

Qualities and potential of the courtyard building type in Finnish contemporary urban environment

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Abstract

The urban milieu of Helsinki has a long tradition of housing organized around courtyards. It started naturally following the principle of spontaneous growing, soon it was cut off by building ordinances, laws and rules that have somehow defined and guided the developing of the city of Helsinki - and they still do. This resulted into a mass on linear apartment building with a little potential for relations between each other. However, during the last decade, the perimeter block has come back as an urban planning tool, especially thanks to its density. In any case, it seems that the potential of this building typology of being an active entity in the urban context, has not been entirely investigated nor applied.

The article describes first a brief historical overview of courtyard buildings in Helsinki, in order to provide the necessary context to the three case-studies that have been selected for a deeper analysis. Two of them are the first perimeter blocks in the Vallila area, built at the beginning of 20C, the third is a contemporary example located in Sompasaari, dating 2021. The analytical method applied to the case-studies results in defining aspects such as dimensions and proportions, the main functions placed in direct connections to the courtyard, the position of accesses and therefore the potential usage of the courtyard according to people's walking paths.

This article wants to prove that the courtyard building should have to work as a micro city, as a generator of social contacts and spatial encounters. These aspects are directly connected to its architecture and can be implemented by using specific design tools that are the result of this study.

Keywords: Perimeter blocks, courtyard, community.

Introduction

After being left apart for more than half a century, courtyard buildings, as perimeter blocks, have come back onto the design tables during the last decade. The reason for this can be found in the strategy of the urban planning department of the city of Helsinki, that has planned new areas like Jätkäsaari and Kalasatama using the perimeter block as main typology for apartment buildings, being clearly the densest solution. This has been fundamental for architects to re-invent and re-consider the perimeter block developed around a courtyard as a contemporary architectural typology. However, the courtyard building is still considered as a mere functional feature and as a necessity for providing daylight into the living units.

It seems that the very idea of building a perimeter block with a courtyard comes now first of all from the urban planning unit of the municipality

Remarkable studies have been conducted considering the issue of daylight for perimeter blocks in Nordic cities and about the courtyard as a pure spatial architectural feature. The role of courtyards has been extensively studied also from the sociological point of view, as an effective tool that helps to avoid social segregation by providing occasions for unplanned encounters.

Starting with a look into the history of courtyard building in Helsinki and Finland and with the results of the analysis of three case studies in Helsinki, this article aims to define a holistic character of courtyard buildings by integrating the architectural aspects with the social potential in order to draw clear principles and guidelines for the design of courtyards or perimeter blocks.

In particular, the study aims to answer to the following questions: is there an ideal scale and dimension for an urban courtyard? What is needed to create a microclimate and a sense of social enclosure? Where are the accesses, and where should the entrances to the housing units and common areas be located? What kind of functions must there be to stimulate its use and enjoyment, and what functions must be in the immediate vicinity directly accessible from there? How does the study of daylight affect the positioning of such functions? Will we be able to switch our way of designing from back yards to courtyards, from building ordinances to good and humane design, from houses as machines to the contemporary domus?

Brief look on courtyard houses and perimeter blocks in the Finnish tradition

Not much information exists on how courtyard houses developed in the Finnish countryside after they supposedly arrived from Sweden. The timber buildings that formed the courtyards have mostly burned, rotted, been moved to other places or their logs have been reused to construct other buildings.

One of the most comprehensive research on the subject was conducted by Panu Kaila and Elias Härö (Härö, Kaila 1976). According to their study, grouping buildings around the yard was realized in its most complete form into a fully closed courtyard that can historically be traced back to the solutions applied in medieval castle architecture. Moreover, the house inspection decree issued by King Charles XI in 1681 recommended grouping the buildings around two courtyards - a courtyard and a cattle yard. Similar statements were included in the building section of the Act in 1734. The closest examples of this kind of arrangements can be found as early as the 17th century in the bourgeois mansions of the coastal towns.

The so-called Ostrobothnian house, in its normal form, followed the pattern of a four-sided closed yard. Thus, it differed substantially from the Eastern Finnish way in which buildings were scattered according to the terrain and usage. In connection with a rectangular or square yard, it had to be distinguished between two different types. Especially in Swedish Southern Ostrobothnia, all the buildings were placed around a unified courtyard. In the area of Finnish Southern Ostrobothnia, the building or row of buildings placed in the middle of the yard divided it into a manor's and cattle yard. Here, an external corridor building, which in its normal form included two storage rooms on both sides of the passage, was given an important position in the courtyard. Correspondingly, above them were the so-called clothing spaces used as sleeping quarters in the summer. Various shelters for animals, stables, cows, pigs and sheep shelters, and other storage rooms, a well, cellars and a toilet formed the "household area" around the yard, where the everyday life of the house was going on all year round.

While in the countryside there are only few examples left (or moved elsewhere) of courtyard houses, the city (center) of Helsinki has a long tradition of housing organized around courtyards (Figure 1) according to Juha Ilonen: before the 1860s the city consisted of wooden houses built along the street

Figure 1. Perimeter blocks and courtyards in Helsinki central area, 2021.

Left: black: building masses, grey:courtyards
 Right: grey: courtyards represented without building mass
 Drawing by the author

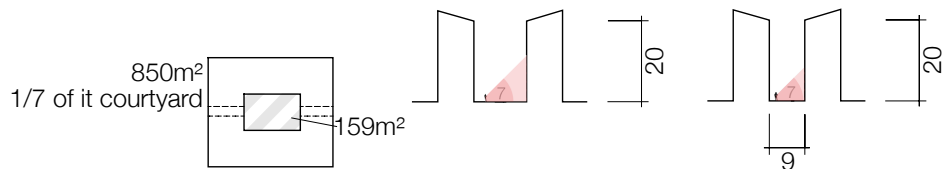
border, with the access only from the back yard. Later, multi-storey buildings started to be built in the backyard of the wooden houses, to finally complete the plot replacing the wooden house left next to the street to a taller multi-storey brick apartment building. Therefore, the yard yet being the same size (or smaller) as the courtyard with wooden houses around it, is surrounded by much taller buildings. It became a dark backyard. Building ordinances were made to fight this issue. In 1875 it was stated that minimum size of a courtyard must be 159 sqm (Figure 2), while in 1895 it was added that the building should leave space for fresh air and light, putting restrictions to the heights of the buildings, until the courtyard city block was finally banned in 1930s.



If in the oldest center of Helsinki the high density was made by wooden houses already positioned around a courtyard, that later have been replaced with taller apartment buildings, the area of Vallila, where two of my case-studies are located, had been planned in the '20s using the typology of perimeter blocks partly replacing the existing tissue of little wooden houses on separate plots. The model for the new urban plan of Vallila, according to R. Nikula (Nikula 1981) came from Sweden, in particular from Göteborg, from the exemplar urban plan by Albert Lilienberg for the area on Kungsladugård, 1916. The plan was based on huge, regular, rectangular perimeter blocks for social housing.

Figure 2. Perimeter blocks in 1875, interpretation from Juha Ilonen's text.

Drawing by the author



Helsinki: Three case studies from 20C and 21C

Even if, as we saw earlier, courtyard houses are not just present in Nordic cities in few cases, but they partly define the urban tissues and entire areas of cities like Helsinki, it is still common knowledge that the typology of the house around a courtyard belongs only to Southern, sunny and warm places. An interpretation of the following quote could be that the 'inventor' of the courtyard is the Graeco-Roman:

"The Graeco-Roman decides to separate himself from the fields, from 'Nature', from the geo-botanic cosmos... Where will he go, since the earth in one huge, unbounded field? Quite simple; he will mark off a portion of this field by means of walls, which set up an enclosed, finite space over against amorphous, limitless space." (José Ortega y Gasset, *The Revolt of Masses*, 1932)

Despite the mere special character of courtyards, what I find useful for this study is to understand the deeper meaning of the courtyard on a deeper level. Some of the principles listed by Vitruvius, like the different level of privacy wanted, could be found in the very recently planned perimeter blocks:

"After settling the positions of the rooms with regard to the quarters of the sky, we must next consider the principles on which should be constructed those apartments in private houses which are meant for the householders themselves, and those which are to be shared in common with outsiders. The common [rooms] are those which any of the people have a perfect right to enter, even without an invitation: that is, entrance courts, cavaedia, peristyles, and all intended for the like purpose.

[...] for men of rank who, from holding offices and magistracies, have social obligations to their fellow-citizens, lofty entrance courts in regal style, and most spacious atriums and peristyles, with plantations and walks of some extent in them, appropriate to their dignity. [...] The rules on these points will hold not only for houses in town, but also for those in the country, except that in town atriums are usually next to the front door, while in country seats peristyles come first, and then atriums surrounded by paved colonnades opening upon palaestrae and walks." (Vitruvius, *De Architectura*, 6.5.1-2)

Interesting examples - not described by Vitruvius though - can be found also in Ostia, where the so-called Case a Giardino, a multi-storey housing block with a central communal space, reminds a contemporary condominium (DeLaine 2020).

From the excavations and research of Roman cities of Pompeii, Herculaneum and Ostia, archaeologists, historians and architects have found out that the town house around a courtyard – the Roman Domus – meant more than a spatial issue: it was the primary cell of the city. Like in households of other preindustrial societies, there is the idea of a macroscopic structure within the domestic realm. This same character can be found in at least two examples from the Helsinki of the 1920s, Nelikulma (by architects Jussi and Toivo Paatela, 1920-1923) and Kone & Silta housing blocks (by architects Armas Lindgren and Bertel Liljeqvist, 1917-1929), where walk through the common courtyard is the only way to get to the apartments, and at the same provide possibility of encounters and social interaction. While Kone & Silta represents the first planned entire perimeter block in the area of Vallila, Nelikulma was the first to be completed.

The contemporary Helsinki city planning shows a return of courtyard buildings in the design of new urban areas (for example in the new – and expensive - quarters of Kalasatama and Jätkäsaari). However, most of these new perimeter blocks, being usually vast and high, are too large and the courtyard loses its scale. Moreover, these courtyards being on a parking deck, no big trees can be planted. There are also positive examples, for example the third case-study, a just completed perimeter block in Sompasaari, by Anttinen Oiva Architects, where the highest masses are placed at the corners in such way that

The contemporary Helsinki city planning shows a return of courtyard buildings in the design of new urban areas.

most of the building is only 5-storey high. The staircases and common spaces are directly accessible from the courtyard, which gives a potentially high level of community feeling. In order to give a scale of three case-studies, I have made a comparison table including some general values of the building, useful for this study (Table 1).

Table 1. Dimensional data.
Information of size and dimension of the three case studies.

	Nelikulma	Kone & Silta	Sompasaari
Plot size (m ²)	4 000	11 800	4 500
Courtyard size (m ²)	1 500	6 900	1 600
Courtyard/plot	1/3	1/2	1/3
Dimension of courtyard (m)	25 x 62	59,5 x 118	35,5 x 51
Gross floor area (Ker ²)	9 965	15 130	13 850
Efficiency (Ker ² /plot)	2,49	1,28	3,08
Apartment units*	138	ca. 180	ca. 168
Inhabitants**	ca. 270	ca. 353	ca. 329
Density (Inhabitants/hectare)	675	299	731

** The amount of apartment units in Kone & Silta and Somparaari are calculated based of floor plan available in on-line archives of Lupaiste Kauppa. For Nelikulma the information comes from the administration company.

** in 2020, according to the Finnish statistical office (SVT), the average number of inhabitants per housing unit is 1,96.

Nelikulma

Nelikulma was designed by architects Jussi and Toivo Paatela in 1920 and completed in 1923. The big perimeter block is located in Vallila district, which was planned to be part of the expanding city center. With its high building density, services like retail shops, tramway and church, Vallila stands out in the fast-growing city expansion of the time. Following the traditions of the culturally important urban way of building, the architects played an important role.

With its 138 apartments, Nelikulma is efficiently built around a courtyard (Figure 3), and it is the first completed example of the new typology of “Large Courtyard Block”. It is also the first completely symmetrical entity of a perimeter block. From this characteristic it takes its name, “Nelikulma”, literally “The House of the Four Corners”. The entrance to all the apartments happens through a common gate, moving further through the courtyard to the staircases, towards a more private space.

Figure 3. Nelikulma.
Floor plan and sections. Drawing by the author.



The courtyard (Figure 4) has two gates facing each other, creating a visual connection across the entire courtyard from Hauhontie to Sturenkatu streets. On the other side, shops and commercial spaces are accessible directly from the street. There is a continuous visual and functional connection between private and public, courtyard and street. The aim of the courtyard was to guarantee the inhabitants an everyday environment that must be beautiful and healthy. Like in Ostia, where the courtyards housed often a garden, a house well, or a fountain, it played a key role in the social interaction of the residents (Karivieri 2020). It offers privacy experiences from both the apartment and street world; when viewed from the street, one is already closer to home, at the same time private residential activities could expand into the common space provided by the courtyard. The emphasis on residential use has given the yard the stamp of a functional everyday environment. Nowadays, with straight accesses from the courtyard, we find in Nelikulma also two common saunas, a laundry, a wood workshop, areas for kids to play, grilling etc. Lindqvist (2003) points out that international connections played an important role in embracing these ideals of new types of community in Finland. The courtyard creates a possibility of encounters that play a key role in the system. The social phenomena of the construction of Nelikulma in the early 1920s included the development of a market economy, the modernization of society, industrialization, migration, and the social housing production that followed the growth of the city.

Figure 4. Nelikulma.
Photo of the courtyard.
Photo by the author.



With such a high number of inhabitants passing almost every day through the courtyard on their way to and from home, the possibility of encounters is extremely high. Following the example of the Roman peristyle, which was more a

space for the household's everyday life, for example for teaching, maintenance etc., in Nelikulma's courtyard take place various activities, spacing from the fixation of furniture to the maintenance of bikes, from grilling to seeing kids playing, from reading a book to relaxing with a glass of wine. The fact that the courtyard is in such frequent use made possible to have a higher level of security and social control than the case in which staircases are accessible directly from the street and the courtyard remains a backyard. Moreover, every apartment has at least one window facing the courtyard, which assures a continuous visual connection between what happens in the home and outside, from private to public.

Nelikulma's courtyards is approximately 25x62 meters, and its depth is related to the peristyle in Casa del Labirinto (Pompeii VI,11,8-10). Here, again, the physical aspect is also important: there is little distance between spaces, which means spatial proximity, frequent interaction and intimacy. Intimacy plays a particular role, since it destroys social distances. Distinction between interior and exterior space is minimized. The undefined border between inside and outside encourages strangers to cross it, while vestibules, corridors, passageways protect the building from the access of strangers.

Kone ja Silta block

Kone ja Silta block was built in 1917-1929 only 100 meter from Nelikulma. The block was commissioned by the company Kone ja Silta Oy. The company got so many commissions of war necessities from Russia during 1914-1917, that it needed more long-term workers. The design of the block was commissioned to Armas Lindgren and Bertel Liljeqvist. Only a quarter of the block was built according to the original plan. In fact, the commissions from Russia drastically vanished after the Finnish independence of 1917, and the company did not anymore need so many apartments. The rest of the block has been completed later, in 1929, according to a plan for social housing by the city of Helsinki. Armas Lindgren was the leading architect until the completion of the block, and he modified the original plans according to the changed needs.

Being Kone ja Silta the first huge courtyard block planned, it opened the way to a new approach for the urban plan of Vallila. As a result, other perimeter blocks were planned and built immediately later, like Nelikulma in 1923 and Euranlinna, by Martti Välikangas, in 1926. The original project with four entrances to the courtyard (Figure 5) distributed symmetrically in the center of each side was followed in only one quarter of the building. The rest of the building, completed later by the municipality, follows a different logic, less majestic and more "functional", with two small entrances on each facade. The complex therefore now boasts a total of six entrance gate to the courtyard and 25 stairways (instead of the original 28) only accessible from the courtyard, like in Nelikulma. In the 1950s, the building counted there more than 180 apartments. Nowadays, the building stands on three separate plots, managed by two housing management companies.

As said before, the perimeter block was planned in an area that, at the time, was characterized by an urban plan based on small wooden houses. The authorities gave the permission to build such an exceptional building and get rid of the previous urban plan, only if it could be sure that it did not shadow the neighbour buildings. Therefore, a stripe of 4 meters was left free, green with

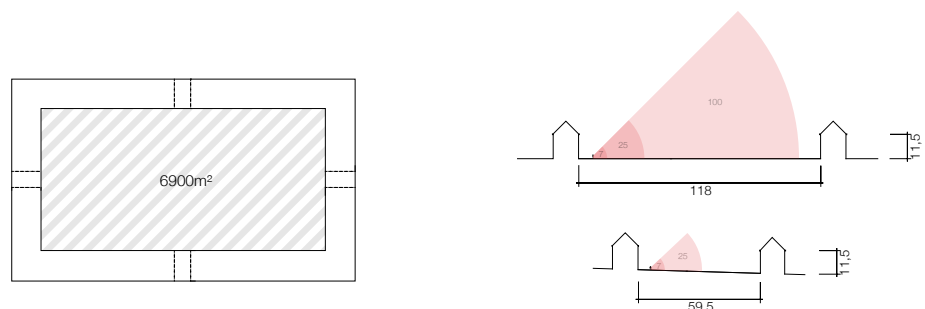


Figure 5. Kone & Silta.

Floor plan and sections. The floor plan represent the original plan with four accesses to the courtyard. Drawing by the author.

bushes or small trees, all around the exterior perimeter of the building. This is a huge difference from Nelikulma and the other perimeter blocks, with the building mass standing on the plot line, giving the building a more urban character.

The other exceptional aspect is the courtyard: due to its size, it acquires more the function of an urban park than a closed courtyard. The landscape plan for the vast 59,5 x 118 meter courtyard (Figure 6) formed inside the block was made by Elisabeth Koch, in collaboration with Lindegren, applying e.g. English garden design ideas to Finland. To give a reference in scale, the courtyard has the size of the playing field of the Helsinki Olympic Stadium. The two small buildings which, according to the project by Lindgren and Liljeqvist of 1916, were to be located symmetrically in middle of the courtyard and have common functions such as laundry, ironing room, sauna, library, reading room, timber warehouse etc., were never built. These two small buildings could be still a memory of the building dividing the two courtyards in the Finnish Southern Ostrobothnian tradition.

Nowadays, within three lots and two separate administrations it is more

Figure 6. Kone & Silta.
Photo of the courtyard.
Photo by the author.



complicated to carry out common functions accessible from the courtyard at the disposal of the entire complex. Fortunately, through agreements, at least the courtyard was kept united and without fences, and it houses a children's playground open to the community during the day. The rest of the courtyard is used as a tree-lined lawn and can be used freely by the inhabitants of the building.

The intimate atmosphere of Nelikulma and Sompasaari leave space here for the greenery of an urban park that one would not say is contained in a building. The certainty of being in a protected environment only occurs when entering the courtyard, which is closed by gates. One could say that Kone ja Silta represents the transitional piece of Vallila changing from a small houses area to a dense urban plan based on perimeter blocks, the final passage from countryside to city.

Sompasaari block

The first perimeter block of the island of Sompasaari, designed by Anttinen Oiva Architects and completed in 2021 (Figure 7), is formed by a building mass of 4-5 storeys on a parking deck. The Sompasaari perimeter block is one of the finest contemporary Finnish examples of a dense building developed around a central courtyard. The courtyard, accessible only by a very small side opening from one of the secondary corners of the building - in the main corner there is in fact a restaurant that overlooks a small pitch formed by the angular concave shape - is very bright and of intimate proportions. The quantity of natural light is guaranteed by the modest height of the mass, with its highest parts, small towers, located in three of its four corners. The courtyard, about 35 x 50 meters in size, is surrounded by a building mass about 13 meters high, with a relationship with the courtyard of 1/3 on the short side and 1/4 on the long side. This means that the observer, the user of the courtyard still sees a nice big slice of sky, also thanks to the absence of consistent trees, both for the novelty of the building and because it is located above a deck containing the parking lots and therefore there is no room for large trees to grow. All seven stairwells are also accessible from the courtyard. This would potentially make the courtyard a place of enjoyment and meeting, were it not for the fact that the city of Helsinki requires that all the stairs must have an entrance also from the street. So, in total, the stairs are accessible from three different places: the street, the parking under the deck, the courtyard. This creates a dispersion of flows and makes it difficult for the inhabitants of the building to meet casually in other places except of the stairwell. Of course, there are meetings in the courtyard, but its users all have a specific reason for being in the courtyard and they do not go there by chance.

The functions directly accessible from the courtyard, are a couple of storages for outdoor equipment and the garbage room. On the sixth and thirteenth floors there are two saunas and a club room, which can be reached via two stairwells. Potentially, therefore, the courtyard would serve as a passageway, but for this we must consider who really uses these spaces and how often. Most of the apartments have their own sauna, so those who live there do not use the common saunas, and those who use the common saunas stay on the roof and do not go down to the courtyard. The outdoor equipment storages are used by families with children, who in any case use the courtyard. Storages can also be found in every stairwell on the street level. The laundry room is relatively used, considering that many have their own washing machine in the house. A big problem with this courtyard, that can be easily solved, though, is that it is not closed by a gate. This undermines the equilibrium in the level of openness of the household, because the constant crossing of the threshold by strangers will tend to undermine household identity. Roman houses show that this was possible even in very little distances (Grahame 2000).

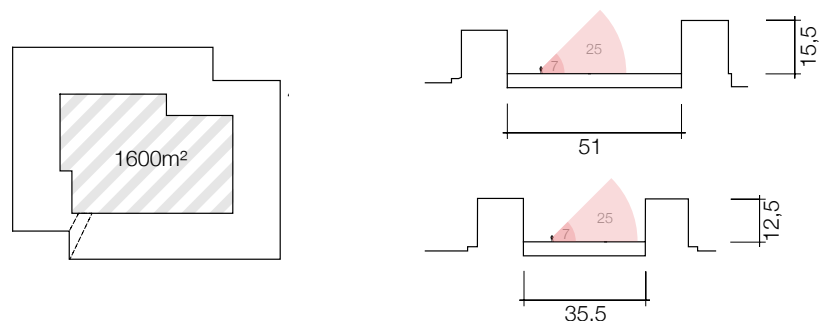


Figure 7. Sompasaari.
Floor plan and sections.
Drawing by the author.

Figure 8. Sompassaari.
Photo of the courtyard.
Photo by the author.

The courtyard is mainly equipped with small green areas and games for children (Figure 8), surrounded by a brick walkway with benches. Beyond to the path there are the terraces of the ground floor apartments, which overlook almost the entire edge of the courtyard. One can easily imagine that the combination of sitting on a bench adjacent to a private terrace is not the best possible. There is no filter between public and private, the observer in the courtyard is at the same height as those who live on the ground floor, even giving an excessive intimacy to the courtyard itself.



Design tools for new perimeter blocks

As can be seen from the case of Sompassaari, the very idea of building a perimeter block with a courtyard comes first of all from the urban planning unit of the municipality, in this case of Helsinki. The urban plan defines the size of the building, height, functions, and also whether the accesses must be from the street or the courtyard. The physical and social potential of the courtyard, in this case, is partly unused. In fact, when the urban plan gives the freedom to choose between normal and courtyard solutions, in most of the cases the choice goes to a normal apartment building with a front and a back yard. This happens for several reasons. First, the staircase must be economically efficient: an elevator must serve as many apartments as possible, which causes long central corridors and high apartment depth. Second, there are fire regulations: if an apartment faces only the courtyard (which often happens nowadays, when the apartments are in both sides of the central corridor), the fire brigade must come into the

courtyard with the fire truck, which not only means that the courtyard cannot be closed in all its perimeter (or it must have a huge gate), but also that the yard becomes eventually an asphalt field. The third issue is the property management and the necessity of building a house in phases.

In this chapter I define some useful tools, or, in other words, some aspects to pay attention to when there is the occasion to design a multistorey building around a courtyard, such as proportions, functions, accesses. Even if this study is only a minor step compared to what Vitruvius did with this tractate, it is still useful to take it as a methodological inspiration: Vitruvius, in his tractate *De Architectura*, (30-15 BC) looking at what was the “normal” architecture of his time, tried to find a general rule of “goodness” of architecture and to summon design principles. His principles have been followed by architects for hundreds of years, culminating in the beauty of Renaissance architecture. Would it be possible to do like Vitruvius and define design principles and tools in order to make the courtyard return to our cities, in a contemporary scale and form?

If the courtyard is too large there will be more dispersion and people will not meet easily. It can already be compared to an urban space such as a square or a street.

Proportions and people’s perception of space

Based on anthropologist Edward T. Hall’s research, Gehl (2001) says that very little happens at distances from 100 to 25 meters, and it is only from 7 to zero meters that all the senses can be used. He states that the limit of the ‘social field of vision’ is 100 meters, and this limit is extremely important in an urban planning context.

Here I apply the theories of Edward T Hall and Gehl to inspire the plan size of the courtyards. As previously said, the 25 meter limit is important and almost fundamental to define the nature of the courtyard itself. 25 meters is also the maximum size of the peristyle of the House of the Labyrinth in Pompeii, including the colonnade. If what happens beyond 25 meters is perceived as distant, being able only to hear voices and see people moving, but not being able to see their emotions, we could say that if two people are in the same courtyard but more than 25 meters apart, then they could think that they are in their own tranquility. If I want to talk to that person, I approach her/him, and she/he will understand my action. It is therefore important that, in the courtyards of the perimeter blocks, there is a sense of community but also the possibility of being alone is guaranteed, so there must be more than 25 meters from the other person at least in one direction. This occurs in all three courtyards examined. Instead, how do you keep the courtyard semblance of intimacy and keep it from being too large or distracting? Let us return to Gehl and Hall. At 35 meters you can speak aloud to someone, while between 50 and 70 meters you can hear a person screaming for help, understand their gender and age, hair color and so on. The courtyards of Sompassaari and Nelikulma lie within these limits. But what happens after 70 meters? Only movement can be perceived. No emotions are perceived, it is not clear whether the person is a stranger or a family member.

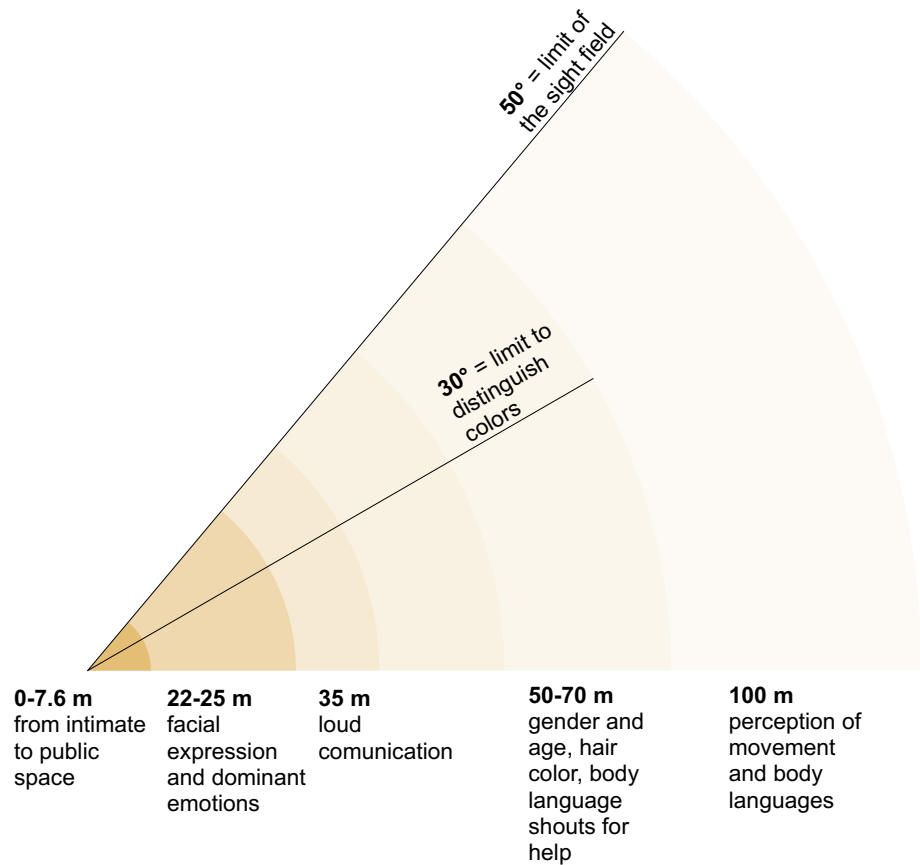
Could we therefore say that the maximum limit to feel at home in a courtyard is between 50 and 70 meters? Considering now the case of Kone ja Silta, its courtyard measures 59.5 x 118 meters, which is the size of an international football field. Thanks also to the large trees and greenery, this therefore offers various possibilities to be alone and not be disturbed, to the point of acquiring more the value of an urban park than a private courtyard. In fact it is also used as a place for a trip or pick nick.

In other words, in order to promote intimacy and proximity the dimension of the courtyard plays a key role. If the courtyard is too large there will be more dispersion and people will not meet easily. A space that is too vast can already be compared to an urban space such as a square or a street. The courtyard must be small enough, the reference scale must always be the human person.

“Nevertheless, the small size of most single courtyard houses would have helped reconcile this conflict by promoting intimacy. Furthermore, the constant interaction generated by the courtyard would have undermined individual social positions by promoting negotiation. For these reasons, we might suspect that in the single courtyard houses, collective identity took precedence over individual identity.” (Grahame 2000, 75-76).

To define the height of the building surrounding the courtyard, let’s take into consideration the visual cone of the human eye, which extends upwards up to 50° (mid peripheral) and is capable of distinguishing colors up to 30° (near peripheral). Measured from the entry point to the courtyard (Figure 10), if there is an angle of sky between 30° and 50°, then you will have a sense of security, you know where you are, because the eye is able to have -vertically- everything under control with a glance, and at the same time this means that the courtyard will be airy and bright. In this case the height of the building will not exceed 3/5 of the width of the courtyard. For example, by interpolating the 25 meters of Gehl, limit under which you perceive dominant facial characters and emotions, you will have a maximum height of 15 meters, which coincides precisely with the optimal value

Figure 9. Vertical visual field and social field of vision.
 The anatomic vertical visual field, combined with Gehl’s social field of vision, gives the basis for the dimensioning of the courtyard.
 Drawing by the author.



of 4-5 floors, which David Sim himself (Sim 2009), speaking of Copenhagen courtyards, defines as a boundary for the walk-up distance.

This proportion is taken to extremes in the case of Nelikulma, while in Sompassaari and Kone & Silta it is abundantly verified (Figure 9-12). This means that, in these last two cases, 1-2 more floors could be added to the building without compromising the quality of the courtyard. Interestingly, Vitruvius writes that the height of the atrium - the first room a guest sees when entering a Roman house - must be 3/4 of its width (Vitruvius, De Architectura, 6.3.4). This means a viewing angle of 36.87 °, which coincides exactly with the ridge of Nelikulma’s roof.

Figure 10. Vertical visual field and social field of vision.

Fig.9 combined with the short sections of case studies takes

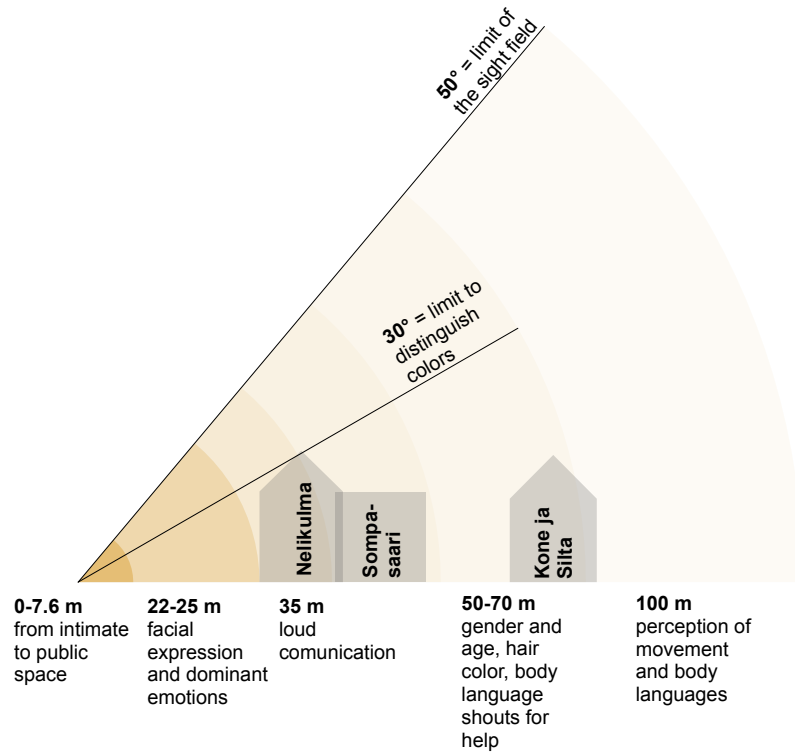


Figure 11. Vertical visual field and social field of vision.

Fig.9 combined with the long sections of case studies takes

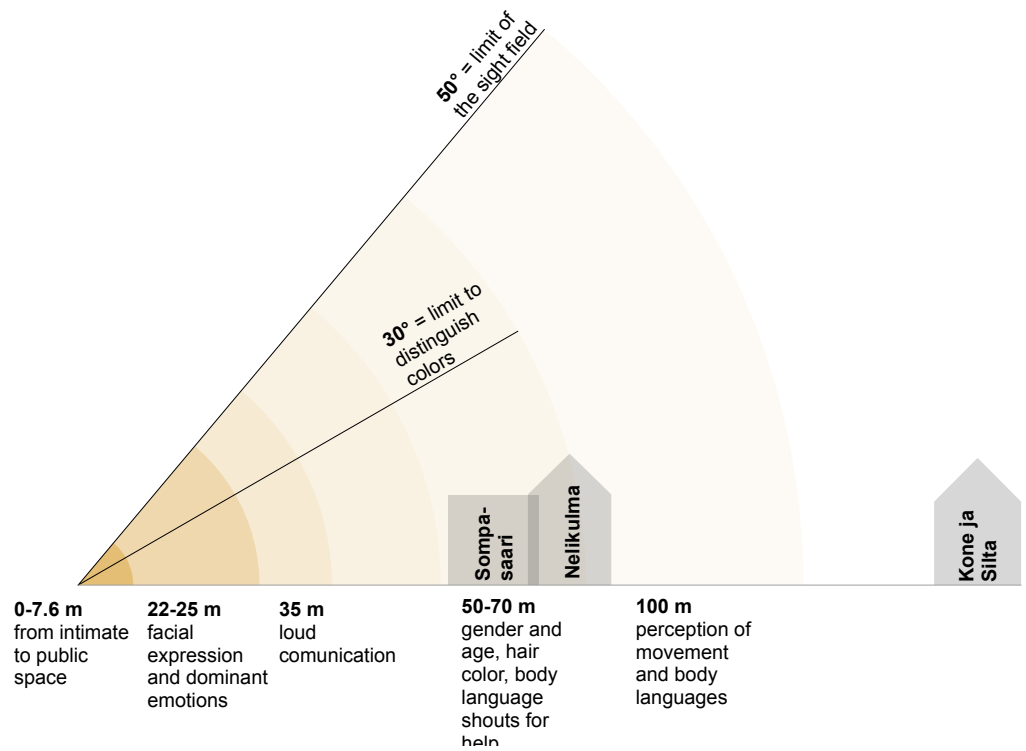


Figure 12. View from the entrance of Nelikulma's courtyard.

The slice of sky visible above the roof is right over the 30° visual cone limit. Photo by the author.



Functions and daylight

From a methodological point of view, Jan Gehl and David Sim made an important step forward in the urban context of Copenhagen, where, like in Helsinki, historically, the courtyards were hard surfaces with smaller outbuildings - toilets, wash houses, storerooms, workshops - rather than green spaces and gardens. They understood the quality of courtyards in living urban environments and worked on a successful renovation and functionalization program of old yards in Copenhagen to take them back into people's lives as an active quality within the build city. For example, when most of the accesses to common functions such as laundry, sauna, shared party room, are accessible and overlook directly and only on the courtyard, the reasons that each inhabitant will have for using the courtyard will be greater than those they will have to go out into the street.

When we talk about closed courtyard in Nordic latitudes, the aspect of sunlight has to be carefully considered. The daylight should affect not only the dimension of the courtyard, but also the placement of the outdoor functions as well as common uses with direct access to it. According to the study of daylight in perimeter blocks conducted by Sundborg, Szybinska and Arbab, it is impossible to create satisfactory daylight conditions during the whole day in dense settlements. Therefore, in Oslo/Stockholm/Helsinki latitude, the period starting from the 1st of May – when people start sitting outdoor – to the 11th of

August is the one that should be considered during studies of sunlight in outdoor spaces (Sundborg, Szybinska, Arbab 2019).

Priorities between outdoor and indoor spaces as well as which part of the day and the year have to be resolved. Since in most Nordic cities the outdoor temperature is most of the time not enough to create comfort ($>20^{\circ}\text{C}$), the study of the sunlight, where are the sunny spots in the courtyard, has to be carefully conducted. Facilities for having breakfast outdoor should be placed in the side where morning sun is shining, while grilling stations and children playground should enjoy the longest possible period of sunlight from noon to the evening. This aspect affects directly also the functions to be placed around the courtyard but indoor. The workshop requires physical work, it should be in the shadow side in order not to be overheated, while saunas and club room want the evening sun.

Unplanned encounters are one of the most valuable features that houses developed around a courtyard could provide

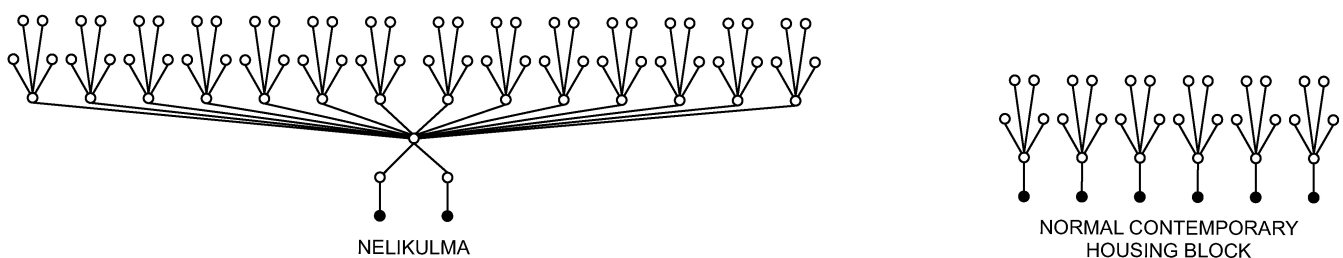
Accesses, fluxes and social enclosure

Every decision, for example, on where to place the access has gigantic effects on the creation of communities. In fact, when we are inside the courtyard, we perceive its meaning from another point of view. It has the power to encourage encounters: "In slightly larger houses, where there was space for a courtyard, the pattern of interaction was much more centralized, with encounters habitually directed towards the courtyard." (Grahame 2000, 4). Grahame argues that if in the houses without courtyard household and individual identities are weak and their inhabitants lacked a developed sense of community, in the houses with one courtyard people demonstrate a clear sense of belonging to a particular household and a definite sense of their own place within it.

When Hillier and Hanson say that for them the household is a 'sociogram', they refer not of a family but of something much more: a social system (Hillier and Hanson 1984). In Pompeii and Herculaneum the houses were primary cells living their own life inside the 'carrier' (the city). Physical barriers delimiting public and public from private were mostly undefined, there were just symbolic barriers around the entrance door, and in many Roman domus, one could even see through many thresholds without entering the house, while the limit was expressed by unwritten social rules and conventions.

At the same time, unplanned encounters are one of the most valuable features that houses developed around a courtyard could provide. In order to prove this, I applied the Hillier and Hanson's space syntax analysis to Nelikulma and an ordinary contemporary housing block, in which each stairway's entrance is from the street (Figure 13).

Figure 13. Convex map.
Space syntax analysis on, Nelikulma and a normal contemporary housing block.
Drawing by the author



This graphic clearly shows that without a central space where everyone must pass through, there is very little possibility of meeting people for coincidence.

Spaces that offer a higher rate of unplanned encounter are integrated spaces (for example courtyards), while segregated spaces offer a higher rate of privacy (for example cubicles or bedrooms of apartments). Built spaces are not only the mirror of the society in which they have been shaped, but they actively direct activities and social relations.

“Random encounters and awareness of others may be a vital motor of social systems at some, or even all levels. Whatever the case, there seems no doubt that this basic, unstructured awareness of others is powerfully influenced by architectural form, and that this must be a major factor in design.” (Hillier & Hanson 1984, 25)

It is therefore important that, in the courtyards of the perimeter blocks, there is a sense of community but also the possibility of being alone is guaranteed

This concept spaces also to the field of social support: physical proximity to other living units, doorway orientation to high-use pathways and interaction nodes (e.g. mailboxes) affect social interaction patterns. (Festinger, Schacter & Back 1950). Porches, balconies, outdoor gardens, terraces and patios increase visual exposure and access to neighbors and thus elevate social contact. Moreover, closed and safe courtyards could provide to children spaces for playing and therefore help parenting. Many research (Stewart 1970, Bartlett 1998, Huttenmoser 1995, Kaplan & Kaplan 1989, Wells 2000, Wells & Ewans 2003) proved that inaccessibility to outdoor play was an important contributor to a preschool-child's distress, strain relations with parents, fewer playmates, poorer emotional development, poor cognitive functioning or psychological well-being. Courtyard works also into the sphere of control. By providing transitional spaces from public to private areas can reduce residents' feeling of isolation and their fear of public spaces (Yancey 1971). Variation in depth is important, as children, the elderly, may be especially sensitive to scale and size.

Conclusions

We will be able to switch our way of designing from back yards to courtyards, from building ordinances to good and humane design, from houses as machines to the contemporary domus.

Even if there are still many open questions before we arrive to define very precise and clear design tools for perimeter blocks and courtyard houses, and considering that every site and plot are different and must be studied case by case, this study helps to define general principles. Next steps of this study are to develop a precise calculation system that permits to estimate the possibility and amount of unplanned encounters by positioning accesses in the courtyard, with the possibility of comparing what happens, in the planning phase, if accesses are many, in different side of the building or for example to the street. Also a deeper analysis of the social field of vision and the perception of space would be needed, with the help of professionals from the specific field.

In this study, we saw that If the courtyard is not only used for leisure but it is also used for circulation, the potential of having unplanned encounters increases. For this reason, common spaces and apartments should be directly accessible from the courtyard. For having more extensive use of the courtyard space, common functions and outside activities should take place in the sunniest spots. The dimension of the courtyard should be calculated interpolating the principles of the social field of vision, the study of sunlight and the perception of space.

Again, for us, the courtyard means something more. It is the key element where the public space of the city can expand into the house, and at the same time protects the privacy and intimacy of more secluded space from the outside world, assuming the role of a buffer, a filter. Moreover, the courtyards make the buildings acquire an active role in the city by welcoming semi-public functions that would otherwise be carried out in places outside the building. There is a fine analogy with Zanker's opinion that architectural forms and decorative elements seemed to serve the same purpose, namely to support their owners in striving for the illusion of inhabiting a villa, and thus suggesting a fairly lavish lifestyle. This describes in an interesting way one purpose of the courtyard and how is seen from the outside. The passer-by, Roman or contemporary, feels a kind of positive jealousy that awakens his interest and makes him understand that beyond that door there is a world of its own.

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