis for 2010. If it is a real basement floor, then it is not lighted well, mostly under the soil level and not employed as a ground floor functionally. For the land use point of view, this assumption causes the neglectence of a few number of storage spaces.

Furthermore, mezzanine floors are also not considered in this analysis, since there are only few examples, and in all of them mezzanine is connected functionally either with the office below, or the residence above. Thus, mezzanine floor usually serves as a low-height storage similar to its original functions or in some buildings such as pension or hotels, as an uncomfortable accommodation space. However

mezzanine floors will be counted in as a separate floor in the Floor Count Analysis in Chapter 4.2.15.

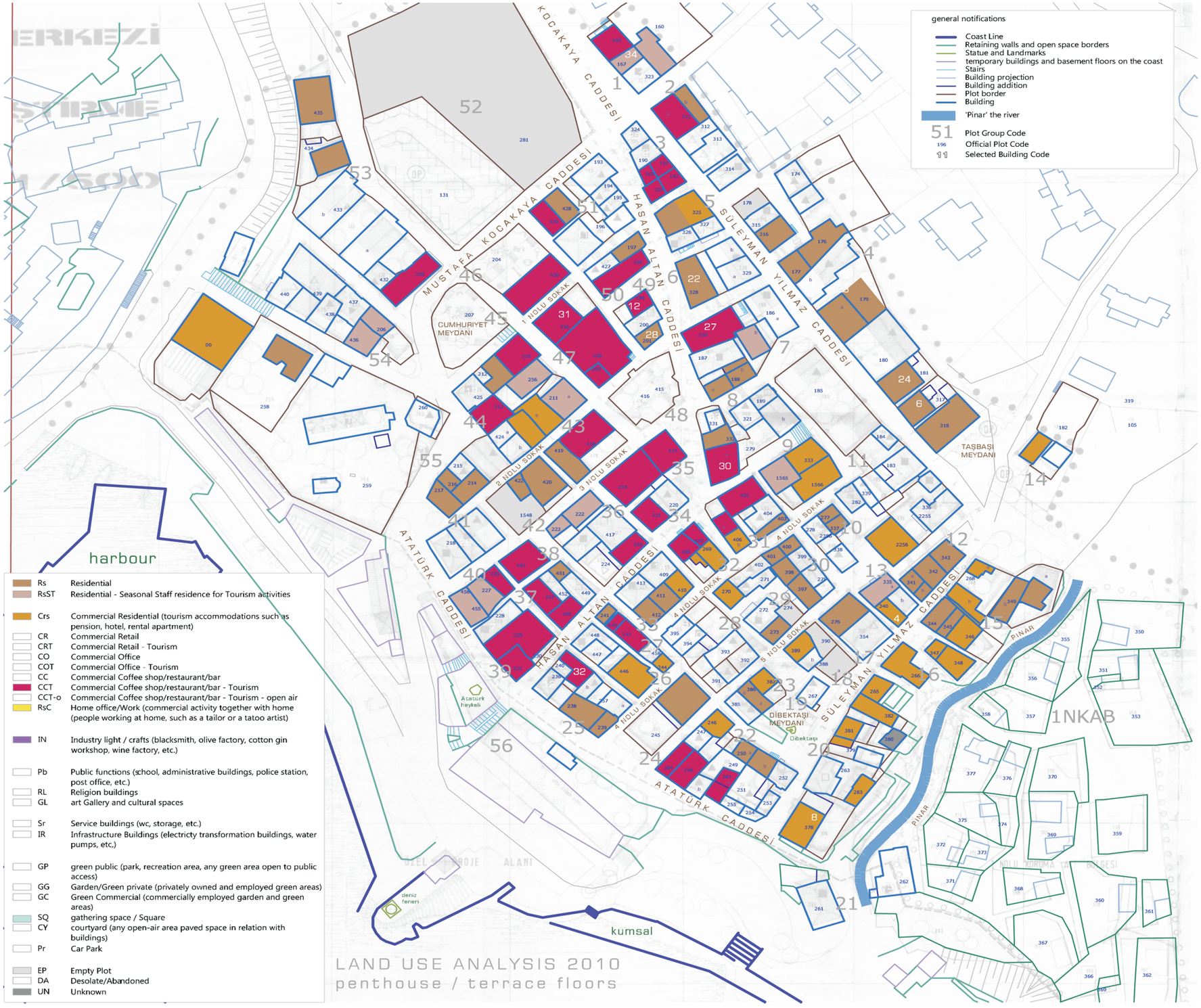
Second floors were also not considered, since they are only on a few buildings, mostly not properly constructed and furthermore indicated in Floor Count Analysis in Chapter 4.2.15.

Finally, in today's Kalkan there is a dense penthouse/terrace floor employment for both commercial and residential activities. In some cases, penthouse space is utilized in relation with roof terrace. In some other cases, the entire flat roof is utilized as a commercial terrace and has no penthouse space at all. Although this is the case, the terrace usually possesses some temporary structures to establish a small closed space. In any situation this demonstrates a serious usage on that floor, thus a separate penthouse/terrace space land use analysis drawing is provided.

Any consideration about the height or the floor count of penthouse/terrace level is not taken into account. The roof level of each building is presumed as penthouse/terrace level. Either there is a penthouse space or an active roof terrace utilization, or both, the building is assumed to possess a penthouse/terrace floor and considered in the related Land Use Analysis drawing.

Drawing 3 - Ground Floor Land Use Analysis for 2010

Drawing 4 - First Floor Land Use Analysis for 2010



Drawing 5 - Penthouse/Terrace Floor Land Use Analysis for 2010

Further notes on Land Use 2010 Analysis drawings

a. Commercial function, have been categorized on 4 sub-categories, as indicated in Chapter 4.2.3.
b. Tourism as a sub-category is differentiated as the commercial facilities directly working through tourists. Since it is difficult to define such a concept, however comes out as a clear fact in the commercial structure of the town, this had been available through differentiating the facilities that are either closed or demonstrating a drastic reduction on their income in winter time. Through this differentiation, the drawing also displays the summer and winter commercial activity difference.
c. There is a variation in Residential building category for 2010 Analysis, namely RsST - Seasonal Staff Residences. These buildings are usually rented for a tourism season by the owners of restaurants, coffee shops and similar facilities to accommodate the staff as a group. These buildings are treated differently from the residential buildings, since they are seasonal residences, utilized like a low-quality hostel. The buildings are usually not in proper conditions.
d. Considering the high land values, it is very difficult to find a building to be in DA - Desolate / Abandoned category, despite the few examples. These examples, some of them are in ruins status, or lacking enough conditions to be employed are categorized as DA.
e. CCT-o category is displays the commercial land use on streets or other public areas. In these cases, land is usually owned by the Municipality or the Public. Either a small shop in the basement floor and not eligible for tourism activity employs a certain area on the street, or a proper ground floor commercial space extends its capacity to outside in the similar way.
f. Residential storage spaces on the ground floors are not differentiated as depot/storage, but instead displayed as residential spaces.
g. Courtyard as a term utilized here for not a specific courtyard space, but instead to indicate any paved open space in relation to a building, without any distinction about its function, to stay in the scope of this thesis.

4.2.3 Land Use for 2010 - Land Use 1948-70 Period / Discussion and Comparison

In 1948-70 analysis, a balance can be observed between residential buildings and commercial buildings. Commercial buildings are mainly assembled on Hasan Altan Caddesi, which seem to be the main vertical axe, and some more on the coast, Ataturk Caddesi, which seem to be the main horizontal axe. Residential buildings, on the other hand, seem to be distributed around the town, beginning from the second blocks behind commercial buildings.

There is also a balance between single floor and double floor buildings, whereas there only very few three floor buildings. If the town is divided with a line on Hasan Altan Street, there are more single floor buildings on the eastern part, and more double floor buildings on the western part. This distinction is clear on functional level as well. The eastern and south-eastern parts of this line seem to be the lower income part of the Town, since the floor number and building base area values are reducing in this part. The public functions and administrative buildings stand on the western part.

Similarly a variety of unbuilt spaces, such as empty space, garden and courtyard can be observed in this part of the Town. There are lots of gardens and green areas in the entire town and furthermore in the eastern part in 1948-70 usage.

Furthermore, existences of 5 distinct squares are noted in the Land Use 1948-70 drawing. Cumhuriyet Meydani, on the western part of the Town, is planned square, which is utilized for official ceremonies, yet the others are public gathering places, probably established through the inner dynamics of Town.

In order to have few words about these squares; The square on the coast was very crowded particularly in the daytime, nourished by the ‘Külüp’ and coffee shops around, the commercial offices, the Town Hall, bakery and Maritime Office, as stated by local inhabitants. It was also on the path for leading the locals to the coast. The other square almost on the bending corner of Hasan Altan Street was also a gathering place, more nourished by the merchants and the people buying their goods. Dibektaşı Meydanı was a on the path leading to the water source and moreover there

was a 'dibektaşı'[108], a special circular rock with a small hole engraved on the middle, utilized for grinding certain materials such as coffee. So people utilizing dibektaşı and locals going to and coming from the water source were gathering on this space.

Another square was on the north-eastern part, called 'Taşbaşı' which was again a junction point for particularly people living in the northern parts of the town. The climate was probably pushing people spend more time outside and all these gathering areas have found their contributors for this reason.

Some small-industry/crafts buildings, particularly on the north half of the town, on the perimeters or near the perimeters can be observed on the drawing.

When Land Use 2010 drawings are the case, the ground floor drawing clearly signifies the massively increased weight of commercial facilities, particularly on the western part of the division from Hasan Altan Caddesi. Almost the whole area as well as the parts of the eastern division have turned to me commercial facilities, most of them seasonal. Similarly, there is a distinctive reduction in the empty areas and green spaces. There are no private gardens, except a few examples of large buildings, which did not turned into commercial facility yet or not allowed to build in their garden. Cumhuriyet Meydani and the governmental plot on the north part were turned to be parks, as well as the square on Hasan Altan Caddesi, yet none of these are neither used by people, nor green. The other squares are not functioning as gathering places, since Taşbaşı Meydani became a car-park area and Dibektaşı Meydanı is probably the only empty space that had not lost its character in physical form and environmental relations, yet area is not used as before.

Some of the courtyards of residential buildings seem to be still courtyards, however, since most of the buildings in relation with courtyard were turned to be commercial buildings, most of the courtyard spaces are used as storage areas or non-functional empty spaces, for some of which even access is physically limited. However all the paved open spaces in the plots are treated as courtyards in these analyses.

The eastern part of the division from Hasan Altan Caddesi seem to be still more residential area, whereas residential buildings are not many, particularly the linear zone on the banks of the river and some other areas were converted to be

[108] large stone mortar in Turkish

pensions and rental homes, and some others to be staff residences. Still it can be said that, the part between 4th Street and 'Pinar'[109], the river, seem to be the more residential district of the town with a lesser level of touristic density.

There are no industry/crafts buildings in the Town in 2010, and plot group no 52 seem to be the only large space that is left, and which can be utilized for something beneficial for the public.

Another outcome that can be read from the drawings is that many commercial activities extended or diffused to the streets and other public open spaces. There are no public, administrative or social functions in the Town Centre, with an exception of an art gallery, one of the good restoration examples on plot 236/25, and the existing mosques on the perimeters of the Town Centre.

Some service space additions, located on the small spaces between buildings or sometimes overflowing or overhanging on the streets are differentiated when 1948-70 and 2010 Ground Floor drawings are compared.

On the Land Use 2010 First Floor drawing, there is a more balanced relation between residential and commercial spaces. Probably first floors are more difficult to be employed by commercial activities. These two functional categories are prevailing categories on this drawing and the third category is the CRs - pension/hotel/rental apartment, clustered in the south-eastern part. Mostly these buildings are not divided functionally, and on all floors the same function is utilized.

2010 Land Use Analysis also demonstrates that there are almost no single floor buildings anymore. On the other hand, Penthouse/Terrace Floor Land Use 2010 drawing demonstrates that not all of the buildings have a penthouse/terrace floor function. Although, it is clear that more than half of the buildings possess a penthouse/terrace function, which again concludes with the usage density pressure, if there are almost no buildings utilizing their penthouse or roof terrace in 1948-70 period. In addition, it can be concluded that particularly buildings covering large areas are utilized on their penthouse/terrace levels.

[109] "Pinar", meaning "spring" in Turkish, is the local name given to the River on the eastern part of the Town. It is probably the fresh water source that has been indicated by Piri Reis.

4.2.4 Built-up Space and Open Space for 1948-70 Period / Analysis

This drawing intends to get a better understanding of the built-up space for 1948-70 period and its relation with the general open spaces of the tissue. Similar to the previous period drawings, the information demonstrated on this drawing is based on three sources mainly; the cadastral maps in Kalkan Municipality, verbal information obtained from local inhabitants and old photographs.

Plots are mostly correct depending on the cadastral maps. Statements about the buildings are also cross-checked and certified with the photographs in order to increase the accuracy of the entire analysis. There can be mistakes or interpretation problems, however the drawing will contribute for picturing the general structure of the built-up spaces for the period, its relation with the open spaces, and provide material for comparison with the current situation.

Additionally, the floor numbers were also categorized as a secondary information in this analysis, for presenting an idea about the general height level and mass structure of the built-up space. Similar to the previous analysis, real basement floor are not taken into consideration when determining the floor numbers.

Drawing 6 - Built Up Space and Open Space Analysis for 1948 - 1970 period

Since cadastral map does not display the exact building locations on the plots for the part on south of Ataturk Caddesi, the information on this part assumed to be speculative and drafted in dotted lines. Plot information depending on the cadastral maps, building information depending on the cross-checked statements of locals and old photographs, and the building numbers seem to complete the picture about the built-up space in that area. The exact positions and sizes of the buildings may be misleading in some parts of this area.

4.2.5 Built-up Space and Open Space for 2010 / Analysis

In order to provide a better understanding of the built-up space of the current tissue, and its relation with the general open spaces of Kalkan Historical Town Centre, a drawing displaying all the built-up spaces for the current situation is proposed in this part. The drawing only displays the building masses, without any distinction to their function or origin. It demonstrates the built-up space arrangement in the current situation, as a background-foreground relation with the open spaces in general.

For displaying the character of the open spaces, open spaces are categorized in green and grey tones. The public, private and commercial green areas, courtyards, car parks are indicated as open spaces. Employment of streets and public open spaces as commercial areas are also displayed in the analysis. Empty plots and Desolate/Abandoned buildings or ruins are also indicated, since they are presumed as not being a part of the built-up space.

Drawing 7 - Built Up Space and Open Space Analysis for 2010

4.2.6 Built-up Space for 1948-70 - Built-up Space for 2010 / Discussion and Comparison

The Built-up Space 1948-70 Analysis Drawing highlights the discussions about the built-up spaces and open space on Chapter 4.2.4. It is clearly legible in this analysis that there were plenty of open spaces in Kalkan Historical Town Centre for 1948 - 1970 period. Particularly the green areas were clustered in the south eastern part of Hasan Altan Caddesi, yet the other part also keeps the same balance between built-up and open spaces through the empty areas, 2 large squares and the large green area around the Mosque.

On the other hand, when the floor count is considered, the higher buildings are mostly clustered around Hasan Altan Caddesi and Ataturk Caddesi, 2 main axis of the tissue, for 1948 - 1970 period. The single floor and double floor buildings seem to be in a certain relation or balance. There are only 2 buildings that have 3 floors due to the statements of locals, one is a residential building and the other is the Town Hall Building, near to each other and on the south-western quarter of the town.

As a concluding remark, it is possible to say that some of the empty spaces around the plots become more meaningful on this drawing when they are as if completed with some more empty spaces inside the plots, such as gardens or courtyards or empty spaces.

In 2010 Built-Up Space Analysis, the reduction in the number and area of all open spaces is clearly distinctive. Most of these spaces are filled with building mass, exceptions of parks and the gardens of registered buildings which are strictly under conservation. The large green area (plot 185/11) on Süleyman Yılmaz Caddesi draws attention in this sense, as the largest open space in Historical Town Centre, other than the reserved Special Project Areas and the garden of Mustafa Kocakaya Mosque (259/55).

It is possible to find open spaces on the banks of Pinar on some plots as an exception. It can be claimed that, 3 parks, the land around the Mustafa Kocakaya Mosque, above mentioned single unbuilt plot and few green areas on the banks of Pinar make up all the open space of Historical Kalkan Town Centre, except the streets.

Metaphorically, the streets are used as open spaces of commercial activities, mainly restaurants, cafes and bars. It is logical in one point, when it is considered that people need open spaces, particularly in Mediterranean climatic conditions, and since there are no open spaces left in the town, some spaces are extended or diffused to the public areas and streets. From another point of view, the town seems to have lost its open spaces for living, and now utilizes streets and other available public areas for open spaces.

4.2.7 Road Network and Alterations / Analysis and Discussion

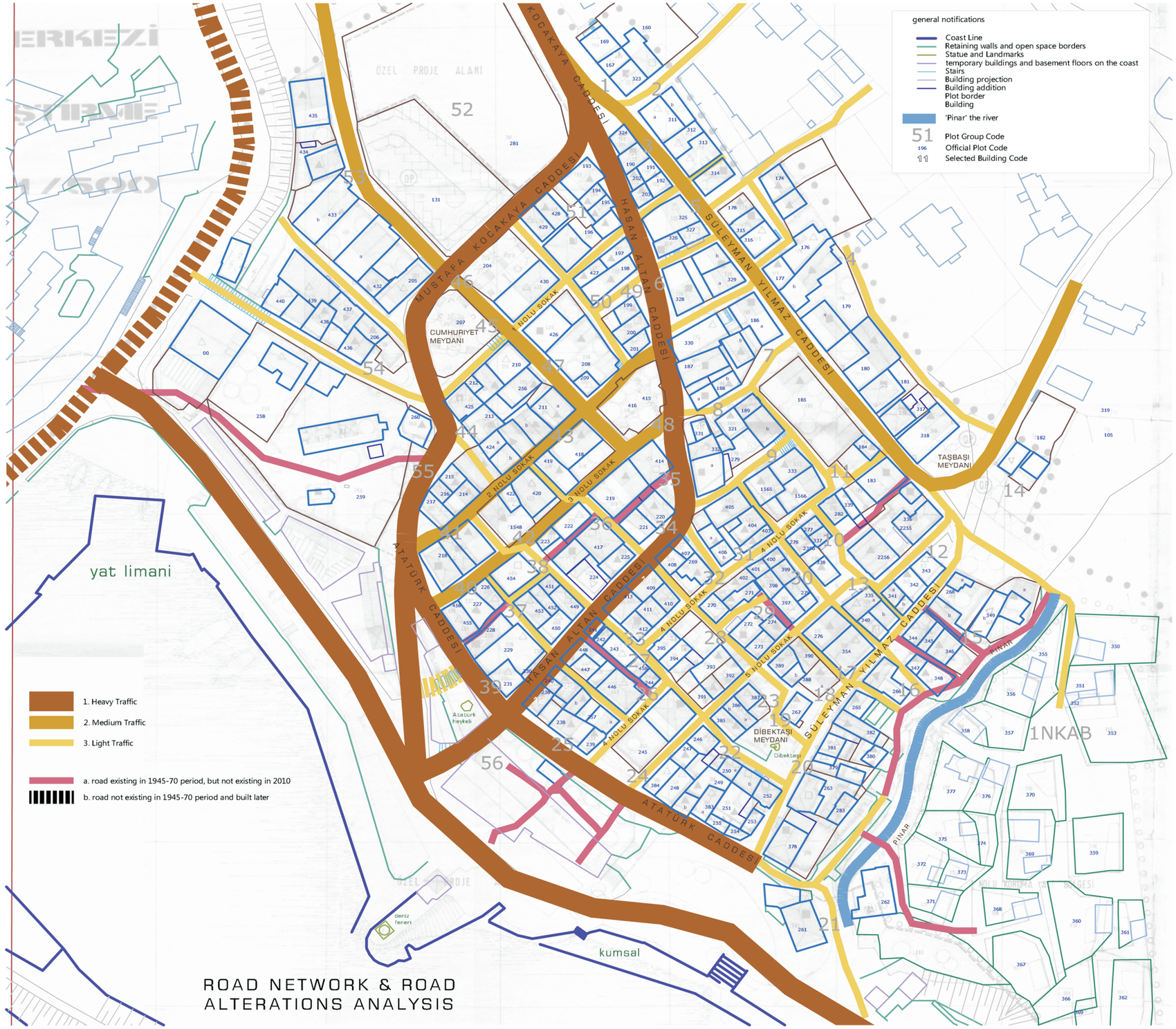
Current road network of Kalkan Historical Town Centre and its reference to 1948-70 period are demonstrated together in this analysis. This drawing intends to display the road network together with the usage densities of the roads.

To begin with, it is necessary to note that all roads and paths in the tissue, even streets that narrow down to 1.20 meters width on some locations are indicated on drawing. Secondly, the roads and paths employed in 1948-70 period were also denoted. The first part of legend, indicates usage densities of roads in 3 categories. Since, most of the conservation area is closed to the vehicle traffic in daytime in the tourism season, the graph indicates the traffic level as a general usage density on the road, namely vehicle traffic density when vehicles are allowed and pedestrian density in other cases. On some points a road's density level may change drastically between high-season and off-season, however these exceptions are neglected for this analysis. Primarily it can be stated that the main axes are the densest roads both in summer for pedestrians, and in winter for vehicles and pedestrians.

Furthermore second part displays the indications for alterations on the paths, namely the roads that become non-usable, mostly because of the additions and exaggerated projections on the buildings. Alternatively few roads that have been altered because of a change on the ownership status or function of the land, are also presented in this category. The roads that have been built in the later times, mostly recently are indicated in the final category with hidden lines, in their respective colours due to the density category.

a. road/path existing in 1948-70 period, but not existing in 2010

b. road/path not existing in 1948-70 period and built later



Drawing 8 - Conservation Status and Alteration Level Analysis

The drawing clearly indicates that the physical status of the tissue had not altered much, since most of the roads and paths are on the same location and actively utilized today. Moreover, the three main streets; Hasan Altan Caddesi, Ataturk Caddesi and Mustafa Kocakaya Caddesi were even not altered in their usage density level. They were the busiest streets in 1948-70 period and they are still in 2010.

Additionally, there no new roads worth mentioning, except the large road connecting the Harbour with the above round about, mostly out of the borders of Historical Town Centre, on the north-western part. This fact demonstrates an interesting conclusion, that the built-up space have extended and enlarged on every direction and every possible method, however since the plot structure is not altered, probably there is no new path requirement in the town. In other words, the increasing population and amount of closed space in the tissue, does not require new road connections. But this must not be understood as a capacity problem. It is clearly observable that there is a car-park problem in Historical Town Centre. Moreover in the summer time the area is closed to vehicle traffic, but still the streets are filled up sometimes with people. However the physical built-up structure of the Town, although it has reached to its utmost points utilizing all means, does not strictly require new paths.

Going one step further and considering not only this analysis, but also the previous Land Use analysis, it can be stated that, despite this enlargement effect in the mass of the town, the main structure of the tissue has not been altered much. This is not related with the buildings themselves, which will be topic of discussion in the next analysis, and not about the land use patterns directly. However, it is seen that, the paths, the primary axes, the high-density and low-density areas and the centre of attraction in the tissue are not altered much.

According to the statements of local inhabitants, there had been a path leading people to the wine factory on the western part of the Town, passing in front of Mustafa Kocakaya Mosque (plot 259/55) from the rock formations. Today there is no wine factory there and this path is not usable. Additionally there are some tiny streets which are blocked by additions, at least some of which are illegal. The primary problem about these blockades is not related with routes, since building blocks are varying in widths between 7 - 25 meters. Thus one can go and pass from

the next street, however for some reasons this seem an important problem for the tissue;

Firstly, the blockades obstacle the wind breeze going through these channels between the buildings for the whole slope. This is valid for particularly the vertical streets. Secondly, since the built-up space has reached its utmost level in the tissue, filling up the streets becomes pushing the limits. And thirdly, for some open spaces, such as courtyards which are not utilized effectively today, there are no more access options. For example, a building converted to a restaurant, utilizes its courtyard, or backside garden as open air storage space and blocks the only path coming to that open space by an addition. Hence the space becomes impossible to access for pedestrians, whereas staff reaches the space from interior, or passing under the low height of a projection. There are 8 street blockades, detected and indicated on the analysis drawing.

Figure 27 - Blockaded street between plots 417/36 and 226/36.

Figure 28 - Blockaded street bw plots 228/37 on one side, 226/40 and 227/40 on the other.

Another significant problem is related with the banks of Pinar. Statements by local indicate that it was possible to travel around on the banks of the river, even though there was not a clear road. And besides there was a bridge providing access to the other side of the river, until recent times. Now it is seen that, one can only walk 35-40 meters on the banks of the river from south to north, until aligning with the building on plot 380/20. The river and its banks are highly valuable and have to

be arranged accordingly, particularly in such a situation of tourism and economic pressure pushing all the limits of built-up space and filling all the gaps. It is a still open space without access and without private ownership on most parts and area can be arranged for people's access, with green areas and the bridge reaching the other bank.

4.2.8 Conservation Status and Alteration Level / Analysis

Conservation Status and Alteration Level of the buildings were handled distinctively in the survey, however they are displayed on the same analysis drawing in order to provide 2 layers of information together.

Conservation Status Analysis intends to demonstrate the era of a building as well as its level of protection or degradation as an entity. The habitation conditions were also classified as an indication of buildings conservation status. For this analysis, 3 primary categories are defined, displaying the era and conservation status of the buildings.

1. ruins: Any ruin, without attention to its architectural features is classified in this category. Ruins are not conserved as buildings that we can collect information about the building's original features, however it may provide certain types and levels of information such as, base area, structural system, partial dimensions, information on openings and etc.

2. traditional buildings: Primarily the buildings built with the traditional techniques and local material before 1970-80 period belong to this category, without any attention to style or features. The usage of local material is not a strict criteria, yet there are some buildings, mostly used as storage spaces or simple industrial activities, that were built around 1960 with brick and concrete slabs or mixed use of traditional techniques with concrete slabs. Since these have been usually built with local resources and the intention about understanding the periodic structure of tissue is prior, they were categorized as traditional buildings. There are 3 sub categories for grouping the conservation status of traditional buildings:

2A. not proper for human habitation: Buildings that are desolate and unemployed, but not in ruin status, are classified in this category. Furthermore a traditional building that is somehow employed, but not in proper conditions

for human habitation is also classified here. Any building, some of its components are in ruin state or displaying a high level of material deterioration, lacking parts in its structural system, roof, floor coverings and fenestration elements are categorized here as well.

2B. proper for human habitation: Traditional buildings, mostly employed by their original owners or the members of the family and still used are in this category. Here the building displays proper conditions for human habitation, such as a closed roof, fully covering fenestration features and proper sanitary systems. However still there are material deteriorations on the structure and finishings, which make the building necessary to be restored.

2C. restored or renovated: Traditional buildings in good condition, displaying no critical levels of material deterioration or lacking parts, or no serious problems depending on lack of materials are categorized in this group. These buildings have usually undergone a comprehensive renovation or restoration or repairs for most of its elements continuously in time.

3. new buildings: The buildings that have been built after 1970-80 period, with modern materials and usually employing concrete as the structural material are classified in this category. The conditions of the buildings are grouped in 2 sub-categories for new buildings:

3A. poor conditions: Any building, desolate, lacking serious parts in its structural system, roof, floor coverings and fenestration elements, or demonstrating a high level of deterioration on some of its materials are categorized here.

3B. proper conditions: This category groups the new buildings that offer proper conditions for human habitation, and no serious structural problems or lacking material.

Analysis about the alteration levels of buildings intend to provide information about the level of alterations made on the original form of the building. This analysis is not related with the deterioration level of the materials of the building. Instead, this analysis targets to display the legibility potential of the architectural elements and features of the building. Even though a building is deteriorated to a certain level which may even make habitation very difficult, but it can still be categorized as `no

particular alteration`, since its original architectural features are mostly readable. The categories are as follows:

1NA no particular alteration: Basic building form and most of the architectural features have not changed for a long time. There are no particular additions or subtractions on the building form, affecting the function or architectural features of the building. All or most of the architectural features such as door, window, terrace, balcony, floor, ceiling and ornaments are original. 1NA category buildings may express small alterations in order to synchronize with the contemporary life requirements.

2MN minor alteration: Main building form is original, yet some additions or subtractions that affects the use and the architectural features of the building, are observed. Service additions, minor plan alterations, change in the architectural features of 1-2 spaces, entrance alterations, alterations in size, shape and location of some fenestrations are included in this category.

3ST serious alteration: Partial or entire structural system changes, reinforced concrete transformation on the slabs, inclusive plan and section alterations are the elements of this category. However, it is still required for a building to demonstrate the primary features of the basic building form and at least some of architectural features of the original building, to be classified in this category.

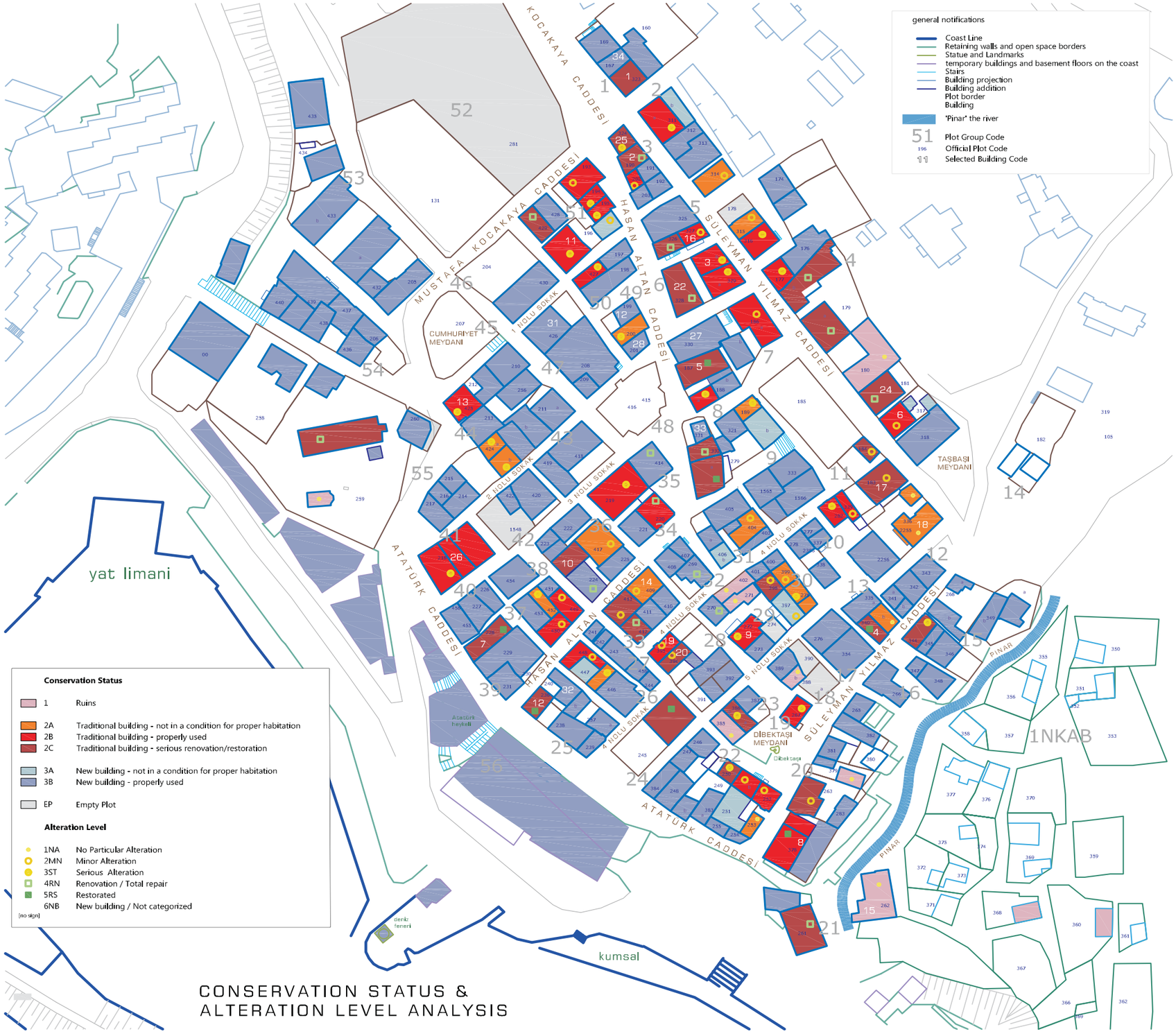
4RN renovation / extensive repair: The building has undergone an extensive renovation or repair. Usually some of the primary features such as structural system, floor system and service spaces are replaced with modern materials, techniques and plan solutions. This category holds the buildings that have gone a comprehensive renovation operation without an officially approved restoration project, since building is not registered. For buildings in this category, it may be very difficult to collect information about the original architectural features, depending on the quality of the renovation operation. Usually it is necessary to have a deep examination, and anyhow at least the main features such as the building body, dimensions and floor numbers are proper with the original situation.

5NB New building: The building has been constructed after 1970-80 period, and possesses no clearly readable common architectural features with the

original building in its place. The 'new building' category on the Conservation Status Analysis mostly matches with this category and 5NB Alteration Status Level is not indicated with a different sign on the analysis drawing. Hence buildings categorized as new buildings, namely 3A or 3B for their conservation status belong to 5NB category for Alteration Level classification and denoted with no extra sign in the analysis drawing.

Exceptionally, in some cases a new building have been designed and built with a certain sensitivity with the architectural features of traditional tissue in Kalkan, particularly in the final 30 years. If this is the case, the building was indicated as new building in conservation status, and notwithstanding with the other new buildings, an alteration level have been assigned for declaring the building have certain architectural features worth mentioning.

6RS restored buildings: Buildings that have been restored officially with the approval of the Antalya Regional Council for Conservation of Cultural and Natural Heritage and Kalkan Municipality. Normally a proper restoration project has to be assumed for transferring the maximum information about the original features of the building. Sometimes this may not be the case in the application. However, in this category, not depending on the success of the restoration, the building is assumed to provide information about its original features by itself and by the satisfactory documentation of restoration project including photographs and approved surveys. Hence, the building physically may lack to transfer the original architectural features in some cases, however this category ensures that the original building had been documented.



CONSERVATION STATUS &
ALTERATION LEVEL ANALYSIS

Drawing 9 - Conservation Status and Alteration Level Analysis

4.2.9 Conservation Status and Alteration Level / Discussion

From conservation perspective, traditional buildings are distributed evenly in parts of Town centre. Significant buildings with particularly large base area or plot areas seem to have been renovated or restored, and smaller buildings are usually in lower conservation levels. Nearly half of the buildings are traditional and nearly half of them are in 2B or 2C status, namely conserved well. This is evaluated as a positive issue for understanding architectural features of the tissue. From another point of view, if the density of commercial activity and high rate of conversion of land use patterns are considered, a better conservation level can be expected.

Table 3 - Conservation Status Values Distrubition

	CODE	TOTAL SURVEYS	205	100,0%
1	1	RUINS	7	3,4%
2	2A	TRADITIONAL BUILDINGS - NOT PROPER FOR HUMAN HABITATION	18	8,8%
3	2B	TRADITIONAL BUILDINGS - PROPER FOR HUMAN HABITATION	29	14,1%
4	2C	TRADITIONAL BUILDINGS - RESTORED/RENOVATED	28	13,7%
5	3A	NEW BUILDINGS - NOT PROPER FOR HUMAN HABITATION	5	2,4%
6	3B	NEW BUILDINGS - PROPER FOR HUMAN HABITATION	118	57,6%

Table 4 - Traditional Building Figures

1	TOTAL TRADITIONAL BUILDINGS INCLUDING RUINS	82
2	TOTAL TRADITIONAL BUILDINGS EXCLUDING RUINS	75
3	TOTAL TRADITIONAL BUILDINGS EXCLUDING RUINS AND RESTORATIONS	47

Alteration Levels Analysis provides complimentary information for above results about information quality provided by the traditional buildings.

Table 5 - Alteration Level Values Distrubition

	CODE	TOTAL SURVEYS	205	100,0%
1	NA	NO PARTIUCLAR ALTERATIONS	10	4,9%
2	MN	MINOR ALTERATIONS	20	9,8%
3	ST	SERIOUS ALTERATION	32	15,6%
4	RN	RENOVATION /REPAIR	13	6,3%
5	NB	NEW BUILDING	119	58,0%
6	RS	RESTORED	11	5,4%

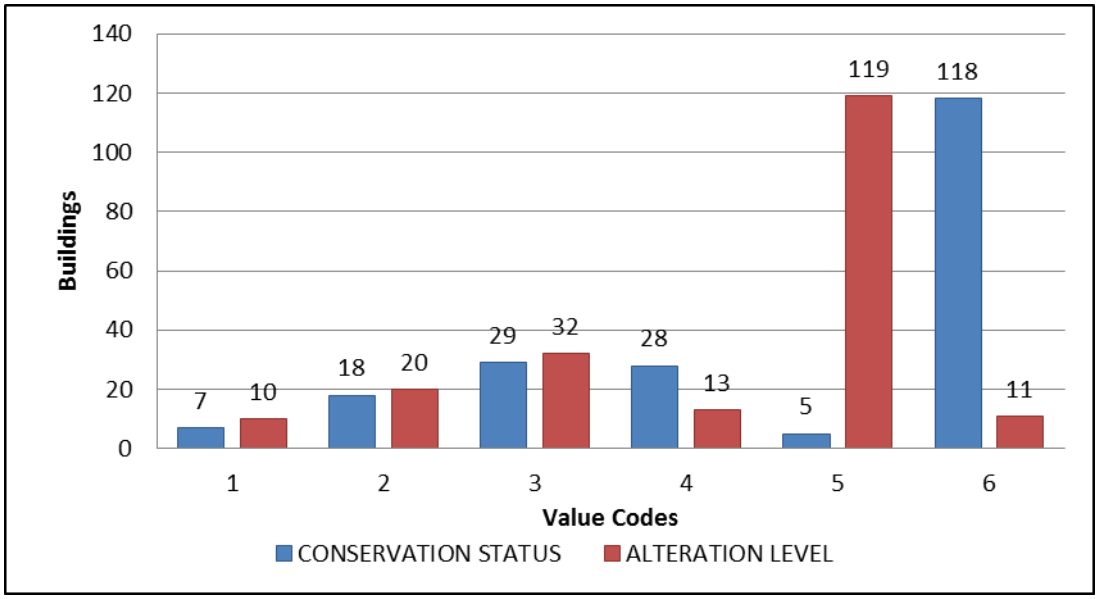


Chart 1 - Conservation Status and Alteration Levels Comparison

Thus following conclusion has to be discussed. It seems that half of the building stock in the Historical Town Centre had been built in the last 30 years and usually built under the space and speed pressures of tourism based commercial activity. The same pressures have been effective on the other half which is traditional and lost nearly half of the traditional buildings which are in serious alteration levels or not in good conditions. From a practical point of view, this can be approved as a partial success and granted to the resistance capacity of the town and the Development and Conservation Plan for Historical Town Centre of Kalkan as well. However, this data also displays that both the building stock and the conservations status are pushed to their limits. If the building stock requirement persists to increase, which will affect the conservation status and alteration levels further negative, in a short period of time, it will be difficult to identify the architectural features and character of the unique tissue in Kalkan Town.

There are totally 30 traditional buildings with 1 or 2 alteration levels, and 9 restored traditional buildings, and it is consistent to claim that these 39 buildings make up the primary building stock that will provide information about architectural features of the tissue and particularly building-based figures.

4.2.10 Building Base Area / Analysis

Information on building base areas are collected in the following ways; the buildings that are known with their restoration or new building projects are measured on the architectural projects. Most of the other buildings, are calculated from the digital cadastral maps, which have proved good results when checked with the real measurements of some of the buildings. However, since the intention is to draw the general picture at this level, a certain error tolerance in relation to the accuracy of the cadastral maps, is accepted in this analysis. Furthermore, some important buildings or doubtful results are measured on-site.

Table 6 - Building Base Area Calculation Method Distribution

	TOTAL SURVEYS	**210**
1	ARCHITECTURAL PROJECTS	42
2	ON-SITE MEASUREMENT	14
3	DIGITAL CADASTRAL MAP	154

When the results are examined, building base areas are grouped into 20 m2 ranged categories, beginning from 25 m2, which seems to be an edge value for habitation. Buildings under this level were usually not employed or already in ruins state. Building Base Area groups and survey results are formed as follows.

Table 7 - Building Base Area Categories Value Distribution

	TOTAL SURVEYS	**210**	**100%**
1	<25 M^2	12	5,7%
2	25-40 M^2	45	21,4%
3	40-60 M^2	57	27,1%
4	60-80 M^2	40	19,0%
5	80-100 M^2	19	9,0%
6	100-150 M^2	24	11,4%
7	>150 M2	13	6,2%

Drawing 10 - Building Base Area Analysis

BUILDING BASE AREA ANALYSIS

4.2.11 Building Approximate Volume / Analysis

Total volume of the building mass can be regarded as an important criteria in analysing Kalkan traditional tissue. Since buildings utilize, various floor levels, first floor and roof terraces, or gradual building bodies, it is not only the base area determining the size of the building. Furthermore the employment of each floor is important in this sense and will also be discussed in the following parts.

For understanding the total volumetric size of the building mass, an approximation method is utilized for a simple and rough estimation for building volume. A 'Height Level Value' is defined as a floor perception/utilization coefficient, which is 0.5 for basement, mezzanine and penthouse/terrace floors, and 1 for ground, first and second floors. This concept will be explained and discussed in more detail in Chapter 4.2.14, Floor Number Analysis. In this part, Height Level Value is used for calculating rough volume estimation for each building. The Base Area is multiplied by the Building Height Level Value, and 2.8 as a sample floor height in meters, in order to receive realistic figures. This figure comes forward as the Approximate Volume Estimation for a building. For the known buildings, large empty spaces such as first floor terraces are subtracted from this figure. And for the gradual buildings, the base areas of separate gradual parts are calculated with their own Height Level Values and approximate volumes of each part are added.

It is required to highlight that, this is an estimation and will be utilized for comparing the buildings in each other and structuring relationships with the other values of buildings. This figure must not be utilized as a single entity, but designed to be used together with other figures in a relational manner.

Table 8 - Approximate Building Volume Estimation Categories

	TOTAL SURVEYS	**189**	**100%**
1	APPROX. VOLUME ESTIMATION <200 M^3	29	15,3%
2	APPROX. VOLUME ESTIMATION 200-400 M^3	86	45,5%
3	APPROX. VOLUME ESTIMATION 400-600 M^3	39	20,6%
4	APPROX. VOLUME ESTIMATION 600-1000 M^3	31	16,4%
5	APPROX. VOLUME ESTIMATION >1000 M^3	4	2,1%

4.2.12 Building Base Area - Building Approximate Volume / Discussion and Comparison

For building base area measurements, the first and the last categories can be assumed to be on the extremes. Most of the buildings under 25 m2 are not employed and in ruins state. Furthermore there are only 13 buildings over 150 m2 size and 2 of them are Mosques. The rest of the buildings are mostly assembled in 3 groups, namely between 25 and 80 m2. The others between 80-150 m2 are the equal to one third of the sum of these 3 groups and seem to be the high-income buildings.

It is difficult to make a classification in the organic tissue of Kalkan Historical Town Centre and the results approve this fact, in a range altering from 20 m^2 to 200 m^2 base areas, sometimes side by side. When the analysis drawing is examined, a virtual line on the northeast-southwest axis can be drawn for dividing the area into 2 parts, where on the south-eastern division, there are more small buildings, such as below average. The other part, contrasting, displays more density of above average sized buildings. Yet these statements have to be accepted as very rough approaches, since there are many exceptions in both divisions.

Another remark on the aerial distribution of the base areas can be concluded as that some of the largest buildings are on the perimeters of the Historical Centre. So that the Town has more distinctive and large scale buildings on its perimeters.

Table 9 – Basic Statistical Figures on Building Base Area and Approximate Volume Estimation

	BUILDING BASE AREA	
1	TOTAL SURVEYS	210
2	AVERAGE BUILDING BASE AREA	67,7 M^2
3	HARMONIC MEAN OF BUILDINGS BASE AREA	49,5 M^2
4	MAXIMUM BUILDING BASE AREA	254 M^2
5	MINIMUM BUILDING BASE AREA	17 M^2
	APPROXIMATE BUILDING VOLUME ESTIMATION	
1	TOTAL SURVEYS	189
2	AVERAGE BUILDING BODY VOLUME	460 M^3
3	HARMONIC MEAN OF BUILDINGS BASE AREA	310 M^3
4	MAXIMUM BUILDING BODY VOLUME	2137 M^3
5	MINIMUM BUILDING BODY VOLUME	77 M^3

The arithmetic average of the building base area data set is 68 m^2, however harmonic mean of the data set, which is a more weighted average is 50 m^2.

When the building approximate volume estimation results are considered, the distribution seems to be more balanced. If the lowest and highest value groups are assumed to be the extreme values of this set, the others are distributed between 200 and 1000 m^3. There are 29 buildings in the 1st group, and there are 12 buildings in the base area analysis 1st groups, which all them seems to be covered by 29. These are buildings that are smaller than 25 m^2 in base area.

On the other hand, from the 200-1000 m^3 buildings, nearly half of the total buildings are in 200-400 m^3 group. And the harmonic mean, namely a weighted average, is 310 m^3. Hence it can be claimed that the large variety of base area range is much more balanced in approximate volumes. Or in other words, the building base area values are somehow stabilized in volume values in terms of closing to averages. In other words, buildings with larger base area seem to be employing less floors in general.

Figure 29 - Building on plot 245/24. Base area and volume estimation values are considerably high, yet the building employs only ground and first floors, with a first floor terrace

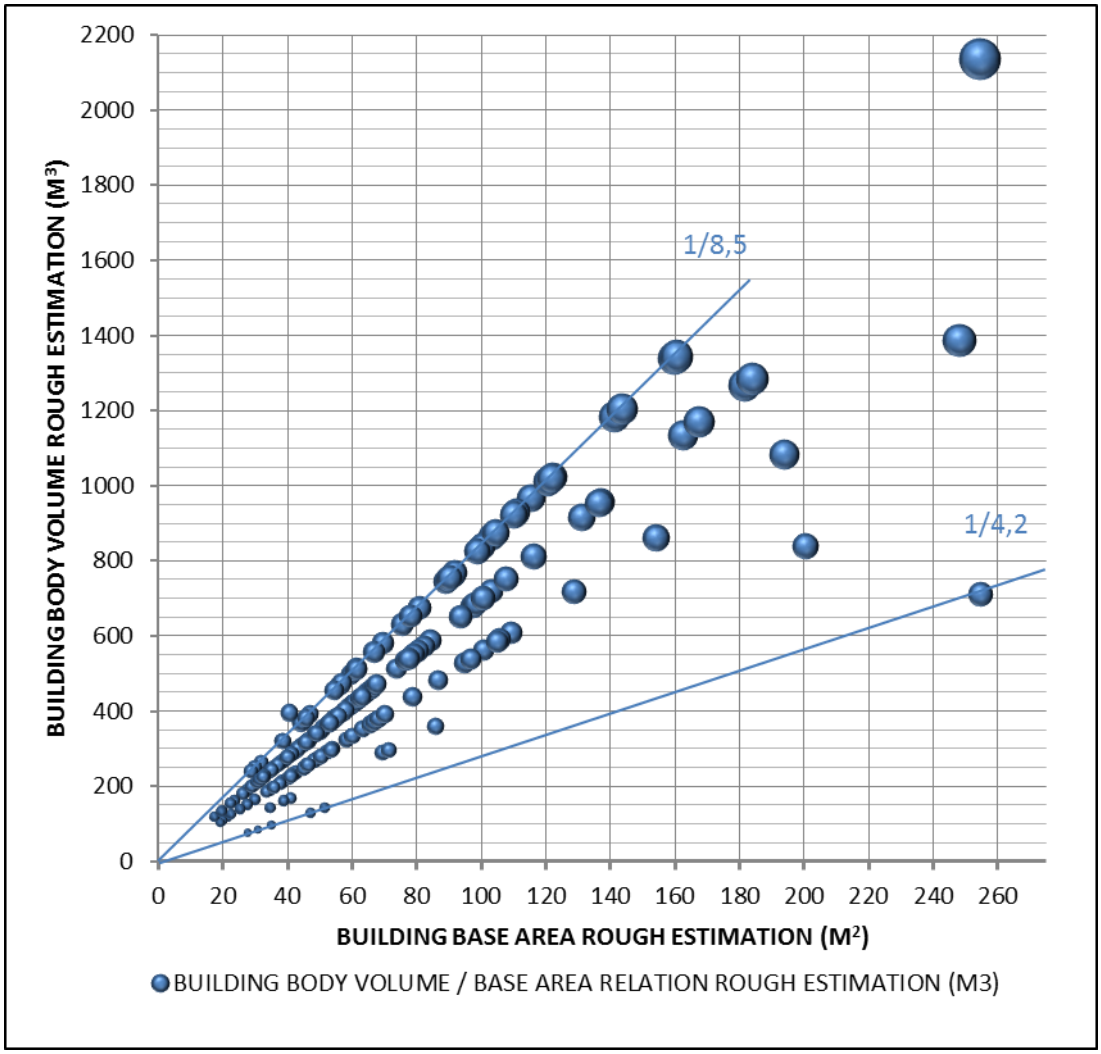


Chart 2 - Building Approximate Body Volume / Base Area Corelation

Furthermore, the above chart demonstrates a clear relation between base area values and approximate volume estimations that is the ratio of base area to building volume is between 1/8.7 and 1/4.2, with the exception of few examples.

4.2.13 Floor Number / Analysis and Discussion

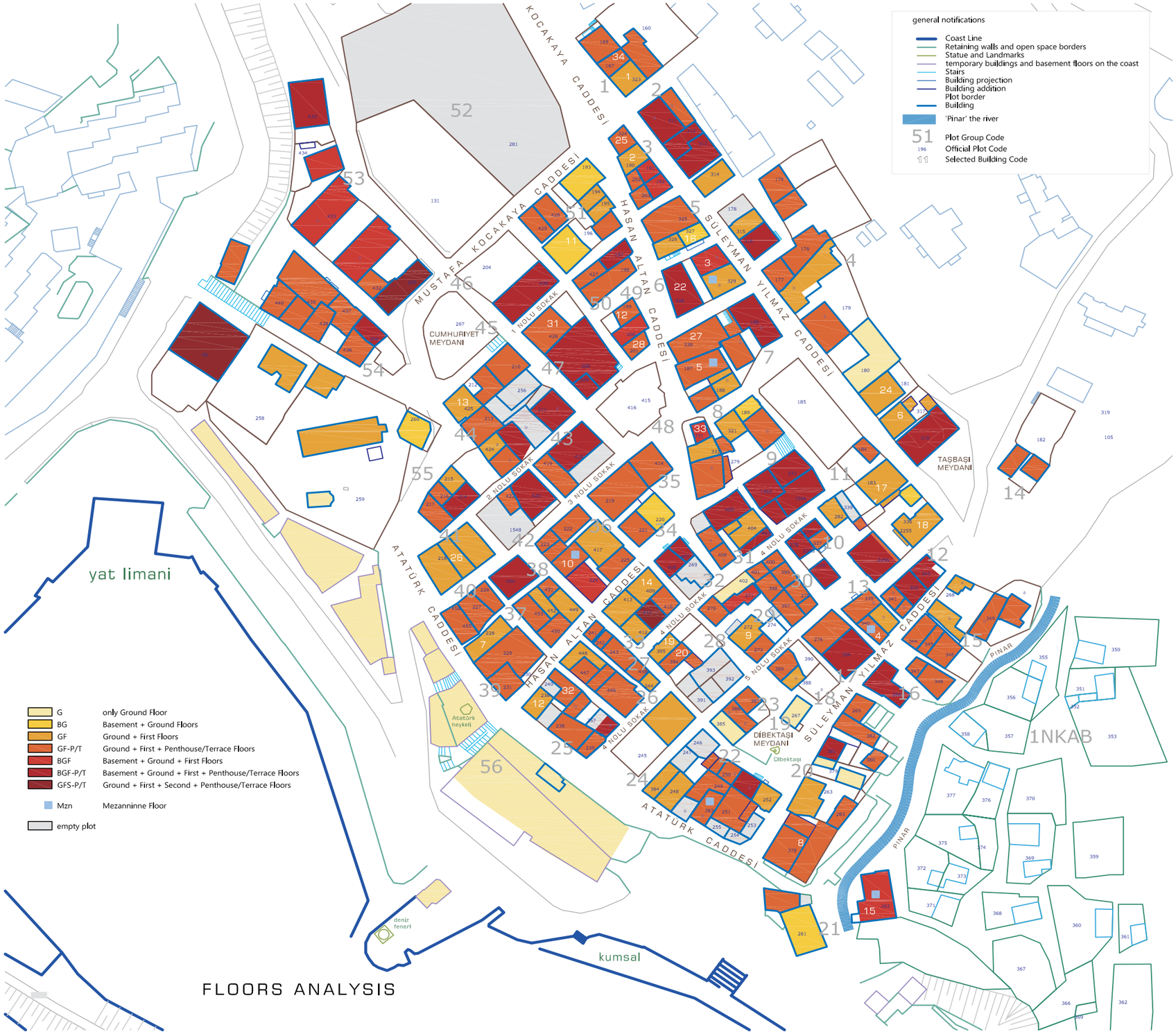
Floor Number is restricted in Historical Town Centre of Kalkan through the conditions defined in Development and Conservation Plan. Accordingly, the ground and first floors are allowed with a half roof terrace option for most of the buildings. Basement Floor depends on the slope and can be utilized for storage and sheltering purposes. However, these conditions are manipulated, and in the current situation there are many examples utilizing basement floor as ground floor or full height penthouse floors.

The height is also limited to 6.5 meters for the eve level, yet it seems that the floor number is as important as, if not more, the building height, since it is more determinant on the perception of the elevation and buildings mass. With small manipulations a building with 6.50 eve level can be perceived as a 4 floor building through the elevations picturing its floor count.

Analysis drawing intends to analyse information on the floor number of the buildings as data, picturing the building height levels roughly, as well. It displays the floor numbers and types of each building. In the survey study, basement, ground, first, second and penthouse/terrace and mezzanine floors are determined for the buildings in the Conservation Area. There are totally 11 various floor combinations exist in the study area. However, since mezzanine floor has a particular position, on the analysis drawing it has been depicted differently. Indicating mezzanine floor with a separate sign as a unique element between ground floor and first floor, 7 varying floor level and type categories are determined and demonstrated on the analysis drawing below.

Table 10 - Distribution of Floor Combinations

	CODE	**TOTAL SURVEYS**	**201**
1	BG	BASEMENT + GROUND FLOORS	7
2	BG+MF	BASEMENT + GROUND + MEZANNININNE + FIRST FLOORS	2
3	BGF	BASEMENT + GROUND + FIRST FLOORS	9
4	BGFP/T	BASEMENT + GROUND + FIRST + PENTH./TERRACE FLOORS	38
5	G	GROUND FLOOR	6
6	G+MF	GROUND + MEZANNINE + FIRST FLOORS	1
7	G+MFP/T	GROUND + MEZANNINE+ FIRST + PENTH./TERRACE FLOORS	3
8	BGFS	BASEMENT + GROUND + FIRST + SECOND FLOORS	1
9	GF	GROUND + FIRST FLOORS	52
10	GFP/T	GROUND + FIRST + PENTH./TERRACE FLOORS	81
11	GFP/TS	GROUND + FIRST + SECOND + PENTH./TERRACE FLOORS	1



Drawing 11 - Floor Combination Analysis

FLOORS ANALYSIS

In some cases, it is difficult to determine if a floor is basement or ground floor. For this reason following criteria had been applied. Firstly, if the height difference between the natural ground level of the two corners of a building is less than 150 cm, then it is considered as 'ground' floor. Furthermore, as a functional criteria, although the floor is under the ground level more than 150 cm on one side, this floor can still be considered as a ground floor depending on three criteria;

i. if the floor is used as a ground floor functionally on the other side, due to, not only the ground level, but also due the employment density.

ii. if the over-ground elevation of the lowest floor can be said to be the primary elevation of the building, due to the employment architectural and ornamental features and also the facing street priority as a ground floor.

iii. the light level of the floor is satisfactory for a normal ground floor mostly.

If there is no mezzanine floor on the building, than the First floor is the floor above the Ground Floor.

Penthouse/Terrace Floor primarily stands for denoting an active space over the final proper floor. So the buildings with penthouse usage, roof terrace employment or half of both are all considered as having an extra floor titled 'Penthouse / Terrace' Floor, for reasons explained in Chapter 4.2.3. Even in the full terrace flat roof cases, terraces have certain elements that form a space or at least perceived as a space. This is sometimes an illegal penthouse floor made of temporary material, or vertical elements and large tensile covering most of the terrace space. Unless the roof space or the roof terrace is employed, then the roof space cannot be counted as a separate floor and usually lower on the height as well.

About a third of all the buildings possess Ground, First and Penthouse/Terrace Floors, which is the provision of Development and Conservation Plan. This category is positive when it is considered that the traditional buildings, which make up the organics of the tissue, possess mostly Ground and First Floors, only lacking the Penthouse/Terrace Floor.

GF category follows GFP/T and the third comes BGFP/T buildings. This three groups make 85% of the total buildings.

When the location distribution of the categories is examined, it is concluded that higher buildings mostly begin about the midst of Hasan Altan Street. On the southern or lower parts, which is about half of the Town Centre, the building height is lower.

Table 11 - Total figures for the Non-Standard Floors (Floors Other Than Ground and First)

TOTAL BUILDINGS WITH A BASEMENT FLOOR	57
TOTAL BUILDINGS WITH A MEZANNINE FLOOR	6
TOTAL BUILDINGS WITH A PENTH./TERRACE FLOOR	123
TOTAL BUILDINGS WITH A SECOND FLOOR	2

On the other hand, mezzanine floor is seen on only 6 buildings and cannot be disregarded. It is one of the unique features of organic tissue and there have been rare examples left. Similarly basement floor is also a part of the tissue, originated as a solution to the slope. In parallel, penthouse/terrace floor, seen in more than half of the total buildings comes out to be a requirement of modern life in this climate, particularly for small base area buildings.

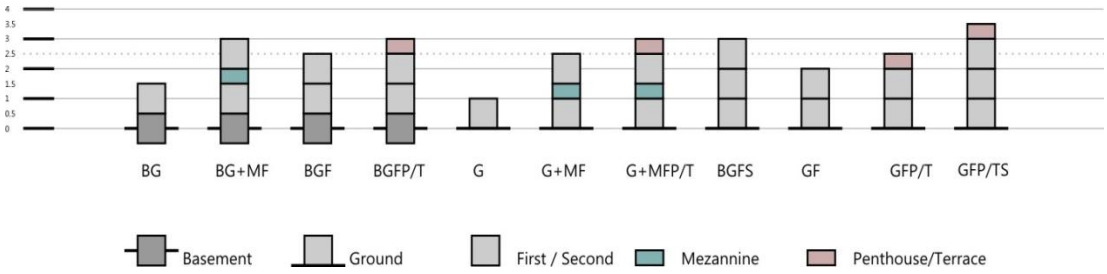
4.2.14 Floor Level Value / Discussion and Definition

Through the above analysis there are 3 conclusions for evaluating the floor number and building height. Firstly, ground and first floors are the natural elements of the organic tissue in Kalkan Historical Town Centre. Secondly, basement, mezzanine and penthouse/terrace floors are also elements of this tissue with various reasons. And finally, the buildings have been perceived not only through their heights, but also through the floor count, which is clear and decisive on the elevation elaboration.

Figure 30 - South and Southeast Views of Building on plot 205/53. It can be clearly observed that the building is perceived as 3 floor building on southeast view and even higher with the perception of basement floor when approached from south corner.

In order to evaluate these parameters together, and supply a certain level of flexibility on the floor number, a value is defined as 'Floor Level Value'. Values are assigned to each floor with respect to its height and perception together. The sum of these values for a building is its 'Floor Level Value'. Value for Basement, Mezzanine and Penthouse/Terrace floors are 0,5, Ground, First and Second Floors are 1. The reasoning logic for these coefficients can be briefly explained as follows; Basement is perceived as a single floor usually on 1 or 2 elevations, yet as a half floor or no floor, depending on the slope, on other elevations. Mezzanine is a low height floor affecting the height of the building as a half floor. On the other hand it is perceived as a smaller single floor, with its small sized windows. Penthouse/Terrace floors are perceived in various scales depending on their height, volume and application. Thus they can be accepted as a half-floor as the average of the existing applications.

The below graphic displays the visual representations and the 'Floor Level Values' for each of the existing floor combinations.

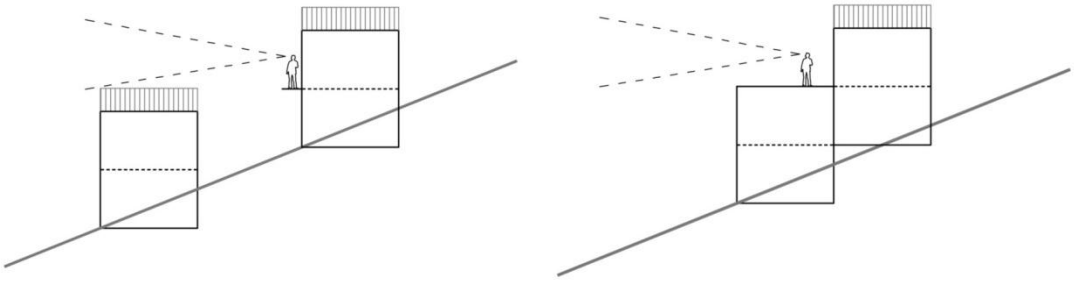


Graphic 1 - Floor Level Values for all Existing Floor Combinations

4.2.15 Gradual Buildings / Definition and Analysis

Normally, because of the serious slope on most of the Historical Town Centre, a building's first floor can enjoy the sea view and benefit from the sunshine and breeze in almost all cases. If the building height is assumed as a constant, if the slope is also a constant (or a variable within a range), and if there exists a certain distance between a building and the one in front of it down the south direction, the lower building does not obstacle the view and breeze of the upper one's, at least on first floor level. The positional arrangements of elements of the tissue in Kalkan stand on this basic principle, which can be observed in most parts of the area, particularly for traditional buildings.

Gradual building, is defined as a building divided into two parts, or two attached buildings, perpendicularly to the slope direction. In fact this is an application of the above principle, expressed for a single building handled in two parts or bodies, instead of referring to relation of two separate buildings. Particularly if the plot or the building base area is large through the slope direction, than for making the building 2 stories high from the higher elevation can result with a huge elevation on the lower part. Hence the building body is divided into two parts and the lower part stands on a separate ground level than the upper part, and from the side elevations one can observe a gradual elevation.



Graphic 2 - Gradual Building Schematic Explanation

There are 31 gradual buildings out of 205 survey results. 6 of these are traditional buildings, and it is clear that this is not a high frequency. However, gradual building is a significant element of the organic tissue, and important solution for a specific design problem.

4.2.16 Building Open Spaces / Analysis and Discussion

Building Opens Space is seen as a highly integral part of the traditional organic tissue in the Historical Town Centre, not only for the buildings themselves, but also for the general structure of the tissue. The result of the survey exposes that most of the buildings in the Conservation Area at least possess a single balcony as an open space. There are only 12 buildings lacking a balcony and any other types of open spaces. Moreover, at least a single balcony is an obvious requirement for a residential unit in Kalkan. Therefore, assuming that almost every building possesses a balcony, 3 other types of open spaces are determined and defined as follows;

1. Courtyard: Any open space on the ground floor level or sometimes heightened to the first floor level, totally or mostly paved, is defined as 'courtyard' in

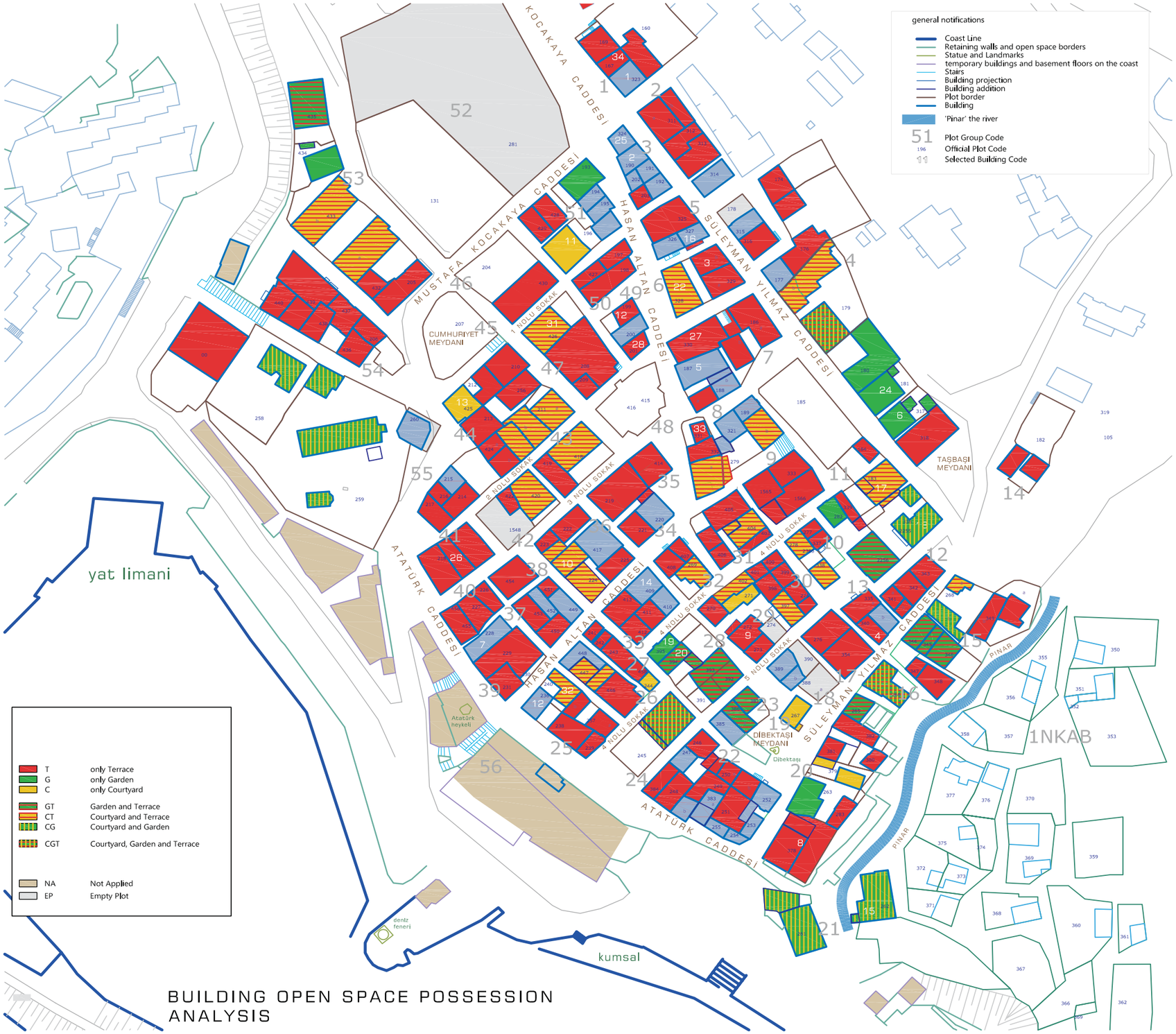
the scope of this study. These spaces provide a certain relation with the building as a semi-private space before entrance. Since some of the buildings are converted to commercial tourism functions, these spaces may be altered from being a courtyard to a welcome or demonstrations space. In some other cases, if the courtyard space is somewhere behind the main tourism axis, then usually it is either employed as an open-air storage space or an addition had already been built on it. If it is still open-air and in relation with the building physically, this study assumes it to be a courtyard as the building open space category, without any attention to its current function.

Courtyards traditionally had high walls around, however there are some cases, which have lower walls or no walls at all. Today, one can only observe a few traditional courtyards keeping their boundary walls on the street side. However the classification of this study, is not related with the space having or not having boundary walls around.

2. Garden: Any green space in relation with the building in the boundaries of plot, or utilized as a private space by the plot owner, have been assumed as 'garden'. Even though, in some cases because of the tourism's deteriorating effect, the plants are difficult to find, unless the space is on a spot of attention. However, any open space on ground floor level, in relation with the building and not-paved has been assumed to be in garden category as building open space category.

3. Terrace: Both traditional buildings and new buildings possess terrace spaces in various forms and on various levels. Mostly terrace spaces are either on the roof level, or on the first floor. Here, without any attention to which floor it is, terrace spaces are categorized as any open-air space on the building, with a closed space underneath.

Various combinations of these 3 main categories are indicated on below analysis drawing.



Drawing 12 - Building Open Space Possession Analysis

BUILDING OPEN SPACE POSSESSION ANALYSIS

All the possible building open space combinations including the no-open space buildings and the balconies are demonstrated on the following table.

Table 12 - Building Open Space Possession Distribution

	CODE	TOTAL SURVEYS	197
1	0	NO OPEN SPACES	13
2	B	ONLY BALCONY	29
3	BT0	BALCONY + FIRST FLOOR TERRACE	5
4	BT01	BALCONY + FIRST FLOOR TERRACE + ROOF TERRACE	1
5	BT1	BALCONY + ROOF TERRACE	83
6	C	ONLY COURTYARD	1
7	CB	COURTYARD + BALCONY	3
8	CBT0	COURTYARD + BALCONY + FIRST FLOOR TERRACE	4
9	CBT1	COURTYARD + BALCONY + ROOF TERRACE	14
10	CG	COURTYARD + GARDEN	1
11	CGB	COURTYARD + GARDEN + BALCONY	4
12	CGBT1	COURTYARD + GARDEN + BALCONY + ROOF TERRACE	2
13	CT0	COURTYARD + FIRST FLOOR TERRACE	3
14	CT1	COURTYARD + ROOF TERRACE	1
15	G	ONLY GARDEN	1
16	GB	GARDEN + BALCONY	6
17	GBT1	GARDEN + BALCONY + ROOF TERRACE	10
18	GCBT0	GARDEN + COURTYARD + BALCONY + FIRST FLOOR TERRACE	2
19	T0	ONLY FIRST FLOOR TERRACE	3
20	T01	FIRST FLOOR TERRACE + ROOF TERRACE	1
21	T1	ONLY ROOF TERRACE	10

Building open spaces are distributed without a clear pattern on location and quantity, probably depending on the unique conditions of each building and plot. However, as a significant parameter on forming the organic tissue, it is necessary to understand the current situation at least on the existence parameters of the open spaces in relation to each other.

For this reason, keeping in mind the above assumptions on no-open space buildings and balconies, the results of the survey are arranged in order to expose the relations of the primary building open space elements.

Table 13 - Distribution of Buildings with Various Open Space Categories

TOTAL BUILDINGS WITH BALCONY	169
TOTAL BUILDINGS WITH COURTYARD	35
TOTAL BUILDINGS WITH GARDEN	26
TOTAL BLGS WITH TERRACE (ROOF AND/OR FIRST FLOOR)	139
FIRST FLOOR TERRACE	19

Table 14 - Distribution of Buildings in Regard to the Number of Various Open Space Category Possessions

	TOTAL SURVEYS	**197**	**100%**
1	LIMITED OPEN SPACES (NO OPEN SPACE, ONLY BALCONY)	42	21,3%
2	SINGLE OPEN SPACES (ONLY COURTYARD, ONLY GARDEN, ONLY TERRACE, CB, GB, BT0, BT1)	112	56,9%
3	2 OPEN SPACES (CBT0, CBT1, CG, CGB, CT0, CT1, GBT1)	39	19,8%
4	MORE THAN 2 OPEN SPACES	4	2,0%

Terrace is observed on about 70% of all the buildings, so that it is the most preferred building open space. Garden and courtyards seem to exist on possible conditions. Furthermore it has to be considered that some of them are converted to closed spaces for satisfying the closed space requirements. With an interpretation on this data, the buildings can be grouped into 4 categories as on the above table. More than half of the buildings, despite the closed space pressure, possess single open space, other than balcony. Considering that buildings categorized as 'Limited Open Space' are mostly the low-quality new buildings, most of the rest possess 2 building open spaces. Finally more than 2 open spaces is a real exception with only 4 examples.

4.2.17 Roof Form and Features / Analysis and Discussion

There are various roof types in Historical Town Centre of Kalkan and survey results for each of these types are as seen on the below table.

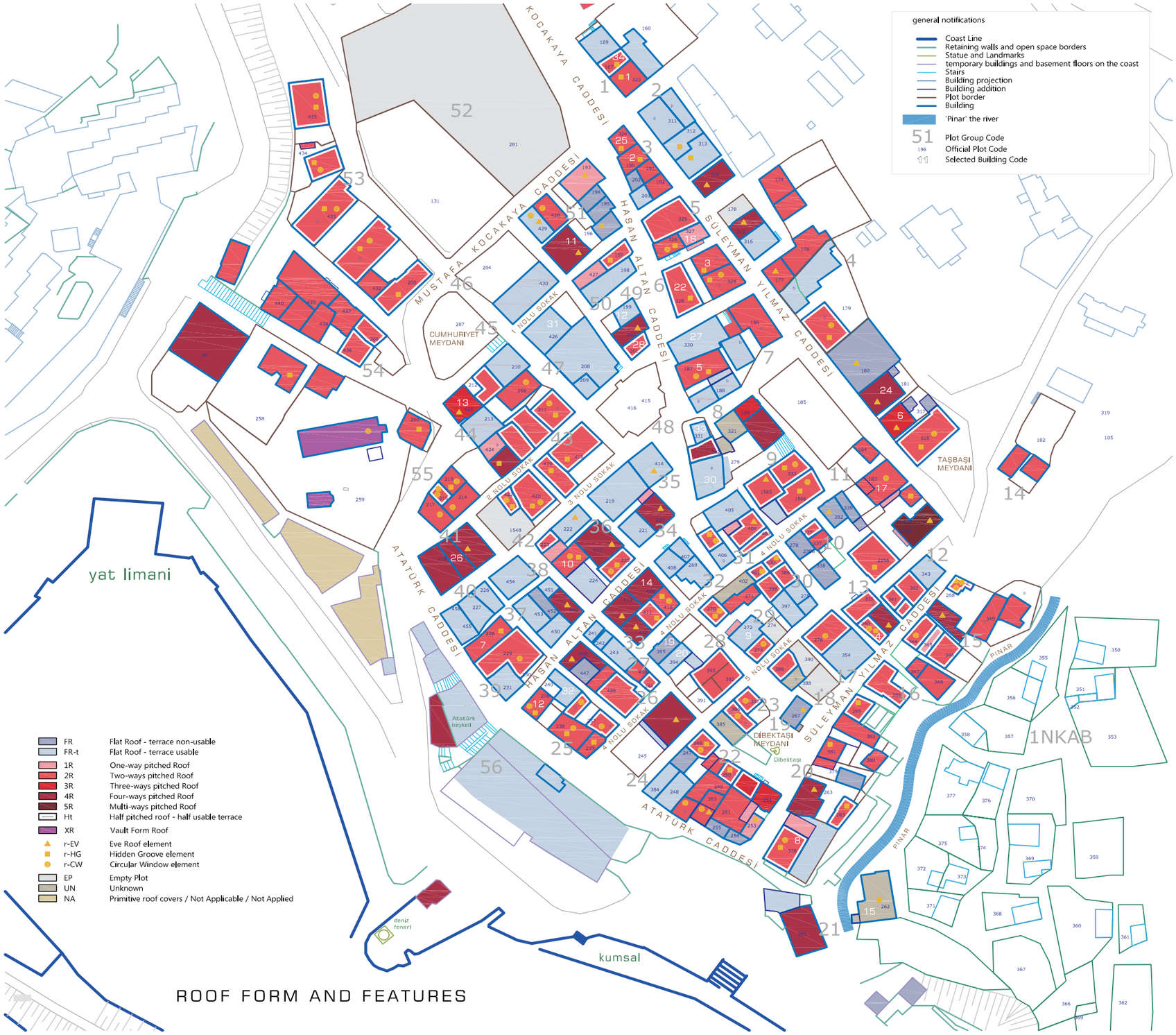
Based on observations on traditional buildings and old photographs as well, most of the buildings traditionally employ 2-ways pitched roof hidden with parapet walls, and pediment in some cases. It is an easy made roof type, with a satisfactory drainage solution of hidden gutters. The other hipped roof types are either rare, or mostly belong to new buildings.

Table 15 - Distribution of Roof Types

	CODE	TOTAL SURVEYS	201	100,0%
1	0AT0	FLAT ROOF / UNUSABLE ROOF TERRACE	18	9,0%
2	0AT1	FLAT ROOF / USABLE ROOF TERRACE	53	26,4%
3	1A	SHED ROOF	5	2,5%
4	1BT1	SHED ROOF / HALF ROOF TERRCE	1	0,5%
5	2A	2-WAYS PITCHED ROOF	26	12,9%
6	2BT1	2-WAYS PITCHED ROOF / HALF ROOF TERRCE	66	32,8%
7	3A	3-WAYS HIPPED ROOF	4	2,0%
8	3BT1	3-WAYS HIPPED ROOF / HALF ROOF TERRCE	1	0,5%
9	4A	4-WAYS HIPPED ROOF	19	9,5%
10	4BT1	4-WAYS HIPPED ROOF / HALF ROOF TERRCE	1	0,5%
11	5A	MULTI-WAYS HIPPED ROOF	1	0,5%
12	UN	UNKNOWN	5	2,5%
13	X	VAULTED SPECIAL TYPE ROOF	1	0,5%

On the other hand, when the current situation is considered, many roof types exist and extended by each combined with half-roof terraces. For keeping the statistic on scope, all the partial roof terraces are assumed as half-terrace without any distinction to their real share on the roof area.

Another important feature for the roof is the architectural, functional and/or decorative elements. Although some more can be named, four of them are selected for being the most distinctive and functional; pediment, hidden groove (sometimes with gutter), roof eve and circular window. These elements are connected with the roof type, yet not exactly determined. Hidden groove may or may not be employed in 2-ways pitched roofs. Similarly, circular window also functions for airing the penthouse space, yet it is not a requirement for a 2-ways pitched roof. Eve, on the other hand, is available for all types, yet exist in some of them. Below analysis drawing exposes the roof types according to the categories indicated above and also demonstrates the elements with specific symbols on buildings, if they possess. Furthermore, the half terraces are indicated through a white rectangle inside the building, in order to provide a distinct layer of information about the terraces.



Drawing 13 - Roof Form and Features Analysis

ROOF FORM AND FEATURES

The frequency of the selected roof elements recorded on survey is exposed on the following table. With the lowest frequency on roof eve, it can still be concluded that all of these roof elements have a noticeable level of frequency which makes them an important part of the tissue.

Table 16 - Distribution of Selected Roof Elements

		TOTAL SURVEYS	**195**	**100,0%**
1		EVE	35	17,9%
2		HIDDEN GROOVE	54	27,7%
3		CIRCULAR WINDOW	42	21,5%
4		PEDIMENT	63	32,3%

2-ways pitched roof and flat roof are predominant clearly. Nearly most of the flat roofs are employed as usable terraces, and similarly most of the 2-ways pitched roofs possess half terraces. There are 34 examples of pitched roof half terraces, which is about 30% of the all inclined roof buildings.

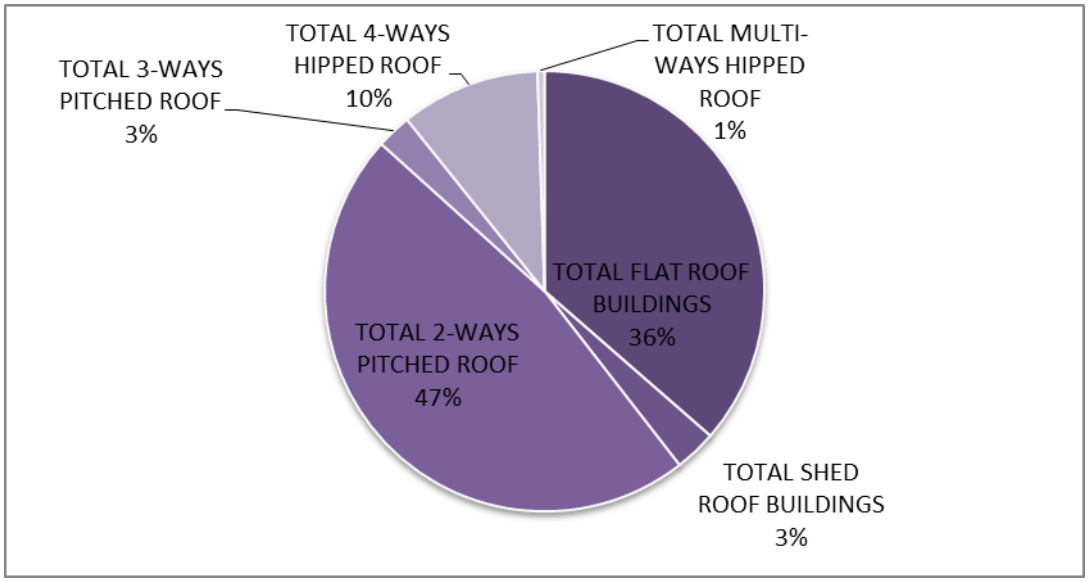


Chart 3 - Distrubution of Primary Roof Types

The selected roof elements on the other hand, mostly dependent on the roof types, where circular window, pediment and the hidden groove are mostly employed in 2-ways pitched roofs, and they make up the typical Kalkan roof, as a 2-ways pitched roof with hidden groove, pediment and circular window. Eve exists mostly on other type of roofs. There are 22 buildings displaying all 3 of 2-ways pitched roof elements. The distribution of the eve deployment due to roof types is indicated on

the below table, with the clear remark that it is basically a part of 4-ways hipped roof as a typology.

Table 17 - Distribution of Eve Employment in Various Roof Types

TOTAL FLAT ROOF BUILDINGS WITH EVE	7
TOTAL SHED ROOF BUILDINGS WITH EVE	2
TOTAL 2-WAYS PITCHED ROOF WITH EVE	0
TOTAL 3-WAYS HIPPED ROOF WITH EVE	2
TOTAL 4-WAYS HIPPED ROOF WITH EVE	17
TOTAL MULTI-WAYS HIPPED ROOF EVE	1

4.2.18 Structural System / Analysis and Discussion

Traditional buildings primarily utilize rough stone as the basic load bearing material, 'bagdadi' technique for inner walls and timber beams as the horizontal structural system. New buildings on the other hand, usually employ modern materials such reinforced concrete and brick. Various building techniques, and composite applications were observed in the survey studies and the structural system of the buildings handled in 2 parts. The first part is the vertical load transfer system.

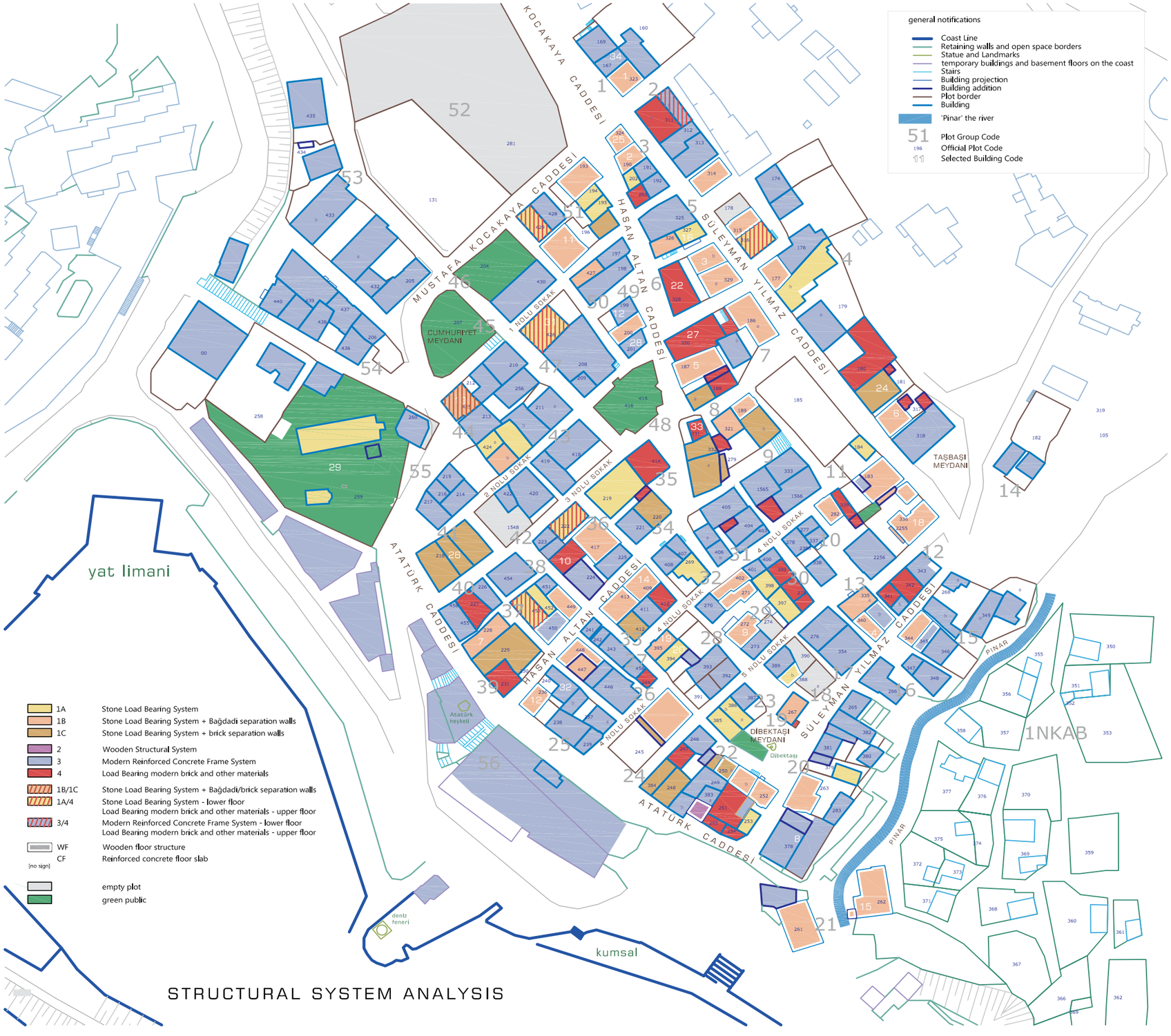
> *"Outer walls of the buildings are constructed with rubble stone masonry. Timber tie beams are used in certain levels for reinforcement. Lime mortar is used as binding material. Inner walls are constructed either with rubble stone or constructed with timber skeleton system. Brick is used as filling material. The walls are plastered with lime plaster. (There is an exception which is not plastered.)*
>
> *The floors and ceilings are constructed with timber and covered with timber planks."*[110]

The first 2 categories are stone load bearing systems, 3rd category is timber construction which is utilized as the primary structural system in none of the buildings, 4 and 5 are typical modern techniques of load bearing systems and reinforced concrete frame system, and 6, 7 and 8 are composite technique and applications. Category 7 indicates restoration examples, where stone load bearing walls are kept and repaired, yet a separate reinforced concrete system is established

[110] Gökçe, Fuat, Dr., *Conservation and Development Plan for Historical Town Centre of Kalkan,* project explanatory report and working documents, Fon Mimarlik Ltd. Sti. Archive, 1992.

inside the building walls as the load bearing system of the upper floors and new floor slabs. The single system categories are indicated with solid colours and composites as line renderings on the analysis drawing.

The second part of this analysis is the horizontal load transfer system, categorized in 2 groups, timber beams and reinforced concrete floor slab. For Timber beams, a denotation is used on the analysis drawing, whereas for reinforced concrete slab, no sign is assigned.



Drawing 14 - Structural System Analysis

STRUCTURAL SYSTEM ANALYSIS

Usually traditional buildings that had not been altered seriously, make use of stone load bearing systems and the new buildings or some of the structurally altered traditional buildings display modern load bearing or reinforced concrete systems. The frequencies of various structural material and techniques are exposed on the below tables.

Table 18 - Vertical Load Transfer System Distribution

	TOTAL SURVEYS	**201**	**100%**
1	STONE LOAD BEARING SYSTEM AND BAGDADI INFILL FOR THE INTERIOR WALLS	45	22,4%
2	ONLY STONE LOAD BEARING SYSTEM	18	9,0%
3	TIMBER CONSTRUCTION	0	0,0%
4	MODERN LOAD BEARING BRICK	23	11,4%
5	MODERN REINFORCED CONCRETE FRAME SYSTEM + MODERN BRICK INFILL FOR THE INTERIOR WALLS	95	47,3%
6	STONE LOAD BEARING SYSTEM AND MODERN BRICK INFILL FOR THE INTERIOR WALLS	18	9,0%
7	STONE LOAD BEARING SYSTEM + MODERN REINFORCED CONCRETE FRAME SYSTEM	1	0,5%
8	PARTIAL MODERN REINFORCED CONCRETE SYSTEM + PARTIAL MODERN BRICK AND OTHER LOAD BEARING MATERIALS	1	0,5%

Table 19 - Horizontal Load Transfer System Distribution

	TOTAL SURVEYS	**201**	**100,0%**
1	TIMBER BEAMS CARRYING THE FLOOR FINISH	**49**	24,4%
2	REINFORCED CONCRETE FLOOR SLAB	**151**	75,1%
3	BOTH FLOOR SYSTEMS EMPLOYED TOGETHER	**1**	0,5%

There are totally 48 buildings, demonstrating on of first 2 categories for the vertical load transfer system, namely load bearing stone, and timber horizontal load transfer system together. It can be concluded that, there are 63 stone buildings, about 48 of which still keeps their timber beams.

4.2.19 Secondary Buildings on the Plot / Analysis and Discussion

There are various types of secondary buildings and additions on the plot both for traditional buildings and new buildings as well. Unless there is only a single building on the plot, and all buildings seem to be the primary buildings, then each building is indexed as separate buildings, such as plots 329/6, 335/13 and 341/12.

However addition buildings of low quality material and workmanship, usually employed for service or storage purposes are considered as secondary buildings or additions. Furthermore, the retail shops built in relation to the buildings are also considered as secondary buildings. In traditional cases, separate closed living spaces exist as well, built on the same plot, as exceptions. Such exceptions are also considered as secondary buildings, since they are not unqualified for material and workmanship, but they fail to demonstrate the features of a single building and instead they seem to be functioning only with the primary building.

For the current situation, there are small secondary building additions on empty parts of some plots, built for usually for service and storage functions for tourism, or sometimes retail functions themselves.

Moreover, on the control process of survey data, it has been noticed that some more secondary buildings may be existing and have not been recorded. Considering the continuous alteration process on the buildings of the tissue in particularly last 30 years, in some cases, illegal additions, every year changing its form and empowering its relation with the primary building, may have come to a level that it is hard to understand that it is not a part of the primary building mass. Hence, as an assumption, existence of some more secondary buildings have to be considered.

Structural systems of the secondary buildings are analysed as well, through a similar categorization with the structural system analysis of the primary buildings. As tough, it has been recorded that, since there are both traditional and new secondary buildings, most of the structural systems categorized in the previous part are employed for the secondary buildings as well.

Following table displays the particular results about the secondary buildings, and the second and third table displays the structural systems for secondary buildings.

Table 20 - Various Figures on Distribution of Additions

BUILDINGS WITH NO ADDITION	**162**
BUILDINGS WITH ADDITIONS / SECONDARY BUILDINGS IN THE PLOT	**33**
STORAGE SAPCE ADDITIONS	**5**
RETAIL SPACE ADDITIONS	**5**
SERVICE SPACE ADDITIONS	**11**
PRIMARY SPACE ADDITIONS	**12**
ADDITIONS DIRECTLY CONNECTED WITH THE PRIMARY BUILDING	**29**
ADDITIONS SEPARATE IN THE PLOT	**4**

Table 21 - Vertical Load Transfer System Distribution for Additions

	TOTAL SURVEYS	**189**
1	STONE LOAD BEARING SYSTEM AND BAGDADI INFILL FOR THE INTERIOR WALLS	2
2	ONLY STONE LOAD BEARING SYSTEM	5
3	TIMBER CONSTRUCTION	1
4	MODERN BRICK AND OTHER LOAD BEARING MATERIALS	13
5	MODERN REINFORCED CONCRETE FRAME SYSTEM + MODERN BRICK INFILL FOR THE INTERIOR WALLS	5
6	STONE LOAD BEARING SYSTEM AND MODERN BRICK INFILL FOR THE INTERIOR WALLS	1

Table 22 - Horizontal Load Transfer System Distribution for Additions

	TOTAL SURVEYS	**189**
	BUILDING WITH NO ADDITIONS	162
1	TIMBERBEAMS CARRYING THE FLOOR FINISH	3
2	REINFORCED CONCRETE FLOOR SLAB	21
3	UNKNOWN SLAB STRUCTURE SYSTEM	3

33 buildings are recorded to have secondary buildings on their plots, and if the remark in the previous part is taken into account, a little more than this number have to be considered for a more realistic conclusion. It can be claimed that, secondary buildings on the plot are an integral part of the organic tissue as well, yet it the frequency is not too high, like 20-25 % of the total buildings. Storage, retail, service and primary spaces, the 4 use function groups designed for secondary buildings, all have a certain level of frequency without any particular predominance. Furthermore it is known already that all of this functions can also be seen in the traditional building plots as well.

On the other hand, a separate secondary building seems to be an exception, since most secondary buildings are directly and physically connected to the primary building. This is an indication of functional requirements.

When structural systems are considered 8 of these secondary buildings are stone, 1 is timber, and 18 is made of modern materials and techniques, displaying that there are few original examples of traditional secondary buildings. Mostly even on registered plots, the secondary buildings are treated distinctively from the primary building and are allowed to be demolished and built by modern material and techniques, since secondary buildings are assumed to be low-quality with particular details or values. For this reason most of the stone secondary buildings were demolished, even if they were on registered plots. Correspondingly, there are only 3 secondary buildings left with timber beams as the horizontal load transfer system, since, even though the structure is made up of stone, the slabs were converted to reinforced concrete.

When the outstanding pressure of tourism is considered, the frequency for secondary buildings can be treated as positive. When it is taken into account that some secondary buildings are traditional elements of traditional plots, either the tissue is successful on resistance for more closed space. This can be claimed, since there is no more space left, when the open space analysis are examined. Yet on the other hand, the requirement level for such small secondary buildings has also been considered. Since open space requirement is overwhelming the streets and the public spaces, secondary building utilization, legal or illegal, not went that far.

4.2.20 Wall Finishing / Analysis and Discussion

The interior spaces and materials are not included in the scope of this study. For this reason, only outside wall finishings of buildings are surveyed and recorded, whereas, depending on the observations in most cases interior wall finish is the same with the outside finish, except the case of modern stone coverings on the outside.

First observations indicate that some of the traditional buildings still preserve their traditional plaster and/or paints on the walls, entirely or partially, and most of them on the other hand, at least converted their finishing to modern plaster and paint. New buildings naturally demonstrate modern plaster and paint, and in some cases

stone covering finish is detected. The results about the survey for outside wall finishings are as follows:

Table 23 - Distribution of Outside Wall Finishings

	CODE	TOTAL SURVEYS	200	100,0%
1	A	MODERN PLASTER AND PAINT	130	65,0%
2	B	MODERN STONE COVER FINISH	4	2,0%
3	C	TRADITIONAL PLASTER	1	0,5%
4	D	TRADITIONAL PLASTER AND/OR PAINT	20	10,0%
5	E	EXPOSED STONE - NO PLASTER / PAINT	7	3,5%
6	F	STONE - JOINTS ARE HIGHLIGHTED WITH THICK PLASTER	6	3,0%
7	G	EXPOSED BRICK - NO PLASTER OR PAINT	0	0,0%
8	H	PRIMITIVE FINISH WITH METAL OR OTHER MODERN MATERIALS	1	0,5%
9	AB	MODERN PLASTER AND PAINT + PARTIAL MODERN STONE COVER FINISH (USUALLY ON THE GROUND FLOOR)	15	7,5%
10	AD	PARTIAL MODERN PLASTER AND PAINT + PARTIAL TRADITIONAL PLASTER AND/OR PAINT	7	3,5%
11	AF	PARTIAL MODERN PLASTER AND PAINT + PARTIAL STONE - JOINTS ARE HIGHLIGHTED WITH THICK PLASTER	5	2,5%
12	DE	PARTIAL TRADITIONAL PLASTER AND/OR PAINT + PARTIAL EXPOSED STONE	1	0,5%
13	DF	PARTIAL TRADITIONAL PLASTER AND/OR PAINT + PARTIAL STONE - JOINTS ARE HIGHLIGHTED WITH THICK PLASTER	3	1,5%

A majority of the buildings employ modern plaster and paint on the outside walls. On the other hand, traditional plaster or in cases that it has been lost and no replacement has been made, the exposed stone with particles of joint materials left, can be observed on 39 buildings, entirely or partially.

Table 24 - Figures for Traditional, Modern and Stone Utilization for Outside Finishing

TRADITIONAL OUTSIDE FINISHING OR EXPOSED STONE OR PARTIAL TRADITIONAL OUTSIDE FINISHING	39
MODERN OUTSIDE FINISHING	161
TOTAL STONE COVERING FINISH BUILDINGS (TOTAL AND PARTIAL)	25

Stone utilization as a covering material is foreign for the area. The traditional buildings are made of rough stone mostly and covered with traditional plaster and paint. Neither exposing the stone is a familiar application, nor utilizing cut stones for

the load bearing construction. In most of the buildings with stone structural system, rough stone is utilized. However, probably for visual appearance of stone elevation is psychologically related with authentic traditional figures for tourism sector and its actors, modern stone covering is becoming popular in new buildings. There are 25 examples utilizing stone covering, and most of these are noted to be on the main axis or focal points of Kalkan Historical Town Centre.

4.2.21 Elevation Decoration and Elements / Analysis and Discussion

Elevation elaboration is an important parameter in traditional Kalkan architecture. Most of the traditional buildings have elaborated elevations, at least on the front elevation, depending on their construction budget probably. On the other hand, it is observed that these elaborations have common elements, repetitions and variations, thus enabling a typical local style, which elements and ratios can be formulized. For these decorative elements, 2 primary statements will be brought forward

Firstly, most of these decorative elements, such as circular roof window, window and door sills, window shutters all have functional reasons. Some of the decorative elements on the other hand, may have not functional reasons but stylistically demonstrate a cultural and visual continuation or a counterpart for antique decoration elements of the Lycian region. Dr. Fuat Gökçe states this as follows; *"An association with the decorative traditions used in ancient times is evident and in the present provides an ongoing continuity with the past."*[111]

This analysis on elevation decoration is based on two evaluation methods. First of these is an evaluation of decoration level of the primary facade of each building. And the second is the evaluation of the existence of particular common decorative elements on the facade.

[111] Gökçe, 1994, p. 41.

Figure 31 - Rich Ornament Level - Southwest Elevation of Building plot 196/51

Figure 32 - Rich Ornament Level - Northwest Elevation of Building plot 378/20, after restoration

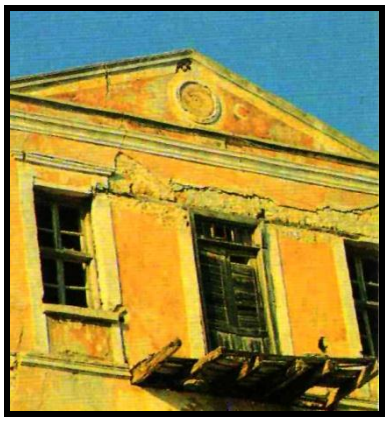


Figure 33 - Rich Ornament Level - Southwest Elevation of Building plot 378/20, before restoration[112]

Figure 35 - Moderate Ornament Level - Southeast Elevation of building on plot 2255/11 (old 336/11)[114]

Figure 34 - Moderate Ornament Level - Southeast Elevation of building on plot 340/13, before and after the restoration[113]

Figure 36 - No Prtc. Ornm. Level - East View of building on plot 395/28

[112] Ibid p. 40.

[113] Before Restoration Image: Kalkan Municipality Archive

[114] Gökçe, 1994, p. 37.

The analysis drawing displays the facade decoration analysis on the buildings, without any reference to their building dates or techniques. Basically, the facade decorations of the buildings were graded in site survey in 3 categories. Plain elevations without any particular ornaments have been classified as the first category. Moderate ornament level buildings, displaying at least a few architectural ornament elements such as plaster ornaments, stone or plaster elaborated window or door sills, elaboration on building edges and decorations on the wooden elements. Rich ornament level buildings are categorized as the ones displaying many of the mentioned features, on at least a single elevation that can be regarded as an elevation possessing ornaments designed with a certain level of integrity and stylistic consciousness.

Moreover, 4 architectural elevation features are selected, and their existence for each building were recorded, as another indication of the elevation elaboration.

i. window/door sills, which can be observed on elaborated traditional buildings and on simple new buildings as well. Windows sills is a primary decorative element, some examples in a few buildings in Kalkan Historical Centre are articulated in detail and with various colours.

Figure 37 - Decorated sills and window shutters on plot 196/51

ii. window/door shutters, a functional decorative element more than its decoration value. Shutters are one defined as one of the elements that is mostly effective on the visual perception of the elevation. And similar to sills, it is utilized in today's buildings as well, probably without any differentiation particularly when the material is wood.

iii. 'pencik' small lighting window on outside doors, an important element both functional and indicative. Pencik displays that how the ground or basement floor is utilized, for if it exists, probably there is lighting requirement inside, namely a retail shop or an office. Whereas on the opposite case, the space is usually a storage space. Furthermore it is

Figure 38 - Door with a 'pencik' on plot 425/44

very functional in increasing the lighting level of dark basement and ground floor spaces.

iv. 'kulak', acroteria like small corner ornaments on the corner of roofs. It is clearly a classical decoration element, still employed today.

Pediment, circular window and eves can also be considered in this sense as elements of elevation decoration, however they have been already recorded and analysed in Chapter 4.2.18, Roof Form and Features Analysis.

Existence of these elements have been exposed by additional symbols on the analysis drawing in order to provide a comparison and evaluation opportunity together with the general facade decoration classifications. In this analysis drawing, the elements are not handled separately, but instead for measuring their existence frequencies, categories are defined based on how many of these elements are utilized. The survey records and the database, on the other hand covers the existence data for each element singularly.

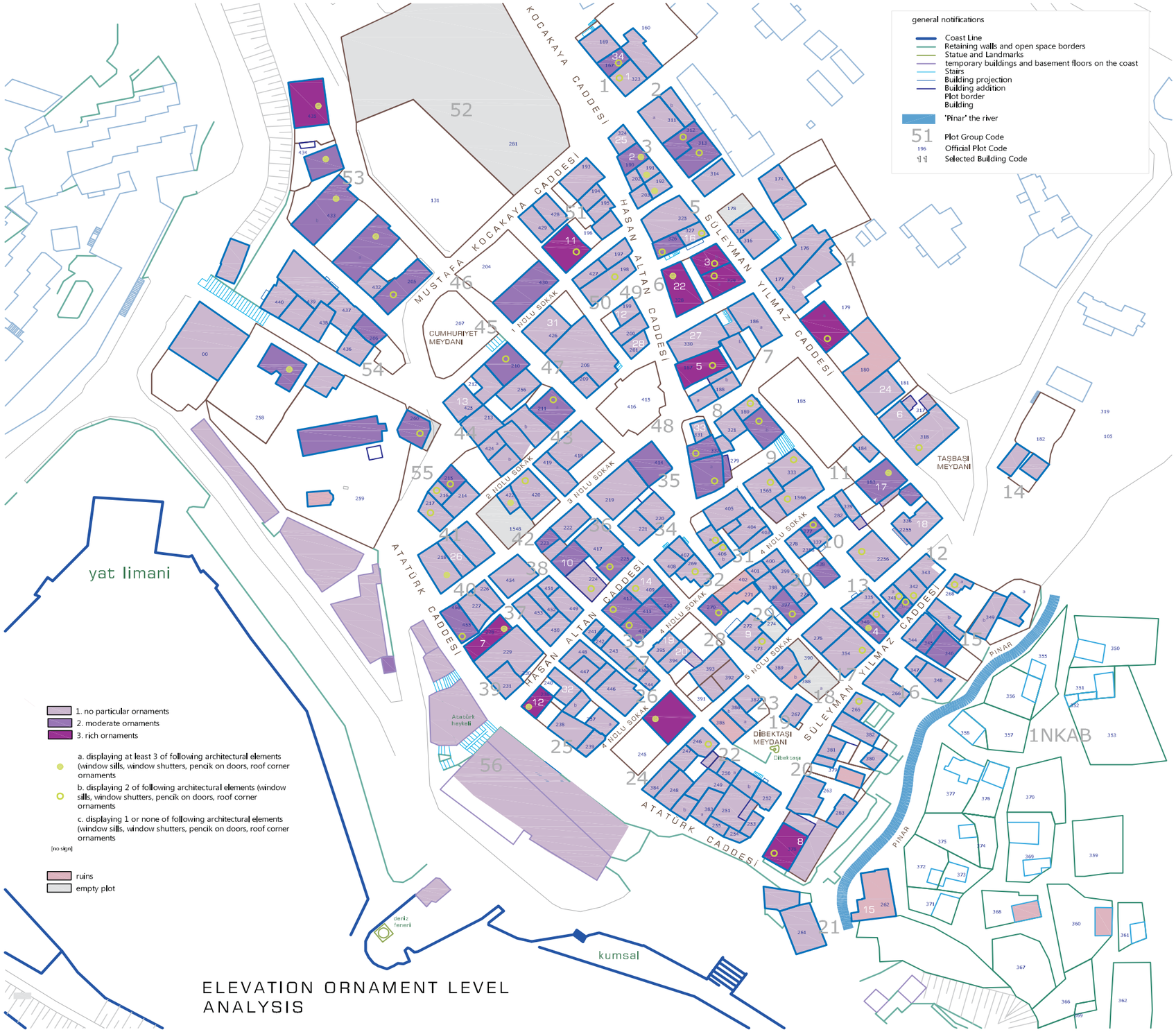
a. buildings displaying at 3 or all 4 of the above grouped architectural features

b. buildings displaying 2 of the above grouped architectural features

c. buildings displaying at 1 or none of the above grouped architectural features - This final category have been indicated by 'no sign'.

Furthermore ruins and empty plots are also indicated on the analysis, since they are not applicable plots for this analysis.

The elevation articulation is one of the eminent features of the traditional tissue in Kalkan. The articulation style is a unique one, usually applied by Greek masters, under Turkish and Republican influence and stylistically nourished from the classical orders and elements. Detailed analysis of each varying elevation ornament can be the topic of another study, yet to stay in the scope of this study, it is intended to understand the various articulation levels, their frequencies on forming the organic tissue and the basic elements that make the elevation articulated in Kalkan architectural environment.



Drawing 15 - Elevation Decoration Analysis

ELEVATION ORNAMENT LEVEL ANALYSIS

When the locations of the buildings categorized under 'rich ornaments' title are analysed, it is seen that majority is larger buildings on the sides of 2 main axes, Hasan Altan Caddesi, and Ataturk Caddesi. These rich ornamented buildings mostly employ 2, 3 or 4 of the categorized decorative elements.

Table 25 - Elevation Decoration Evaluation Results

CODE	TOTAL SURVEYS	205	100,0%
0	NO PARTICULAR ORNAMENTS	157	76,6%
1	MODERATE ORNAMENTS	36	17,6%
2	RICH ORNAMENTS	12	5,9%

It seems that most of the buildings are in the first group, however it has to be considered that most them are new and unqualified buildings. The second group, on the other hand, with 36 examples distributed all around Historical Town Centre, comes forward as the primary group for Kalkan Buildings, when the unqualified new buildings are filtered.

Table 26 - Decoration Elements Distribution

	TOTAL SURVEYS	205	100,0%
1	DOOR/WINDOW SILLS	93	45,4%
2	DOOR/WINDOW SHUTTERS	107	52,2%
3	PENCIK' - SMALL WINDOW OPENING ON A DOOR	17	8,3%
4	KULAK' - CORNER ORNAMENT ON THE ROOF LOWER CORNERS	22	10,7%

Sills and shutters, being functional elements, exist about half of the buildings, yet pencik and kulak are more rare elements existing on about 10% of the buildings. Instead of evaluating the single existence frequencies of these elements, the below table demonstrates the existence groups.

Table 27 - Decoration Elements Distrubtion based on the number of elements on buildings

	TOTAL SURVEYS	210	100,0%
1	BUILDINGS DISPLAY 3-4 ELEMENTS	15	7,1%
2	BUILDINGS DISPLAY 2 ELEMENTS	55	26,2%
3	BUILDINGS DISPLAY 1 OR NONE ELEMENTS	140	66,7%

Furthermore, as an example, if the 'rich ornaments' group is handled and the distribution of these elements between the members of this group is analysed, the below table indicates that 1, 2 and 3-4 elements categories are distributed quite

evenly. This information indicates that the perception of the elevation as rich ornamented, is not directly related with the existence of more of these elements. Instead the articulation and usage of these and other decorative elements, moreover the integrity of this usage as a coherent style, is the determining factor for the perception of the ornament level of an elevation.

Table 28 - Distribution of Buildings Displaying 3/4 elements based on Elevation Ornament Levels

1	ELEVATION DECORATION LEVEL 1 - displaying 3-4 elements	4
2	ELEVATION DECORATION LEVEL 2 - displaying 3-4 elements	7
3	ELEVATION DECORATION LEVEL 3 - displaying 3-4 elements	4

4.2.22 Projections / Analysis and Discussion

Projections are one of the most significant architectural elements in Kalkan Historical Town Centre. It is already clear that the climate requires intense use of open space utilizations and as seen in building open space analysis in Chapter 4.2.17, almost every building at least possess a single and small balcony. Furthermore, projections are employed as important features of the elevation articulation and building perception. For this reason, they are developed in time, not only functionally but also decoratively. In parallel there many types and features in relation to the projections. In order to understand the logic behind these types, the general issues such as existence frequencies of the projection types, as well as details in relation to projections will be analysed in this section.

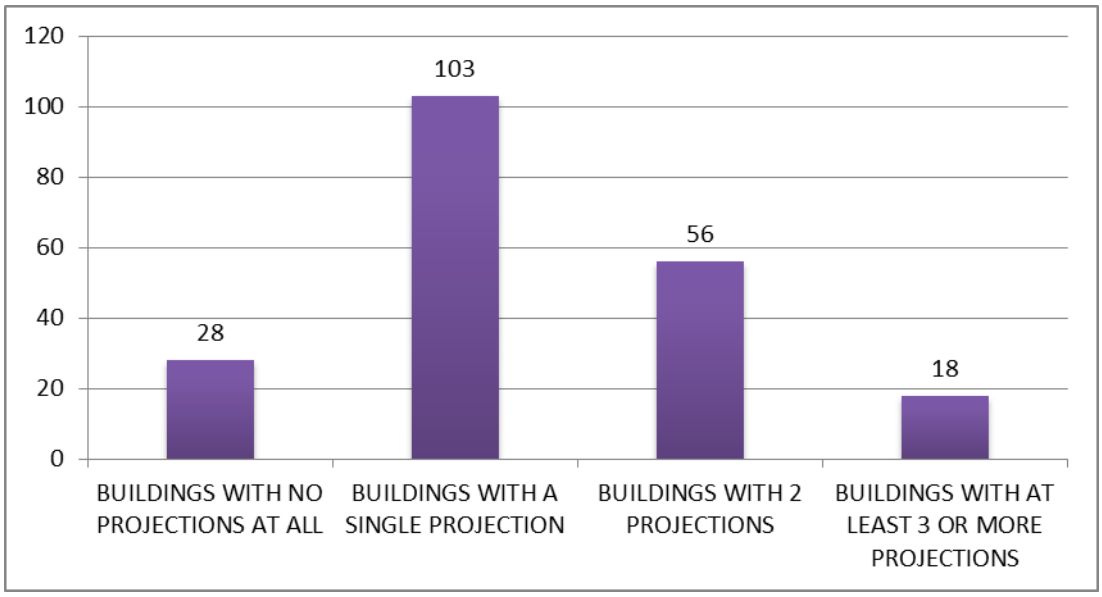
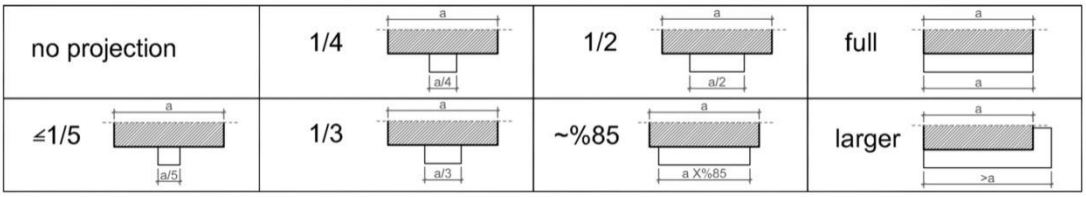


Chart 4 - Distribution of Number of Projections

There are totally 265 projections on the surveyed buildings, which comes to 1.34 projections per building as an average number, excluding the no-projection buildings.

The projections are mostly single floor height and between 1-1.5 m width. Hence the determining factor about the size of a projection is its length, which takes various values thought the study area. The width range is more for closed projections with a small difference. Firstly, the elevation ratio of the projections will be focus of analysis. Projections are grouped according to their Length/Elevation Ratios on the following groups.



Graphic 3 - Projections Based on Projection Length/Elevation Length Ratio

Table 29 - Distribution of Projections Based on Projection Length/Elevation Length Ratio

	TOTAL SURVEYS	**265**	**100%**
1	ELEVATION RATIO SMALLER THAN 1/5	13	4,9%
2	ELEVATION RATIO 1/5	4	1,5%
3	ELEVATION RATIO 1/4	38	14,3%
4	ELEVATION RATIO 1/3	101	38,1%
5	ELEVATION RATIO 1/2	63	23,8%
6	NOT THE FULL ELEVATION LENGTH, BUT 80-90% OF THE TOTAL ELEVATION LENGTH	22	8,3%
7	FULL ELEVATION LENGTH	23	8,7%
8	LARGER THAN THE FULL ELEVATION LENGTH	1	0,4%

The first group is mostly formed of new buildings, such pension and hotels trying to create a small balcony for each room. Nearly half of the projections belong to 1/3 group, almost other half belongs to 1/4 and 1/2 groups. However, groups 6, 7 and even 9 are not to be neglected, since there are unique types and features included in this minority. It is beneficial to recall that Conservation and Development Plan for Historical Town Centre of Kalkan dictates 1/3 ratio for the projections.

For analysing the relation between the projection length and elevation length ratio and the number of projections that a building possesses, the below chart is devised, with building projection number on x-axis, and projection ratios on y-axis.

the bubbles are highlighted in size due to the number of total projections corresponding to that specific point's values. Y-axis values are approximations of the length ratio, namely 15 stands for group 1, 20 for 2, 25 for 3, 33 for 4, 50 for 5, 85 for 6, 100 for 7 and 130 for 8.

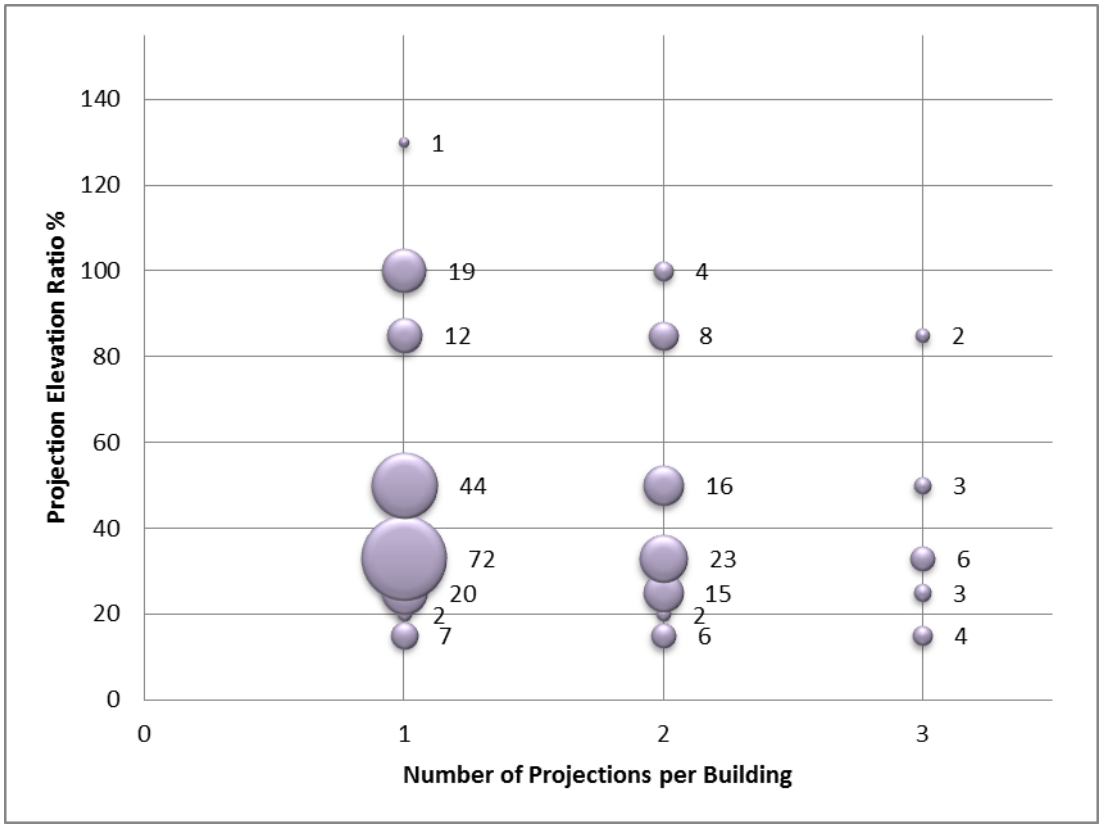


Chart 5 - Projection/Elevation Ratio And Building Projection Number Corelation

Hence, 1/3 and 1/2 ratio projections are mostly employed if there is a single balcony. On the other hand, if a building has 2 balconies, the distribution is more even, as well as on 3 balconies case. This fact highlights the 1/3, 1/2 and partially 1/4 projections as typical, whereas on 2 or 3 balcony cases, frequency for the other projections, until 1/1 are more balanced.

The other features about projections that are categorized in this analysis are listed below.

1. Space Enclosure - Open, Closed: This feature differentiates the closed space projections and open space balconies. For a projection to be categorized as closed space, it must be full closed. The semi-open spaces, such roofed balconies and other types of semi-enclosure are all categorized as Open Projections. Even a single

example on plot 329/7, a unique open balcony closed with glass surfaces have been grouped as a special type open balcony.

2. Structural Material: Wooden, Concrete: In this categorization, the basic structural material transferring the load to the building mass is considered. Balconies with concrete floor slab and wooden elements over it are categorized as concrete projections.

3. Roof Situation: No roof, shed roof, 2-ways pitched roof, 3-ways hipped roof, shed roof long projection type: The last element in this category indicates special type of balconies, with shed roof, some elements like WC, entrance or stairs and half closed with panels to a certain height, or partially on the length.

4. Plan Form: Rectangular, L-Shaped

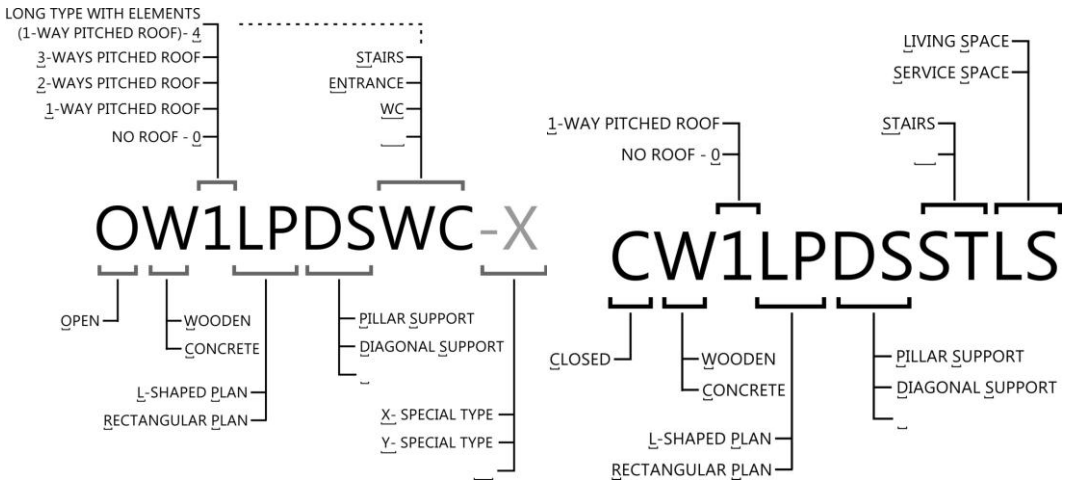
5. Support: Pillar Support, Diagonal Support

6. Spatial Elements: WC, Entrance, Stairs

7. Space Function (for only Closed Projections): Primary Living Space, Service Space (kitchen, wc, shower, storage)

For making the variations more clear, a donation system for labelling the projection types expressing the above categorized features, will be utilized. Labelling system, exposed below, will be employed on the further parts.[115] Length/Elevation Length Ratio is not included in this system, since it is about the size of projections as a distinct categorization.

[115] The database includes information on each building's each projection according to this labeling system.



Graphic 4 - Labelling System for Projection Categorization

Table 30 - Distribution Of All Projection Types According to Labelling System Explained Above

CLOSED PROJECTIONS	**12**
CC0LPSS	1
CC1RPDSLS	2
CC1RPSS	1
CC0RPPS	2
CC0RPSS	1
CW1RPPSSSST	1
CW1RPSS	2
CW1RPSSDS	1
CC0RPLS	1
OPEN PROJECTIONS	**249**
OC0RP	70
OC0RPST	2
OC1RP	46
OC1RPPS	1
OC1RPST	1
OC2RP	27
OC3RP	8
OC4RPST	1
OC1RPWCDS	1
OW0RP	8
OW0RPDS	1
OW1LP	1
OW1RP	32
OW1RPDS	8
OW1RPPS	1
OW1RP-X	1
OW2RP	12
OW2RPDS	4
OW2RPPS	1
OW3LP	1
OW3RP	9
OW3RPDS	2
OW3RP-Y	0
OW1LPDSWC	1
OW4RPPS	4
OW4RPST	3
OW4RPWC	1
OW4RPWCST	2

Figure 39 - Most Typical Balcony Projections with 1/3 length/elevation length ratio - OW2RP on plots 324/3 and 190/3

Figure 40 - An Exceptional Projection possesing all 3 Spatial Elements on plot 327/5 with full elevation length - OW4RPPSSTENWC type[116]

Figure 41 - An exceptional projection which is considered as length larger than the elevation when the stairs on right side is included, on plot 314/2 - CW1RPPSSSST type

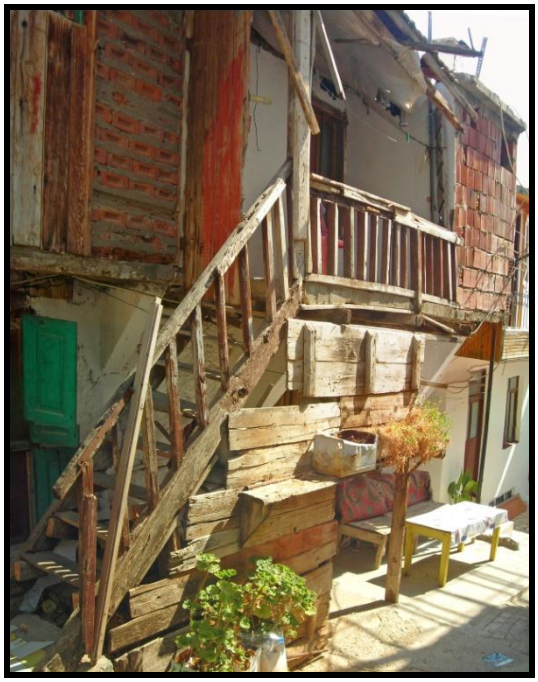


Figure 42 - Projection OW4RPWCST type on plot 189/8

Figure 43 - Projection with 80-90% length/elevation length ratio on plot 228/37 - OW1LP type

[116] cited from author's approved restoration project survey drawings

Basic distinctions are Enclosure, Structural material, roof type and plan form, and displayed on the below chart except roof types which is differentiated on a separate chart.

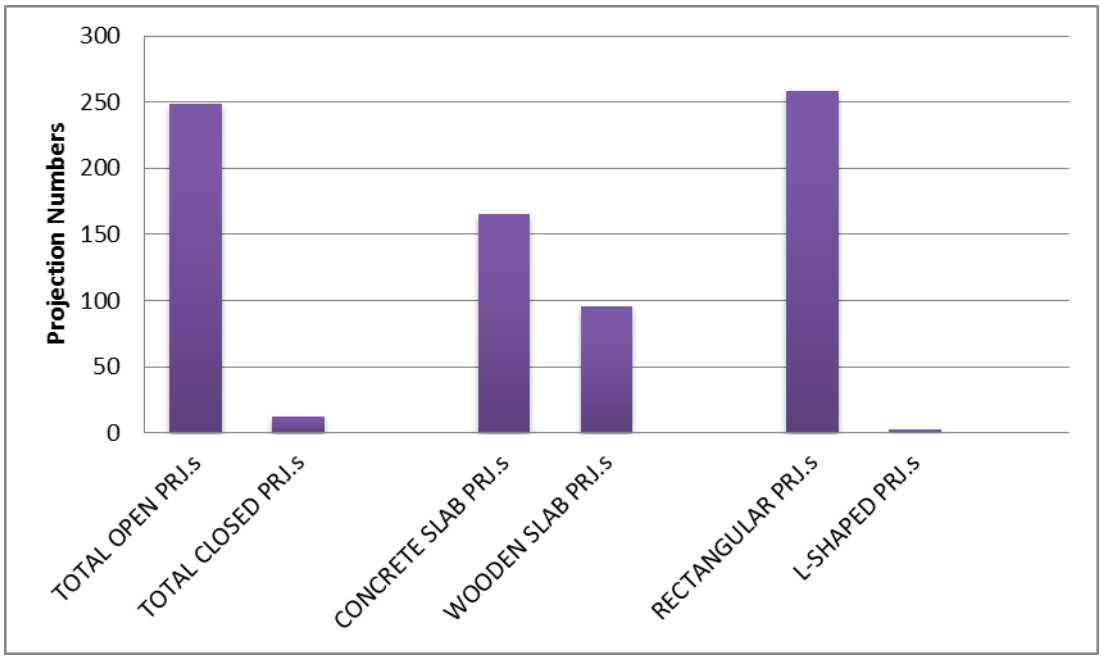


Chart 6 - Comparison of Basic Features of Projections

As observed on Chart 6, Closed Projections and L-Shaped Projections are very rare. On the other hand, wooden projections are about a third of the total. Probably the reason is, many of the new buildings prefer concrete slab for practical reasons, even though timber material is utilized for the above construction. Additionally most of the wooden balconies are open, and with a lower ratio most of the closed balconies possess concrete slabs.

If supported projections are considered, 24 of 28 are wooden and possess spatial elements such stairs, entrance and wc, which needs supporting because of extra weight. Analysing the below chart, it is possible to claim that most of the supported projections are larger than 1/3 elevation ratio. Moreover even larger ones such 6th, and 7th projection/elevation length ratio groups are mostly supported.

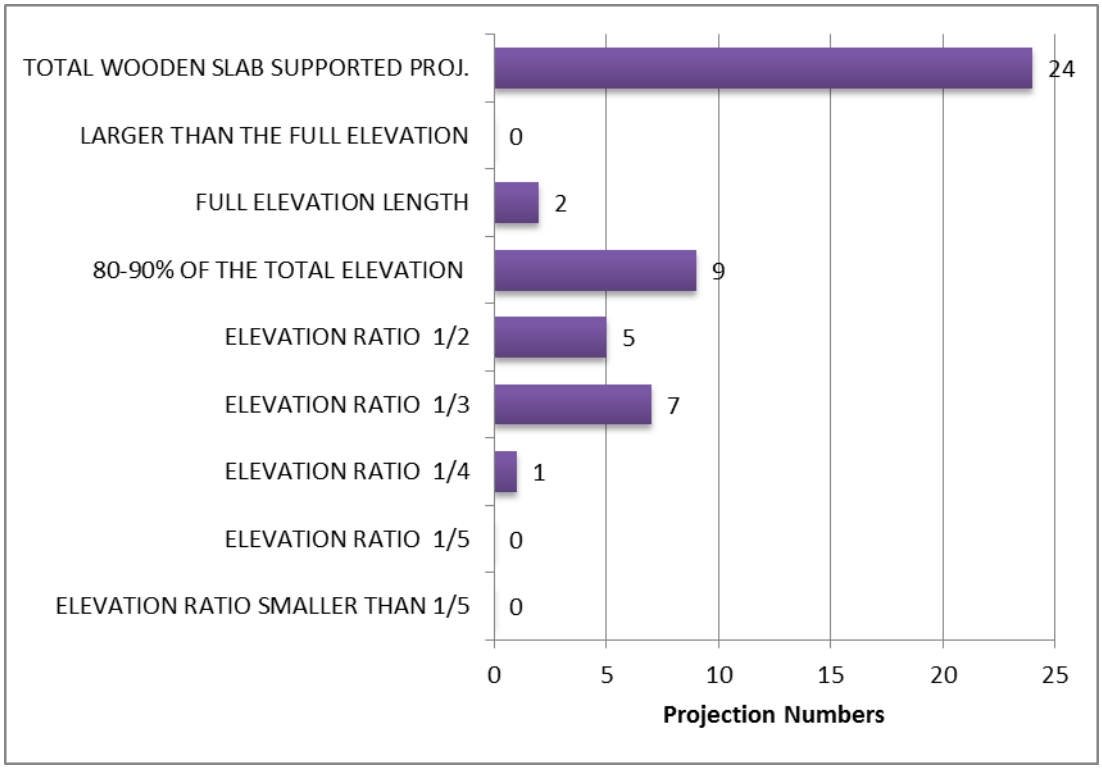


Chart 7 - Elevation Ratio Distribution of Wooden Slab Supported Projections

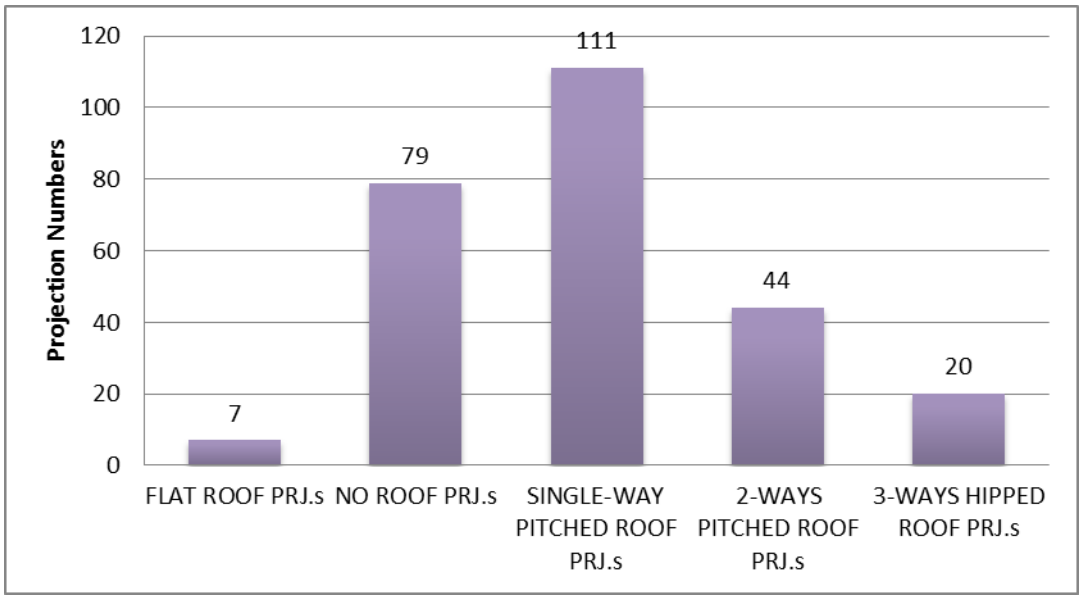


Chart 8 - Comparison of Roof Types of Projections

A flat Roof group consists of exceptional examples with flat roofs, and cases where the eve of the terrace makes a full covering for the balcony.

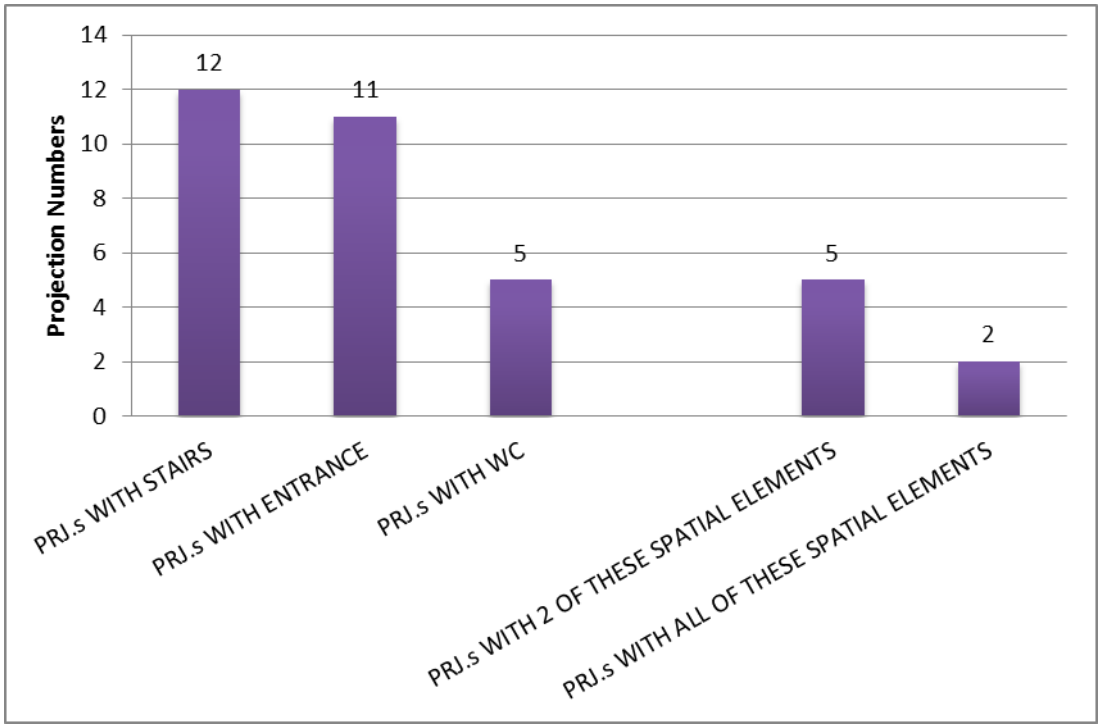


Chart 9 - Spatial Elements on Projects

4.2.23 Building List

The list of all the buildings that are surveyed in Kalkan historical Town Centre are displayed on the below Table 31 with basic data.

PLOT GROUP	PLOT NO	BLG NO	A1 BLG AREA M2	A2 BLG ROUGH VOL. EST. M3	B1 ELEV. ORN. LEVEL	B2 GRADUAL BLG	B6 SILLS	B6 SHUTTERS	B6 PENCIK	B6 KULAK	B7 PILSTR & PAINT	C1 CONS. STATUS	C2 ALT. STATUS	C3. FLOOR COUNT	C4 OPEN SP.	C5 ADDITIONS	D1 ST. SYS.	D1 ADDT. STR. SYS.	D2 PROJ. RATIO 1 (%)	D2 PROJ. RATIO 2 (%)	D2 PROJ. RATIO (3 %)	D2 PROJ. TYPE 1	D2 PROJ. TYPE 2	D2 PROJ. TYPE 3	D3 ROOF SYS.	D3 ROOF EVE	D3 ROOF HID. GROOVE	D3 ROOF CIRC. WIN.	D3 PEDIMENT
55	0	0																	kontr	kontr	kontr								
0	dntrol	ontro	ontrol	ontrol	dntrol	dntrol	ontrol	ntrol	ntrol	ontrol	ntrol	dntcl							ol	ol	ol	ntrol	ntrol	ntrol		l	ntrol	ntrol	
52	131	131																											
1	160	160	84,2	589,5	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	52		33			OC1RP			0AT1	0	0	0	0
1	167	167	42,7	299,1	1	0	1	1	0	0	A	6	5	GFP/T	BT1	0	52		33			OC0RP			2BT1	0	1	0	0
1	169	169	73,5	514,5	0	0	0	1	0	0	A	6	5	GFP/T	BT1	0	52		100			OC0RP			0AT1	0	0	0	0
4	174	174	66,9		0	1	1	0	0	0																			
4	176	176	99,0																										
4	177	177	54,1	378,4	0	0	0	0	1	0	A	3	3	GFP/T	B	0	11		33			OC0RP			2A	1	0	0	0
4	178	178																											
4	179	179A	116,0	811,9	2	1	1	1	0	0	A	4	4	GFP/T	CGBT1	0	52		33			OC0RP			2BT1	0	1	1	0
4	179	179B	154,0	862,6	0	0	0	1	0	0	F	3	3	GF	CT0	0	22		0						0AT1	0	0	0	0
4	180	180	254,4	712,4	0	0	0	0	0	0	A	1	1	G	G	0	42		0						0AT0	1	0	0	0
4	181	181	94,6	529,6	0	0	0	1	0	0	A	4	4	GF	GB	S0	62	42	33			OW3RP			4A	1	0	0	0
14	182	182																											
11	183	183	109,1	611,0	1	0	1	1	1	0	D	2	2	GF	CT0	S0	11	22	50	85		CW1RPSS	CW1RPSS		2A	0	1	1	1
11	184	184																											
11	185	185																											
7	186	186B	59,1	413,4	0	0	1	0	0	0	A	6	5	GFP/T	CBT1	0	52		33	33		OC0RP	OC0RP		0AT1	0	0	0	0
7	186	186A	121,1	1017,4	0	0	0	1	0	0	AD	3	2	BGFP/T	BT0	L0	11	42	33			OW3RP			2A	0	0	0	1
7	187	187	103,1	866,4	2	0	1	1	0	0	A	4	6	G+MFP/T	B	0	11		33			OW1RP			2A	0	1	1	1
7	188	188B	37,5	210,0	0	0	0	0	0	0	A	6	5	GF	B	D0	42	42	33			OC1RP			0AT1	0	0	0	0
7	188	188A	38,9	272,5	0	0	0	1	0	0	A	3	3	GFP/T	BT1	H0	62	42	33	50		OW1RP	CC1RPDSLS		0AT1	0	0	0	0
8	189	189	34,5	144,9	0	0	0	1	1	0	DE	2	3	BG	B	0	11		50	50	33	OW4RPWCST	CC1RPDSLS		3A	0	0	0	0
3	190	190	48,5	271,4	1	0	1	1	0	1	A	4	4	GF	B	0	11		33	100		OW2RP	OW4RPPS		2A	0	1	0	1
3	191	191	29,4	206,0	0	0	1	1	0	1	A	6	5	BGF	B	0	52		15			OC2RP			2A	0	0	0	1
3	192	192	35,2	246,6	0	0	1	1	0	1	A	6	5	BGF	B	0	52		15			OC2RP			2A	0	0	0	1
51	193	193	85,7	360,1	0	0	0	0	0	0	AD	3	2	BG	GB	0	11		50			DEMIR KONSTR			1A	1	0	0	0
51	194	194	34,2	191,4	0	0	0	0	0	0	A	3	3	GF	0	0	22		0						0AT0	0	0	0	0
51	195	195	33,2	186,2	0	0	0	0	0	0	A	3	3	GF	B	0	22		100			OC0RPST			0AT0	0	0	0	0
51	196	196B	40,6	170,6	0	0	0	1	0	0	A	5	2	BG	0	0	62		0						0AT0	1	0	0	0
51	196	196A	105,6	591,4	2	0	1	1	0	0	D	3	3	GF	CB	S0	11	42	33	33	50	OW3RP	OW1RP-X	CC0LPSS	4A	1	0	0	0
50	197	197	44,9	376,8	0	0	0	1	0	0	A	6	5	BGFP/T	BT1		52		33			OW2RP			2BT1	0	1	0	1
50	198	198	97,0	679,0	0	0	1	0	1	0	A	6	5	GFP/T	BT1	0	52		33	15		OC0RP	OC0RP		0AT1	0	0	0	0
49	199	199	37,8	264,5	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	52		50	33		CC0RPPS	OC0RP		0AT1	0	0	0	0
49	200	200	50,8	355,9	0	0	1	0	0	0	A	2	3	BGF	B	0	11		100			OW1RP			4A	1	0	0	0
49	201	201	35,8	250,4	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	52		50	50	85	OC1RP	OC1RP	OC1RPST	2BT1	0	0	0	1
3	202	202	21,3	119,5	0	0	0	1	0	0	DF	3	2	GF	0	0	21		0						0AT0	0	0	0	0

PLOT GROUP	PLOT NO	BLG NO	A1 BLG AREA M2	A2 BLG ROUGH VOL. EST. M3	B1 ELEV. ORN. LEVEL	B2 GRADUAL BLG	B6 SILLS	B6 SHUTTERS	B6 PENCIK	B6 KULAK	B7 PILSTR & PAINT	C1 CONS. STATUS	C2 ALT. STATUS	C3. FLOOR COUNT	C4 OPEN SP.	C5 ADDITIONS	D1 ST. SYS.	D1 ADDT. STR. SYS.	D2 PROJ. RATIO 1 (%)	D2 PROJ. RATIO 2 (%)	D2 PROJ. RATIO (3 %)	D2 PROJ. TYPE 1	D2 PROJ. TYPE 2	D2 PROJ. TYPE 3	D3 ROOF SYS.	D3 ROOF EVE	D3 ROOF HID. GROOVE	D3 ROOF CIRC. WIN.	D3 PEDIMENT
3	203	203	28,7	200,9	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	42		33	33		OW1RP	OW1RP		0AT1	0	0	0	0
46	204	204																											
53	205	205	115,3	968,6	1	1	1	1	0	0	A	6	5	BGFS	BT1	0	52		15	15	15	OC1RP	OC1RP	OC1RP	2BT1	0	1	0	1
54	206	206	46,8	392,8	0	0	1	0	0	0	A	6	5	BGFP/T	BT1	0	52		85	50		OC0RP	OC0RP		2BT1	1	0	0	0
45	207	207																											
47	208	208	254,4	2136,5	0	0	0	0	0	0	A	6	5	BGFP/T	T1	0	52		25	25	33	OC0RP	OC0RP	OC0RP	0AT1	0	0	0	0
47	209	209	31,6	265,1	0	0	0	0	0	0	A	6	5	BGFP/T	T1	0	52		25	25	33	OC0RP	OC0RP	OC0RP	0AT1	0	0	0	0
44	210	210	91,1	765,4	2	0	1	1	0	0	AB	6	5	BGFP/T	BT0	0	52		33	33		OC2RP	OC2RP		0AT1	0	0	0	0
44	211	211A	88,8	745,7	1	0	1	0	0	1	AB	6	5	BGFP/T	CBT1	0	52		25	25		OC3RP	OC3RP		2BT1	0	1	1	1
44	211	211B	80,6	677,1	0	0	1	0	0	0	A	6	5	BGFP/T	CBT1	S0	52	22	25	25		OC2RP	OC2RP		2BT1	0	0	0	1
44	212	212	60,0	420,2	0	0	1	0	0	0	A	6	5	GFP/T	BT1	0	52		33			OC0RP			2BT1	0	0	0	1
44	213	213	82,1	574,4	0	0	1	0	0	0	A	6	5	GFP/T	BT1	0	52		33			OC0RP			0AT1	0	0	0	0
44	214	214	59,4	498,9	0	0	1	0	0	0	A	6	5	BGFP/T	BT1	0	52		15	15		OC0RP	OC0RP		2A	0	0	1	0
44	215	215	38,2	214,0	1	0	1	0	0	1	A	6	5	GF	B	0	52		50			OC3RP			2A	0	1	1	1
44	216	216	27,4	191,5	0	0	1	0	0	1	A	6	5	GFP/T	BT1	0	52		33			OC0RP			2BT1	0	1	1	1
44	217	217	60,0	419,7	0	0	1	1	0	0	A	6	5	GFP/T	BT1	0	52		33			OC0RP			2BT1	0	0	1	1
41	218	218	247,9	1388,3	0	1	1	1	1	0	A	3	3	GF	T0	0	61		25			OC1RP			4A	1	0	0	0
35	219	219	162,3	1135,8	0	1	0	1	0	0	D	3	3	GFP/T	T01	0	22		0						0AT1	0	0	0	0
34	220	220	69,2	290,5	0	0	0	0	0	0	D	3	4	BG	0	0	61		0						4A	1	0	0	0
34	221	221	61,5	430,8	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	52		50	50		OC1RP	OC1RP		0AT1	0	0	0	0
36	222	222	65,7	459,9	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	242		25			OC0RPST			0AT1	1	0	0	0
36	223	223	26,0	182,2	1	0	1	0	0	0	A	6	5	GFP/T	BT1	0	52		50	33		OC0RP	OC0RP		2BT1	0	0	0	0
36	224	224	60,6	509,3	1	0	0	1	0	1	A	4	4	BG+MF	CBT0	H0S0	42	52	50			OW2RP			2A	0	1	1	1
36	225	225	55,1	385,6	1	1	1	0	0	1	AB	6	5	GFP/T	BT1		52		20	20		OC0RP	OC0RP		2BT1	0	1	1	1
40	226	226	43,3	303,1	0	0	1	0	0	0	A	6	5	GFP/T	BT1	0	52		33			OC1RP			0AT1	0	0	0	0
40	227	227	64,7	453,2	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	42		33			OC0RP			0AT1	0	0	0	0
39	228	228	78,4	439,1	2	0	1	1	0	1	A	4	6	GF	B	0	12		100			OC1RP			2A	0	1	0	1
39	229	229	167,3	1171,3	0	0	0	0	1	0	F	6	5	GFP/T	BT1	0	62		33	33		OC0RP	OC0RP		2BT1	0	0	1	0
39	230	230																											
39	231	231	63,8	446,4	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	42		100			OC0RP			0AT1	0	0	0	0
25	236	236	46,1	258,0	2	0	1	1	1	1	AB	4	6	GF	B	0	11		33	25		OW0RP	OW0RP		2A	0	1	1	1
25	238	238	80,4	562,6	0	0	1	0	0	0	A	6	5	GFP/T	T1	0	52		33			OC2RP			2BT1	0	1	1	1
25	239	239	34,4	240,6	0	0	1	0	0	0	AB	6	5	GFP/T	BT1	0	52		33			OC1RP			2BT1	0	1	0	0
25	240	240	52,8	369,9	0	0	1	0	0	0	A	6	5	GFP/T	CBT1	0	52		33			OC0RP			0AT1	0	0	0	0
27	241	241	19,5	136,7	0	0	0	1	0	0	A	6	5	GFP/T	BT1	0	52		50			OC1RP			0AT1	0	0	0	0
27	242	242	17,3	121,2	0	0	0	0	0	0	A	6	5	GFP/T	T1	0	52		0						0AT1	0	0	0	0
27	243	243	53,8	376,3	0	0	0	0	0	0	A	6	5	GFP/T	T1	0	52		20			CC0RPSS			0AT1	0	0	0	0
27	244	244	19,7	110,4	0	0	0	0	0	0	A	6	5	GF	CB	0	42		33			OC1RP			2BT1				0

PLOT GROUP	PLOT NO	BLG NO	A1 BLG AREA M2	A2 BLG ROUGH VOL. EST. M3	B1 ELEV. ORN. LEVEL	B2 GRADUAL BLG	B6 SILLS	B6 SHUTTERS	B6 PENCIK	B6 KULAK	B7 PILSTR & PAINT	C1 CONS. STATUS	C2 ALT. STATUS	C3. FLOOR COUNT	C4 OPEN SP.	C5 ADDITIONS	D1 ST. SYS.	D1 ADDT. STR. SYS.	D2 PROJ. RATIO 1 (%)	D2 PROJ. RATIO 2 (%)	D2 PROJ. RATIO (3 %)	D2 PROJ. TYPE 1	D2 PROJ. TYPE 2	D2 PROJ. TYPE 3	D3 ROOF SYS.	D3 ROOF EVE	D3 ROOF HID. GROOVE	D3 ROOF CIRC. WIN.	D3 PEDIMENT
24	245	245	128,4	719,2	2	0	1	1	1	0	A	4	6	GF	GCBT0	S0	11	62	33			CW1RPSSDS			4A	1	0	0	0
22	246	246	48,4	339,1	0	0	1	1	0	0	AB	6	5	GFP/T	BT1	0	52		33	33		OW3RP	OW3RP		2BT1	0	1	1	1
22	247	247	35,3	197,9	0	0	1	0	0	0	A	6	5	GF	0	0	42		0						0AT0	0	0	0	0
22	248	248	68,1	381,5	0	0	0	0	0	0	F	6	5	GF	BT1	0	62		100			OC0RP			0AT1	0	0	0	0
22	249	249																											
22	250	250A	31,1	217,6	0	0	0	1	0	0	F	4	3	GFP/T	BT1	0	62		100			OW1RPDS			2BT1	0	1	0	1
22	250	250B	43,9	369,0	0	0	0	1	0	0	A	3	2	BGFP/T	BT1	0	11		100			OW1RP			3BT1	0	0	0	0
22	251	251	56,8	397,9	0	0	0	0	0	0	A	5	5	GFP/T	BT1	S0	42		100			OC0RP			0AT0	0	0	0	0
22	252	252	45,1	252,8	0	0	0	1	0	0	A	3	2	GF	B	0	11		33	33		OW3RP	OW3RP		3A	0	0	0	0
22	253	253	27,6	77,4	0	0	0	1	0	0	D	2	1	G	0	0	21		0						1A	1	0	0	0
22	254	254	18,9	105,9	0	0	0	0	0	0	A	6	5	GF	0	H0	42	2	33			OW1RP			0AT0	0	0	0	0
22	255	255	22,5	125,9	0	0	0	0	0	0	A	6	5	GF	0	H0	42	2	33			OW1RP			0AT0	0	0	0	0
44	256	256	79,0	552,7	0	0	1	0	0	0	A	6	5	GFP/T	BT1	0	52		33	25		OC2RP	OC0RP		2BT1	0	0	1	0
25	257	257A	44,1	370,1	0	0	1	0	0	0	AB	6	5	BGFP/T	BT1	0	52		33			OC2RP			2BT1	0	0	1	1
25	257	257B	32,6	228,2	0	0	1	0	0	0	A	6	5	GFP/T	T1	0	52		0						2BT1	0	0	1	0
55	258	258	100,6	563,2	1	0	1	1	0	1	A	6	5	GF	CGB	0	52		50			OC0RP			2A	0	1	0	0
55	259	259	193,6	1084,4	2	0	0	0	0	0	A	4	4	GF	CG	S1	22		0						X	0	0	1	0
55	260	260	71,1	298,4	1	1	1	0	0	1	A	6	5	BG	0	0	52		0						2A	0	1	0	1
21	261	261	200,4	841,5	0	0	0	1	0	0	A	4	6	BG	CG	S0	11		0						4A	0	0	0	0
21	262	262	141,1	1185,2	0	0	0	0	0	0	E	1	1	BG+MF	CGB	L0	11	11	50			OW0RP			2A	0	1	0	1
20	263	263	86,4	483,9	0	0	0	1	0	0	D	4	2	GF	GB	0	11		15			OW1RP			4A	1	0	0	0
20	265	265	44,4	310,8	0	1	1	1	0	0	A	6	5	GFP/T	GBT1	0	52		33	33		OC0RP	OC0RP		2BT1	0	1	0	1
16	266	266	89,8	754,0	0	1	1	0	0	0	AB	6	5	BGFP/T	CGBT0	L0	52	52	100			OC1RP			2BT1	0	0	0	1
19	267	267	46,9	131,3	0	0	0	0	0	0	C	3	3	G	C	S0	12	42	0						0AT0	1	0	0	0
15	268	268A	25,0	140,0	0	0	1	1	0	0	A	6	5	GF	CBT1	0	52		33	50		OW1RPPS	OC0RP		2BT1	1	1	1	1
15	268	268B	58,1	325,4	0	0	0	1	0	0	A	6	5	GF	CGB	0	52		25	50		OW1RP	OW1RP		4A	1	0	0	0
32	269	269	28,6	200,3	0	0	1	1	0	0	AD	4	4	GFP/T	CBT1	L0	22	52	50			OW1RPDS			0AT1	0	0	0	0
30	270	270	42,2	295,6	1	0	1	1	0	0	AB	6	4	GFP/T	BT1	0	52		25	25		OC1RP	OC1RP		2BT1	0	1	1	1
30	271	271	42,6	298,4	0	0	0	1	0	0	E	1	1	BGF	CB	0	11		100			OW4RPST			UN	UN	UN	UN	0
29	272	272	59,9	335,5	0	0	0	1	0	0	D	3	3	GF	BT1	0	11		50	85		OW1RP	OW4RPPS		0AT1	0	0	0	0
29	273	273	39,9	279,6	0	0	1	1	0	0	A	6	5	GFP/T	BT1	0	52		33			OW3LP			2BT1	0	0	1	1
29	274	274																											
30	275	275	31,5	220,7	0	0	0	1	0	0	A	2	3	GFP/T	BT1	0	42		50			OW1RP			0AT1	0	0	0	0
17	276	276	97,4	681,7	0	1	0	1	0	0	A	4	6	GFP/T	BT1	0	52		25			OC1RP			2BT1	0	0	1	0
10	277	277	61,3	514,8	1	1	1	1	0	0	A	6	5	BGFP/T	BT1	0	52		33	33		OC2RP	OC2RP		2BT1	0	0	0	0
10	278	278			0	0	0	1	0	0	B	6	5	BGFP/T	CBT1	0	52		25			OC0RP			0AT0	0	0	0	0
8	279	279	98,0	686,1	1	0	1	1	0	0	A	4	6	GFP/T	CBT1	L1	62	52	25			OC2RP			0AT1	0	0	0	1
52	281	281																											

PLOT GROUP	PLOT NO	BLG NO	A1 BLG AREA M2	A2 BLG ROUGH VOL. EST. M3	B1 ELEV. ORN. LEVEL	B2 GRADUAL BLG	B6 SILLS	B6 SHUTTERS	B6 PENCIK	B6 KULAK	B7 PILSTR & PAINT	C1 CONS. STATUS	C2 ALT. STATUS	C3. FLOOR COUNT	C4 OPEN SP.	C5 ADDITIONS	D1 ST. SYS.	D1 ADDT. STR. SYS.	D2 PROJ. RATIO 1 (%)	D2 PROJ. RATIO 2 (%)	D2 PROJ. RATIO (3 %)	D2 PROJ. TYPE 1	D2 PROJ. TYPE 2	D2 PROJ. TYPE 3	D3 ROOF SYS.	D3 ROOF EVE	D3 ROOF HID. GROOVE	D3 ROOF CIRC. WIN.	D3 PEDIMENT
11	282	282	42,2	236,5	0	0	0	1	0	0	A	3	3	GF	GB	0	11		100			OC1RPWCDS			0AT0	1	0	0	0
20	283	283	42,8	299,6	0	0	0	1	0	0	A	6	5	GFP/T	BT1	0	52		50	50	50	OC2RP	OC2RP	OC2RP	2BT1	0	1	0	0
2	311	311A	100,2	841,6	0	0	0	0	0	0	A	3	3	BGFP/T	BT1	0	42		50			OC0RP			0AT1	0	0	0	0
2	311	311B	49,8	348,9	0	0	0	0	0	0	A	5	5	GFP/T	BT1	0	452		85			OW0RP			0AT1	0	0	0	0
2	312	312	61,2	513,7	1	0	1	1	0	0	A	6	5	BGFP/T	BT1	0	52		15	15	15	OC0RP			0AT1	0	1	0	0
2	313	313	91,7	770,4	1	0	1	1	0	0	A	6	5	BGFP/T	BT1	0	52		15	15	15	OC0RP			0AT1	0	1	0	0
2	314	314	67,3	377,1	0	0	0	0	0	0	D	2	2	GF	B	H0	11		33	85		OW1RP	CW1RPPSSSST		4A	1	0	0	0
4	315	315	49,1	274,8	0	0	0	1	0	0	D	2	2	GF	B	0	11		50			OW0RP			4A	1	0	0	0
4	316	316	69,2	581,7	0	0	0	0	0	0	A	3	3	BGFP/T	BT1	0	242		100	33		OC0RP	OC0RP		0AT1	0	0	0	0
4	317	317	63,2	353,8	0	0	0	1	0	0	A	3	2	GF	GB	D0	11	42	33			OW3RP			3A	1	0	0	0
4	318	318	159,5	1339,5	0	1	1	1	0	0	A	6	5	BGFP/T	BT1	0	52		33	33		OC2RP	OC2RP		2BT1	0	1	1	0
8	321	321	52,3	292,7	0	0	0	0	1	0	A	6	5	GF	B	0	12		85			OC1RP			UN	UN	UN	0	0
1	323	323	65,3	365,6	0	0	1	1	0	0	A	4	4	GF	B	0	11		50	33		OW1RP	OW1RP		2A	0	1	0	1
3	324	324	39,9	223,6	0	0	1	0	0	0	A	4	3	GF	B	0	11		33			OW2RP			2A	0	1	0	1
5	325	325	130,8	915,9	0	1	1	0	0	0	A	6	5	GFP/T	BT1	0	52		100			OC0RP			2BT1	0	0	0	1
5	326	326	42,4	237,3	1	0	1	1	0	0	A	4	4	GF	B	0	12		33	85		OW2RP	OW4RPWCST		2A	0	1	1	1
5	327	327	38,6	162,1	0	0	0	1	1	0	D	3	2	BG	B	0	21		100			OW4RPWC			1A	0	0	0	0
6	328	328	110,7	929,6	2	0	1	1	1	1	A	6	6	BGFP/T	CBT1	0	42		33	33		OC3RP	OC3RP		2BT1	0	1	0	1
6	329	329B	61,6	431,4	2	0	0	1	0	1	A	3	3	BGF	BT1	0	11		50			OW3RP-X			2A	0	1	1	1
6	329	329A	77,4	541,9	2	1	0	1	0	1	A	3	3	G+MF	BT0	0	11		33			OW3RP-X			2A	0	1	0	1
7	330	330	137,0	958,8	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	42		50	50	50	OC0RP	OC0RP	CC0RPPS	0AT1	0	0	0	0
8	331	331	26,0	181,8	0	0	0	0	0	0	AB	6	5	BGF	BT1	0	42		50			OC1RP			0AT1	0	0	0	0
8	332	332	47,9	268,3	1	0	1	0	1	0	A	4	4	GF	BT1	0	62		50			OC1RP			4BT1	0	0	0	0
9	333	333	75,3	632,1	0	0	1	1	0	0	A	6	5	BGFP/T	BT1	0	52		50	33	33	OC2RP	OC2RP	OC2RP	2BT1	0	1	1	1
13	335	335B	41,2	230,9	0	0	0	1	1	0	D	2	1	GF	B	0	11		50			OW1LPDSWC			4A	1	0	0	0
13	335	335A	60,6	424,5	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	42		50	33	33	OW2RP	OW2RP	OW4RPPS	2BT1	0	0	0	0
11	336	336																											
10	337	337																											
10	338	338	66,6	559,4	1	0	0	1	0	0	B	6	5	BGFP/T	CBT1	0	52		25			OC0RP			0AT0	0	0	0	0
11	339	339	29,5	165,3	0	0	0	0	0	0	D	3	2	GF	BT1	L0	42	42	85			OW0RPDS			0AT0	0	0	0	0
13	340	340	38,2	320,9	1	0	0	1	1	0	A	4	6	G+MFP/T	T1	0	11		25	50	85	OW0RP	OW1RPDS	OW1RPDS	2BT1	0	1	1	0
12	341	341A	28,6	200,5	0	0	1	1	0	0	A	6	5	GFP/T	BT1	0	42		85			OW2RPPS			2BT1	0	0	0	1
12	341	341B	17,2	120,5	1	0	1	1	0	0	A	6	5	GFP/T	BT1	0	52		33			OC3RP			2BT1	0	0	0	1
12	342	342	56,1	471,2	0	0	1	1	0	0	A	6	5	BGFP/T	BT1	0	42		33	33		OC1RP	OC1RP		2BT1	0	0	0	1
12	343	343	56,6	475,6	0	1	1	0	0	0	A	6	5	BGFP/T	BT01	L0	52		33			OW2RPDS			0AT1	0	0	0	0
15	344	344	52,5	367,3	0	1	0	1	0	0	D	4	3	GFP/T	GBT1	0	11		130			OW1LP			2BT1	0	0	1	1
15	345	345	30,4	213,0	1	0	0	1	0	0	B	6	5	GFP/T	GBT1	0	51		50			OC1RP			1BT1	0	0	0	1
15	346	346	62,2	435,6	1	0	0	1	0	0	A	6	5	GFP/T	GBT1	0	52		50			OC1RP			2BT1	0	0	0	0

PLOT GROUP	PLOT NO	BLG NO	A1 BLG AREA M2	A2 BLG ROUGH VOL. EST. M3	B1 ELEV. ORN. LEVEL	B2 GRADUAL BLG	B6 SILLS	B6 SHUTTERS	B6 PENCIK	B6 KULAK	B7 PILSTR & PAINT	C1 CONS. STATUS	C2 ALT. STATUS	C3. FLOOR COUNT	C4 OPEN SP.	C5 ADDITIONS	D1 ST. SYS.	D1 ADDT. STR. SYS.	D2 PROJ. RATIO 1 (%)	D2 PROJ. RATIO 2 (%)	D2 PROJ. RATIO (3 %)	D2 PROJ. TYPE 1	D2 PROJ. TYPE 2	D2 PROJ. TYPE 3	D3 ROOF SYS.	D3 ROOF EVE	D3 ROOF HID. GROOVE	D3 ROOF CIRC. WIN.	D3 PEDIMENT
23	387	387	36,8	257,7	0	0	0	1	0	0	AD	6	5	GFP/T	GBT1	0	52		33	33		OW2RPDS	OW2RPDS		2BT1	0	0	1	1
18	388	388B	27,3	152,6	0	0	0	0	0	0	E	1	1	GF	0	0	21		0						UN	UN	UN	UN	UN
18	388	388A																											
18	389	389	46,3	324,2	0	0	0	1	0	0	A	6	5	GFP/T	T1	0	52		33	85		OW1RP	OW1RP		2BT1	0	0	0	1
18	390	390																											
28	391	391	136,3	954,4	0	0	1	0	0	0	A	6	5	GFP/T	GBT1	0	52		100			OC1RP			2BT1	0	0	0	0
28	392	392																											
28	393	393																											
28	394	394	42,9	300,4	0	0	0	1	0	0	A	4	3	GFP/T	GBT1	L0	21	52	85	100		OW1RP	OC4RPST		0AT1	0	0	0	0
28	395	395	40,8	228,6	0	0	0	1	0	0	D	3	3	GF	GB	0	12		33	85		OW1RP	OW4RPPS		0AT0	0	0	0	0
30	397	397	54,6	382,2	1	1	1	0	1	0	F	5	5	GFP/T	CBT1	0	22		50			OC1RPPS			0AT1	0	0	0	0
30	398	398	41,0	286,9	0	0	1	0	0	0	A	4	3	GFP/T	BT1	0	22		50			OC1RP			2BT1	0	0	0	0
30	399	399	34,8	243,7	0	0	0	1	0	0	A	2	3	GFP/T	BT1	0	42		50			OW1RPDS			2BT1	0	0	0	0
30	400	400	23,2	162,4	0	1	0	1	0	0	A	6	5	GFP/T	BT1	0	52		50	50		OC1RP	OC1RP		2BT1	0	1	0	0
30	401	401	19,3	135,3	0	1	0	1	0	0	A	6	5	GFP/T	BT1	0	52		50	50		OC1RP	OC1RP		2BT1	0	1	0	0
30	402	402	30,6	85,7	0	0	0	0	0	0	E	1	1	G	CBT1	0	11		0						UN	UN	UN	UN	0
31	403	403	29,8	250,5	0	1	0	0	0	0	B	6	5	BGFP/T	BT1	0	52		25			OC1RP			2BT1	0	0	0	0
31	404	404	66,5	372,4	0	0	0	1	0	0	D	2	2	GF	CT0	D0	52	4	0						2BT1	1	0	0	0
31	405	405	90,0	756,4	0	1	0	0	0	0	A	6	5	BGFP/T	BT1	0	52		50	25		OC0RP	OC0RP		0AT1	0	0	0	0
31	406	406A	32,7	228,8	0	0	1	1	0	0	AB	6	5	GFP/T	BT1	0	52		33			OW2RP			2BT1	0	1	1	1
31	406	406B	45,5	318,5	0	0	1	1	0	0	A	5	5	GFP/T	BT1	0	52		33	100		OW1RP	OW1RP		0AT1	0	0	0	1
32	407	407	45,5	382,2	0	1	1	0	0	0	AB	6	5	BGFP/T	BT1	0	52		50	50		OC0RP	OC0RP		0AT1	0	0	0	0
32	408	408	28,6	240,4	0	1	1	0	0	0	AB	6	5	BGFP/T	BT1	0	52		50	50		OC0RP	OC0RP		0AT1	0	0	0	0
33	409	409	44,6	249,7	0	0	0	0	0	0	AD	2	2	GF	B	0	11		25	25		OW1RP	OW1RP		4A	1	0	0	0
33	410	410	65,7	460,1	1	0	0	1	0	0	A	6	5	GFP/T	B	0	42		50	85		OW3RP	OW3RPDS		2A	0	1	1	1
33	411	411	40,4	395,9	1	0	0	1	0	0	AB	6	5	GFP/TS	BT1	0	52		50			OC2RP			2BT1	0	1	0	0
33	412	412	46,2	258,4	1	0	1	1	0	0	A	4	4	GF	B	0	62		33	85		OW1RP	OW1RPDS		4A	1	0	0	0
33	413	413	68,1	381,3	1	0	1	1	0	0	A	4	2	GF	B	0	11		33	25		OW1RP	OW1RP		4A	1	0	0	0
35	414	414	93,4	653,6	1	0	1	1	0	0	A	6	6	GFP/T	BT1	S0	42	42	50	33		OC3RP	OC3RP		0AT1	1	0	0	0
48	415	415																											
48	416	416																											
36	417	417	104,6	585,9	0	0	0	1	0	0	D	2	2	GF	B	0	11		25			OW1RP			4A	1	0	0	1
43	418	418	120,6	1012,8	0	1	1	0	0	0	A	6	5	BGFP/T	CBT0	0	52		33	25		OC0RP	OC0RP		2BT1	0	1	0	1
43	419	419	76,5	535,4	0	0	1	0	0	0	A	6	5	GFP/T	BT1	0	52		33			OC2RP			2BT1	0	1	0	0
42	420	420	110,0	923,6	0	0	1	1	0	0	A	6	5	BGFP/T	CBT1	0	52		33	33	33	OC2RP	OC2RP	OC2RP	2BT1	0	1	1	0
42	422	422	31,2	218,6	0	0	1	1	1	0	A	6	5	GFP/T	BT1	0	52		50			OW2RPDS			2BT1	0	1	1	0
44	424	424B	48,9	342,1	0	0	0	0	0	0	AD	2	3	GFP/T	T0	L0	12	42	0						4A	0	1	0	0
44	424	424A	37,3	208,7	0	0	0	0	0	0	H	2	3	GF	0	0	22		0						1A	0	0	0	0

PLOT GROUP	PLOT NO	BLG NO	A1 BLG AREA M2	A2 BLG ROUGH VOL. EST. M3	B1 ELEV. ORN. LEVEL	B2 GRADUAL BLG	B6 SILLS	B6 SHUTTERS	B6 PENCIK	B6 KULAK	B7 PILSTR & PAINT	C1 CONS. STATUS	C2 ALT. STATUS	C3. FLOOR COUNT	C4 OPEN SP.	C5 ADDITIONS	D1 ST. SYS.	D1 ADDT. STR. SYS.	D2 PROJ. RATIO 1 (%)	D2 PROJ. RATIO 2 (%)	D2 PROJ. RATIO (3 %)	D2 PROJ. TYPE 1	D2 PROJ. TYPE 2	D2 PROJ. TYPE 3	D3 ROOF SYS.	D3 ROOF EVE	D3 ROOF HID. GROOVE	D3 ROOF CIRC. WIN.	D3 PEDIMENT
44	425	425	70,1	392,6	0	0	0	1	1	0	A	3	3	GF	CB	0	612		33	25		OW3RPDS	OW1RPDS		3A	1	0	0	0
47	426	426	107,4	751,8	0	0	1	1	0	0	E	6	5	GFP/T	CBT1	0	242		85			OC1RP			0AT1	0	0	0	0
50	427	427	39,8	278,9	0	0	0	0	0	0	D	2	3	GFP/T	T0	0	12		0						1A	0	0	0	0
51	428	428	57,7	403,7	0	1	0	0	0	0	A	6	5	GFP/T	BT1	0	52		33			OC0RP			2A	0	0	1	1
51	429	429	55,4	388,0	0	0	1	0	0	0	A	4	4	GFP/T	BT1	0	242		50	50		OC0RP	CC0RPLS		0AT1	1	0	1	0
46	430	430	160,2	1346,0	1	1	1	0	0	0	A	6	5	BGFP/T	BT1	0	52		33	15	15	OC0RP	OC0RP	OC0RP	0AT1	0	0	0	0
53	432	432																											
53	433	433A	181,4	1269,5	1	1	1	1	0	1	A	6	5	BGF	CBT0		52		25	25	25	OC1RP	OC1RP	OC1RP	2BT1	0	1	1	1
53	433	433B	183,8	1286,5	1	1	1	1	0	1	A	6	5	BGF	CBT0		52		25	25	25	OC1RP	OC1RP	OC1RP	2BT1	0	1	1	1
53	434	434	77,3	541,2	1	0	1	1	0	1	A	6	5	BGF	GB		52		33			OC1RP			2A	0	1	1	1
53	435	435	143,6	1206,0	1	0	1	1	0	1	AF	6	5	BGFP/T	GBT1		52		0			OC0RP			2BT1	0	1	1	1
54	436	436	66,5	465,5	0	0	1	0	0	0	A	6	5	GFP/T	T1	0	52		0						2BT1	0	0	0	1
54	437	437	72,7		0	0	0	0	0	0	AF	6	5						33			OC1RP							0
54	438	438	65,7		0	0	0	0	0	0	AF	6	5						33			OC1RP							0
54	439	439	155,3		0	0	0	0	0	0	AF	6	5						33			OC1RP							0
54	440	440	66,6		0	0	0	0	0	0	AF	6	5						33			OC1RP							0
26	446	446	100,4	702,8	0	0	1	0	0	0	AB	6	5	GFP/T	BT1	0	52		33			OC1RP			2BT1	0	0	0	0
26	447	447	32,3	225,9	0	0	0	0	0	0	D	2	3	GFP/T	CT1	0	12		85			OW0RP			0AT0	0	0	0	0
26	448	448	53,5	299,7	0	0	0	1	0	0	ED	3	2	GF	B	0	11		25			OW1RP			4A	1	0	0	0
37	449	449	53,3	298,4	0	0	0	0	0	1	D	3	2	GF	B	0	11		50			OW1RP			4A	1	0	0	0
37	450	450	52,8	369,9	0	0	1	0	0	0	A	3	2	GFP/T	BT1	0	11		50			OW0RP			0AT1	0	0	0	
37	451	451	22,2	155,5	0	0	1	1	0	0	A	6	5	GFP/T	BT1	0	52		33			OC0RP			0AT1	0	0	0	0
37	452	452	35,6	199,4	0	0	0	0	0	0	E	2	3	GF	0	0	21		0						0AT0	0	0	0	0
37	453	453	62,8	439,3	0	0	0	0	0	0	A	6	5	GFP/T	BT1	0	242		100	50		OC0RP	CC1RPSS		0AT1	0	0	0	0
38	454	454	98,5	827,8	0	0	1	1	0	0	A	6	5	BGFP/T	T1	0	52		0						0AT1	0	0	0	0
40	455	455	67,5	472,3	1	0	0	1	0	1	A	6	5	GFP/T	BT1	0	52		50			OW2RP			0AT1	0	0	0	0
40	456	456																											
27	458	458	25,0	140,0	0	0	0	1	0	0	A	6	5	GF	BT1	0	52		0						2A	0	0	0	0
42	1548	1548																											
9	1565	1565	77,9	654,1	0	0	1	1	0	0	A	6	5	BGFP/T	BT1	D0	52	42	33	33		OC0RP	OC0RP		2BT1	1	0	0	0
9	1566	1566	104,4	876,8	0	1	1	0	0	1	A	6	5	BGFP/T	BT0	0	52		50	33		OC2RP	OC0RP		2BT1	0	1	1	1
11	2255	2255	96,5	540,4	1	0	0	1	0	0	DE	2	1	GF	CGB	L1	11	11	85	100		OW1RPDS	OW4RPST		5A	1	0	0	0
11	2256	2256	121,5	1020,2	0	0	1	1	0	0	A	6	5	BGFP/T	GBT1	0	52		33	25	25	OW2RP	OW2RP	OW2RP	2BT1	0	1	0	1
56	old	old																											

CHAPTER 5

RELATIONAL ANALYSES

This chapter provides further analysis on 2 groups. In the first part, the result and findings of the 1st level analysis will be discussed, and through this discussion, the 2nd Level Analysis will be designed. 2nd level analysis will be the interpretations of the results of the 1st Level Analysis, in comparison to each other, namely result data sets are compared to each other, or explaining the correlation of various parameters of Kalkan Historical Town Centre Buildings Data Set.

In Chapter 5.3, a further level analysis will be discussed, this time with the intention of identifying the rules for algorithm design. In this part of the study, analysis will be held on a 36 buildings data set, formed of selected buildings on Kalkan Historical Town Centre. For these selected buildings more data will be employed in order to not only providing more detailed information on specific issues, and also this data set will be utilized as a verification group for the results of the previous analysis realized about 200 buildings.

5.1 Evaluation of the 1st level analyses

5.1.1 The comparisons

In the first part, staying in the scope of this thesis, Land-Use, Built-Up Space, Open Space and Road Network analyses were demonstrated for understanding the alterations and comparisons between the 1948-70 period and the current situation. One of the clear outcomes of these analyses is a certain level of destruction on the social and functional, spatial and climatic balances of the traditional tissue.

Primarily, building stock can be claimed to be on its limits. On Built-Up Space analysis, it is legible that, there are no empty spaces of any kind left, with the exception of a few plots, owned by private and government. Government owned plots are park areas, which are not working as parks or gathering spaces, but mostly works for tourism sector's expansion or storage areas. Similarly private plots that are not built-up yet are very small building ruins, which are owned with dozens of partners who cannot agree on for a development of any kind. All the other spaces are filled up with buildings. Areas that are not allowed have been started to be built-up through additions, and illegal temporary buildings, such as the additions on the public streets or private open space areas.

When mass and height level of the building stock is considered, the same statements can be repeated. Most of the buildings have reached to the available maximum building height and many examples, particularly the ones utilized in relation to tourism have started to push the limits, through illegal additions or temporary structures on the penthouse floor or the roof terrace. From the building height limitation perspective, the exceeding mass is not too much in general, since it is only some height difference on roof or illegal usage of terrace, however when the perception of elevations and building mass is considered, many buildings seem to utilize 3 or sometimes 4 floors at all, with all the elevation elements, such as fenestrations and projections.

On the land use level, destruction of the balance is much clearer. Commercial functions have invaded the tissue, resulting with a town, more than half of it is not used in any sense, for half of the year. In parallel, commercial tourism functions, staff residences and rental holiday spaces are the primary actors of this effect.

None of the 5 gathering areas denoted on 1948-70 analysis, are working as gathering spaces. Likewise there are no new gathering spaces, and it seems that there is no one also for gathering. Most of the population in summer is working hard throughout the daytime, since the tourism season is limited. And in the summer, Kalkan becomes a highly dense town in comparison to its residing population.

The problem about open spaces is not only limited with gathering spaces. The built-space vs. open space relation is degraded as much as possible, however the open space requirement is continuously increasing in relation to development. This

can be read from the increase in roof terraces, and the significant ratio of expansion of the commercial functions to public areas and streets on the land use and open space analyses and discussions in Chapters beginning from 4.2.2., to 4.2.6.

Furthermore, from the climatic perspective, the town cannot benefit from the sun and the breeze as well, as it was in 1948-70 period. Together with the degradation of both public and open spaces, all the floors are built even pushing the limits, creating a much larger building stock, avoiding breeze to travel to inner parts of the town. Some of the streets are blocked by built-up structures, avoiding sun and breeze as well, to reach to further parts. In parallel, this over-sized building stock, and serious reduction on the green level, also causes a change on the moisture level and ever-heating of Town Centre, though the details of this subject is not included in the scope of this study.

On the other hand, it is remarkable that, the organic tissue has a certain character which demonstrates a level of resistance against the destructive effects of tourism based development. Contribution of 1996 Conservation and Development Plan's approach and primary principles is highly important for this resistance. The building sizes and permissions are, although not defined in a detail as required by the tissue, still working for preserving the character of the tissue, by keeping the new buildings in scale, and enforcing conservation and proper restoration of qualified buildings.

Similarly, the nature of the traditional tissue in Kalkan has a certain power of resistance through integral means. The plot sizes and the building arrangements are limited in opportunities that tourism based development requires. Furthermore, as observed in various analyses, features of the Town Centre are usually distributed all around, without a clear division or separation of zones. Through this important character, no area turns to be an isolated development or deposition quarter.

In parallel, it can be claimed that the buildings under conservation also help the conservation of their near surroundings. Firstly they come forward as references, and in some cases with proper restorations, for being qualified buildings not only for residential purposes but also commercial and tourism functions. Moreover, because of the limitations for buildings adjacent to registered ones, any plot around a registered plot is also supervised by Antalya Regional Council for Conservation of

Cultural and Natural Heritage, making illegal alterations and additions difficult. Since registered buildings are distributed all around the tissue, they work like small conservation stations, affecting the surrounding.

Road Network analysis in chapter 4.2.7 demonstrates that the main axes and the usage densities of the paths in the Town, are not altered much. Thus the general layout and structure of the Town, including the functional resources and access paths are similar with the 1948-70 situation, despite the great change on the building stock, population and commercial activities.

The conservation Status and Alteration Level Analysis, exposes that there are 82 traditional buildings including ruins and restorations, with 41 of them low alteration levels or restorations. It is true that, restoration is open to discussion for its alteration effect. However, an officially restored building, even though it is not a proper restoration example, has certain legible features demonstrating the traditional status, at least a proper survey of measured drawings. In this sense, the traditional building stock still has the ability to demonstrate the features of the organic tissue through its development process of about last 100 years.

In general, 2 primary conclusions will be highlighted under the light of these evaluations. The building stock and the density for Kalkan Historical centre have reached its boundaries, and already started a spoiling effect culturally and architecturally. Though, on the other hand, organic tissue demonstrates a strong resistance through its character and there is still enough material for reading the unique and determining features of the traditional tissue, in detail, building and the tissue levels, all.

5.1.2 Interpretations for directing the 2nd Level Analyses

Above mentioned material is basically the traditional building stock for the building level analysis, and particularly traditional building stock with low alteration levels. Following this anchor, some of the further analyses will be filtered by traditional buildings and for the necessary cases, by the ones with low alteration values.

Another noteworthy outcome is related with the building size, incorporated roughly through building base area and building mass volume properties. General

categorizations on these factors and their relation to each other are measured and discussed in the previous chapter. On this level, this relation, in reference to traditional buildings where necessary will be a base medium for measuring the relations of other architectural features, in order to achieve results that will contribute to design of final algorithms.

For utilizing the analysis results on floor number, a value is defined as 'Floor Level Value', which will guide to measure and design the building height in reference to its scale and perception at the same time.

The open space requirement for the buildings in Kalkan is clearly demonstrated on Building Open Space analysis. One of the outcomes is that, with the exception of some unqualified or supporting buildings, most of the buildings at least possess balconies as open space, and the open space employment is increasing in relation with the capacity or availability. %80 of all the buildings, possess at least a single open space type other than the balcony.

Roof Analysis in Chapter 4.2.17 demonstrates that dominant roof types are flat roof and 2-ways pitched roof, which becomes typical for Kalkan Traditional Architecture, with parapet walls and elements like circular window and hidden groove behind. On the other hand, Structural analysis expose that about a quarter of all the buildings preserve their traditional structural system as both vertical and horizontal load transfer systems. Similarly, 39 traditional buildings preserve their traditional outside finishing material and technique, entirely or partially.

When it comes to elevation articulation, on the 1st Level analysis depending primarily on the survey data, selected decorative and/or functional elevation elements are analysed together with a general approach for measuring the elevation's articulation level. The distribution of these values on traditional buildings will provide more information leading to concluding result about elevation articulation. Furthermore, for analysis of elevation morphology, an approach will be designed on a further data set of selected buildings from the tissue. These buildings will be analysed in more detail through digital models in Chapter 5.3.

It has been observed that, the projections are integral and developed elements of the organic tissue. There is a great variation of projections throughout the tissue, which makes the analysis complicated. For processing the results of this analysis and

enabling more detailed analyses, a labelling system has been designed and all the survey data had been recorded accordingly.

Closed projections do not offer a high frequency with 12 total examples throughout all data set. Based on the results of the analysis on projections, it can be concluded that there are 2 major types for open projections, noting few examples of unique special types, that cannot be categorized under these groups.

1. balconies with standard width and varying elevation length ratio from 1/5 to 1/2.

2. elongated balconies or 'long projections', sometimes possessing certain spatial elements, and in varying elevation length ratios from almost full elevation length to even larger than full elevation length.

First group includes the most prevalent projection types, whereas the second group is rare, but an indispensible element of the organic tissue, in some cases enabling entrance, service and/or circulation functions.

The following 2nd level analyses will be designed under the light supplied by the outcomes of the 1st level. The previous analysis have provided the basic information about the architectural features and other selected categories on Kalkan Historical Town Centre doe picturing the general, and the further analysis, employ this data, utilizing various categories in relation or comparison to each other, in order to achieve more specific results for shaping the algorithm on the final chapter.

5.2 2nd Level Analyses

5.2.1 Building Size

One of the most primary integrals of the traditional tissue in Kalkan is the building size, which was analysed through the basic parameters of building base area, building body volume, and Floor Numbers the previous chapter. In this part these analyses will be filtered to traditional buildings which had already been defined as follows for this study: A building with conservation status value lower than 5 and alteration levels 1, 2, 3 or 6 . On the below tables the distribution of base

area and volume groups established in the previous chapter have been filtered for traditional buildings.

Table 32 - Building Base Area and Volume Categories Compared on All Buildings and Traditional Buildings Data Sets

	CATEGORY	#	%		CATEGORY	#	%
1	BASE AREA <25 M2	12	5,7%	**1**	TRAD. BLG.S BASE AREA <25 M2	1	1,2%
2	BASE AREA 25-40 M2	45	21,4%	**2**	TRAD. BLG.S BASE AREA 25-40 M2	20	24,4%
3	BASE AREA 40-60 M2	57	27,1%	**3**	TRAD. BLG.S BASE AREA 40-60 M2	27	32,9%
4	BASE AREA 60-80 M2	40	19,0%	**4**	TRAD. BLG.S BASE AREA 60-80 M2	12	14,6%
5	BASE AREA 80-100 M2	19	9,0%	**5**	TRAD. BLG.S BASE AREA 80-100 M2	6	7,3%
6	BASE AREA 100-150 M2	24	11,4%	**6**	TRAD. BLG.S BASE AREA 100-150 M2	10	12,2%
7	BASE AREA >150 M2	13	6,2%	**7**	TRAD. BLG.S BASE AREA >150 M2	6	7,3%
	TOTAL SURVEYS	**210**	**100,0%**		**TOTAL TRAD. BLG.S INCLUDING RUINS**	**82**	**100,0%**
	AVERAGE BUILDING BASE AREA	**67,7**			**TRAD. BLG.S AVERAGE BUILDING BASE AREA**	**415,1**	
1	EST. BODY VOLUME <200 M3	29	15,3%	**1**	TRADITIONAL BLGS EST BODY VOLUME <200 M3	13	15,9%
2	EST. BODY VOLUME 200-400 M3	86	45,5%	**2**	TRADITIONAL BLGS EST BODY VOLUME 200-400 M3	43	52,4%
3	EST. BODY VOLUME 400-600 M3	39	20,6%	**3**	TRADITIONAL BLGS EST BODY VOLUME 400-600 M3	10	12,2%
4	EST. BODY VOLUME 600-1000 M3	31	16,4%	**4**	TRADITIONAL BLGS EST BODY VOLUME 600-1000 M3	11	13,4%
5	EST. BODY VOLUME >1000 M3	4	2,1%	**5**	TRADITIONAL BLGS EST BODY VOLUME >1000 M3	5	6,1%
					TOTAL TRAD. BLG.S INCLUDING RUINS	**82**	**100,0%**
	T-Rhb	**14**			**TRAD. BLG.S AVERAGE BUILDING EST. BODY VOLUME**	**413,7**	

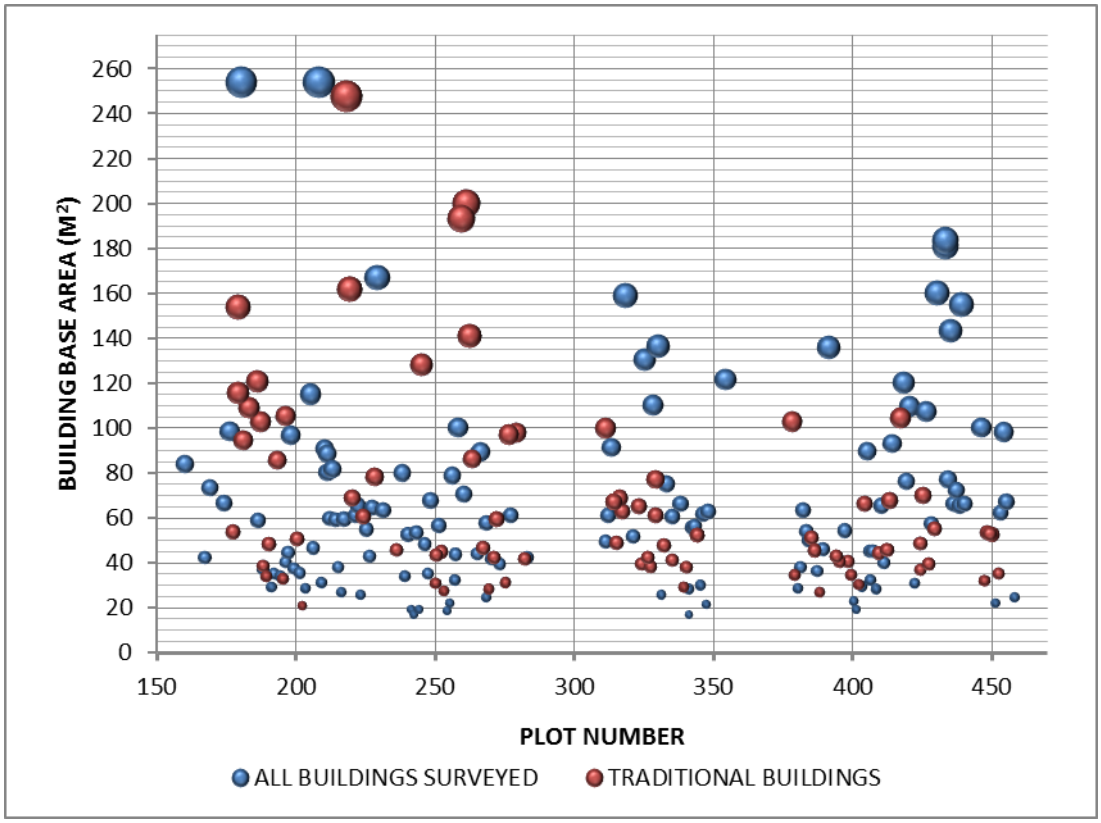


Chart 10 - Building Base Areas - All Buildings And Traditional Buildings Comparison

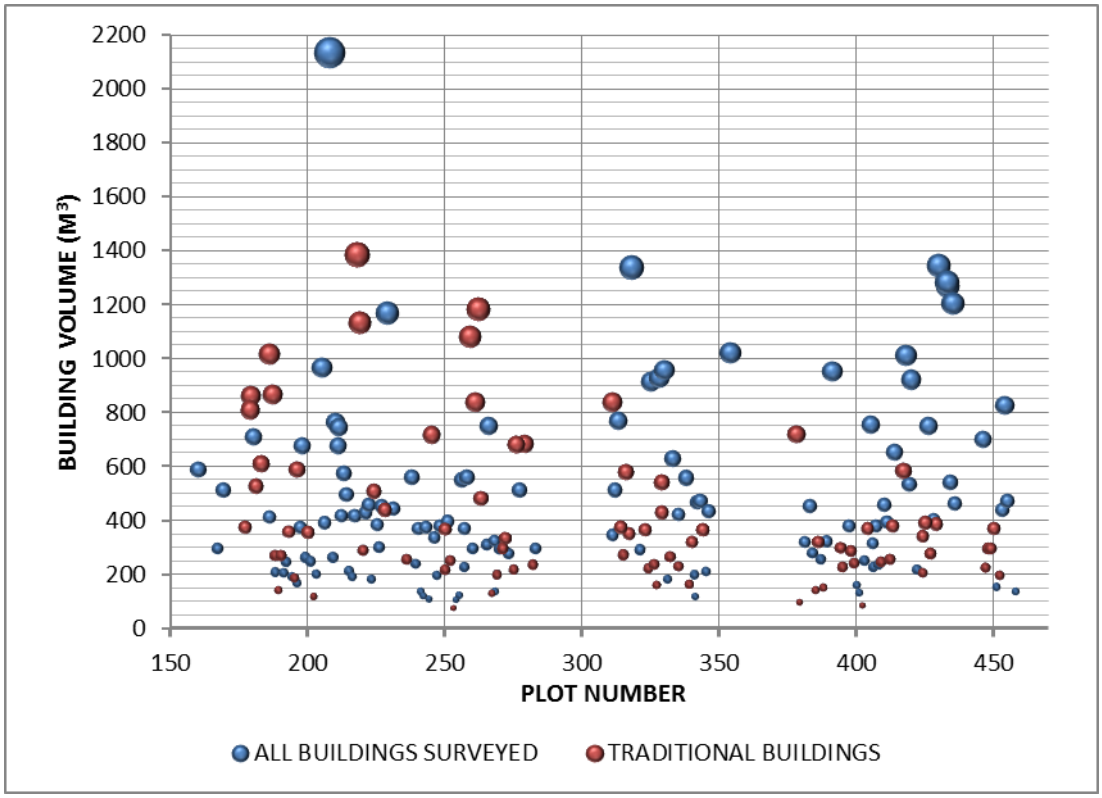


Chart 11 - Building Approximate Volume Estimation - All Buildings And Traditional Buildings Comparison

There is no significant difference between the distribution of building size values between all buildings and the traditional buildings except building body volume groups 3 and 4, where it is observed that there are only 21 buildings between 400-1000 m^3 in traditional set, and 49 buildings in the new buildings set. Since the relation is not similar in base areas comparison, it can be argued that difference particularly comes from the utilization of the floor number. The buildings with similar base areas occupy more volume in buildings in that category. The below charts compare the building size relations of new buildings and traditional buildings side by side.

On the other hand when the building base areas and body volumes are compared to each other for new buildings and traditional buildings, similar ratios are observed on the below chart for ratio of area to volume.

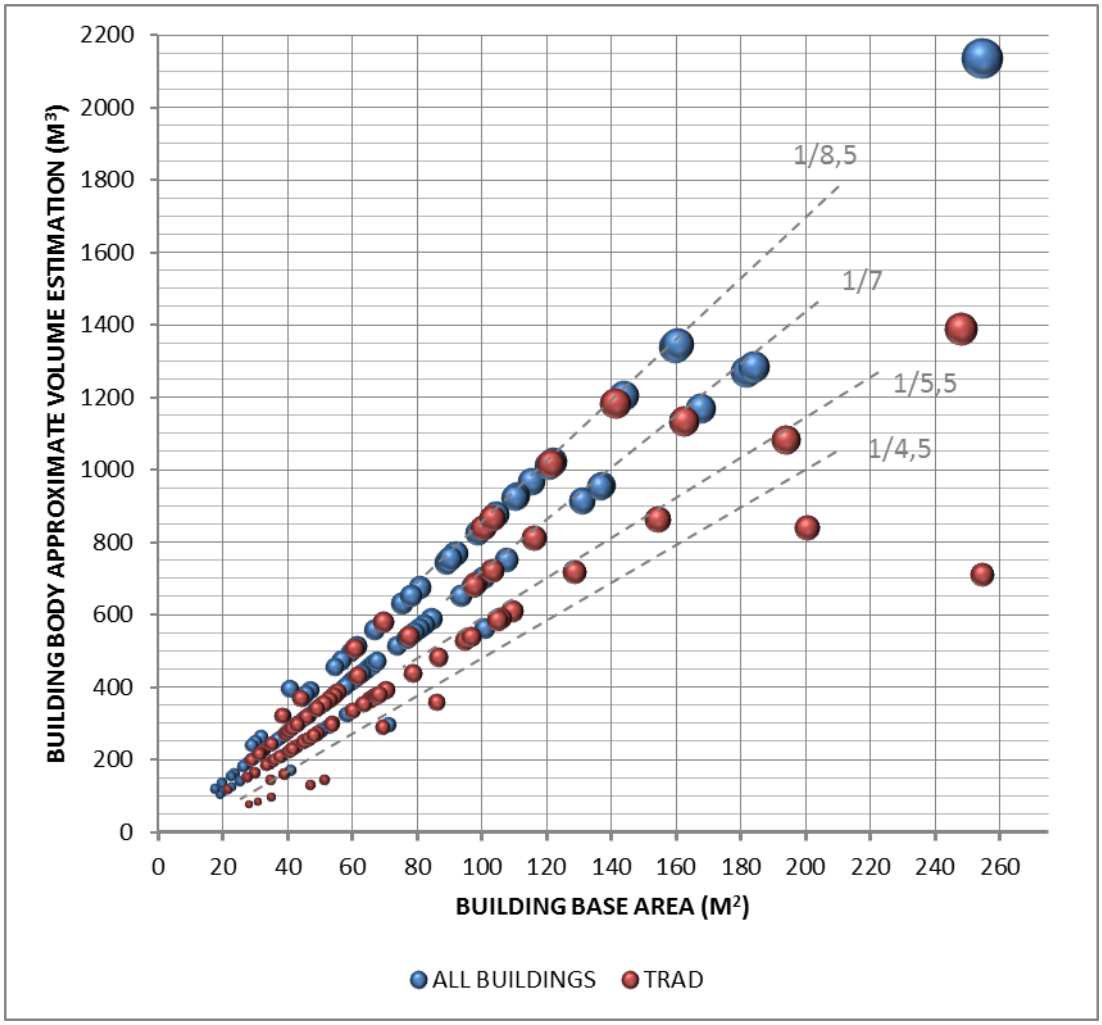


Chart 12 - Building Base Area - Approximate Volume Estimation Relation

In more detail, 3 clear lines can be observed displaying the ratio on the chart, where most of the buildings obey. However, as a comparison, it can be concluded that new buildings are clustered widely on the above 2 lines, and traditional buildings on the below 2 lines, even with a fourth ratio line for smaller buildings under 400 m^3 and 100 m^2. Thus the outcome can be concluded as follows:

Building Base Area / Approximate Body Volume Correlation:

Ratio 1: 1/8.5 - Mostly new buildings, few traditional buildings

Ratio 2: 1/7 - Both groups of buildings

Ratio 3: 1/5.5 - Mostly traditional buildings, few new buildings under 100 m^2 and 600 m^3

Ratio 4: 1/4.5 - Mostly traditional buildings under 100 m^2 and 400 m^3 in size.

An interpretation of these ratios will be employed for defining the basics of building size.

5.2.2 Building Size - Floor Number Correlation

As seen in the first part of analyses, Floor Number is one of the determinant factors in the organics of the tissue. Furthermore, it is not only the floor number, nor the building height which is effective on the building mass and its perception. Instead, Floor Level Value had been introduced in the Chapter 4.2.14, as a measure for both parameters weighted on floor number side.

For a rough calculation, if the buildings are assumed as box like bodies, when the above ratios are applied, following floor number values are obtained:

1/8.5 - 3 1/7 - 2.5 1/5.5 - 2 1/4.5 - 1.6

For defining a value limit to contributing to the continuity of the character of the organic tissue in new buildings, the lowest base area/volume ratio displaying the highest floor level value seems to be the extreme case. When it is mostly composed of new buildings, it can be concluded that these buildings are mostly the ones that push the possible limits under the pressure of commercial activities.

Table 33 - Building Size - Floor Level Value Corealation

BLDG.BASE AREA / APP. VOL. ESTIMATION	PLAN	3D	FLOOR LEVEL VALUE
1/8.5			3
1/7			2.5
1/5.5			2
1/4.5			1.6

On the other hand, when special floors such as basement, mezzanine, penthouse/terrace and second floor are considered, their distribution rate on the entire set is not distinctive for traditional buildings data set, and all buildings data set, as follows:

Table 34 - Comparison of Distribution of Buildings Possessing Special Floors on All Buildings and Traditional Buildings Data Sets

CATEGORY	BLG. #	%	CATEGORY	BLG. #	%
TOTAL BUILDINGS WITH A BASEMENT FLOOR	57	30,3%	TRAD. BLG.S WITH A BASEMENT FLOOR	14	31,1%
TOTAL BUILDINGS WITH A MEZANNINE FLOOR	6	3,2%	TRAD. BLG.S WITH A MEZANNINNE FLOOR	5	11,1%
TOTAL BUILDINGS WITH A PENTH./TERRC. FLOOR	123	65,4%	TRAD. BLG.S WITH A PENTH./TERRC. FLOOR	26	57,8%
TOTAL BUILDINGS WITH A SECOND FLOOR	2	1,1%	TRAD. BLG.S WITH A SECOND FLOOR	0	0,0%

Considering all data about floor level value, it will be argued that, the tissue has a certain intentional limit for various reasons. Normally, all buildings possess ground and first floors for the current situation and there is a balance between single floor buildings and these double floors for the traditional case. Other floor types than these primary floors are utilized under control and not lavishly employed when the traditional buildings are considered. The limitations about these special floors are based on the requirements and their effect on the surrounding buildings or plots.

For traditional buildings, basement floor is usually a requirement to cope with the slope where necessary, not a space utilization. Terrace floor is only applied for the required cases, where there is a problem with the open space opportunities of the building. There are 36 buildings with terrace on roof or first floor, out of 75 total traditional buildings excluding ruins. Mezzanine is also a function of the social and economic life on special cases. It will not be proper for the inner characteristics of Kalkan Historical Town Centre architectural tissue, to exercise all of them on the same building.

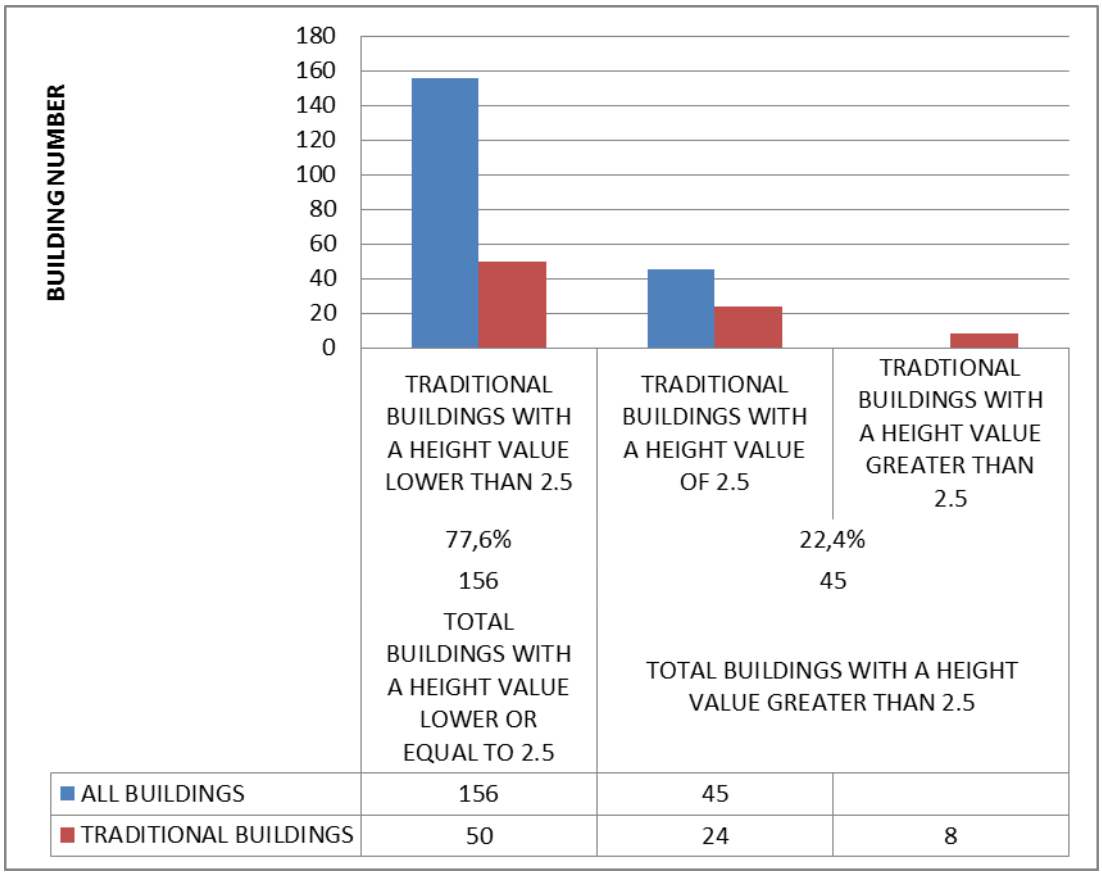


Chart 13 - Frequencies of Buildings with Lower and Upper Floor Levels than 2,5 are Compared in Relation to All Buildings and Tradtional Buildings Data Sets

This limit comes forward as 2 primary floors, and 1 special floor if required, namely 2.5 floor level value. On the above chart, the frequency of buildings with lower and upper values of 2.5 for all buildings and traditional buildings data sets compared. Below charts, in parallel, display the distribution of floor level values of traditional buildings in relation to building base area and building volume.

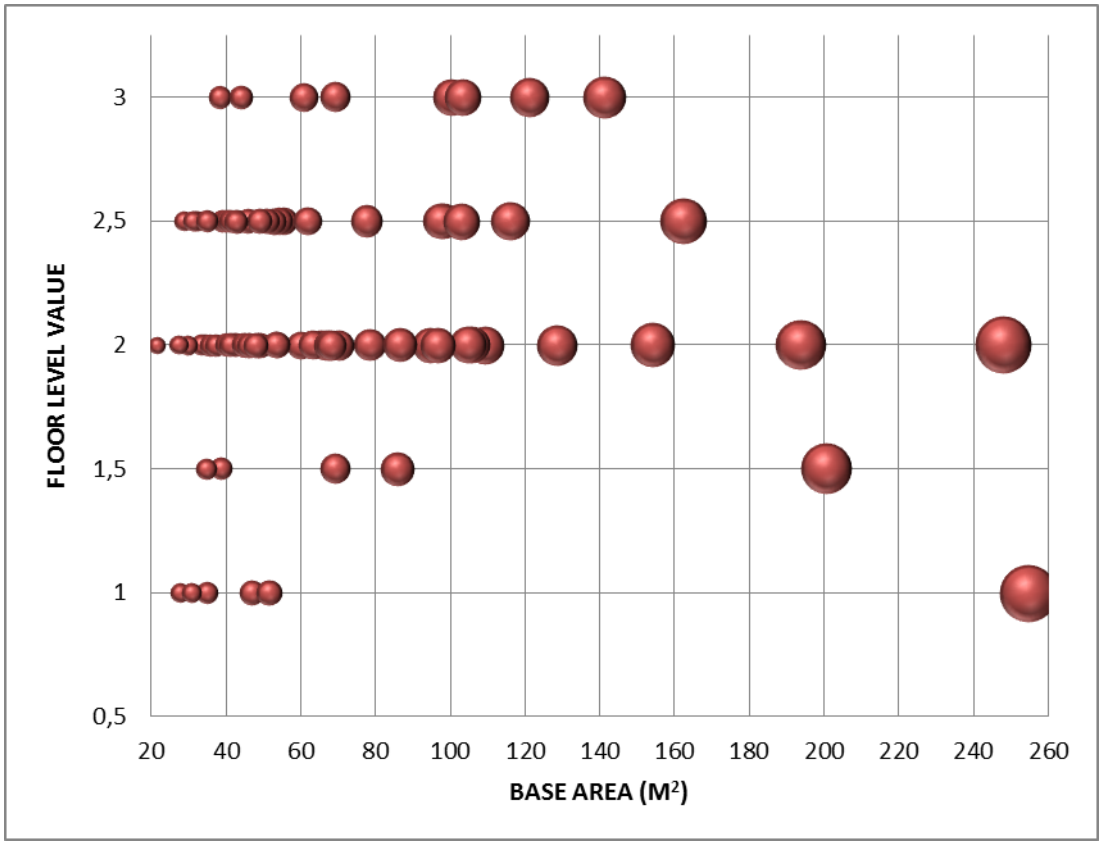


Chart 14 - Floor Level Value / Base Area Corelation for Traditional Buildings

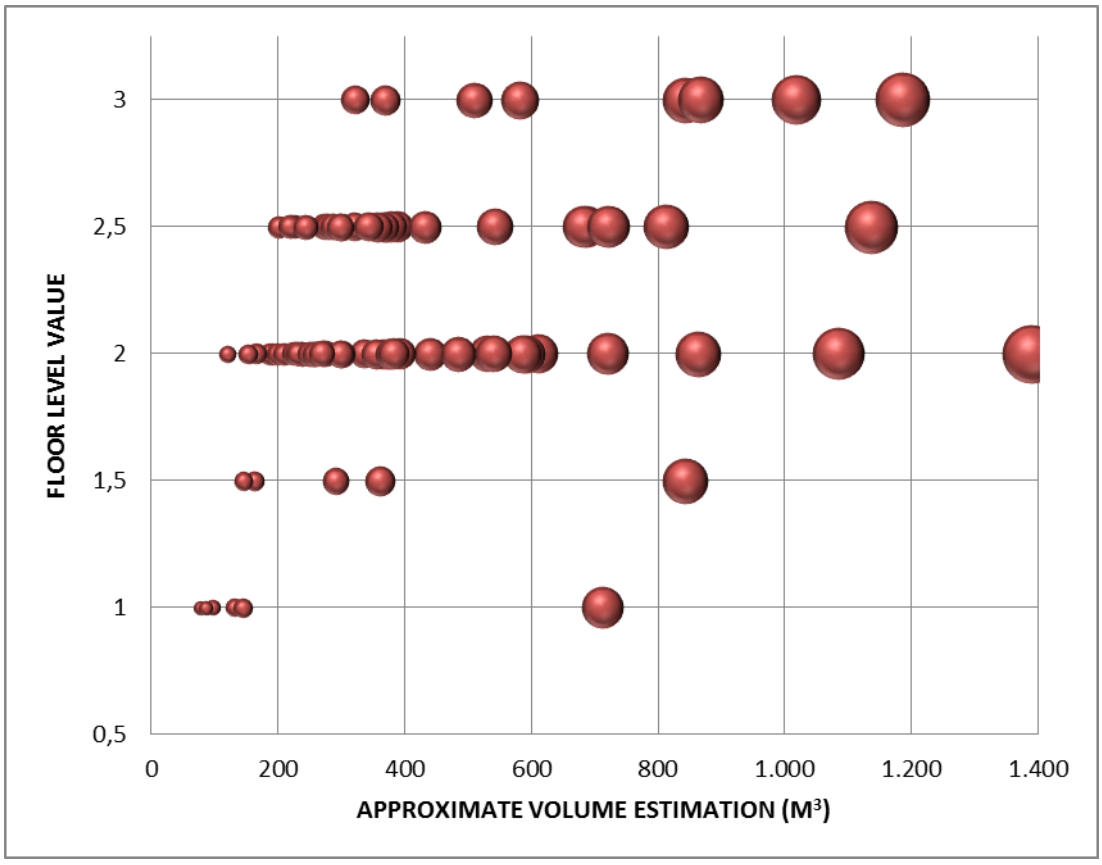


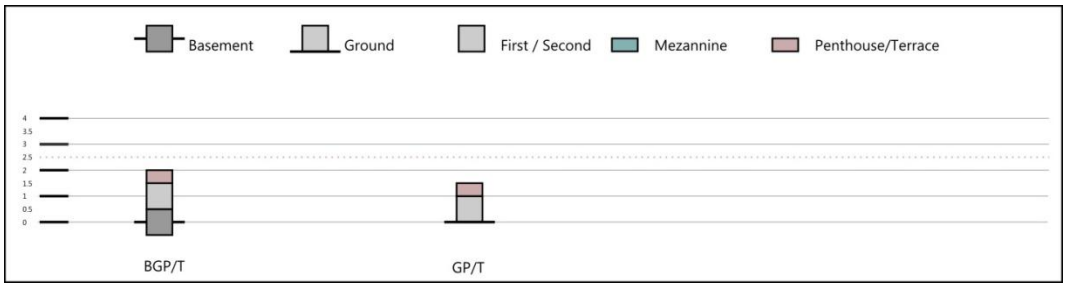
Chart 15 - Floor Level Value / App. Volume Estimation Corelation for Traditional Buildings

On extreme values such as base areas larger than 150 m^2, the floor value is 2 or lower. However when the volume is indicated, on extreme values such as volumes larger than 1000 m^3, floor value level is 2 or higher. On the other hand, if the lower extremes are considered, for base area analysis a fairly balanced distribution occurs with a weight on 2 and 2.5 values in cases smaller than 40 m^2, and for volume analysis, in cases smaller than 200 m^3, the values are lower than 2,5 reaching to even 1.

Reading these results, together with the above analysis it will be discussed that, traditional tissue offers a logic for keeping the building in scale, where everything in relation to building increases as the building size increases. This is not a general principle observed in all analysis and naturally, in some cases the opposite is true. However, for example in extremes of volume - floor level value relation, there is tendency in values to come over 2 up to 3. In parallel, for lower extremes, namely lower than 200 m^3, there is a tendency to reduce floor level value, such as most of the lower volume values correspond to 1.5 or even 1.

Generally the limitations are flexible for extreme cases, such as for example, if a building is so small that has no opportunity for open spaces; an extra penthouse floor, or a projection larger than the elevation length can be proposed. However, in some cases it is required to approach from a perspective of scale instead of equality for the conditions or opportunities, in order to better understand the organic structure of the tissue.

Finally, there are no buildings in the traditional tissue with floor combinations of basement floor / ground floor / penthouse/terrace floor and ground floor / penthouse/terrace floor. Seemingly not very functional, particularly the second one, these can also be regarded as potential floor combinations with floor level values under the general evaluation and furthermore appropriate with the previous analysis. The below graph displays the floor level value demonstrations for these two new types.



Graphic 5 - Potential Floor Combination Proposals with Floor Level Values ≤ 2,5

5.2.3 Building Form and Gradual Buildings

Building form is simple throughout Kalkan Historical Town Centre. All buildings are rectangle in shape, with only 2 exceptions, which are the combinations of previous building bodies. For this reason, building base area and the floor count, as well as the open space analysis on the roof and first floor is a satisfactory approach to understand the building form. However there is a single variation, gradual buildings as explained in Chapter 4.2.15. A gradual building is simply two smaller buildings adjacent to each other, standing on varying levels of topography, when approached from a formal perspective.

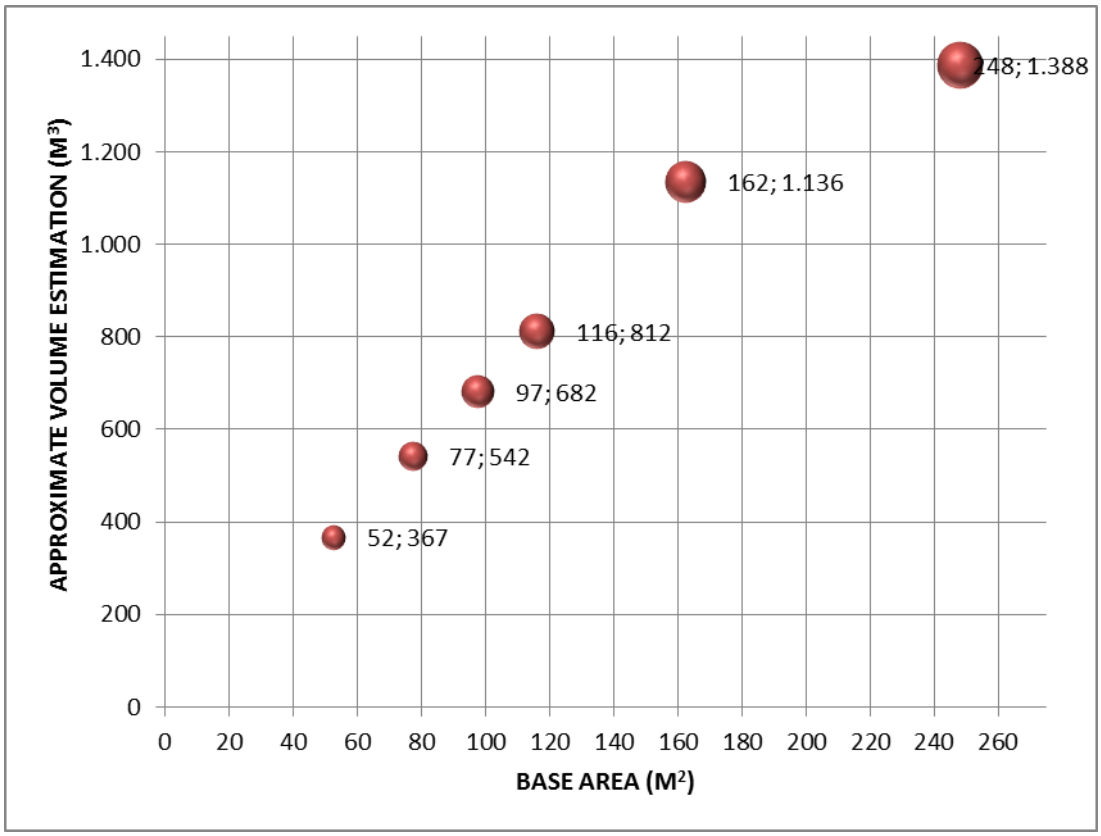


Chart 16 - Traditional Gradual Buildings / Building Size Correlation

This is a solution for level difference and there are some examples in the traditional buildings. As s solution, gradual buildings are adopted by the authors of Development and Conservation Plan and proposed for some plots, resulting with more examples between the new buildings. 6 of 31 total gradual buildings are traditional, and below chart demonstrates their building sizes.

As observed in the chart, traditional gradual buildings are in various sizes, including the largest building of the entire data set. The smallest is a little above the average and the starting from the second one the rest are included in large sized buildings of the traditional data set. This makes sense, since gradual building comes as a solution for a problem, it is applied in the problem cases. the problem case, in this sense is large buildings, particularly on the dimension through the slope.

5.2.4 Building Open Spaces

In addition to the previous analysis on building open spaces, the situation on traditional building data set will be discussed on the following lines. Below table demonstrates about 80% of the traditional buildings are in either Limited Open Space category or Single Open Space Category. In order to examine the relation of building open spaces with building size, particularly for open space groups 3 and 4, the below two charts will be utilized.

Table 35 - Distribution of Traditional Buildings in Regard to the Number of Various Open Space Category Possessions

	TOTAL SURVEYS	**77**	**100%**
1	LIMITED OPEN SPACE TRADITIONAL BUILDINGS (NO OPEN SPACE, ONLY BALCONY)	30	39,0%
2	SINGLE OPEN SPACE TRADITIONAL BUILDINGS (ONLY COURTYARD, ONLY GARDEN, ONLY TERRACE, CB, GB, BT0, BT1)	30	39,0%
3	2 OPEN SPACES TRADITIONAL BUILDINGS (CBT0, CBT1, CG, CGB, CT0, CT1, GBT1)	14	18,2%
4	MORE THAN 2 OPEN SPACES TRADITIONAL BUILDINGS	3	3,9%

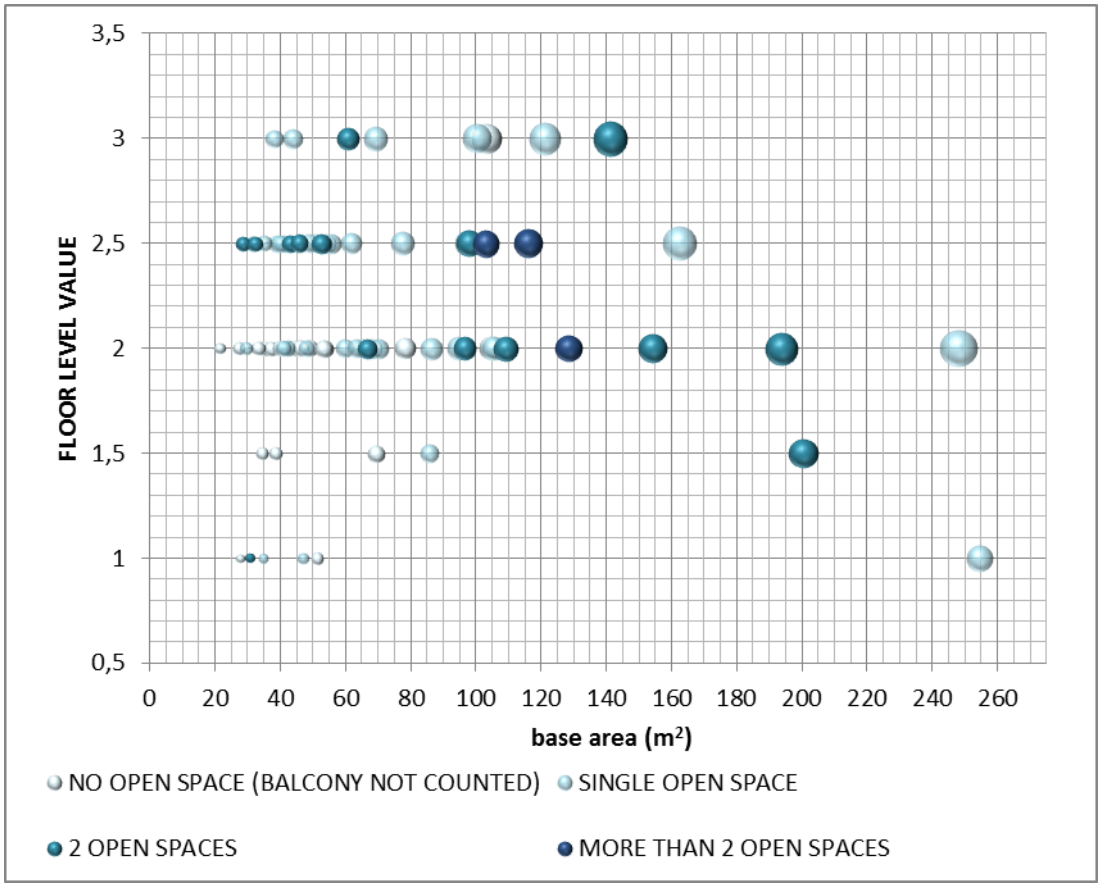


Chart 17 - Corelation of Traditional Building Open space Groups in Relation to Floor Level Value

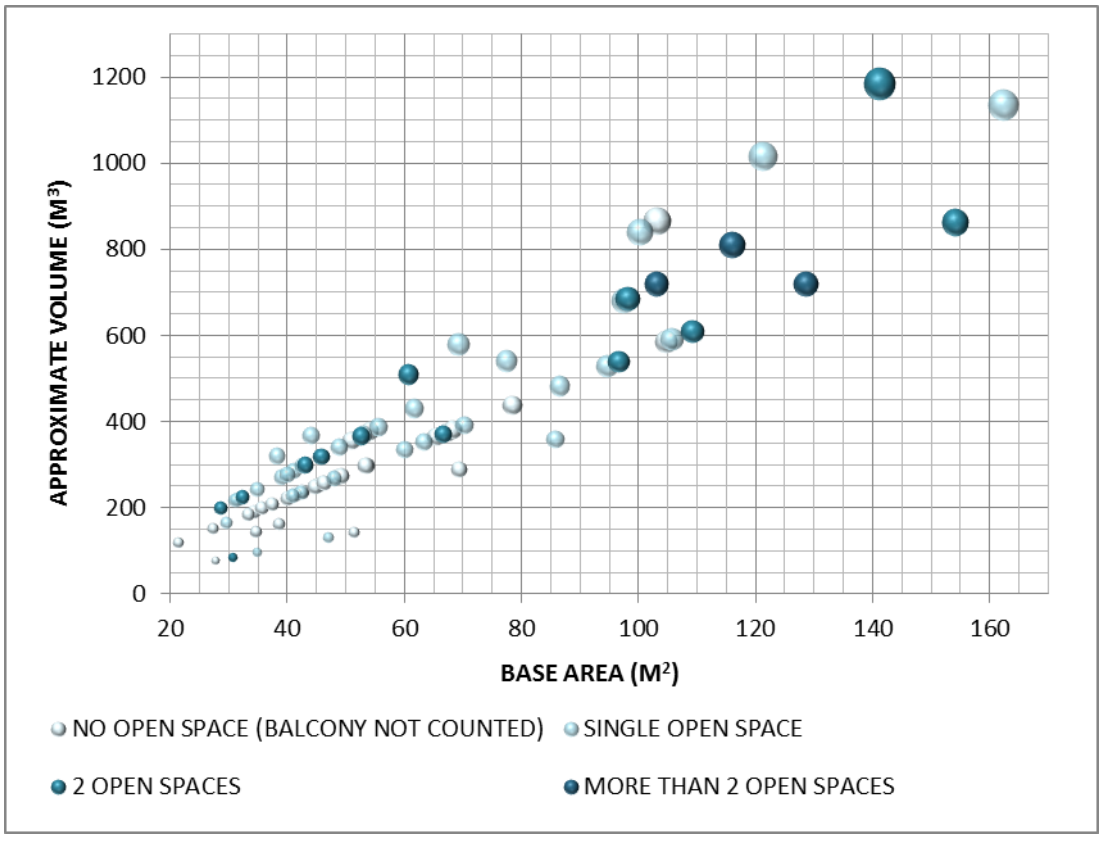


Chart 18 - Correlation of Traditional Building Open Space Groups In Relation To Building Size

It is observed that, more than 2 open spaces for a building is an exception for traditional buildings and all of the 3 examples in this category belong to large buildings group, between 100-150 m^2 base areas. However it is known from previous general analysis and discussions, that climate and life style in Kalkan requires as much as open space as possible. Similarly, when the Built-up Space for 1948-70 Period Analysis in Chapter 4.2.4 is examined, there were more than twice of open spaces in the traditional tissue. This effect may reduce private open space requirement, since there are empty spaces which are also utilized by the inhabitants. For example people were spending time on Dibektaşı Meydani and Taşbaşı Meydani as if they were spending time in their courtyards or gardens. Hence these extreme values have to be understood not as an exception, but instead as the requirement or desire which can today only be available through large buildings. Furthermore it also necessary to recall that, some of the open spaces on traditional buildings was turned to be closed spaces in time.

It is also clear, particularly on the second chart, that general distribution of open spaces demonstrates a tendency to increase as the building size increases. However there are also exceptions such as single open space buildings as the largest values. When these buildings are analysed, there are specific reasons for this. On the floor level analysis, all groups exist particularly on 2 and 2.5 floor levels.

Single or no open space grouped buildings with 1 or 1,5 Floor Levels are also a part of the distribution. For very small plots, such features can be read on the chart.

Besides the following statements, there is no clear outcome for these correlations, under the light of the general evaluations about the tissue in Kalkan,. For the character of the tissue, both building spaces and general open spaces are significantly important. In these exceptional cases, large projections can be regarded as open spaces, if there is no possibility of roof or other open spaces.

5.2.5 Roof Types and Terrace Spaces

The basic roof types were specified for the Kalkan Historical Town Centre in Chapter 4.2.17. Below chart exposes this distribution of roof types on traditional buildings.

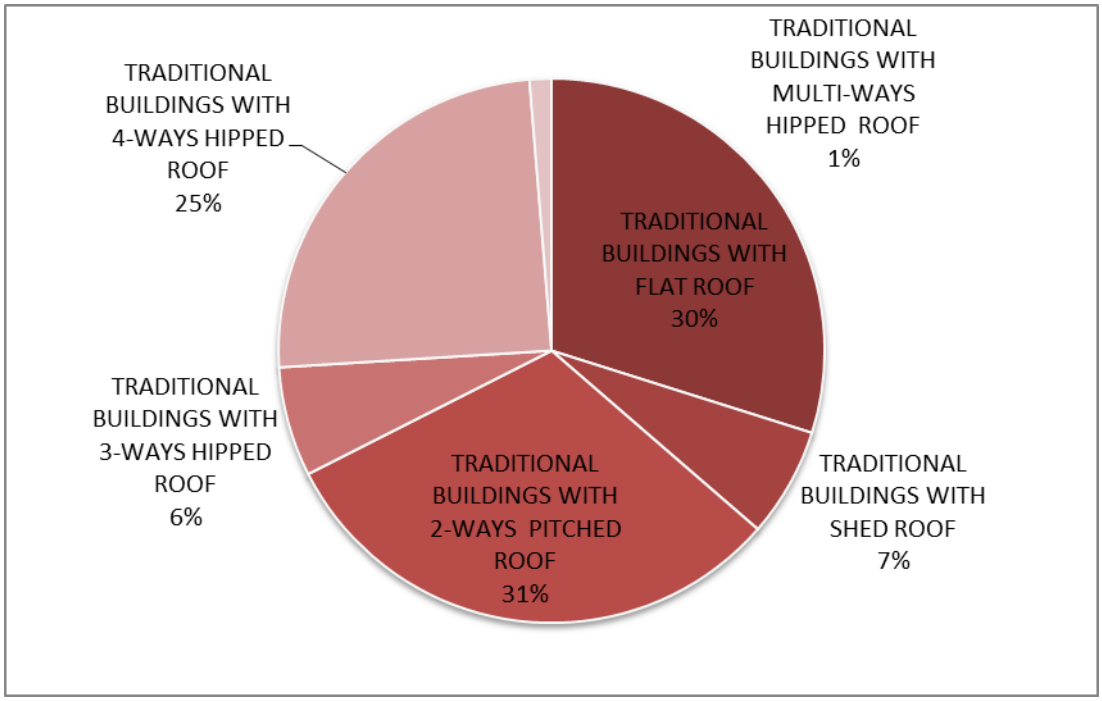


Chart 19 - Distrubution of Primary Roof Types on Traditional Buildings

Here it has been observed that 2 main categories are turned into 3 main categories in traditional buildings case; Flat roof, 2-ways pitched roof and 4-ways hipped roof. However it has to be recognized that typical roof feature of Kalkan is 2-ways pitched hidden roof with parapet walls. Some of the other variations are formed of either roof terrace requirement, or because of the combination of two buildings. As a support for his argument, the roof types of traditional buildings with low alteration values and restored buildings is analysed and it has been detected that percentage of flat roofs decrease down to 17% from 30%. Furthermore in the survey, it has been examined that there are some large traditional buildings with 4-ways hipped roof and eves. At this point, it is important to highlight that roof type is in close relation with plan form and distribution of these roof types also has a connection with plan form. At this stage, it can be concluded that these 3 roof types are the integral characteristics of the tissue. The below chart displays the roof types distribution on building size for traditional buildings.

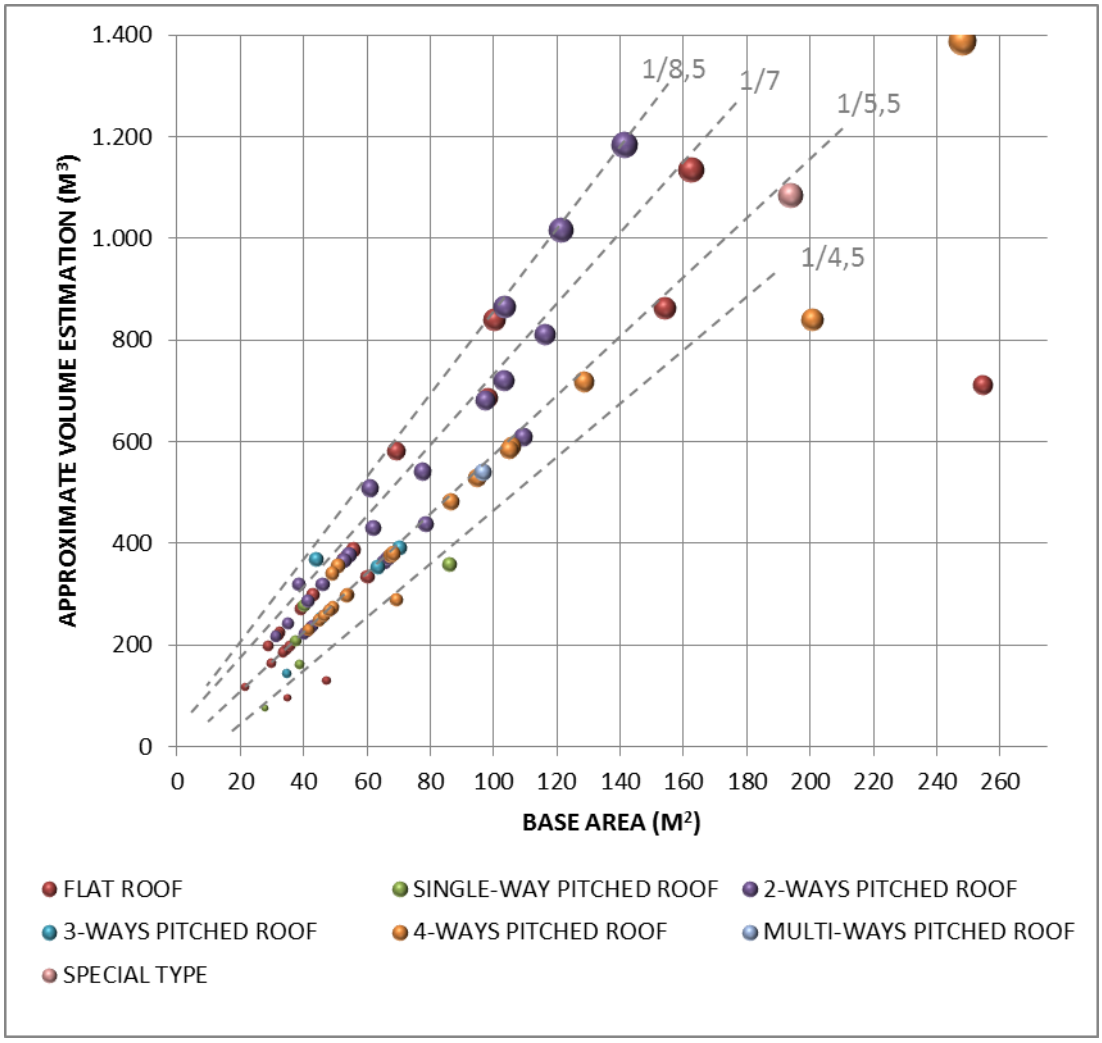


Chart 20 - Traditional Buildings Roof Types Distribution On Base Area - Approximate Volume Estimation Correlation

Examining the chart, at first, it can be concluded that 4-ways hipped roof buildings are mainly clustered as being on the 1/5.5 line of base area-volume correlation, which means mostly it had been applied to buildings with height level value of 2.

Secondly, outcome of the chart can be stated as, 2-ways pitched roof can be observed in all building sizes, up to 120 m^2 base are and 1000 m^3. After this level, other roof types are observed, with an exception of plot 262/21. Lami Ünal House which is an exceptional building for varying factors such as building form. The building form had been structured eclectically in time, as examined through the structural and spatial analysis on-site and discussed in Chapter 3.4.1. Furthermore, the building has not the same body on ground floor level and roof level, and categorized roof type is a roof for much smaller space on the roof level when

compared to other parts of the building. In addition, the roof type is an estimation based on form of ruins. Considering all this vague information about plot 262, this building is presumed as an exception at least for roof type categorization.

Moreover 3-ways hipped roof, shed roof and multi-ways hipped roof are exceptional cases, when these cases are examined. Mostly these buildings have higher alteration values and serious conservation levels, namely either altered buildings, or low-income buildings which are not in proper conditions.

When it comes to roof elements discussed in Chapter 4.2.17, it is clearly seen that selected roof elements are utilized mostly in combination with certain roof types. 24 of 29 roofs with eve are either flat roof or 4-way hipped roofs. Getting into more focus, flat roof buildings with eve are not a part of the traditional tissue, since they are mostly commercial roof restaurants with concrete flat slabs, utilizing eves for spatial enlargement of the terrace area. In this sense, eve is, as a roof element associated with 4-ways hipped roof in Kalkan traditional tissue.[117]

On the other hand, circular window and hidden groove are naturally elements of 2 ways-pitched roof with parapet wall. In a better expression, circular window is an element of pediment, which is utilized with 2 ways-pitched roof. Besides 2-ways pitched roof is utilized in Kalkan, as hidden roof with parapet walls and eventually hidden groove, hence hidden groove is entirely associated with 2-ways pitched roof.

5.2.6 Projection Types

Initially below chart will be proposed in order to demonstrate the elevation ratio distribution of projections on traditional buildings. Analysing this chart, 1/5 length and smaller projections are not considered in this and further parts, for as explained before they are not the natural elements formed in the organics of the tissue, but reasoning from recent commercial requirements. The other types seem to be the integral elements of the tissue.

[117] Eve is assumed to be more than 20 cm. Eves lesser than 20 cm are not counted on the survey.

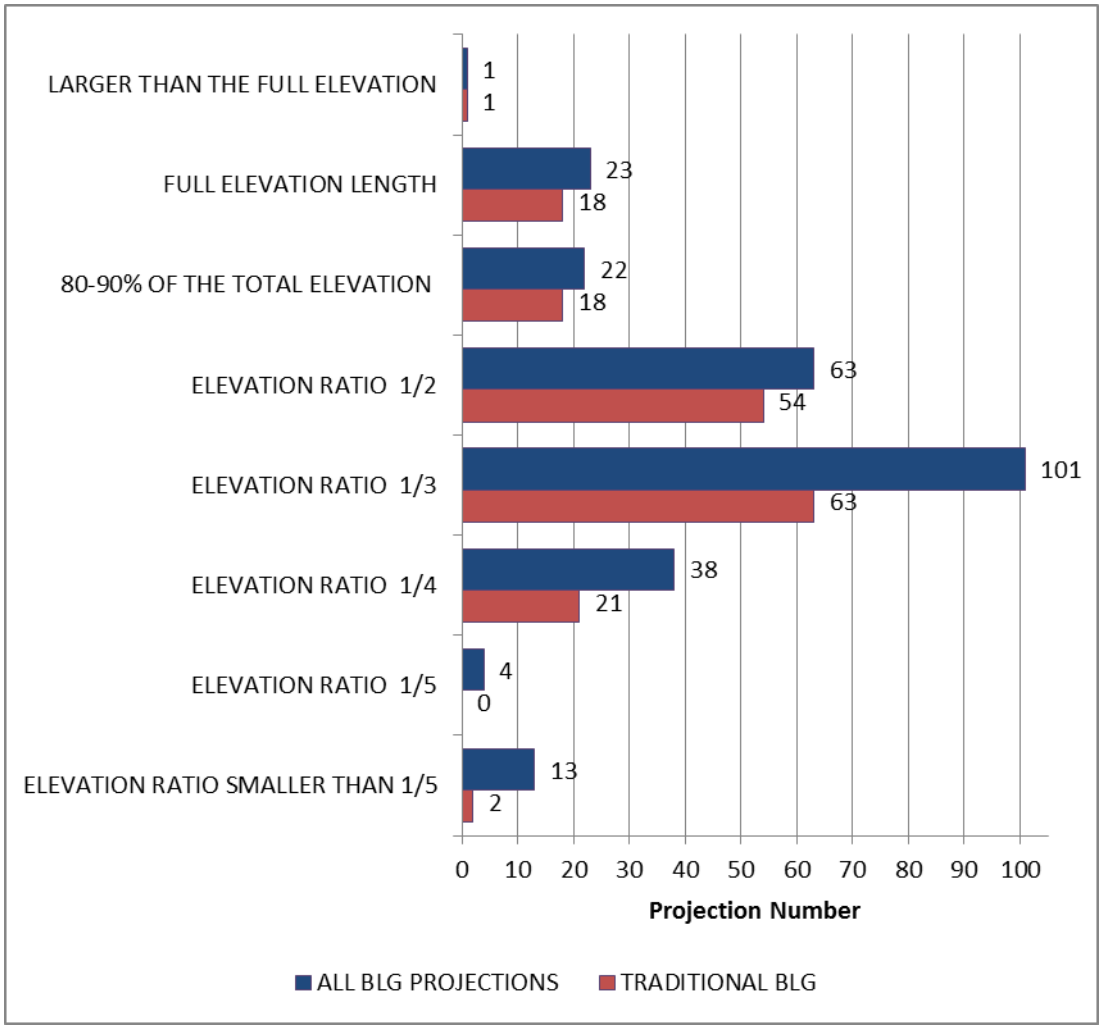


Chart 21 - Elevation Ratio Distribution of Projections for Comparison with Traditional Buildings

The main projection type for the projection/elevation length ratio categorization is 1/3 and secondly 1/2. 1/4 ratio is also seems to have a serious frequency. There are totally 21 projections with 1/4 ratios, and when they are analysed in focus, it is observed that 7 separate buildings employ 3 projections each with 1/4 ratio, displaying clearly that 1/4 ratio projections are utilized if the building possess 3 or more projections. Larger ratios than 1/2 offer lower frequencies but as indicated before, are integral parts of the tissue. Furthermore, it has been observed that, beginning with the projections of 85% and going on larger ratios, the projection displayed varying features, such as each case becomes a special type itself. For this reason they will be dealt under a second title as 'Large Projections' following this chapter.

From the structural point of view, all traditional buildings employ wooden projections as well as a few new building examples. On the opposite, new buildings

mostly utilize concrete structure, however in most cases these concrete slabs are completed with a varying level of utilization of wooden elements, such as pillars, balustrades, and roof for decorative purposes. Approaching from this angle, it can be argued that, the structural projection material of the organic tissue is timber.

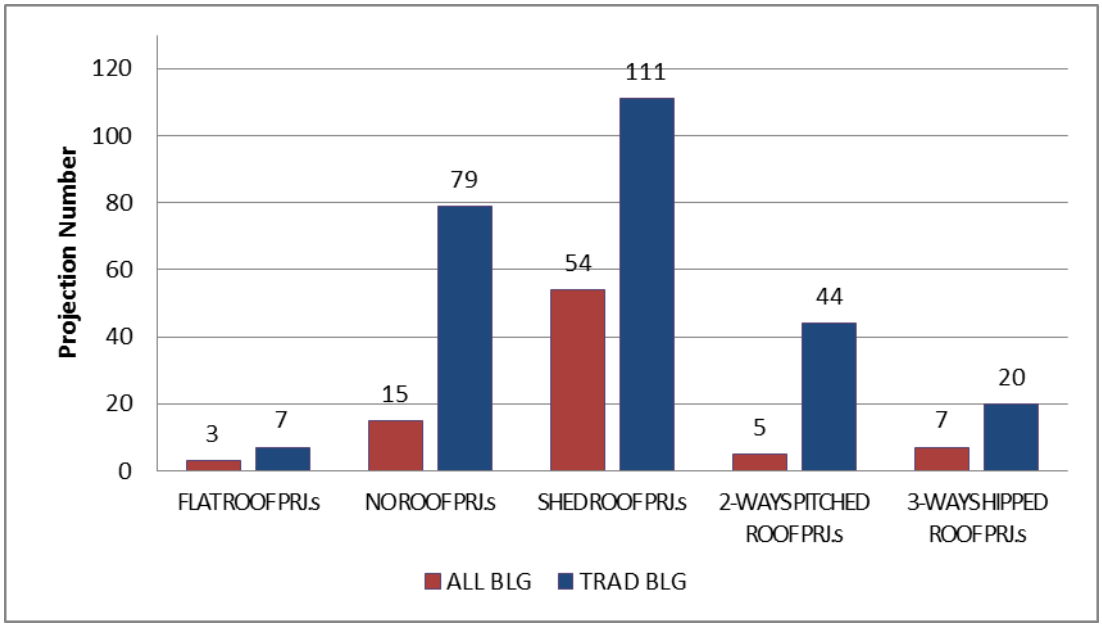


Chart 22 - Comparison of Roof Types of Projections

For understanding roof types of projections, above chart will be utilized. As seen on the chart, most of the projections in traditional buildings employ shed roof, similar to the all buildings data set, probably for it is the easiest solution. 2-ways pitched and 3-ways hipped roof examples are usually modified examples, or in some cases the projection had been built with no roof, and after some time a roof had been built. It is required to accept all these types as integral parts of the organic tissue, with the exception of flat roof. Flat roof is not an element of the tissue for projections and added in time, made of concrete.

Primarily shed roofs will be proposed for projections, however 2-ways pitched and 3-ways hipped roofs will also be employed as well as no-roof projections in frequency parallel to their frequencies on traditional data set. No-roof will be applied for the smallest scale projections such as ones with lengths smaller than 150 cm.

5.2.7 Large Projections

Large projections are projections over 1/2 elevation length ratio, which establish a different category with their particular features. Some of the large

projections, provide open balconies, such as smaller type projections but in larger scale. Furthermore there are various features for large projections as examined in Chapter 4.2.22.

Initially, one of these particular features is supports, namely diagonal and pillar supports, only used in large projections. Most of the large projections are employed in traditional buildings, and even this also displays that it is an important character of the traditional architectural tissue.

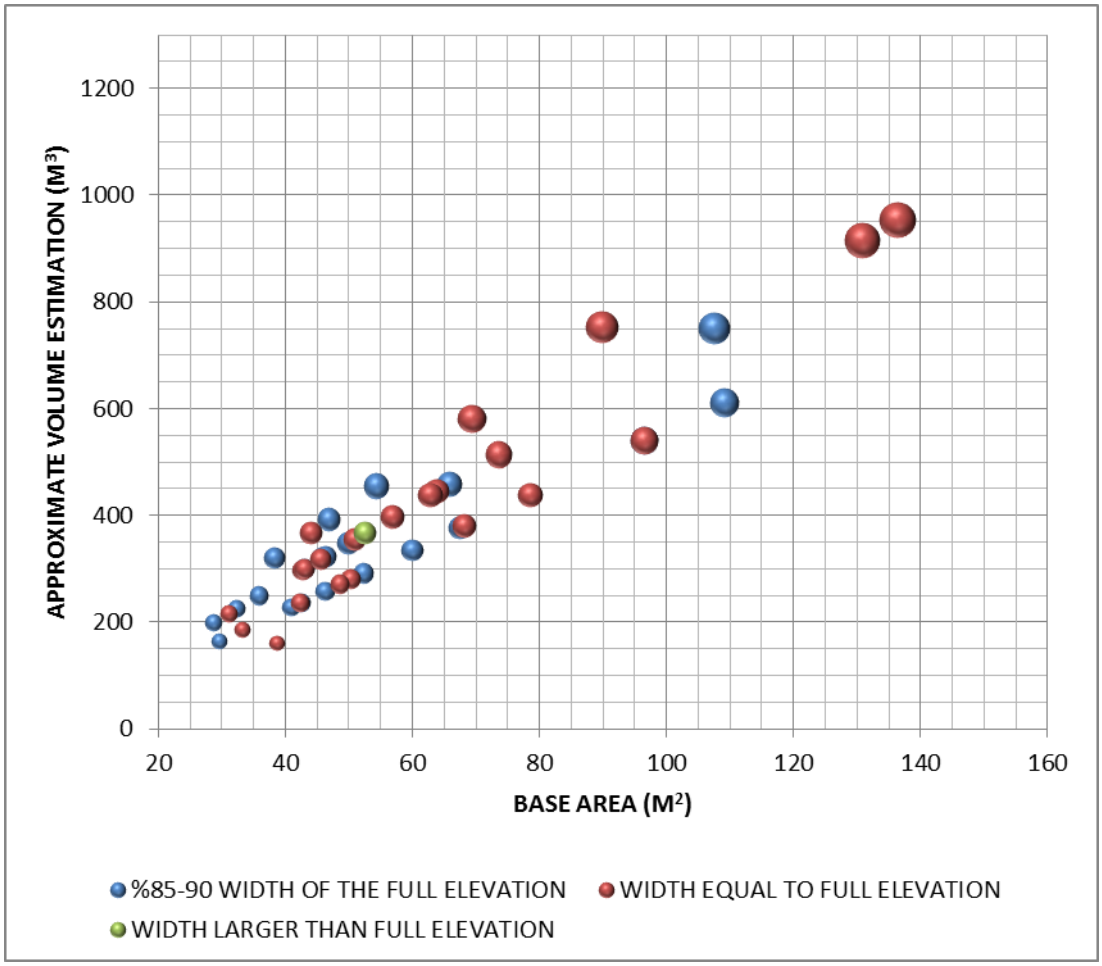


Chart 23 - Distribution Of Large Projections In Relation To Building Size

The distribution of large projections in relation to building size is examined on the above chart, in three various series of length/elevation ratio. The four largest buildings in this chart will be neglected on this analysis for the following reasons; plots 196/51 and 183/11 are closed service projections, and plots 391/28 and 325/5 are new buildings with unqualified concrete projections. Considering these exceptions, all the large projections belong to small buildings, accumulated in more as the building size decreases on chart. On the other hand, the only example of

projection with larger length than the elevation, namely plot 344/15, naturally cannot provide a pattern or frequency as a single case. However, it has to be considered as a unique example.

As another variation of large projections is the category with spatial elements such as wc, entrance and stairs. These are mostly supported projections and there are not many examples. The below chart displays their correlation in regards to building size. It is exposed that these are utilized for very small buildings, particularly excluding 2 exceptions around 100 m2 base area. Going into more detail, the two examples possessing all 3 elements are very small buildings in base area and significantly in floor level value.

Figure 44 - Large Projection on Plot 327/5. The projection possesses all three spatial elements, namely wc, entrance and stairs. It is supported and it covers the full elevation. the building is a very small example with 39 m^2 base area and 162 m^3 total volume and lacking any other open spaces than this balcony.

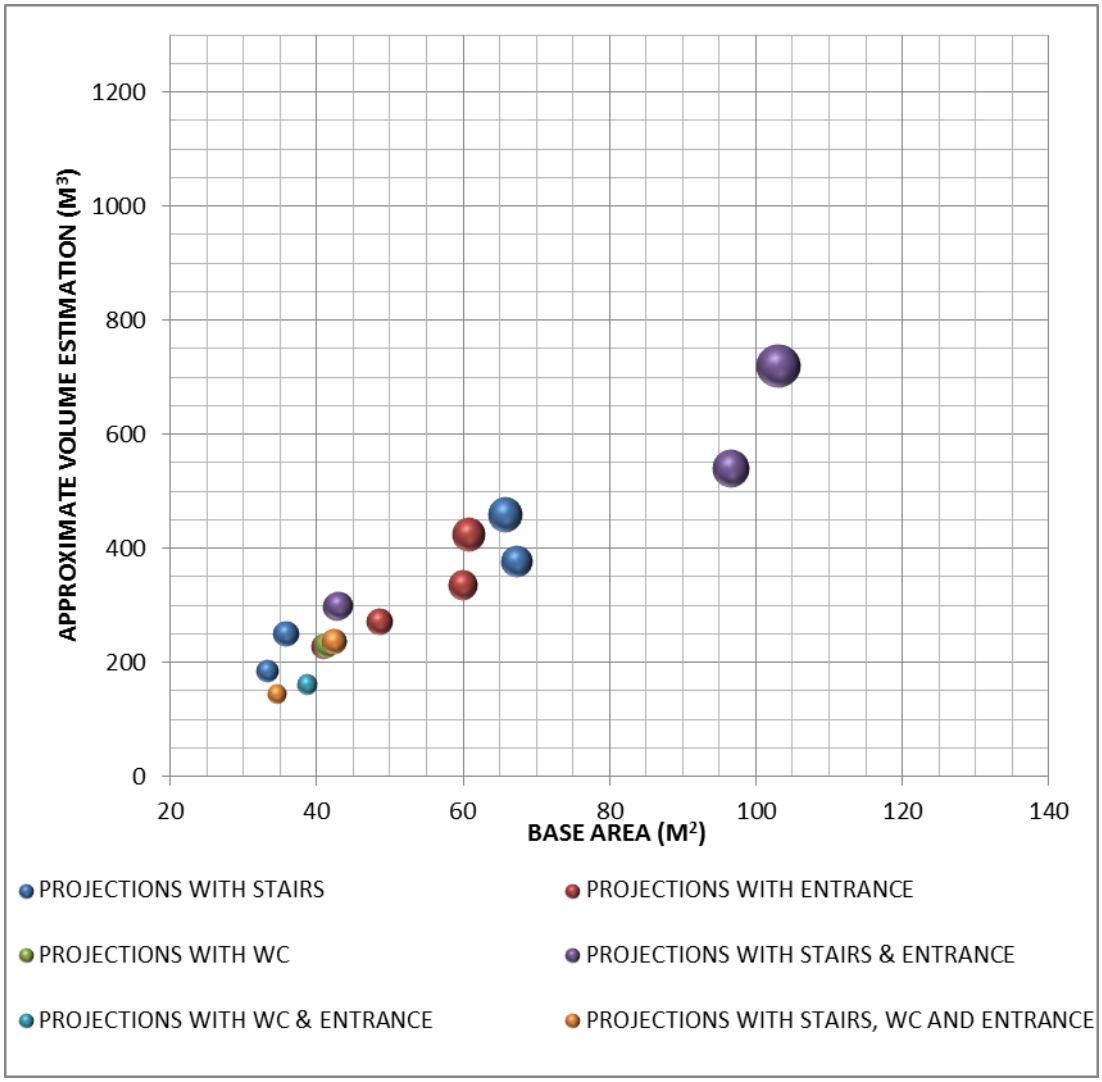


Chart 24 - Distribution Of The Projections With Spatial Elements, In Relation To Building Size

This feature, being typical for Kalkan historical Town Centre, is principally a solution to certain problems again. Entrance from stairs is a solution for the slope, where it is necessary to supply entrance from a level higher than the ground level, usually on back sides of the buildings. However, it has also been remarked that, this is also a solution for small building sizes. Any of these spatial elements, including the entrance which is usually combined with stairs, provide the opportunity of leaving these spaces outside, gaining effective space for the inside. Hence spatial elements on projections are a general solution to small buildings size and in some cases to slope at the same time.

Final notes about large projections in this section will be about closed projections. Closed projections are not a popular technique in traditional tissue and there are only 3 examples of it, whereas for the new buildings 8 examples are added

to the list. When the new building examples are considered, they are all unqualified concrete projections, usually added later. The target is either to enlarge the inner space, or covering some of the open balcony into closed space for service functions usually.

When the traditional examples are considered, all the examples are service spaces, usually added later similar to the new building examples. In this sense, there is no satisfactory and qualified data for analysing closed projections in this level, other than the chart below, displaying the concrete and wooden closed projections in relation to building size.

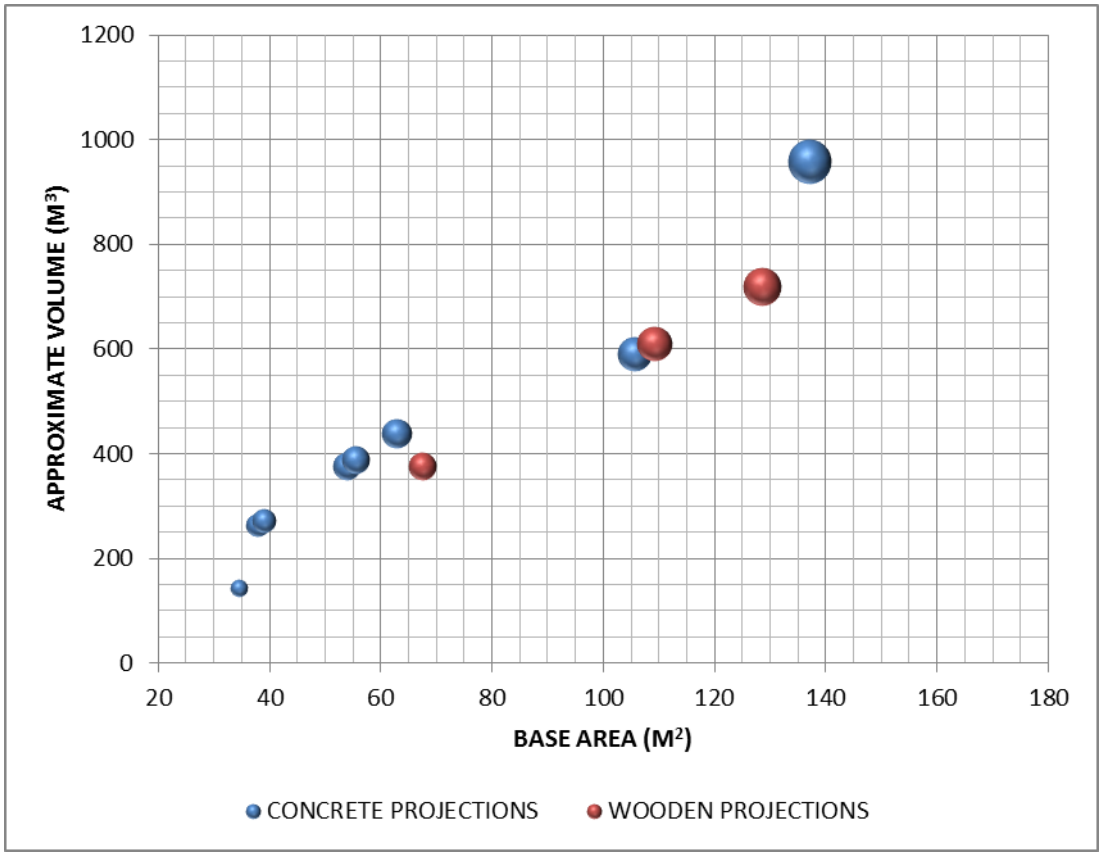


Chart 25 - Closed Projections In Relation To Building Size

5.2.8 Elevation Decoration and Elements

Initially, below chart will be presented, clearly displaying the similarity of the facade decoration comparisons between all buildings and traditional buildings data sets. The numbers are altered, since there are 210 buildings in the first set and 82 buildings belonging to the second set, namely with conservation status is smaller than 5. As exposed on the chart, the balance between the categories is the same for

both sets, either the comparison is between Elevation Decoration Level values assigned in the survey study, or the elevation elements are considered.

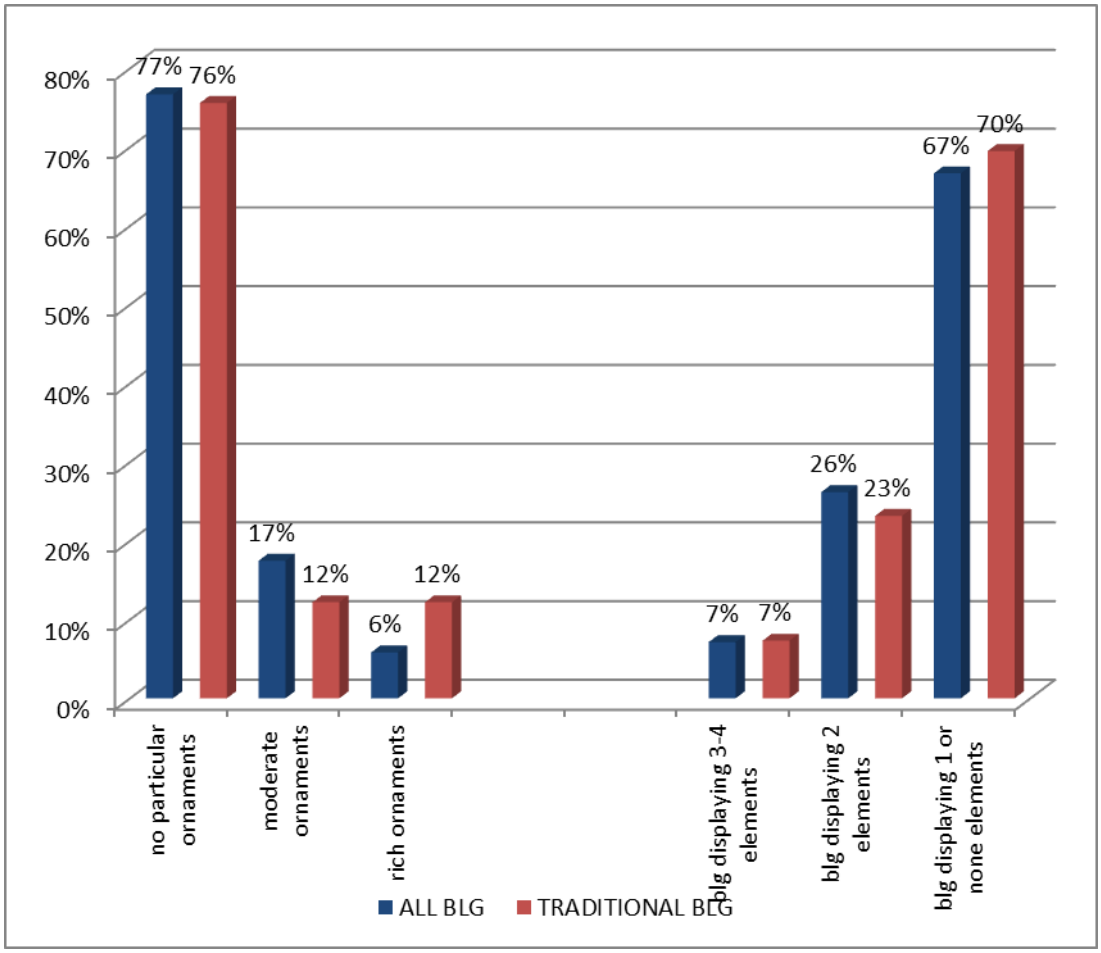


Chart 26 - Comparison of Elevation Articulation Values

The only significant difference is between the rich decoration level building ratios, where in the traditional set, the ratio is doubled. Not in that scale, yet a similar relation can be read for elevation decoration level 1 buildings as well. So that there is a balance between new buildings and traditional buildings about the issue of facade decoration.

For the next step, the Elevation Decoration Level Value of traditional buildings was compared with various parameters of building size on below charts. It is not a very direct connection, however it can be concluded that facade decoration more likely to increase when base area increases. In this sense, more ornamented buildings are said to be in middle range values in the first chart.

For the Chart 28, the elements included in Roof Type Analysis in previous sections will be the subject of investigation here. The chart demonstrates that most

of the traditional buildings possess 3 or 4 elements. As base area increases, the points are clustered closer to values 3 and 4.

It is clear that, rich ornamented buildings will be provided within a certain level of equilibrium, with less ornamented category with lesser priority.

A final note about elevations, it is observed that facade decoration has a certain relation with the traditional buildings in the tissue. If a building, particularly its main elevation has a large open area or empty space in front of it, such as 8 - 10 m, then it is more likely to be rich ornamented buildings, With a single exception, all rich ornamented buildings have facades, providing a large space in front of it.

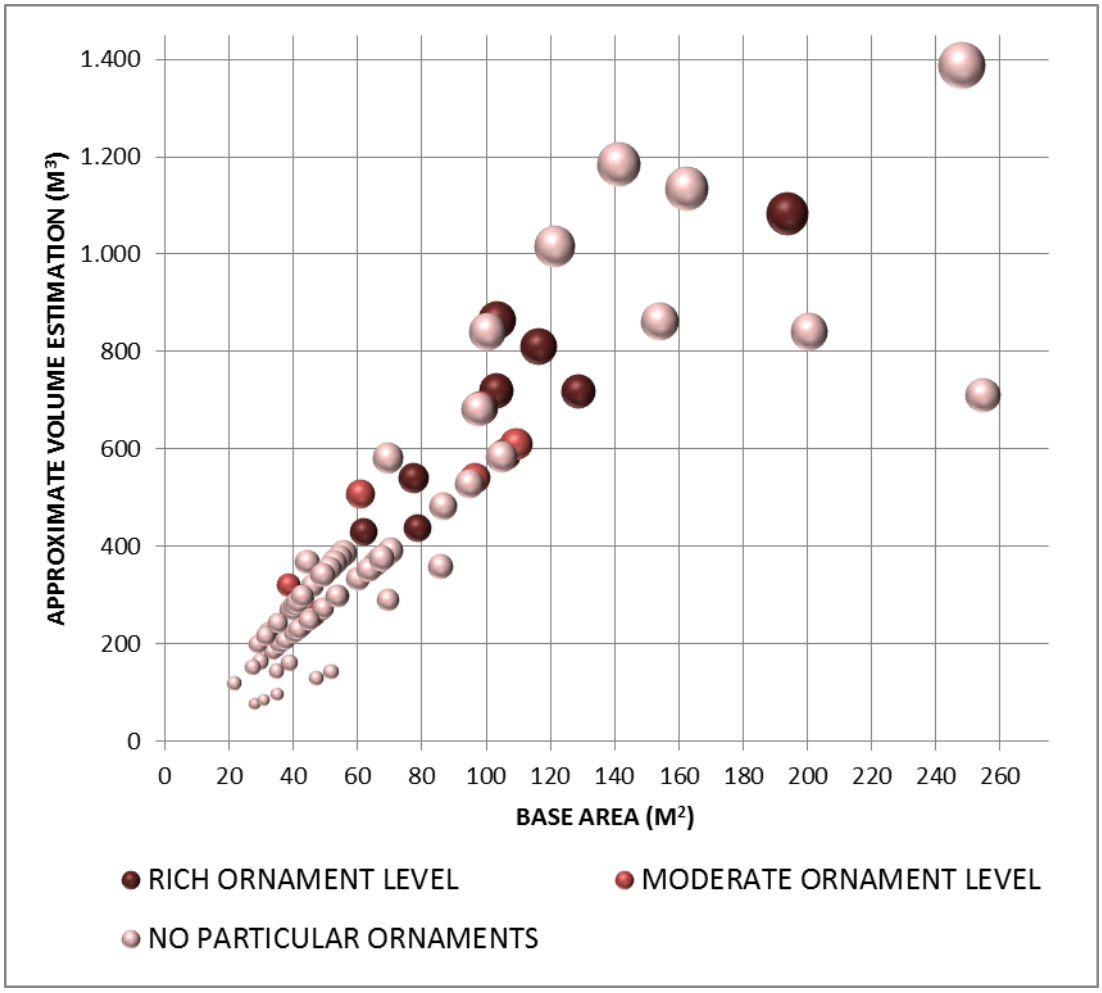


Chart 27 - Traditional Buildings Elevation Decoration Level Distribution On Base Area - Approximate Volume Estimation Correlation

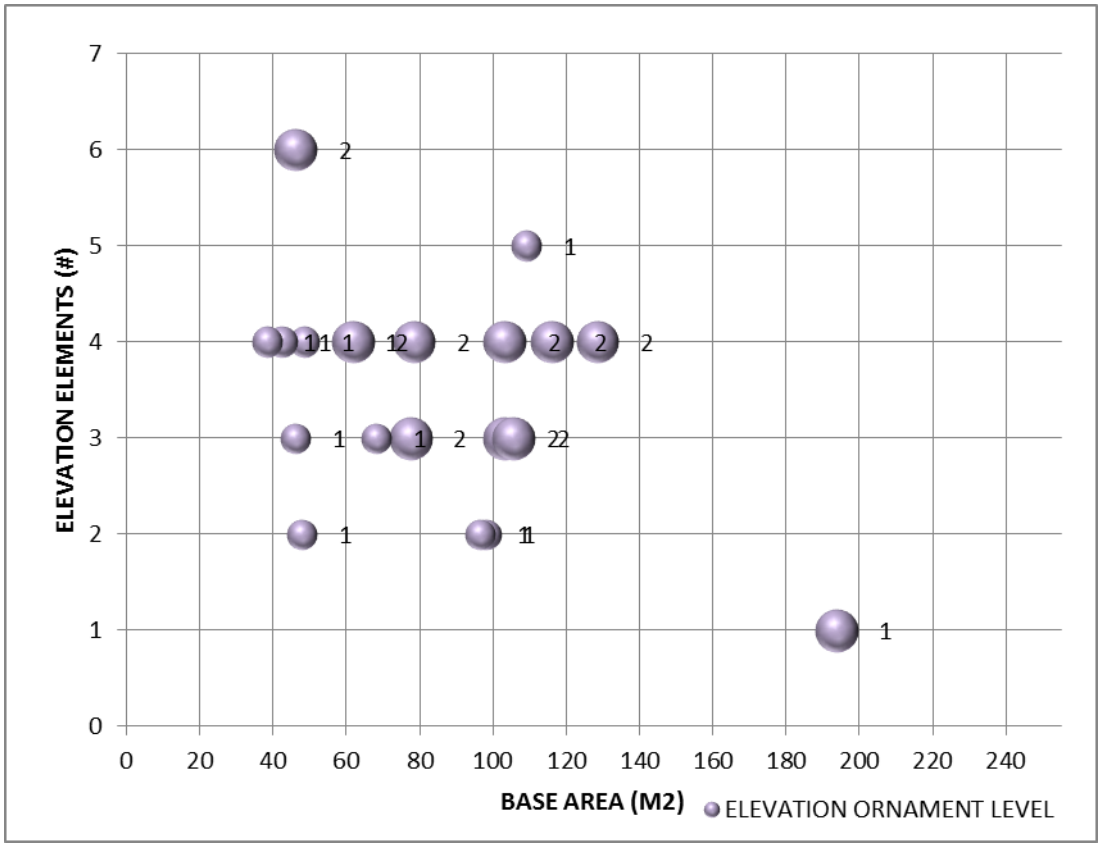


Chart 28 - Traditional Buildings Elevation Elements And Base Area Correlation In Relation To Elevation Ornament Level Values

5.3 Selected Buildings and 3rd Level Analyses

Above analyses pictures the basic features of the entire tissue, as well as a narrowed set for traditional buildings, in comparison to each other where necessary. Furthermore on 2nd Level Analyses some architectural features are compared to others and correlations have been exposed. 2nd Level Analyses, searching for the relations of patterns of architectural features, they also provide basic intentions for rule definitions in order to set up the general layout of algorithms.

For more detailed analysis on building level, defining a third data set and narrowing down the data a step further, a set of buildings have been selected. The basic idea for establishing this data set was to provide a defined set of information presenting more accurate and detailed data which can exhibit further architectural features of traditional tissue on building level. For this reason, documentation such as restoration projects or measured survey drawings are supplied to be utilized for buildings that are existing.

5.3.1 Selection Criterion

82 buildings have been defined as 'traditional' due to conservation status and alteration level criterion defined in the previous parts. Through a careful elimination of non-documented examples, and a further elimination through the registration status, namely registered buildings have been preferred as displaying the characteristics of the tissue more clearly and distinctively, the data had been narrowed down. 30 of the 38 registered buildings had been sufficiently documented, and 27 of 30 have been selected for this part of analysis.

Although the basics of the organic tissue stand on the traditional buildings and features of the Town, it is impossible to differentiate the modern built-up space and its effects on this setting. In the previous analyses, in most cases analyses have been narrowed down to traditional buildings level, however accompanied with the interpretation of the outcome values for new buildings. Furthermore, being not too many in number, buildings have been discovered as humbly reflecting characteristics of the traditional tissue as well, without clearly opposing architectural features and/or illegal manipulations. Thus, 5 more buildings in N and T-Rhb categories were also included in selected buildings data set, for representing the proper part of the built-up space of new buildings, yet, in a number that will not drastically affect the essence of outcomes.

First of these new building examples is plot 167/1, a small building designed by architect Zehra Şenaltındağ, who had designed many new buildings in Kalkan Historical Town Centre in 1980s and 90s, when it was changing its state from a very small and isolated town to a tourism centre. The building is one of her early examples and was utilized for some years as office by herself. Plot 240/25 is an interesting example with L-type plan and a courtyard. It had been built instead of a demolished building, just behind one of the most significant examples of the traditional tissue, namely plot 236/25. Third selected new building is plot 201/49, all around surrounded by small traditional buildings in the centre of the town. It is T-Rhb category and rebuilt, however properly with the previous dimensions and building mass with all architectural features, including a unique example of large projections, originally possessing stairs and entrance.

Figure 45 - Building on plot 167/1

Figure 46 - Plot 236/25

Figure 47 - Building on Plot 201/49. This building have been rebuilt in the place of the old building seen in the old photograph displayed as Figure 10.

Figure 48 - Building on Plot 201/49

Figure 49 - Building on Plot 330/7

Fourth of the additional buildings, on a central location looking at the traditional square on the middle of Hasan Altan Caddesi, plot 330/7 is selected. It is a new large building, with interesting closed space projection examples and no other particular features at all, selected as a plain example. Finally, plot 327/5, a particularly small building with basement and ground floors and categorized as TR-hb, is also included in the set. This building, due to its small size, is a perfect example for large projections with entrance and wc on it, and displays no further particular architectural features.

These 32 buildings were analysed through their traditional states, opposite of the previous analysis which were based on the current status and related information. Since in this part, it will be necessary to understand the original status of the buildings, as much as possible. The previous analyses intend to reveal the rules that make up the traditional tissue through basic architectural features. There are two reasons for the change of the strategy in this part. First is increase in the level of detail of analysis, which requires the original status of each building. Secondly, the analysis in this part, on the distance of buildings and neighbouring status, as the determinant factors shaping the form of the tissue, will be providing more realistic and informative results when applied on the traditional forms of the buildings. Particularly, considering this second reason, the new form of the town had been formed in the last 20 years under the pressure of tourism, and reached to its limits as discussed in the previous parts of this study. For these reasons, the traditional forms of the buildings, before the alterations made under the pressure of the commercial activity have been preferred as the data source for this 3rd Level Analysis. Thus, restitution drawings, if available, have been employed. More than half of the set was lacking restitution drawings, and for these cases, measured survey drawings and author's own interpretations have been utilized for the analysis.

5.3.2 Selected Buildings

At the end of this section a detailed list of the selected buildings is provided, indicating their identity properties and some values in relation to architectural features. Most of the important buildings, about which documentation can be supplied, were included in this list, as well as certain exceptions preferred consciously. Some examples display extreme or close to extreme cases for the tissue,

such as significantly small base areas and utilization of large projections as plot 190/3, or satisfied with its small size and simple mass, such as plot 324/3 and some other largest base area cases, such as plot 329/6, plot 328/6 and 218/41.

Figure 50 - North and East Views of Building on plot 329/6

Figure 51 - Various Views of Building on plot 218/41. The building is known as 'Akin Pansiyon', and had been the oldest of the pensions in town. This pension is said to have been at least 50 years old with the same function, as a pension when there was no tourism activity in the Town.

As a further exception, the largest building in base area and volume as well, Mustafa Kocakaya Mosque had also been included in the list. The Mosque had been converted from a Christian Church in 1934 after Christians have been sent to Greece

in 1924. Although exact date is unknown, building is estimated to be built on the second half of 19th century, with the date 1897 carved on the bell approving this argument.[118]

Mustafa Kocakaya Mosque is a unique and exceptional building for various perspectives. Firstly, since it is a religious building, it was very large when considered with the residential buildings and small commercial facilities in Kalkan Historical Town Centre. This also provides an idea about the scale of the Town in the second half of 19th century. Furthermore, reasoning from its style as a church, the architectural features, and details are also exceptional for the traditional tissue in Kalkan. However, it still had been presumed as an element of the tissue, with its scale and relations, as a member of the organics. The exceptional results reasoning these exceptional features of the Mosque, will be indicated and filtered on the analyses, where necessary.

Some features of the selected buildings are displayed on the Table 36 below.

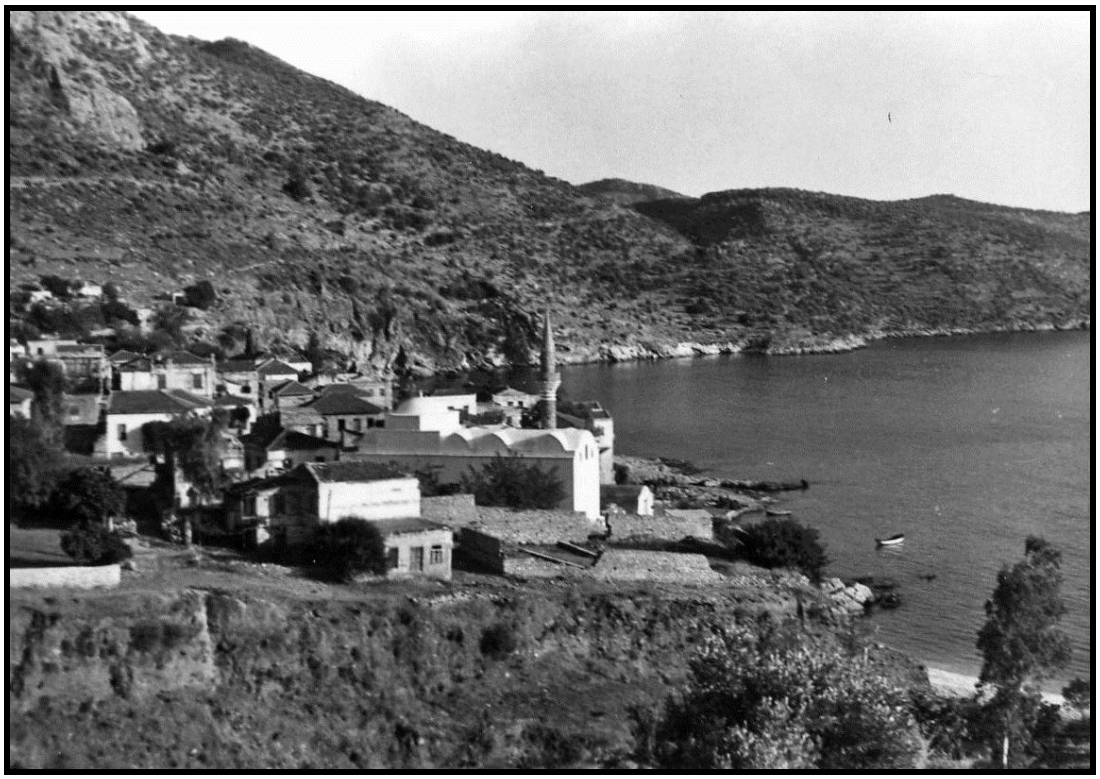


Figure 52 - Image displaying Mustafa Kocakaya Mosque and Kalkan from Southwestern Part of the Town[119]

[118] Information on building and converting dates are quoted form Measured Drawings by Asir Project Ltd. The church bell still exists in the storage of Kalkan Municipality.
[119] Şeref Karabağ Kalkan Photograph Archive, estimated image date: 1970s

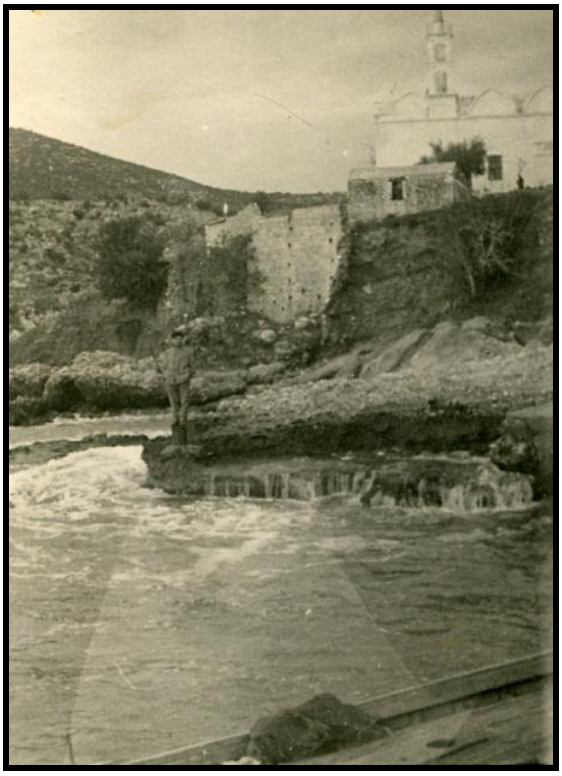


Figure 53 - Old Photograph - View displaying Mustafa Kocakaya Mosque and the rocky coastline which has been filled up today[120]

Figure 54 - Mustafa Kocakaya Mosque today[121]

[120] Şeref Karabağ Kalkan Photograph Archive, estimated image date: 1950s

[121] Asir Proje Web Site. http://www.asirproje.com.tr/mustafa-kocakaya-camii.htm#more-87, last visited in October 2010.

Selected Bldg. #	Plot Group #	Plot #	Width as the short dimension (cm)	Length as the long dimension (cm)	Length / Width Ratio	Front Façade	Height (Eve Level) (cm)	Bldg. Base Area (m2)	Floor Level Value	Bldg. Body Volume (m3)	projection #	Front Elevation Direction	Primary Open Space Direction	Front Elevation Azimuth Angle (CCW from North)	Registration Status	total adjacent buildings	TOTAL OPEN ELEVATIONS	FACADE1	FACADE2
1	1	323	840	840	1,0	WIDTH	800	71	2	564	2	SW	0	230	TRgs	2	1	adjacent	adjacent
2	3	190	640	850	1,3	WIDTH	810	54	2	585	2	SW	0	232	TRgs	2	0	adjacent	adjacent
3	6	329	1.020	1.440	1,4	LENGTH	900	147	2	1.666	2	NE	SW	58	TRgs	0	0	330	300
4	13	340	430	820	1,9	LENGTH	900	35	3	605	3	SW	0	230	TRgs	2	1	adjacent	adjacent
5	7	187	770	1.180	1,5	WIDTH	870	91	3	1.211	2	SW	0	239	TRgs	1	0	adjacent	adjacent
6	4	317	730	820	1,1	WIDTH	580	60	2	390	2	SW	NE	230	TRgs	0	0	250	150
7	39	228	540	1.400	2,6	WIDTH	676	76	2	1.325	2	SW	NE	239	TRgs	1	0	adjacent	110
8	20	378	860	1.140	1,3	LENGTH	950	98	2,5	1.235	2	SW	SE	209	TRgs	1	1	adjacent	∞
9	29	272	700	970	1,4	LENGTH	530	68	2	440	2	SW	NE	222	TRgs	1	0	adjacent	550
10	36	224	690	1.000	1,4	WIDTH	920	69	2,5	920	2	SW	SE	226	TRgs	1	0	adjacent	307
11	51	196	1.000	1.060	1,1	WIDTH	730	106	2	820	3	SW	SE	227	TRgs	0	0	580	200
12	25	236	560	840	1,5	WIDTH	660	47	2	466	1	SW	SW	221	TRgs	0	1	440	325
13	44	425	845	845	1,0	WIDTH	700	71	2	500	3	SW	NE	226	TRgs	1	0	adjacent	300
16	5	327	500	950	1,9	LENGTH	550	48	2	496	1	SE	SE	145	TRhb	2	0	adjacent	adjacent
17	11	183	920	1.230	1,3	LENGTH	680	113	2	998	1	NW	SW	323	TRgs	0	1	∞	630
19	28	395	500	920	1,8	WIDTH	540	46	2	457	2	SW	NE	227	TRgs	1	1	adjacent	∞
20	28	394	470	984	2,1	WIDTH	510	46	2	494	1	SW	NE-E	227	TRgs	1	1	adjacent	∞
21	24	245	1.120	1.171	1,0	LENGTH	767	131	2,5	913	2	SW	SW	224	TRgs	0	0	1400	400
22	6	328	1.088	1.438	1,3	WIDTH	1015	156	2,5	1.822	2	SW	SW - NE	253	TRgs	0	0	560	900
23	4	179	920	1.260	1,4	LENGTH	766	116	2,5	1.216	2	SW	SW-NE	219	TRgs	1	1	adjacent	∞
24	4	181	849	870	1,0	WIDTH	549	74	2	416	2	SW	NE	232	TRgs	1	0	adjacent	680
25	3	324	597	617	1,0	LENGTH	806	37	2	307	2	SW	0	240	TRgs	1	1	adjacent	∞
26	41	218	1.284	1.904	1,5	WIDTH	910	244	2	3.299	2	SW	SW-NW	239	TRgs	0	2	∞	∞
27	7	330	700	1.715	2,5	LENGTH	900	120	3	2.647	2	SW	SW	241	NRhb	1	1	adjacent	∞
28	49	201	453	740	1,6	WIDTH	868	34	3	475	3	SW	SW-SE-NE	236	TRhb	1	2	adjacent	∞
29	0	259	800	2.576	3,2	LENGTH	800	206	2	830	0	S	0	179	TRgs	0	3	∞	∞
30	8	279	895	1.132	1,3	LENGTH	770	101	2,5	987	1	SW-W	SW-W	257	TRgs	1	0	adjacent	1638
31	47	426	940	1.820	1,9	LENGTH	638	171	2,5	2.113	1	SW	SW-NE	229	TRgs	1	0	adjacent	965
32	25	240	703	1.000	1,4	WIDTH	720	70	2,5	377	2	NW	NW	307	N	2	0	adjacent	adjacent
33	8	331	507	585	1,2	WIDTH	553	30	2	189	2	SW	SW	235	TRgs	1	2	adjacent	∞
34	1	167	440	850	1,9	WIDTH	615	37	2,5	444	1	SW	SW	230	N	3	1	adjacent	adjacent
35	7	188	500	770	1,5	WIDTH	590	39	2,5	350	0	SW		242	TRgs	1	1	adjacent	∞

Selected Bldg. #	Plot Group #	Plot #	FACADE3	FACADE4	Height diff. caused by slope 1 (cm)	Height diff. caused by slope 2 (cm)	Slope1	Slope2	basement fl. Height (cm)	ground fl. Height (cm)	mezzanine fl. Height (cm)	first fl. Height (cm)	area of front facade (m2)	total area of front facade openning gs (m2)	ratio of openning to facade
1	1	323	∞	550	200		24%	0%		440		360	67,2	15,3	22,8%
2	3	190	450	600	370		58%	0%		440		370	51,8	11,0	21,3%
3	6	329	500	490		200	0%	20%		480		420	129,6	14,5	11,2%
4	13	340	∞	200		65	0%	15%		275	245	330	32,3	6,2	19,2%
5	7	187	400	800	70		9%	0%		280	220	370	67,0	12,6	18,8%
6	4	317	820	760		150	0%	18%		240		340	42,3	5,9	14,0%
7	39	228	300	600		170	0%	12%		330		350	36,7	7,7	21,1%
8	20	378	631	750	220	130	19%	15%		400		390	81,7	11,9	14,6%
9	29	272	350	750	30		3%	0%		240		290	36,6	7,6	20,7%
10	36	224	1200	550		50	0%	5%		280	330	320	63,5	14,9	23,4%
11	51	196	330	260	220		22%	0%		400		330	77,4	12,0	15,4%
12	25	236	480	∞		90	0%	11%		350		310	37,0	10,8	29,1%
13	44	425	550	750		40	0%	5%		310		400	59,5	13,7	23,0%
16	5	327	330	700	270		28%	0%		250		300	52,3	14,0	26,7%
17	11	183	560	200	295		24%	0%		370		310	83,6	12,8	15,3%
19	28	395	400	440		170	0%	18%		250		290	27,0	5,4	20,2%
20	28	394	600	400		170	0%	17%		250		290	25,4	4,8	19,0%
21	24	245	300	300	220		19%	0%	165	315		365	52,8	8,8	16,7%
22	6	328	500	300	220	120	20%	8%		210	367	388	88,8	15,3	17,3%
23	4	179	440	875		150	0%	16%		295		300	75,0	13,9	18,5%
24	4	181	170	618		190	0%	22%		240		319	47,5	10,5	22,2%
25	3	324	830	580		193	0%	32%		405		330	44,4	11,6	26,2%
26	41	218	560	340		339	0%	18%		340		285	78,8	13,4	17,0%
27	7	330	500	500	350		20%	0%	350	300		310	46,2	15,5	33,6%
28	49	201	∞	460		196	0%	26%	256	284		268	36,4	4,9	13,4%
29	0	259	400	∞	250	145	10%	18%		835		329	66,8	9,1	13,6%
30	8	279	900	400		295	0%	33%		350		385	83,2	15,8	19,0%
31	47	426	450	380	97		5%	0%		320		290	58,3	15,4	26,4%
32	25	240	400	200	90		13%	0%		325		310	25,4	9,0	35,5%
33	8	331	∞	400	75		15%	0%		253		310	28,7	9,9	34,5%
34	1	167	adjacent	∞		143	0%	17%		285		300	25,7	8,2	31,7%
35	7	188	250	550		120	0%	16%		290		300	29,5	10,0	34,0%

5.3.3 Methodology of 3rd Level Analyses

32 selected buildings were digitally modelled in 3d with a certain abstraction level and through the utilization of simple geometries. The digital model of 32 buildings in Kalkan Historical Town Centre, the most qualified and unique examples representing about 15% of the total buildings, will work as a data source for further analyses and applications.

For this study aims to reach outcomes that will assist to new building design in traditional setting, on the conceptual level, digital models designed in order to produce data source that have been conceptualized as explained below. The conceptual models of the selected buildings will be employed as the data source for 3rd level analysis, which will be proceeding in this chapter, finalizing the rules for new building algorithms. Through this part of the study, the outcome of the analysis will be specified for this data set, improving the rules to a further specification level based on these 32 buildings.

Since utilizing models as the data source is the primary intention of this part of the study, conceptual abstraction of the buildings had been a primary criterion for digital modelling. In order to simplify the buildings, following analysis titles are defined with their own assumption and ignorance criterion each. These titles are constituted under the light of the previous analyses, on one hand tracking the path drawn through the previous analyses, and on the other targeting to open a way for more specified results.

On the final part, the analysis based on digital models will be demonstrated and the outcome will be discussed. Some of the results will be analysed through statistical information displaying varying features of the buildings in comparison to each other. Furthermore, varying architectural elements and features will be displayed on the basis of these 32 buildings in relation to each other. These graphics at the end, intend to represent for the architectural features of the tissue on a conceptual level, demonstrating the frequencies, exceptions and unique types together.

The buildings have been modelled based on the restitution or survey drawings for traditional buildings and design projects for new buildings. In previous analyses, buildings were considered through primary buildings mass and additions, without

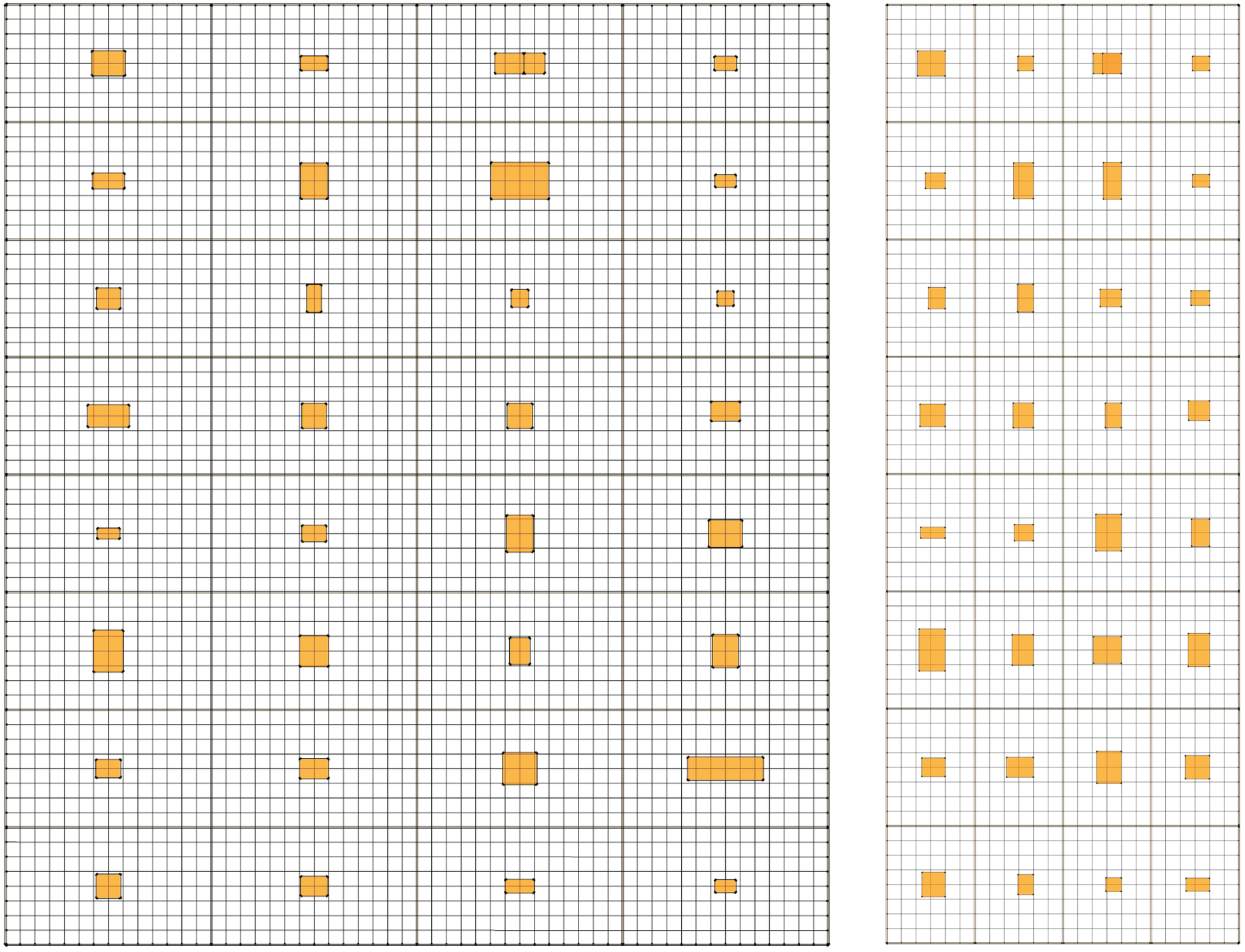
any concern for reasons explained before these analyses. In this part, in order to be more specific on open areas and relations of building with each other, buildings have handled with all the spaces existing on the plot. There is still no concern for the plot size and structure, since ownership issue is not a part of the scope of this study, however each space in relation to a building on the plot are considered and modelled with a certain level of abstraction. In other words, any space other than the primary building mass on the plot, if exists, is modelled and interpreted to an architectural categorization.

In this sense, all the closed and open spaces were modelled as volumetric spaces as an abstraction. Building open spaces, or spaces between the buildings were modelled as volumes or spaces that have 3 dimensions, in order to be utilized for the analysis.

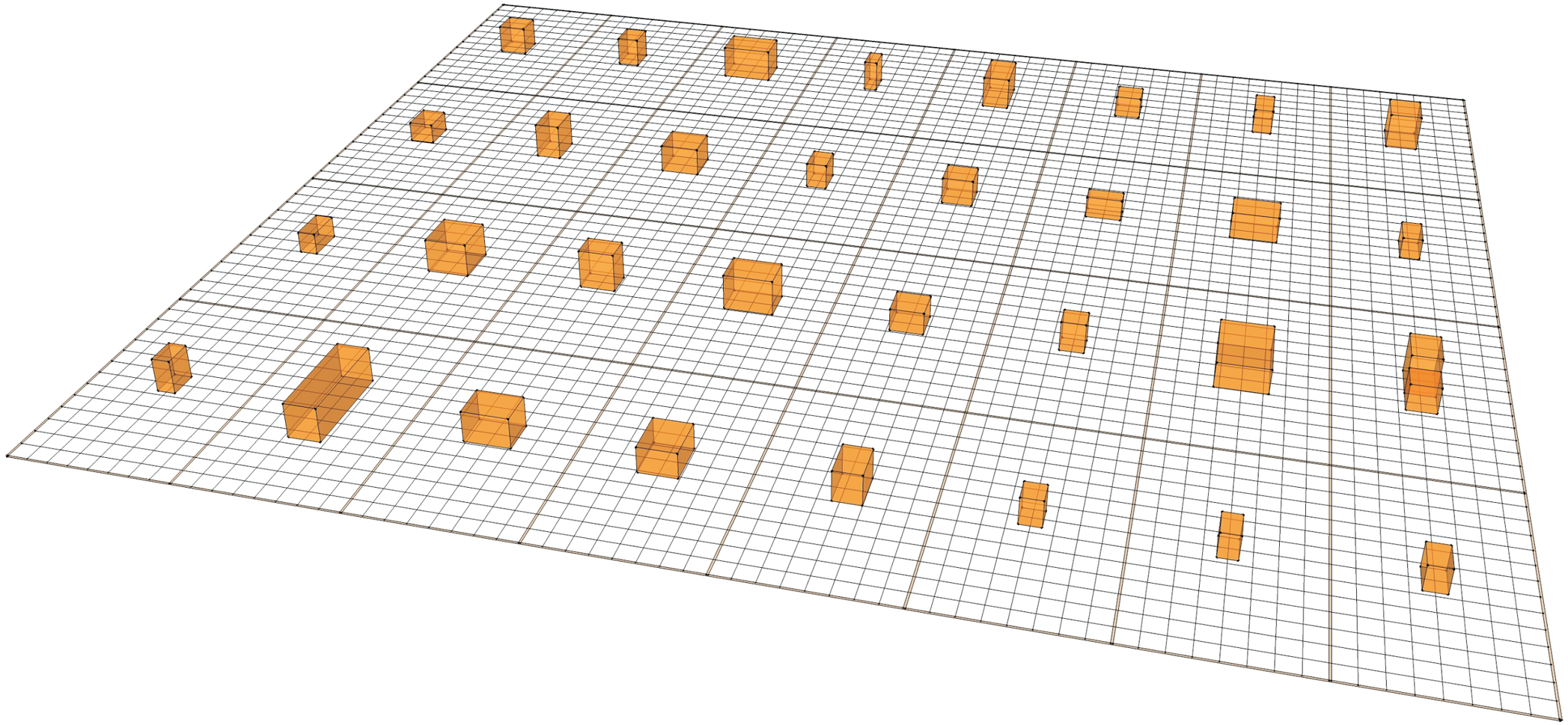
All the dimensions are utilized with a round off to 1 cm precision, and this is converted to 1 m^2 or m^3 for the base area and volume calculations. However the raw data still exist with the initial precision in the data set.

5.3.4 Building Primary Mass

The modelling study begins with the primary building mass. The building mass in this sense, is abstracted to simple rectangle form and modelled demonstrating the real dimensions on width, length and height for each selected building. Basic data supplied by this set of digital models as variables for algorithms will be Width, Length and Height, and the relational variables will be defined as W/L ratio, Base Area and Building Volume.



Drawing 16 - Conceptual Plans and Sections of Building Mass for Selected Buildings



Drawing 17 - Conceptual Perspective Views of Building Mass for Selecteds

Below charts display the length / width ratios of building base areas and the comparison of this ratio for base are and building height values.

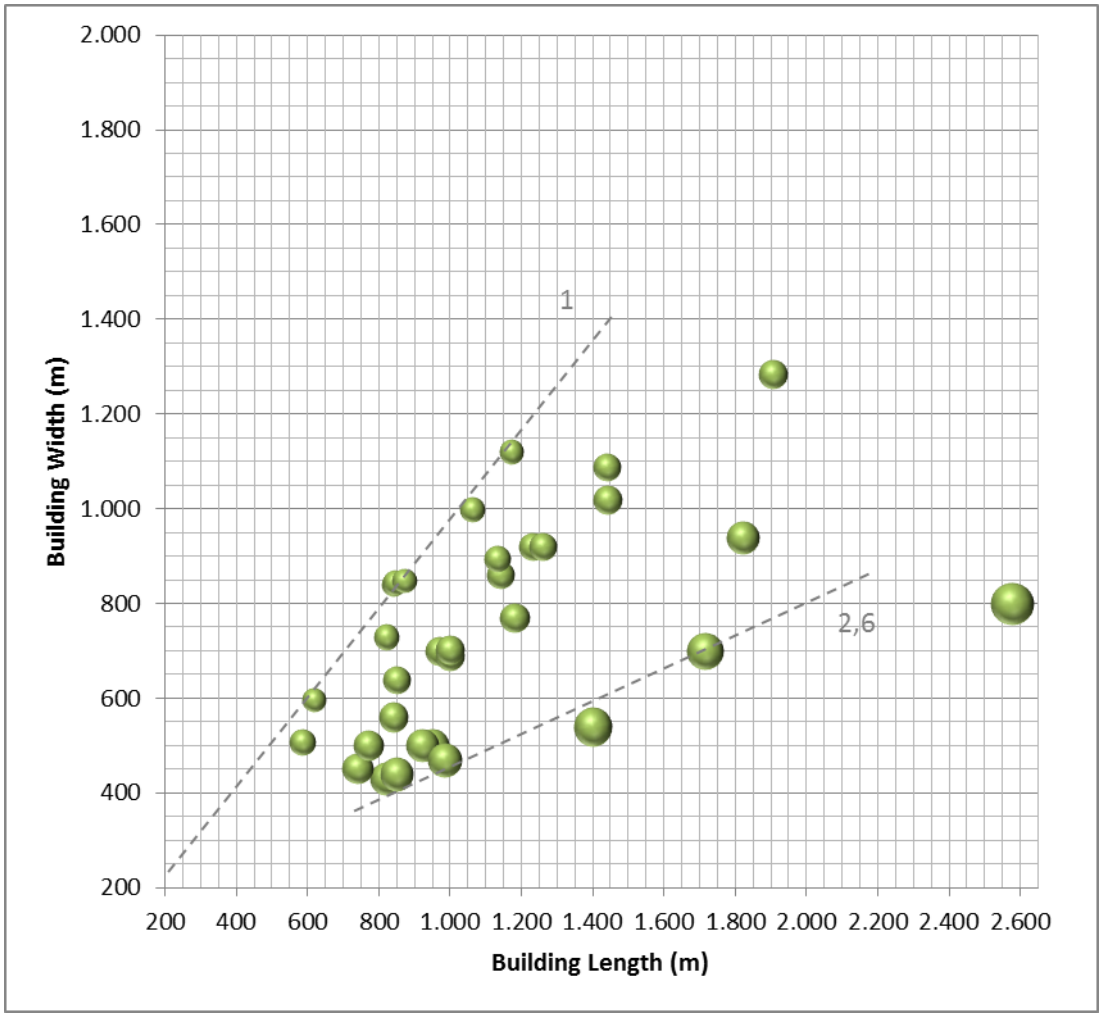


Chart 29 - Selected Buildings Length And Width Values

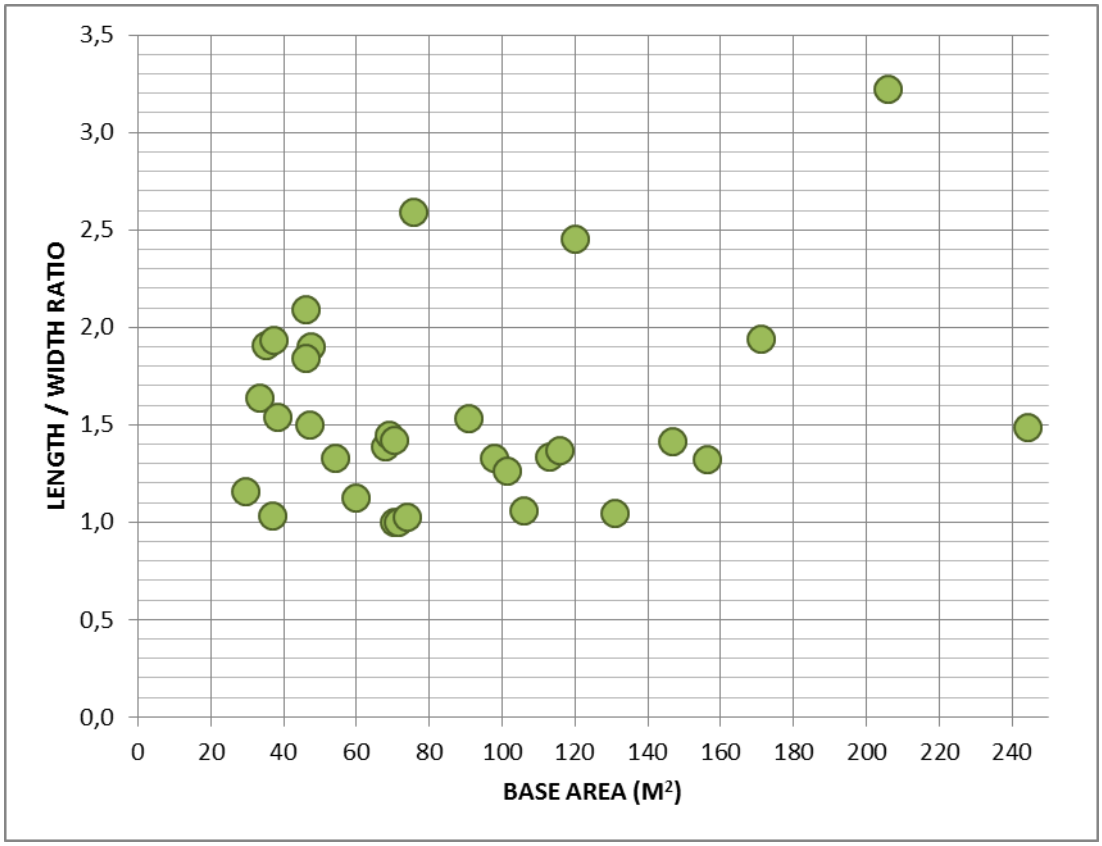


Chart 30 - Selected Buildings L/W Ratio - Base Area Relation

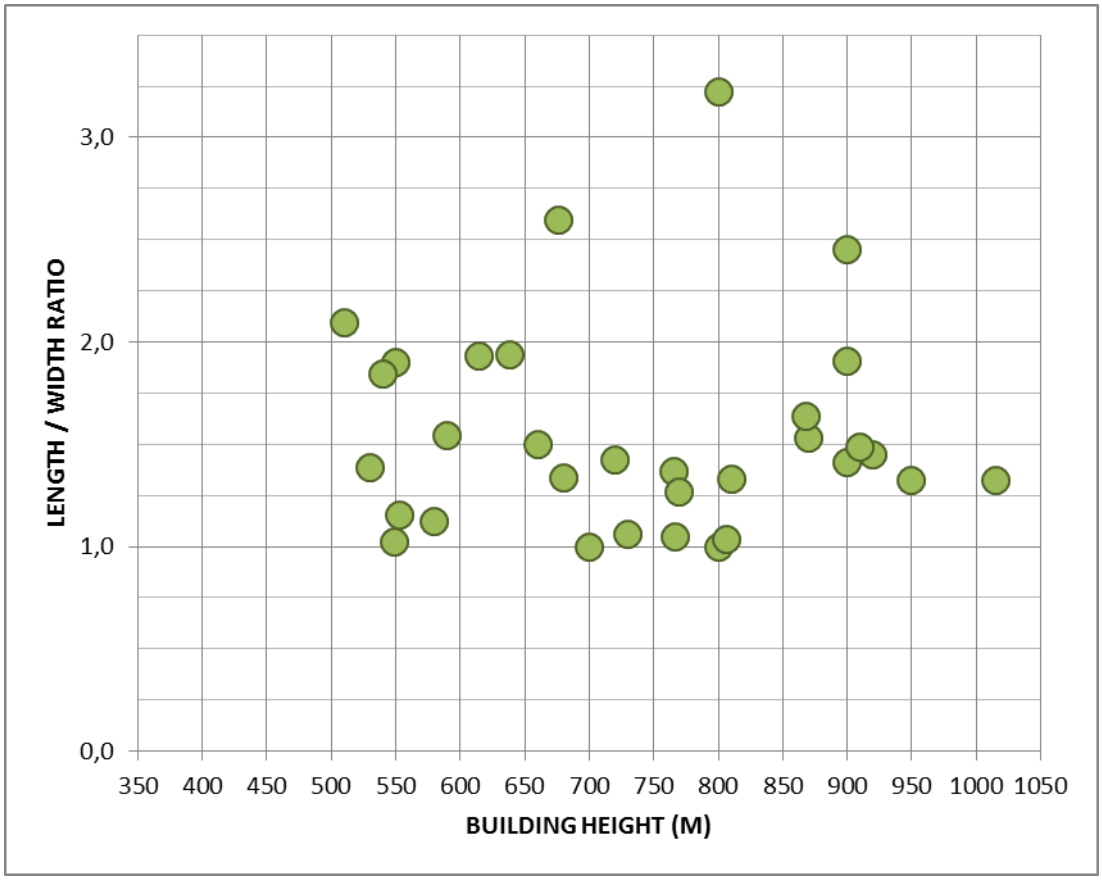


Chart 31 - Selected Buildings L/W Ratio - Building Height Relation

Length / Width ratio varies between 1 and 2,6 for selected buildings when the elongated basilica form of Mustafa Kocakaya Mosque is not considered. There is more concentration between 1 and 2 ratios on data points. On the second chart, it is displayed that, with some exceptions, the ratio is lower than 1,5 for buildings with a base area larger than 80-100 m^2 group.

When the distribution of Length/Width ratio over building height values is examined, it is demonstrated that for middle group height values, the ratio is smaller than low buildings and high buildings as well. This fact will be interpreted as follows; L/W ratio average is 1,55 and weighted average is 1,43. Assuming that most of the buildings employ numbers on a certain range around 1,43, it can be concluded that, for lower buildings further ratios are applied in order to get increase the volume, and for larger buildings a similar range expansion is available for having a shoe-box shape instead of a square-like form.

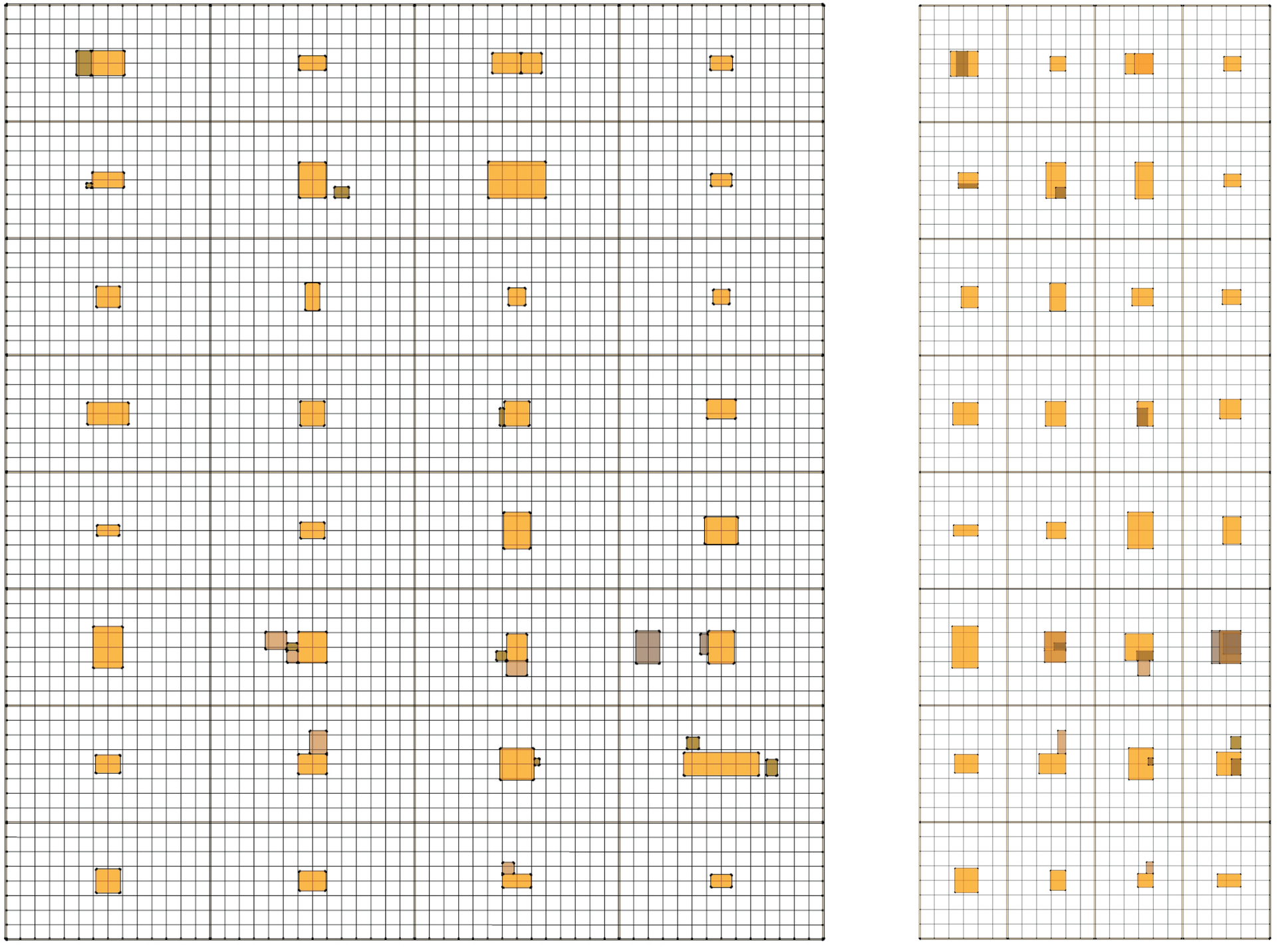
Table 37 - General Statistical Figures in Relation to Dimensions of Selected Buildings

	WIDTH	LENGTH	L/W RATIO	HEIGHT	BASE AREA	FLOOR LEVEL	VOLUME
MINIMUM	430	585	1,00	510	30	2,00	189
MAXIMUM	1.284	2.576	3,22	1.015	244	3,00	3.299
AVERAGE	744	1.117	1,55	737	88	2,28	924
WEIGHTED AVERAGE (HAR. MEAN)	680	1.005	1,43	709	65	2,23	600

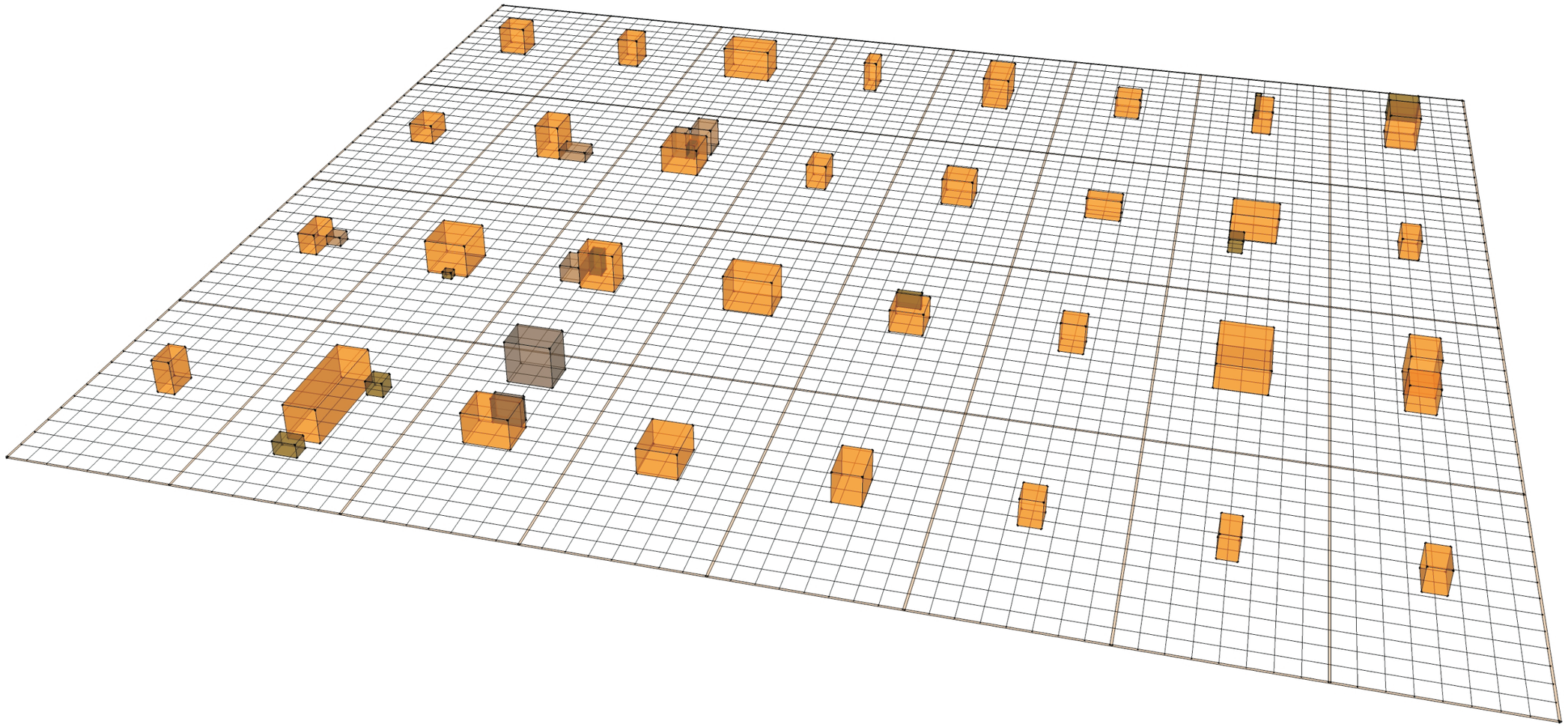
5.3.5 Secondary Buildings / Additions

As analysed in the previous parts, secondary building in relation to the primary building is not a prevalent case for the traditional tissue, however existing in a certain frequency, particularly for larger buildings and plots. It is seen that 10 of the 32 buildings in this set possess secondary buildings, with a ratio larger than the general ratio for the entire Town Centre.[122] One of these examples in selected buildings set is the Mosque, which naturally has some additions such as a semi-closed space for washing and gathering, a chapel from the Church times and a further space for storage built on the second half of 20th century.

[122] The rate of building employing secondary buildings in relation to primary building has been calculated as 20% for all buildings data set and 31% for the selected buildings.



Drawing 18 - Conceptual Plans and Sections Demonstrating Primary Mass and Additions for Selected Buildings

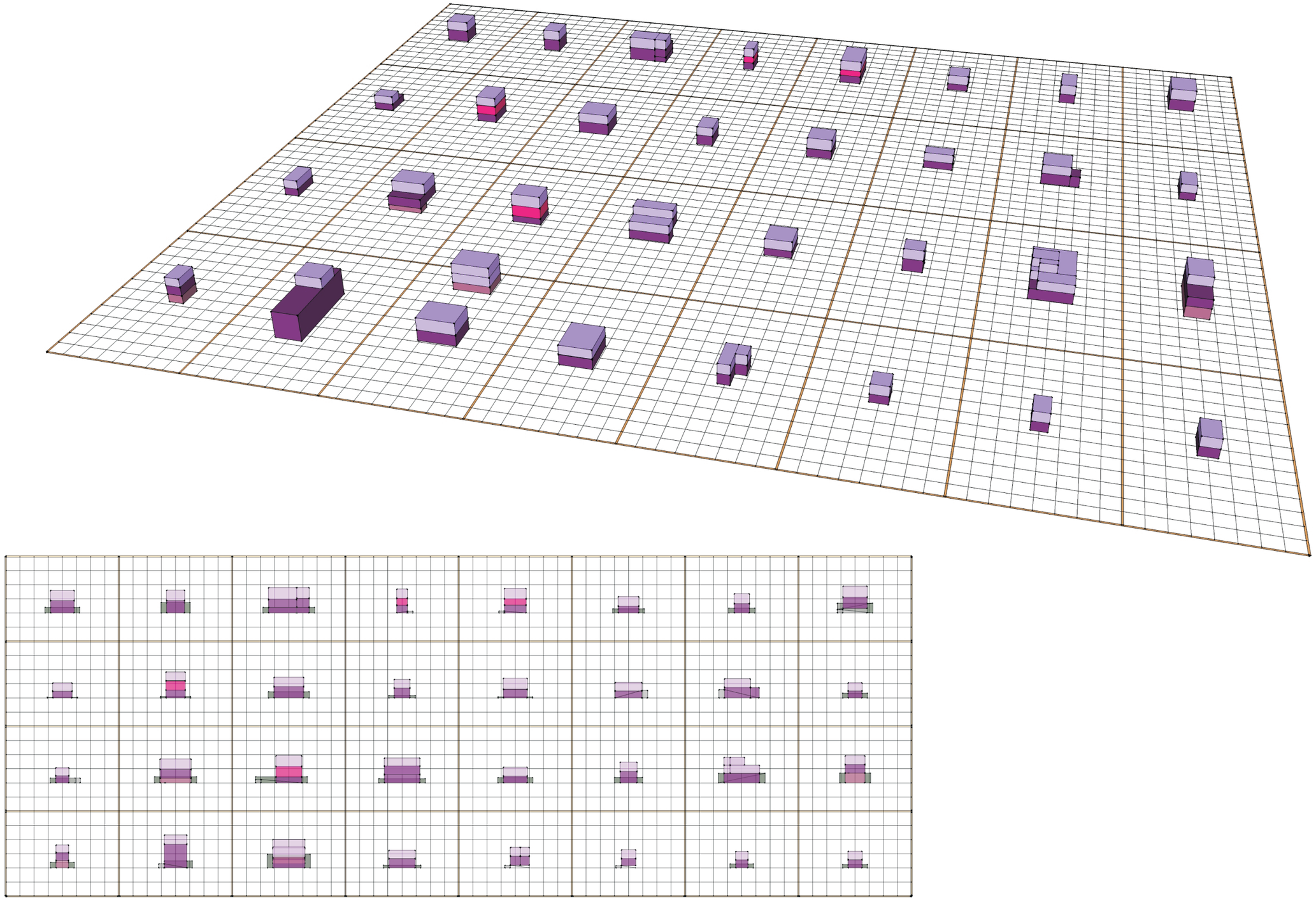


Drawing 19 - Conceptual Perspective Views Demonstrating Primary Mass and Additions for Selected Buildings

When the functional utilization of the additions is examined, most of the additions are service spaces, or storage spaces added in time, with two exceptions of primary living space in new buildings. Since this study intends to analyse the architectural elements and their relations making up the traditional tissue, it is demonstrated that most of the secondary buildings were added to the tissue after requirements appear particularly on service functions. For this reason, it is not fully proper to consider secondary buildings in designing algorithms for new buildings. However in order not to totally neglect secondary buildings, this feature will be considered with a low frequency, only available for large and small buildings. Secondary buildings are mostly located on northern facade or in some cases, at least eastern or western facade, but not on the southern facade.

5.3.6 Building Height and Floor Number

Up to this level, height of a building is not considered as absolute height information, and yet the floor number and the perceived building height had been the focus of examinations, in reference to the general structure and perception of the tissue. On this level, for selected buildings the height will be considered as a separate parameter as well as the previously defined Floor Level Value parameter.



Drawing 20 - Conceptual Section and Perspective Views Demonstrating Building Height and Floor Volumes for Selected Buildings

Primary conditions about floor level value have been designed in the previous parts, and the building height values will be discussed in this part of the analysis. Examining the charts, general limit for building height is found out about 10 m. Furthermore buildings with floor level value 2 tend to be lower than buildings with floor level value 2,5 naturally. In this sense varying height limits for varying floor level values can be utilized.

In parallel with the outcome of the previous analysis, there are more buildings with lower building height and floor level value in the smaller base area groups, until 60 m^2.

Ground Floor Height varies between 210 cm and 480 cm, excluding the Mosque which is full height ground floor, and first floor height varies between 268 cm and 420 cm.

On the other hand, there 4 buildings in 32 displaying mezzanine floors and this ratio is more likely to represent the frequency of mezzanine floors in traditional tissue.

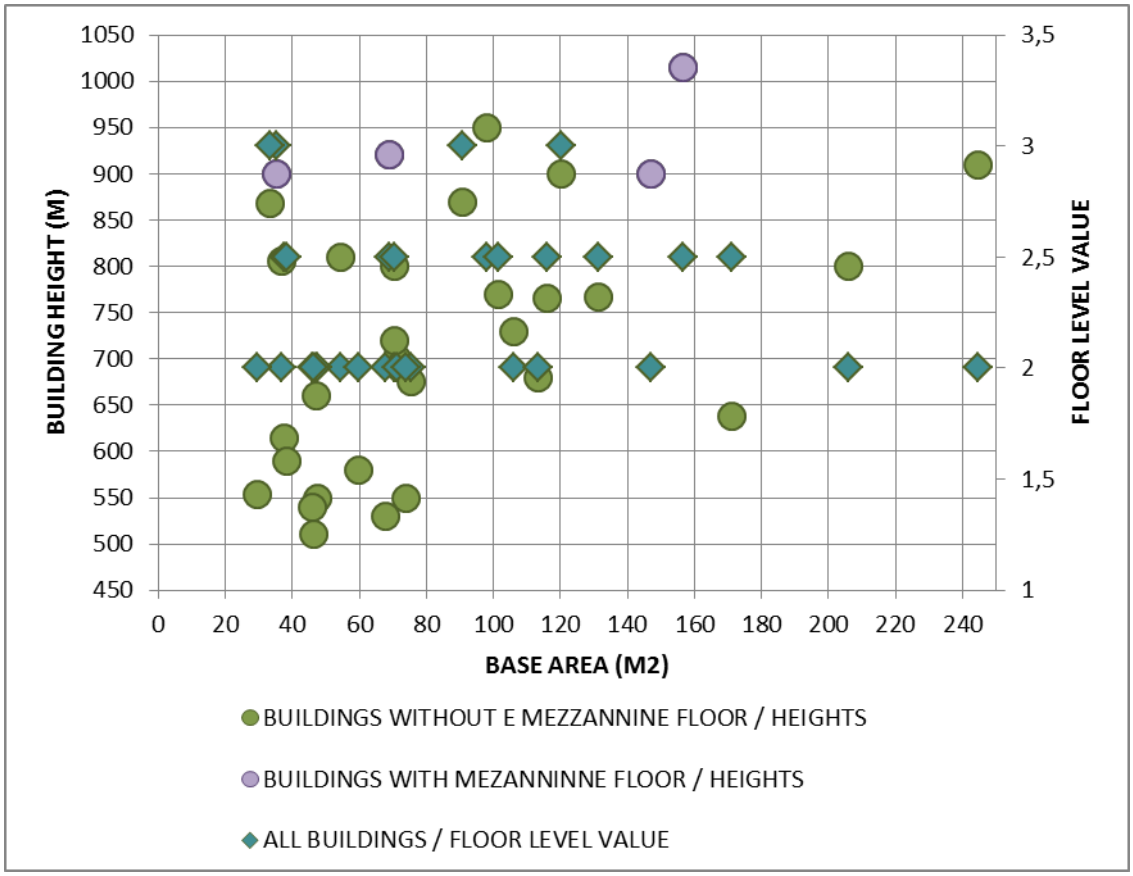
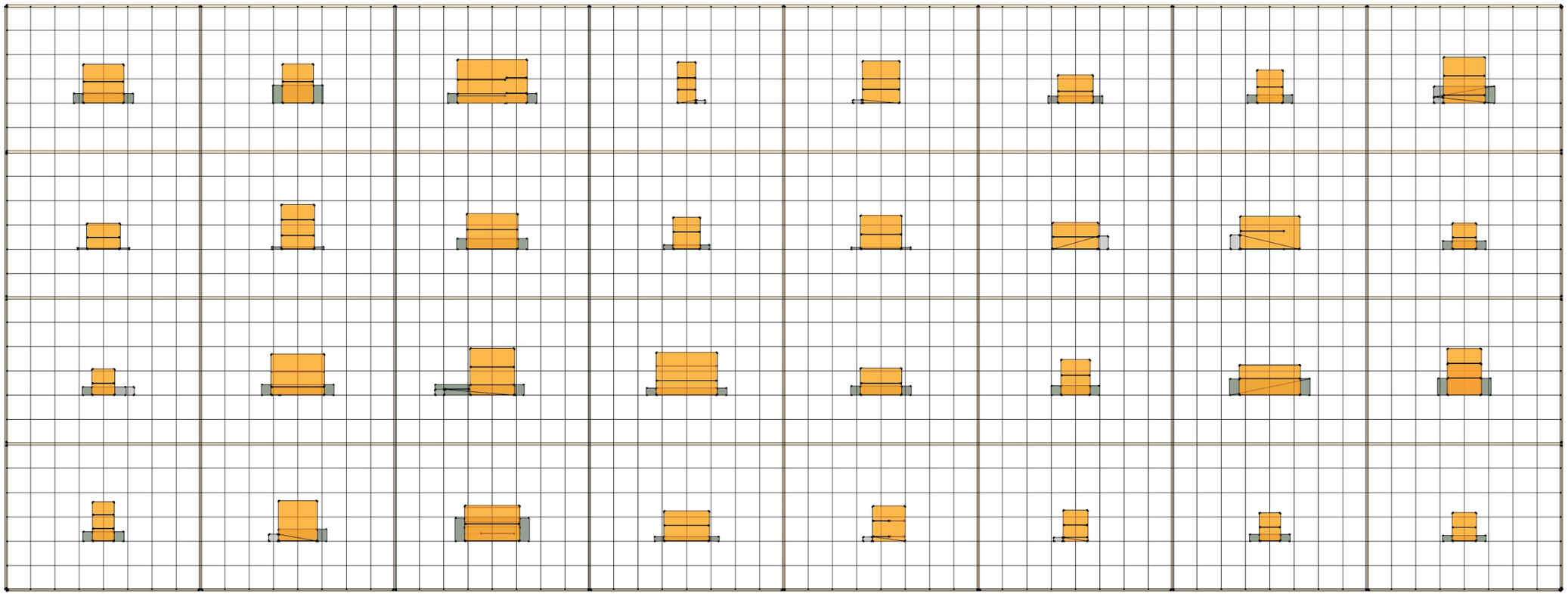


Chart 32 - Selected Buildings Height and Floor Level Values Compared to Base Area Relation



Drawing 21 - Conceptual Section Demonstrating Floor Levels and Slope for Selected Buildings

Basement Floor utilization mostly depends on the level of slope and will be discussed in the following section.

5.3.7 Slope Treatment

Slope is one the primary features of Kalkan's topography and therefore architectural tissue. Basement floors and gradual buildings are the solutions for slope treatment proposed in the traditional tissue. When selected buildings are analysed in order to demonstrate their relation with slope, it is concluded that there are no buildings, at least having slope on either width or length sides. Width represents the shorter side and length represents the longer side in this study. 30 cm height difference between two ground level corners of the building is defined as the minimum limit for mentioning a slope. In other words, lesser differences are neglected.

29 buildings have slope on single direction and 3 buildings have on both directions. On 18 buildings slope is on the shorter side direction and in 24 buildings slope is on the longer side direction. The height difference caused by the slope on a single elevation reaches up to 370 cm in plot 324/3, which is a full floor height or even more.

Figure 55 - Building on Plot 324/3

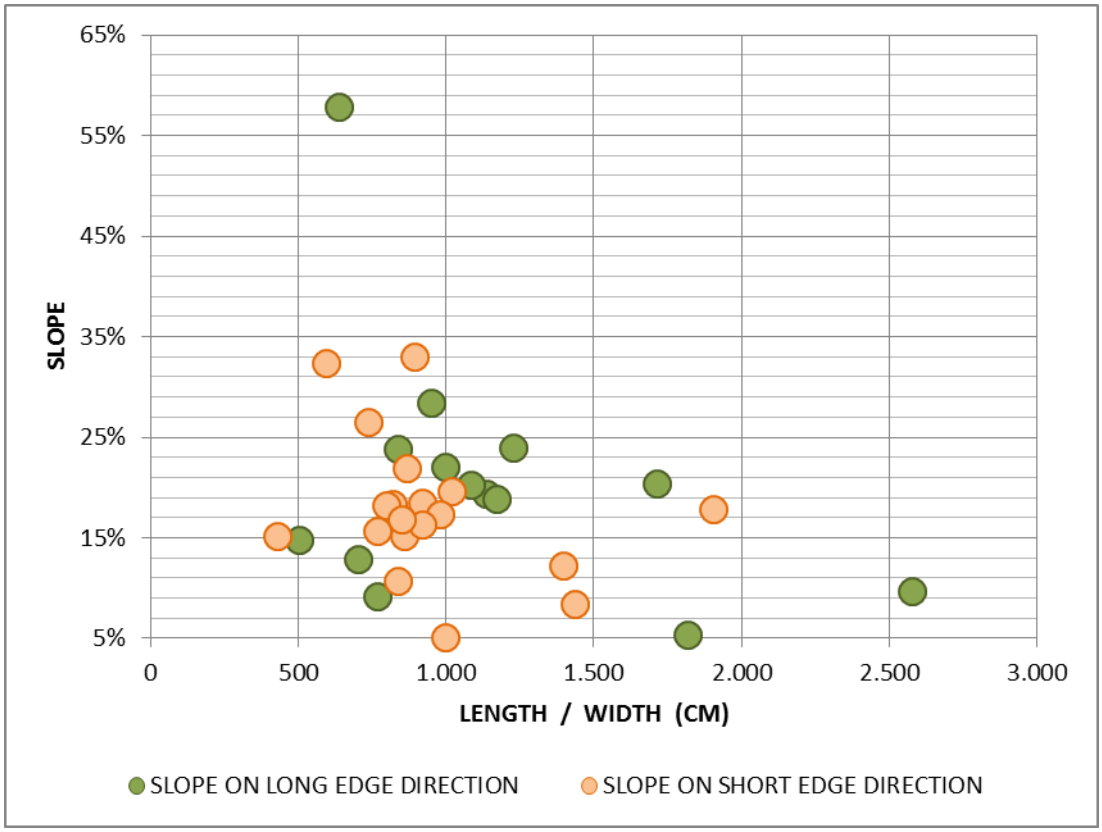
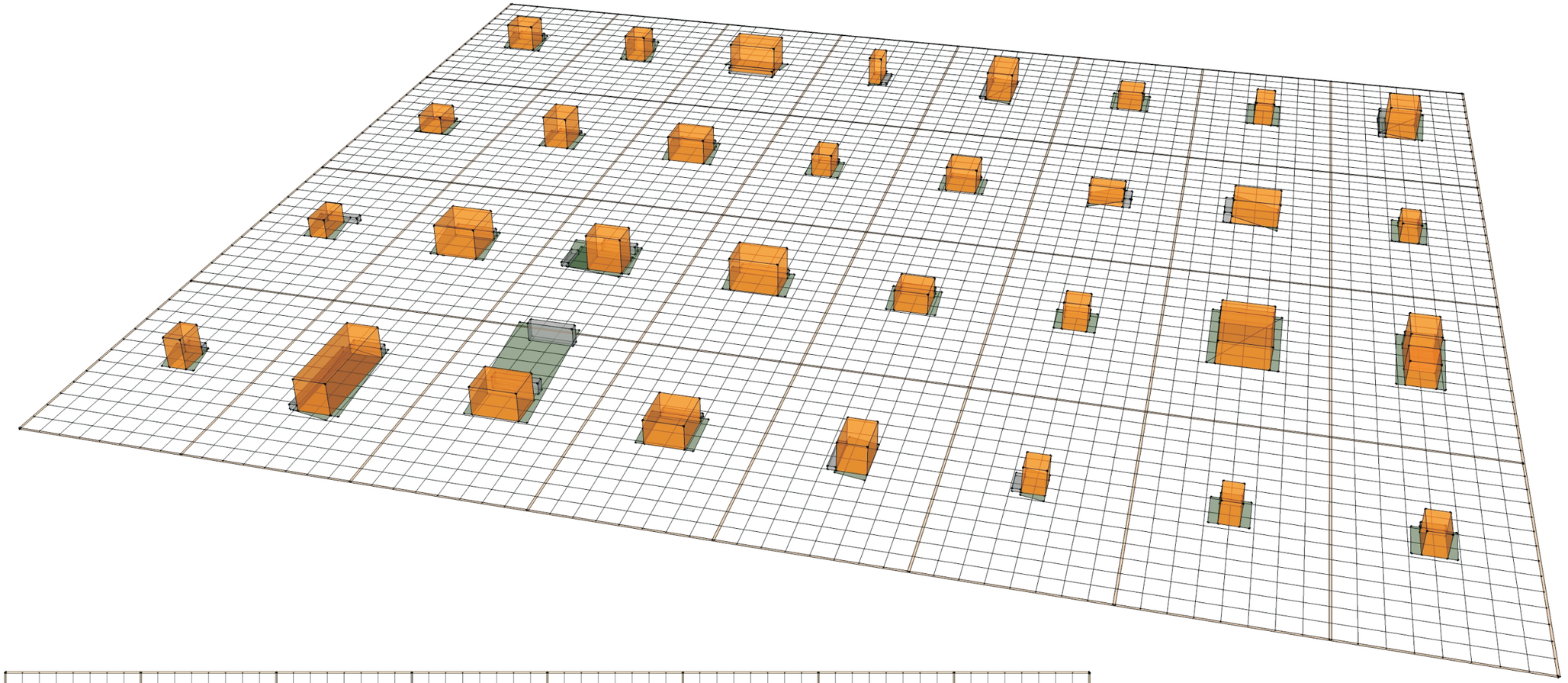
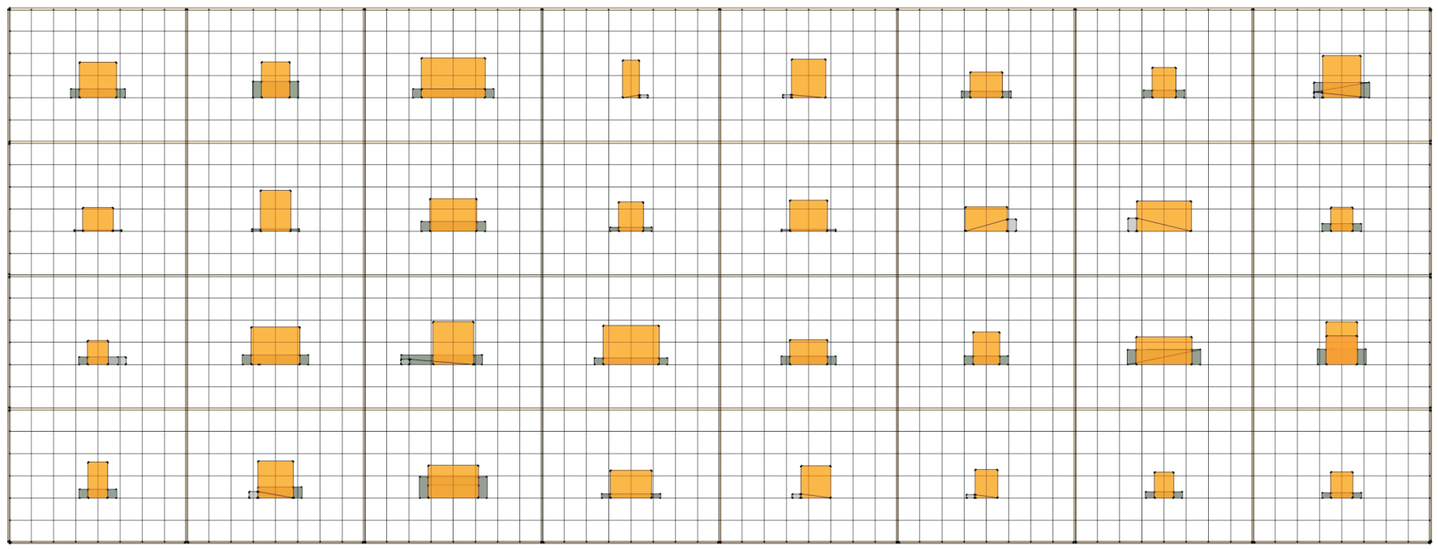


Chart 33 - Selected Buildings Elevation Dimension / Slope Relation

When the criterion proposed in Chapter 4.2.13 is considered, there not too many basement floors existing in the selected building set, although there are serious slope cases. Mostly the lowest floor of a building is utilized, even if it is connected to a street on single elevation. Hence, employment of a basement floor, as defined in this study, is conditional and not prevalent. Instead, basement floor is usually utilized as ground floor, opening to the lower street.





Drawing 22 - Conceptual Section and Perspective Views Demonstrating Building Mass and Slope Relation for Selected Buildings

For understanding the relation between building height and slope level, it is necessary to have a comparison of height differences caused by slope for each building. Reading the chart, it is stated that building height has a certain correlation with the slope, where it affects the ground level of the building. In other words, the ground level difference of the area building stands on has a certain effect on the building height. Similarly it can be stated that, in most of the highest building cases, there is a considerable level of slope, as a parameter on building height.

Approaching to this fact from another perspective, if the difference of the highest ground level point that the building stands on and the building height is calculated, this value is between 280 and 870 cm. This states that, if the slope is high, then the building height tends to be high, indicating a basement floor utilization, either it is basement in the definition employed in this study or treated as a ground floor.

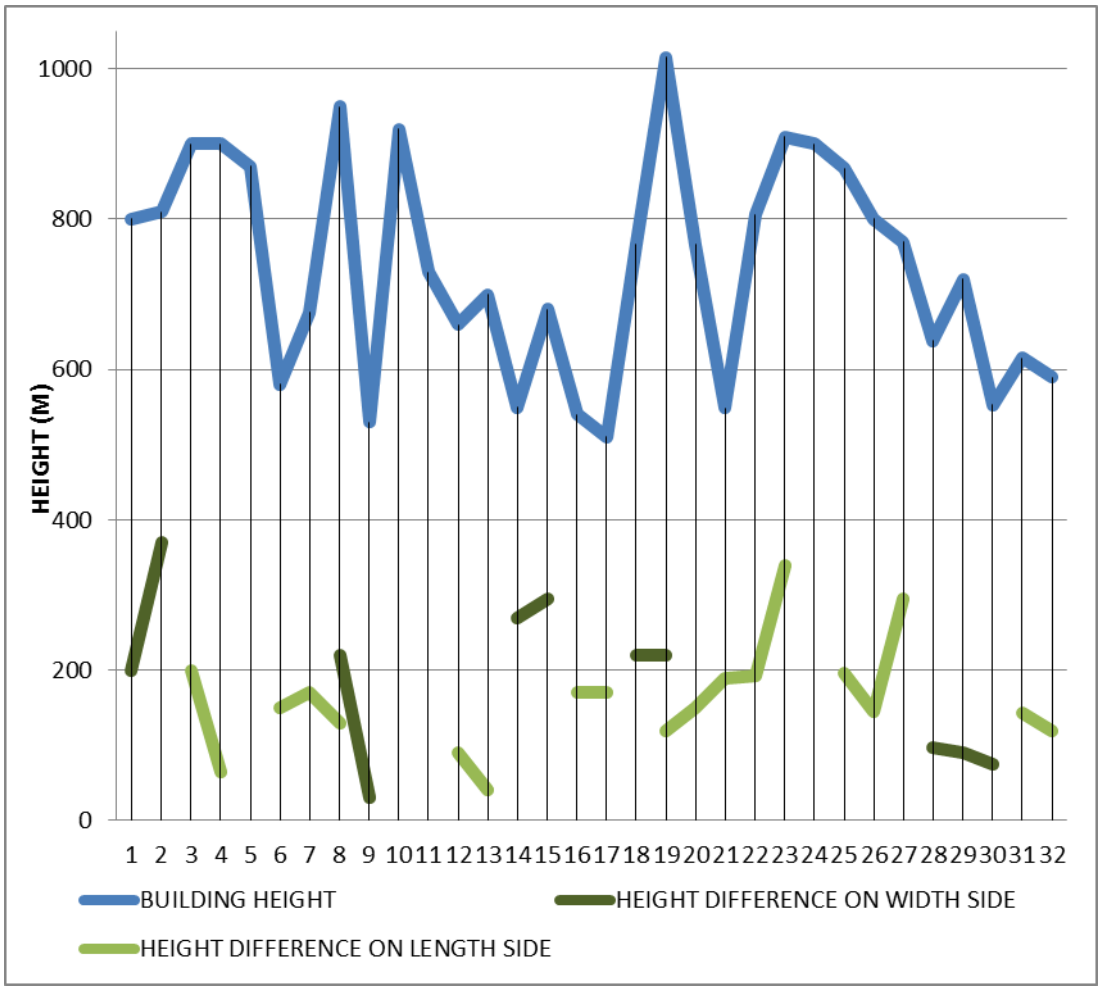
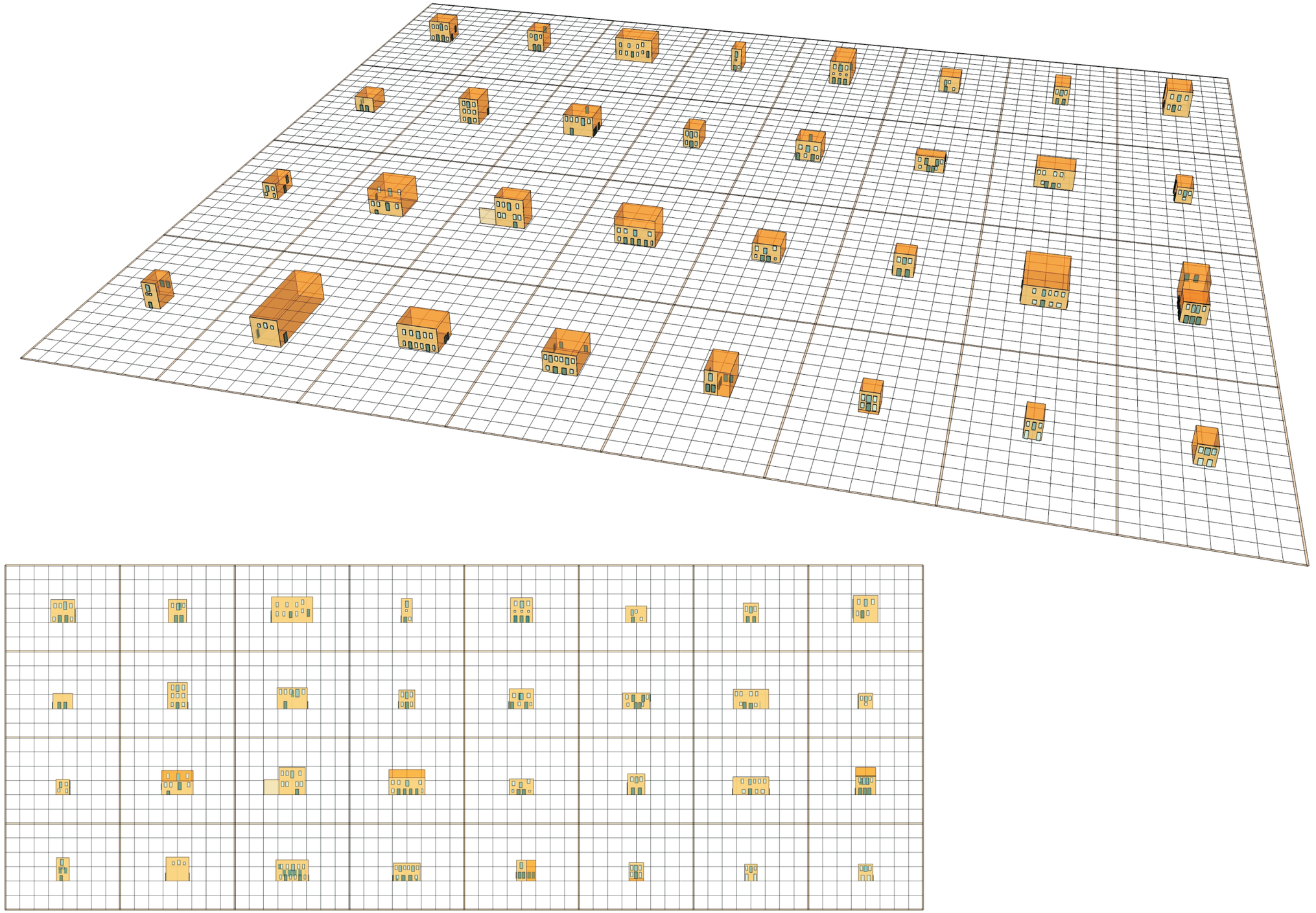


Chart 34 - Building Height And Height Difference On Ground Level Caused By Slope

5.3.8 Front Elevation Relational Analysis

Some of the architectural elements utilized as typical features of traditional tissue in Kalkan, were analysed in the previous analyses in relation to their frequencies and their combination frequencies. Furthermore elevations of buildings were analysed in relation to an articulation scale. It is considered that, the detail of elevation articulation is not in the scope of this study, since it is more related with architectural style and approach. However, another significant parameter to be classified in the scope of this study in relation to elevation articulation, is the relation of fenestrations and elevation.

For this analysis, only front elevations are utilized. In some buildings of the traditional tissue, particularly large and qualified ones with 'rich ornament level' status, either all elevations or clearly exposed 2 or 3 elevations are articulated. In some other cases, only front elevations are articulated. This analysis will be run through only on front elevations in order to supply satisfactory information and the outcome can be applied for other elevations as well. On the digital models, the front elevations of the buildings and the fenestrations are exposed as seen in below images.



Drawing 23 - Conceptual Section and Perspective Views Demonstrating Front Facade Articulation for Selected Buildings

In 22 of 32 selected buildings front/primary facade which is considered in this analysis is on the shorter side of the rectangle and in 10 cases on the longer. This fact is mostly related with the plot shape and furthermore the slope level. As a general principle, comparatively flat elevation was selected as the front elevation, however other cases were practiced as well. Similarly shorter facade is usually utilized as the front. The reasons behind this choose are based on interior plan arrangements and facade articulation. On the simplest form of traditional tissue, the building is 2 floors high, shoe-box like with a ratio about 1,4, and covered with a 2-ways pitched roof with hidden groove and pediment. In this simplest form of building, the shorter side is the primary elevation and in ideal conditions, it looks to south as well as the small balcony on the elevation which benefits from sun and view. On the other hand, by locating the shorter elevation to south, the building preserves its inner temperature more than the opposite case, when the longer elevation will be under the effect of direct sunlight.

In conceptual digital modelling, outside doors and windows on the elevation were considered. Through the below chart, analysed openings were demonstrated and the below table provides general figures about the windows and doors. All the doors and windows are plotted below for their width and length dimensions, in order to display their relations to each other.

Table 38 - Figures of Openings of Front Elevations of Selected Buildings

	WIN. WIDTH	WIN. HEIGHT	WIN. W/H RATIO	DOOR WIDTH	DOOR HEIGHT	DOORS W/H RATIO
MINIMUM	57	68	0,88	85	123	1,09
MAXIMUM	125	193	2,46	130	280	2,80
AVERAGE	86	147	1,72	107	221	2,09
WEIGHTED AVERAGE	84,29	139,3	1,64	105,8	217,4	2,04

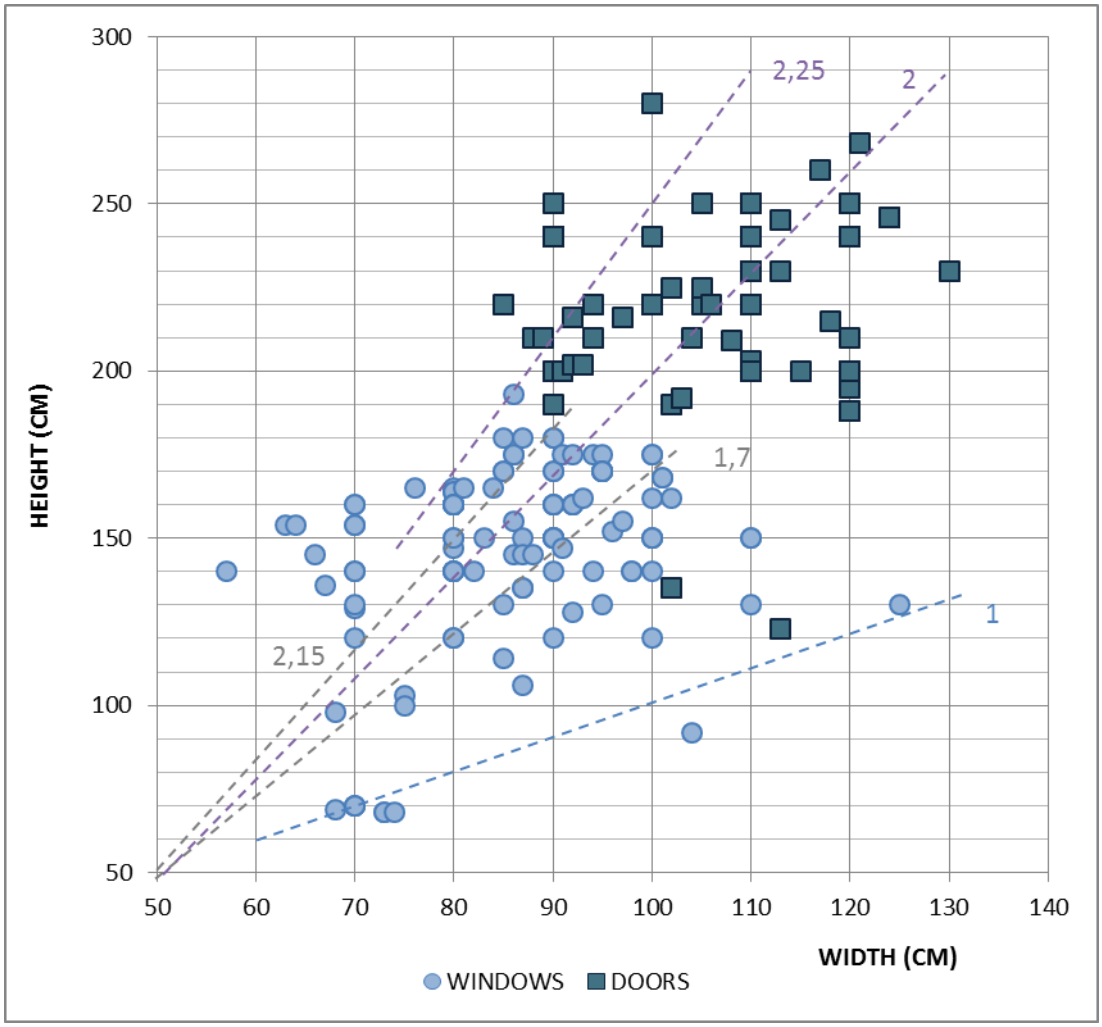


Chart 35 - Width/Height Ratio of Opening on Front Facade of Selected Buildings

The Width/Height ratio for windows is defined as 1/2 in the Development and Conservation Plan. Regarding that there are lots of exceptions in this chart, including the square like windows in mezzanine floors and modified windows, which are not a few, it can be stated that, there is an accumulation around 2 value as a ratio, whereas the averages are around 1,7. The number of windows with a W/H ratio between 1,7 and 2,15, for providing a certain flexibility in design and applications limitations, is 62 out of 122 total windows. Considering the small modern windows and mezzanines, this is a significant number and can be accepted as window ratio in general.

The values such as 57 or 68 for both width and height, belong to either mezzanine floor windows or other cases where modern design vocabularies are utilized for staircase shafts, service spaces and exhibition areas in commercial

functions of restoration or renovation projects. In this sense, a second W/H ratio can be pronounced as 1 or close values for rectangle mezzanine windows.

For the doors, similarly there is a variety of ratios, however it is observed that most are clustered in the W/H ratio range between 2 and 2,25, namely 40 of 79 total outside doors. It is required to understand the exceptional cases, particularly for lower ratio doors such as low height basement floor or storage space doors, or higher ratio of ground floor commercial space doors, which are manipulated recently.

Figure 56 - Monumental Door on Plot 196/51

Another typical door ratio can be defined as the range between 2,4 and 2,7, which is a special case with few examples in data set, namely the monumental entrance doors. Particularly in upper class residences accessed through a courtyard, such as plot 196/51 or accessed from the street such as plots 329/6 and 245/24 where a large door with a higher ratio is utilized, mostly with 2 wings. This is a special entrance door, mostly employed in comparatively large buildings.

As a second assessment, in order to understand the morphology of the elevation as a general figure, front elevations are analysed to reveal the relations opening areas and total elevation area.

Table 39 - General Figures on Opening Ratios of Selected Buildings Set

	WIN/FAÇADE RATIO	DOOR/FAÇADE RATIO	OPENINGS/FAÇADE RATIO
MINIMUM	2,0%	3,4%	11,2%
MAXIMUM	20,9%	28,1%	35,5%
AVERAGE	9,0%	12,7%	21,7%
WEIGHTED AVERAGE	7,1%	9,9%	19,9%

The two bottom values for win/facade ratio are exceptional values to be ignored, since they are renovated buildings converted to commercial retail shops. For this reason, they usually employ large full glass-glazed doors and possibly no windows required in this sense. However, without glazed doors, such a small ratio of windows is not logical. Thus, it is better to state that win/facade ratio is varying between 4% - 21%, with a weighted average around 7,1%. For the final ratio of the openings to entire elevation area, the values are more definitive, namely in a range of 11% to 35%, with a weighted average around 20%.

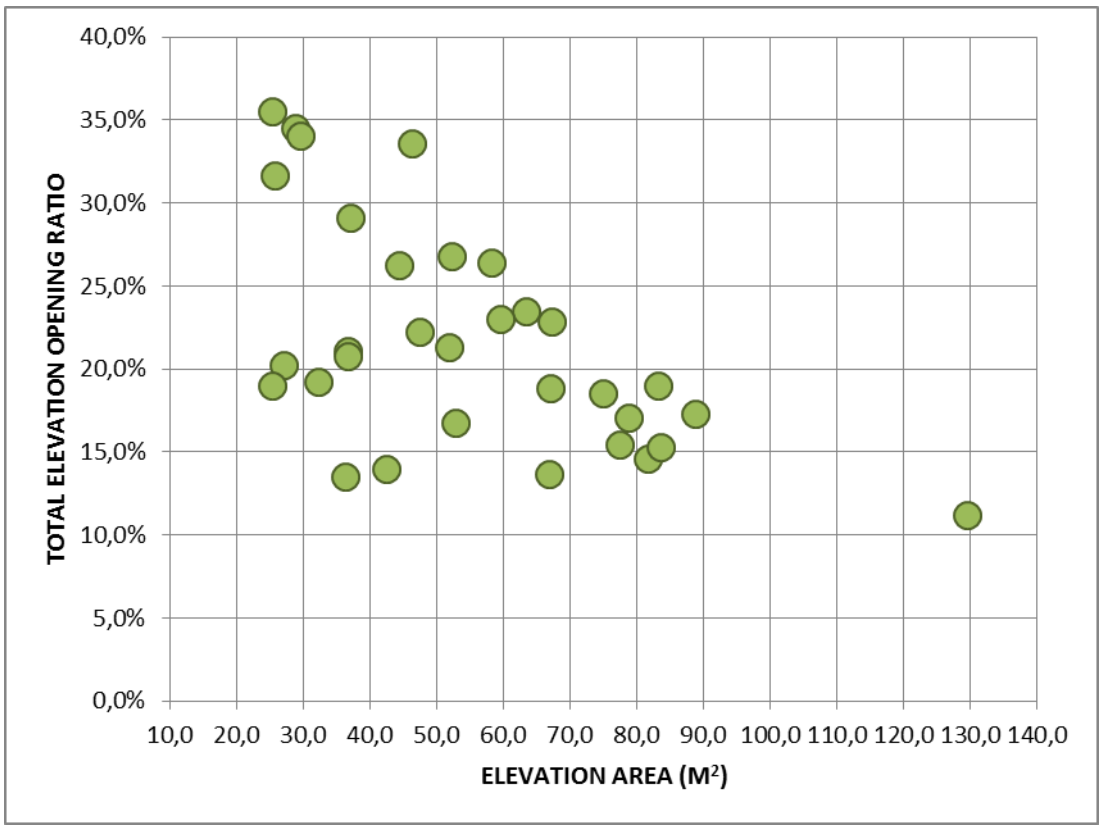


Chart 36 - Elevation Opening Ratio - Elevation Area For Selected Buildings

Analysed from the chart above, the upper limit of total opening ratio decreases in relation with the elevation area. In cases of smaller elevation areas such as 25-35

m^2, the opening ratio reaches to 35% in some cases, however for 70-90 m^2 elevation buildings, the opening ratio is more likely around 15-20%. This is probably based on light and air requirements of the inner space. For normal orders and average sized buildings, it is observed that opening ratios around 15-20% are utilized in the traditional tissue. However if the elevation area is smaller such as 25-30 m^2, then this ratio is extended up to 35% in order to supply satisfactory light and air inside. For a further discussion on the elevation opening ratio and building size relation, below chart is provided.

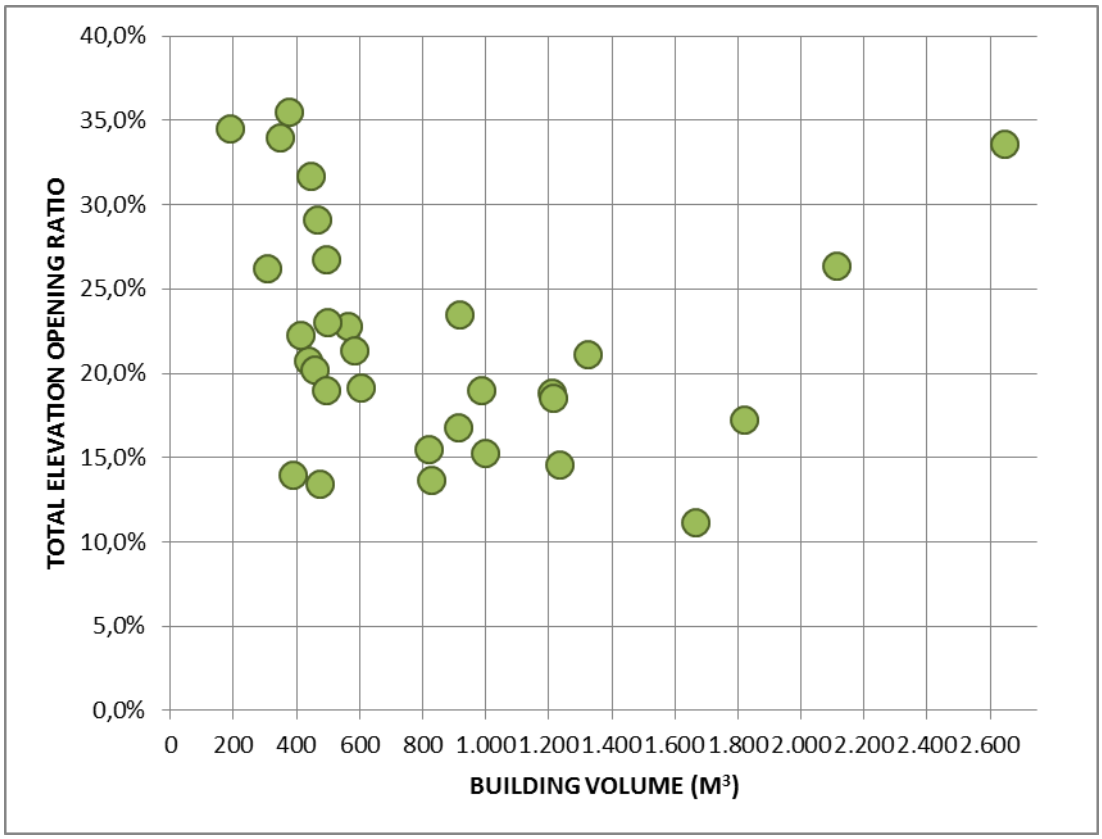


Chart 37 - Elevation Opening Ratio – Estimated Building Volume Relation For Selected Buildings

A similar relation can be observed on the base area comparison as well. As the building base area enlarges, such as after 600 m^3, the upper values of opening ratio is reduced from 35% to 25%, and for values such as 1.000 to 1.400 m^3 volume, the ratio is more around 15-20%. Some exceptional buildings are observed, however as a general principle this trend show to be valid in most of the selected buildings, with the similar reasons for the comparison of opening ratio with elevation area, which is already a function of building volume.

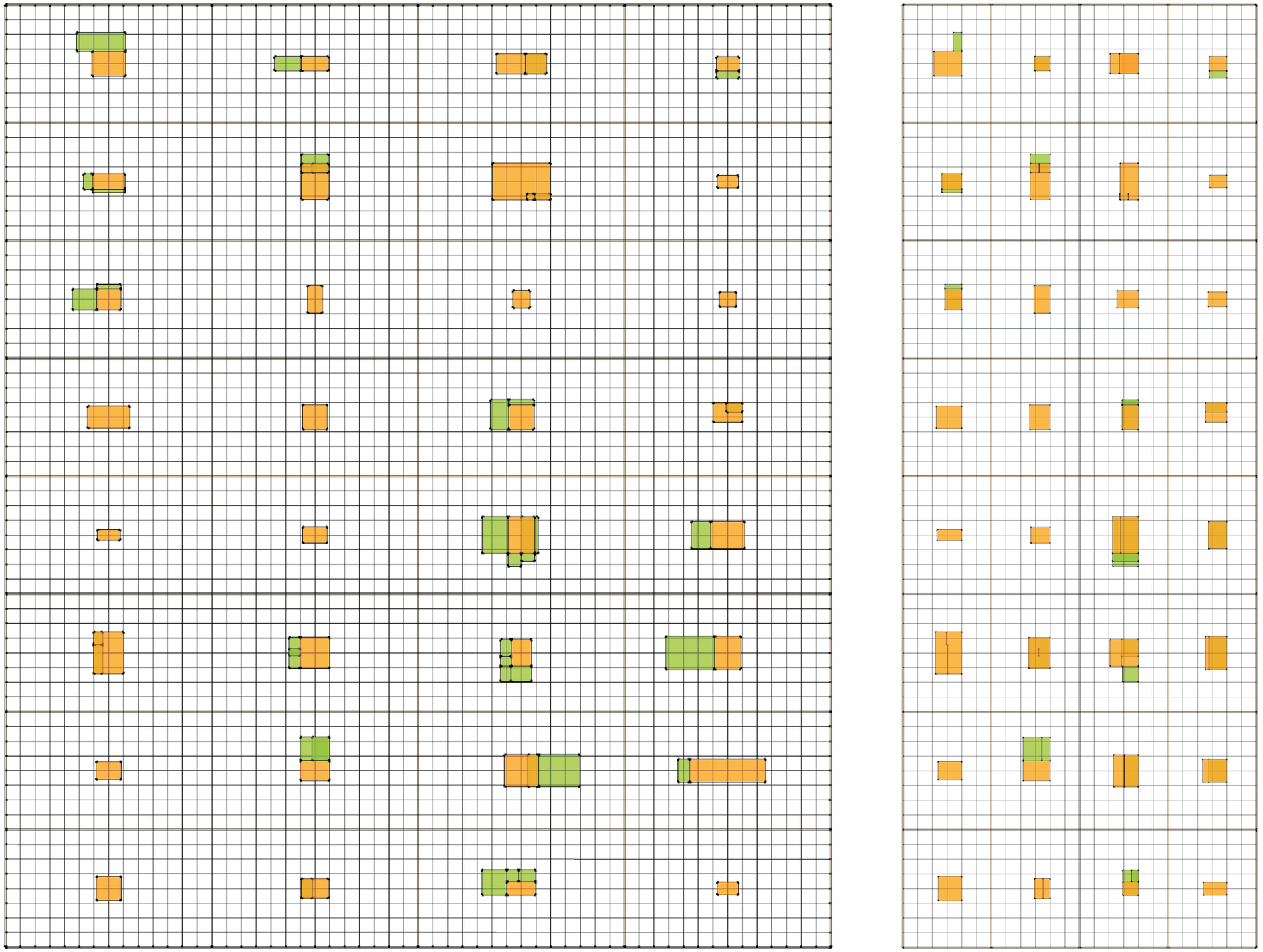
5.3.9 Building Open Spaces

Buildings open spaces are analysed in the previous sections, not on their size and dimensions, but on their existence and types. Since plot arrangement and ownership conditions are not in the scope this thesis, the size and dimensions of the building open spaces is not surveyed. However, there is a discussion on the general built-up space and open space relationship of Kalkan Historical Town Centre, which states a certain relation in general tissue, and this can be extended to plot level.

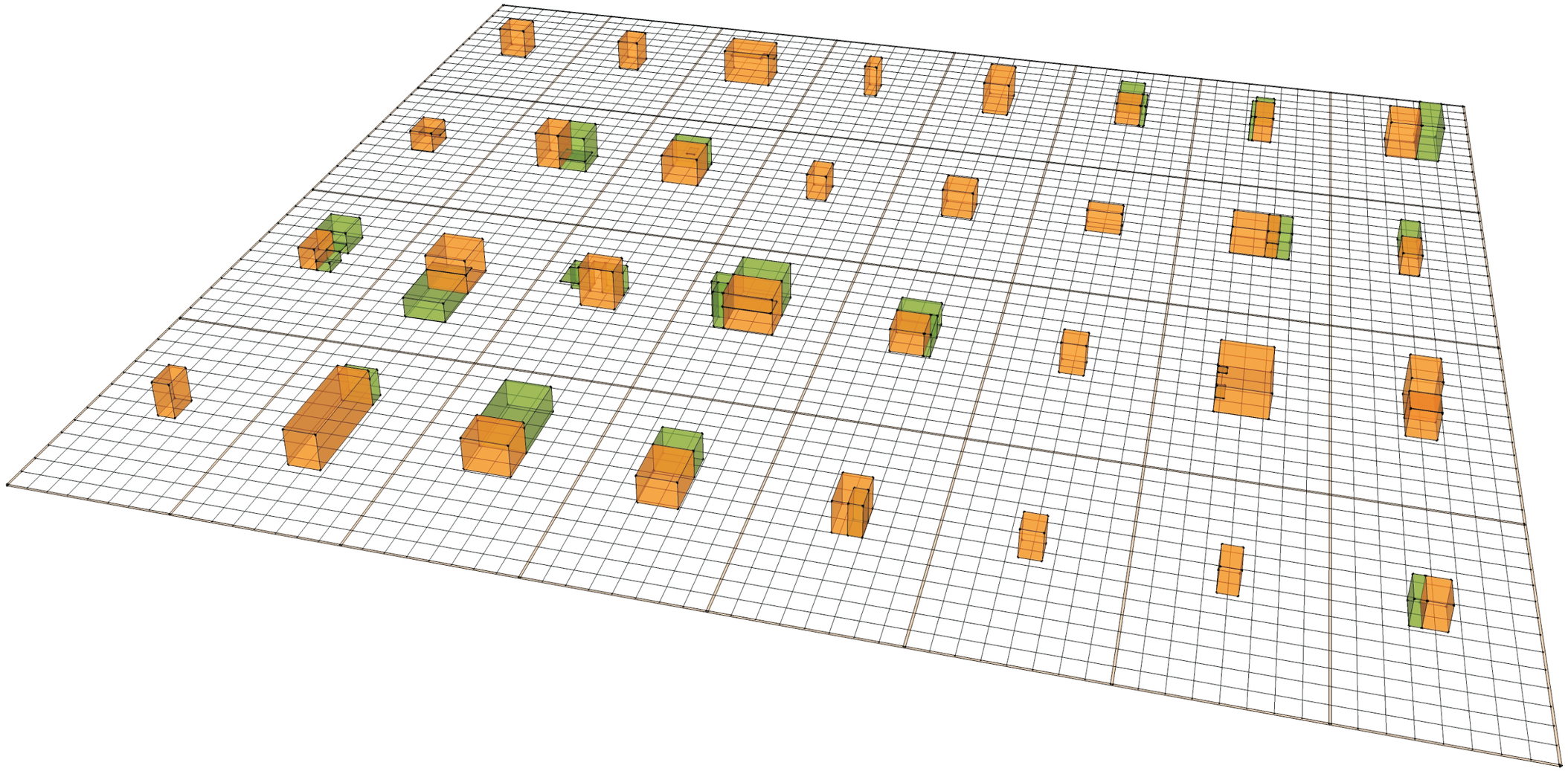
In this part of the study, the building open spaces other than balconies will be demonstrated on conceptual models, for understanding various approaches in relation to building sizes and forms.

It is observed that, the preferred direction for open spaces is mostly the sides of the front elevation, namely side elevations. However, front elevation side is also utilized in some cases, yet it is mostly not available since the building is on the edge of the possible land from the front elevation direction. The least preferred direction is the rear elevation direction, yet in this case usually larger open spaces are available.

18 of 32 buildings employ building open spaces other balcony projections. Since the selected buildings are composed of a set of qualified and mostly high-income residential buildings when compared to the general structure of the tissue, the conclusions can not represent the general. Moreover, some of the open spaces are very large in area, comparable to the building size. This is not a usual case for the current tissue, in its deteriorated structure under the pressure of tourism and related construction activity. But this selection set displays that, in the traditional tissue these building open spaces are very important not only with their existence, but also with their sizes. There are buildings, usually small in size, with no building open spaces other than the balcony projection, but there are also buildings with large open spaces, such as garden and courtyard as well. Furthermore the existence of these two groups and the interval groups in between demonstrate a certain balance in relation to each other.



Drawing 24 - Conceptual Plans and Sections Demonstrating Primary Mass and Building Open Spaces for Selected Buildings



Drawing 25 - Conceptual Perspective Views Demonstrating Primary Mass and Building Open Spaces for Selected Buildings

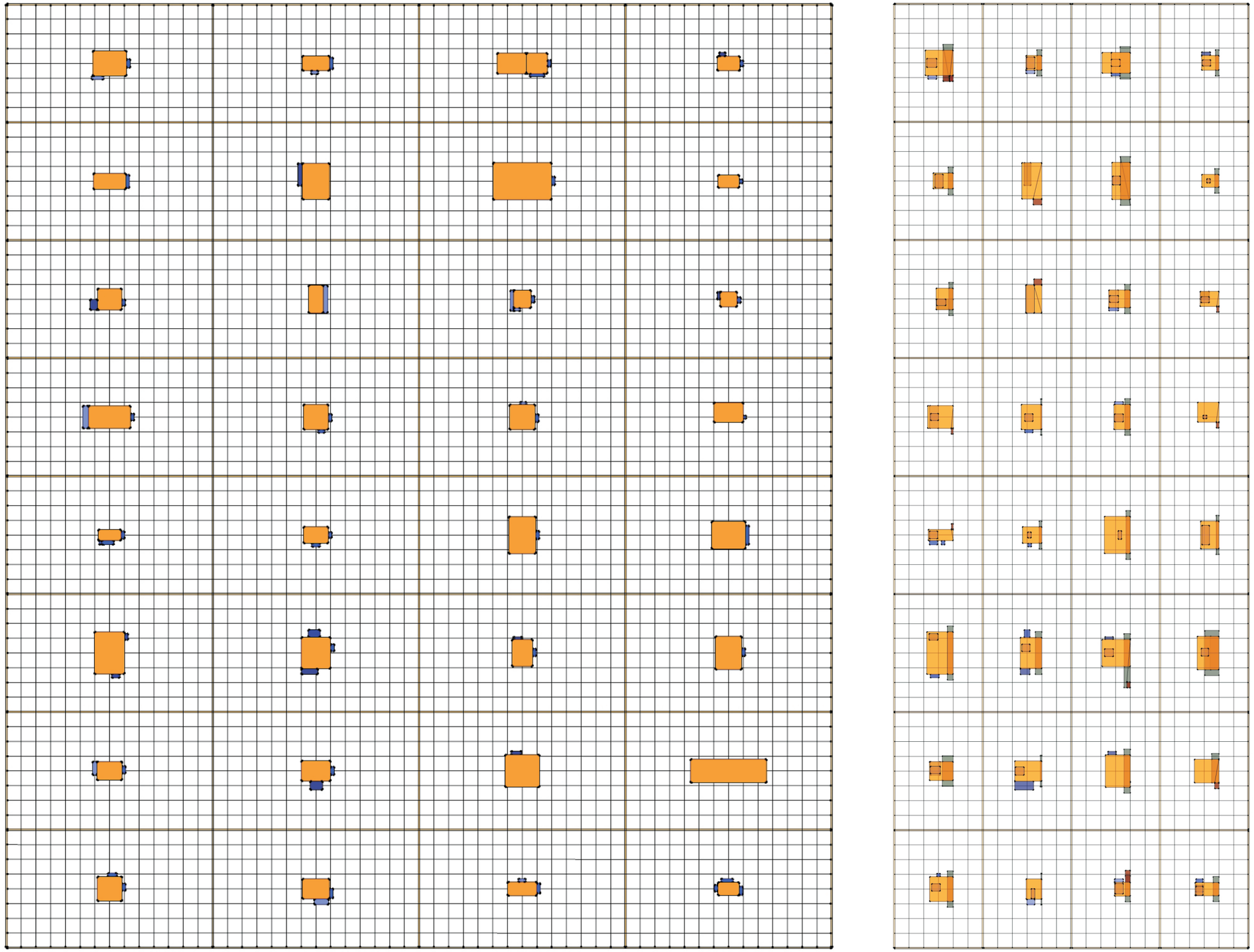
5.3.10 Projections

There are totally 56 projections on 32 selected buildings which make up about 20% of total projections in the entire study area. Projections on selected buildings are displayed as digital models in different categorizations. No further categorized analysis on projections are proposed in this part. In this part projections are categorized to parameters in relation to their spatial scale, enclosure and function, for conceptual modelling, These categories are closed projections, open projections with a roof, open projections without a roof and finally large projections, half closed and/or possessing spatial elements in some cases. There is only a single building lacking a single projection in this data set, which is Mustafa Kocakaya Mosque.

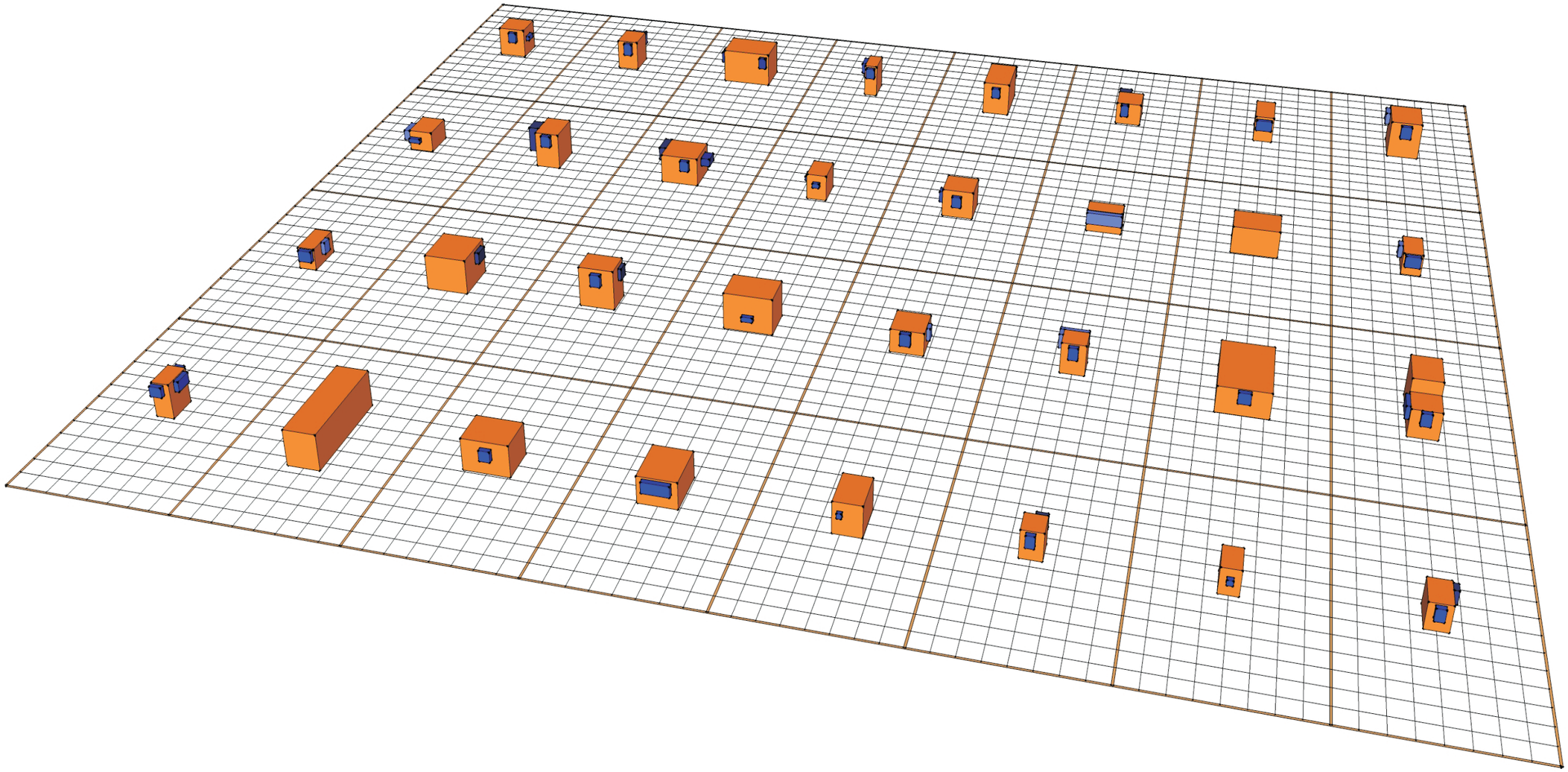
To conclude, first of all, it is observed that in most of the buildings a projection on the middle of the front elevation exists. Secondly it is clearly seen that even in large buildings, projection number can be 2 or 3, yet the dimensions of the projections are not in direct relation with the scale of the buildings. Moreover, as stated in the previous analyses, for smallest building groups in size, projections get larger in size and inhabit spatial elements. The relation with the height difference caused by the slope is also evident on digital models, that in some of these cases, projections are utilized for entrance and stairs. Rear elevation is not preferred for open projections for it is not beneficial for climatic conditions mostly, and instead in some cases, closed or semi-closed large projections are utilized at the rear elevation.

Furthermore all the above arguments on projection size are mostly related with their length, not the width, Width is almost fixed around 120 cm, with a certain flexibility depending on the dimension of the street it stands on.

Height of the projection is another parameter in relation to its size. There are no measurements for the height. The height of closed projections is assumed to be similar to the engaged floor height. Height for the open projections, on the other hand, depends on roof status, which is the determining factor for the spatial perception of the projection. Projection with a roof employs a semi-closed space and conceptually interpreted as closed volumes with a certain height level, on model. However, open projections only demonstrate an open space spatially and denoted as 100 cm height volumes on conceptual models.



Drawing 26 - Conceptual Plans and Sections Demonstrating Primary Mass and Projections for Selected Buildings



Drawing 27 - Conceptual Perspective Views Demonstrating Primary Mass and Projections for Selected Buildings

5.3.11 Orientation

Natural topographic orientation dictated through the slope and the land itself is through southwest in Kalkan Historical Town Centre. Most of the buildings in the study area have utilized this direction as their primary elevation direction, so as the selected buildings set. This orientation provides the benefit from sun, breeze and the view. Furthermore it can be stated that, there has to be a reason if the building's primary elevation is not looking southwest or at least south or southeast.

There are only 3 examples in selected data set which are not looking to any of these directions. Plot 329/6 employs NE as the primary elevation, because it is one of the biggest buildings in Kalkan, surrounded by another building attached on the southwest, and 2 narrow streets with 250 cm width. The only proper street is on northeast direction. In this case, building employs a large first floor terrace on southwest direction in order to benefit advantages. Second exception is plot 183/11, where the determination of front elevation is not clear. The building has a courtyard and a first floor terrace as well looking at the southwest, with main entrance on the courtyard. However, the elevation is not articulated in this part, since it is not exposed to any other street or building. In this sense another elevation is articulated and accepted as the front elevation in this study. The third exception is the Mosque, which had been as a Church originally with the church orientation principles.

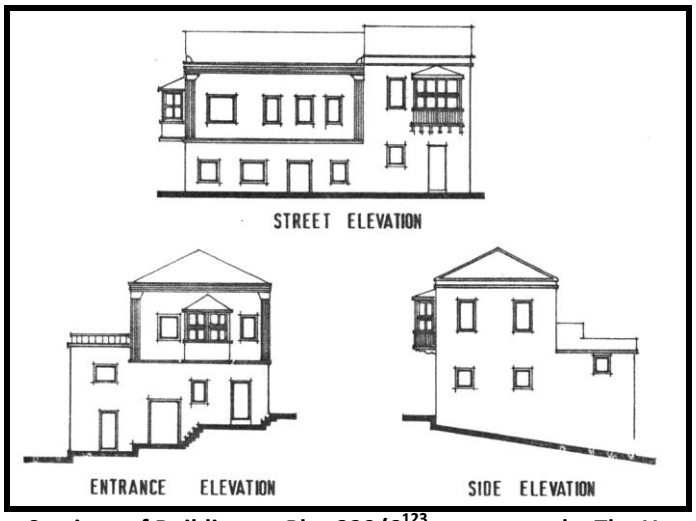


Figure 57 – Survey Sections of Building on Plot 329/6[123] – not to scale. The Upper Drawing is the Northeast Elevation and the Below Drawings are respectively, Southeast and NorthWest Elevations.

[123] Fon Mimarlik Ltd. Sti. Archive – Measured Drawings for Development and Conservation Plan for Historical Town Centre of Kalkan.

Analysing some more examples in the traditional tissue, it can be stated that, the primary direction for the primary elevation of the building is southwest. Depending on the situation of the land, the second choice is south and the third choice is southeast. If none of these are possible for a specific reason, than any other elevation looking to north may be utilized and articulated as the front elevation, but in this case the building employs an open space looking at the southwest direction to benefit from the advantages. Below table displays the front elevation and open space orientations of each building on the selected buildings set.

Table 40 - Orientations of Front Elevation and Building Open Space for Selected Buildings

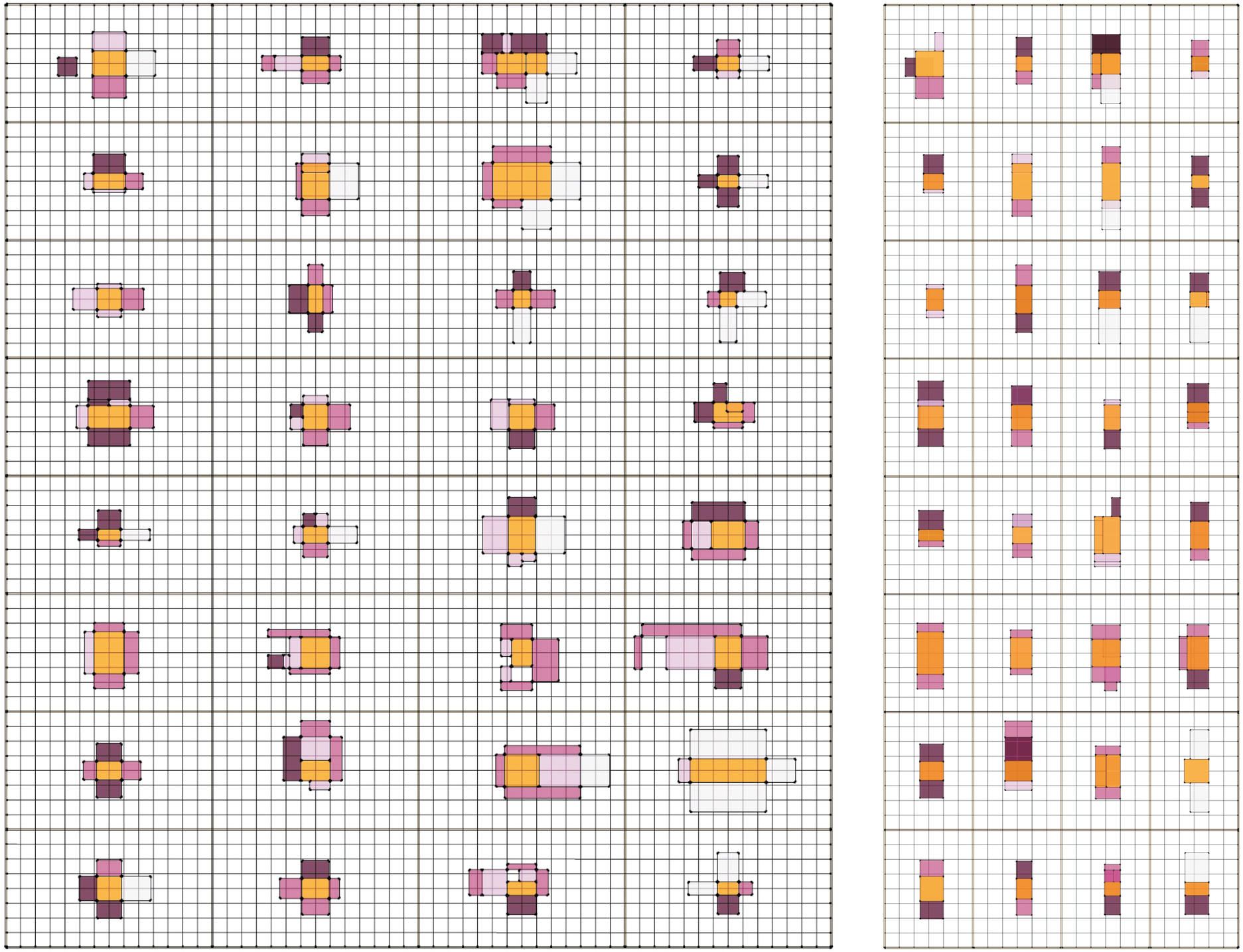
Selected Bldg. #	Plot Group #	Plot #	Front Elevation Direction	Primary Open Space Direction	Front Elevation Azimuth Angle (as degree, CCW from North)
1	1	323	SW	0	230
2	3	190	SW	0	232
3	6	329	NE	SW	58
4	13	340	SW	0	230
5	7	187	SW	0	239
6	4	317	SW	NE	230
7	39	228	SW	NE	239
8	20	378	SW	SE	209
9	29	272	SW	NE	222
10	36	224	SW	SE	226
11	51	196	SW	SE	227
12	25	236	SW	SW	221
13	44	425	SW	NE	226
16	5	327	SE	SE	145
17	11	183	NW	SW	323
19	28	395	SW	NE	227
20	28	394	SW	NE-E	227
21	24	245	SW	SW	224
22	6	328	SW	SW - NE	253
23	4	179	SW	SW-NE	219
24	4	181	SW	NE	232
25	3	324	SW	0	240
26	41	218	SW	SW-NW	239
27	7	330	SW	SW	241
28	49	201	SW	SW-SE-NE	236
29	55	259	S	0	179
30	8	279	SW-W	SW-W	257
31	47	426	SW	SW-NE	229
32	25	240	NW	NW	307
33	8	331	SW	SW	235
34	1	167	SW	SW	230
35	7	188	SW		242

5.3.12 Relations with other buildings

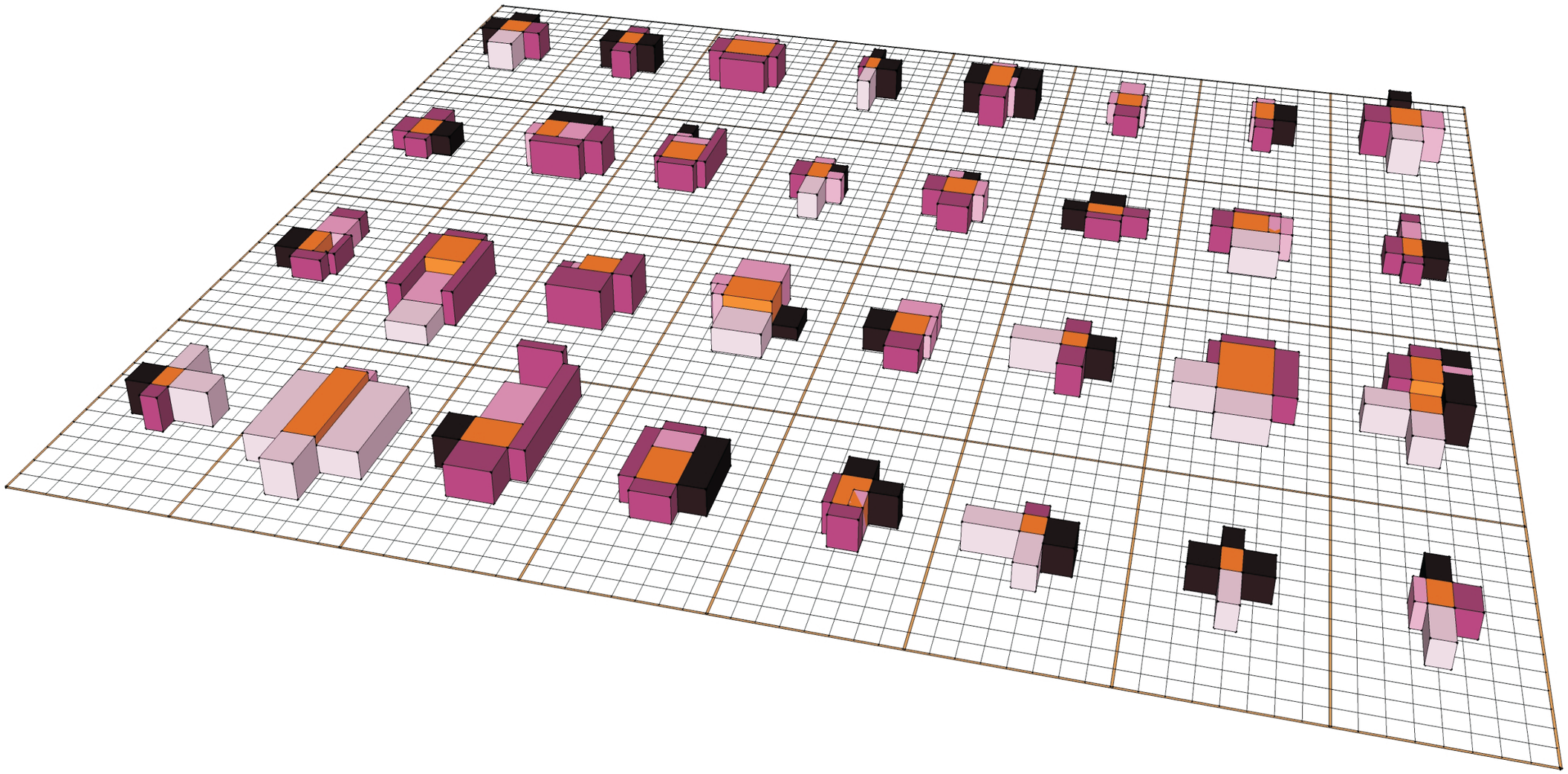
Although the plot shapes and related issues are not considered, the relation of buildings with each other will be discussed in this part. There are various examples of building positions in relation to the others throughout the study area. Buildings attached on one side, attached on two sides, attached on 3 sides, and free standing categories all possess a serious number of buildings on the site. On the conceptual level, it is considered that, the distance between the buildings, either it is a street or a privately owned open space, is significant in realizing the parameters of the tissue.

To understand these relations and their frequencies, the space on sides of the building is the topic for analysis, without attention to its ownership value and other parameters. From this perspective, the options that a building may have on one side is either another building, or a street space, or an empty space such as a garden or a courtyard owned by the same owner or belonging to another plot.

Considering the building as a rectangle entity, the below images display the surrounding spaces on each side of the buildings in the data set. The dark brown shapes display the adjacent building attached to the building, and the others display the spaces between the building and the other building. These spaces are categorized in 3 groups in pink tones. The darkest represents the distance with another buildings where the space is street, the middle pink tone represents the building space utilized as courtyard or empty space, but not public. Finally, lightest pink tone demonstrates large open spaces longer than 12 meters on that side of the buildings. If there is nothing on that direction on 12 meters or more distance, either it is street, or open space or both, the space is considered as open, without a measurement of the next building. Because of the slope in Kalkan, if it is open for 12 meters, it can be assumed to be open, for a building, or in other words, if the distance between 2 buildings is larger than 13 meters, it is assumed as ‘infinite’, and is not obstacling view, sun or breeze of the subject building.



Drawing 28 - Conceptual Plans and Sections Demonstrating Primary Mass and Surrounding Spaces for Selected Buildings



Drawing 29 - Conceptual Plans and Sections Demonstrating Primary Mass and Surrounding Spaces for Selected Buildings

As analysed in these images the relations with the surrounding buildings is treated with a certain balance. There are exceptional cases, but generally for the morphology around the building has a balance between close distances and attached buildings, or similarly elevations and large street distances. Below table demonstrates the figures on buildings with attached buildings, buildings with open elevations and their conjuncture.

Table 41 - General Figures on Buildings and Adjacent Spaces for Selected Buildings

		OPEN ELEVATION ON 1 OF OTHER ELEVATIONS	**OPEN ELEVATION ON 2 OF OTHER ELEVATIONS**
BUILDINGS WITH ATTACHED BUILDING ON 3 DIRECTIONS	1	1	-
BUILDINGS WITH ATTACHED BUILDING ON 2 DIRECTIONS	5	2	0
BUILDINGS WITH ATTACHED BUILDING ON 1 DIRECTIONS	17	7	2
BUILDINGS WITH NO ATTACHED BUILDINGS	12	2	2
BUILDINGS WITH OPEN ELEVATION ON 3 DIRECTIONS	1		
BUILDINGS WITH OPEN ELEVATION ON 2 DIRECTIONS	3		
BUILDINGS WITH OPEN ELEVATION ON 1 DIRECTION	12		

In the single case of the data set, where a building has 3 adjacent neighbours, the fourth direction is an open elevation. Similarly, 2 of 5 of the second group with 3 adjacent buildings, has an open space on their one sides. Other 3 buildings, on the other hand, possess 400, 700 and 800 cm distance to the next building on their third elevations, which makes a considerably large space. This relational balance can be observed throughout all the set, with some exceptions. Since this is an organic tissue, not planned through certain principles and by a single hand, to have such exceptions depending on the limitations of the land and other real conditions, is expectable. However both these figures and digital modelling analysis confirm the existence of a balance on the spatial relationship of buildings with each other.

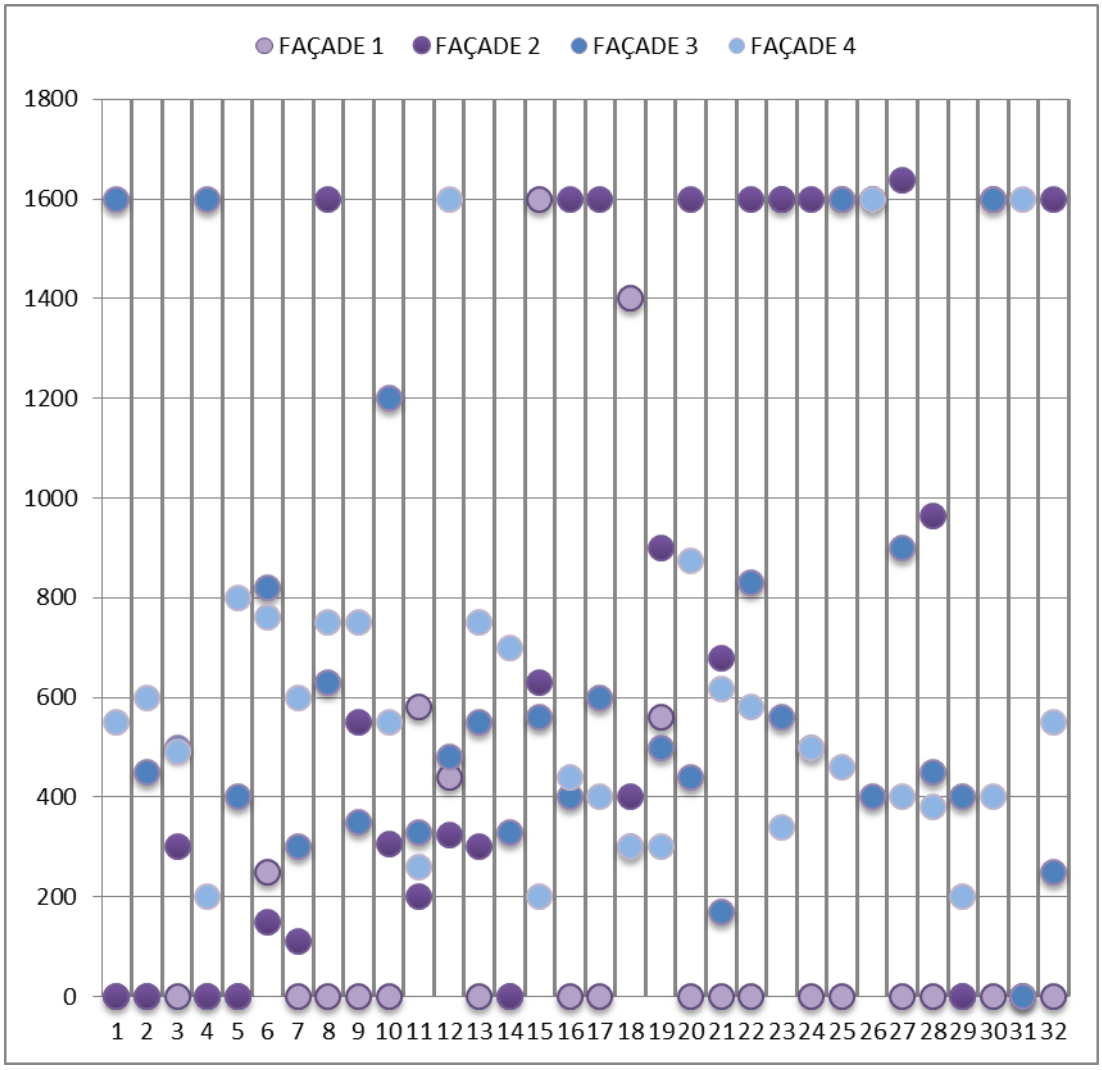


Chart 38 - Building Distance With The Next Building in Each Direction

This study does not propose an analysis on street level or access paths. However, it has been observed in the previous analysis that the streets are mostly paths between the building plots, converted to streets later. There are streets up to 150 cm narrow width in Historical Town Centre. On the other hand, it can be concluded that the main street axis is southwest-northeast. The main axes of the Town Centre for a long time had been Hasan Altan Caddesi and Ataturk Caddesi, perpendicular to each other, however streets parallel to Ataturk Caddesi, defined as the horizontal axis on the street grid, are minor when compared with the vertical elements of the grid. Horizontal streets are narrower in general and a lesser density can be observed.

There are certain reasons and consequences of this structure, which will not be discussed in detail here. However it can be concluded that, functionally, the life and

culture in the town had a powerful connection with the sea, particularly before the road had been built. The town was working as an important post for merchants through its natural harbour. Furthermore the historical water source 'Pinar" is also on the coast. This helps the breeze to reach to the internal parts of the town, through the vertical street corridors. Moreover, vertical corridors contribute to have great vistas through the slope and finalizing with the Mediterranean. For all these reasons, the vertical elements of street grid is more developed and gained importance in the organics tissue of the study area.

The minimum length for width of streets is about 30-40 meters and in the route, the street may alter its width and geometric shape through the utilization of the buildings. Horizontal streets can get narrower such as 150 cm widths. On the other hand, it is difficult to find vertical streets tighter than 260 cm, and in general low density streets are about 300-400 cm wide.

CHAPTER 6

ALGORITHM DESIGN and CONCLUSION

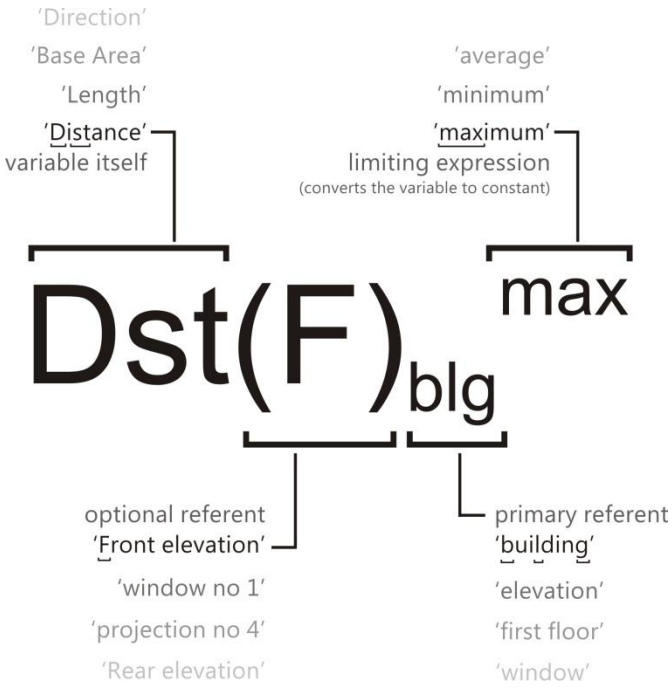
This study aims to analyse the architectural features and the parameters making up the organic tissue of Kalkan Historical Town Centre, a unique and considerably unspoilt architectural heritage. In the previous two chapters, features of the traditional tissue were analysed on a conceptual level to demonstrate the basic parameters and relations between the elements.

This final chapter intends to outline the basics of a set of new building design algorithms to be utilized digitally as a relational system. Outcome of previous analyses will be utilised for designing the basics of algorithms. For this, in the following part, elementary design rules will be developed based on the results provided by the analysis. In better words, the findings will be abstracted into simple relational rules that can be converted to digital algorithms.

6.1 Algorithm Design

6.1.1 Basic Variable Declarations for Algorithm Design

Below, the variable proposals for algorithms are declared. This list can be extended and altered on coding process when required. However it sets out the basic parameters of the system that will determine the structure of the tissue. The verbal structure utilized for titling the variables have been annotated below.



Graphic 6 - Labelling System for Variable Naming

L_{blg}	Building length (longer elevation)
W_{blg}	Building width (shorter elevation)
H_{blg}	Building height, measured from ground level to eve level
H_{gf}	Ground floor height of a building
H_{bf}	Basement floor height of a building
H_{ff}	First floor height of a building
H_{mf}	Mezzanine floor height of a building
L/W	Length / Width ratio for base area
A_{blg}	Building Base Area
V_{blg}	Building Approximate Volume
A/V	Base Area / Building Volume ratio
L_{elv}	Elevation length
FLV	Floor level value
Frq	Frequency of a certain element or value of a building distributed on the whole set of buildings
N_{fl}	Floor Number of a building
N_{os}	Number of open spaces
N_{prj}	Number of projections

$Dst(F)_{blg}$	Distance of a building to the closest building on the side of one of the defined elevations (Front, Rear, Right, Left)
S_{fr}	Slope on front elevation (Front, Rear, Right, Left)
Dir_{fr}	Direction of the normal on front elevation (Front, Rear, Right, Left)
$Dir_{os}(1)$	Direction of open space 1
$Dir_{prj}(1)$	Direction of projection 1
RT	Roof type of building
$RT_{prj}(1)$	Roof type of projection 1
$L_{prj}(1)$	Projection length for projection 1
$W_{prj}(1)$	Projection width for projection 1
$L_{P/L}(1)$	Projection length / elevation length ratio for projection 1
$W_{win}(1)$	Width for window 1
$H_{win}(1)$	Height for window 1
$W/H_{win}(1)$	Width / Height ratio for window 1
EOL	Elevation ornament level
WA/EA	Total window area / Total elevation area ratio
DA/EA	Total door area / Total elevation area ratio
$Dir_{prj}(1)^{max}$	Maximum Direction of projection 1
H_{ff}^{min}	Minimum first floor height

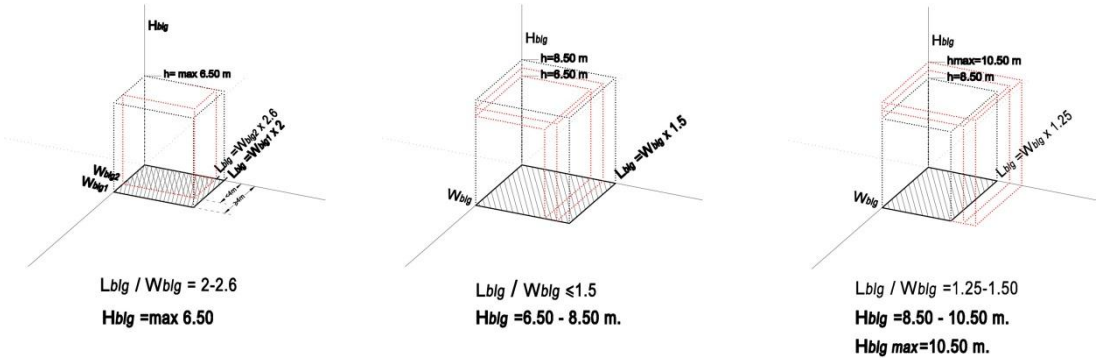
6.1.2 Design Rules Defined Through Analysis

Rule Set 1 - Building Form

Basic building form is rectangle. Length / Width ratio (L/W) will be between 1 and 2, and can be extended up to 2,6 for required cases. Required cases are defined as narrower elevations than 400 cm and will not exceed 20% of the total buildings.

Length / Width ratio for buildings higher than 650 cm and lower than 850 cm will be lower than 1,5 and for buildings higher than 850 cm, higher than 1,25.

Experimental contribution: L-shaped plan form will be utilized with a defined set of vocabulary.



Graphic 7 - Building Size Options / Rule Set 1

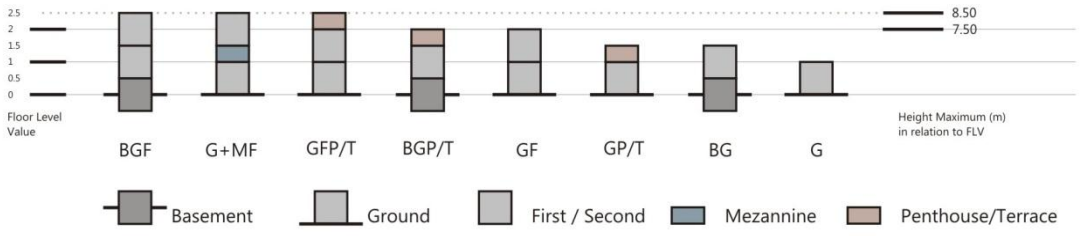
Rule Set 2 - Building Height and Floor Number

The Floor Level Value limit is 2,5, however at least for half of the buildings 2 will be applied. For cases when basement is necessary, or building is lacking open spaces thus requiring a penthouse/terrace floor, 2.5 will be applied.

If the base area is larger than 150 m^2, Floor Level Value will be limited to 2.

As an exceptional case, Floor Level Value 3 will be applied for 5% of the total buildings. For a 3 FLV, it is a must that rear elevation has to be an 'open elevation'. For cases with total building volume over 800 m^3, Floor Value Limit can be applied as 3, if the building is on slope, utilizing basement floor and a first floor terrace as well.

The maximum building height limit is 10,5 m for all cases. Standard building height limit for Floor Level Value 2,5 is 850 cm, and for Floor Level Value 2 is 750 cm.



Graphic 8 – Possible Floor Combinations and Height Limit

Ground Floor Height will be between 250 cm and 480 cm, whereas first floor height will be between 270 cm and 420 cm. If mezzanine exists ground floor height will be limited to 350 cm.

General frequency for buildings with mezzanine floor will be under 12.5% of the total buildings.

Base Area / Building Volume Ratio will be between 4,5 - 8,5 with the following frequencies:

Table 42 - Base Area / Building Volume Ratio Distribution

Ratio 1	1/8,5	15%
Ratio 2	1/7	60%
Ratio 3	1/5,5	25%
Ratio 4	1/4,5	for buildings under 100 m^2 and 400 m^3 in size

Gradual building form will be applied for buildings with base area larger than 55 m^2 and volume larger than 450 m^3. For a gradual building, slope on the longer side has to be more than 15% and the length of the longer side has to be more than 750 cm.

A building's height must not block the view of the rear building's first floor level. For this reason the building height (on eve level) must be at least 180 cm lower than the rear buildings first floor slab level.

Experimental contribution: Mezzanine is the result of a functional necessity in the old merchant/representative residents in Kalkan. Since it is not a functional requirement for a new building, mezzanine can be interpreted as an entresol with gallery space.

Rule Set 3 - Orientation

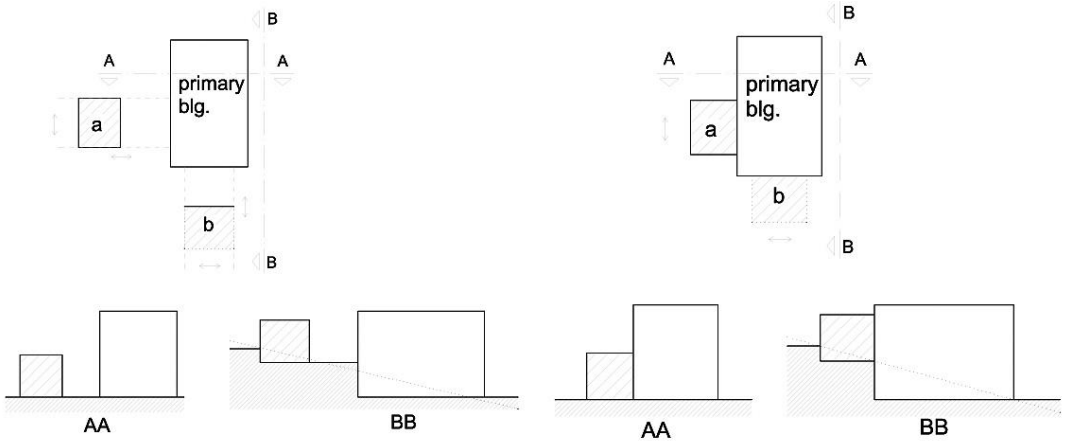
Front elevation will be directed perpendicular to southwest direction, if not possible south or southwest respectively. If none of these are possible, than any north direction will be utilized for front elevation, with the condition that building will possess at least a single open space looking at the southwest or south direction.

Rule Set 4 - Secondary Buildings

Secondary buildings will be allowed up to 20% of all buildings, on the north facade, or in required cases on northeast and northwest facades. For buildings smaller than 40 m^2 base area, service space additions, and for buildings larger than 80 m^2, storage space additions can be proposed.

The building mass will be single floor height and it will not be obstacling the open space in relation to building. Building volume must not exceed the third of total volume of the primary building. Secondary buildings may or may not be

connected directly to the building, if directly connected; the roof will be flat roof serving as a first floor terrace for the primary building.



Graphic 9 - Secondary Building Locations

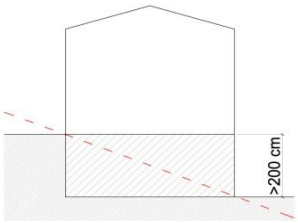
Rule Set 5 - Building Open Space

Firstly each building will possess at least a single open space, preferably 2 open spaces, excluding balcony. Furthermore if the building size is equal or above than 60 m^2 in base area, 400 m^3 in building volume, and 2 as Floor Level, it will possess 2 open spaces, preferably one on the ground level. This rule will also be designed in relation to roof and terrace properties.

As a variation on the tissue, with a 15% or lower frequency small buildings with base area lower than 40 m^2, will be designed, with limited open space opportunities. For small buildings lower than 40 m^2, 1,5 floor level value and single open space combination may be utilized.

Rule Set 6 - Slope Treatment

Basement is only allowed, if there is a height difference more than 200 cm between ground level of the corners of a building elevation. However, based on the floor level value criteria, in this case proposing a mezzanine or penthouse/terrace floor is not allowed.

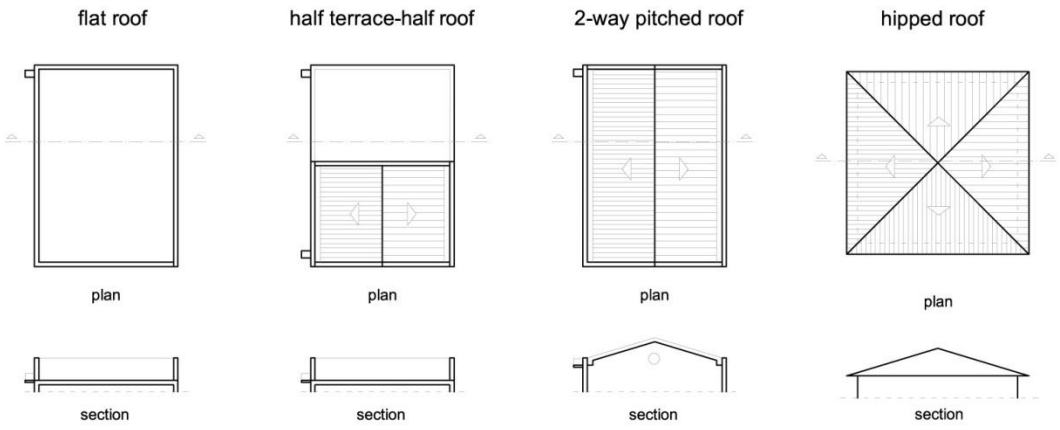


Graphic 10 - Basement Floor Condition

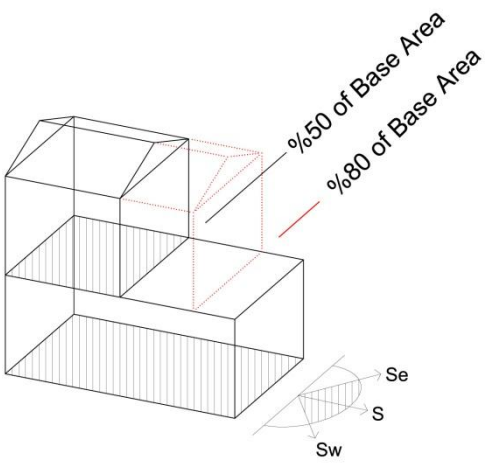
Building height, for these slope cases, when calculated from the highest point on the ground level where the building stands on, will be between 280 - 800 cm., with the other limitations on the building height.

Rule Set 7 - Roof Form

3 types of roofs will be utilized. Flat roof will be utilized with a lower frequency than 20% and for buildings with base areas lower than 80 m^2. The mostly accepted roof type will be 2-ways pitched roof with parapets, with about 35-40% frequency, up to 120 m^2 base area and 1000 m^3 volume. For larger buildings, if 2-ways pitched roof is employed, half of the roof will be utilized as roof terrace. Half-roof terrace will be applied with 30% frequency. Hipped roof will be utilized for 1/5.5 base area - volume ratio, and with height level value of 2. Hipped roof will be applied for larger buildings than 120 m^2 base area and 1000 m^3 volume, if not a gradual building or half terrace is not applied. Normally 3-ways hipped roof will not be used, only with the exception of a building to use hipped roof and have an adjacent neighbour on one side. Eve will be applied for hipped roofs and circular window and hidden groove for 2-way pitched roofs.



Graphic 11 – Roof Types



Graphic 12 - First Floor Terrace

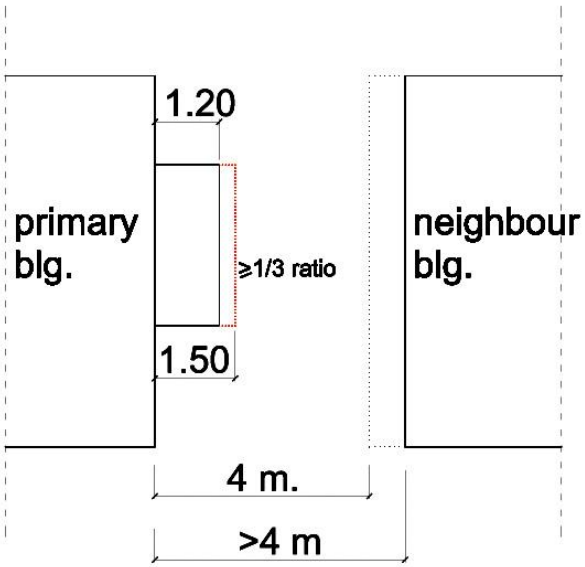
If the base area is over 80 m^2, first floor can be utilized on a smaller base area between 50-80% of the total base area, in order to create first floor terrace, looking to south, southeast or southwest directions. In first floor terrace cases, no roof terrace will be applied.

Rule Set 8 - Projection Types

1/4 elevation ratio projections will be utilized only if the building possess 3 or more projections. Standard elevation ratio for projections are defined as 1/3 and 1/2. As proposed before, buildings will have at least one projection, and in possible cases, or if the building proposes 2 major elevations, 2 projections, selected from standard ratios.

For elevations smaller than 400 cm, minimum projection elevation ratio is 1/3.

Width is limited between 90 -120 cm for standard balconies. If a projection is on side elevations, and if the projection / elevation ratio is equal or larger than 1/3, and if the neighbouring building distance on that direction is over 400 cm, than width of the open projection can be extended up to 150 cm.

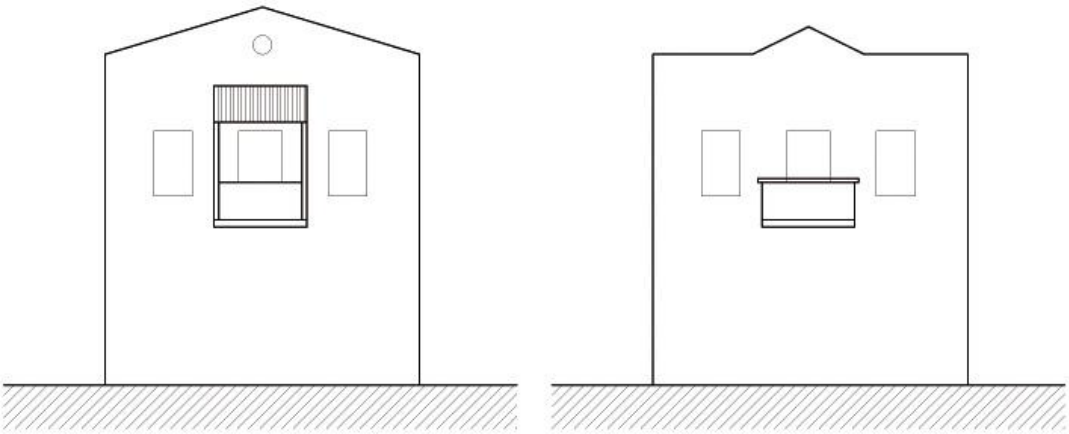


Graphic 13 - Projection limitations

For closed projections, the width limit is 200 cm.

Primarily shed roofs will be used for projections; however other roof types will be applied in following frequencies. Shed roof - 65%, 2-ways roof -15%, 3-ways hipped roof - 10%, and no-roof - 10%. No roof will be applied for the smallest scale projections such length smaller than 150 cm. If the projection is on north elevation, no-roof type projection will be primary.

If a pediment exists on the elevation of projection, mostly shed roof will be preferred for the projection. If pediment is smaller than the elevation length, a no-roof projection will be utilized.



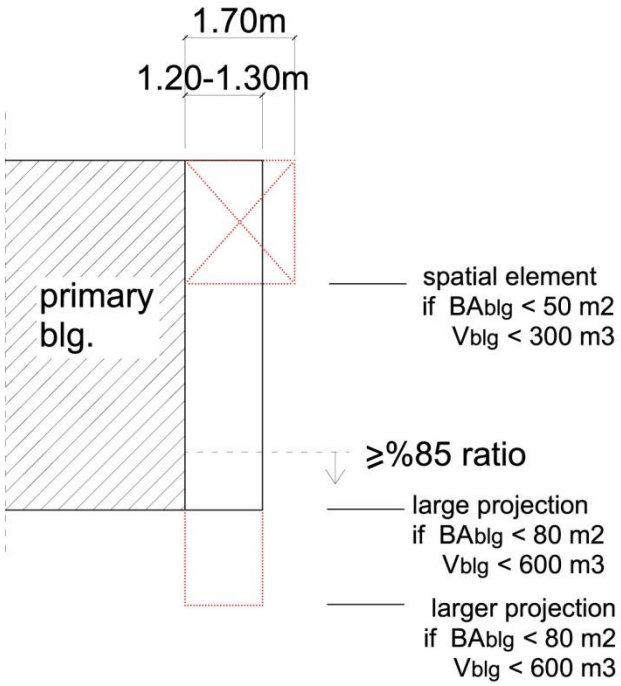
Graphic 14 - Pediment and Projection Roof Relation

Rule Set 9 - Large Projections

If the building elevation is smaller than 400 cm, large projections may be proposed. Other than this condition, large projections are only allowed for buildings smaller than 80 m^2 base area and 600 m^3 building volume, with building base area / volume ratio smaller than 1/5. For buildings smaller than 60 m^2 base area and 400 m^3 volume, projections larger than the elevation length is an option, but will be applied with a 25% frequency in its own domain.

For buildings smaller than 50 m^2 and 300 m^3 in building size values, spatial elements can be utilized on large projections, including stairs, wc and entrance. Other elevations than southwest direction and front elevation of the building, (if not the same) will be considered.

For standard large projections, the width is between 120 and 130 cm. On cases, where the projections employs a spatial element or half-closed, width can be extended up to 170 cm, if the neighbouring building distance is over 400 cm.



Graphic 15 - Large Projection Conditions

Projections will be supported, if the length is over 200 cm and/or the width is over 130 cm. If projection possesses a spatial element such as wc, stairs or entrance, it will certainly be supported.

Experimental contribution: Similar new spatial elements can be proposed for large projections. Interior stairs, cabinet spaces, kitchenette for very small buildings, storage areas, even semi-open living spaces are proposed to be considered as new functions that can be solved on large projections.

Rule Set 10 - Elevation Treatment

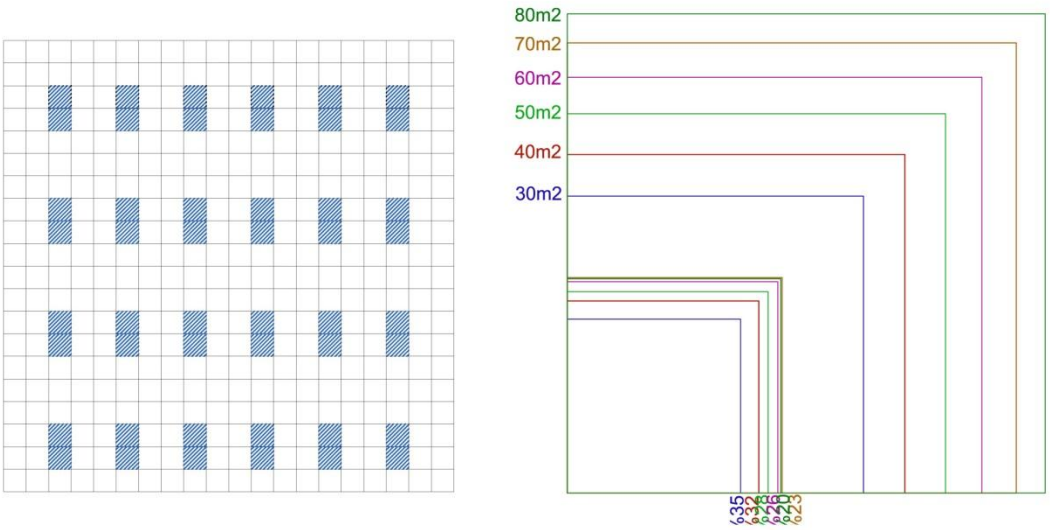
Elevation Ornament Level will be rich for 25% and 45% building will be moderate. However the detail of the elevation articulation is out of the scope of this study, so this will be provided as a proposal to the designer.

The shorter facade will be accepted as the front facade and will be directed to southwest in possible cases. If it is not possible, the first choice is to rotate the building and still preserve the shorter facade as the primary facade and the second choice is to keep the building as it is with at least a single balcony projection as open space on the shorter facade, and articulate the longer facade as the primary facade.

Window height / width ratio will be between 1,7 and 2,15. Other than this limitation, for mezzanine floors and special cases, 1 is proposed as the ratio.

Ratio for typical outside door will be between 2 and 2,25. A further type of monumental outside door, available only one for each building, is allowed for only buildings larger than 80 m^2 in base area. The monumental outside door ratio will be between 2,4 and 2,7.

Window/Facade ratio will be between 4% and 16%, and Door/Facade ratio will between 4% and 25%. More prior than these ratios, total opening to elevation area ratio will be in the range of 12% - 35%, in a relational connection with the elevation area and the building volume as well. For 30 m^2 elevation area the top limit of total openings is 35%, 32% for 40 m^2, 28% for 50 m^2, 26% for 60 m^2, 23% for 70 m^2, 20% for 80 m^2. In parallel, for buildings with volume under 600 m^3, values up to 35% are allowed, and for buildings between 600 and 1200 m^3 volume size, values up to 25% are allowed, and finally for buildings larger than 1200 m^3, values under 20% are allowed.



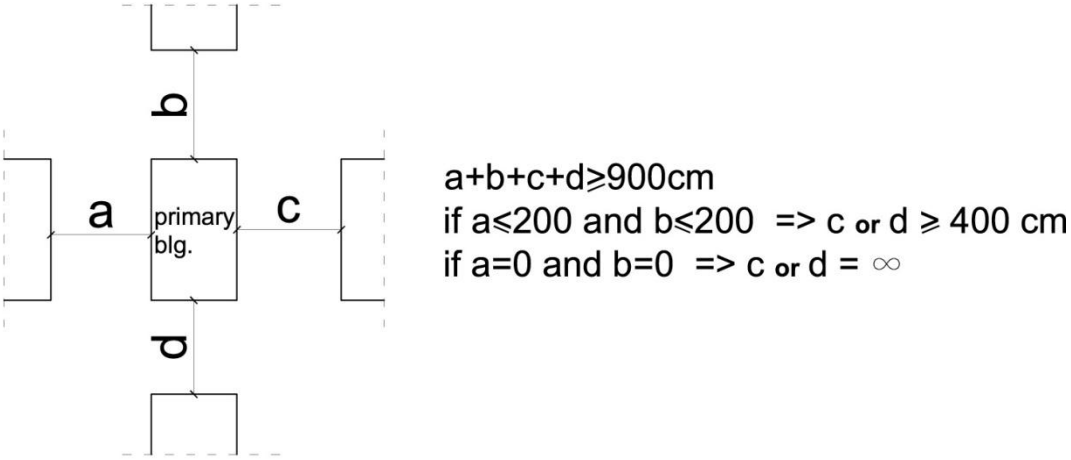
Graphic 16 - Conceptual Representation of 12% opening on an Elevation and Varying Elevation Opening Ratios for Various Facade Sizes

Rule Set 11 - Relation with other buildings

70% of the total buildings will be attached at least on side. 25% of this domain can be attached on 2 sides, and as an exceptional variation 10% of the attached buildings domain can be attached on 3 sides.

A building will possess at least 900 cm total distance as the sum of the distances to other buildings in all directions. If the building has attached neighbours, this rule is still valid. If building has 2 attached buildings, at least 1 elevation has to be an open elevation. For attached buildings southeast-northwest axis will be preferred. The buildings will not be attached on southwest direction, if it is not compulsory.

If the distances on 2 sides of the building are below 200 cm (counting an attached building as 0), one of the other sides has to be at least 400 cm.



Graphic 17 - Neighbouring Building Distance Conditions

If a building stands in front of another one and slope is so small that behind building is blocked by front one even on first floor level, certain precautions have been proposed. First, lower building's height will be reduced by altering the floor heights to minimums and the higher building's height will be maximized to the limits by altering the floor heights. In this case, if the slope is smaller than 15%, front building will be extended to the sides by increasing its volume. Unless the problem has been solved, behind building will be moved to its' sides.

Streets will be formed by the designer depending on the building locations. Streets will be minimum 150 cm for horizontal, and 280 cm for vertical ones. The minimum street length is 35 m continuously.

For vertical streets, solutions in relation with the high slope level, such as terraces and stairs will be proposed by the designer.

Rule Set 13 Rule Exceptions

In order to strengthen the effect of continuity of the building wall and the ground into each other, green-walls and similar elements are proposed. This will help creating a smooth continuity between the topography and the building.

6.1.3 Application of Rule Sets

This thesis is completed with the rule sets establishing the raw form of design algorithms, since the further stages require advanced scripting experience as well as skills in interface design. The raw form of the rule sets has to be converted into algorithmic form in a defined script language such as MEL, Maxscript of Generative Components in order to work. However the variables, constraints and differential relations are defined in the rule sets, in the suitable form to be converted to algorithms, structuring the final differential system for new building design in traditional setting.

The ruins on the project site, for this case will be de initial start point as base plans for the buildings. For these existing base plans, the location of the buildings and the width and length variables will be presumed as given and the further parameters will processed, such as floor count, roof type and others.

For the new building design, the script is intended to provide the required interface for the designer in order select the location for new buildings. Following the proposal of location, the other parameters will be designed by the designer and the script, whereas the script responses to the designer through the constraints and dependent relations. If designer offers a length, or width, the system will provide the other parameters such as width/length ratio, floor count, volume and so on. Through the process, in each stage there will be limitations and options in relation to all the other parts of the setting, namely the whole. Designer will be free to choose from the proposed selection sets within the constraints.

The grouping of the rule sets are as follows for defining the operation phases of the final form, as well as the general priorities of application stages. However this is not a definitive priority, thus system is composed of elements in relation to each other through various rule sets. For example building width/length ratio is a basic parameter which will be processed in the first stage, through it is related with many

other parameters such as utilization of large projections, selection of the roof type, or neighbour distances of the buildings. In any stage, all this information will be structured in relation to each other, so on each manipulation, with an object-oriented scripting approach, all these relation algorithms will work and inform designer about the limitations and relations in all phases, or alter the necessary conditions accordingly. Hence the stages indicated below are designed for new building design, mostly without any existing parameter defining objects, leading a path through the design stages, but not defining them or their operation order constantly.

1. Building Form, Building Height and Floor Count, Orientation, Paths Rule Sets

These parameters compose the basic parameters of the system, that many of the other parameters are defined as functions of each of these or combinations. Building Floor Heights are also grouped in this first category.

2. Relation with Other Buildings, Slope Treatment, Secondary Buildings Rule Sets

These constitute the secondary priority group, addressing parameters mostly in relation to basic building form. Secondary Buildings is an exceptional parameter which is a function of land use pattern and requirements, thus will be mostly depending on designer's choices. The parameters in relation with secondary buildings, such as size and form or more detailed connections with the primary buildings such as utilizing the roof as a first floor terrace will operate after the choice of existence of the secondary building.

3. Projection Types, Large Projections, Building Open Space and Roof Form Rule Sets

The third group is composed of architectural features of a building, defined completely with rule sets in relation to other parameters. Operation of this group rule sets will be mostly as 'form selecting' mechanism where script proposes the available options and designer chooses, script responds through the other options occurred in this new stage or the problems with the constraints and designer responds and so on.

4. Elevation Treatment and Exceptions

This is the final stage where the parameters are mostly depending on the first group rule sets and relation in the elements of this group. Elevation Treatment is a limited category, where 3 basic parameters are processed by the system. Elevation openings ratio is operational in relation to its sub-parameters. Secondly some elements for the façade treatment will be proposed by the system, and finally facade decoration is in the scope of this system as a general scale in order to express the elaboration level of the elevations as discussed in the related parts of this study. Through this information, detailed facade design and order has to be manually operated by designer, since it is out of the scope of conceptual design level provided in the project.

Exceptional cases where necessary and related to the spontaneous situation of the system will be proposed by the system, such if the L/W ratio is reduced to a certain level, a large projection option is available through this parameter.

5. Debugging and constraint consideration

At all levels, system has to provide satisfactory information on the problem areas where the constraints have been exceeded or pushed to the limits. Furthermore paradoxical situations have to be reported by the system, as a debugging procedure that will contribute to improvement of the system.

6.2 Concluding Discussions

In this part, the methodology and the results of this study will be briefly discussed as well as the further research opportunities in relation to the improvement of the outcome.

6.3 Overall Evaluation of the Work

This study intends to propose a methodology for the architectural analysis of a traditional organic tissue with the objective for understanding the design logic and converting it to computational design data. Through the discussion and introductions in 1st and 2nd chapters, the methodology and strategies employed in computational design have been examined. The approach based on computational design strategies, continuously working in the background, constitutes the abstraction and

interpretation levels of the entire analyses that the outcome is aimed to be in suitable form to define a system of interconnected relations.

The analysis carried on in Chapter 3, is based on the discussions expressed in the first part of the same chapter, in relation to the topic 'new building in traditional setting' with a conservation perspective. However analysis methods of conservation have been filtered with the above mentioned criterion, as well as the scope of the thesis. This scope structures a conceptual level for this thesis, since otherwise this work became missing its basic goal, which is to propose a conceptual methodology of analysis and design within the principles of conservation discipline and utilizing computational tools as well as the design approach. Approaching it from another standpoint, this study investigates the opportunities of computational tools and methods for the analysis and processing of an organic tissue, namely a specific traditional setting.

Understanding traditional setting of Kalkan Historical Town Centre as an organic tissue, this study approaches to it as a complex entity composed of differential relations between its fragments. Again recalling the scope, socio-economical parameters in this structure are briefly discussed where required in order to understand the general context and neglected for analytical procedures, purifying the integral elements to selected architectural features. Hence the rest of Chapter 3 proposes various issues in relation to Kalkan town, as the case study and context of this study. This information and discussions about the context provides a rich background for the analysis in the following parts of the study,

Relations between architectural features defining the elements of the tissue have been analysed in Chapters 4 and 5, where first of these presents some general analysis of the traditional tissue based on basic conservation approach intends to understand various features of a setting. The design of these regional and architectural investigations, recalling the scope again, are limited with the basic features of a building mass and neglecting architectural features in relation interior arrangements and details. In corporation with these filters, Chapter 4 draws the basic layout for the architectural composition of the traditional tissue of Historical Centre of Kalkan Town.

In Chapter 5, the methodology proposed in this thesis is extended through new analyses in the form of comparison and relational analysis, aiming to reveal the direct or indirect relations between various architectural features of traditional setting. In parallel, interpretations of the outcome of these various levels of analysis, seeks for rules that make up the tissue. These rules have been designed in this final part, Chapter 6.1.

In the final part, in order to achieve operable results, rule sets have been proposed for constituting a differential design system. These sets make up the core for algorithms of a differential system for producing a tissue with similar characteristics and organic form to Kalkan Historical Town Centre. Such a system will be employed as a decision support mechanism for building new design in a traditional tissue.

6.3.1 Critical Discussions

It is required to examine the results of the designed system in order to make a satisfactory evaluation. This study stays on the conceptual level and will not develop the working algorithms concretely. However, as indicated above, the process provides a certain level of armour guarding the conservation side of the design, for staying always on the conservation approach side.

As a critical approach to this study, it can be argued that there are too many factors that are disregarded. On one side, this is true; however, as explained above, a conceptual level was necessary for producing results. Furthermore, this proposal has to be evaluated as an experimental methodology which is open discussion and improvement. But at the same time, it has to be applicable to various contexts to be tested and this openness requires an abstraction to some extent. The methodology, as proposed, can be applied to other settings, however the analysis filters have to adopted properly.

In parallel, the scope can be improved for a larger set of information. In this way, not only more architectural features, such as interior arrangements, door and windows as separate elements, details, decorations, streets and urban spaces can be handled as elements of the traditional tissue, and also the approach can be extended to cover more features in relation to socio-cultural and economic structure of the

tissue. Issues in relation to plot size, shape and interior arrangement, ownership status, perioding in more detail can be counted as some of these parameters that can be introduced in the analysis titles of this study, for a more extensive examination.

It can also be argued that, the result is not open to development to some extent, apart from its succession level, since the result is a differential system with defined relations. An important parameter fixing the level that system incorporates itself with outer factors is the openness of the traditional setting itself. As it is discussed in the introductory parts about the traditional tissue, the Town seems to be demonstrating a powerful resistance against the deterioration effects of tourism and related developments. However it is not evaluated from the architectural perspective. For a brief approach, it can be stated that Town have not seen any qualified architectural examples in order to understand its integration capability, excluding few cases.

Moreover, methodology proposed here attributes its development opportunity to certain strategies. One of them is the experimental proposals which are defined in rule sets differentially and will be open to designer's preference and improvement. Secondly, methodology introduces traditional setting with the concept of randomness through the utilization of computational design tools. Digital-organics strategy maintains a potential for emergent elements or relations to contribute the outcome. This contribution may occur in various levels, for Kalkan particularly, since the data set is composed of a considerably limited and definite set of data.

As a first example to explain this contribution, the study on floor level value may be proposed. New building types were proposed with deduced floor combinations, providing the emergence of new forms with the utilization of these combinations and other relational parameters together. Secondly, the methodology has an inherit potential for emergent forms or types. Despite new proposals are not existing for architectural features, they are still capable of emergent elements through the relational structure of the design logic, namely elements never seen before may come into being.

A further contribution can be provided with a trial-error mechanism, or a self-learning strategy attributed to the system. Details of this application are assumed to

be out of the context of this study, yet it is possible to alter the rules and algorithms through observation of unintended results.

Finally, it has to be considered that application of this methodology will produce conceptual results, which have to be elaborated by the designer in order to be buildings. Material choices and structural techniques have been included in the analysis stages yet excluded in the algorithm design stage. In this sense, new materials have to be tested on results for their adaptability with the traditional setting and the forms produced through the methodology proposed in this study.

6.3.2 Further Research

Further research proposals in relation to this study can be based on three various directions. First of these directions can be accepted as the scripting of the algorithms and their application on the computer, which will be the complimentary of this study, enabling more extensive discussion and improvement of the results.

Moreover, second direction can be defined as the extension of the analytical approach and scope of study. Namely not only more architectural features but also features in relation to socio-cultural and economic domains will be included in the analysis and algorithm design processes. Through this approach, experimental methodology proposed here will be developed to produce more complicated results as well as a greater potential for emergent forms and concepts, increasing the complexity of the system.

Since a considerable amount of the settlers of Kalkan have come from island of Meis (Castellerizo) and the areas surrounding Kalkan, namely the Lycian land, it is also required to extend the coverage of the study to these areas through comparison and similarities, as being the third of further research directions. Through investigation in this direction, more satisfactory results can be provided to discussion with a more extensive domain of information, particularly on the architectural basis.

Finally, it is necessary to adopt this methodology to other traditional tissues with distinct features and more complicated architectural features. Through these further researches, methodology proposed here will be open to testing and discussion on strategies and results on various environments.

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