Enrique Castaño Perea
Ernesto Echeverría Valiente *Editors*

# Architectural Draughtsmanship

## From Analog to Digital Narratives

Springer

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ISBN 978-3-319-58855-1 ISBN 978-3-319-58856-8 (eBook)
https://doi.org/10.1007/978-3-319-58856-8

Library of Congress Control Number: 2017941054



Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Preface

The book presented here is a compilation of articles collected under the title*Architectural Draughtsmanship: EGA (Architectural Graphic Expression) From Analog to Digital Narratives*. It is the result of the International Congress EGA (Architectual Graphic Expression)16 held in Alcala de Henares in June 2016 with the subheading: "Teaching and researching in architectural graphic expression."

This was the 16th edition of the Congress, and it was again centered on the exchange of knowledge of what is taking place within the arena of architectural graphic expression inside and outside of our country.

The implementation of a successive curriculum over a short period of time (BA in Architecture, BA in Fundamentals of Architecture, Master of Architecture and Ph.D.) has led to the necessity of restructuring all areas of study within this field, and for that reason, it seemed the right moment to turn our attention to the work of professors and researchers. As the last Doctor Honoris Causa of the University of Alcala Kenneth Frampton said in his acceptance speech, we have to reclaim innovation by starting from tradition, both in terms of architecture and educational disciplines attached to it.

This book is organized into two major parts:

A/ Research into the field of architectural graphic expression, including related areas of education, in which innovative experiences have been presented in the new curricula,

B/ and how to teach research methods that are essential to the work and experiences found in the field of postgraduate studies.

The editors have grouped the articles into four major chapters, according to their individual subjects:

1. Innovation Teaching Strategies (Teaching experiences applied in EGA).
2. Design and Education (General education concepts in EGA).
3. Design and Architecture (Design issues related to current architectural practice).
4. History and Cultural Heritage (History of a particular designs and/or the design's application within the architectural heritage).

Blind pairs reviewed all articles as a guarantee of quality in order to obtain the recognition of the scientific community.

All the works are in English, although they may have originally been written in one of the languages of the Congress, either Spanish, Italian, or Portuguese, with the goal of emphasizing their respective international characters.

We believe this compilation of articles could be the trigger to start a new collection of books about the international relevance of architectural graphic expression. It is the result of the important contributions taken from the congresses dedicated to the subject that have been held regularly for over thirty years, with the participation of a large number of researchers from European and Latin-American countries.

Alcalá de Henares, Spain

Enrique Castaño Perea
Ernesto Echeverría Valiente

# Contents

**Part II Design and Education**

# Analysis of the Plan for the Study of the Historic City. Methodological Transfers Between Architecture and Archeology

**Mercedes Díaz Garrido**

**Abstract** This paper deals with the study of the historic city through the plot plan as a source of knowledge. Methodological issues are tackled in their relation to two different yet linked concepts, morphology and stratigraphy, with the purpose of setting the basis for each and their respective links to the areas of architecture and archeology as disciplines, and a proposal is made for the application of both concepts to the analysis of the plan. At the background lies the reflection on drawing in investigation and on the need for multidisciplinary outlooks.

**Keywords** Historic city · Urban morphology · Urban stratigraphy

This paper reviews the concepts and the theoretical principles upon which the analysis of the plan of the historic city, particularly of the plot plan, as a source of knowledge, could be based. This idea arises as a research on the church of Santa Maria in Carmona is in progress.[1] Due to the importance of this building and to its influence on the development of the city, the project has an urban-scale approach in order to establish the relation architecture—city along the different stages of their growth and transformation. The complexity of the plan of Carmona, which is the outcome of a continuous settlement from antiquity, has given rise to the theoretical reflection here put forward around the nature of the historic city as construction, as well as around the urban shape and its analysis.

The paper consists of two sections:

In the first, two linked and complementary concepts are reviewed: *morphology*, as used in urban analysis, and *stratigraphy*, as used in archeology of architecture. Both are related to a certain understanding of the nature of the object of study—city

[1]Project I+D+I "Seville Cathedral Gothic: Architecture and city in the spheres of influence of the Cathedral of Seville", Ref.: HAR2012-35152.

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E. Castaño Perea and E. Echeverría Valiente (eds.), *Architectural Draughtsmanship*,
https://doi.org/10.1007/978-3-319-58856-8_99

and building respectively—, and the method adopted by each for the form analysis is considered.

In the second, a proposal is made for a synthesis of both concepts, directed at the analysis of the historic city which is regarded as a simultaneously organic and stratified construction. A method is sketched for the analysis of the urban shape using the plot plan as a basic document. In this method is implicit the primary role of drawing as a means and a tool for documentation, analysis and spread of the results.

## 1 Morphology and Urban Analysis

The term morphology is to be found in texts on urban analysis as a synonym for urban shape, generally used in relation to typology. Whereas the last, as well as the concept of type, are studied and precisely defined, this is not the case with the first. Let us see what we understand by morphology and in what ways this concept is used in urban analysis.

Morphology is a term used in different branches of knowledge, from linguistics through geology to biology among others, meaning the study of the shape and structure of something, especially of an organism. In every instance it refers to the study of the shape in relation to the logic of its shaping. The study of the shape is thus understood as a reading of the process of its shaping by means of identifying the patterns and the rules or laws which have determined it.[2]

The relations typology—morphology and building type—urban shape were emphasized by urban analysis, but it is in Caniggia that we find a more thorough development understanding the urban shape as really connected to the concept of morphology, even if the author does not use this term. His book *Lettura dell'edilizia di base* (Caniggia and Maffei [1979] 1995) is a wide exposition of his approach, which can be summarized in the following issues:

- The *city as a historic organism*, this organicity meaning an identity as well as a kind of structured order, with the presence of elements and relations at different levels.
- The structure as the result of the process of shaping, hence the *identity history—structure*.
- *Analysis as a reading*, as a reconstruction of the process which can be recognized in the structure itself.

[2]The term was introduced by Goethe in his studies on the form of the plants as "Morphologie" from the old Greek "morphé" (form) and "logia" (treatise). It already expressed its two defining ideas: the existence of typical, archetypical or primitive forms, and evolutionary process which is subject to patterns of formation and transformation.

– The process as dominated by the existence of elemental patterns and schemas which are common to the same cultural context. This is called *typological process*.
– *Progressive levels of organization* of the urban organism, belonging to different scales of observation and to different times of reading.

The idea of typological process leads to *comparison* as a method, an issue that can be found in further texts by the same author. Thus, it is Caniggia's purpose to identify and typify the processes, through a comparative study of similar examples, within a precise cultural background: "(…) we can isolate behaviors that are typified, codified and therefore recognizable to us, within a spatial and temporal interval, and at the same time we can also verify the organic, coinciding diversification of those behaviors as that interval changes. So we will be able to reconstruct a series of typological processes that will connect analogous objects from different periods of time" (Caniggia [1974] 1997, 30).

The interest for typological processes leads simultaneously to a requirement for evolutionary continuity of the urban area under inspection, as is shown in his article "Lettura delle preesistenze antiche nei tessuti urbani medievali" (Caniggia [1974] 1997). Here the author refers to urban analysis as an archeological method for the study of the historic city in the following terms: "It is our purpose to examine within what limits, and with what probability of success, it could be possible to deduct the structures of an ancient city if its place is occupied by a modern aggregate, reading in the last its characteristics with a systematicity comparable to the one which can be obtained from other methods, that is with a theoretical and technical formulation which warrants enough objectivity; as long as some essential conditions are satisfied: the transition from the old to the new aggregate should have taken place through a gradual transformation, not by means of a traumatic, sudden substitution, and without being abandoned for too long" (ibid, 27) (Fig. 1).

But as refers to a thorough study of an urban organism, especially when its complexity is increased by its age, the difficulty lies in identifying the different processes along its evolution and in finding relations among them. It is to this purpose that we introduce the concept of stratigraphy.

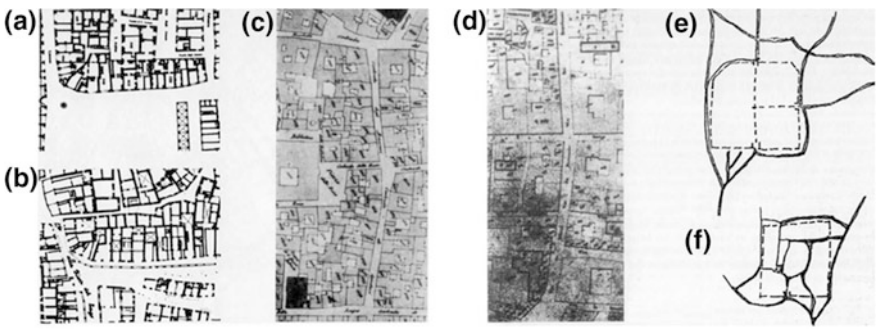


**Fig. 1** Caniggia. Similar middle-age transformations in analogous ancient structures

## 2 Stratigraphy as an Archeological Method

Stratigraphy is originally a geological method used for the study of the processes that gave birth to the formations in Earth. It starts from the conception of these formations as stratified and of the historical character of stratification, as wells as from the existence of a number of laws which determine its shaping. It takes into account the layers or levels which can be recognized, along with the interfaces or discontinuities between them, both being the outcome of periods of time, whether of sedimentation or of interruption and erosion of the deposit. Given its cumulative, nature-originated, relatively simple character, a few principles or laws would allow the recognition of the relative sequence of layers from its spatial situation. These are the laws of *superposition*, of *original horizontality* and of *original continuity*.

Owing to its origin in geology, stratigraphy is the object of a specific development in archeology, where it became established with the method proposed by Edward Harris in the 1970s (Harris [1979] 1991). It is then that the principles of *archeological stratigraphy* are defined, from those principles a system of register known as Matrix Harris is developed in which the stratigraphic sequence is pictured as a diagram. This method can be put into practice in an archeological site, where the natural conditions of stratification are altered by human activity.

In this case, the principles or laws of archeological stratigraphy would influence the physical disposition of the archeological stratification, enabling the archeologist to determine the relative chronological order in which the stratification was created. But, in contrast to the linear cumulative character of geological stratification, most archeological sites show multilinear stratigraphic sequences. Taking this into consideration, Harris introduces a new law in addition to the laws of geological stratigraphy which are suitably adapted. This is called by him the law of *stratigraphic succession*; it refers to the way every stratigraphic unity is shown within the sequence as depicted through its own diagram, the Matrix Harris, so that superfluous relations are eliminated. Thus, "Matrix Harris provides archeology with a method which enables the diagrammatic expression of stratigraphic sequences in a very simple way" (ibid, 58) (Fig. 2).

From urban archeology, discipline where it was born, the stratigraphic method as proposed by Harris reaches the archeology of architecture, where it will undergo a new specific development toward what is known as *stratigraphic method for the reading of faces or stratigraphic analysis of historic buildings* (Caballero Zoreda 1995, 38). This method means understanding the building as a historic construction and its use for the reading of façades, regarding these as stratigraphy. Its birth takes place coinciding with the development of middle-age archeology in Italy, with the contribution of such architects as Roberto Parenti or Gian Pietro Brogiolo.

In the definition of the stratigraphic unities as well as of their relations, stratigraphic and architectonic concepts are used. Both are defined after their characteristics: material continuity and differentiation, but also after the constructive action which brought them forth. The criteria for their identification should be not only stratigraphic but also constructive and formal, and they require that the

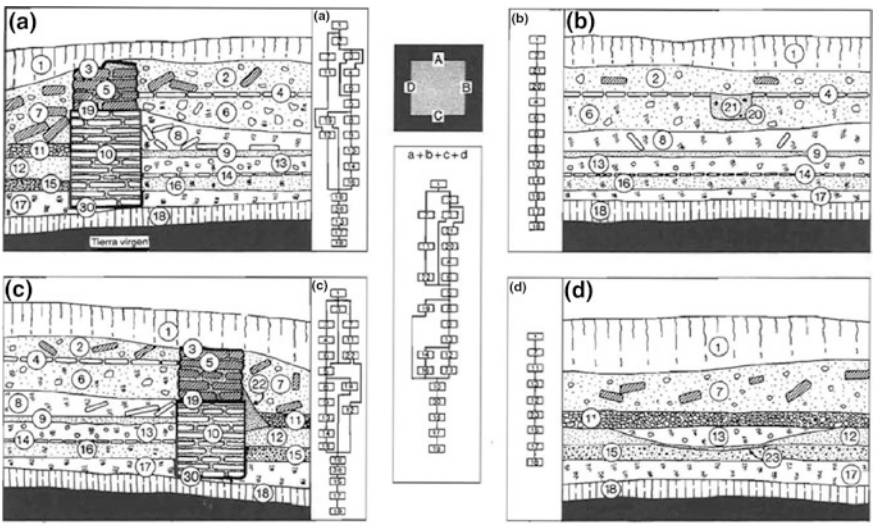


FIGURA 21. Esta ilustración, junto con la siguiente, muestra la construcción gradual de una secuencia estratigráfica a través de las secciones representadas en los perfiles A-D. Según la ley de sucesión estratigráfica, los cuatro perfiles se han fundido en una sola secuencia (a+b+c+d), habiéndose eliminado todas las relaciones superfluas.

**Fig. 2** Harris. Gradual construction of a stratigraphic sequence

constructive techniques and processes, as well as the formal aspects of the building, be known: (Fig. 3)

- The layer, or wall stratigraphic unity, is defined as "the minimal built unity which can be stratigraphically isolated from those surrounding it, and the basic object of study—a fragment of a wall or of a window, a putlog hole, a piece of a slab, a filling…—" (Caballero Zoreda 1995, 39).
- With respect to the interface or surface: "As in elements, three aspects can be distinguished in surfaces, the first being genetic, or constructive activity, which gave birth to its geometrical appearance or shape, the last having a temporal value. Geometrically, it is defined as the limits or surfaces of the elements divided by it" (ibid, 40).
- The relations between stratigraphic elements are defined as stratigraphic-constructive: "The analysis of the stratigraphic-constructive relations is doubtlessly the most delicate stage of the process. Three different readings come together in it: the reading of the spatial situation of the elements—in contact or not, above, underneath, alongside—which is associated with the reading of the constructive action that created them—covering, filling, leaning, placing aside, cutting, joining, etc.—and which ends with a temporal sequence—simultaneity, priority or posterity—" (ibid, 43).

As the constructive process is different, more complex than in the accumulation of an archeological site, the stratigraphic sequence cannot be deduced so straightforwardly from the spatial situation of the elements; it should be expressed in terms

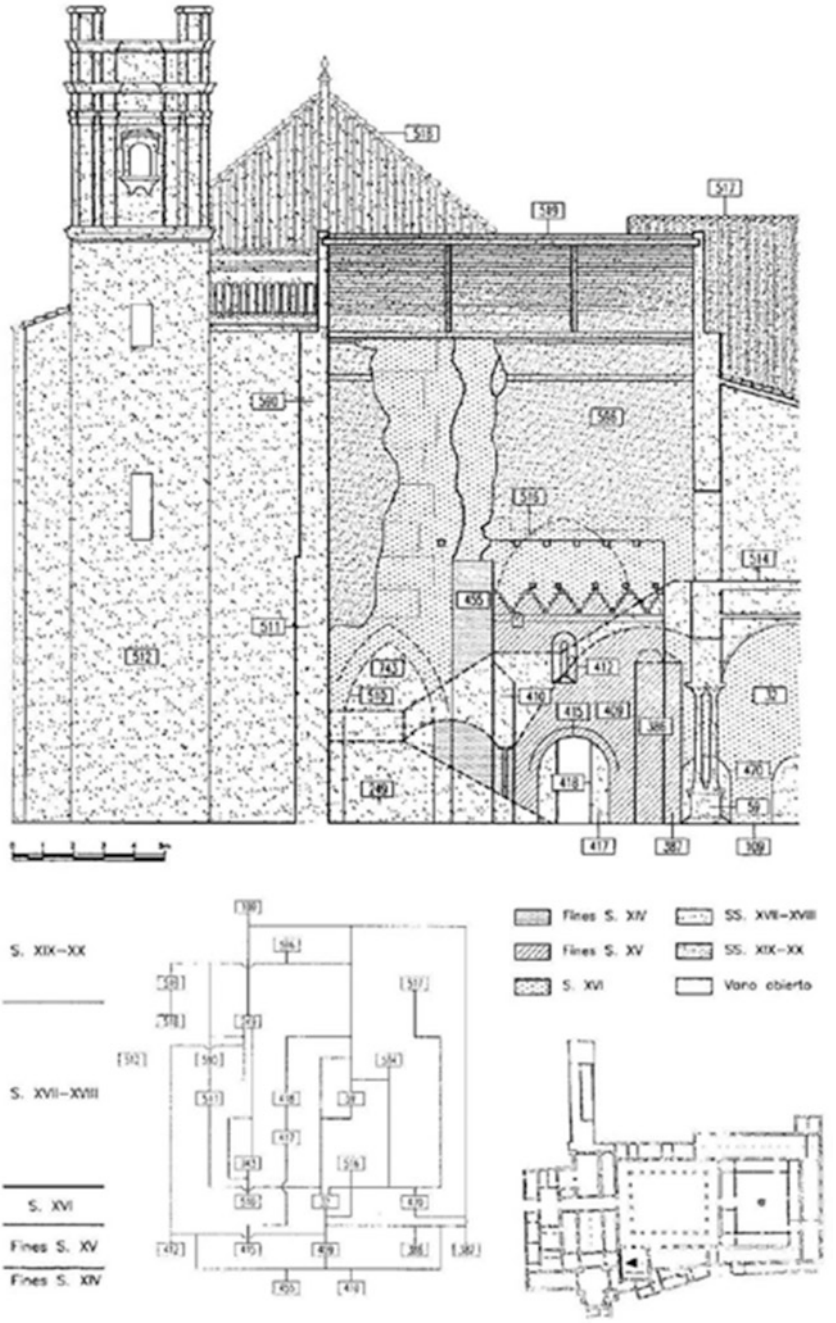


**Fig. 3** Reading of faces. Miguel Ángel Tabales. Carmen Headquarters, Seville

of constructive process. Its formal aspects would also mean a further factor of complexity. The adoption of the very laws or principles of archeological stratigraphy, even if adapted and expanded, and through it of geological stratigraphy, seems somewhat unnatural. Indeed they are no longer mentioned as laws but as principles, or even more imprecisely as phenomena: of *superposition*, *succession and continuity*; of *original horizontality and lateral continuity*; of *cross or cut relations*; of the *temporal discontinuity and of the greater importance of hiatus in the stratigraphic record*.

As for the method used, it consists of the development of a number of stages:

- *Graphic documentation and observation*. A fundamental stage, since "to document, as a synonym for reading a document, somehow means in the analysis of historic buildings the same as excavation in a site".
- *Distinction of elements and their record in analytic files*. Distinct elements and interfaces are analyzed by means of files where they, as well as the actions since their creation and their relations to the rest, are described.
- *Diagram or matrix of relations*. It depicts the temporal sequence, where the elements are chronologically ordered after their relations of diachrony in vertical columns and of synchrony in horizontal rows. Diagrams are first built in files, element by element, and are thereafter assembled to produce the area diagrams.

Far from being a literal application, the method of face reading means a rather free interpretation of the stratigraphic method, made unique by some characteristics. First, because it involves the integration of two disciplines, archeology and architecture, that take part in its definition. Second, because of the possibility of using a method conceived in the field of excavation for the analysis of a built reality in its apparent conformation, in this case through its façade. These are the characteristics that we intend to bring to the study of the city, and the reason why we speak of the plan as stratigraphy in the following section.

## 3 The Plot Plan as Stratigraphy

What follows might be considered a sketch of a *stratigraphic-morphological method for the analysis of the plot plan of the historic city* which makes a parallel use of notions derived from both concepts. This method points to a global analysis through the plan, understanding this as the result of an evolution in which morphological and stratigraphic processes participate. The morphological analysis would provide the theoretical basis from which the city could be considered as construction. The stratigraphic method would provide the systematization and, in spite of being an archeological method, a certain possibility of abstraction of the object, of dealing with some moments of the analysis from perceptive criteria based on the formal characteristics of the stratification.

## 4 Historic City as Stratified Construction

Quoting Rossi ([1966] 1992, 60), we understand the city as architecture, as collective construction in time, and here we would add: as stratified construction.

When we speak of construction of the city we do not refer to material construction but to conformation, so that the concept of *urban shape* would best match the idea of *city as construction*. We speak of a structured shape, understanding the city as an organism composed of two kinds of elements, the primary elements and the residential area. The primary elements would be those that direct or guide the growth—elements of the site such as the territorial pathways, built elements such as ramparts or delimitations, urban scale pathways, places or singular buildings—. The residential area is the extension, the most of the construction of the city, and as urban analysis has shown its construction is determined by the building type and by its way of aggregation as it makes up the urban tissue.[3]

But the city as a whole, especially as concerns cities with a long history, is the product of the superposition of different moments in its construction, of different structures, that can follow several ways of spatial relation to the previous ones: coincidence, juxtaposition, superposition…. This is why we speak of stratified construction or, similarly, of stratified urban shape.

## 5 Plot Plan as Stratigraphy of the Historic City

It is well known that the plan is the graphic document by means of which we perceive the whole urban shape in the reach of its growth, in its extension. Thence we speak of the plan, in particular the plot plan, as stratigraphy and of its possible stratigraphic-morphological analysis.

The plot plan best reflects the character of the city as construction for some reasons. First, the plot is an element which usually remains, contrary to the renovation of buildings. It is also the connecting element between building type and tissue, reflecting the features of the type which have to do with its way of aggregation. Finally, thanks to the commonly seriated, modulated character of the tissue it is sometimes possible to recompose the original plotting schema as it was at the time of its birth. The plot is therefore an essential element for distinguishing tissues and recognizing its original shape.

## 6 Goals of the Analysis and Stages of the Work

The purpose of the stratigraphic analysis of the plan would be to identify, characterize and typify, if possible, the different actual structures in their relation to different times of shaping, as well as to determine the temporal sequence as it can be

[3]"Primary elements and the concept of area" (Rossi [1966] 1992, 111–185).

deduced from the spatial relations between structures. The analysis of the plan thus carried out provides an amount of data that can be considered in order to establish the process of urban conformation even though they must be contrasted with the data from historical or archeological sources.

A draft of the work stages is proposed which is similar to that used in the reading of faces, with some differences. Stages: documentation and observation, identification of structures and relations, establishment of the temporal sequence, plus a stage of synthesis (our addition). We will make some remarks which imply the basic importance of drawing as a means and as a tool:

– *Documentation and observation.*

Since we mean to read the shaping process, the plan for the analysis must be a reliable plot plan, as old as is allowed by the existing historical cartography. Unfortunately, in most cases the first plot plan available were made around 1970—cadastral implantation plans—, after the spread of photogrammetric flights, while the first adequately accurate urban plans—military plans—dating from the late 19th century. In order to make up for the lack of a plot plan antedating the contemporary transformation of the city, the task of reconstituting the historical plan must be undertaken with the inclusion of an approximate plot plan obtained from the elimination of those plots which appear to postdate the reconstituted plan.[4] This reconstitution is done in as many steps as historical plans are used, in a backward sequence.

As reconstitution we understand the redrawing of the historical plan with the present digital plan as a graphic basis. After superimposing the historical plan on the present plan, by means of simple operations of rotation and scaling, we can make element comparisons. This can lead us to a number of actions: eliminating from the present digital plan the elements subsequent to the reconstituted plan, checking those which remain, including from the reconstituted plan the missing elements. The reliability of the process is in proportion to the number of plans in the sequence. At least there should be two plans, beginning with the cadastral implantation plans and ending with the oldest historical plan.

This process represents not only the stage of documentation but also a first stage of analysis and observation. Analysis, because it allows the growth and transformations during the interval of time encompassed by the whole plan series be detected and eliminated. Observation, because simultaneously we get a certain acquaintance with the plan and are able to see differentiated structures in it (Figs. 4 and 5).

– *Identification of structures and relations.*

By this is meant the distinction of formal structures and of relations among them, so that a reading is achieved which is meaningful and coherent, that is, a reading that conveys a logical shaping process.

[4]The term reconstitution is employed following the proposal made by Javier Ortega Vidal in is paper "Drawing and building life", published by EGA, Revista de Expresión Gráfica Arquitectónica, n° 11, Universidad Politécnica de Valencia, 2011.

**Figs. 4 and 5** Reconstitution of the historical plot plan of Carmona

The structures thus identified will be defined by the selection of some elements present in the plan—pathways, plots, arrangement of streets, blocks…—They will also belong to a fragment of the urban shape, related to a given time in the construction of the city. The reading or interpretation of these will consist of its formal description or characterization and of its classification or adscription to a type of urbanism if possible.

The spatial and formal relations between structures—coincidence, juxtaposition, superposition, hierarchy…—can be read as temporal relation—continuity, growth, transformation…— (Fig. 6).

– *Establishment of the temporal sequence.*

The establishment of the complete temporal sequence as a reading of the shaping process would derive from the total spatial structures and relations detected.

In this stage as in the previous, the reading is never self-evident, mainly in the cities with a more complex stratigraphy, requiring now a progressive, now a trial and error approach. Drawing the plan is essential in this process as a way of visualizing and checking (Fig. 7).

– *Synthesis.*

The reading which has been obtained from the stratigraphic analysis of the plan should be coherent with the data provided by other sources, with which it must be contrasted in what we understand as a synthesis. Nevertheless, the method should not lose its autonomy as a source of knowledge for the urban history of the city, being conditioned a priori by no other hypothesis. It is thus possible that the contradictions to other data prevent the analysis from reaching clear conclusions, but it may also enable questions to be raised that should be answered as an equally important progress of knowledge.

Drawing plays here too a main role as a kind of graphic synthesis in the possible elaboration of the hypothetic sequence of urban conformation.


**Fig. 6** Identification of structures

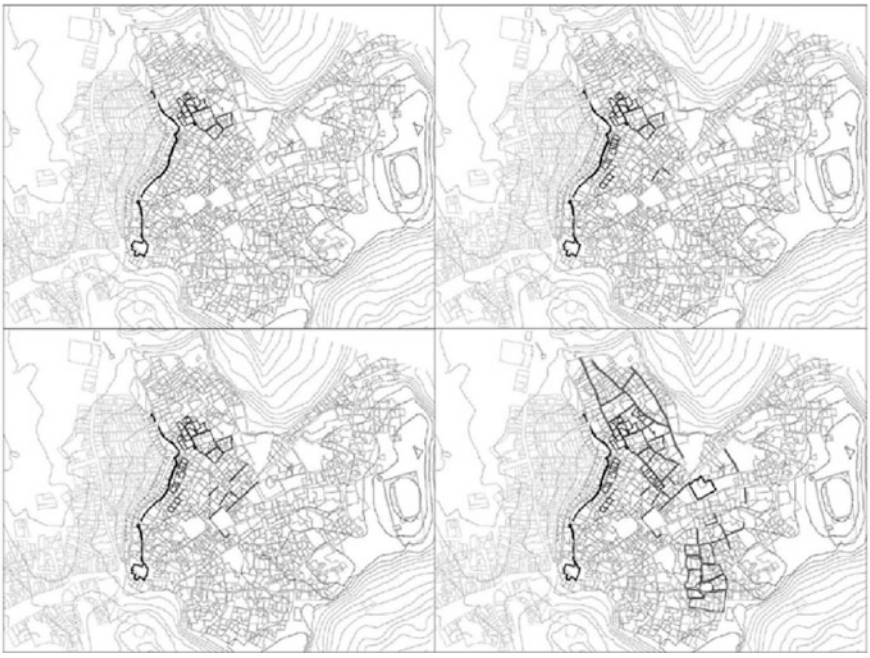

**Fig. 7** Temporal sequence of identified structures

**Fig. 8** Analysis of the area surrounding the church of Santa Maria

## 7 Scales or Levels of Analysis

The plot being the essential element for the analysis, the scale of this should be that of the historic area or of a distinguishable part of it. It is nonetheless necessary to have in mind a larger scale or level, in whose shape the elements of geographical location as well as those primary elements related to the creation of the site or the first occupation take part. In the same way, the study of a fragment should be related to a reading of the whole. This has to do with the organic nature of the city and with the *levels of progressive organization* of the urban shape as they are called by Caniggia (Fig. 8).

As we said before, the work on the historic area of Carmona has led to a reflection on the concepts and the method to be followed. In this case we have been able to verify that theory and practice walk hand in hand and progress together. The work is in an advanced stage and will be shortly published as the proceedings to the conference to be held in the city with the purpose of making known the result of the research project.

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**Mercedes Díaz Garrido** Architect from the University of Seville (1991) and Ph.D. Associate Professor at the same University (2005). Her priority field of research lies in the city and its architecture and in the implications of the graphic tools for its study. Her doctoral thesis *Triana and the right bank of the Guadalquivir River. Evolution of an urban shape from its origins to the mid-20th century* received a Focus Abengoa Foundation award and was published by this Foundation and the University of Seville. She is now a member of the research group Strategy for information and management of Heritage, HUM-799.