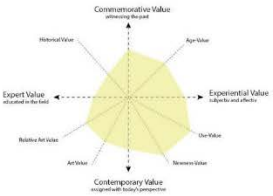
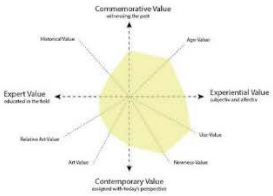
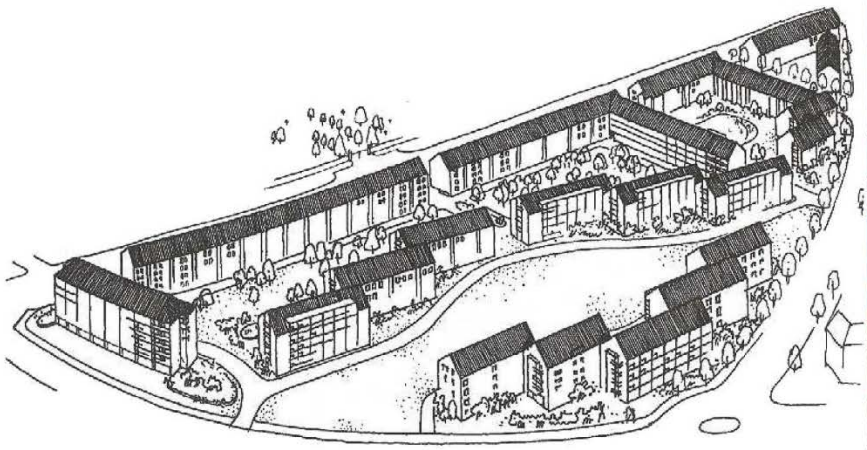
The renovation of residential housing developments from Danish modernism




Master Thesis

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CONTENTS

MOTIVATION

This report elaborates on the renovation of residential housing development from Danish modernism built from the 1930s to the late 1950s. The period represents a significant moment in the history of Danish architecture. Modernist ideas gained ground in the housing sector and secured attractive and healthy living conditions for Danish working- and middle-class people. The most renowned architects were employed in order to establish the new residential houses. The result was a unique, high-quality architecture with a significant architectural and cultural-historic value.

Today, sixty to ninety years after construction, most of these buildings require fundamental renovations in order to adapt to modern demands and maintain attractive and healthy living conditions. Many buildings exhibit severe problems with eroded building components, outdated installations, moisture ingress, mould formation and high energy consumption. Outdated floorplans have to be modernized in order to attract residents from different social backgrounds. New additions might be needed in order to adapt to the changed circumstances and to increase the attractivity of the development. Such profound interventions can easily destroy the architectural and cultural-historic values of the buildings, since the modernist architecture - with its sober expression and fine detailing - is particularly vulnerable to unqualified changes.

A considerate planning and a good understanding of the values at risk is therefore crucial for a successful renovation project. The present report tries to enhance this understanding by various means. The report offers a brief theoretical background that points out the original concepts and intentions of modernist architecture and then tries to open the discussion towards suitable heritage assessment and possible conservation strategies. While the analysis of recent renovation projects introduces a methodology to analyse, evaluate and reflect on implemented solutions, the final design project sets the focus on the possibilities that new additions can offer to the modernist developments.

It is hoped that the theoretical, empirical and practical content of this report can assist and inspire the reader in future renovation projects. Many references of the presented report are originally written in Danish. The report can thus also be valuable for the English reader, who cannot access the original sources.

The presented report is the outcome of a master thesis project that was supervised and examined at the School of Architecture of Lund University. At the same time, the work was co-supervised from the Department of Architecture and Integrated Design at Rambøll in Copenhagen. The input and guidance from both, academia and industry, was a very interesting and fruitful combination. However, the different perspectives and interests also implied a certain distinction in the desired outcome of the work. This is reflected in the formulation of two separate study tasks, Task 1 and Task 2. Although the two study tasks investigate two different aspects of the renovation and modernisation of modernist housing developments, the employed knowledge and the findings of the studies are firmly connected and complement each other.

Task 1 analyses and evaluates the renovation of *existing buildings*. This investigation was of particular interest for Rambøll, who recently conducted two major renovations of residential housing developments from Danish modernism. The task was to investigate how those renovations affect the cultural heritage values and what can be learned for future renovation projects. The analysed renovation projects focus on improvements on a building and detail level, while possible improvements on a building composition level and urban scale were not much considered.

Task 2 then comprises a design project that elaborates on the potentials of *new additions*. Although the study task deals with the specific problem of two new additions for the housing development of Bispeparken, the proposal tackles various typical challenges that are generally connected with housing developments of the considered time. Apart from providing new and varied apartments for the development, the proposal also demonstrates how wisely planned additions can achieve decisive improvements on a building composition level and urban scale as well. Task 2 thus detaches from the specific renovation projects of Rambøll and their focus on the renovation of existing buildings. Instead, the task elaborates on the possibilities that new buildings can offer to a modernist housing development and formulates a project that allows the student to investigate and develop suitable solutions in a creative design process.

The report commences by a theoretical background that is equally important for both study tasks. A brief introduction to Danish modernism and the subsequent focus on residential housing developments built between the 1930s and late 1950s presents typical characteristics and ideas of the modernist architecture and thereby educates the reader in their specific architectural and culture-historical values. The report continues by discussing typical renovation tasks of modernist housing developments, approximately sixty to ninety years after their construction. The chapter presents typical challenges on three different levels of scale and includes suggestions for both, the renovation of existing buildings and the possible improvements by new additions. In order to provide the renovation architect with guidance on how the various renovation tasks can influence our cultural heritage, the subsequent chapter deals with the important question of how to assess and maintain heritage. The discussion presents the most important developments within the international heritage discourse and explains their influences on the official practice in Denmark. Important insights for suitable solutions are given for both, the design of new additions and the renovation within the built context. An introduction to the concepts of New Heritage and authenticity widens the discussion for suitable interventions. While the concept of New Heritage strengthens the objective to create use-value, the discourse on authenticity elaborates on a suitable design for new components which intend to reflect the *original spirit* of the modernist architect.

Task 1 then analyses recent renovation projects of residential housing developments from Danish modernism. The investigation begins with a short summary of previously conducted analysis by Gudmand-Høyer [GuHø18] and applies a similar evaluation approach for the renovations of Lundevænget and Tingbjerg; two housing developments from the 1930s and 1950s which were recently renovated under the consultancy of Rambøll. The analysis help to reflect on the chosen renovation approaches and help to assess their impact on the various heritage values. The employed evaluation scheme can also be utilized for future renovation projects, since the scheme helps to discuss and agree on a suitable renovation strategy for the planned interventions.

Task 2 comprises a design project that suggests two additions for the residential housing development of Bispeparken. The additions tackle various challenges discussed in the theoretical background of the report. On a building level, the additions provide variously sized apartments, modern floorplan layouts, elevator accessibility and generous communal spaces. On a building composition level, they contribute to a better zoning of outdoor spaces, an increased attractivity of the development and a general activation of the urban surrounding. The proposed solution thus demonstrates how new additions can improve a modernist housing development on various scales while minimizing the conflicts with existing fabric and the possible destruction of built heritage.

DANISH MODERNISM

This chapter serves as a brief introduction to the modernist movement in Denmark. It starts with a short presentation of the historical context and circumstances from which the movement emerged and then introduces into its general concepts and particularities. The given information helps to develop a sensitivity towards the architectural and culture-historical values of the considered architecture and provides a useful introduction to the more specific presentation of residential housing developments from Danish modernism in the subsequent chapter.

CONTEXT

Today, large parts of the inner city of Copenhagen are still defined by the classicistic developments that started after the Copenhagen Fire of 1795. It was under city architect J.H. Rawert when the streets of Copenhagen were re-built as 'architecturally excellent residential milieus in perfect accord with Danish mentality' [Fab78, p.94]. Both, streets and houses, were planned in a scale that is still much appreciated today. The residential buildings were planned in the so-called Harsdorff style that originated from the Harsdorff mansion at Kongens Nytorv (Figure 1). Following the strict classicistic guidelines of architects like Harsdorff, Rawert and C.F. Hansen, Copenhagen gained an 'extra-ordinarily harmonious classicist stamp' until the 1830s [Fabe78, p.113].

For the less moneyed citizens of Copenhagen, living conditions became increasingly worse towards the 1850s. With an advancing industrialization, the city grew rapidly and living space within the fortification walls became limited. As a result, additional floors were added to existing buildings and backyards were densified with workshops and miserable, tiny dwellings [Fab78, p.118]. The declining housing conditions (Figure 2) became obvious during the devastating cholera outbreak of 1853, but finally increased the efforts to improve the housing situation in Copenhagen. An important decision in this process was to allow an extension of the city towards the west and give up the western fortification line. The ramparts were demolished in the 1860s.

The new housing developments towards the emerging suburbs of Østerbro, Nørrebro and Vesterbro were mainly driven by local builders and not architects. Industrialized building products and prefabricated elements became available and were integrated after individual taste and ability of the builders. It was the time when the strict guidelines of classicism were increasingly diluted, and inspiration was drawn from various historical references. A diverse mix of historical styles, even within one single building, was typical for this epoch of historicism. Many building projects were accused to be of poor quality, both in materiality, craftmanship and design composition [Fab78, p.130]. The private builders were also accused to be most interested in the representative appearance of the building towards the street, while not bothering much about the living conditions of the tenants behind the pretty facade. The rather uncoordinated building activities took place without much control of the public, and the results in terms of a healthy city development with improved living conditions were disappointing.

With the beginning of the 20th century, city planning and new housing developments should be brought under public control again. In 1912, the Workers' Co-operative Building Society (AAB) was founded as

the first social housing organization in Denmark, following the aim to establish affordable housing for working class people. In 1922, a Government Housing Fund was established and turned the municipality of Copenhagen into a large building promoter itself. The municipality bought large amounts of building ground at the city's periphery, where they could implement guidelines for maximum building heights and footprint areas in order to restrict the exploitation by private investors.

At the same time, leading Danish architects began to rebel against the uncoordinated mix of styles during historicism. They strived for simplification with pure forms and clear rhythm. Once again, they found inspiration in the past and the classical forms of antiquity. The emerging neo-classicism still employed classical forms and proportions, but avoided any unnecessary ornaments. While decoration was reduced and the building volume simplified, an increased emphasis was put on accentuated materiality, fine detailing and advanced craftmanship. The simplified forms - with a strict rhythm and repetition - fitted well to the increased demand on affordable housing solutions, and several significant state-aided housing projects were realized in the neo-classical style. The most prominent example might be the Hornbækhus (1922-23) in Copenhagen by architect Kay Fisker (Figure 3).

Although the neo-classicist movement showed a certain emphasis on rational solutions and the intention to create affordable housing with improved living standards, the housing projects encountered a growing criticism from the more progressive currents of international functionalism. Similar to all preceding periods, the architectural qualities of the buildings were still heavily determined by the appearance and proportions of the outside. The planning of the inside was secondary. The facades did not adapt to any of the inside functionalities. Architect Thorkild Henningsen wrote in the Kritisk Revy that neo-classicism would 'terrorize the city with houses in which toilet windows, living room windows and entrance doors all look the same' [Hart79, p.165].

Figure 1: On the left: Harsdorff Mansion at Kongens Nytorv (1780). On the right: Typical Harsdorff inspired residential building at Brolæggerstræde 2 (1797) built after the Copenhagen Fire, cornice decoration limited to corner windows, corners cut off in order to increase the accessibility for firefighter vehicles.

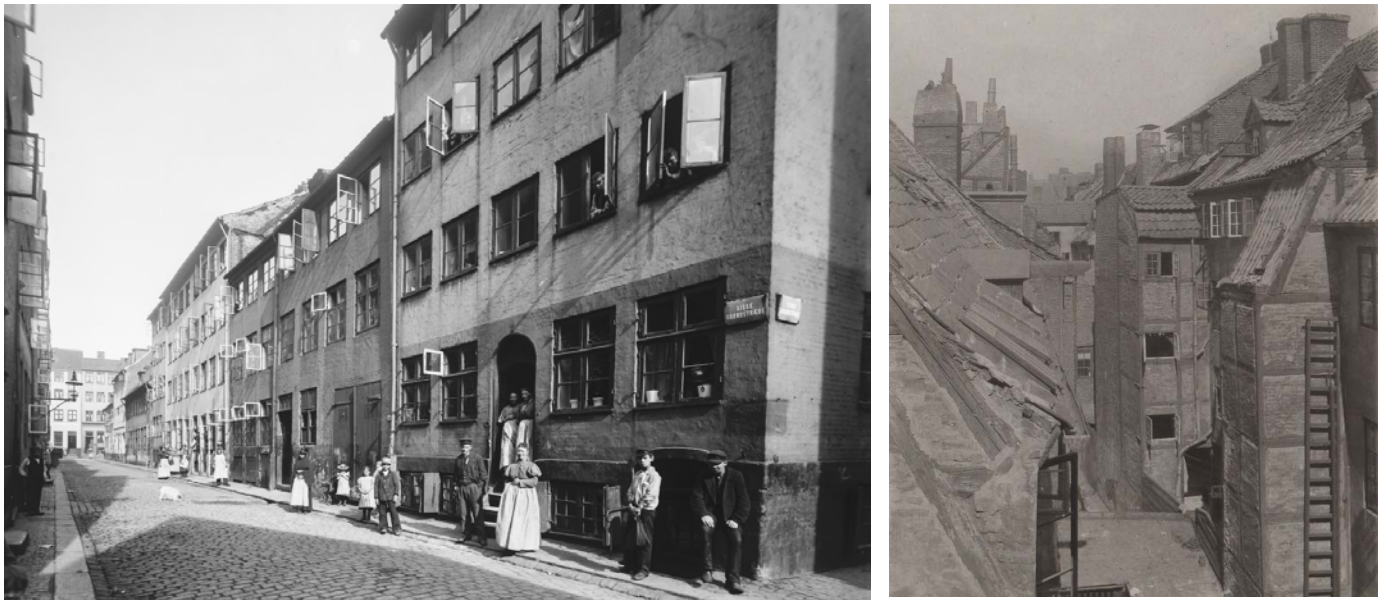


Figure 2: Living conditions in the city centre at Lille Brøndstræde towards the end of the 19th century

Figure 3. Hornbækhus by Kay Fisker (1923)

PHILOSOPHY

The beginning of the 20th century was defined by great technical advances and societal changes. The modern society with its cars, planes and new building materials like steel and reinforced concrete did not believe to find the answers to its contemporary challenges in traditional architecture and traditional building techniques. A radically new architectural language was sought to be developed, strictly based on the desired functionality and the possibilities of the novel building materials, while deliberately breaking with outdated building traditions and decorations that serve no purpose. From now on, form should follow function, and not tradition!

The housing sector was of major interest for the modernist movement. Functionalistic design was considered to provide the suitable philosophy to improve the existing living conditions significantly. While all preceding architectural styles were primarily concerned about the outer appearance of the residential building, the modernist approach put focus on the actual functionality of the apartments. New projects should be planned from the inside to the outside. The functionality of the apartment should be considered first, while the outside façade should then adapt and reflect the inner functionality. The planning included a highly democratic notion. Every apartment should provide similar living qualities to its tenants, with own bathroom and similar access to light, air and green outside areas.

With the façades adapting to the inside functionality, modernist architecture was meant to be easily readable from the outside. Windows and openings were now placed in accordance to the needs of the rooms behind and not only to comply with the rhythm of a certain historical style. Newly employed building technologies and non-carrying outer walls facilitated a rather horizontal façade expression. Horizontal strips of ribbon windows and windows stretching over corners were a common feature in modernist buildings. Balconies became a typical feature of modernist apartments as well, they complied with the goal to provide good light conditions and access to fresh air for all tenants.

AESTETICS

Modernist architecture strived for simple solutions that were based on functionality and not on historical references and ornaments. The aspired simplicity was obtained by the design of slender and delicate details and by utilizing a limited amount of carefully composed and processed materials. Emphasizing and celebrating the employed materiality became a prominent feature of a more honest architecture. The fine details and increased focus on materiality set high standards on the architectural planning and demanded highly skilled craftmanship.

The simplicity was also reflected in the clean geometrical forms of the building volumes. The strong geometries with precisely defined edges were emphasized by flat roofs or angled roofs with plane surfaces and limited roof overhang. At ground level, the buildings met their surrounding in a clearly defined line in order to maintain the strong geometrical appearance of the volumes. In addition to the rather sharp and cuboid shapes, some rounded forms - mainly inspired by modern ocean liners of the time – were introduced as well.

The era of functionalism was a heyday for architects. It was a time when everything could be designed by architects, from the building itself to the window handles, the furniture, the wallpapers and the

commodities [Brue14, p.20]. Modernist architecture employed a rich colour palette, mainly utilizing light pastel colours, but also darker wall colours. Towards the less saturated end, the palette contained colours like dark-grey, mole-grey and olive-green, towards the saturated end it contained colours like a clear light-blue, ochre-yellow and intensive red [Brue14, p.87].

It can be stated that the functionalistic revolution was not only driven by functionality, but by strong stylistic ideals as well. The 'anti-style' of functionalism became quickly a style itself [Brue14, p.18]. The slogan 'form follows function' should thus not be misunderstood as 'only function defines form'. The functionalistic ideals followed strict aesthetical rules and sought fine details of advanced craftmanship and carefully composed materials. This makes the buildings vulnerable to unqualified or unthoughtful changes.

PARTICULARITIES

In many European countries, the desire for a radical new beginning was enhanced by the devastating experiences of World War I. In Denmark, however, the modernist ideas of Bauhaus in Germany, De Stijl in Holland and Le Corbusier in France did not find the same perceivable impact [Fab78, p.167]. Denmark was not much affected by the disasters and losses of the war and did not experience the same need for revolutionary artistic change. Here, the achievements with the rationalised and non-decorative architecture of neo-classicism and the efforts of establishing a more democratic housing market with affordable prices were able to suppress the more progressive voices from abroad.

This changed significantly with the Stockholm exhibition in 1930, a housing display by the Swedish Crafts Association, which was curated by the art historian Gregor Paulsson who appointed Gunnar Asplund, a Swedish architect with a primarily neo-classicistic design language, as chief architect of the exhibition. The exhibition showed single-family and apartment houses designed by young Swedish architects utilizing new building materials and unconventional floorplans that were largely inspired by German Bauhaus and Le Corbusier. The successful exhibition had a big impact on Scandinavian architects, and even Gunnar Asplund began to free himself completely from historical influences. Architects in Denmark turned away from neo-classicism and put their full attention towards the functionalistic concepts of Le Corbusier and Bauhaus.

After Stockholm, however, certain national particularities on functionalism remained in Denmark. While the European movement was quite dogmatic with its demand to abandon everything related to the past, the functionalism in Denmark was still based on local building traditions. There was a long-lasting distrust in using reinforced concrete for critical building components. The well-known clinker bricks maintained the preferred building material for carrying wall structures. Floor slabs were still built in wood. The continuous use of traditional building materials was also supported by the shortage of steel and iron during and after the second world war. Certain concerns also existed towards flat roofs, and most modernist buildings in Denmark were built with a reliable and well-proven inclined roof construction. Those inclined roofs exhibited large, plane surfaces and a minimized overhang in order to maintain the strong geometrical expression of the building volumes.

The integration of traditional building elements led to a fertile combination of Danish craftmanship with the new ideas of functionalism. Many renowned Danish architects were involved in the planning of

modernist housing projects. The result is a unique architectural heritage, with modernist buildings of highest quality, precise architectonic form and genuine materials that age nicely [BeDa14, p.39].

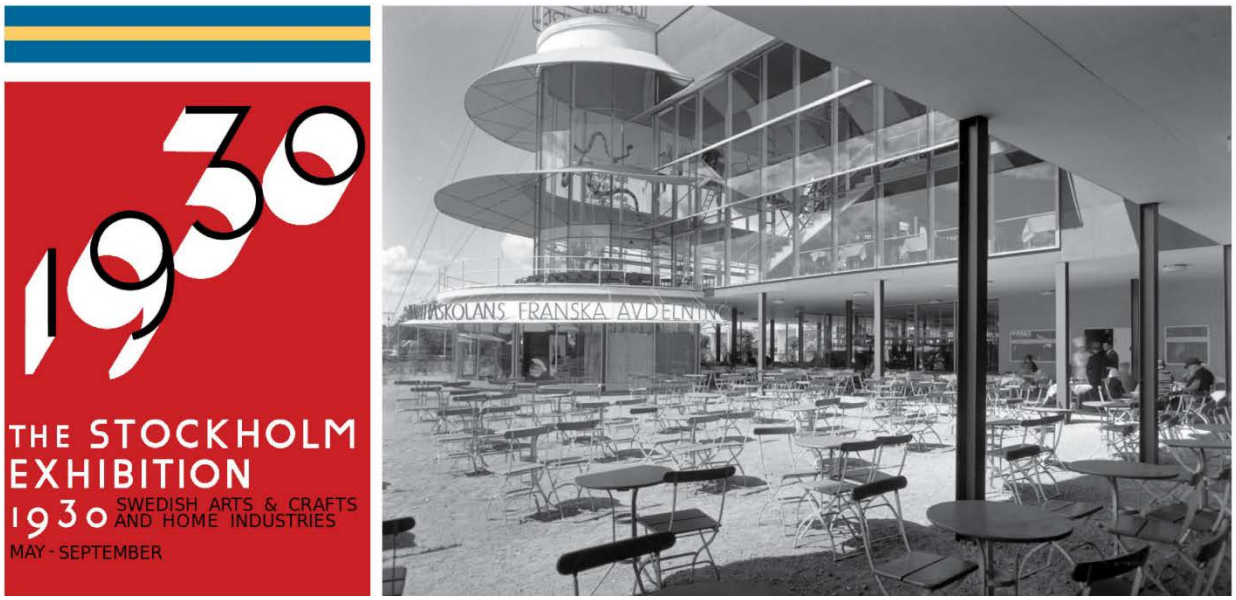


Figure 4: Stockholm Exhibition 1930, Poster and Exhibition Pavilion

Figure 5: Dronningegården (1943) by Kay Fisker and C.F. Møller, Typical example of Danish Modernism with fine brick detailing and inclined roofs

This chapter provides an overview of the most significant developments in the Danish housing sector between the 1930s and late 1950s. It includes information about the typical characteristics, intentions and achievements of the various housing developments and thereby helps to understand their inherent architectural and culture-historical values. The content of the chapter is sorted chronologically within three different levels of scale.

BUILDING COMPOSITION LEVEL

In the 1920s, efforts were made to provide residents a better access to light and green outside areas. While the backyards in the city centre were rather narrow and dark, the new housing projects at the city's periphery started to capitalize on the more spacious building grounds. Large neo-classicistic building blocks were developed around much bigger enclosed squares and provided green recreational areas for its tenants. The Hornbækhus (1922-23) at Borpus Allé by Kay Fisker (Figure 3) constitutes one of the most prominent examples. The enclosed garden area was planned by landscape architect G.N. Brandt.

With the growing success of functionalism in the 1930s, the intentions to provide better access to light and nature were further prioritized. This led to the first park layouts with buildings no longer aligned with the streets of the block perimeter but placed freely in detached parallel housing blocks. With this layout it was possible to obtain equally good light conditions and better access to the recreational park surroundings for all apartments. The first park layout in Denmark was established with the development of Blidah Park (1932-34) at Strandvejen (Figure 7). It was designed by a group of architects around Ivar Bentsen and Edvard Heiberg.

Figure 6 illustrates the evolution from the traditional enclosed square developments in the city centre, via the large square developments of neo-classicism, to the park developments of modernism.

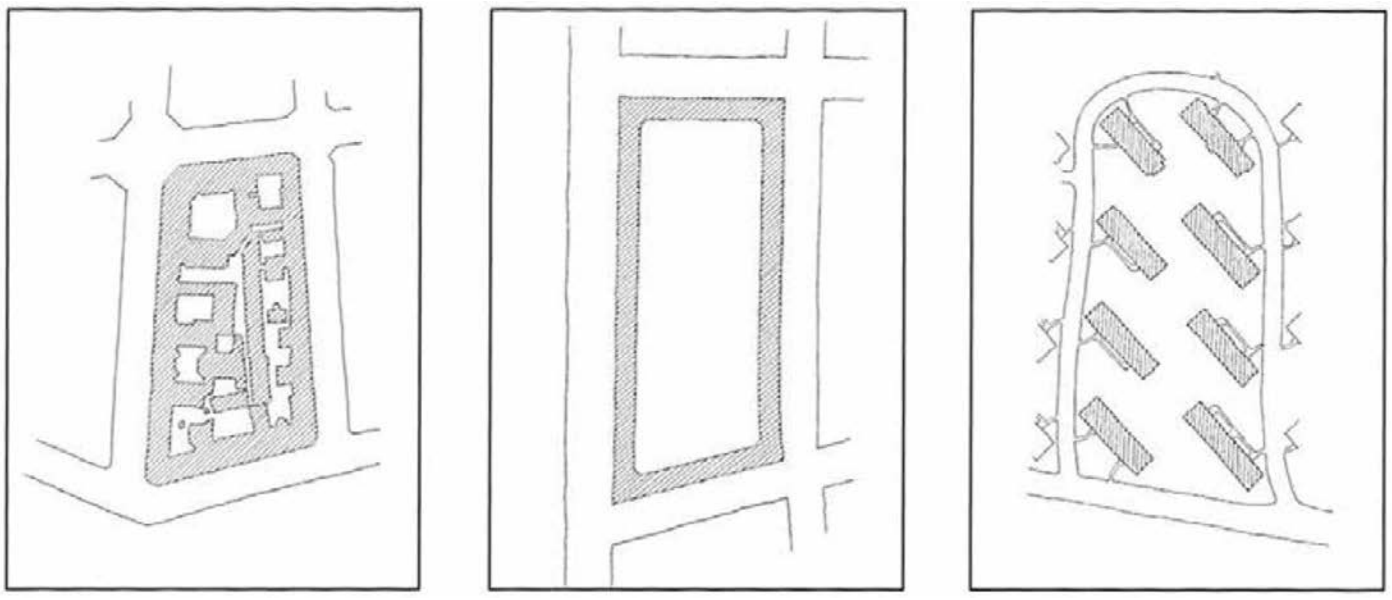


Figure 6: Evolution from traditional enclosed square developments (left), via neo-classical large square developments (middle), to modernist park layouts (right), [BeDa14]

Figure 7: Blidah Park. The first park development with detached parallel housing blocks. The rounded shapes of the blocks at the northern end of the park were inspired by modern ocean liners (Illustration by A. Skøjt-Pedersen, 1933)

Figure 8: The building layout of Blidah Park (1932-34) with its strictly parallel block orientation (left) and the building layout of Haunstrupgård (1938) with its comb structure for improved wind conditions and better defined outside areas (right)

The housing blocks of Blidah Park exhibit a strict north-south orientation and a relative displacement in order to provide the best possible light conditions for each of the apartments (Figure 8, left). Despite the improved access to light and nature, it became evident that the strict parallel block layout also implied disadvantages, such as unfavorable wind directions and the sense of discontinuous outdoor spaces [RoBe17, p.29]. In the development of Haunstrupgård (1938) a new comb structure was implemented in order to improve the wind conditions and create better defined outdoor spaces (Figure 8, right).

Towards the 1950s, the building layouts became more diverse. New housing developments were planned at the transition of city and countryside in order to increase the recreational qualities. The increased car traffic helped to further separate the work life in the city from the private life in the suburbs. Housing projects developed towards increasingly self-contained units around a small center with shopping opportunities [BeDa14, p.71]. The large housing project of Tingbjerg (1958-72) by Steen Eiler Rasmussen is a prominent example for this time (Figure 9)[1].

[1] The renovation of Tingbjerg I is described in Task 1 of this report (p.51 ff.)

The housing developments of the 1930s to 1950s were planned and perceived as a unified ensemble in close relation to the adjacent landscape. The sharply cut geometries of the building volumes and the plane grass fields of the surrounding park areas were meant to emphasize each other and form an appealing composition [BeDa14, p.119]. Landscape architect C.Th. Sørensen, who was involved in many big housing projects of the time, had a big influence on the developed qualities. He was aiming for solutions that both respect the big scales of the multi-story buildings but also the smaller scale of the residents. The chosen vegetation should promote high recreational values and include spaces for playgrounds. The design was also driven by practical thoughts. The large grass fields were supposed to be maintained more easily [BeDa14, p.39]. However, access to the grass fields was usually only possible through the few common staircases of the buildings. There was no direct access from the apartments of the ground floor [BeDa14, p.61]. Such design might have been chosen in order to maintain the strong geometrical intersection between building volumes and park, but also in order to keep the democratic spirit of the development and to not prioritize the residents of the ground floor.

Figure 9: The housing development of Tingbjerg by Steen Eiler Rasmussen (1955)

In the 1960s, the trend towards highly rationalized and economic building methods led to housing developments with strictly geometrical layouts and with no consideration or adaption to the encountered landscapes [RoBe17, p.32]. The characteristic high-rise buildings of repetitive concrete elements and heights of up to 16 storeys [RoBe17, p.56] were later accused for the deterioration of the urban environment [Fab78, p.251]. Nowadays, these developments are often seen as the deterrent example of modernist architecture and of unsuccessful city planning.

The modernist ideals of the 1930s showed a strong impact on the developed floorplans. With the intention to plan the future houses from the inside to the outside, the rooms were increasingly designed after functionality. The room layout was seeking for the most beneficial light conditions. Usually, the living room and an eventual second, smaller room were facing towards the south or west, while kitchen and sleeping room were facing towards the north or east [BeDa14, p.104]. Sleeping rooms were planned big enough to put a bed, a bedside table and a wardrobe. The kitchen was small but functional in order to provide quick access to cupboards and workspaces. Toilets turned into bathrooms. A decisive step towards an improved and healthier living standard was made by providing 90% of all newly built apartments from the 1930s with access to district heating and warm water [RoBe17, p.47].

In order to provide affordable housing for everybody, the apartments were still very compact in size. Although students of the Royal Danish Academy of Fine Arts concluded in a study of the 1930s that the aim should be to provide one room per family member [Hart79, p.176], the most common apartments continued to be a two-room apartment with small kitchen and bathroom. Towards the 1940s and 50s, the most prevalent apartments were still two- or three-room apartments, although the apartments grew successively in size to an average between 60m^2 and 100m^2 [RoBe17, p53].

The balcony became one of the most prominent features of modernist housing projects. This was motivated by two independent factors that supported each other. One reason was that the typical kitchen stairs into the backyard became increasingly obsolete after the flats were equipped with central heating and garbage chutes. Instead of a staircase to the backyard, fire regulation required the implementation of balconies as a second fire escape [Fab78, p.195]. At the same time, balconies were an appropriate tool for the architects to increase the connectivity to the outside and they developed quickly to a regular outdoor space [BeDa14, p.39].

Balconies became a dominating architectural motive of modernist housing projects. A first example of the so-called balcony architecture was the monumental Storgården (1935) at Tomsgårdsvej (Figure 10, left). The many balconies gave the façade a strong rhythm and emphasized the slight curvature of the building volume. The most influential building in terms of balcony architecture is certainly the Vestersøhus (1935-39) at Vestersøgade (Figure 10, right). The recessed balconies alternate with the projected oriels of the living room and form the so-called balcony-oriel principle that was afterwards imitated in many modernist building projects [Fab78, p.196]. Apart from an improved privacy and wind climate in the outside, the balcony-oriel principle also provided improved light conditions for the adjacent living rooms.

Despite the attached balconies, the buildings still strived for simple cubic expressions. Sometimes balconies were pulled back entirely into the building volume until the railings were aligned with the outer facade. The balconies were then read as an integrated entity of the building rather than an attached element [RoBe17, p63]. Sometimes balconies with rounded corners were utilized in order to contrast and pronounce the strong geometry of the building [BeDa14, p40].

Figure 10: Storgården (1935) by Povl Hansen and Knud Hansen (left) utilizing balconies as a dominating architectural motive

Figure 11: Vestersøhus (1935-1939) by Kay Fisker and C.F: Møller with the iconic balcony-oriel principle

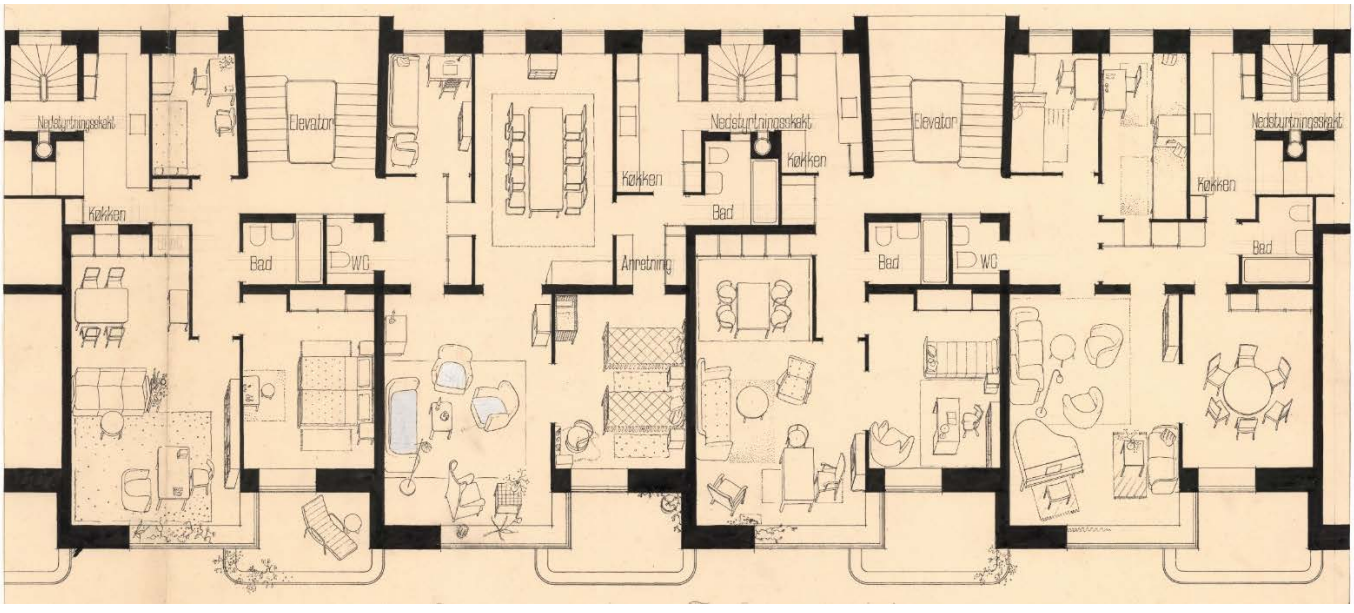


Figure 12:Floorplans of the Vestersøhus (1935-1939) by Kay Fisker and C.F. Møller demonstrating four possible setups for the apartment. Living room always oriented towards the preferred side with balcony and view to the lakes. The apartments still contained a secondary staircase next to the kitchen.

Danish functionalism was characterized by carefully constructed details with a high level of craftmanship. The aim was to obtain simple and reasonable forms by utilizing only a few selected, but robust materials [BeDa14, p.77].

Due to the prevalent scepticism towards reinforced concrete as the building material for crucial load-carrying elements, brick walls remained the most common wall structure in Denmark. While the more traditional red bricks were preferably used in areas close to the city centre, the cheaper yellow bricks were used in the suburbs. From the mid-1930s flamed bricks with more varying colour shades were used. A finer detailing was achieved by utilizing coloured wall joints or the alternation of different joint types [RoBe17, p.60]. The bricks were usually arranged in a cross bond, but other techniques were introduced for subtle decoration purposes as well. Layers of yellow and red bricks were alternated in order to emphasize openings or the horizontal orientation of the façades [Brue14, p.33]. The subtle brick details produced both a simple but also lively expression of the facades and were one of the only decorations of the buildings. At the same time, plastered brick walls were utilized to emphasize unbroken facades such as gables which frequently had no openings in order to support the strong geometrical expression of the building. Considering the housing projects constructed between 1946 and 1959, a share of 88% was built in bricks [RoBe17, p63]. In the 1930s, the outer walls were usually built with single layered brick walls. Later, the wall constructions changed gradually from a single layer built-up to a cavity wall built-up of two layers, firmly connected with a brick binder. [RoBe17, p63].

The residential buildings in Denmark mostly exhibited gable roofs covered with tiles or less inclined roofs covered with eternit. Large and unbroken roof surfaces emphasized the strong building geometry and contributed to a pleasant and calm building expression. The connection between roof and façade was accomplished in a considerate detail in order to retained the sharp geometrical expression of the building volume [BeDa14, p60]. At the gables, the roof met the façade without overhang [RoBe17, p63]. The roof substructure was still traditional and made of wood.

Floor slabs were at the beginning still made of wood, although steel beams were increasingly considered in order to support the increased loads of balconies and bathrooms. However, steel was scarce during the war and wood had to be used instead [RoBe17, p60]. Later, when the floor slabs were made of reinforced concrete, they were usually casted as a continuous element that also included the cantilevers for the balcony floors [BeDa14, p63]. This continuous floor slabs to the outside constitutes a common defect of modernist construction techniques.

The typical modernist windows were made of steel, but wooden windows were widely utilized as well [RoBe17, p62]. Like the steel frames, the wooden frames showed a very simple detailing without any decorative profiling. The aim was to reduce the frame thickness as much as possible and to maximize the window size. The windows exhibited big glass panes and were not divided by glazing bars [Brue14, p.73]. With the increased window sizes, new joints were developed to open or tilt the windows. Steel beams were introduced as lintels in order to carry the brick walls above. A further development of this was the possibility to stretch the windows over the corner of the buildings. The corner window became another characteristic element of modernist architecture.

It was popular to combine red brick masonry with white painted windows, or yellow bricks with grey eternit roofs [BeDa14, p.40]. However, other combinations and colours were realized as well [Brue14, p.75]. Decorative details with bricks or prefabricated concrete elements were utilized scarcely and with caution. They were mostly used to emphasize geometrical forms or building elements, such as doors, windows or parapets [RoBe17, p48]. Entrance doors were particularly emphasized. They were mostly framed by a fine detail of bricks or concrete elements; a small canopy of natural stone or reinforced concrete was also characteristic. Typically, the entrance doors exhibited big windows and were manufactured with fine woods like mahogany [BeDa14, p.60].

In the 1960s the architectural expression was increasingly determined by the goal of rationalisation. Architecture was reduced on the assembly of big prefabricated concrete elements while carefully designed details and traditional craftmanship became irrelevant. This development took away the interest of the architects on social housing in the 1960s, and they rather focused on individual houses, public institutions and private businesses [Fab78, p.207]. One could conclude that form has followed function too much.

Figure 13: Detailed views on the housing developments of Dronningegården and Bispeparken

Although the modernist housing developments were planned by the most renowned architects and exhibit high-quality materials and craftmanship, many of the sixty to ninety year old buildings require profound renovations today. The chapter presents the most typical challenges of today's renovation projects within three different levels of scales. Many of the described challenges will be addressed in the two study tasks of this report. While the analysed renovation projects of Task 1 mainly tackle the challenges described on a detail and building level scale, the design proposal of Task 2 suggests improvements that tackle the challenges described on a building and building composition level scale.

BUILDING COMPOSITION LEVEL

While the modernist park developments contain valuable recreational potentials for the tenants, many of the outside areas have difficulties to be as attractive and frequented as originally intended. Many housing projects were planned as rather introvert and self-contained developments in the suburbs, with small shops and bars for the residents [BeDa14, p.71]. Today, those small shops and bars compete with the many offers of the growing city. While the residents find plenty of alternatives elsewhere in the city, the repellent structure of the development does not attract people from the outside. This results in developments with empty shops and abandoned public spaces.

Especially in the 1930s, architects put high priority on the creation of improved and equal light conditions and a good access to nature. However, there was not much consideration on how the building volumes should be arranged in order to create attractive community spaces and a sufficient density to activate the public spaces. Many modernist park developments exhibit a rather low density of inhabitants.

A comprehensive renovation should therefore consider the implementation of extensions and additions that help to increase density and contribute to an improved organization of the public spaces. New purpose should be given to the shops that lost their customers, while the functionalities should serve and strengthen the community. Efforts should be made to establish a better integration of the development into the surrounding quarters. The rather repellent and self-contained structure should be broken up.

Several modernist housing projects are affected by the heavily intensified traffic situation. Projects that were planned in a recreational suburban area with good connection to the city are now part of a growing city and located next to busy arterial roads [BeDa14, p.71]. This constitutes an additional challenge when creating more attractive outdoor spaces. It also leads to augmented requirements on soundproofing for windows and balconies.

BUILDING LEVEL

The apartments of functionalistic housing projects usually exhibit a rather repetitive and uniform floorplan design. Since the 1950s, however, our way of living changed significantly. While in the 1950s still 60% of all Danish households complied with the ideals of the typical family with two adults and minimum one child, today only 18% of the Danish households live in this constellation [BeDa14, p.72]. At the same time, other forms of living became more common, including patchwork families, shared

flats and single households. These changes in society demand for different and more varied apartment layouts. A thoughtful renovation process should therefore include the modernisation of the existing floorplans. New additions can increase the spectrum of available apartments as well. A varied range of apartments will contribute to a better social mix of tenants and prevent exclusion and the formation of ghetto-like structures.

The expectations on living standard, available space and room sizes have increased as well. Especially the small bathrooms do not comply with today's standards. However, living quality does not only depend on the available square metres, but also on the room organisation. The kitchen should become a more integrated part of the apartment and should no longer be locked off in a small, separated room. The floorplans should tend to be more open, possibly with some continuous spaces that connect both sides of the apartment. Shared spaces should be strengthened.

Figure 14 shows a typical example for the modernization of a two-room apartment. On the northern side, the bathroom is extended and the kitchen is integrated in a bigger kitchen with dining area. On the southern side with balcony, the bedroom remains in the smaller room, while the living room exhibits a more open connection to the dining area. This layout is most suitable for singles or couples without kids. In order to increase living space and provide apartments for families or shared flats, it might be possible to remove adjacent, non-bearing walls and include living spaces of the neighbouring apartments.

In an aging society, it is increasingly relevant to provide wheelchair accessible apartments. Residential buildings from the 1930s to 1950s usually do not provide barrier-free access to the apartments, not even on the ground floor. Well-thought solutions must be found in order to provide accessibility to those apartments without endangering the overall aesthetics of the cautiously defined building volumes.

A new floorplan layout might also be influenced by the chosen heating and ventilation system. A centrally located corridor with a lowered ceiling might help to install a ventilation system that reaches all connected rooms of the apartment. An interior insulation layer or a decentralized heating system mounted at the outer walls will reduce the available apartment space and influence the chosen floorplan layout as well.

Figure 14: Original layout (left) and typical transformation (right) of a floorplan in a residential building from the 1950 [BeDa14]

A major problem of modernist housing developments is the relatively low insulation standard with its unfavourable effects on indoor climate and energy consumption. The fine architectural language with its carefully designed details makes it particularly difficult to find appropriate renovation solutions which comply with today's standards and, at the same time, do not endanger the architectural values.

Cold surfaces, due to badly insulated windows, walls or floors, increase the risk of mould formation. The highest risk of mould formation occurs at so-called *thermal bridges*, where the insulation properties are locally disturbed. Several construction methods and details from modernism exhibit such thermal bridges and proved to be inadequate for a good and healthy indoor climate. Characteristic defects occur at places where structural components of concrete or steel connect between the outside and the inside. The higher thermal conductivity of the structural component lowers the insulation properties of the building envelope and forms a critical thermal bridge. An example is the floor slab of reinforced concrete that cantilevers to the outside in order to form a projected balcony floor. Another example are the steel beams that are utilized to carry the brick walls above the wide window openings. Problems also occur at the connection between wall and window. In functionalistic architecture, the window frames are usually very slender and therefore constitute a critical thermal bridge. Mould formation can also occur under the windows, where non-carrying walls can exhibit relatively thin wall thicknesses of only half a brick size [BeDa14, p.80]. The inner corners of the building constitute another risk for reduced temperatures and mould formation; the so-called geometrical thermal bridge is due to the relatively high ratio between cold outer wall and warm inner wall at the building corners.

Insufficient insulation properties do not only increase the risk of mould formation, they also increase the energy consumption of the building. The most effective way to improve energy efficiency is to wrap the entire building in a layer of exterior insulation. However, an exterior insulation covers the brick work of the facades and is not the preferred option when architectural qualities should be maintained. More elaborate solutions should be considered.

A popular approach focuses on the insulation of the gable walls, while the lateral facades are maintained in its original state. Usually, the gables consist of rather plane surfaces with no or only a few openings. This makes them easy to insulate, both from a practical point of view but also from an aesthetical point of view, since an additional layer of insulation is particularly noticed around wall openings. A popular, but labour-intensive technique tries to keep the original bricks visible. In order to achieve this, the outer layer of the original brick wall is removed before the exterior insulation is applied. The removed bricks are then cleaned and used for the new outer layer of the gable wall. If good quality bricks were utilized in the original wall, 85% to 90% of the removed bricks can be re-used after cleaning [BeDa14, p.148].

The insulation of the gable walls is able to reduce a substantial part of the energy losses that leak through the outer walls. However, if aiming for a minimized energy consumption and a maximized indoor climate quality, the lateral facades should be insulated as well. If the original bricks should be kept visible, an interior insulation is the only feasible choice - although such an insulation implies several challenges. In order to prevent the risk of humidity and mould formation between outer wall and interior insulation, the outer wall needs to be sufficiently watertight and a vapor barrier needs to be carefully applied from the inside. New concepts for interior insulations without vapor barrier are currently tested. They use capillary active materials in order to transport the condensed humidity towards the wall surface where it

can evaporate [Sbi18]. Another interesting approach is the installation of a ventilated insulation wall that uses an airstream between outer wall and insulation layer in order to remove the humidity [Hvii19]. However, both concepts are not sufficiently tested or developed in order to be applied in current housing renovations.

In [BeDa14, p.135] some rough estimates are given for the energy consumption of a typical, not renovated modernist housing development from the 1940s/50s. Figure 15 shows how this consumption splits into the different components like windows, outer walls and roofs. The graph indicates where the highest potentials for an effective energy reduction can be found.

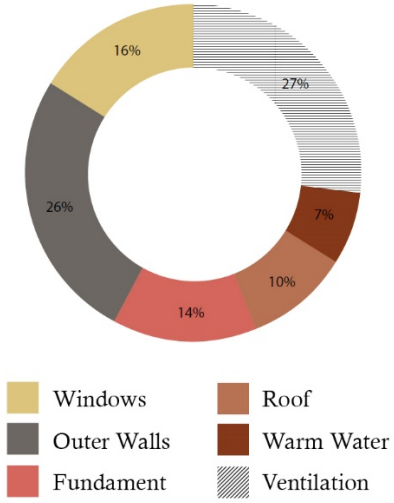


Figure 15: Averaged shares of energy consumption for an apartment building from the 1940s/50s before renovation [BeDa14]

Many of the residential housing developments built between the 1930s and the late 1950s exhibit significant architectural and cultural-historic values. During the renovation of buildings with heritage value, discussions and doubts about the most suitable interventions evolve rather quickly. Between the different interests of municipality, housing association and the national building fund [2], it can be difficult for the renovation architect to find the right compromise between building modernisation and the maintenance of heritage values. In order to provide a better orientation for future decisions, it was found useful to elaborate on common conservation strategies and the various heritage values they are based on. After a short study of the chronological developments in the field, an introduction to the current discussions in Denmark is presented, with a particular focus on the renovation of residential housing projects from Danish modernism. An introduction to the concepts of New Heritage and authenticity widens the discussion for suitable interventions. Graphical communication tools are presented which can help to improve the planning process for future renovations. The chapter terminates with a more detailed view on authenticity in the modernist context and elaborates on the question how new components should be designed in order to maintain *the spirit* of the original architecture.

CHRONOLOGICAL DEVELOPMENT

The book '*A history of Architectural Conservation*' by Jokilehto [Joki86] comprises an informative study of the historic development of major European conservation strategies and their contribution to the existing international policies of today. Already in the ancient worlds of Egypt, Greece and Italy certain attempts to conserve and restore pivotal monuments could be identified. However, it was during the Renaissance in Italy when people started to appreciate the architectural values of the ancient Rome and started to recognize the need to protect the heavily decaying monuments. In his tenth book of the treatise '*De re aedificatoria*', Leon Battista Alberti (1404-72) pointed out various reasons for the protection of historic structures. They included the architectural qualities, the solidity and beauty, and the didactic and historic values of the buildings. Alberti was convinced that ancient remains were 'the most skilful masters' from whom much could be learnt [Joki86, p.18].

In other parts of Europe, it was also the fear of loss and destruction that raised awareness for the values of endangered historic towns and religious monuments[3]. In France, the restoration of various cathedrals that suffered vandalism after the French Revolution was carried out by Eugène Viollet-le-Duc (1814-79) whose name became firmly linked with the prevalent restoration concept of the nineteenth century. For Le-Duc, restoration should aim to 'reinstate the building in a condition of completeness which may never had existed before' [Joki86, p.279]. He also argued that 'the best plan is to suppose one's self in the position of the original architect, and to imagine what we would do if he came back to the world and had the programme with which we have to deal laid before him' [Joki86, p.283]. Additions to the original fabric were allowed and could exhibit different styles. If later repairs had weakened the original structure without other merits, it was justified to restore the building back to its original unity. Le-Duc also

[2] While the housing association is interested in a user-friendly and economic solution that generates attractive and affordable apartments, the municipality is in charge of enforcing the demands derived from the official heritage evaluation methods, such as SAVE [SKLS11]. The National Building Fund has no legal power, however, its decision on which interventions to support financially can influence the process as well.

[3] Loss and destruction caused by conflicts such as the Thirty Years War and the French Revolution

accepted the use of modern materials, such as steel instead of timber. Le-Duc was in charge of many church restorations, including the restoration of Notre-Dame in Paris. While Le-Duc's proposal for the construction of two new spires at the western façade was not approved (Figure 16, left), he established a new fleche on top of the cathedral's transept (Figure 16, right) in a different style than the original. Le-Duc's fleche burned down in the fire of 2019 and discussions started about the appropriate way of restoration.

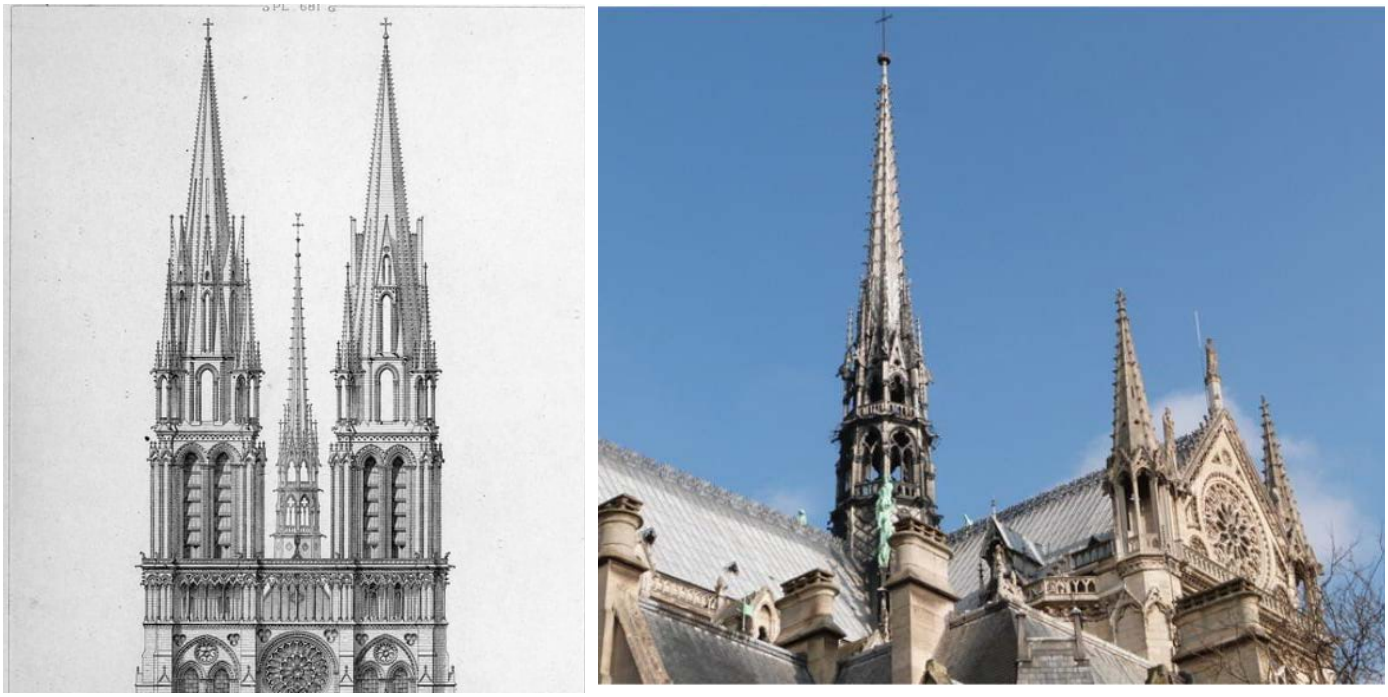


Figure 16: Le-Duc and Notre-Dame: Proposal for the construction of two spires at the western façade (left); Built fleche that burned down in 2019 (right)

Le-Duc's restoration philosophy was not only approved in France but found followers in various restoration projects throughout Europe. However, many restorations in the spirit of Le-Duc were facing a growing scepticism, deeming the interventions as too violent and destructive for the historical values of the buildings. The most prominent criticism was formulated by English art historian John Ruskin (1819-1900) whose view on conservation became the classical counterpart to the theories of Le-Duc. He was outraged about the prevalent reconstruction works that he saw in England and Italy. In his work '*The Seven Lamps of Architecture*' he exclaimed that 'neither by the public, neither by those who have the care of public monuments, is the true meaning of the word restoration understood. It means the most total destruction which a building can suffer' [Joki86, p.304]. For Ruskin, a historic building could never be repaired or even restored with contemporary craftmanship. Every building belongs to its particular time, any change to it would destroy its genuine character. However careful, however laboured the reparation work would be, it would still result in a cheap copy of the original. As a consequence, the deterioration and final perishing of the building would be inevitable. When Ruskin witnessed some preservation works at the Campanile of Giotto in Florence he commented: 'Let them take the greatest possible care of all they have, and when care will preserve it no longer, let it perish inch by inch, rather than retouch it' [Joki86, p.311].

A dispute on the most appropriate conservation strategy was also fought in the Germanic countries. The profound restorations of the Frauenkirche in Munich and Cologne Cathedral were as much discussed as the decision to maintain the Castle of Heidelberg in ruins [Joki86, p.374]. New inputs to the discussion were then given by art historian Alois Riegl (1857-1905). His value theory became a vital reference and

tool within the field of building conservation and heritage. It will also play a role in the evaluation of recent renovation projects in Task 1 of this report.

Riegl differentiates between the so-called *commemorative* and *contemporary values* of a building. Within the commemorative values, he distinguishes between *age-value* and *historical value*. The age-value develops rather naturally over time, it refers to the weathering, the patina, and the eventual historical layers added to the building since its first construction. The historical value, however, arises from the building's historical significance and its particular role in the development of human activity [Joki86, p.379].
The contemporary values of Riegl divide into the *art-value* [4] and the *use-value*. The art-value is divided into a *relative art-value* and a *newness-value*. While the relative art-value is evaluated in relation to other artistic works of the considered time, the newness-value is related to the appreciation of a well-kept condition without damages or wear. With the *use-value*, Riegl acknowledges the importance for a building to be utilized and valuable for the present user, although this might mean wear and tear to the original fabric [Joki86, p.380].

Riegl also employs a second possibility to categorize the above-mentioned values, i.e. the classification into *expert-values* and *experiential values* [GuHø18, p.101]. While expert-values can only be determined with a certain knowledge and expertise in the field, experiential values can be understood and appreciated by every person, independent of education and status. The differentiation between expert-values and experiential values will constitute another important aspect in the further discussion of this report. Figure 17 shows the various values introduced by Riegl, as well as the two major classification possibilities.

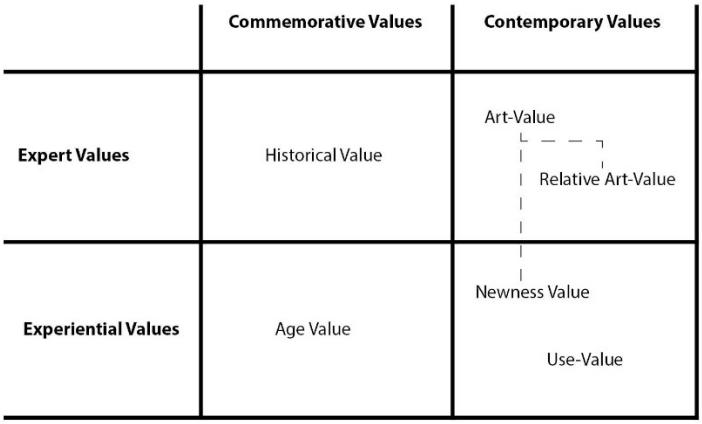


Figure 17: Heritage Values of Riegl and the classification into Commemorative/Contemporary Values and Expert/Experiential Values [GuHø18]

[4] For Riegl, an artistic work cannot be evaluated on the basis of common, absolute criteria; it can only gain value if it is appreciated by the prevailing, artistic spirit of the time, the 'Kunstwollen' [Joki86, p.379]. The art-value is thus dependent on the time in which it is evaluated. It is a contemporary value and not a commemorative value.

The established concepts of cultural heritage assessment and preservation in Europe are based on international guidelines that were formulated after the devastating experiences of World War I and World War II. The vast destructions in many European countries raised the awareness of a common heritage that needs to be protected by common efforts. Built heritage preservation became the subject of several international meetings. Their declarations and formulations were adopted into many national guidelines, and the Charters of Athens (1931) and Venice (1964) still represent the established and official understanding of heritage assessment and preservation in Europe and Denmark.

The *Charter for the Restoration of Historic Monuments* in Athens (1931) seems to formulate a certain compromise between the opposing concepts of Le-Duc and Ruskin. The declaration is in favour of the maintenance and preservation of buildings, but allows thoughtful restorations if they are indispensable. If a restoration is needed, 'the new materials used for this purpose should in all cases be recognizable' and 'the historic and artistic work of the past should be respected, without excluding the style of any given period' [Ath31]. Restorations and additions should thus stay visible and should not merge into the overall structure - a common criticism towards Le-Duc's church restorations. The conference also recommends that 'the occupation of buildings, which ensures the continuity of their life, should be maintained' which can be interpreted as a recognition of Riegl's use-value.

The *International Charter for the Conservation and Restoration of Monuments and Sites* in Venice (1964) was developed after World War II. It widely adopts the positions of the preceding Charter of Athens, but extends its regulations - after the bombing and extinction of entire cities during WWII - to the conservation and restorations of building ensembles and sites as well. The charter was approved by 61 countries from Europe, America, Africa, Asia and Australia and became a fundamental document within international conservation theory [Jok86, p.421]. The charter reflects the maturing consciousness towards all historical periods and states that 'the unity of style is not the aim of a restoration' and that, in case of superimposed work, 'the revealing of the underlying state can only be justified when the material which is brought to light is of great historical, archaeological or aesthetic value' [Ven64]. Restorations should be 'based on respect for the original material and authentic documents […] and must stop where conjecture begins' [Ven64]. The charter further clarifies that 'replacements of missing parts must integrate harmoniously, but must be distinguishable from the original' [Ven64]. The importance of a maintained use-value is not articulated anymore, it is only stated that a conservation should facilitate some 'socially useful purpose' [Ven64].

The Charter of Venice is reflected in many national legislations for heritage preservation. However, although very influential, the charter received a lot of criticism for being too European and Western, without keeping in mind other cultural backgrounds and conservation practices. Later developments therefore tried to extend this rather narrow concept of heritage values and heritage preservation.

The Nara Document on Authenticity (1994) then extends the official heritage discourse by the concept of authenticity[5] and formulates the important insight that conservation judgements and heritage values are rather relative than universal. The document acknowledges that 'all judgments about value attributed to cultural properties may differ from culture to culture' and that 'the respect due to all cultures requires

[5] The aim of authenticity was already mentioned briefly in the Venice Charter, but was not further explained [Jok09]

that heritage properties must be considered and judged within the cultural contexts to which they belong' [Nar94]. The document embraces both *historical-material authenticity*, which includes tangible aspects such as material, location and setting, and *social-cultural authenticity*, which includes intangible aspects such as function, tradition, spirit and feeling [Joki09, p.132]. The Nara document aimed particularly at the host of the conference, Japan, with its popular conservation practices; namely the periodic dismantling, repair and reassembly of wooden temples [Stov08, p.9]. Such methods, e.g. practiced at the Ise Shrine (Figure 18), would have failed the recommendations of the previous international charters on conservation. Now, the methods are recognized since they maintain the cultural traditions and conform with the social-cultural authenticity.

Figure 18: Ise Shrine in Japan. The shrine is rebuilt every twenty years

An important next step in the discussion constitutes The *Convention on the Value of Cultural Heritage for Society* in Faro (2005). The convention brought some fundamental new aspects into the cultural heritage discourse, which today also unite under the concept of *New Heritage*. In contrast to traditional heritage approaches, aiming to protect the physical fabric of 'the best buildings', Faro defines heritage as everything that is created, utilized and valued by people [Fair14], both while interacting with the built environment and while interacting with each other [GuHø18, p.122]. Heritage is produced and exercised by everybody. It belongs to everybody and can only be a value if it is a value for the people. Therefore, heritage assessment and heritage preservation cannot be based on the exclusive decisions of outside experts. Instead, a more democratic process with members of the engaged *heritage community* is needed[6]. This new understanding of heritage can, for example, lead to the protection of more 'ordinary' architecture, which might be overlooked by experts but might be highly appreciated by common people [Fair08, p.38]. Another consequence of the Faro convention is that built heritage evolves from 'something that needs to be protected from harm' into 'something that can be exploited as a useful resource' [Fair08, p.40]. Until 2020, the Faro convention was ratified by 19 members states of the Council of Europe. It is not yet approved by Denmark. Gudmand-Høyer states that the concept of New Heritage has not yet arrived in the official Danish heritage practice [GuHø18, p.131].

[6] 'A heritage community consists of people who value specific aspects of cultural heritage which they wish, within the framework of public action, to sustain and transmit to future generations' [Far05].

While the Charters of Athens and Venice constitute influential documents for the official and established heritage discourse in Denmark, the ideas of Nara and Faro do not have much impact on the current practices. The heritage discourse in Denmark is blamed to be rather traditional and still heavily driven by expert opinions [GuHø18, p.93]. It is also criticised to account solely for the tangible and physical aspects of heritage, while the intangible aspects, which e.g. arise between the user and the building, are neglected [GuHø18, p.97].

The most prevalent evaluation procedure for buildings with conservation value in Denmark is the SAVE method (Survey of Architectural Values in the Environment) [SKLS11] which is also utilized to evaluate the heritage values of the residential housing developments from Danish modernism. The method is mainly based on the evaluation of the following three value categories: [7,8]

- *Environmental Value* is assigned to the particular relation between building and surrounding, both considering the larger context between building and landscape, or the enclosed spaces of a building complex, or the relation between the inside and outside of a single building.

- *Culture-historical Value* is assigned to the physical aspects of a building, that tell about previous function, use, ideals, construction techniques and the time of erection. The value is also assigned to modifications that happened over time and witness a historic evolution. Culture-historic values can also be assigned to symbolic values.

- *Architectural Value* is assigned to a characteristic form, proportion, construction, scale, motive, composition, materials, interior, craftsmanship, light condition, atmosphere, acoustic, functionality, details and spatial experiences, relations and hierarchies.

The SAVE method is broadly formulated and can, in general, also include experiential and intangible values. Intangible values could be addressed within the environmental value category, the architectural value category, or during the evaluation of the nativeness and authenticity[9]. Experiential values could be addressed within the environmental value category or the architectural value category. However, although experiential and intangible values are mentioned in certain evaluation reports, they are usually not much considered in the final value assessment [GuHø18, p.99]. Values that are appreciated by the users of the building are not taken into account. The opinion of the user and the qualities created while interacting with the building or other users are ignored. Instead, it is the traditional and exclusive view of the experts that determine the heritage. In [SLKS11, p.39] it is explicitly stated that 'one should be aware that the determined conservation value has nothing to do with the use-value'.

[7] Apart from the three listed value categories, the SAVE method also takes into account the level of nativeness and the general condition of the building [SLKS11, p.34]

[8] The presented value descriptions are taken from Gudmand-Høyer [GuHø18, p.94] and translated into English

[9] While the nativeness in the SAVE method [SLKS11, p.36] is solely describing tangible values, the definition of authenticity in [SLKS12, p.13] is including intangible values as well.

In her work '*Værdibaseret udvikling af Danmarks almene boliger'*, Gudmand-Høyer analyses the current value assessment and renovation process in the Danish social housing sector [GuHø18]. She observes various conflicts between the involved parties of the renovation process, usually represented by the architect, the housing association of the building, the municipality in charge, and the National Building Fund [10]. Gudmand-Høyer identifies a poor communication as the major problem when trying to reach consensus between the different interests of the involved parties and presents a couple of (graphical) communication tools that can facilitate a more purposeful discussion. The tools do not only support a more democratic process while framing a solution, they also try to include a more modern perception of heritage preservation, where an increased focus is set on resource development and the strengthening of use-value.

The evaluation tool *Screening of Cultural Environments* (SAK) developed by the Aarhus School of Architecture is mentioned as an example for such a tool and takes a step towards the ideas of Faro and New Heritage. Apart from solely defining the rather traditional heritage values that are worth to be conserved and maintained, the method also focuses on the various potentials of the site and understands them as a resource for cultural development and economic growth. The visual representation as shown in Figure 31 can be used as a communication tool that helps experts, municipalities and other involved parties to discuss and agree on the possible development.

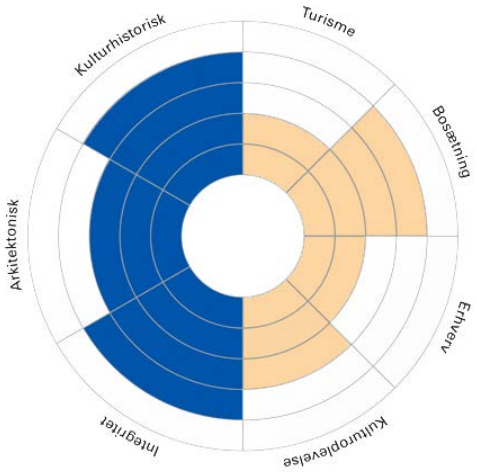


Figure 19: Visual representation of conservation values (blue) and potentials for development and growth (yellow) of the SAK method [Aar18]

As a further communication tool, Gudmand-Høyer introduces an evaluation scheme that is based on the value theory of Alois Riegl [11]. The evaluation scheme is illustrated in Figure 20. While the horizontal axis spans between the two poles of expert value and experiential value, the vertical axis spans between the poles of commemorative and contemporary value. The subordinate values, as defined by Riegl, are then sorted into the four quadrants of the resulting scheme. Although the scheme exploits the rather

[10] While the housing association is interested in a user-friendly and economic solution that generates attractive and affordable apartments, the municipality is in charge of enforcing the demands derived from the official heritage evaluation methods, such as SAVE [SKLS11]. The National Building Fund has no legal power, however, its decision on which interventions to support financially can influence the process as well.

[11] See the values of Riegl on p.27 and Figure 17

traditional values of Riegl, Gudmand-Høyer considers it a useful and simple tool to analyse and improve present and future renovation projects in the Danish housing sector. The scheme includes experiential values and thus puts focus on the opinion of 'non-experts' and users of the building. The use-value, in particular, is able to describe the values appreciated and created by the residents. Similar to the analysis of Gudmand-Høyer [GuHø18, p.213ff.], the scheme will be utilized in Task 1 of this report in order to examine recent renovation projects in the Danish housing sector. However, the scheme can also help to identify the aims and expectations of future renovation projects and facilitate a better communication between the involved parties.

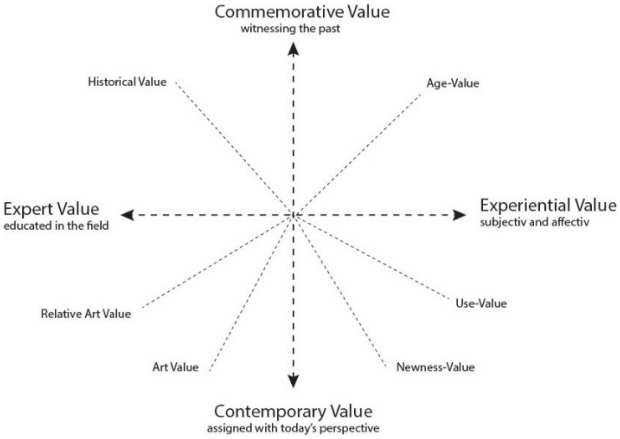


Figure 20: Evaluation scheme of Gudmand-Høyer [GuHø18] based on the value definitions of Alois Riegl. The scheme can facilitate a better communication process between the involved parties about the aims and expectations of a renovation project.

There might be a difference between the values that are detected and appreciated before the renovation and the values that are supposed to be maintained or emphasized after the renovation. This evolution or shift in values can be expressed by two consecutive schemes, one compiled for the status before the renovation and one compiled for the status after the renovation. A representation like in the model of Overgaard (Figure 21) can illustrate how value categories can change intentionally during a renovation process. While the size of the circle represents the level of magnitude of the respective category, the distance of the circles to the center of the graph represents its importance.

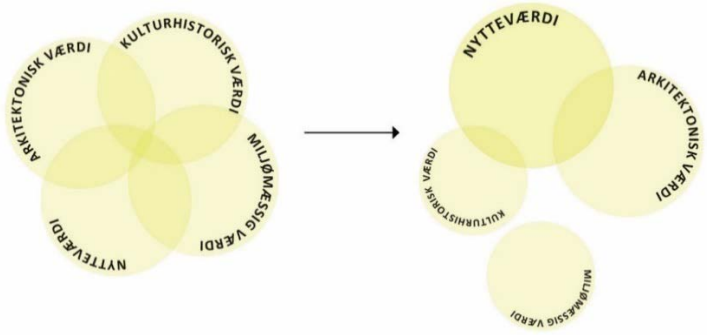


Figure 21: Evaluation scheme of Overgaard [Over14] that can illustrate the intentional shift of values during a renovation project

Apart from a better communication between the involved parties, Gudmand-Høyer also suggests that an agreement about the intended objectives in terms of value preservation and development should be

reached at a rather early stage of a renovation project [12]. This could prevent later frustrations and delays of the project in case the expectations do not match [GuHø18, p.382].

THE AIM OF AUTHENTICITY

The above-mentioned schemes can help to formulate and discuss certain conservation strategies and determine which heritage values should be maintained or further emphasized during a renovation process. However, Gudmand-Høyer points out, that it is not necessarily the presence of a certain set of heritage values that determines a successful renovation in terms of heritage conservation. Instead, it is stated that the decisive criterion for a successful renovation is the maintenance of authenticity [13] [GuHø18, EgNi14]. While authenticity is not a heritage value itself [Nar94], authenticity is considered a required quality in order to ensure the credibility of the maintained heritage values [EgNi14, p.20]. Bernard Feilden addresses the role of authenticity in his definition of heritage conservation by stating: 'Conservation seeks to prolong the life of cultural property and, if possible, to clarify the historic and artistic message without loss of authenticity' [Alho12, p.191].

After Gudmand-Høyer, the official Danish understanding of authenticity can be classified into the three categories *material authenticity, communicative authenticity and structural authenticity*.[14]

- *Material Authenticity* is tied to the presence of original material and substance. This relates to the understanding to see the building as a physical, historical document which - due to its original material and craftmanship - contains a historical knowledge and value.

- *Communicative Authenticity* is tied to the documentation value of the building and its ability to narrate about the building's development over time. The building's function and the building's changes should be readable. New additions should be easy to identify.

- *Structural Authenticity* is tied to a well-preserved, structural logic of the building. In contrast to the material authenticity, it is not the original substance, but the original idea that is important.[15]

In the official Danish understanding, a renovation can thus be considered successful in terms of heritage conservation, if those three categories of authenticity are maintained [GuHø18, p.116]. The three categories are utilized in Gudmand-Høyer's analysis of recent renovation projects presented and deployed in Task 1 of this report.

In her publication *Questioning Authenticity* [Hey05], Hilde Heynen states that the established concept of authenticity in Europe is mostly understood as referring to the genuineness of the material substance. 'An authentic seventeenth-century church is thus a church that is, in its shape, appearance, and materials, essentially the same as it was when it was newly constructed' [Hey05, p.2]. However, she also mentions

[12] Until '*Skema A*' of the LBF funding procedure [GuHø18]

[13] The term authenticity has its roots in Greek antiquity, where a document was called authentic if it was indeed from the author it was claimed to be [EgNi14, p.11].

[14] The three categories are translated from [GuHø18, p.116]

[15] The definition of [GuHø18, p.116] is here supplemented by the conservation principles formulated in [SLKS12] and frequently mentioned in Danish publications. It is stated there that reparations should primarily be done in the same materiality and construction method as the existing, and that additions should be carried out in the same quality as the existing [SLKS12, p.10/11].

that in the 20th century, a shift in the understanding of authenticity can be observed, when authentic solutions try to 're-create a situation that is as close as possible, in materiality as well as in appearance, to the actual historical origin of a building' [Hey05, p.2]. This re-creation with new materials violates the tangible aspects - and thus the traditional European understanding - of authenticity and argues for the more intangible aspects of authenticity that develop new solutions with new materials, but *in the spirit* of the original.

However, when talking about a renovation approach that introduces new components designed *in the spirit* of the original, the following question emerges: What kind of solution is in the spirit of the original? Or: What kind of solution is considered to be authentic? In the modernist context, this is a particularly interesting question, which is addressed in the subsequent section.

AUTHENTICITY IN THE MODERNIST CONTEXT

In her publication *Questioning Authenticity* [Hey05], Hilde Heynen discusses the difficulties of maintaining authenticity during the renovation of modernist buildings. She points out that the modernist architects themselves put great importance into the creation of authentic and honest architecture. Their design was driven by functionality and the new capabilities of modern materials; their design was not driven by imitating previous styles. The modernist architect intended to provide a straightforward and honest answer to the requirements and challenges of modern life; the term authenticity was connected with the courage to face the challenges of modernity [Hey05, p.2].

If we, today, are facing the task to renovate a modernist building, we must question what it actually means to find a suitable and authentic solution. Imitating and re-creating the solutions from the early 20th century might be in accordance to the prevalent renovation strategy in Denmark [16]; however, it feels in contradiction to the original intentions of the modernist architect. It could therefore be discussed, if a suitable and authentic renovation of a modernist building could (and should!) include state-of-the-art materials and new construction methods in order to secure the purpose of a functional and useful architecture.

In this context, the quote of Eugène Le-Duc [17] is worth a thought again, in which he suggests that the renovation architect should try and act as the original architect would do today. In my opinion, a modernist architect would not like to imitate and re-create in an old and outdated style. Instead, the modernist architect would judge the renovations and additions in terms of their intended functionality and the honest treatment of the employed materiality and structure.

[16] As further discussed in Task 1 of this report

[17] The quote from p.25 is here repeated for convenience: 'The best plan is to suppose one's self in the position of the original architect, and to imagine what we would do if he came back to the world and had the programme with which we have to deal laid before him'

Task 1 analysis the renovation projects of Lundevænget and Tingbjerg - two housing developments from the 1930s and 1950s which were recently renovated under the consultancy of Rambøll. The studies have the aim to analyse the employed renovation practices and assess their impact on the various heritage values. The findings should help to reflect on the recently conducted renovations and support a considerate planning of future renovation projects. The investigations start with a short summary of previously evaluated renovation projects by Gudmand-Høyer [GuHø18]. Her evaluations are translated [18] and included in the present studies, since they contribute to a more varied view on the current renovation practices and the implemented solutions in Denmark. The examples also enhance the understanding of the utilized evaluation method by Gudmand-Høyer [19], which is subsequently employed in order to analyse the renovations of Lundevænget and Tingbjerg.

PREVIOUS INVESTIGATIONS

BELLAHØJHUSENE

The Development

The Bellahøjhusene were built between 1951-57 and are considered Denmark's first high-rise buildings. The development consists of 28 buildings with 9 to 13 floors, where each building consists of two apartment towers shifted to each other and connected via a glass tower with stairs and elevator as a particularly modern feature. The buildings were built with a, at that time, novel concrete construction utilizing both slip formwork and pre-fabricated elements. The façades are covered with concrete tiles. In the project *Rammer for udvikling* [RoBe17], the development was rated as a development with the highest conservation value of 1.

Figure 22: Bellahøjhusene

[18] Gudmand-Høyer's work is written in Danish
[19] See 'Towards an improved Value Assessment' on p.31

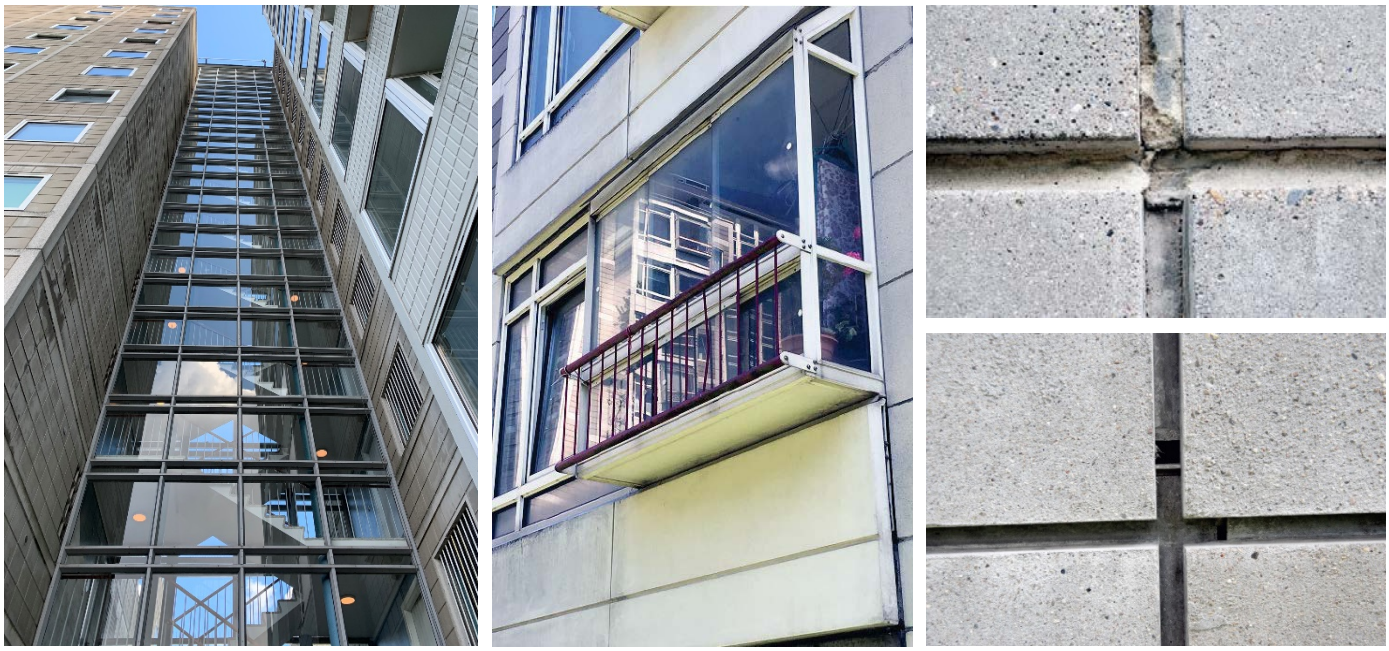


Figure 23: Bellahøjhusene: Original glass tower with stairs and elevator (left), Cantilevered balcony construction from the 1990s (middle), Old and new façade tiles on mock-up (right, up+down).

The Renovation

A major focus in the planned renovation is given to the facade with its characteristic concrete tiles. It was decided to remove the original, worn-out tiles and substitute them with new tiles (Figure 23, right). The new tiles are made out of a light fiber concrete. They have the same surface measures as the old, but are 3 cm thinner in order to gain space for an improved thermal insulation of the façade. As seen on the picture, the new tiles are no longer mounted with mortar, but with a light metallic substructure. The new joints are thus not filled with mortar neither, instead, an airgap exists between the tiles. A lot of care was taken while choosing the colour of the new tiles. The colour should correspond to the colour which the existing tiles exhibit today. The new tiles should thus imitate a certain age and omit that the renovated buildings appear ‘sparkling new’ [GuHø18, p.225].

The windows are planned to be exchanged. They should maintain format and colour, but can be made out of wood, aluminum or composite materials - depending on the architect in charge. The balcony parapets that were closed in the last renovation of the 1990s are opened up again by using white painted steel balustrades. This solution is similar to the original solution found on drawings from the 1950s. However, balconies that were closed off with a glass covering and extended during the renovation in the 1990s (Figure 23, middle) will maintain their appearance. Residents were too happy with the gained space due to the extended balconies.

The glass towers with staircase and elevator (Figure 23, left) should be brought back to the original appearance of the 1950s as well. If windows or elevator shafts need to be exchanged, the chosen materiality, forms and colours should stay in line with the original plans. The intention of the renovation is to ‘maintain and enhance the existing atmosphere’ [GuHø18], a modern elevator with new materials and shapes is considered to destroy this atmosphere.

The Evaluation

In her analyses of the chosen renovation approach, Gudmand-Høyer concludes that the façade renovation challenges both the material and structural authenticity, since the original material is removed and a novel structural system is applied. Instead, the focus is put on a similar visual appearance and an improved use-value by an increased thermal insulation. The same approach is chosen for the glass towers. New materials are added with the idea of modernization, while trying to maintain (or re-create) the visual appearance and atmosphere of the 1950s. For the balconies, an ambivalent strategy was observed. In some cases, additions of the 1990s renovation were removed and the communicative authenticity was weakened. In other cases, the 1990s additions were kept.

With respect to the heritage values of Riegl, it can be states that focus was put on the improvement of the use- and newness-values, while the age-value is challenged due to the removal of original material. The contemporary values are rather strengthened. Apart from the increased use- and newness-values, the architectural ideas of the architects and the art-value are maintained. The graphical representation of Gudmand-Høyer's evaluation is shown in Figure 24.

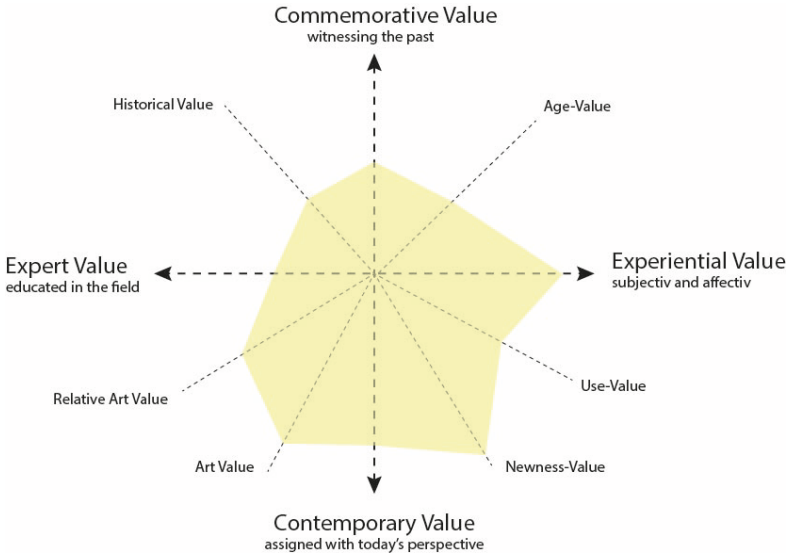


Figure 24: The renovation approach of Bellahøjhusene evaluated by Gudmand-Høyer [GuHø18]

The Development

Højstrupparken was built between 1949-53 and is considered one of the most important housing developments in bricks between 1940-1959 [GuHø18, p.230]. The development is built in red bricks with red joints and red roof tiles. The walls are partly built as cavity walls. Pre-fabricated concrete elements are used at the balconies and at the entrance doors. Balconies, windows and doors are painted in white. In the project *Rammer for udvikling* [RoBe17], the development was rated with a conservation value of 2.

The Renovation

The general idea of the renovation was to conduct a rather comprehensive intervention while keeping the overall visual character and identity of the development. This includes the re-use of original material and the re-interpretation of original elements in new components. A focus is set on the improvement of the living conditions in the apartments and the optimization of the energy consumption. The planned renovation comprises a thermal insulation of the gable walls as described in the theoretical background of this report [20]. Its result can be seen in Figure 26 (left). The lateral walls of the buildings are kept in their original state and no additional insulation is applied. Balconies are renewed and increased in size (Figure 26, middle). The balcony constructions are renewed in order to remove the thermal bridges from the continuous floor slabs. The balconies at the gables are covered in glass in order to increase the available indoor space (Figure 26, right).

The Evaluation

The analysis of Gudmand-Høyer concludes that the material authenticity is better preserved than in the Bellahøjhusene, since original bricks are incorporated in the newly insulated gable walls. However, the mix of old and new bricks makes it difficult to distinguish original from new fabric and reduces the communicative authenticity of the development. The lateral walls are not insulated and stay in its original state. This preserves the material authenticity on the cost of a higher energy consumption. The new balconies, however, challenge both the material authenticity and the structural authenticity.

Figure 25: Højstrupparken

[20] See 'Typical Renovation Tasks' on p.23

Figure 26: Højstrupparken: Insulated gable wall with a mix of old and new stones (left), Mock-up of new balcony and oriel on ground floor (middle); Illustration of covered gable balcony on ground floor (right)

In terms of the evaluation scheme of Gudmand-Høyer, the age-value is increased in comparison to the renovation of the Bellahøjhusene. Due to the new balconies and thermal insulations the use-value is further increased. The relative art-value is seen higher than in the Bellahøjhusene, probably because of successful re-interpretation of original elements. Figure 27 summarizes the evaluation graphically.

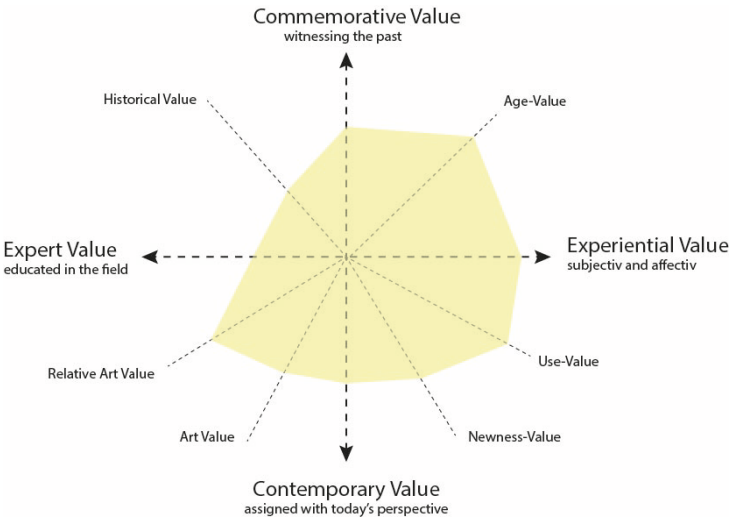


Figure 27: The renovation approach of Højstrupparken evaluated by Gudmand-Høyer [GuHø18]

The Development

Brøndbyparken Afd1 was built between 1949-55 by the renowned architect Kay Fisker. While Afd1 is not yet assessed by an official evaluation procedure, Brøndbyparken Afd3 is assessed with the official conservation value of 2 [RoBe17]. Afd3 is particularly known for the bended balcony motive as shown in Figure 28. Although Brøndbyparken Afd1 is not evaluated yet, a similar value assessment as for Afd3 is expected [GuHø18, p.243].

The Renovation

During the renovation of Brøndbyparken Afd1, all outer walls are insulated by adding a new layer of insulation and a new layer of bricks to the outside. The chosen bricks for the new outer walls are shown in Figure 29 (bottom right). Since the thickness of the outer wall increases to 60cm, an extension of the roof is required as shown in Figure 29 (top right). The renovation includes the attachment of new balconies as seen in Figure 29 (bottom left). The formerly recessed balconies are removed in order to increase the interior space of the apartments. The design of the new balconies is inspired by the famous balconies of Afd3, they exhibit a similar bending of the parapet and are built with similar pre-fabricated concrete elements. Windows and doors are exchanged, they keep the same format but exhibit different materials and are painted in white.
The aim of the renovation was not the strict maintenance of the original substance of the building. Instead, the existing forms were utilized as an inspiration to create something new and react on the current challenges. An architect in charge of the renovation is cited in [GuHø18] with the words: 'Kay Fisker could have found this solution as well'. The intention was to conduct the project *in the spirit* of Kay Fisker - an approach that corresponds to the conception of Le-Duc and also touches the thoughts on authenticity within the modernist context [21].

Figure 28: Brøndbyparken Afd3: Famous balcony motive by Kay Fisker

[21] See 'Authenticity in the modernist context' on p.34

Figure 29: Brøndbyparken Afd1: Original balconies (top left) and new balconies (down left), Extended roof with new tiles (top right), Original tiles (bottom middle) and new tiles (bottom right) of the insulated outer wall

The Evaluation

The analysis of Gudmand-Høyer concludes that the material authenticity is heavily challenged in the presented renovation, both by the newly built outer walls, the newly added balconies and the exchanged windows and doors. The structural authenticity is considered to be maintained since the utilized construction principles - e.g. for the newly added balconies - can be found in other parts of Brøndbyparken as well. The communicative authenticity is also challenged since the historical readability of the building is covered by the new layer of bricks.
Figure 30 illustrates the evaluation in the frame of Gudmand-Høyer's evaluation scheme. While the commemorative values are severely weakened, the contemporary values are relatively intact.

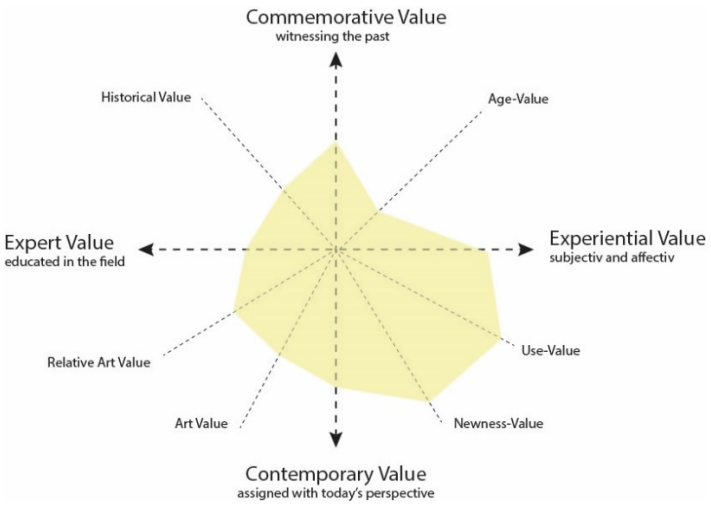


Figure 30: The renovation approach of Brøndbyparken Afd1 evaluated by Gudmand-Høyer [GuHø18]

In the analysed renovation projects of Gudmand-Høyer, some common tendencies can be observed. The primary goal was to modernize the existing developments and (re-)create attractive and healthy living conditions for the residents, with good indoor climate, more varied and bigger apartments, modernized installations and the reduction of energy consumption. Focus was primarily set on the usability and on the user of the buildings. This focus generates conflicts with the traditional understanding of heritage preservation, since original material has to be removed and replaced. As a compromise between the demands of traditional heritage preservation and the intention of creating attractive and healthy living conditions, the desired interventions are tried to be carried out *in the spirit* of the original architecture, with a focus set on *imitating* the visual appearance of the original. While the preservation of the original material is compromised, the new solutions try to create a visual experience that is sought to be *typical* for a building of the considered time. While the traditional concepts of material, structural and communicative authenticity are challenged, the new solutions rather try to create an *authentic experience*, with solutions that only look like from the 1930s, 1940s or 1950s. Gudmand-Høyer describes this new concept of authenticity within the field of residential housing renovations with the term *amplified authenticity,* which includes solutions that have not even been present in the original building and thus create a perceived 'authenticity' that has never existed before.

With its focus on usability and its intention to use the existing buildings as a resource and starting point for further developments, the current approach in the renovation of residential buildings from modernism already includes several aspects formulated in the New Heritage movement. The experiential values, such as use-value and newness-value are strengthened, while the expert values, such as the culture-historical values have to step back. Gudmand-Høyer describes a certain discrepancy between the traditional demands on heritage preservation and the actual, user-oriented renovation approaches already conducted within the field of residential housing developments. These different perceptions of heritage preservation lead to conflicts that have to be discussed and resolved.

THE DEVELOPMENT

The residential housing development of Lundevænget was built in the years 1934 - 1935 and is considered one of the first park developments in Denmark. It was designed by the renowned architects Poul Baumann, Edvard Heiberg & Karl Larsen and Frederik Wagner. Lundevænget consists of 14 detached parallel housing blocks and was built in connection with the neighbouring housing development of Ryparken, which consists of 11 housing blocks. Together, Ryparken and Lundevænget provide 900 apartments for approximately 3000 residents [ArkHe36, p.12]. The housing development of Lundevænget was considered to offer everything that a collective housing development would need, including district heating, washing machines, day-care for children and access to the nearby sport facilities [ArkHe36, p.16]. The park area was designed by C.Th. Sørensen and utilized a particularly robust grass from England that allowed an intensive use by both adults and kids [ArkHe36, p.14]. Figure 32 shows one of the centrally located playgrounds for the children of Lundevænget, right after its implementation.

The intentions to achieve optimal sun and light conditions for the residents are reflected in the sophisticated studies and discussions of Vagn Kaastrup, who investigated and evaluated various possible building layouts for Lundevænget [ArkKa36]. With his light studies as illustrated in Figure 31 (left), he assessed the achievable sun hours for each day of the year. His investigations confirmed that the chosen building orientation of Lundevænget secured the best access to sun and light for the residents. However, he also criticised that several decisions were not based on strict functionalistic considerations. If a flat roof construction would have been chosen, the amount of available sunlight could have been increased by 1 to 1,5 hours daily. Especially in the darker winter months, the 'romantic' choice of an inclined roof construction would thus constitute a big compromise for the residents. Kaastrup also argued that a doubling of the building height – while constructing every second row of houses only – would have improved the light conditions for the residents even further.

In [ArkHe36], Edvard Heiberg gives some further insights into the planning process of Lundevænget. Here, it is mentioned that the final roof design of Lundevænget was decided by Poul Baumann, just because he was the first who could start constructing his buildings. The other architects then needed to follow his design.

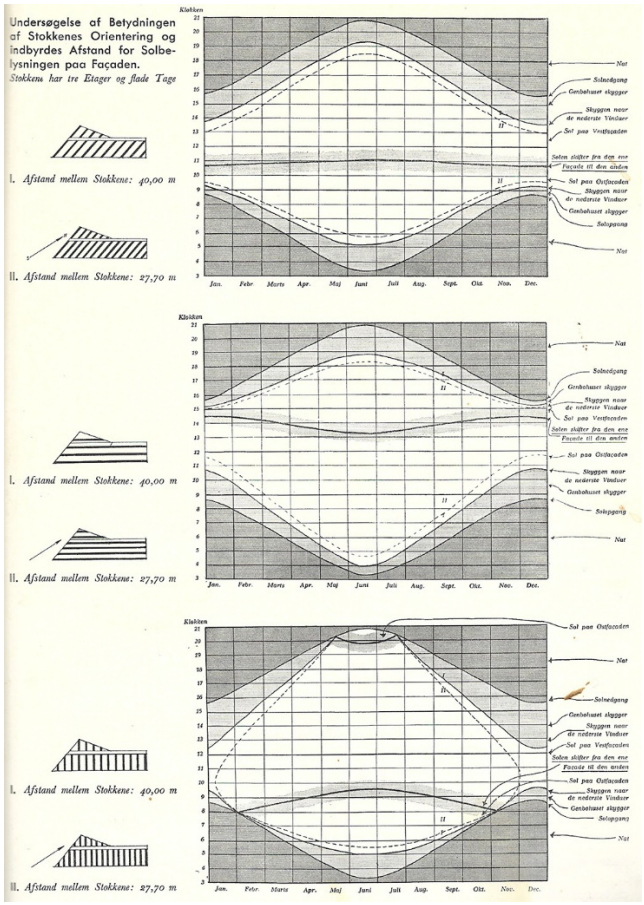


Figure 31: Light studies for the best building layout of Lundevænget (left) [ArkKa36], Rounded balconies by Povl Baumann (right) [ArkHe36]

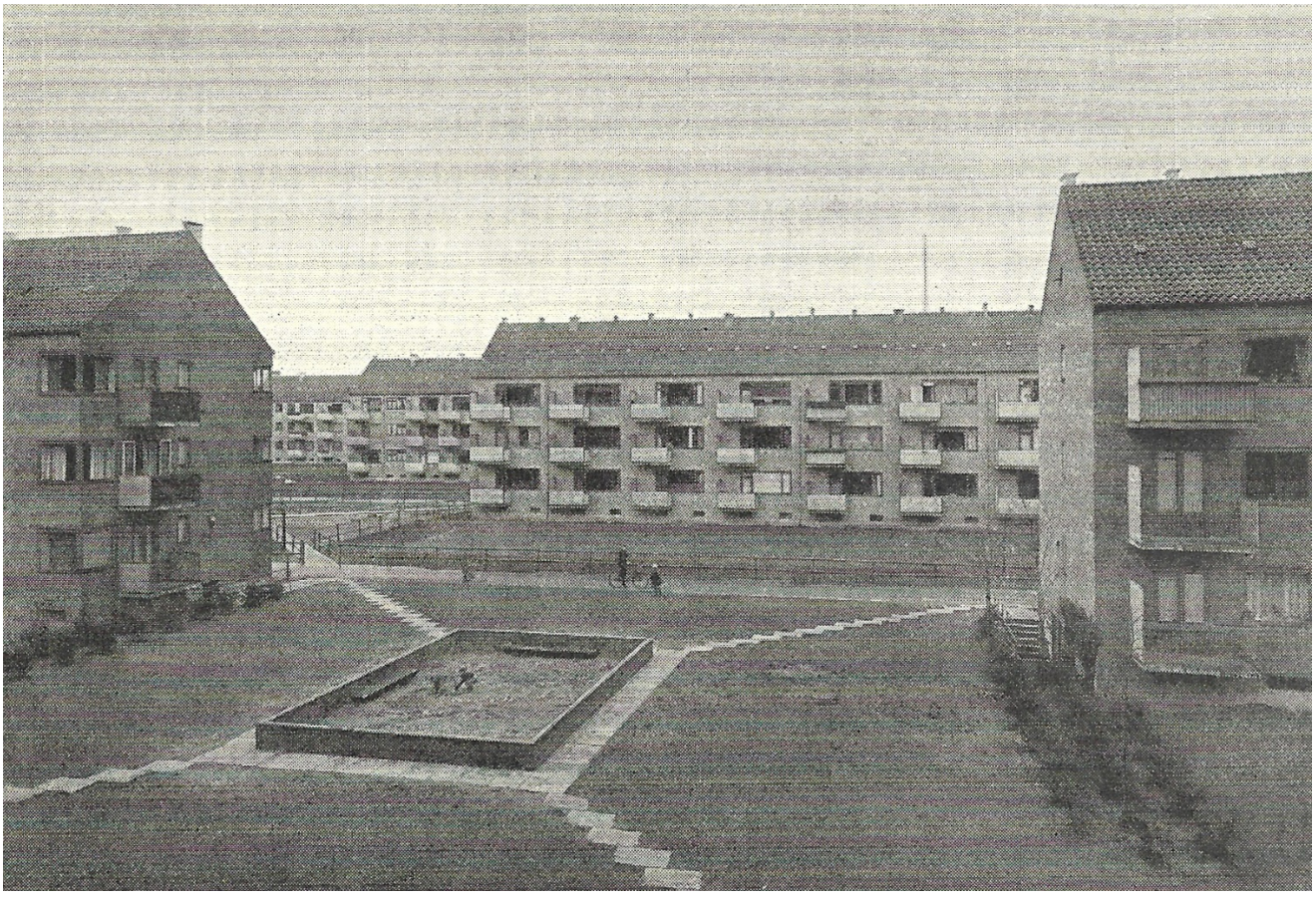


Figure 32: Playground at Lundevænget [ArkHe36]

Motivation

More than eighty years after construction, the building blocks of Lundevænget were in need of a fundamental renovation. The brick walls were in bad condition, the joints were crumbling and the bricks were humid. The thermal insulation of the walls was insufficient and the embedded steel beams suffered from heavy corrosion. The indoor climate was poor and exhibited severe mould formation in various locations (Figure 33, left). The roof was untight and the entire roof construction was in a bad condition. Continuous reparation works were necessary (Figure 33, bottom right). Bathrooms and kitchens were old and worn-out, leakages in water pipes caused moisture problems in the wooden beam floors. Apart from the rather urgent structural deficits, Lundevænget was also suffering from the monotonous and outdated apartment layouts from the 1930s. Most of the apartments were typical two-room apartments of 55 sqm with small kitchens and small bathrooms. They could no longer attract a varied mix of residents from different social backgrounds. While the development was originally planned for young families, in 2014, only 6% of the residents were families with children [Ram14, p.19].

Figure 33: Lundevænget: Water and mould damages at a gable apartment (left), corroded steel beams (top right), reparations on original tiled roof (bottom right)

Renovation approach

The preliminary master plan for the development [Ram14] contains information about the chosen renovation approach. The aim was to strengthen and improve the development of Lundevænget and to create attractive apartments for today and the next fifty years. The intention was to find solutions that respect the existing qualities and, at the same time, fulfil the demands of a modern dwelling [Ram14, p.8]. It was intended to utilize small and precise interventions which respect the existing fine architecture. The renovation should also bring back some original qualities of the development which were covered or erased by previous renovations. In the adjacent park area, the planned interventions should be inspired by the original ideas of landscape architect C.Th. Sørensen. At the same time, new plantings should enhance the outdoor qualities by creating niches and an improved biodiversity [Ram14, p.50]. The

improved spaces should invite for more outdoor activities. Private gardens were planned in front of the ground floor apartments, directly accessible via external staircases.[22]
Necessary reparations of the brick walls were planned to be 'disguised' [Ram14, p.42]. However, new brick details were suggested at the insulated gable walls.[23] The entrances of the apartments with elevator access were also planned to be marked with new brick details [Ram14, p.34].[24] A particular focus was set on the continuous information and inclusion of the residents during the development of the master plan. A close collaboration with the residents was considered beneficial for a successful planning. Residents that are included in the planning process would also be more tolerant towards noise and other inconveniences during the renovation [Ram14, p.25].

Implementation

In order to improve the indoor climate, the gable walls were insulated in a similar approach as in Højstrupparken and described in the theoretical background of this report [25]. The result is shown in Figure 34. At the lateral walls, no additional insulation was applied, but the bricks were cleaned and joints were repaired.

The roofs were in a condition where further reparation works were not feasible. Therefore, the roofs were re-built from scratch. The new roofs exhibit similar roof inclinations and similar roof tiles as the original. In some buildings, new roof apartments were established. Here, the originally plane roof surfaces needed to be equipped with skylight windows (Figure 36 and Figure 37).

It was decided to remove the existing windows that stem from a renovation in the 1980s and exchange them with new windows that comply to modern standards. The new windows try to re-establish the appearance of the original wooden windows installed in the 1930s. Both, the chosen colour and format refer to the original. However, due to easier maintenance and limited funding, a different materiality was chosen. Some of the original windows featured a small horizontal division with a ventilation window on top. It was decided to re-establish this window division in order to match the original façade expression and rhythm even better. In the new version, however, this 'ventilation window' cannot be opened and is for decoration purposes only. Both, the gray windows from the 1980s and the new brown windows with original rhythm and imitated ventilation window are shown in Figure 35 (left). An entire façade with the re-established window rhythm can be seen in Figure 36. The newly adjusted window sizes can also be observed in Figure 38 (left, middle) and Figure 39 (left, middle).

Bathrooms and kitchens are entirely new in order to match modern standards (Figure 38). Radiators are placed along the outer walls to lower the risk of mould formation (Figure 39, middle). A modern ventilation system is implemented in order to keep the moisture levels below the critical value for mould formation. The renovation also includes the creation of larger three- and four-room apartments in order to attract families and other household constellations. Several buildings now include double-height loft apartments with one floor located under the inclined roof. Elevators are installed in four staircases and the connected apartments are made accessible for wheelchairs. The elevators are established inside the

[22] The private gardens + external staircases, as shown in the preliminary master plan, were finally not implemented.
[23] The brick details at the gables, as shown in the preliminary master plan, were finally not implemented.
[24] The brick details at the entrances, as shown in the preliminary master plan, were finally not implemented. However, the entrance areas were marked with a slightly recessed brick field (see Figure 35, right)
[25] See 'Typical Renovation Tasks' on p.23

Figure 34: Lundevænget: Original gable wall (left), Insulated gable with new windows (middle), Transition between insulated gable wall and original wall (right)

Figure 35: Lundevænget: New and old windows (1980s) next to each other (left), Entrance with recessed brick wall to mark entrance with elevators (right)

Figure 36: Lundevænget: Renovated facades with new windows and new roof + roof apartments

Figure 37: Lundevænget: Example of a new roof apartment (left: old attic; right: new upper floor)

Figure 38: Lundevænget: Example of a renovated kitchen (left: old; middle: new) and renovated bathroom (right)

Figure 39: Lundevænget: Old windows from 1980s (left) and new windows with radiator in a renovated apartment (middle); Mockups of planned balconies (right)

building volume and are not seen from the outside. An area with a recessed brick wall marks the entrances with elevators (Figure 35, right).

Initially, it was planned to renew the balconies of Lundevænget as well. The existing balconies are not original and stem from the renovation in the 1980s (see Figure 36). While the original development of the 1930s exhibited three different types of balconies (each of the three architects used its own particular model), the balconies were unified in the 1980s renovation. In order to decide for the design of the new balconies, three mockup models were built and mounted at Lundevænget (Figure 39, right). All three models were mainly inspired by the balcony utilized by Frederik Wagner. However, due to cost restrictions, it was finally decided to maintain the balconies from the 1980s renovation.

Evaluation

Both, the elaborate approach to insulate the gable walls and the decision to maintain the lateral walls without additional insulation layer, help to preserve the material and structural authenticity of the buildings. The communicative authenticity is challenged, since the newly erected gable walls blend old and new bricks and prevent the clear readability of the newly added materiality. However, the chosen approach for the gable wall insulation strengthens the age-value when compared to other, less sensitive solutions. Keeping the lateral walls without additional insulation layer helps to maintain the age- and the historical value.

In other parts of the renovation, the material, structural and also the communicative authenticity are challenged more severely. The windows are exchanged, the roofs are renewed, the kitchens and bathrooms are re-built from scratch. Several floorplans experience substantial changes and the installation of elevators also require structural changes. While the changes challenge the traditional concepts of heritage preservation, they decisively improve the experiential values of the users, such as the use-value and the newness-value.

The communicative authenticity is challenged by the intentions to hide[26] necessary changes and reparations in the brick walls. Somewhat inconsistent to that, the entrances with newly established elevators are marked with a particular brick detailing; an intervention that strengthens the communicative authenticity and makes old and new better readable from the outside.

Where the preservation of original material was not possible, the chosen solutions are in-line with the renovation approaches observed in the previous examples, where new solutions try to imitate the visual appearance of the original. The new windows imitate the appearance of the original windows, even though the materiality and the functionality – with a non-openable ventilation window - are different. The historical value and the age-value are weakened, while the art-value is increased due to the re-established window and façade expression. The new roofs exhibit similar roof inclinations and roof tiles as the original and help to maintain the original proportions and ideas of the architects. This strengthens the art-value as well.

The graphical evaluation within the scheme of Gudmand-Høyer is shown in Figure 40.

[26] As explicitly mentioned in the preliminary master plan [Ram14, p.42]

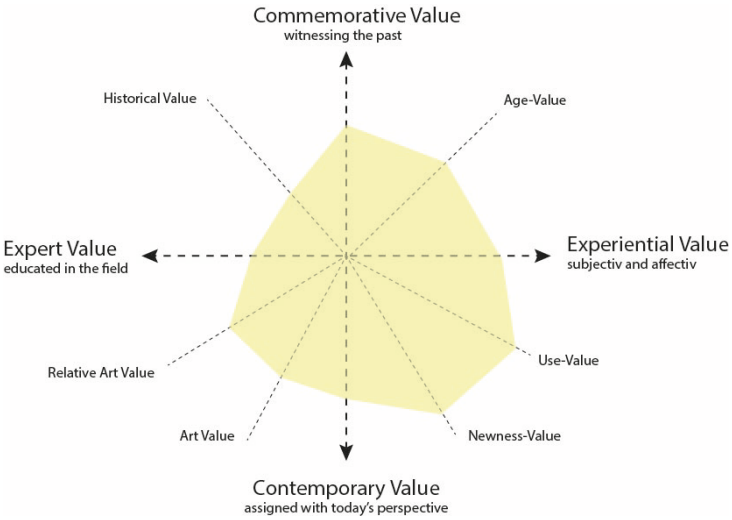


Figure 40: The renovation approach of Lundevænget represented in the evaluation scheme of Gudmand-Høyer [GuHø18]

THE DEVELOPMENT

The residential housing development of Tingbjerg is a remarkable and famous housing project designed by Steen Eiler Rasmussen. The development was built in two stages, with Tingbjerg I being built between 1955-1958 and Tingbjerg II being built between 1964 and 1972. The development was planned in the green outskirts of Copenhagen, where it should create a 'city within a city' and provide all necessary infrastructure needed for an independent living. This included public squares and fields for recreation and sports, a shopping street, educational institutions, kindergartens, playgrounds and even an indoor swimming pool. It was the intention of the architect to create a new and modern living close to nature with all requirements needed to attract residents of all ages and different social backgrounds [Ras63]. The available floorplans were more varied than in the earlier modernist housing developments, although still smaller when compared to the standards of today. Altogether, the development hosts nearly 1100 apartments. Its large extensions can be seen in the layout plan of Figure 9.

In order to integrate the development well into the countryside, the building blocks were restrained to a height of three storeys and the roof inclination was chosen to be very subtle only. Apart from the yellow brick facades, the French windows with its white window shutters became an iconic motive of Tingbjerg (Figure 41). The park areas were designed by C.Th. Sørensen and set focus on the social interaction and good usability for children and families.

Figure 41: Yellow brick facades and white window shutter of Tingbjerg

Motivation

Since several years, Tingbjerg is part of the Danish national list for *particularly exposed areas* (or: *ghetto list*), which is based on criteria such as criminality rate, education level, income level and ethnic background [Ghet19]. While the criteria for the list are questionable, various initiatives try to improve the situation and remove Tingbjerg from that list. The renovation and modernization of a large number of apartments is one of those initiatives [Ting15]. The present analysis refers to the renovation of Tingbjerg I, which is administrated by the social housing organisation FSB.

The renovation had the aim to create well-functioning dwellings with a good indoor climate and modern kitchens and bathrooms [Ram13, p.7]. A further aim was the transformation of Tingbjerg into a green and sustainable housing development. This should not only consider energy savings, but should also include the environmental impact during production, utilization and demolition of the building components [Ram13, p.13]. Before the renovation, the dwellings suffered from partly severe mould formation, particularly in the apartments connected to the exposed gable walls. The problems also occurred in bathrooms, kitchen surfaces and behind built-in closets that were installed towards the outer walls (Figure 42, left and middle). The joints of the outer brick walls were eroded (Figure 35, right) and additional problems with humidity rising from the cellar were reported [Ram13, p.10]. The roof construction with in-situ casted concrete elements was badly insulated and caused substantial heat losses [Ram13, p.12]. The fascia construction of casted concrete constituted a thermal bridge with a severe risk for humidity and mould formation towards the inside (Figure 46, top right).

Figure 42: Tingbjerg: Example of severe mould formation in bathroom (left) and behind a built-in closet (middle); Example of eroded brick joints (right)

Renovation approach

The renovation should be carried out without compromising on the original, characteristic architecture. The spirit of the architect should be maintained, and the existing architecture with its fine details should be preserved [Ram20]. The fine detailing and rich brick patterns at the gables should be maintained despite the implementation of a thermal insulation layer. The original roof construction should be

maintained, with an improved insulation that should not destroy the original architectural expression of the roof [Ram13, p.12]. At the same time, several new components should be added as well. Windows should be exchanged, and external staircases should be installed in order to connect the ground floor apartments with the gardens. Some gable walls should be broken up in order to implement small balconets that improve the light conditions of the connected apartments [Ram15, p.13]. The renovation tried to put focus on the needs and comforts of the residents. The aim was to create an attractive residential area, where people like to move to, and like to stay [Ram13, p.7]. It is emphasized in [Ram15, p.10] that the renovated dwellings should be attractive 'for everybody' - including families and older people. Several flats should gain accessibility for wheelchairs and elevators should be installed. Similar to the approach in Lundevænget, residents were involved in the planning process in order to develop suitable solutions and to raise acceptance.

Implementation

The gable walls were insulated in a similar way as in Lundevænget and Højstrupparken. For two of the gable walls, however, the level of complexity for the restoration was further increased since those gables exhibited rich brick patterns (Figure 43, left). The brick patterns were sought to be maintained and the final result is shown in Figure 43 (middle). The lateral walls were kept in their original state and without the application of an additional insulation layer. In Figure 43 (right) the transition between a re-erected gable wall and an originally kept lateral wall can be seen. In Figure 44 (left) a refurbished lateral wall with repaired joints and newly installed windows is shown. The window frames have a slender and fine appearance that fit well into the architectural context. It was decided to exchange both, windows and doors in order to remove the existing thermal bridges and fulfil the new demands on energy efficiency. The intended penetration of gable walls in order to establish balconet windows [Ram15, p.13] was finally not implemented. The solution would have destroyed original material and would have challenged the clean geometrical expressions of the gables.

A more substantial transformation was established by providing all apartments of the ground floors with direct access to a small private garden. These small gardens are taken from the larger and rather unstructured public spaces between the buildings. As shown in Figure 45 (middle), the new access is provided by steel staircases of rather contemporary design. The idea behind this addition was to utilize and activate the large outside spaces in a better way.

New kitchens were installed in all apartments. All apartments that connected to an exposed gable wall were equipped with a new bathroom as well. Figure 44 (right) shows examples of a new kitchen and toilet. The kitchens were available in three different versions with slightly varying colours for cabinet doors, work plate and wall covering. A new ventilation system was installed in order to ensure an air humidity below the critical values for mould formation. The built-in closets constituted a risk for mould formation and were removed, alternative solutions for the emerging niches were proposed, such as an open shelf or a small table [Ram15, p.8].

The original roof structure could be kept, but an additional layer of outer insulation had to be applied on top of the roof. The thickness was limited to 150-250mm in order to maintain the existing architectural expression [Ram13, p.12]. A sketch of the insulated roof is shown in Figure 46 (left). The sketch also shows the rather difficult enterprise of removing the thermal bridge that stems from the roof fascia

manufactured as a massive concrete element. The favoured solution wraps the roof fascia in a 45mm thick insulation layer which is then covered by a board of fiber concrete (Figure 46, left). However, as seen in Figure 46 (top right), the existing fascia already touched the upper window frames of the façade, and the additional insulation layer with fiber board cover was difficult to install. The final solution is illustrated in Figure 46 (bottom right).

The 33 smallest apartments of the development were merged into 3 new three-room and 9 new four-room apartments [Ram13]. 20 flats are transformed into wheelchair accessible apartments, 12 of them in a building block where three new elevators were integrated into the existing staircases and context (Figure 45, right).

Figure 43: Tingbjerg: Original brick detailing at gable (left) and restored brick detailing after gables were insulated (middle); transition between original wall and re-built gable wall (right)

Figure 44: Tingbjerg: Repaired brick wall with repaired joints and new and slender window frames (left), Examples for new kitchens and bathrooms (right)

Figure 45: Tingbjerg: Small gable wall with French balconies (left), new staircase access and private gardens for apartments at ground floor (middle), Integrated elevators with slight extension of staircase walls (right)

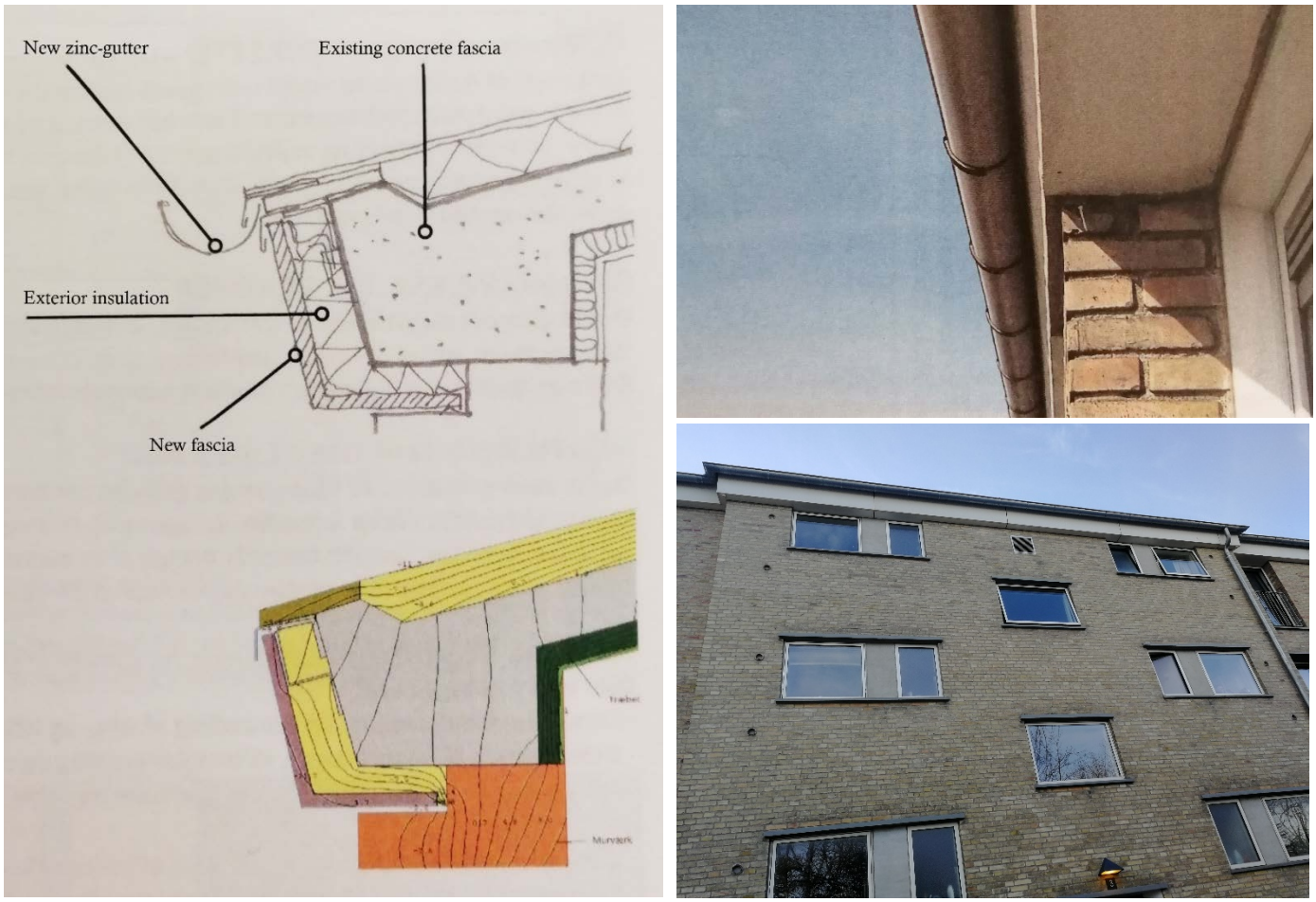


Figure 46: Tingbjerg: Sketches [Ram13] for new roof fascia after new insulation layers (yellow) are applied (left), original non-insulated roof fascia (top right), roof fascia with new cover after insulation was applied (bottom right)

Evaluation

The gables are insulated with an elaborate technique similar to the solutions in Lundevænget and Højstrupparken. The lateral walls are repaired but no additional insulation was applied. The treatment of the outer walls can thus be evaluated in the same way as in the renovation of Lundevænget. The material and structural authenticity is mostly maintained and the age-value partly preserved. A particular effort is made to restore the rich brick patterns on two of the gables in order to maintain the art-value.

In contrast to Lundevænget, the roof construction could be maintained. This strengthens the material and structural authenticity, although the original material is hidden under an additional insulation layer. The insulation of the fascia and the covering with fiber cement boards is, however, problematic. As seen in Figure 46 (bottom right) the chosen solution results in a visually relative prominent fascia, that opposes the fine and slender appearance of the original architecture. Apart from the altered proportions, the fiber cement boards exhibit visible air gaps between the single elements, which does not correspond to the fine qualities of modernist craftmanship. While the insulation strengthens the use-value of the building, it clearly weakens the architectural and art-value of the buildings. In the smaller gable walls, such as shown in Figure 45 (left), the increased size of the fascia seems particularly disturbing.

Another example for the prioritization of use-value can be found in the installation of the external staircases and the establishment of private gardens (Figure 45, middle). However, the solution also challenges two concepts of the original architect. On the one hand, the external staircases dissolve the strong geometric form of the buildings, which was originally emphasized by the sharp encounter between building volume and plane grass fields [27]. On the other hand, the privileged access for the residents of the ground floor opposes the democratic spirit of the original plans, in which all residents should be treated equally. The external staircases and private gardens can thus be evaluated as a gain for the use-value, but at the same time as a loss of the original intentions of the architect. In the evaluation scheme of Gudmand-Høyer this is reflected in a decrease of expert values, i.e. art and historic value.

As mentioned in the renovation approach, the interventions had the clear intention to establish an attractive residential area, where people like to move in, and like to stay. The use-value and newness-value are highly strengthened, the new apartments fully comply with the desired requirements. At the same time, it was formulated that the spirit of the original architecture should be maintained. This intention is recognizable in the elaborate insulation of the gable walls, the sensitive reparation of the lateral walls and the selection of windows. However, the interventions were not fully successful in the chosen solution for the fascia insulation and the installation of the external staircases.

The graphical representation of the maintained and strengthened heritage values is shown in Figure 47.

[27] As described in the theoretical background on p.16

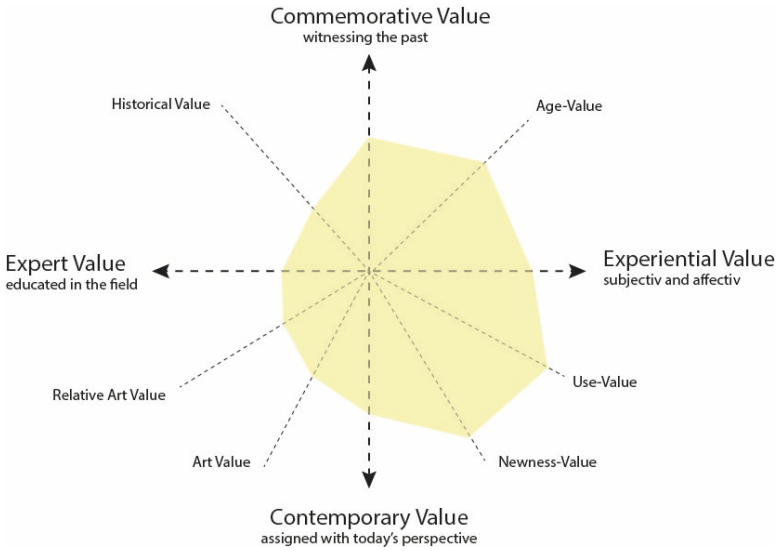


Figure 47: The renovation approach of Tingbjerg represented in the evaluation scheme of Gudmand-Høyer [GuHø18]

The analysis of Task 1 show that the recent renovations of modernist housing developments put a clear focus on the strengthening of the use- and newness-value. The aim of the renovations was to create attractive dwellings with a good and healthy indoor climate. Similar to the concepts of New Heritage, the considered buildings were perceived as a valuable resource to create future values for the users and the neighbourhood. Residents were included in the planning phases of the projects and thus contributed to a more democratic renovation process.

The improvement of use- and newness-value was the primary motivation for the renovations. However, the determined implementation of user-friendly solutions triggered conflicts with the built heritage and challenged the traditional and official concepts of heritage preservation and authenticity. The three categories of authenticity, material, structural and communicative authenticity, were frequently challenged. Many times, it was not possible to create and preserve the use-value without destroying original fabric [28]. Examples are the application of additional insulation layers, the installation of new roofs, the change of windows, the modernization of kitchen and bathrooms, the installation of elevators and the creation of more spacious apartments.

The necessary changes and additions to the original fabric were intended to be carried out *in the spirit* of the architect or in correspondence to the forms and colours that are today associated with modernist architecture. Where the original fabric could not be maintained, new solutions with improved properties try to imitate the visual appearance of the original and try to maintain the *authentic experience* of the place. An example are the newly installed windows at Lundevænget, which correspond to the original windows in rhythm and colour, but exhibit a different materiality. Further examples are the entirely new façades of Bellahøjhusene and Brøndbyparken. With the new solutions, most of the traditional heritage values [29] cannot be kept. Only the architectural value can be partly maintained, since the appearance and proportions of the buildings still correspond to the original plans of the architect. This re-creation of visual appearance seems to be an accepted compromise between traditional heritage values and the need for modernization. It is therefore a popular conservation approach in the current residential housing renovations in Denmark.

A second observed tendency in the examined projects was the intention to conduct *invisible optimizations* that try to smear out the line between old and new fabric. Examples can be the insulated gable walls that use original bricks, or the installed elevators at Tingbjerg. While the chosen solutions integrate nicely into the existing fabric, the distinction between old and new fabric is difficult. The subtle integration is intended by the architects, however, in terms of traditional heritage preservation, a clear distinction between old and new would be desired.

In the renovation of Tingbjerg, decisive improvements could be made with respect to the implemented use- and newness-value. With the elaborate renovation of gable walls, lateral walls and roof, a substantial portion of material and structural authenticity could be maintained. The windows are new, but fit well into the context. Criticism can be formulated towards the implementation of the fascia insulation, since

[28] The paradox of 'destroy to preserve' is frequently mentioned in [GuHø18]

[29] The traditional heritage values refer to the heritage values acknowledged by the official heritage discourse and advocated by the municipalities (p.30)

it opposes the fine detailing and craftmanship of the original, modernist architecture. The external staircases and private gardens of the ground floor apartments improve the use-value, but also challenge the original intentions in terms of aesthetics and democratic principles. Those interventions reduce the art- and historic value of the development.

In the renovation of Lundevænget, similar improvements in terms of use- and newness-value could be made. The elaborate renovation of gable walls and lateral walls strengthens the material and structural authenticity. Roofs and windows had to be replaced with new fabric, but the solutions are considered appropriate and manage to maintain the art-value of the original architecture. The imitation of a formerly existing ventilation window is perceived critically, since the window cannot be opened and only serves decorative purposes. The solution can be considered to be opposing to the original convictions of the modernist architect.

It should be mentioned here, that the evaluation tool of Gudmand-Høyer still leaves room for interpretation, especially when various interventions and maybe opposing tendencies have to be evaluated in one single evaluation scheme. In a more detailed analysis and discussion, it might be advantageous to evaluate different interventions with separate schemes. The scheme neither includes all useful terms and categories utilized in the discussion, the important evaluation of the maintained authenticity is, for example, not reflected. The scheme neither exhibits a fixed scale, and evaluations are always relative. However, it is the conviction of the author, that the conscious utilization of the above introduced terms and concepts can support a more qualified discussion between the involved parties of future housing renovation projects. A clear and precise formulation of the intended goals will also lead to more consistent solutions, where different components of the same renovation project should exhibit similar intentions and evaluations.

TASK 2: THE POTENTIAL OF ADDITIONS

Task 2 comprises a design project in which the potentials of new additions are investigated. Although the studies deal with the specific problem of two new additions for the housing development of Bispeparken, the proposal tackles various typical challenges that are connected with the renovation of modernist housing developments [30]. While Task 1 focuses on the renovation of *existing buildings* and mainly considers improvements on a detail and building level, Task 2 demonstrates how *new additions* can offer convincing solutions on both, a building level and building composition level. Wisely placed additions can not only provide new and varied apartments for the development, but can also achieve decisive improvements on an urban scale. The proposed additions at Bispeparken create variously sized apartments with modern floorplan layouts, elevator accessibility and generous communal spaces while they contribute - at the same time - to a better zoning of outdoor spaces, an increased attractivity of the development to the outside and a general activation of the urban surrounding. The presented design project thus demonstrates how new additions can improve a modernist housing development on various scales while they minimize the conflicts with existing fabric and the possible destruction of built heritage.

GUIDELINES FOR ADDITIONS

Already in the analysis of the renovation projects in Task 1, the discussion touched the question of how a suitable design for new components should look like. How much should the new components adapt to the original materiality and appearance? Which design and solution fits to the original building and is *in the spirit* of the modernist architect? Valuable information about the most suitable conservation strategies and interventions is given in the theoretical background of this work [31]. The guidelines formulated in the Charter of Venice [Ven64] or the Danish preservation principles [SKLS12] occupy a central part in this discussion, but also the comments on authentic solutions in the modernist context (p.34) should be considered.

In the specific context of suitable designs for new additions, the following references can provide further orientation. In her book *Funkishuset*, Jeanne Brüel states that ‘an extension which takes its starting point from the buildings sharp and simple forms has most chances to become architecturally successful’ [Brue14, p.38]. She recommends a design that incorporates existing geometries and proportions and tries to ‘aim for a fine and calm transition between old and new’ [Brue14, p.38]. Claus Bech-Danielsen states that ‘the modernist approach of reasonable form and fine craftmanship details with few and robust materials should be recognized in new interventions’ [BeDa14, p.77]. In her publication *New Exterior Additions to Historic Buildings*, Anne Grimmer recommends that an extension should be ‘distinguishable from the historic building’ and ‘subordinate in size and design’ [Grimm10, p.14]. She also states that the colours and materials should be ‘harmonious with the historic building materials’ [Grimm10, p.14].

[30] See ‘Typical Renovation Tasks’ on p.21 ff.
[31] See ‘Heritage Value Assessment and Preservation’ on p. 25 ff.

At the time of its completion in 1941, the residential housing development of Bispeparken was Scandinavia's largest building complex, consisting of nine building blocks and 785 apartments, mostly intended for young families with children. The buildings were designed by the most renowned architects of the time, including Edvard Heiberg, Frederik Wagner and Kaare Klint [32]. The landscape of the development was designed by C.Th. Sørensen. Although the buildings were designed by different architects, the common guidelines regarding brick colour, roof inclination and roof tiles helped the development to emerge as a unity. In the book *Rammer for udvikling* [RoBe17], the development is listed with the highest conservation value of 1.

Some original illustrations and plans of the development are shown in Figure 48. The illustrations indicate the particular arrangement of the buildings, chosen to maintain a free view on Grundvigs Church and to create a visual connection between Grundvigs Church and Grundvigs School. The contours of the development are determined by the given street triangle of Frederiksborggade, Tagensvej and Tuborgvej. The development is located on sloping terrain, with the highest point in the northern part towards Grundvigs Church. In order to secure an undisturbed view to the church, the building heights of the northern blocks 1A and 1B are limited to three floors, while the height of the southern block 6 exhibits six floors. Most of the apartments feature an east/west orientation, but several apartments also feature a north/south orientation. The private balconies can point to the east, to the west or to the south, depending on the street access and the preferred outlook towards the park areas.

During a site visit at Bispeparken, two opposing qualities could be observed (Figure 49). On the one hand, there is the rather green Bispeparken with private balconies facing the recreational park areas in the centre of the development. On the other hand, there is a rather grey side of Bispeparken with private balconies facing the large asphaltic surface of Frederiksborggade. One aim of the presented design project is to improve this rather sad aspect of Bispeparken.

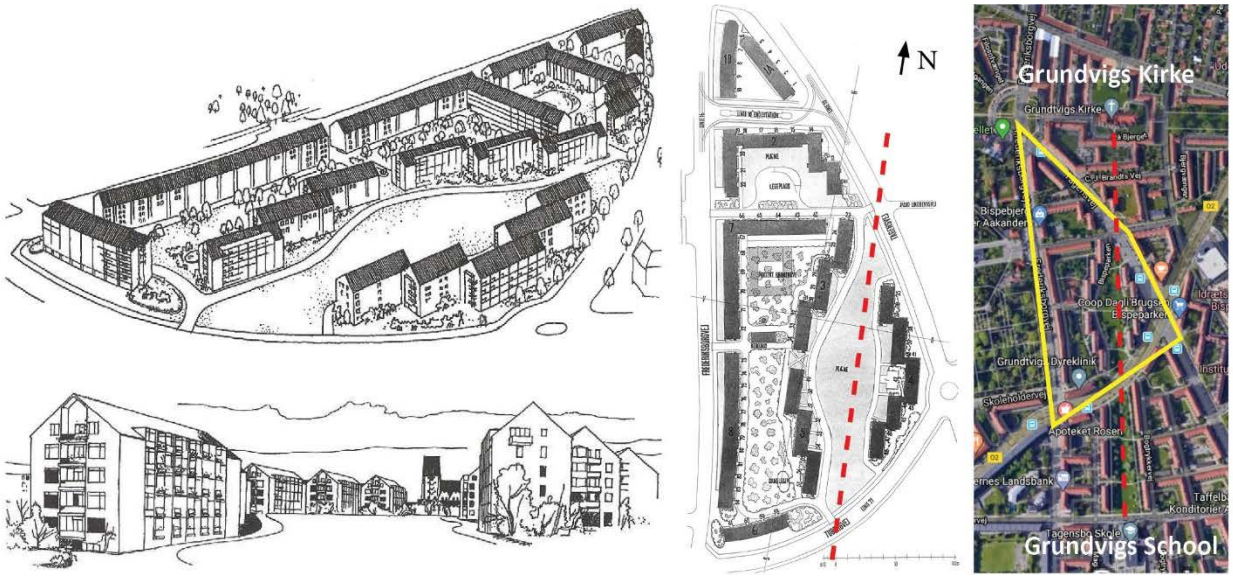


Figure 48: Original plans of Bispeparken with view on Grundvigs church (left), idea of visual connection between Grundvigs Church and Grundvigs School (right)

[32] Kaare Klint is the son of Peder Jesper Klint who built the nearby Grundvigs Church

Figure 49: Bispeparken today, with the rather 'green' Bispeparken (right) and the rather 'grey' Bispeparken towards Frederiksborggade (left)

In recent years, Bispeparken encounters several social challenges and is part of the national list for *particularly exposed areas (*or: *ghetto list)* [Ghet19]. The development and its residents fulfil four out of five criteria defining such area; namely a high criminality rate, a low education level, a low per-capita income and a high number of residents with non-western background. Various initiatives try to find solutions that improve the life quality and perception of Bispeparken and its neighbourhood Bispebjerg [Fsb16, KøKo16, Vand15]. The strategic development plan of Vandkunsten [Vand15] points out several attributes and deficits of Bispebjerg and suggests various improvements.

The report identifies the oversized streets and the unalluring sidewalks as a major deficit of Bispebjerg. Large parts of Bispebjerg are perceived as a transit area for cars. As a pedestrian, it is hard to orient and move around, and it is also difficult to distinguish between private and public spaces.

The suggestions by Vandkunsten are summarized in the illustration of Figure 50. Extended and re-designed sidewalks could improve the situation for pedestrians and facilitate encounters between people. New plantings and additional trees could be utilized to emphasize the image of a 'green quarter'. The area could exhibit zones of less car traffic in order to increase the feeling of safety. Events and specific meeting points, both indoor and outdoor, could strengthen the community feeling. Parking areas could be merged and reduced in order to free spaces for other uses. A better indication of ownership could increase the quality of the semi-private outdoor spaces. Public walkways through larger housing developments could be clearly indicated. Frederiksborggade is pictured as a street with reduced car traffic. As a pedestrian, it should be easy to cross the street and access the adjacent cemetery and park.

The strategic plan by Vandkunsten also elaborates briefly on the possibilities for densification in the area. New buildings are appreciated in order to supplement the available functionalities and increase the number of bigger apartments that attract a more varied mix of residents [Vand15, p.21/p.54]. However, within Bispeparken, not many possibilities for building additions were indicated, although plenty of

Figure 50: Illustration of the strategic development plan for Bispebjerg by Vandkunsten [Vand15]

green spaces appear on the map. This corresponds to the *Grøn Strukturplan* by FSB [Fsb16] which explains well the original intentions and values of the park areas designed by C.Th. Sørensen and the necessity for their further existence.

Some short information about the three major green spaces of Bispeparken is given in the following. The large corridor between blocks 3, 4 and 5 (indicated in Figure 49) is not considered to be available for additions. The view to the church has to be maintained and plans to transform the fields into a big urban park are about to be finished [Vand15, p.30]. The free space in the south of block 2 is neither available for additions. It was recently re-designed in order to serve as a natural percolation field for rain water [Fsb16, p.40]. The large, stretched area between blocks 3, 5, 6, 7 and 8 was originally planned as a forested area and should stand in contrast to the open fields between blocks 3, 4 and 5. During the years, the forested area was more and more repurposed, loosing much of its recreational space to both, underground and overground parking, a laundry and communal building.

It was therefore decided by the author, that future activities should rather focus on re-claiming the lost areas and re-establish their originally intended character, instead of adding more buildings there.

The decision to respect the original ideas of the development - and to rather re-establish the lost recreational spaces than losing them - made the search for a suitable spot for additions more difficult. However, in the northern part of the development, a location was found where the additions could accomplish both, adding new functionality to the development AND improving the existing urban situation. This location is indicated in Figure 51.

In comparison to the original plans of Figure 48, it can be seen that the area was formerly occupied by a tram station. After the tramline was removed, the gap between the buildings was left undefined and with no clear ownership. The proposal now tries to adjust the site to those changed circumstances. The suggested additions will help to close the existing gaps between the building blocks and help to better define a semi-private space for the residents. An additional connection through building block 2 will help to merge the different semi-private spaces of Bispeparken and enhance the relations within the community.

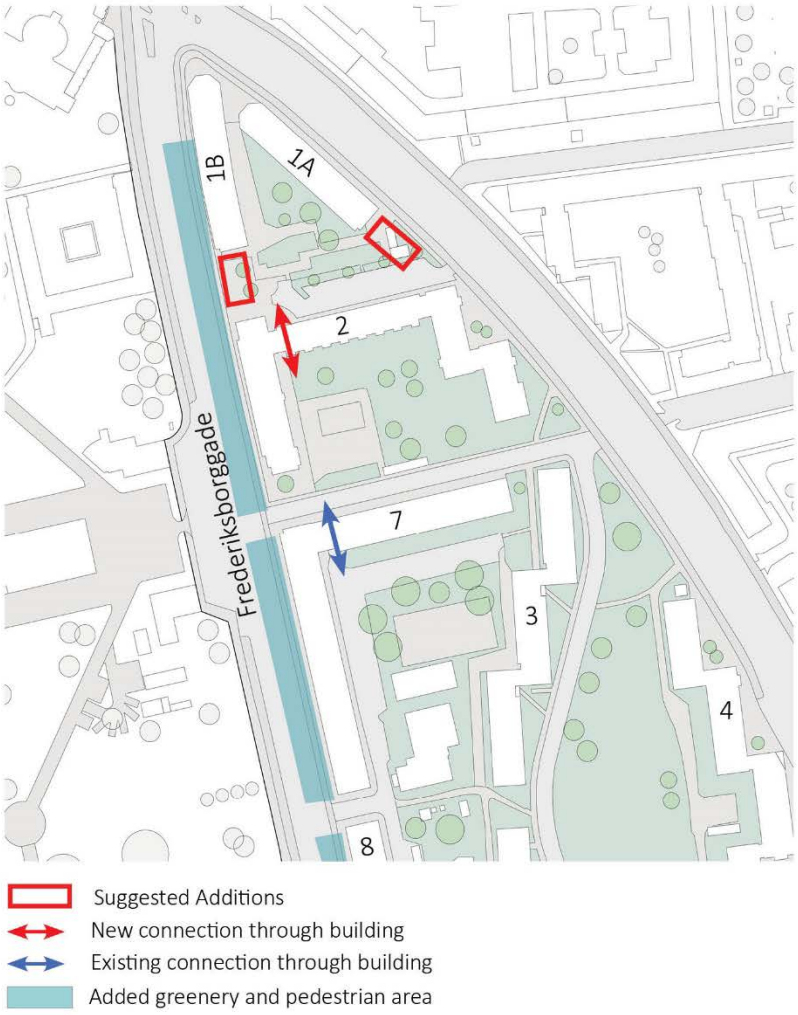


Figure 51: Suggested Additions for Bispeparken

The suggested additions will host shared flat apartments of various sizes and generous community spaces. All flats will exhibit elevator access and allow for multi-generational co-living, where the different generations can live together and support each other. The varied flat sizes will contribute to a diverse mix of residents. The building towards Frederiksborggade will constitute an interface between the residents and the public. The ground floor will include a workshop and a community kitchen which facilitate events that can be organized by both, the residents of Bispeparken and interested people from the outside. In this way, Bispeparken will help to improve the social cohesion within the area. Similar to the suggested intervention by Vandkunsten, Frederiksborggade will be transformed into a traffic reduced street with added greenery and a higher priority for pedestrians and bikes.

The project is inspired by existing co-living initiatives where people of different generations live under the same roof. Figure 52 illustrates some selected qualities of the co-living initiatives in Vrijburcht (Amsterdam) and Spreefeld (Berlin) which are sought to be achieved in Biseparken as well. The upper left illustration depicts the generous outdoor terraces of Vrijburcht, providing both, access to the apartments and the opportunity to meet with the neighbours. The upper right illustration shows the floorplans of a so-called *cluster unit* in Spreefeld. The variously sized flats contain an own kitchen and toilet, but also connect to a common space with shared kitchen, where residents can meet and interact with each other. The other two illustrations show communal spaces for various activities. Similar to Spreefeld, Bispeparken will offer a workshop where residents of Bispeparken and people from the outside can organize courses and events.

Figure 52: Examples of interesting co-living projects. Vrijburcht in Amsterdam (left) and Spreefeld in Berlin (right)

Figure 53 shows some pictures of the considered site. Besides a small playground and some park benches, the space is currently occupied by approximately 20 parking lots and a 150m^2 exhibition space for tombstones.

Figure 53: Pictures from the project site

BUILDING COMPOSITION LEVEL

Figure 54 illustrates the initial thoughts when trying to find the most appropriate building volumes for the planned additions.
Version 1 intends to maximize the available square meters for the planned apartments. However, this building layout - with a building placed parallel to block 2 - creates shadows in the northern court yard and affects the light conditions of the existing apartments in block 1A. Additionally, the layout creates a street-like connection that cuts through the development and enhances the separation of the northern courtyard.
In Version 2, the shapes of the building volumes are slightly more adapted to the context and intended functionality. The building parallel to block 2 is reduced in length in order to improve the light conditions in the court yard, while it is still long enough to host several apartments with a north/south orientation. Unfortunately, the layout still invites people from the outside to enter the development. As indicated in the respective diagram, they would even enter the northern court yard more likely. After all, this version constitutes an unclear statement and an unfavoured compromise between Version 1 and Version 3. It is therefore disregarded.
Although the available footprint size is smallest, Version 3 presents the preferred solution for the given project. Both additions are perceived as a rather linear extension to the building blocks 1A and 1B. The extensions establish a clear separation between inner yard and outer street and prevent people from entering the development without purpose. The building in the east is built higher than its surrounding in order to compensate for the reduced footprint size. The building also widens up towards the south in order to host a sufficient number of dwellings with well-oriented balconies.

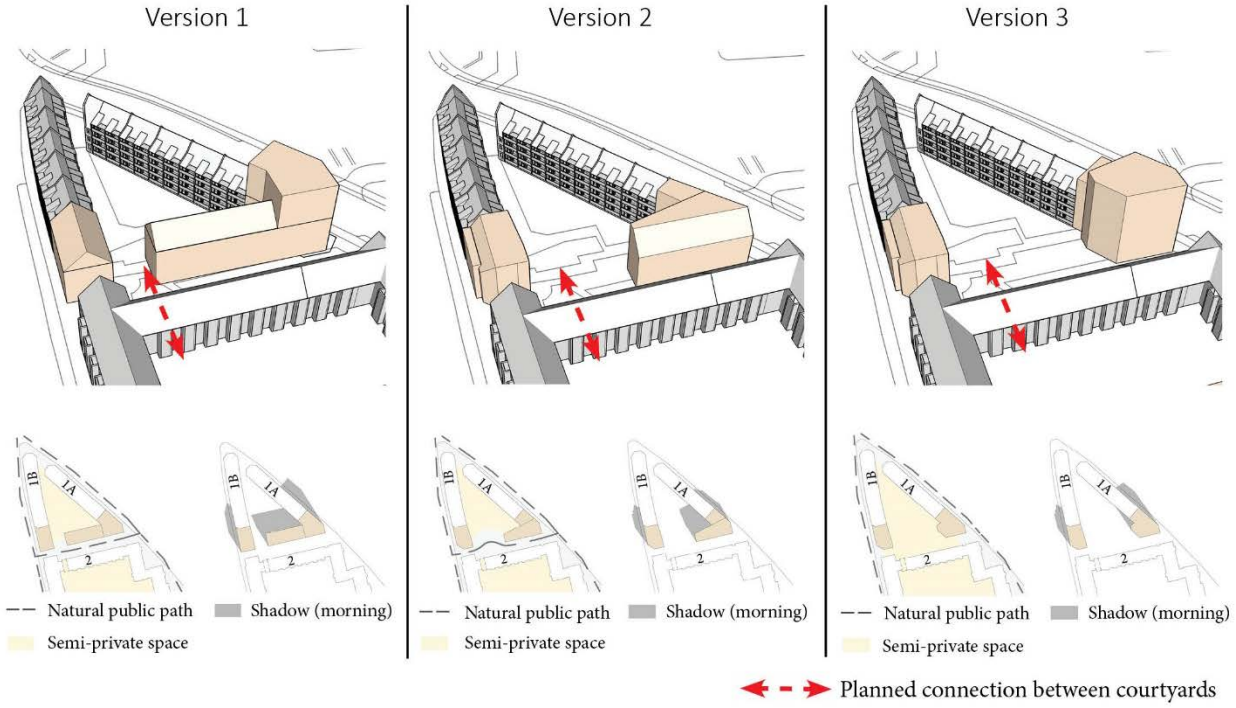


Figure 54: Initial process to find appropriate building volumes. Version 1 maximizes the available square meters for the apartments, but Version 3 minimizes shadows and defines best the semi-private courtyard

The building volumes were further developed by incorporating more of the intended functionality on a building composition level.

Figure 55 illustrates how the common terraces of both buildings are facing the semi-private court yard in order to enhance the social interaction of the community. The common terraces also facilitate the access to all apartments and connect with outdoor staircases and elevators. The terraces of the eastern building cut through the building volume and reach Tagensvej. This arrangement is chosen in order to maintain the main entrance of the eastern building on the same side as the existing buildings. The division of the building volume also improves the light conditions inside the building.

Figure 56 illustrates how the ground floors of the planned additions help to activate Frederiksborggade and Tagensvej. Especially towards Frederiksborggade, the installation of a community kitchen, a workshop and exhibition space will enhance the interaction between residents and urban surrounding. Towards Tagensvej, two additional retail spaces will complement the already existing shops.

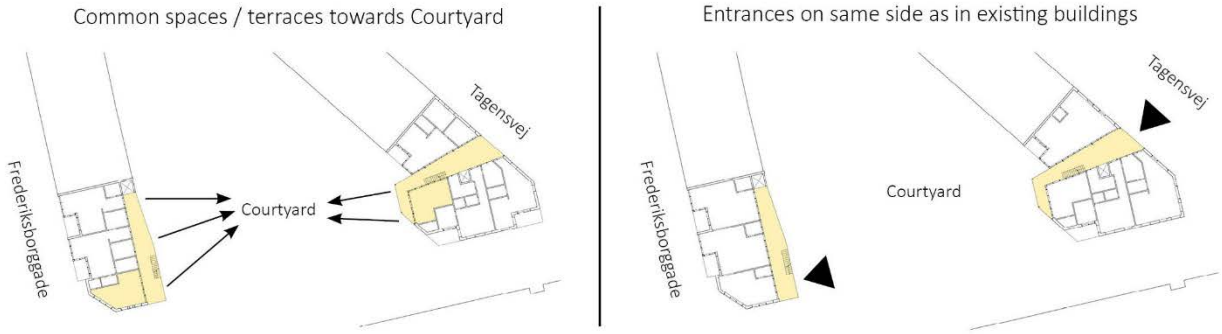


Figure 55: Location of common spaces and main entrances

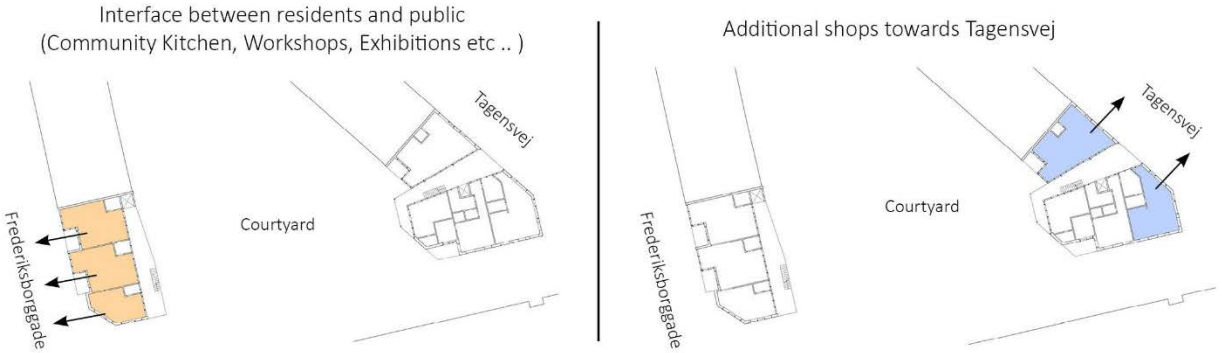


Figure 56: Interface to public via Community Kitchen, Workshops, Exhibitions and Shops

The developed design also includes various considerations on the building level scale. Figure 57 illustrates the implemented concepts for the addition towards Tagensvej. The considered building plot was rather challenging, since the building is located at a corner with an angle much less than 90 degrees. This means that only a small portion of the façade can turn towards the calm court yard in the south-west. The final layout thus developed from a quite functionalistic approach that tries to provide good light conditions for all apartments and a preferred orientation towards the calm court yard. This was achieved with a fanned apartment layout as illustrated in Figure 57 (top left). All apartments exhibit an orientation that points away from the busy street. The private balconies face two major sun directions, while three of the four balconies have direct visual contact to the inner yard. In contrast to the traditional floorplan layouts of modernism, the kitchen moves to a central location of the apartments, mostly in direct connection to the private balconies. The illustrations on the bottom left of Figure 57 indicate how the common terraces cut through the building and, on every second floor, connect to a common indoor space that faces the inner court yard. The apartment sizes can be adjusted by connecting the available 'switch-rooms' to different apartments. On the ground floor, two retail spaces supplement the already existing shops towards Tagensvej.

Figure 57: Concepts of building towards Tagensvej

Figure 58 illustrates the implemented concepts for the addition towards Frederiksborggade. Towards the street, the new building adopts the oriel-balcony motive of the existing building. However, the new oriels and balconies are wider than the existing in order to allow larger interior spaces. The kitchen plays a

central role in the apartments and exhibits a direct connection to the oriels and balconies. While the private balconies turn towards the west, the common terraces are located on the opposite side and face the inner yard. Similar to the building towards Tagensvej, the common terraces connect to a communal indoor space on every second floor. There are also various 'switch-rooms' that can be connected to different apartments and help to adjust the apartments for different types of households. On the ground floor, the building provides an interface to the public, with a workshop, a community kitchen and a small exhibition space. The workshop can host courses of various kinds. They can be organized by the residents of Bispeparken, but also by interested people from the outside. The community kitchen is opened for everyone. The cooking can be organized by the residents, but people from the outside can also be invited to participate. When the kitchen is not used for cooking, the space could host a local coffee place. A small exhibition space can exhibit and sell works from the workshops. The shared facilities will strengthen the community of Bispeparken and will also help the residents to connect to and include the outside. Events will help to strengthen the social cohesion of the neighbourhood and will also transform the housing development of Bispeparken to a visible destination with a positive image.

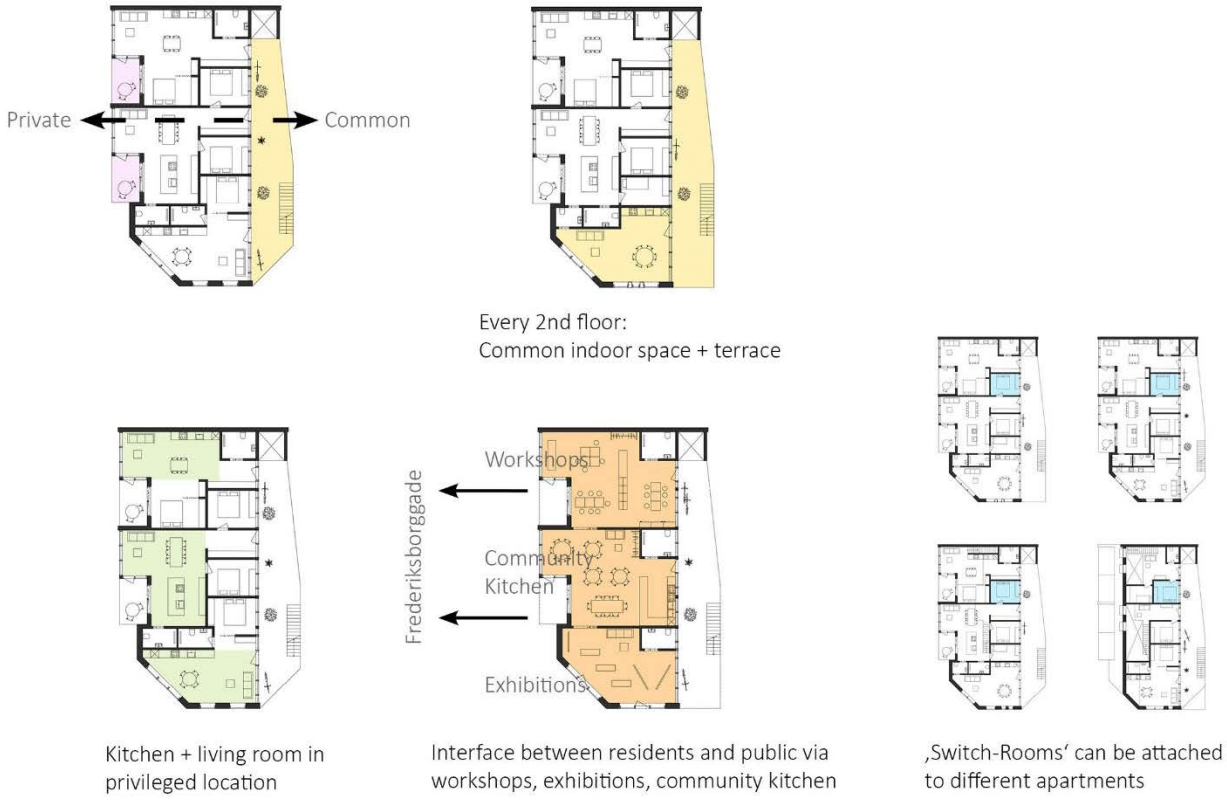


Figure 58: Concepts of building towards Frederiksborggade

Figure 59 illustrates the preliminary building volumes that include the above-mentioned concepts. It can be seen that the western addition towards Frederiksborggade is nearly a linear extension of the existing building block, also adopting the oriel-balcony motive at its western façade. At its southern end, the corner towards the street is chamfered. This refers to the chamfered corners of the existing buildings in the north and helps to indicate a niche where people are invited to rest and meet. The taller building in the east exhibits a chamfered corner as well. Apart from a well-directed widening of the street, the inclined corner helps to adapt the orientation of the building to the adjacent building blocks further south. The height of the eastern addition adapts gradually to the surrounding buildings in order to create a

sensitive transition. Both additions exhibit inclined roof areas towards the street in order to adapt to the surrounding buildings. Towards the court yard, the roofs are not inclined in order to utilize the available space for the loft apartments more efficiently.[33]

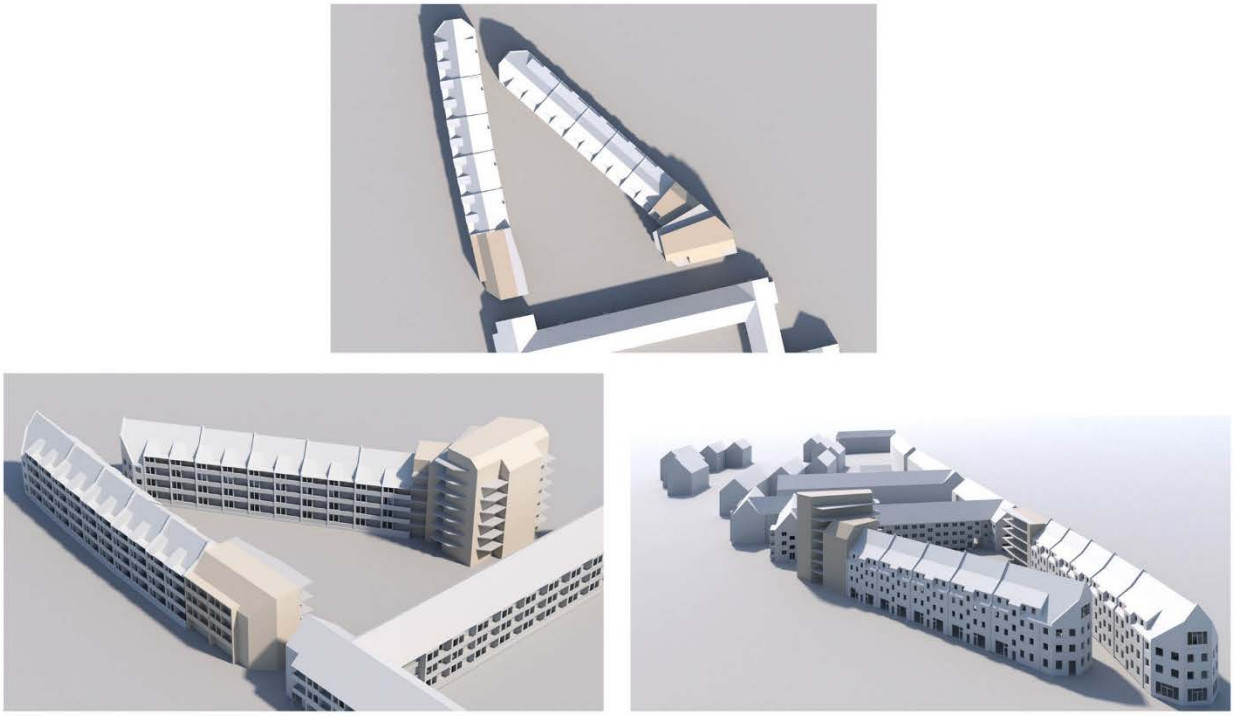


Figure 59: Preliminary 3D Volumes of the suggested additions

[33] In the Appendix on p. 84 ff. more detailed floorplans will be presented, including the floorplans of the duplex loft apartments.

In a next step, the existing materiality of Bispeparken is analysed in order to find a suitable materiality for the new building volumes.

Figure 60 illustrates that the prevalent elements of Bispeparken are yellow brickwork, grey pre-fabricated concrete elements and steel structures that are mostly painted in oxblood red. Figure 61 shows door frames painted in the same red colour, some frames are also painted in yellow. The exact same colours can be found in the close surrounding of Bispeparken, where buildings are of similar age. The pictures also show two types of balustrades, some rather closed balustrades covered with concrete elements and some rather open balustrades of thin vertical metal bars. Figure 62 then demonstrates that the modernist architecture of the area shows both, relatively open facades with a lot of glass elements and rather closed facades with prominent brick walls and smaller windows.

This combinations of rather closed facades with ceramic elements and open facades with curtain walls can be found in new constructions as well. Two examples of such contemporary buildings are shown in Figure 63. Apart from the open and closed facade constructions, the two examples exhibit strong geometrical forms and a rather sculptural appearance which can fit well into the modernist context. Both references constitute a fertile inspiration for the proposed materiality and detailing at Bispeparken.

Another reference for the design at Bispeparken is shown in Figure 64. The reference depicts a useful example for the combination of old and new fabric. The new bricks exhibit a particular surface pattern that creates an interesting texture and contrast to the existing building. The distinction between old and new is easy to perceive, while the found solution is still harmonious with the existing. The new windows adopt the frame width, the frame thickness and the frame colour of the existing, however, the new windows extend to the floor and adapt to modern living standards. Both, the way of adopting to the existing window pattern and the way of reaching a distinct new, but harmonious surface pattern for the brick walls, will be utilized in the presented design proposal.

Figure 60: Existing materiality (1/2). Yellow brickwork, gray concrete elements and (mostly red painted) steel structures

Figure 61: Existing materiality (2/2). Red and yellow door frames, Open balustrades with thin steel bars and closed balustrades with concrete elements

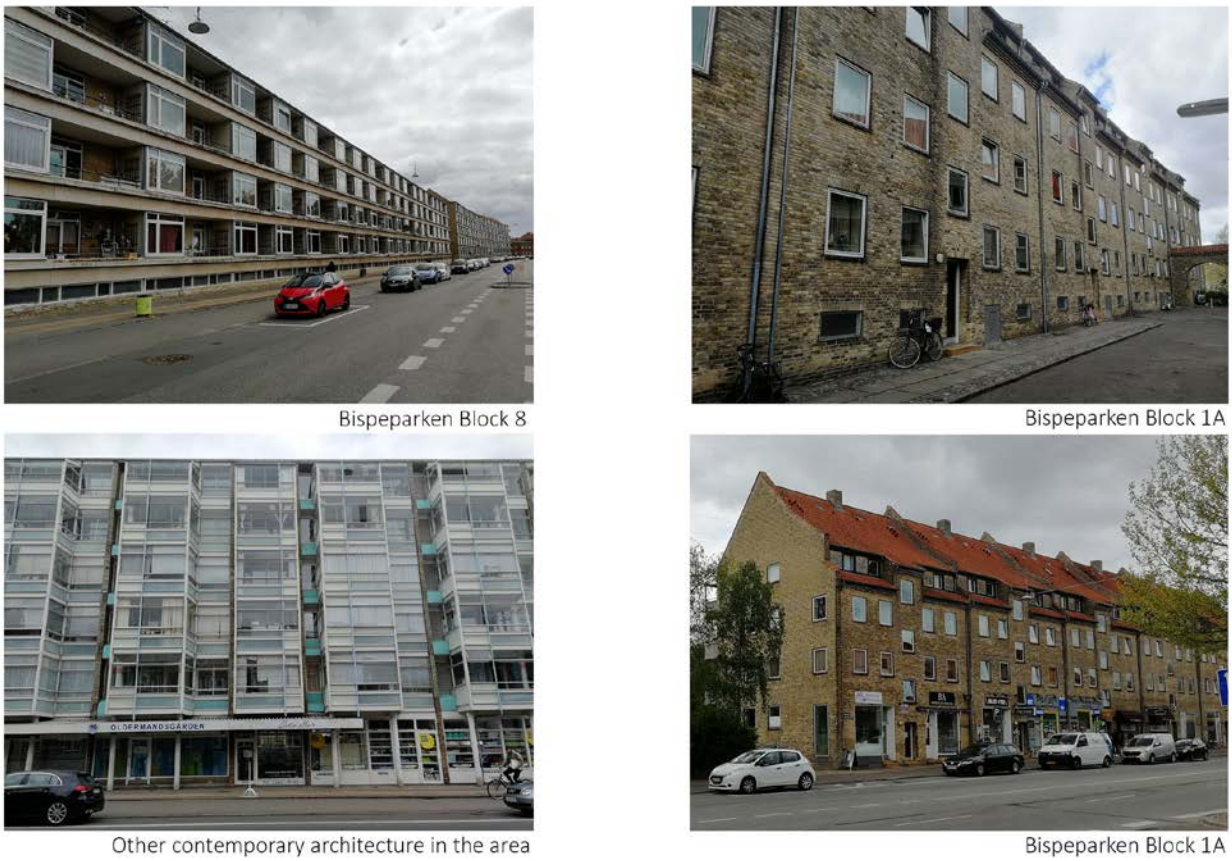
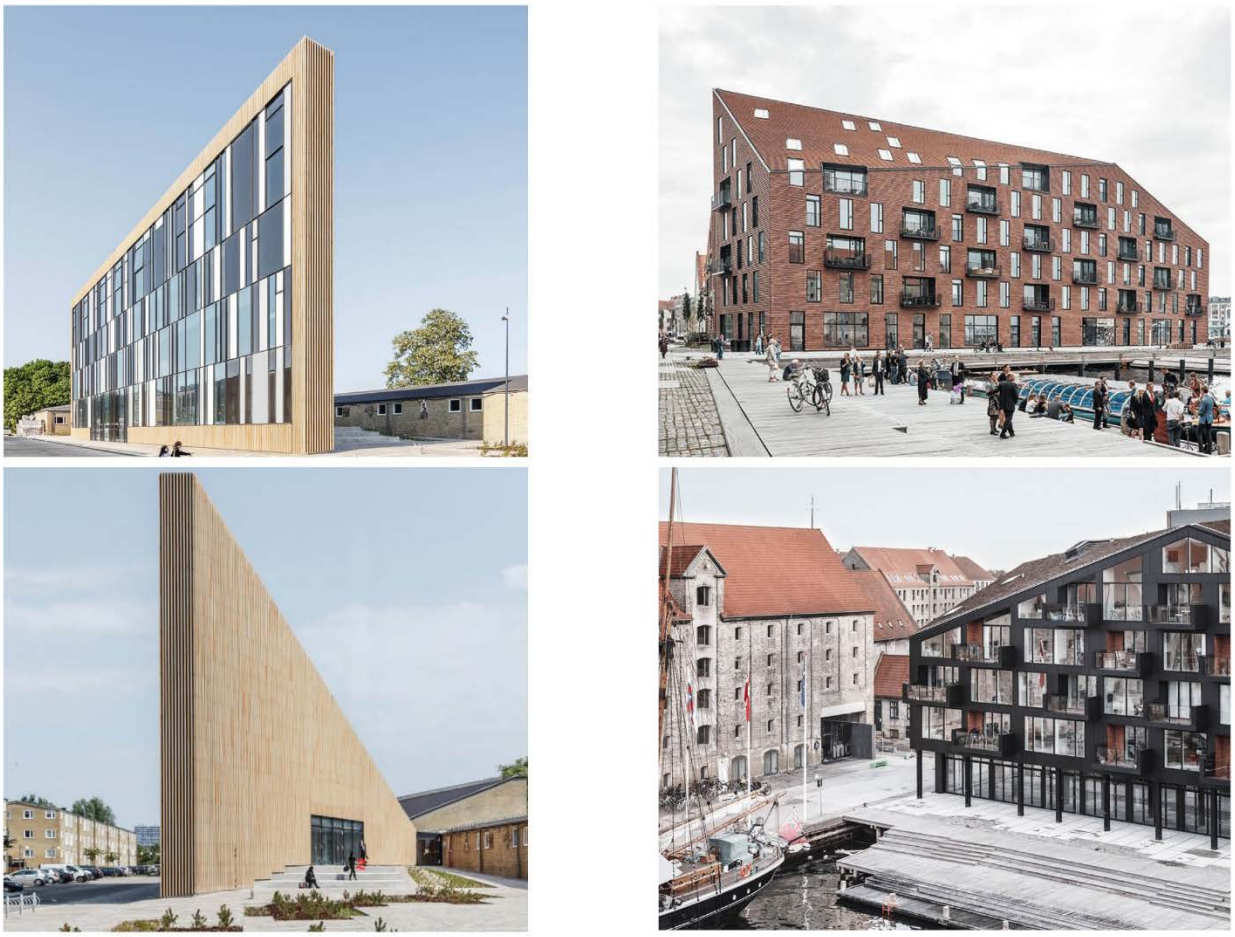


Figure 62: Existing architecture at Bispeparken and surrounding. Relatively open facades with glass elements (left) and rather closed facades with bricks (right)



Tingbjerg library

Krøyers plads

Figure 63: References of contemporary architecture utilizing a combination of rather closed ceramic facades and relatively open curtain wall facades

Figure 64: Reference for the combination of old and new fabric. The particular surface pattern of new bricks creates an interesting texture and a nice contrast to the existing brick wall. New windows adopt the frame colour and width of the existing windows, while the new windows extend to the floor.

VISUALIZATIONS

Figure 65: Visualization of addition towards Frederiksborggade (View from Street)

Figure 65 shows an illustration of the planned addition towards Frederiksborggade with suitable materiality and detailing. Seen from the street, the building exhibits a rather massive volume of yellow bricks with a strong and clean geometry. The inclined roof adapts to the existing buildings. The oriel-balcony motive is adopted from the adjacent buildings as well. However, the oriel width is increased with the size of one window in order to achieve a more spacious interior. While the white elements are made out of metal, the grey elements utilize a cement-based material. The illustration also shows parts of the new Frederiksborggade. The car lane is reduced in width and exhibits a paved surface similar to the pavement for the pedestrians. The priority for pedestrians and bikes is increased. In front of the new building, the street offers possibilities to sit and meet. In front of the existing building, greenery is added and the privacy for the residents is improved. The qualities of the private balconies towards Frederiksborggade are now similar to the qualities in other parts of the development[34]. The street also offers additional parking lots between newly planted trees and thus balances out the lost parking lots from the inner yard.

Figure 66 shows the same building seen from the court yard. The common terraces are built in a red steel structure, utilizing the same colour as the existing steel structures of Bispeparken. The curtain wall behind the terraces incorporates white metal sheets. The elevator is installed at the northern end of the common terraces. As a vertical element, the elevator shaft marks a clear transition between old and new building. With columns that are not placed at the corner and with a partly chamfered floor slab, the terraces exhibit certain modernist characteristics.

[34] Compare with Figure 49

Figure 66: Visualization of addition towards Frederiksborggade (View from Courtyard)

Figure 67 directs the view to the opposite side of the court yard and shows the second and taller addition towards Tagensvej. It can be seen how the height of the building is visually reduced by the gradual increase of building heights. Towards the court yard, the common terraces exhibit a slightly rounded contour which also refers to a common modernist motive. The different types of balustrades indicate which balconies are private and which are used by the community. While the private balconies exhibit a closed balustrade of cement-based material, the common balustrades are made out of thin vertical metal bars. Both types of balustrades are inspired by the existing architecture [35].

In Figure 68, the addition is shown from Tagensvej. Towards the street, the building exhibits a rather massive appearance with strong geometries. The yellow brick walls are a prominent feature. The window rhythm of the addition is based on the window rhythm of the existing building on the right but develops a slightly different pattern. Similar to the reference shown in Figure 64, the window width and frame colour is adopted from the existing building. However, the new windows are larger and extend to the floor. On the ground floor, the shop entrances and windows have a similar appearance to those of the existing buildings. Figure 69 shows another view from Tagensvej, but from a location further down the street. The view illustrates how the relatively tall building integrates into the given context without developing a too dominant appearance. Some of the windows are smaller and do not extend to the floor since they are placed above the worktop of the kitchens.

[35] See Figure 61

Figure 67: Visualization of addition towards Tagensvej (View from Courtyard)

Figure 68: Visualization of addition towards Tagensvej (View 1 from Street)

Figure 69: Visualization of addition towards Tagensvej (View 2 from Street)

URBAN CONTEXT

The large-scale plan of Figure 70 demonstrates how the new additions integrate into the urban context of Bispebjerg. The additions protect the inner yard between the building blocks 1A and 1B and create an area of increased privacy for the residents. The plan also illustrates how the urban surrounding is activated and improved. The street width of Frederiksborggade is reduced for cars while more space is given to pedestrians and bikes. The new Frederiksborggade exhibits qualities of a pedestrian street and facilitates an easy access to the adjacent cemetery and park. The private balconies of block 1B, 7 and 8 obtain a green buffer zone towards Frederiksborggade, with vegetation similar to other parts of Bispeparken. The plan also indicates an improved design for the semi-private yard in the south of building block 7. The area regains its originally intended, recreational value by re-establishing bigger parts of the forested areas. When compared to the existing situation as indicated in Figure 49 and mentioned on p.64, the old communal building and laundry building are removed and replaced by a new building located along a clearly indicated, public path that leads through the development. Its southern terrace constitutes another possible interface between the residents of Bispeparken and people from the outside.

In Figure 71, a more detailed view of the plan illustrates how the ground floors of the two new additions interact with its urban surrounding. It can be seen how the workshop, community kitchen and exhibition space help to activate Frederiksborggade and how the shops towards Tagensvej are oriented. The protected inner yard provides possibilities for urban gardening, barbeques and other gatherings. It also exhibits an entertaining playground for the kids of Bispeparken. A new pathway through building block 2 connects the northern court yard with the other recreational spaces of the development.

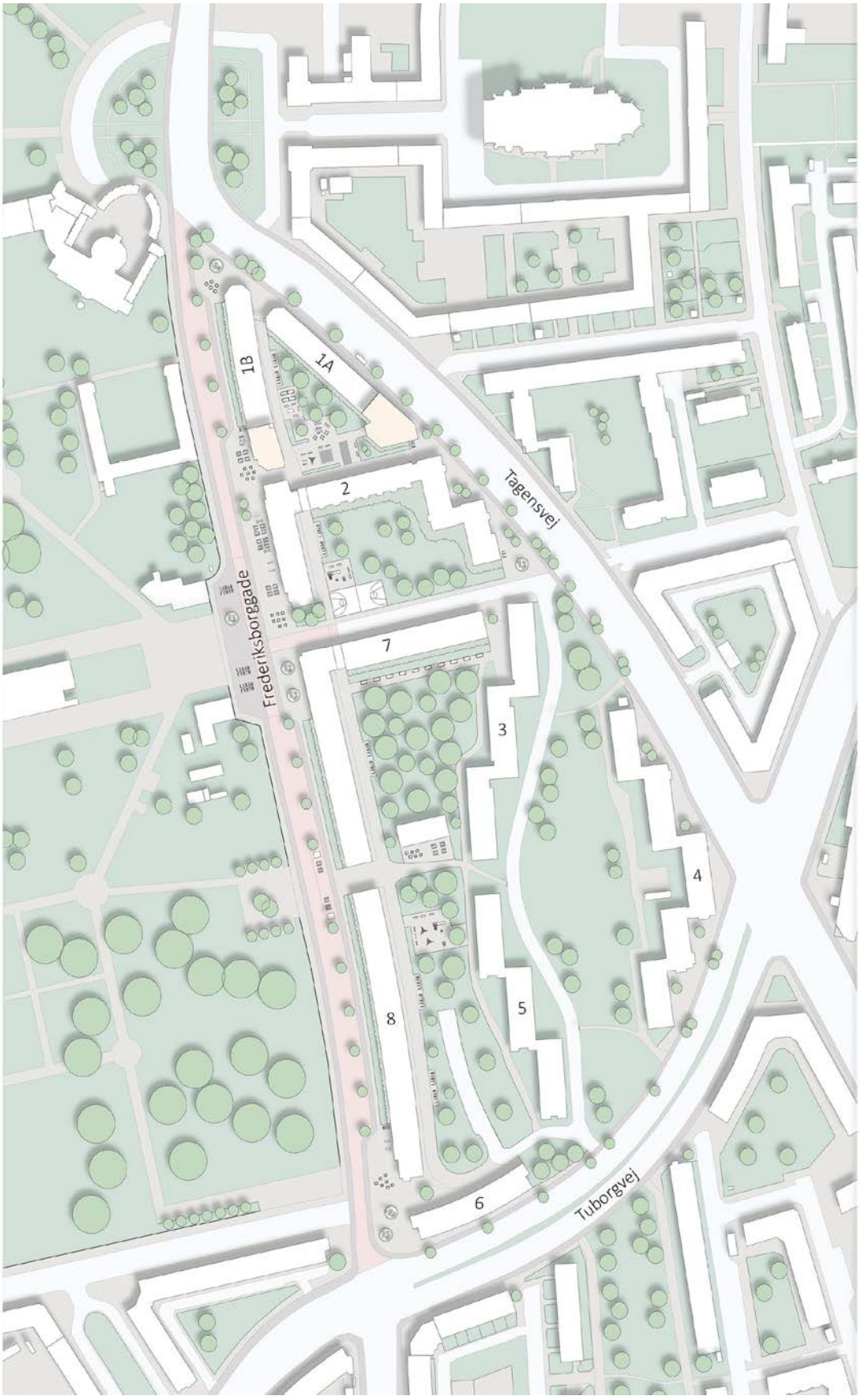


Figure 70: New urban context with implemented additions, Scale: 1:2500 (A4)

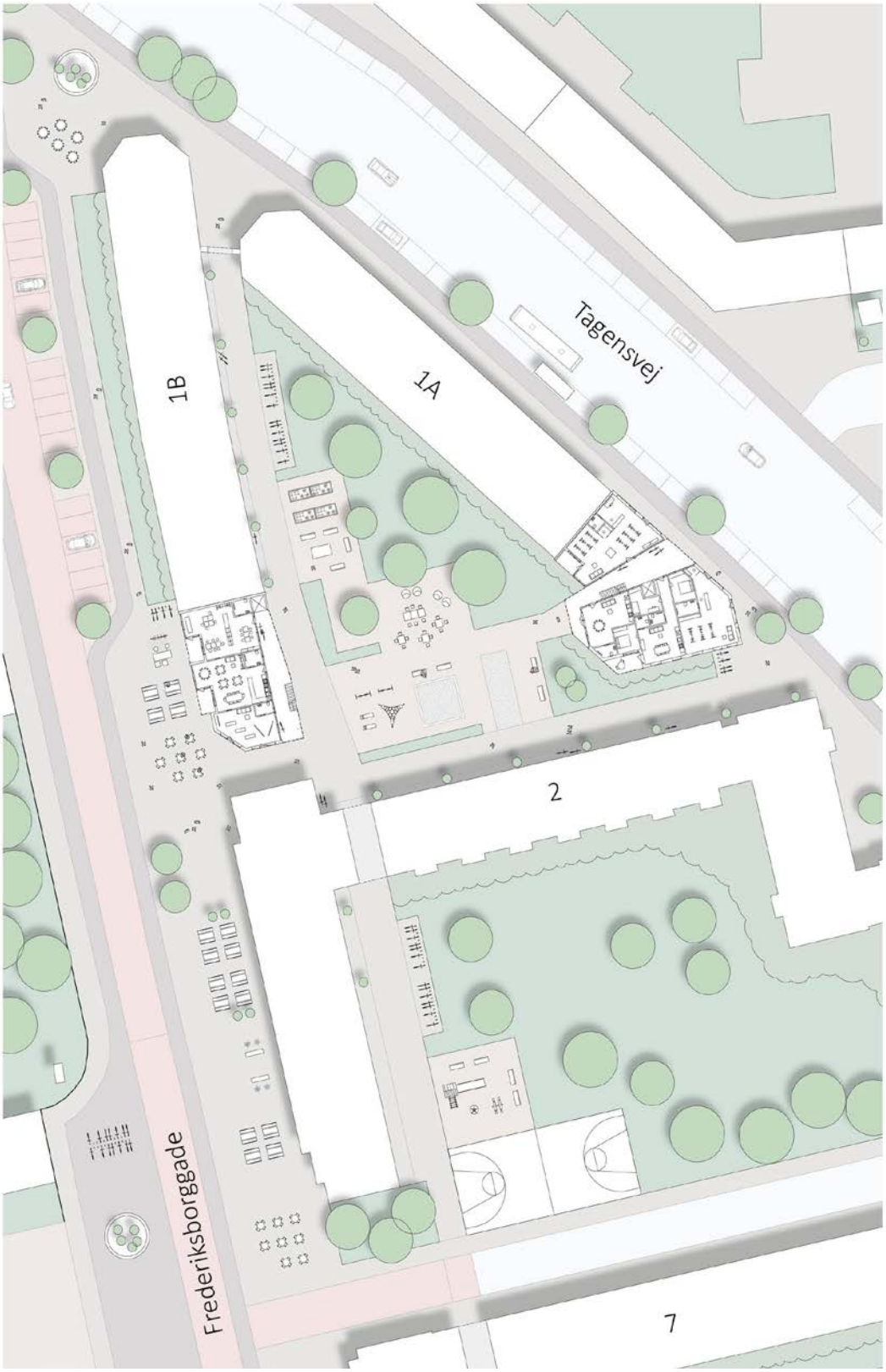


Figure 71: New urban context with implemented additions, Scale: 1:800 (A4)

Task 2 comprises the design of two new additions for the housing development of Bispeparken. The proposed additions should not further minimize the characteristic and recreational spaces of the development. Instead, the additions should adjust the development to the new circumstances that occurred after a tram station was removed from the northern part of Bispeparken. The new buildings help to close the occurring space between the building blocks and help to better define the semi-private space between the buildings.

The design project incorporates the findings and suggestions from previous analysis for the area [Fsb16, KøKo16, Vand15]. Towards Frederiksborggade, the project establishes an interface to its urban surrounding via a workshop, a small exhibition space and a community kitchen. Towards Tagensvej, two new retail spaces supplement the already existing shops. The project also illustrates the possibilities of a traffic-reduced and greener Frederiksborggade with a higher priority for bikes and pedestrians. The new apartments exhibit generous shared spaces and common terraces that face the semi-private court yard. All apartments have elevator access and invite for a co-living that includes all ages. The apartments exhibit various sizes and are in general more spacious than the apartments of the existing buildings. The proposal therefore tackles various typical challenges of modernist housing renovations [36] and particularly demonstrates the potentials of new additions on an urban scale. At the same time, the conflicts with existing fabric and the destruction of built heritage values is minimized.

The suggested design exhibits rather closed facades of yellow brick work towards the street and rather open facades towards the common terraces and courtyard. The materiality is harmonized with the prevalent materiality of the existing buildings. The chosen dimensions and forms of the buildings dare to put a contemporary stamp on the building design. However, the project still tries to adapt to the visual character of the existing buildings and tries to include elements and colours that are related with Danish modernism. The design is therefore influenced by the current Danish renovation philosophy that tries to imitate the visual appearance of the original architecture [37]. In the final reflections of this work, this approach will be further discussed.

[36] See 'Typical Renovation Tasks' on p.21 ff.
[37] See Task 1 and its conclusions on p.42 and p.59

The findings of this report are summarized in the individual conclusions of Task 1 and Task 2 and are not repeated here. Instead, this final remark shall be used to reflect on some observed tendencies within Danish renovation projects of modernist housing developments.

In Denmark, the prevalent renovation approach tries to design solutions that are *in the spirit* of the modernist architect. The solutions imitate the visual appearance of the original architecture in order to maintain an authentic experience of the place[38]. However, it is argued here that authenticity and authentic solutions might mean something else within the modernist context. In the beginning of the 20th century, the modernist architects deliberately broke with the past in order to create modern, functionalistic solutions that can cope with the challenges of society. If modernist architects would be in charge of today's renovation projects, they would probably not be in favour of the imitation and re-creation of outdated designs from sixty to ninety years ago. Instead, they would rather try to focus on new materials and new solutions that can cope with the new challenges of today [39]. As an example, it can be questioned if a modernist architect would still build with bricks. With the new insulation requirements, bricks usually only constitute an expensive and heavy cover on top of an exterior insulation layer, while the load-carrying structure is made of concrete and/or steel. Bricks are thus utilized to imitate the visual impression of well-known references from the past, while a functionalistic approach might utilize other - more honest - materials and construction methods.

Those thoughts lead to the question of how a new functionalistic or *modern* architecture should look like today. While functionalistic architecture originally focused on solutions of high usability and comfort, a new functionalism has to embrace other aspects and challenges as well. Modern architecture must not settle for solely optimizing the usability and comfort for the user, but must also consider the environmental impact of the utilized components during their entire lifespan. Today, a good functionalistic design must include thoughts about energy and resource consumption and the important question of recyclability. The concept of 'design for deconstruction' [Mor05] aims for a design that incorporates those aspects already during the design phase of the building. Similar to a Fairphone®, the concept tries to find modular and standardized design solutions with components that can be replaced, re-used and recycled easily. I believe that the modernist architects of today would develop their buildings and architectonic solutions on the basis of those design guidelines. Similar to the old functionalism, this new functionalism would be reflected in the designs of facades and other building components and would constitute an entirely new design language.

[38] See Task 1 and its conclusions on p.42 and p.59

[39] As mentioned in 'Authenticity in the modernist context' on p.34

The following pages supplement the presentation of the design proposal with some informative elevation views of the suggested additions and some more detailed floorplans. The presented floorplans also include the layouts of the duplex loft apartments.

Figure 72: Elevations of addition at Frederiksborggade, Scale 1:250 (A4)

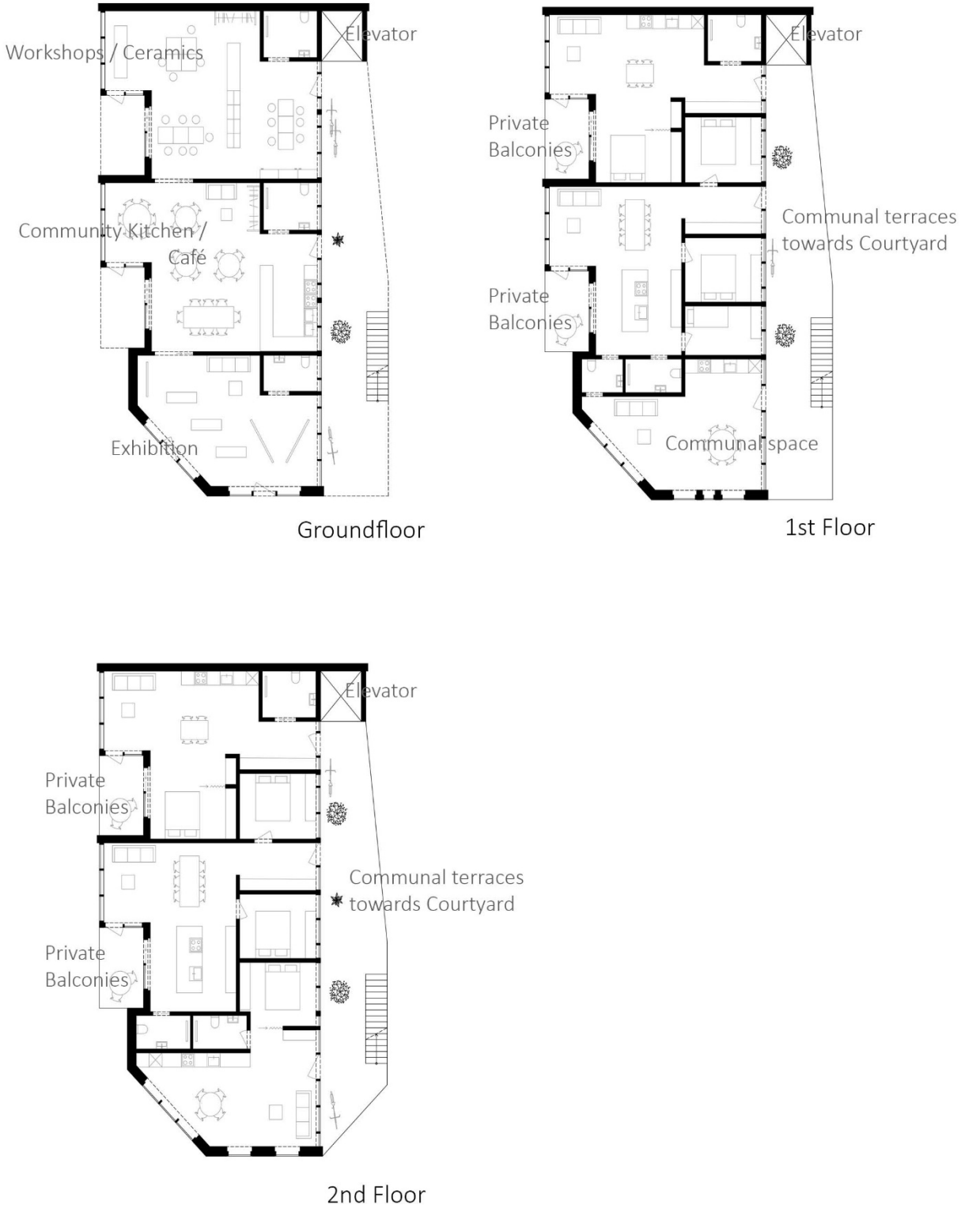


Figure 73: Floorplans of addition at Frederiksborggade, Scale 1:250 (A4)

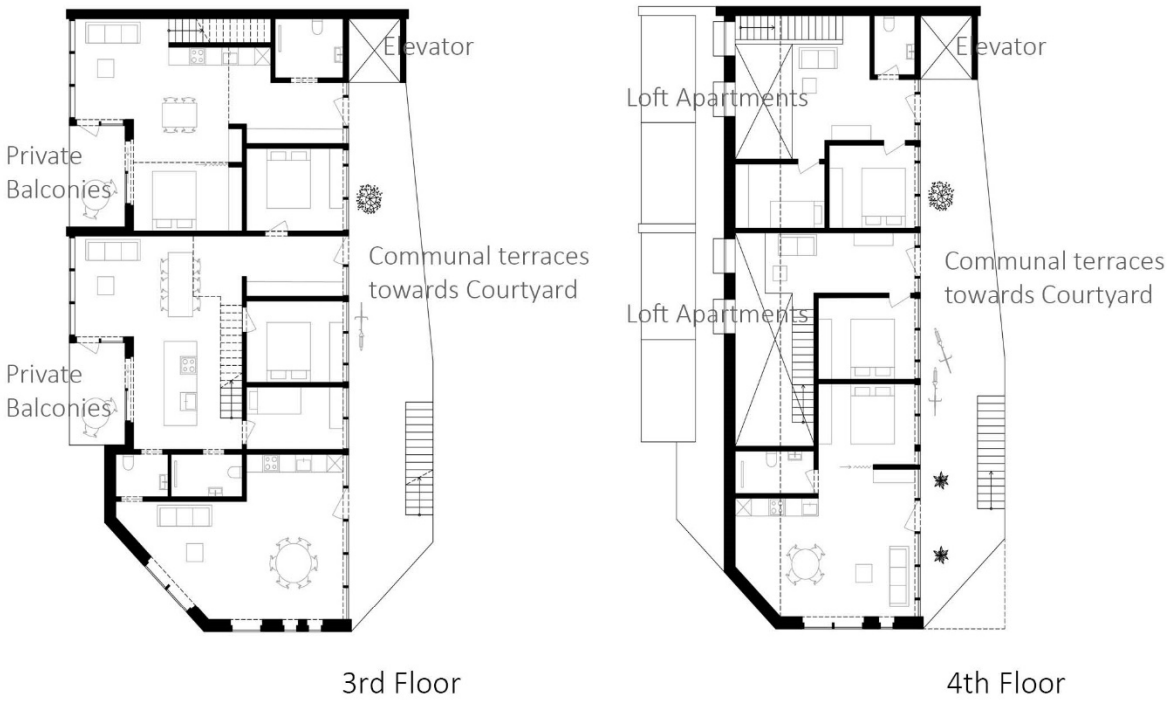


Figure 74: Floorplans of addition at Frederiksborggade (Duplex loft apartments), Scale 1:250 (A4)

Figure 75: Elevations of addition at Tagensvej, Scale 1:250 (A4)

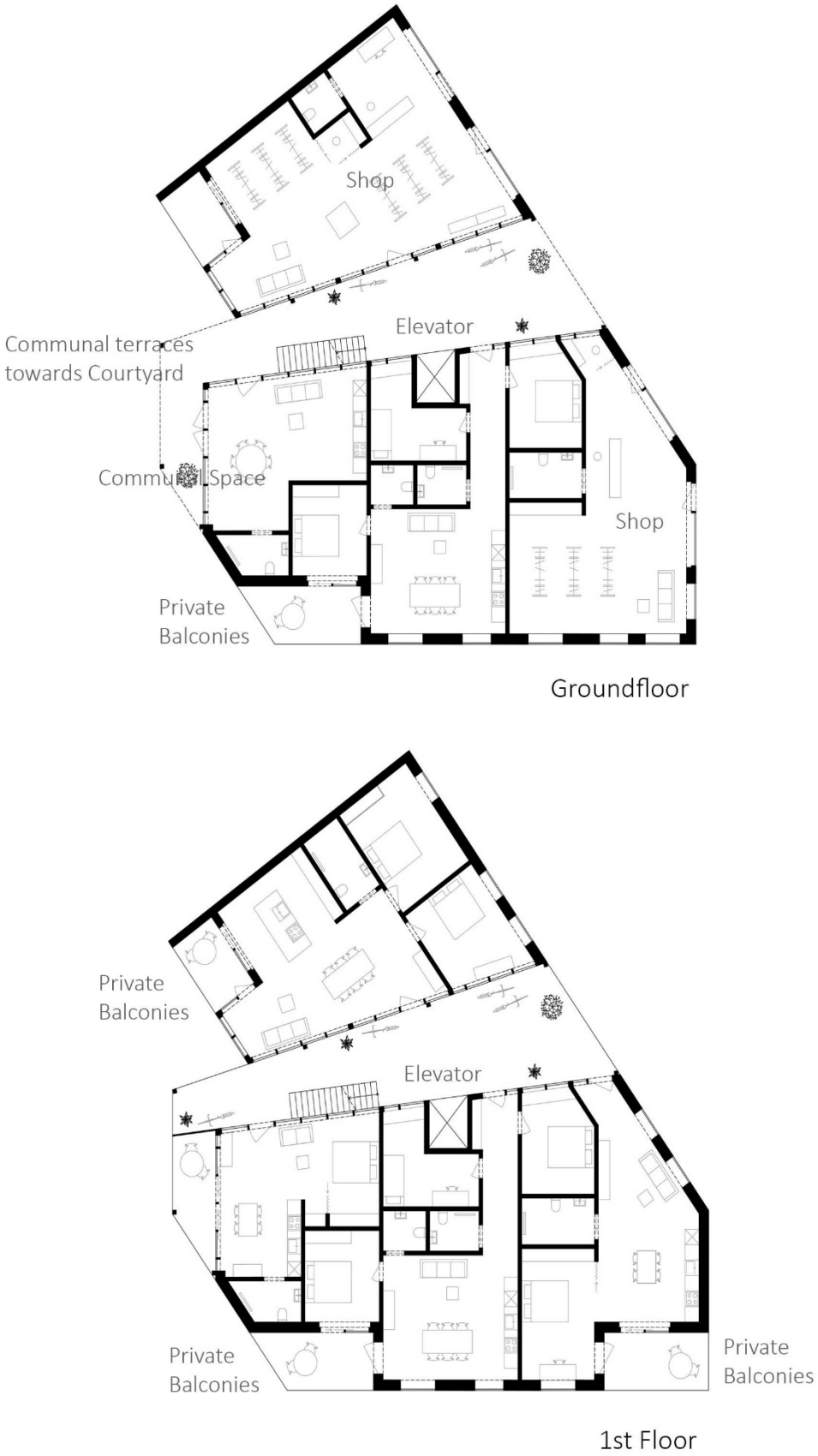


Figure 76: Floorplans of addition at Tagensvej (1/2), Scale 1:250 (A4)

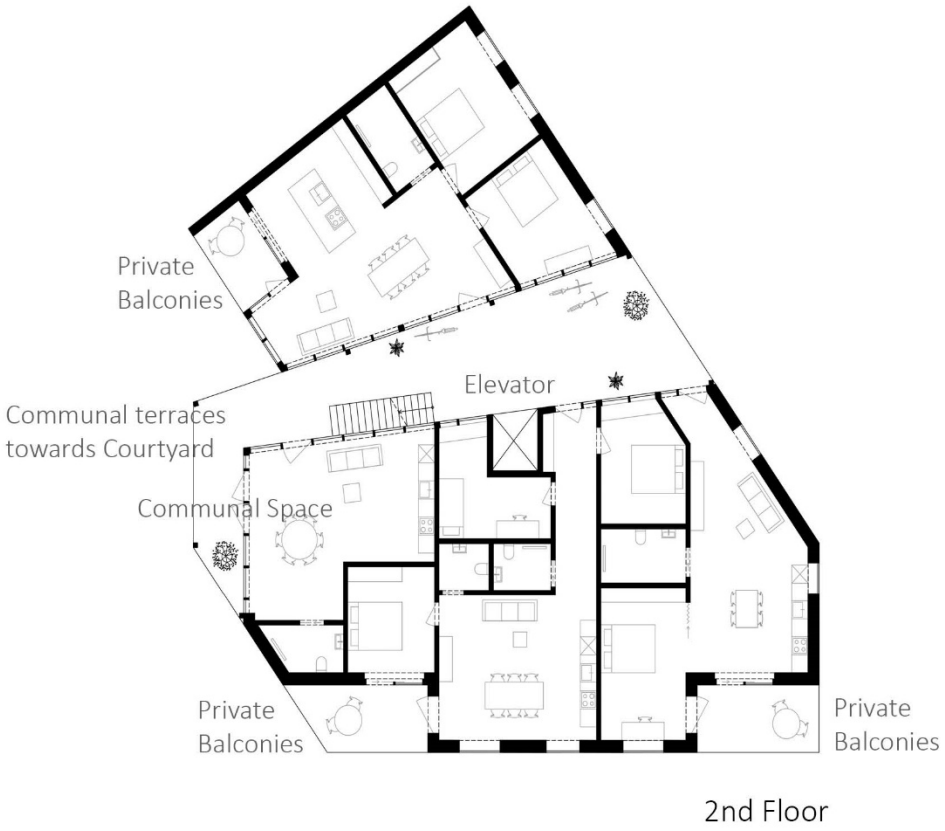


Figure 77: Floorplans of addition at Tagensvej (2/2), Scale 1:250 (A4)

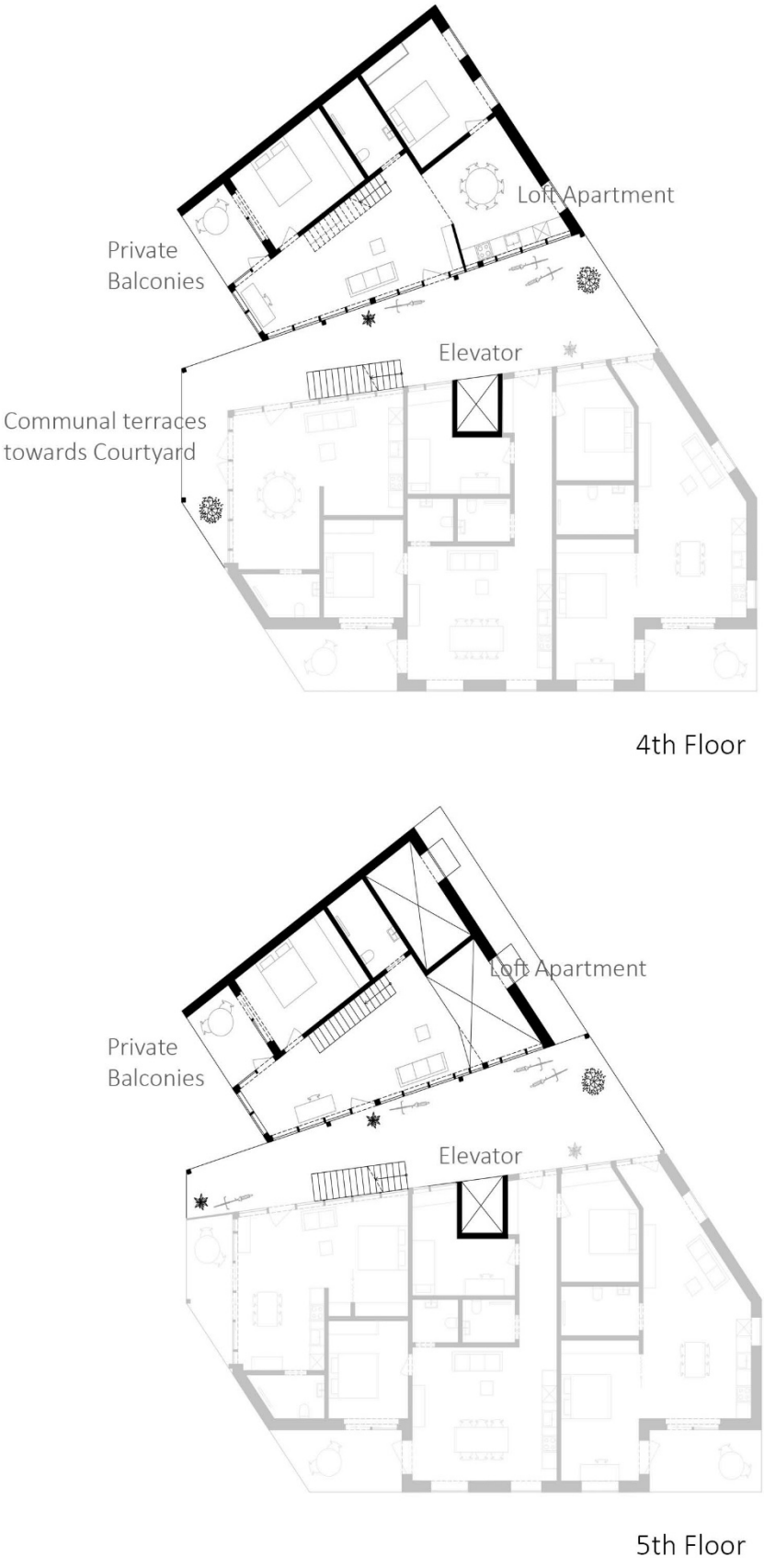
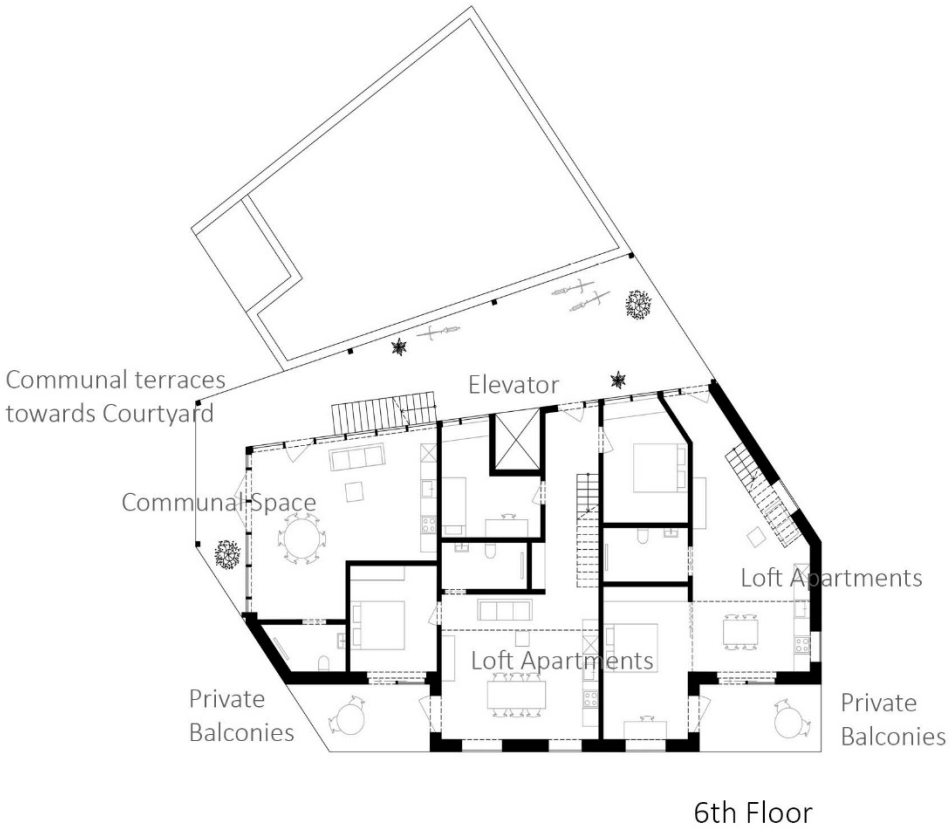


Figure 78: Floorplans of addition at Tagensvej (Duplex loft apartments 1/2), Scale 1:250 (A4)



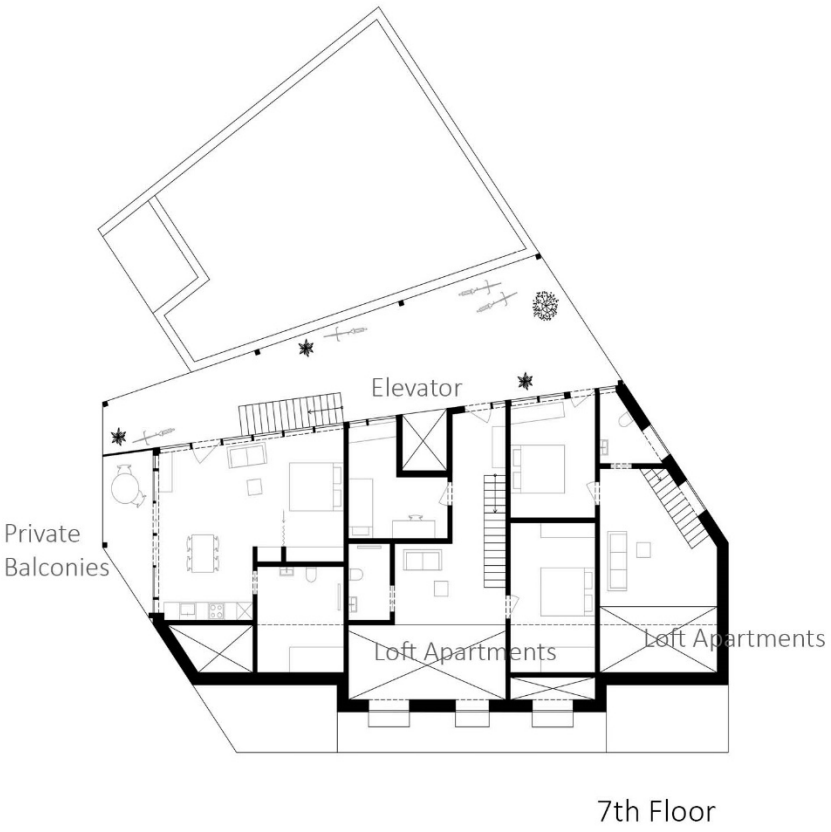


Figure 79: Floorplans of addition at Tagensvej (Duplex loft apartments 2/2), Scale 1:250 (A4)

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