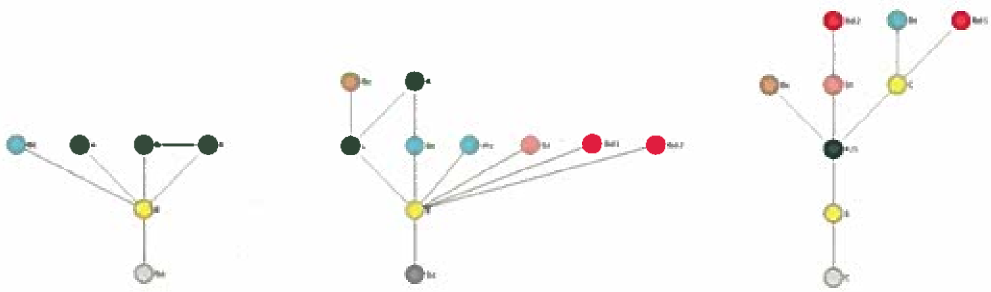
Bendik Manum

Apartment Layouts and Domestic Life; The Interior Space and its Usability

A Study of Norwegian Apartments Built in the Period 1930 - 2005



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Abstract

The background for this study is Norwegian housing where floor plans of new apartments seem to differ significantly from what previously has been built as well as from what architects have considered good quality. The study consists of two empirical surveys. The first is a diachronic analysis examining the development of apartment layouts since the 1930s, while the second is a synchronic interview-based survey where different apartments identified through the diachronic study are examined as dwellings for contemporary living.

The features of apartments particularly examined in the diachronic analysis are the sizes of rooms and the spatial configurations of the apartments, two features that are decisive for the degree of generality concerning functions or use. These features of space have been analysed in a sample of 150 apartments built in Oslo since 1930. The conclusion of this analysis is the identification of three generations of apartments. Apartments of the first generation, which was common until about 1955, were general with respect to sizes of the rooms as well as to the spatial configuration. Around 1960, there was a change towards larger apartments and functional specificity. In the second generation of apartments, those that were typical in the period from the 1960s until the early 1980s, the individual rooms were highly differentiated in size and positioned in accordance with their very specific function. Since then, the number of rooms has decreased and the spatial layout has become simpler, the kitchens are now usually in the living room and the bedrooms have become smaller. These apartments, which are the third generation, are specific with respect to use in that the bedrooms are rooms for sleeping while the “living and kitchen room” is the place for all daytime living.

The three generations of apartments defined by the diachronic analysis are not just a theoretical classification of floor plan layouts but also a typology that captures features relevant for real domestic lives. Sizes of rooms and configurational aspects of the interior spaces are decisive for what kind of households that lives in a particular apartment as well as for how they use their rooms. A conclusion from the interview-based survey is that generality works; the first generation of apartment, the apartment characterised as general due to large "second largest rooms" and a spatial layout where all rooms have access directly from the entrance, is the kind that houses the largest range of households. This is very different from the apartments being built now, which are appropriate only for a limited range of households. Since they rarely have more than one place for daytime living, they are unsuitable for the many households where daily lives consist in simultaneous and not easily co-existing activities.

Where theory and methodology are concerned, the field of architectural research named "space syntax" has been a basis for figuring out the subject to examine as well as for carrying out the analyses. This study not only illustrates how space syntax can be useful for identifying patterns across a sample of dwellings, but also how the configurational features of space captured by the space syntax methodology are relevant for households preferences of dwellings and for their daily living.

Preface

This thesis comes out of an interest in apartment layouts born while studying architecture in the late 1980s. When observing the Norwegian dwellings built at that time, they seemed to differ from what previously had been considered good architectural quality. This was particularly the case when comparing them to the tradition of Scandinavian modernism as represented by Bengt Espen Knutsen, who in his esteemed architectural practice as well as in his teaching has emphasised to create spaces for living rather than buildings as esthetical objects. An aim of this thesis has been to develop a knowledge-based contribution to a discussion about layouts and qualities of dwellings. Two theoretical and methodological references have been essential in order to develop a subject of interest into a research question and in order to figure out relevant empirical inquiries; one is the Scandinavian tradition of survey-based housing research, the other is the methods for analysing architectural space developed within the field of architectural research named space syntax. This positioning of the work does not imply that other aspects of housing or alternative theoretical and methodological approaches would not be interesting, only that it would have led to different studies than the one carried out.

I am grateful to The Oslo School of Architecture and Design for my education here, for inspiring periods with part-time teaching in the years thereafter and most of all for giving me the opportunity to carry out the study that is summarised through this thesis. I will thank Halina Dunin- Woyseth for important support at crucial stages of the work and for guiding me to Björn Klarqvist and his PhD-symposiums at Chalmers Institute of Technology. Klarqvist's teaching of space syntax provided a basis for this study. I am also very grateful to Julienne Hanson at the Bartlett, University Collage London, for her highly skilled guidance in space syntax analyses of dwellings. Where more local condition are concerned, I must thank Jon Guttu for his advices about housing research in theory and in practice and supervisor Bjørn Sandaker for his support and for his reading of drafts that were rarely on schedule. I must also thank Espen Rusten and Paul Benze for managing to transform my description of a space syntax tool into the very easily applicable software AGRAPH.

This thesis has an empirical basis that I alone would never have managed to establish. I am therefore very grateful to Husbanken and to OBOS for their financial supports that have made it possible to get highly skilled students' assistance. I would first like to thank Erlend Torkildsen and Cleas Cho Heske Ekornås for all their hours spent in the archives of the local authorities as well as for their computer skills applied in digitising and organising the hundreds of drawings. I must then thank Ida Lenander, Line J. Musæus, Maja Fjøsne and Håvard Brevik for their excellent work in carrying out the interviews. I am also very grateful for the hospitality of all those letting us into their private home and participating in the interviews. When it comes to the finishing stages of the work, I am grateful to Ann Giæver for her patient attempts to improve my English and to Jonas Adolfsen for handling the numerous illustrations that were originally in all kinds and qualities of digital as well as analogue formats.

Finally, I am thankful for the love and patience of AnneLise, Birk and Jarand; a support that this study could never have been done without.

Oslo, September 2006

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This software is free download from http://www.aho.no/ahograph/.

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NOTE:
The appendices listed above were originally in A4-format. The floor plans in the printed appendices are therefore not in original scale. For floor plans in original scales, please se the separate appended volume.

Appendix (as a separate volume):

"OBOS 1930–2005, et snitt gjennom norsk bolighistorie"

This appendix is a "catalogue" presenting the housing projects and the apartments examined by the diachronic analysis.

1 Introduction

1.1 PROBLEM

During the recent 15 years, urban housing has developed into a major section of Norwegian building construction. This is due to attractive urban sites being made available after relocation or closing down of industry and institutions, rising economic wealth and an increasing interest in urban life. As a result of this development, planning and design of apartment buildings have recently become a major field of the Norwegian architectural practice; architects are at the moment designing apartments that will be the future homes for a huge number of people. These new apartments seem to differ from earlier ones concerning basic architectural features such as floor plan, sizes of rooms and daylight conditions. Parallel to the extensive construction of new urban dwellings and the change in apartment layouts, the households and their preferences have become more diversified. Two questions can therefore be raised. The first is about what is going on: if the layout of apartments has changed significantly, what explicitly are these changes? The other questions relate to domestic life and to the quality of housing: if the existing Norwegian apartments are diverse in terms of floor plan layout, how do the different layouts relate to households and their daily living? By studying these issues, it might be possible to shed some light on how our future stock of dwellings, a stock that will include all apartments under construction and planning now, will correspond to the needs and preferences of the population.

1.2 BACKGROUND

The following two sections elaborate on the background for this study; the first describes the layout of recently built apartments while the second comments upon contemporary conditions of living and housing in more general terms.

1.2.1 The Layout of Apartments

The interest in housing has been changing in both intensity and character throughout the history of architectural practice. Studies of housing contributed to the development of the Modern Movement within architecture between the World Wars. This was a period when architects were deeply involved in housing politics as well as in housing design. One aim of architecture was to simplify the trivialities of life and to reflect use was considered an essence of beauty. Le Corbusier stated that *”A great epoch has begun. There exists a new spirit. ... we shall arrive at the ”House-Machine”, the mass-production house, healthy and beautiful in the same way that the working tools and instruments which accompany our existence are beautiful.”* [1] Even though Le Corbusier’s house-machine has been seriously questioned as a vision for living, later generations of architects have not rejected basic ideals of modernism such as comfort, light and usability, from being essential features of a dwelling.[2] However, if we compare recently built apartments with these ideals of the modernist tradition in housing, the floor plans now appear to be less determined by concern about actual living. Architectural features of interior space that in the modern tradition have been essential and where recently built dwellings seem to differ are indoor daylight conditions, the size and shape of the rooms and how the different rooms of a dwelling are positioned in relation to each other.

As far as daylight conditions are concerned, the debate in Norway during the 1930s was whether bathrooms and staircases without windows, and thereby without daylight and views to the outside, were acceptable. In studies of the loss of daylight caused by increasing building depths, the range of depths

[1] Le Corbusier at the 5th C.I.A.M. congress in Paris in 1937. (Buhl, 1965)
[2] This is very different from housing in larger scales in the sense that contemporary ideals about the latter clearly differ from the early modernist vision of large freestanding buildings in suburban park-like landscapes.

then being evaluated was between 7 and 12 metres.[3] In new apartments of today, kitchens without direct views to outside are common; most kitchens are appendices to the living room, appendices where the only daylight comes through the living room. As for the depth of the buildings, housing blocks are now rarely as slender as 12 meters; the housing project shown in figure 1.1 has a building depth of about 17 meters. Regardless of what is attempted through the design of walls and windows, such a deep building block implies much floor area where it is hard or impossible to achieve good daylight conditions.

As regards the size and shape of the individual rooms, at least two aspects are worth comment. Firstly, living rooms of new apartments often have the character of "space left over after planning"; living rooms appear as "leftovers" after minimum versions of the other rooms have been positioned. This happens in several ways; one is that outside corners of adjacent rooms appear as boxes into the living room; another is that the positioning of openings towards adjacent rooms limits the potential use of the living room. Figure 1.1 and figure 1.2 show two apartments where the "living-and-kitchen-room" has this character. Secondly, while the diversity of use and preferences with respect to domestic life is increasing[4], the rooms of the dwelling seem to be moving towards becoming more mono-functional in the sense that the living room is the only room for daytime living while the other rooms are tiny and appropriate only for specific and predefined use.

When it comes to the positions of the rooms in new apartments, a common layout is main bedrooms accessible only through the living room. In order to access the bathroom from the main bedroom in such an apartment, a mother would have to pass through both the living room, where her teenage daughter might be entertaining friends, and the entrance, where dirty winter boots are likely to be slipped off. Figure 1.2 shows such an apartment. Given the option of choosing among otherwise equal conditions, these features of a floor plan layout would hardly be the first choice.

[3] This was an important issue for debate within the Norwegian architecture profession in the 1930s, see for instance *Bedre boligtyper – bedre boligbygging"* (Øvergaard,1938), *Olika husbredder och deras bggnadskostnader* (Markelius, 1935) or other articles in the magazine *Plan* (1933 and 1935).

[4] Preferences about housing and living are strongly influenced by cultural and national background. Due to the various traditions with respect to the roles within the families and to activities such as cooking and dining, the preferences about apartment layouts are diverse. The increasing number of persons with a non-western national background implies an increasing diversity in the preferences of living among the population. Another phenomenon that makes the preferences more diverse is the increasing variety of households caused by the less dominant position of households permanently consisting of two parents and the children they have in common. (See tables 1.3.a and 1.3.b.)

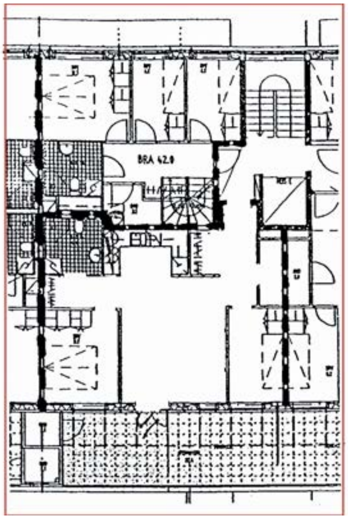

Figure 1.1
“Badebakken”
(1999-2002)

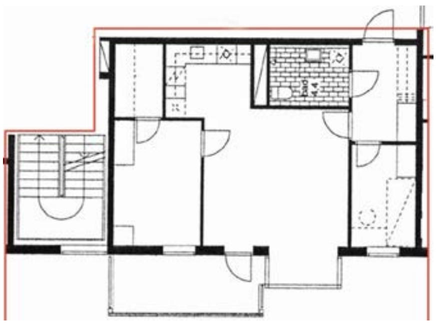

Figure 1.2
“Pilestredet Park”
(2002-2006)

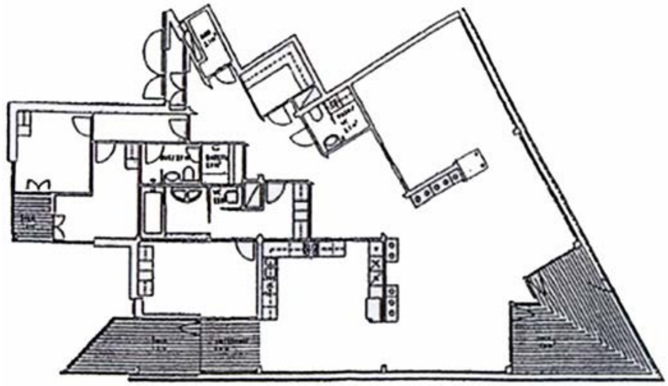

Figure 1.3
“Stranden”
(1990)

The fact that the features mentioned above are trivial makes their frequent occurrence in new dwellings remarkable. What is even more remarkable is the lack of debate within the architectural profession about this issue. Most remarkable is the fact that architecture containing very strange interior spaces are not only rarely criticised[5], but that such projects are formally described as excellent by the architectural profession. The project "Stranden" on Oslo's best seafront site was not only presented in the magazine "Byggekunst" without criticism[6], it has also been honoured by "Anton Christian Houen Fund's Certificate for Outstanding Architecture", a prize considered to be Norway's most prestigious architectural reward.[7] Figure 1.3 shows the floor plan of an apartment in this building. The size and shapes of the area by the entrance as well as the bedrooms are corridor-like and seem to be accidental consequences of struggling with the fact that large parts of the floor areas are distant from windows and direct daylight. It is hard to imagine that this project would have been acknowledged if the interior space of the apartments had been the subject of evaluation.

The fact that a housing project like "Stranden" is awarded, does not imply that critical remarks about recently built dwellings do not exist. In fact, critical remarks are not hard to find informally. The problem is that the disadvantages of many new dwellings rarely are pointed out explicitly and in public. Much of the professional skill and knowledge of practicing architects has the character of being implicit or tacit.[8] When tacit knowledge is no longer familiar to the majority of a profession, at least two problems arise. First, it is hard for those not having the skills to be aware of this. Second, for those who suspect the existence of relevant knowledge that they do not have themselves, this knowledge is hard to find. Within the profession of architects, such a lack of previously familiar tacit knowledge now seems to be the case where housing and dwellings are concerned. Skills of designing dwellings in general and floor plan layouts in particular, skills taken for granted by earlier generations of architects, seem to have been neglected or lost. It might be that previous knowledge and skills, which focused on improving the standard of housing and were concerned with many trivial aspects of usability, is now out of date, but, as argued above and in the following section, this does not seem to be the case.

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[5] One of the few critical comments is "Acceptera inte" ("Do not accept") by Klarqvist and Thiberg (2003).

[6] The project was published in *Byggekunst* 1991: 4. *Byggekunst* is the main Norwegian architectural magazine, published by NAL, The Norwegian Architects Association

[7] ***"****Anton Christian Houens fonds diplom for god arkitektur , ...Norges mest prestisjetunge arkitekturpris****.*** *--- De prisbelønte byggverkene utgjør i dag en del av den nasjonale kulturarven. Samlet representerer de det ypperste som er skapt av arkitektur i Norge i det forrige århundre – til inspirasjon for det som skal bygges i det neste.",* quote from Grønvold (2000), pointing out the superiority of the architecture honoured by this reward.

[8] For those reading a Scandinavian language, the tacit knowledge of the architectural profession is elaborated by Ulf Janson (1998) in his thesis on the practice of the Swedish architect Jan Gezelius.

Even though housing design is still an important task for architects today, it is a field where other professions also have a strong influence; housing developers employ estate agents as consultants and pay as much attention to them as to the architects concerning basic design questions such as floor plan layouts. When a particular layout is the best seller, this layout is likely to be regarded as the most profitable one. This assumption is not necessarily correct as households that intend to buy an apartment, rarely imagine kinds of dwellings other than those in existence and being offered for sale. The fact that a particular kind of apartment is sold most easily, does not prove that it is as desirable as possible; it just indicates that it is the one most preferred among the apartments on offer. Apartments of other and unknown layouts might very well sell better. Due to the influence of other professions, the lack of excellent new apartments is not solely the responsibility of the architects. However, given that we as architects aim to improve the situation, we should rather focus on issues within the field of architecture as long as we can achieve improvements here. The assumption that this is possible is the background for writing this thesis.

1.2.2 The Standard of Living and Housing

Concerning the contemporary standard of Norwegian dwellings, there are at least two conceptions that are worth comments. One is about the standard of housing in general and political interpretations from this, the other is about the term and the subject "need for housing" in particular.

The contemporary standard of Norwegian housing and its political implications was a main subject at a seminar at NTNU (The Norwegian Institute of Technology) in June 2004. It was here argued that the quality of housing and living conditions in Norway was the best in the world and that the housing politics of the government had therefore been successful.[9] This argument is not convincing. Firstly, the quality of housing in terms of technical installations and floor area per person, which are the features measured in order determine "the standard of housing", does not necessarily correspond to the population's quality of living in more general terms. Secondly, even if we accept that the Norwegian quality of life is excellent due to high quality of dwellings with respect to floor areas and technical standards, this does not indicate any success in recent Norwegian planning and politics as far as housing is concerned.[10] The liberal housing market, which was the policy argued for, is a new phenomenon in Norway. It has developed since the early 1980s and it represents ideals for building, buying and ownership of dwellings very different from those of the preceding post-war policy. Less than one third of the Norwegian dwellings built after the Second World War, have been built since 1985. If there is any Norwegian housing-policy that should be given the credit for a high standard of living, it is therefore not the recent one but the very different, governmentally planned housing production that went on up to the 1980s.[11]

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[9] This was particularly pointed out by Roger Iversen from "Kommunaldepartementet", which is the Governmental section responsible for housing policy.

[10] A reason for the high quality of Norwegian housing in terms of technical standard and floor areas per person is the few dwellings of very low standard. An explicit aim of Norwegian post war politics has been to reduce and prevent bad housing, an aim that until the early 1980s was carried out by means of legislation and by norms to be followed in order to achieve cheap governmental loans. These loans were given gy Husbanken, the Norwegian governmental bank for housing. See Husbanken (1985 and 2000) about their terms and guidelines for design.

[11] Since 1985, 450,000 dwellings have been built in Norway, while 1,150,000 were built between 1945 and 1984. (Numbers of dwellings according to Statistisk Sentralbyrå (Statistics Norway). The conservative government of Willoch came to power in 1983. Due to the time required for planning and constructing housing projects, 1984/1985 is here set as the time limit when counting the dwellings built.)

A conference in 2003 about Norwegian housing research, illustrates the perception of needs for housing in Norway.[12] The fields pointed out to be of importance, were sustainability (in terms of pollution, energy consumption and economy of building materials), the cost of building construction and the dwelling as representing personification and identity. Several key speakers explicitly stated that there was no longer any "need" for housing in Norway. This perception, which is a pleasant one for politicians as well as for planning authorities, can be questioned. Within a liberal market, "need" is understood as potential buyers` demands. In a fully liberal housing market, which is now more or less the case in Norway, a particular household's need for a better or a larger dwelling is not noticed unless the household enters the purchasing field. If we understand the need for housing to be nothing but the demand in terms of such an interest in buying, and determine the standard of living by average floor area per person, groups of the population might have serious personal needs for better housing conditions without its being noticed at all. If "need for housing" should include the actual living conditions and personal wishes of real households, then the information relevant for determining the current standard of living is more than the average floor areas pr. person.

In order to get some information about contemporary households and their living conditions, a minor survey was carried out at an early stage of this study. The survey was based on questionnaires and the participants were the pupils of two classes at the School of Lambertseter in Oslo. Table 1.1 (at the end of this section 1.2) shows the sizes of the households (by number of persons) and the sizes of the apartments (by number of rooms) for the pupils of these two classes at the School of Lambertseter in 2001. Lambertseter is one of the early suburbs of Oslo; it was under construction from the mid-1950s and until the 1960s. The population of Lambertseter is today a mixture of people who have been living there since the 1950s and -60s and many who have grown up there and moved back in addition to people who have moved there without living there before, representing a mixture of cultural and national backgrounds. Even though the data is not statistically representative, due to the limited sample, they describe the "spaciousness of living" for households at Lambertseter with schoolchildren in 2001. As shown in table 1.1 the number of persons per room was 1.18 on average, which represents remarkably cramped living in Norway. By comparison, the average number of person per room in Norway was 0.6 in 2001.[13] The living conditions for

[12] This was a conference summing up a Norwegian research program on housing, at Hotel Bristol, Oslo, in December 2003.
[13] According to Statististisk Sentralbyrå / Statistics Norway, http://www.ssb.no/fobbolig/tab-2002-09-23-01.html, table 1, page 1.

households with children at Lambertseter in 2001 was more cramped than the average for Oslo 50 years ago, the latter being 1.1 person per room in 1958.[14]

From this brief look at the results of the "Lambertseter-survey" and other simple statistics of households and living conditions, we can draw at least two conclusions about standards of living and the "need for housing". One is that the complacent attitude about contemporary housing conditions should be revised. The survey at Lambertseter shows that living conditions for many households today are similar to what was considered unacceptably cramped living in Norway 50 years ago; the problem of cramped living has not been solved, even today; many households need larger dwellings. In the present fully commercial market, this is not noticed as long as the families living in cramped conditions cannot afford larger apartments and therefore do not enter the market as potential buyers. These needs do therefore not influence the planning or the design of new dwellings. A second conclusion is that cramped living is far from evenly distributed with respect to national and cultural backgrounds[15]; housing conditions have become part of the complex problem of immigration and physical and social segregation, a problem that maybe represents the most urgent challenge to western democracies.

When it comes to the discipline of architecture, the situation of contemporary living and housing described above should influence the subjects focused upon at all stages from urbanism down to design of particular dwellings. As far as apartments are concerned, a renewed interest in the layout of the interior space should be appropriate if we intend to respond to the contemporary variety of preferences, preferences that include a need for better housing conditions among all those still living in cramped conditions. An aim of this study is to contribute to such a renewed interest in the quality of dwellings with respect to the daily lives necessarily being lived in them.

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[14] The living conditions in 1958 are described by Brochmann (1961, p. 30).
The same patter is found if comparing with Ås (1971); the percentage of households with children living in cramped conditions was 44 at Lambertseter in 2001 while it on was 40 in all Norway in 1967, see table 1.2.

[15]This fact is not captured by data on average living conditions, but can easily be seen by a look at official Norwegian statistics that clearly point out the cramped living of non-western immigrants. 66 % of such households in Oslo that consist of more than two persons live cramped (in the sense having less than one room per person). Among Western immigrants and non-immigrant households, the percentages are 27 and 18, respectively. (See http://www.ssb.no/fobinnvbolig/fig-2002-11-12-01.html) The cramped living conditions of non-western immigrants is not at all surprising when comparing data on households and data on income; the households of non-western background are larger and have significantly lower incomes than households of other backgrounds.
(see (http://www.ssb.no/fobinnvbolig/tab-2002-11-12-04.html and http://www.ssb.no/emner/02/01/fobinv/fig-2002-09-09-01.gif) for the distributions of households (by size of the households) among households with different background by nationality) and http://www.ssb.no/emner/05/01/inntinnv/tab-2001-08-29-04.html for incomes by nationalities.)

Table 1.1 Spaciousness of living, for the pupils in two classes at Lambertseter School in 2002 (8.class)

Apartm. number	Persons in the household: Parents	C.>16	C. 6-16	C. 0-5	Others >16	Total	Rooms	Persons pr. room	Remarks	I	II	III
1	2	1	1			4	6	0,67	detatched house			x
2	1		2			3	3	1,00			x	
3	2		2			4	3	1,33	changed to 4 rooms	x		
4	2		1	1		4	3	1,33		x		
5	2	2	1			5	3	1,67		x		
6	1		1			2	4	0,50				x
7	2		5			7	3	2,33	very well being	x		
8	1		2			3	4	0,75				x
9	2		2			4	4	1,00			x	
10	2	1	2			5	5	1,00			x	
11	2	1	1			4	4	1,00			x	
12	2	2	1			5	4	1,25		x		
13	2	1	1			4	4	1,00			x	
14	2	2	1			5	3	1,67		x		
15	2		2			4	3	1,33		x		
16	2		2			4	4	1,00			x	
17	1	1	1			3	3	1,00			x	
18	1		2			3	3	1,00			x	
19	2		2	1		5	3	1,67		x		
20	2	1	3			6	5	1,20	detatched house	x		
21	1	1	1			3	3	1,00			x	
22	2		2			4	4	1,00	detatched house		x	
23	2	1	1			4	2	2,00		x		
24	1		1			2	2	1,00			x	
25	1	2	1		1	5	5	1,00	(married brother)		x	
26	1		2			3	3	1,00			x	
27	2		1			3	5	0,60				x
28	2	1	3	1		7	4	1,75		x		
29	2		2	1		5	3	1,67		x		
30	1		1			2	4	0,50	detatched house			x
31	1		2			3	4	0,75				x
32	1		2			3	4	0,75				x
33	1		1			2	2	1,00			x	
34	1		1			2	2	1,00			x	
35	1		3	1		5	3	1,67		x		
36	2	1	1			4	3	1,33		x		
37	2		3			5	3	1,67		x		
38	2		2			4	3	1,33		x		
39	2		4			6	3	2,00		x		
40	2		4			6	5	1,20	detatched house	x		
41	2	1	3			6	5	1,20	detatched house	x		
42	2		3			5	5	1,00	detatched house		x	
43	2		2			4	5	0,80				x
Persons per room (on average)								1,18	Numbers	19	16	8
									Percetages	44	37	19
									Numbers	97	56	27
When detached houses not included								1,23	Percetages	54	31	15

Number of rooms includes bedrooms and living rooms but NOT kitchen

Rooms smaller than legal minimum size is not included (apartment nr. 24 og nr.3)

Legend of "spaciousness":

Spaciousness according to Ås (1971, p.19)

I	Cramped:	number of rooms < number of persons
II	Appropriate:	number of rooms = number of persons
III	Spacious:	numberof rooms > number of persons

Table 1.2 Spaciousness of living
(according to categories of Ås (1971), see table 1.1)

	Spaciousness of living (percentages of households)		
	Households with children Norway 1967	All households Oslo 1967	Households with schoolchildren Lambertseter 2002
Narrow	40	31	44
Appropiate	22	29	37
Spacious	38	40	19
Reference	Ås (1971, p.19)	Ås (1971, p.21)	Table 1.1

Table 1.3.a Households by kinds of households. 1980, 1990 og 2001. Norway.

Kind of household	1980	1990	2001
		Numbers	
Total	1 523 508	1 751 363	1 961 548
Singles (without children)	425 725	601 095	739 563
Couples (without children)	306 924	340 634	412 611
Single parent with youngest child < 18 years	54 272	88 953	106 987
Couple with youngest child < 18 years	485 386	442 349	452 950
(Total, households with youngest child < 18 years)	539 658	531 302	559 937
Several adults (see note)	251 201	278 331	249 437
		Percentages	
Singles (without children)	27,9	34,3	37,7
Couples (without children)	20,1	19,4	21,0
Single parent with youngest child < 18 years	3,6	5,1	5,5
Couple with youngest child < 18 years	31,9	25,3	23,1
(Total, households with youngest child < 18 years)	35,4	30,3	28,5
Several adults (see note)	16,5	15,9	12,7

Note:
these are households with more than one adult, where at least one is not part of a couple
households with children older than 18 living at home and younger children are not included here

Table 1.3.b Households by kinds of households. 1980, 1990 og 2001. Oslo

Kind of households	1980	1990	2001
		Numbers	
Total	222 291	244 440	266 856
1 Singles	101 776	128 272	138 659
2 Couples	46 841	43 638	48 527
3 Singles with children	9 220	13 265	13 755
4 Couples with children	38 021	34 665	41 308
5 "Several adults"	26 433	24 599	24 607
		Percentages	
1 Singles	45,8	52,5	52,0
2 Couples	21,1	17,9	18,2
3 Singles with children	4,1	5,4	5,2
4 Couples with children	17,1	14,2	15,5
5 "Several adults"	11,9	10,1	9,2

1.3 CONTENT AND STRUCTURE OF THE THESIS

The study described in this thesis has examined the spatial layout of dwellings through rather extensive empirical surveys. The work has thereby been different from studies that focus on developing theory and apply architectural objects as examples shedding light on subjects developed on the theoretical level. The content of this thesis corresponds to the study carried out, in that theories and methods are not the main subjects but issues elaborated in order to describe and position the research question and in order to explain the surveys and the analyses carried out.

The study consists of two main empirical inquiries: one that has examined how apartment layouts have developed through time and one that has examined how different apartment layouts relate to households and their preferences and well-being. The results of these inquiries are a large amount of empirical data. In order to prevent the main text from becoming too long, larger tables and the more extensive figures, such as forms from the interviews, tables and floor plan drawings, are presented as appendices at the end of the thesis. The total sample of apartments analysed is presented by drawings and some key information in a volume separate from the thesis; a catalogue-like volume that documents a historical development of Norwegian apartments as well as an important segment of the existing Norwegian stock of dwellings.

The structure of this thesis is conventional. After this introductory chapter 1 explaining the background for the study, chapter 2 and 3 elaborate the research question and the methodology, respectively.[16] Chapters 4 [17] and 5 describe the empirical studies and analyse the results, while chapter 6 discusses the findings and draws some conclusions about contemporary housing design in the light of the findings of the empirical inquires. Based on the findings achieved, the final chapter 7 reflects upon the context of contemporary housing and on dwellings in times to come.

[16] Some of the content of chapter 3 about methodology has been presented in a paper at the conference *"Methodologies in Housing Research"* at KTH, Stockholm in 2003. (Manum, 2003)
[17] The main results of the analysis of apartment layouts through time have been presented at the "*5th International Space Syntax Symposium"* at TU Delft in June 2005. (Manum, 2005)

2 Focus and Limitations

The aim of this study has been to examine how the interior space of Norwegian apartments has developed through time and, in the light of this, to compare and discuss different floor plan layouts with respect to the daily lives of the residents. An issue particularly focused on, is the dichotomy of generality versus specificity as regards functions or use. The features of interior space given particular attention, are the sizes of the rooms and the spatial configurations of the apartments. These features are decisive for domestic life, and drawbacks regarding them can hardly be compensated by high quality in other features of the dwelling. Compared to such features as colours, furniture and technical equipment, which the households might easily change or upgrade according to their personal preferences at any time, most spatial layouts are determined by the construction of the building or by the technical infrastructure in ways that make them harder to alter. The spatial layout is therefore important simply because of its permanence; the floor plan layout has long-term consequences, positive or negative depending on its quality.

There are two principal ways of describing a route. One is to describe where precisely to go, such as which road to follow and exactly where to turn. Another is to describe the route relative to its surroundings, such as to go south of the mountain and not to cross the river. In the latter case, the elements referred to are not the paths followed but more distant objects that by being well known or characteristic are landmarks for recognising the route. The following pages describe this study in both these way, first by a review of how research-like studies of dwellings have developed over the past 150 years and then by explicitly describing the subject focused upon in this study.

2.1 A REVIEW OF HOUSING RESEARCH

Needs for dwellings and the importance of interior spaces appropriate for everyday lives have been major concerns in much of the work referred to in the following review, in the housing studies of the early modernist as well as in the Scandinavian surveys of dwelling layouts and housing conditions in the post-war period. Given that contemporary housing, even in wealthy Norway, involves not only a question of identity and representation, but still also of usability and needs, as is argued in the previous chapter, such previous studies particularly of the layout of dwellings should represent a basis of knowledge relevant for this study.

The interest in and the analytical approaches to housing and living conditions, which developed during the first decades of the 20th century, resulted from the extensive urban changes that had been going on in the most industrialised countries for about hundred years. During the industrialisation of the 19th century, the population in European cities grew rapidly.[18] Due to lack of dwellings and of technical amenities such as heating, clean water and sanitary systems, the living conditions of the new working class were appalling.[19] For various reasons, ranging from fear of revolution to the industries' need for healthy workers, housing conditions became an issue of wide political and social interest in the late 19th century England. This was the background for the ideals of the "Garden Cities". In order to handle the problems of the over-crowded and densely built working-class housing areas, Ebenezer Howard (1898) proposed decentralised and less densely built cities inspired by the rural. The concept of "Garden Cities" reflected a belief in architecture and urban planning as a means of improving health and social conditions; a way of thinking that during the first decades of the 20th century, were also brought to apartment buildings and to the individual dwellings and their interiors.

[18] The population of London more than doubled from 950,000 in 1800 to 2,300,000 in 1850 and doubled again to 4,500,000 in the year 1900. In Norway the population of Oslo grow almost exponentially during the 19th century, from 9,000 in 1800 to 112, 000 in 1880 and to 227,000 in 1900.

[19] This was the subject of "*Die Lage der arbeitenden Klasse in England*" by Friedrich Engels (1845), English title: "*The Condition of the Working Class in England*".

In Norway, the theologian Eilert Sundt and the medical doctor Axel Holst were pioneers in studying living conditions. Sundt carried out a series of studies and several of these addressed particularly poverty in Oslo. (Sundt, 1858 and 1870). Holst (1895) documented that the housing condition for the workers were unacceptably unhealthy and cramped.[20] The concern of Nanna Broch, who worked for the local authorities in Oslo from 1919 to 1945, was that low quality dwellings made women's housework and children's lives to a daily struggle. Her series of exhibitions[21], which documented the bad living conditions and argued for technical improvements and better dwellings, achieved a broad public attention and were important for the political interest in housing conditions that emerged during the 1920- and -30s. (Johansen, Berge and Andresen, 1961)

The architects' concern about housing was not only based on such social interests but also on more operational approaches. In mass production within industry, studies of efficiency had been essential in order to design optimal lines of production. Methods from such studies were transferred to studies of homes and housing. An example is *"Efficient Housekeeping or Household Engineering, Scientific Management in the Home"* by Christine Frederick (1925), with the sub-title "*A correspondence course on application of the principles of efficiency engineering and scientific management to the every day tasks of housekeeping*." Her writings were based on studies of the time spent and the movements made during work in the domestic kitchen. Similar analyses were carried out by Margarete Schütte-Lihotzky in her development of *"Die Frankfurter Küche"*. Her concern was to develop kitchens that were comfortable and practical places in which to work. According to Noever (1992), Schütte-Lihotzky was inspired by dining in trains where food for 100 persons was efficiently prepared in kitchens of only 4 m2. A publication by Schütte-Lihotzky from 1921 had the informative subtitle *"Wie kann man durch richtigen Wohnungsbau der Frau Arbeit ersparen"*.[22] *"Die Frankfurter Küche"* was published as a full-scale kitchen and demonstrated through movies showing the kitchens in use.[23]

[20] Holst applied the official norm (according to Christiania Sundhetskomission 1893), which defined less than 15m3 space per adult as very cramped living, and found that the living in 17% of workers dwellings were very cramped and that this percentage was more than 50% in some areas. (Holst, 1895, p. 16-21)

[21] The exhibitions were named "Østlandsutstillingen" and went on from 1928 to 1956.

[22]This would in English be *"How to reduce the work of the housewife by building the right dwellings*". Margarete Schütte-Lihotzky (1897-2000) was the first female Austrian architect, she won prices for her designs even before graduation and collaborated with several of the most famous architects of the time (Adolf Loos, Peter Behrens, Ernst May and Bruno Taut). She was imprisoned by the Nazi-regime and later prohibited from architectural practice due to membership in the Communist Party. She received the Architectural Reward of the City of Vienna in 1980 and awarded membership in "Gesellschaft der bildenden Künste Ôsterreichs" in 1997. For more about Schütte-Lihotzky and her work, see Noever (1992) or Hirdina (1984).

[23] Schütte-Lihotzky's kitchen was exhibited at "Die Frankfurter Frühjahrsmesse" in 1927. After being presented at the Stockholm exhibition in 1930, "Die Frankfurter Küche" of Schütte-Lihotzky became a basis for the studies and the design of kitchens takings place in Sweden, studies that were brought back to Middle Europe termed as "The Swedish Kitchen" after the Second World War. (Hirdina 1984)

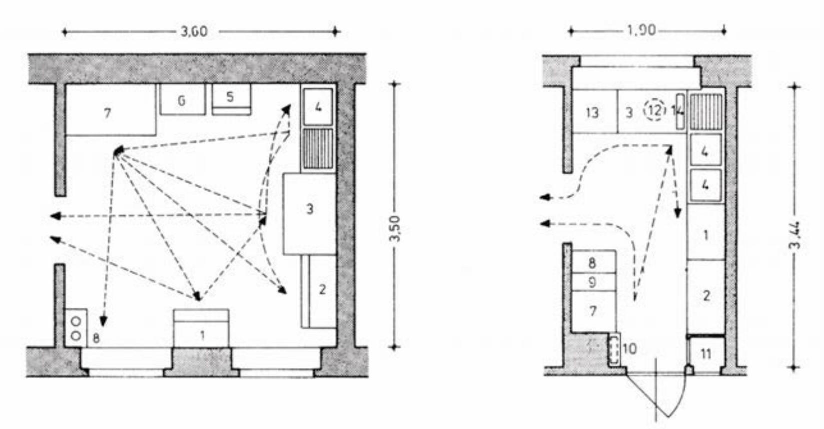


Figure 2.1 “Reduzierung der Schritte”, a study by Schütte-Lihotzky.

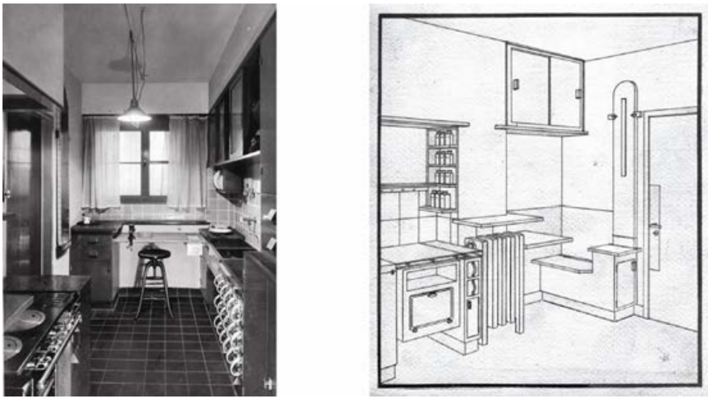


Figure 2.2 Two of Schütte-Lihotzky’s kitchens.

Walter Gropius, Alexander Klein and Otto Haesler were also architects who carried out analytical studies as a background for their housing designs.[24] Klein and Haesler were particularly concerned with the layout of the apartment, doing studies like comparing the depth of the building and the floor plan layouts to rental costs. These costs were later compared with the income of the households in need of dwellings. The work of Klein became a basis for the *“Bauentwurfslehre”* by Ernst Neufert (1936), a work that has been published in numerous editions and that has been the main normative reference for a generation of post-war-architects. The discussions and focus of Scandinavian architecture were closely connected to what happened in Germany, and the close relations between politics, social interest and architectural practice were manifest at the Stockholm exhibition in 1930.[25]

[24] See: Adler (1927), Bredsdorff (1938), Isaacs (1983), Klein (1931, 1934), Warhaftig (2000) and *Plan:3* :”Erfaringene fra Tyskland”.

[25] For those reading Danish, a review of the Stockholm Exhibition can be found in Hansen (1930).

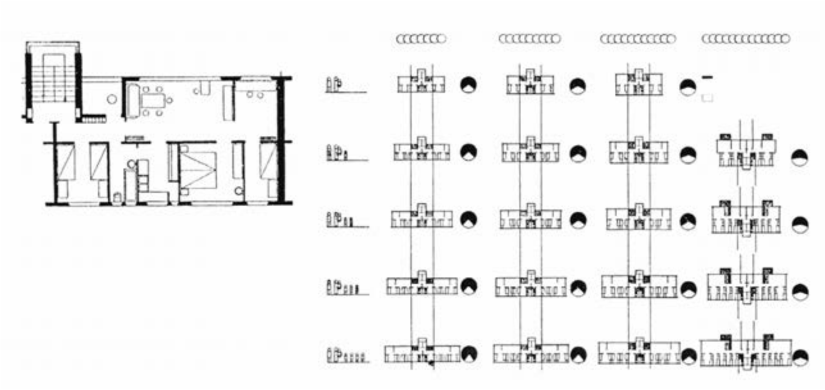


Figure 2.3
A study by Otto Heasler. Different versions of a floor plan (to be selected in accordance with the economy and the size of the household).

In the beginning of the 20th century, Norwegian architects also became concerned about bad living conditions and the need for housing, and towards the 1930s they became deeply involved in the political and social debate on housing as well as in the planning and design of the buildings.[26] In Norway the magazine “Plan” contributed to information and debate on housing and apartment layout in a series of articles, some of them very similar to the works of Klein and Haesler. (Plan, 1933: 1, 2 and 1935: 3.) The analytical studies of housing in the early 20th century constituted a basis for modernism within architecture, firstly by representing a critique of traditional housing design and secondly by developing innovative designs. The architecture of the 1920s and -30s, particularly the architecture developed in Germany[27] during the Weimar republic, has inspired housing and apartment design ever since.[28]

[26] A subject for discussion was what kind of housing to build, tiny apartments (which people could afford) or larger apartments (which by architects were considered to be better but rarely could be afforded by those households most in need of improving their housing conditions), two points of view emphasised by the architects Rivertz and Hals, respectively. See Rivertz (1935).
[27] Among the well known projects from this period are *Siemensstadt* in Berlin and *Weissenhofsiedlung* in Stuttgart, projects consisting of works by numerous of the famous architects of the time such as Peter Behrens, Le Corbusier, Walter Gropius, Hugo Häring, Mies van der Rohe and Bruno Taut. See for instance Pommer and Otto (1991) about Weissenhofsiedlung and Rave and Knöfel (1968) about dwellings in Berlin.
[28] Concerning items of interior design such as lamps and kitchen equipment, the designs developed during the 1920s and -30s are not only still today important references today, they are even highly fashionable. This is interesting as the analytical kinds of studies that were the basis for these designs rarely any longer are taken seriously. It could be that contemporary dwellings are excellent concerning any aspects of design where such analytical studies might be relevant. However, as indicated in the previous chapter, this does not seem to be the case. The situation is more that contemporary interior design represents a kind of post-modernism where icons of early modernism appear in eclectic manners without the original references to use or to ease of life, being a kind of “non-functional functionalism”.

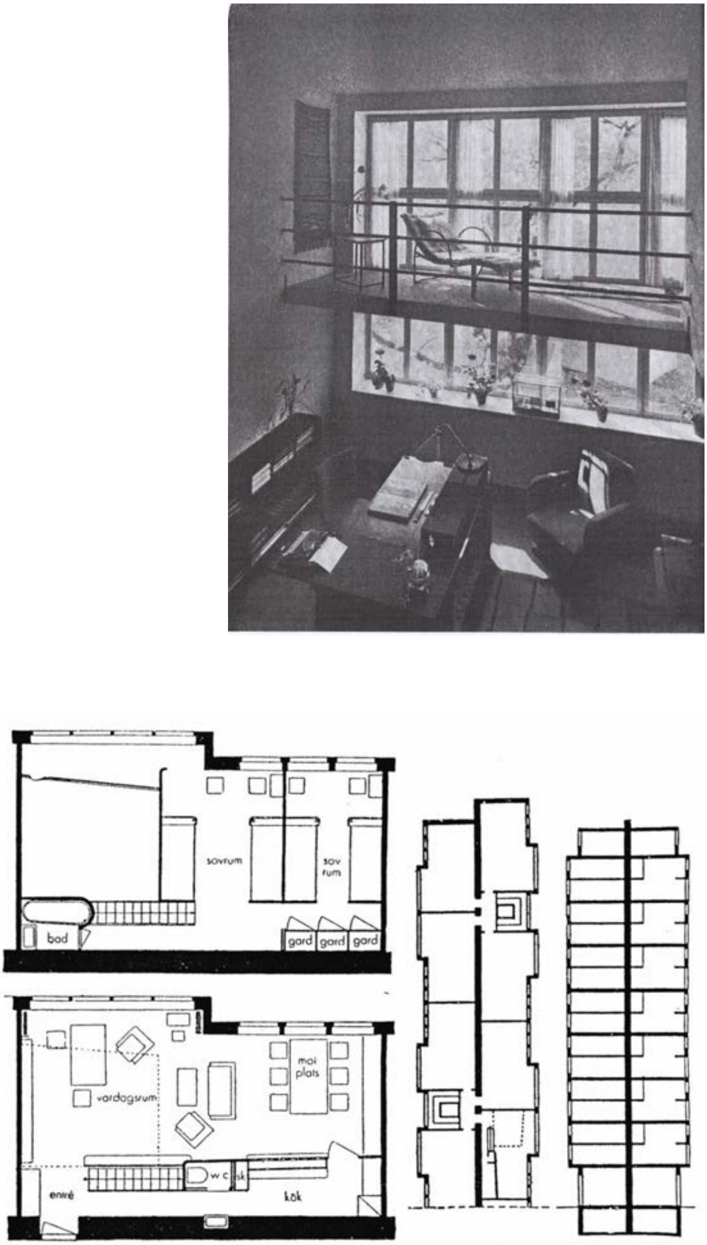


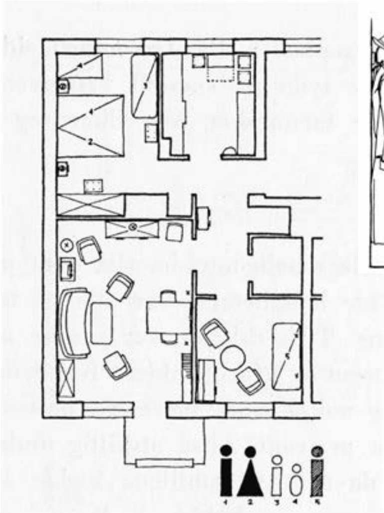
Figure 2.4
An apartment from the Stockholm exhibition, 1930. Architect: Kurt von Schmalensee.

In the history of Norwegian housing research, one of the most important works is the survey by architect Carsten Boysen and his colleagues. As the publications presenting the results were edited by Odd Brochmann, the survey is usually (and therefore also in this thesis) in short named the housing surveys of Brochmann. This extensive piece of work started during the Second World War with the aim to evaluate small apartments built in the years before the war. At this time, it was well known that the standard of living in many old apartments was low due to overcrowding in houses with low technical and sanitary standards. The subject of the survey was to what extent the new housing projects, i.e. those built during the 1930s, did (or did not) manage to improve this situation. The aim of the survey was to establish factual knowledge relevant for planning and designing future dwellings. The survey consisted of extensive registrations of housing conditions and of the residents' evaluations and preferences. The data were analysed by architects, doctors and psychologists. The survey was presented in a series of publications (Brochmann 1948, 1952 1958 and 1961) that contained historical reviews of housing conditions, detailed analyses of floor plans and rooms with respect to the space needed for various domestic activities, in-depth "case studies" of particular households and their living conditions as well as statistical analyses of households and dwellings. From these analyses, many guidelines for design were identified, such as that apartments designed for more than 4 persons should have separate WCs and that kitchens should not be less than 8 square metres. (Brochmann, 1948, p. 138)

There has always been an aspiration to teach people "the right ways of living" inherent to architects' interest in housing and dwellings.[29] The publications of Brochmann are representative for their time in this respect. Brochmann (1948, p. 102) argues that, in order to prevent "wrong use", such as using the kitchen as a kind of living room, kitchens should not be too large. Other examples are his critiques of "representative" living rooms preferred even by cramped living households,[30] of "heavy furniture" and of "bad-taste" paintings and decorations. However, regardless of this belief in the relevance of architects' aesthetical taste, the surveys of Brochmann and his colleagues are still impressive by the amount of relevant data collected and by the broad approach of the analyses. Figure 2.5 illustrates some of the content of the survey.

[29] A discrepancy between architects' preferences and "common taste" is at least as old as the architects' interest in dwellings. The architects' concern with the totality of domestic life and their well-meant teaching of people about how to live, is described in the essay "The Rich Poor Man" by Adolf Loos already in 1900. (Munz and Künstler, 1966, p. 223) Rolness (1995) has elaborated the somewhat more modest consern of Norwegian architects in the same respect.

[30] This kind of "representative" living room is a parallel to the traditional use of the English "parlour" described by Hanson (1998, p. 121).



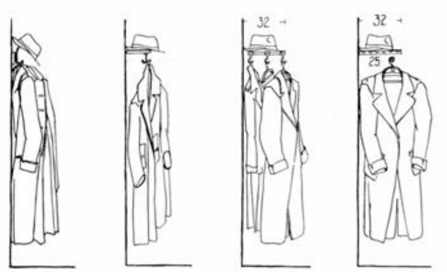
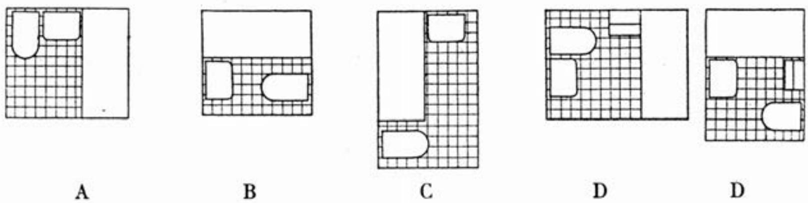


Figure 2.5
Some figures from the publications of Brochmann.
2.5a A particular household and their apartment; a family of four, with one room for let.
2.5b Layouts of entrances, how to hang the coat, where Brochmann recommends the alternative on the right.
2.5c Drawing documenting a living room. In text, Brochmann criticises the “heavy” furniture. He was also annoyed by the diversity of quality and exemplifies this by “good paintings and the best porcelain placed beside rubbish”.

In *“Bostadsplanering”*, a pamphlet packed with information, the Swedish architect and scholar Björn Klarqvist (1969) has summarised the current state of Swedish housing research and dwelling design in the late 1960s. Among Klarqvist’s references is Lennart Holm’s doctoral thesis about dwellings and living condition is Sweden.[31] (Holm, 1955) Figure 2.6 and 2.7 show some illustrations from this Swedish housing research. Figure 2.7 is one out of the many detailed results of Holm about domestic lives, showing where men and women spend their time, while figure 2.6 shows his result about the residents’ evaluations of different bathroom-layouts. Figure 2.8 shows Klarqvist’s illustrations of how a bedroom that is not too small can be used in different ways. The figure at bottom right (in figure 2.8) shows proposed section of a kitchen.



T 285. ***Bedömningen av badrumstypernas storlek. (Samtliga lägenheter med badrum av dessa typer.)***

Typ	Antal	Missnöjesprocent
A	285	5
B	121	50
C	29	45
D	44	0
Summa	479	100

Figure 2.6
Satisfaction with different bathroom layouts. (Holm, 1955)

[31] The above-mentioned Odd Brochmann was among those who guided the survey of Holm.

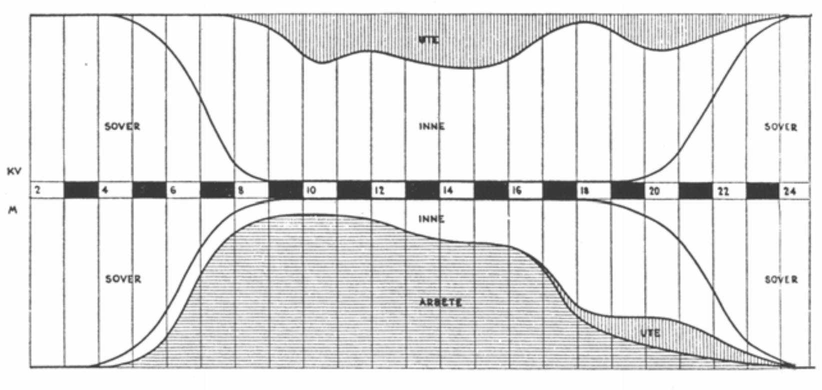


Figure 2.7
Women's and men's activities through the day. (Holm, 1955)

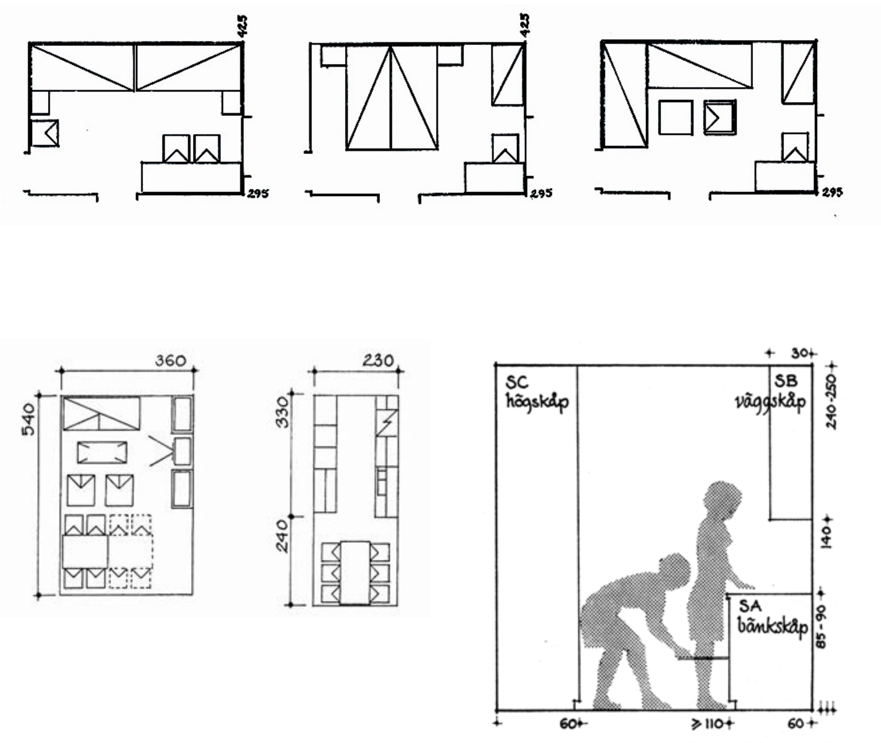


Figure 2.8
Three figures from Klarqvist (1969), showing alternative use of a bedroom that is not too small, recommended sizes of living room and kitchen and recommended section of a kitchen.

As intended, the survey of Brochmann and colleagues became a basis for planning of housing as well as for design of dwellings in more detail, issues that have been major interests of Norwegian architects, planners and politicians in the post-war period. During this period, until the late 1970s, the governmental institutes of building research in Norway, as well as in Denmark and Sweden, have focused on the layout of dwellings in terms of alternative floor plans and the space needed for various domestic activities. In all three countries the governmental institution for building research developed normative guidelines for designing and evaluating apartments, represented by Svennar (1975) in Norway, Bredberg (1978) in Sweden and Ranten and Vedel-Pedersen (1982) in Denmark. Svennar's guidelines proposed appropriate sizes for different rooms and captured essential information about the space needed for specific domestic activities, but they are less useful when it comes to evaluation or design of entire dwellings. The works of Bredberg as well as those of Ranten and Vedel-Pedersen describe many and detailed parameters of the dwelling layout relevant to the quality of living and represent thereby a large body of knowledge. However, since they are extremely extensive, they are useful for evaluating apartments already designed rather than applicable to the process of creating new layouts. The normative guidelines developed by research institutions were implemented into planning and design through Norwegian building legislation and as terms to be followed in order to achieve favourable loans. The latter was managed through "Husbanken", the Norwegian Governmental Bank of Housing.[32]

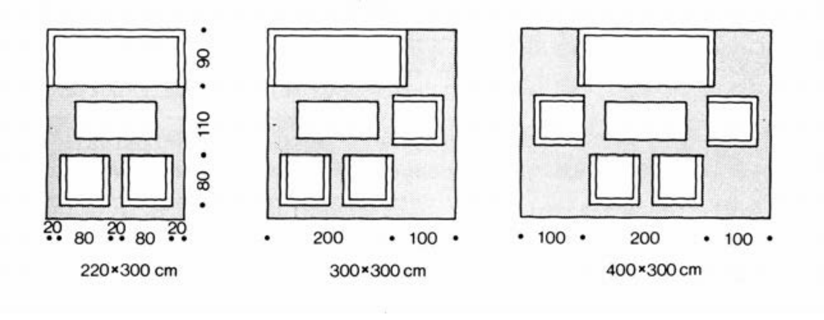


Figure 2.9.a
Recommended place needed for living room furniture. (Ranten and Vedel-Petersen, 1982)

[32] The guidelines of Husbanken, which are called "Husbankens minstestandard", still exist. (Husbanken, 2000) The aim of this minimum-standard, which concerns sizes of rooms and other features of the floor-plan, was originally to prevent low quality dwellings. Today, it is usual that new apartments do not meet this "minimum standard" where sizes of rooms and daylight conditions are concerned.

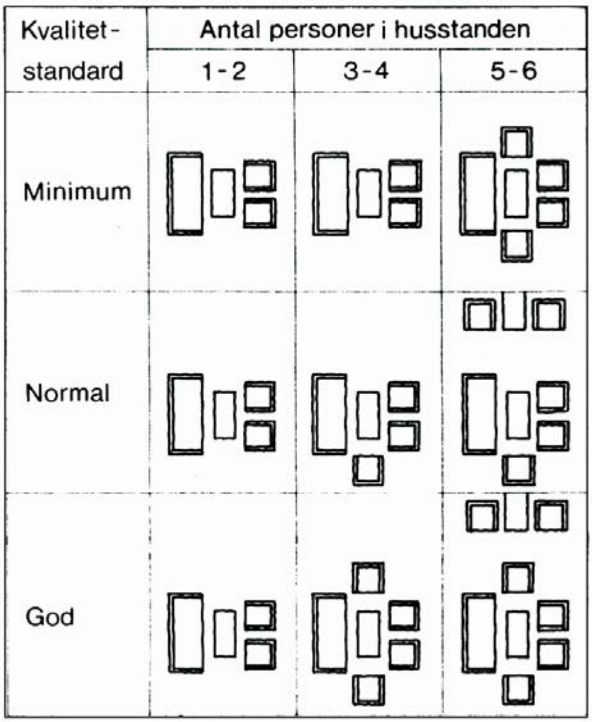


Figure 2.9.b
Recommended size a living room, depending on standard of living and number of persons.
(Ranten and Vedel-Petersen, 1982)

In 1967, NBI (the Norwegian institute of building research) carried out a comprehensive survey about housing and living, a survey published in two reports by Ås (1971). These reports contain extensive information about the Norwegian stock of dwellings, about the households and about their living conditions. The results of Ås about spaciousness of living referred to in section 1.2.2 are among the results of this survey. Figure 2.10 is another example of results from this survey about the households' preferences, showing percentages of respondents that considered their rooms too small. (In order to please 80 % of the households, the living rooms, the kitchens and the bedrooms should be 20, 8 and 12 m2, respectively.)

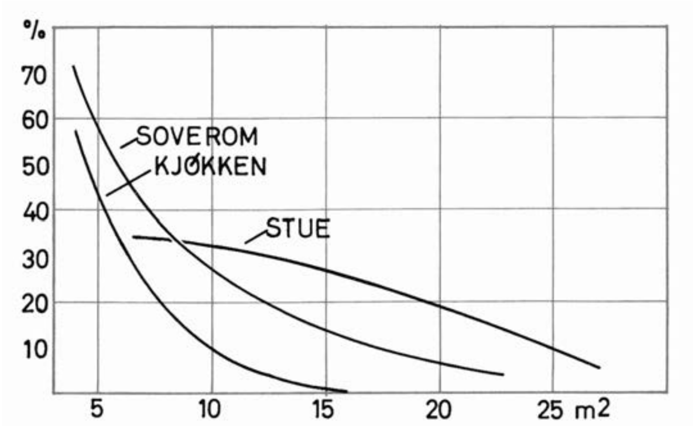


Figure 2.10
Room-sizes and residents' satisfaction.
(Percentages of households considering their rooms too small. (Ås, 1971))

During the 1970s, extensive criticism of the large buildings, the monotonous neighbourhoods and the segregation of functions that characterised housing projects built in the 1960s and 1970s emerged.[33] A consequence of this criticism was that residents' influence on the own living condition became a subject of major interest.[34] The focus of research changed from the buildings and the individual dwellings to the broader aspects of living and domestic life; to an interest in finding out how people best could participate in the planning and the design of their dwellings.[35] Another consequence of the critique of large and repetitive housing projects was that alternative kinds of buildings became a subject of interest. Particularly in Denmark this lead to a renewed interested in "low and dense" housing. The research report *"Tæt lav – en boligform"* by Statens Byggeforskningssinstitut (1971) [36] argues that this principle, which is an old historical tradition in urban settlements, is efficient

[33] An origin of this critique on an urban level was "The Death and Life of Great American Cities" by Jane Jacobs (1961). She argued that urban planning, all since Ebenezer Howard, were trapped in the misunderstanding that well functioning cities could be intentionally designed in detail.
In Norway, the housing projects constructed during the 1960s and 1970s were less criticised than in Britain and in Sweden. To what extent this can be explained by the smaller size of Norwegian housing projects or by the layouts of Norwegian dwellings, is an interesting issue not followed here.
[34] The residents did not have more direct influence on the planning of their dwellings in the decades before, but the need for "user's participation" in the design process was then not on the agenda. The focus on individual freedom and right of choice that was a part of the political changes of the 1960s and 1970s can explain some of this emerging demand for user's participation. However, it is hard to argue that the demand was not caused also by the housing projects built during the 1960s and 1970s.
[35] In "*The Production of Houses"* Christopher Alexander (1985) extended his earlier proposals for architectural design (Alexander, 1977) into guidelines also for the design processes. *"In the modern world, the idea that houses can be loved and beautiful has been eliminated almost altogether."* Alexander states (p.14) and describes his aim of constructing a housing process that results in houses where *".. people feel proud and happy to be living in them and would not give them up for anything, because they are **their** houses, because they are the product of **their** lives, because the house is everything to them, the concrete expression of **their** place in the world, the concrete expression of themselves."*
[36] Statens Byggeforskningsinstitut is the governmental institute of housing research in Denmark.

with respect to costs as well as site-areas while it avoids the problems of large high-rise housing projects. Even though several "dense and low"-projects were built,[37] the concept became a critique of high-rise housing rather than the new guideline for housing design.

As the 1970s passed by, there were still many pre-war dwellings of very low technical and sanitary standard while it had become clear that the large high-rise housing projects were the solution. Parallel to the interest in users' participation and the search for alternative principles for new dwellings, a new subject of interest was how to improve the dwelling standards by renovation of the existing stock of dwellings rather than by demolition of existing houses and construction of new dwellings from scratch.

Other aims of the research during the 1970s and –80s was to find out to what extent the apartments built were in accordance with the normative guidelines and to compare the actual living conditions to what was assumed by researchers and architects. The research institutions therefore carried out interview-based surveys in order to gather data about real households and their preferences. One such study was the Swedish research from the late 1970s presented in a series of reports entitled *"Bostadsutformning, bostadsanvändning"* (Statens Institut för Byggnadsforskning, 1979 and 1980). This survey examined 308 dwellings of altogether 33 kinds built during the period 1942-1975. By collecting detailed information about the households, their daily living and their dwellings, the survey established an empirical basis applied in order to evaluate the normative guidelines. Among the findings were that a wider range of activities than assumed went on in the kitchen, that the kitchen should be larger for this reason and that the main activity in the living room was watching TV. Concerning bedrooms, it was discovered that many parents moved into one of the smaller bedrooms in order to let teenagers move into the largest bedrooms. Figure 2.11 is an illustration from this survey that documents the furniture of the dining rooms, (showing the dominant positions of the TVs) while figure 2.12 shows the sizes of circular kitchen tables. The latter is an example of one of the very detailed results of this study.

[37] The project "Skjettenbyen" showed in figure 2.22 is such a "low and dense" housing project.

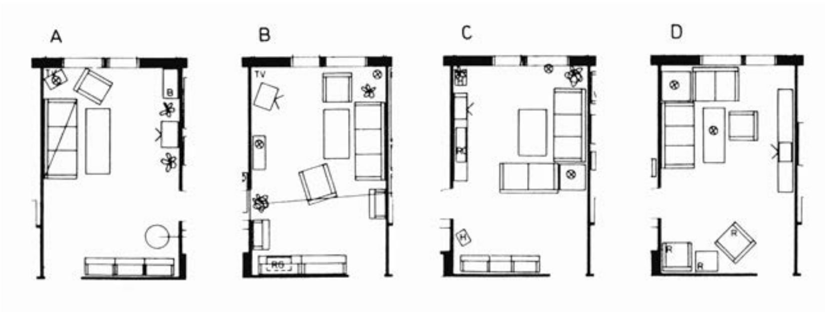


Figure 2.11 Examples of the "TV-based" furniture in living rooms. (M80:3)

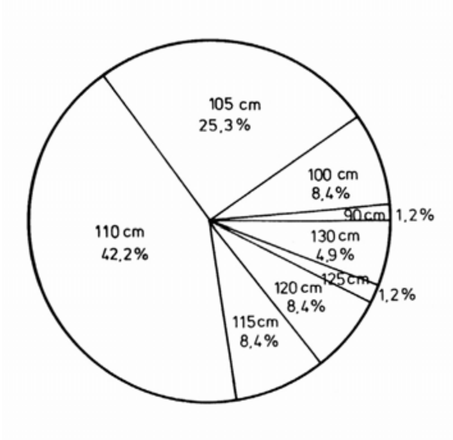


Figure 2.12
The sizes of round kitchen tables.
(M80:3)

In Norway, similar studies of households and their living conditions were carried out by Guldbrandsen (1973) and by Guttu, Jørgensen and Nørve (1985). The former examined the living in "one-rooms-apartments" in the suburb Ammerud, concluding that such apartments were too small to be acceptable for permanent living (see figure 2.13), while the latter was an in-depth study of 3 kinds of apartments built during the 1970s, carried out by visits and interviews in altogether 30 apartments. Similarly to the Swedish research *"Bostadsutformning, bostadsanvändning"* mentioned above, they found that households preferred larger kitchens and that many parents moved into the second largest bedroom. They also found that people disliked bedrooms accessed only through the living room; particularly when this was the case for the largest bedroom. Some conclusions of Guttu, Jørgensen and Nørve were that the size of the kitchen should be increased to about 15m2; becoming a kind of second living room, and that the second largest bedroom should be as big as the largest, which means about 12 m2.[38] (See figure 2.14.)

[38] Guttu, Jørgensen and Nørve (1985, p. 64).

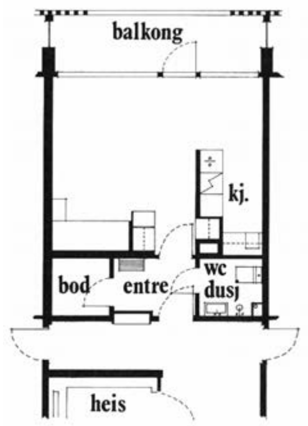


Figure 2.13
The dwellings examined by Gulbrandsen (1973), an apartment that few residents, due to size and to lack of a separate bedroom, found acceptable for permanent living.

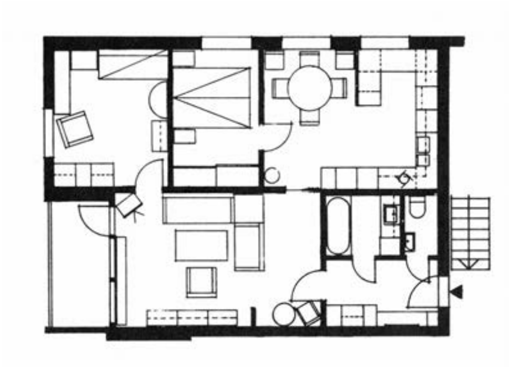


Figure 2.14
One example from the survey of Guttu, Jørgensen and Nørve (1985), an apartment where the parents have moved into the second largest bedroom. The figure also illustrates the kind of floor plan where the residents were dissatisfied with through-passage in the living room.

Since the 1990s, housing research has again been paying more attention to the building, but this time focusing on sustainability and economy rather than on floor plan layouts. The issues of interest have been the use of energy and materials on the one hand and profit and efficiency of construction on the other. The segment of research that is still about layout of dwellings is "universal design".[39] Because normative guidelines for "universal design" are terms for achieving favourable governmental loans, universal design is a concern where research still influences the layout of new housing projects.

[39] Universal design encompasses not only concern about those permanently disabled but also the understanding that most people will have periods when their ability or ease of movement is restricted.

The tradition of Scandinavian housing research described above, has become part of the architectural research that is now developing into an academic field at the institutions teaching architecture. Some of the doctoral theses that concern dwellings are Støa (1995) and Guttu (2003), respectively from NTNU and from AHO in Norway, and Farah (2000), Johansson (1997) and Nylander (1998) from Sweden; Farah and Nylander from Chalmers, Gothenburg and Johansson from KTH, Stockholm.[40] Støa has studied Norwegian one-family houses from the 1980s. This kind of housing represents the majority of Norwegian dwellings and there is a striking discrepancy between the ideals of architects and those of the households living in this, the most common, kind of Norwegian dwellings. Støa has examined the households' ideals about living as well as the layout of the houses and the gardens. She describes how the households' preferences are due to the need for "*personalisation*" of the building and the building process. Ideals about dwellings are the subject also of Guttu's thesis, but while Støa focused on the ideals of the households, Guttu has studied how the professionals' ideals about dwellings have developed in Norway since the Second World War. In Sweden, Farah has studied Sudanese dwellings, comparing the spatial layouts of "traditional" and "architect-designed, modern" houses. By applying space syntax analysis,[41] she found that the dwellings, regardless of being "traditional" or "modern", consist of a "male-zone" and a "family-zone". According to Farah, a courtyard is the most "central" space in the traditional dwellings (or "most integrated" if applying space syntax terminology), while the "family hall" is the "core" of the modern dwellings. The theses of Nylander and Johansson are both about Swedish dwellings. The aim of Nylander has been to conceptualise "non-measurable" architectural attributes. Nylander notifies altogether seven "fields of attributes", these are "materials and detailing", "axiality", "enclosure", "movement", "spatial figure", "daylight" and "organisation of spaces", and argues that essential "non-measurable" features of architecture can be captured by applying these. He has studied 4 housing projects built in the period from 1987 until 1993, by visiting the apartments and interviewing the residents as well as the architects. His thesis presents analyses of the apartments with respects to these "fields of attributes" and exemplifies the "fields of attributes" by the apartments. The study of Johansson is another thesis that presents theoretical elaborations related to surveys of dwellings. While Nylander intends to develop an original methodological framework for

[40] A study that has some relevance to this study without focusing on common dwellings is the one of Margrethe Dobloug (2006). In her dissertation-lecture about contemporary buildings for elderly she pointed out the new typology of dwellings being developed in Norway, a kind of dwellings particularly designed for elderly needing some care. These dwellings for elderly enforce the tendency found by this thesis, the tendency that new dwellings are tiny and appropriate only for particular kinds of households.
[41] Space syntax analysis is elaborated in section 2.3 and 3.4.

analysing architecture, Johansson uses his 6 cases of housing research as background for discussing case-studies and qualitative evaluation of artefacts in general. While Nylander's thesis is of the kind where architects aim at developing theoretical approaches and methodologies specific to architecture,[42] Johansson's thesis represents a useful introduction to existing theory and methodology that are relevant for the evaluation of architecture in general and for survey-based architectural research in particular.

Figure 2.15.
Nylander analyses "axiality" and "movement", two out of his altogether seven "non-measurable fields of attributes".

This review illustrates the development of research-orientated studies of dwellings from early international modernism, where innovative architectural design was closely related to analytical studies, up to the more scholarly housing research of today.[43] In spite of the research now going on in the institutions teaching architectural design, there is, at least in Norway, a remarkable lack of interaction between research and analytically based knowledge on the one side and architectural practice and teaching on the other.[44] In a knowledge-based society and in a research-based educational system, this represents a challenge for architectural research as well as for architectural practice and education.

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[42] Nylander attempts to grasp the "non-measurable". Coolen (2005) has discussed this subject more in detail. An interesting question is whether such attempts manage to reveal essentials of "the non-measurable" or if it fails due to the problem of "measuring the immeasurable". The "non-measurable" attributes of Nylander represent interesting fields of discussion, as several of them, particularly "axiality" and "movement" are studied in explicit and "measurable" manners through the methods of space syntax, see sections 2.3 and 3.4.

[43] For those who are interested in Scandinavian housing research and design, but do not read Scandinavian languages, a review of the subject is available in English. *"Housing research and design in Sweden"* edited by Sven Thiberg (1990) is an English version of "Bostadsboken" from 1985. Besides reviewing history of housing research and housing design, it contains an extensive listing of relevant references.

[44] Jansson (1998) describes how theoretical knowledge as such rarely constitutes basis for architectural practice; the main references for architectural design are knowledge of specific buildings and not theory in written form.

2.2 VOID AND SOLID

"Housing" as well as the more specific "dwelling" are terms that can be applied to cover a wide range of meanings. Rapoport (1990) argues that a dwelling is more than the structure built.

"-- a dwelling is not just a structure; it is an institution, a social and cultural unit of space created to support the way of life of people."

A focus on space rather than on the building is also part of the approach in this study. The question about what space is and how space might be studied, can be elaborated as an architectural issue or more in general. Concerning architecture and space particularly, Scruton (1979, p.43) has made the following statement:

"..the theory that the experience of architecture is an experience of space is obviously indefensible. If space were all that interested us, then not only must a large part of the architect's activity seem like useless decoration, but it is even difficult to see why he should bother to build at all."

Scruton here argues that architecture cannot be about space since it is about building. However, by this logic, where interest in one issue (space) must be solely about this, excluding any interest in other issues (such as the building), the conclusion might as well be the opposite. It is a fact that living takes place in space and not in the physical mass of buildings. By the logic Scruton applies above, he could therefore as well conclude that architecture cannot be about building since we know it is about space. However, such focus on one by dismissing the other is like attempting to remove the vase from the faces in figure 2.16; space and building represent void and solid and are thereby mutually dependent upon on each other. The relationship between space and building can be pointed out by referring to lectures of the Swedish scholar Björn Klarqvist. His standard introduction when teaching space syntax is to draw a person standing in an empty flat landscape; a human in a space that is an infinite hemisphere. By placing one wall (or one box) in the space and then one more, he points out how the purpose of building is to create space by limiting an initial space. In brief, architecture is about defining space, and to construct buildings is a means for doing this. The physical building and the space within and surround it define each other similarly to the vase versus the faces; without the faces there is no vase as without the physical building there would be no interior space. However, if we are particularly interested in the vase, it might be relevant to study the vase without having the faces explicitly in mind at the same time; some enquiries about the vase might even need such a focus on the vase. Similarly, it might make sense to focus on the internal space, having the building in mind only in terms of being the physical surrounding that defines the space. Based on the assumption that the spatial layout is of major importance for human behaviour, preferences and well-being, this kind of focus on the space is the basis of this study. This does not imply that features of the physical building (other than those physically defining the space) do not influence the same; it means that it should be relevant to study characteristics of architectural space in particular. The subject of this study, or the "unit of analysis" if applying a term of Yin[45], is the interior space, this as opposed to the building. The objects and features that define, serve and characterise the space, such as structures, technical installations, materials, colours and textures, are relevant in terms of being the context of the interior space but are not explicitly examined by this study. The subject is "the physiognomy of the void" in the sense that the focus is on the space rather than on the building, and on particular features of the space rather than on intentions, perceptions or experiences concerning space.

Figure 2.16 Void and solid; the vase and the faces.

[45] Yin uses the term "unit of analysis" at two levels, both in the meaning of a precisely described *main subject* of inquiry, where there should be just one, (Yin, 1994, p. 23) and as the possible *subunits* to study within a case. (Yin, 1994, p. 39) The term is here applied in the former meaning. About the term "*unit of analysis"*, see also Patton (1987, p. 50).

2.3 SPATIAL CONFIGURATIONS

A feature of "the physiognomy" of space focused upon in this study is the spatial configuration. Configurational aspects of space are an issue often implicitly touched upon when discussing floor plans or typologies of buildings. In "Bauen Der Neuen Wohnbau" Bruno Taut (1927, p. 68) criticised a contemporary dwelling for having "aufgeschwemmter Grundriss" (a "spread-out floor plan") and for consisting of "totes Raum" ("dead space"). Further, he stated that the search for the best floor plan is the mission of the real architect:

"..Wir wissen deshalb, dass auf dem Gebiet des Wohnungsbaues hierin allein, d.h. im Suchen nach dem besseren Wohnungsgrundriss die Aufgabe des wirklichen Architekten liegt." [46]

The architects' major tool for designing spatial layouts is drawing floor plans. Within housing research, basic features of the dwelling have been analysed by examining floor plans and comparing these to knowledge and data about households and the social, economic and technical contexts. Among the early works that explicitly concerned the interior space, are those of the architect Alexander Klein, who in the 1930s carried out extensive studies of spatial layouts of houses and apartments. He analysed contemporary dwellings and proposed guidelines for new designs. He studied daylight conditions, the proportions of rooms and the positioning of rooms relative to each other. Figure 2.17 illustrates how Klein (1934, p. 115), by applying simple graphics on the floor plan drawing, pointed out how the positions of the staircase and the doors affect the space of a living room. Klein's marking of floor-areas needed for convenient movements is a simple technique that illustrates some basic properties of the spatial layout. Figure 2.18 shows this kind of marking at the floor plan drawings of a new apartment (from the same project as the one showed in figure 1.1). Most of the living-and-kitchen-room is "occupied" by necessary access to other rooms and to the kitchen, leaving little space left for dining, relaxing, watching TV or other activities that we know people prefer to do in their homes. Klarqvist (1969) and Svennar (1975) are among those who have applied graphics similar to Klein's, when analysing floor plans and when describing guidelines for designing the rooms of dwellings.

[46] This in English would be something like "…we know, when construction of housing is concerned, that solely in this, in the search for the best apartment-floor-plan, lays the mission of the real architect".

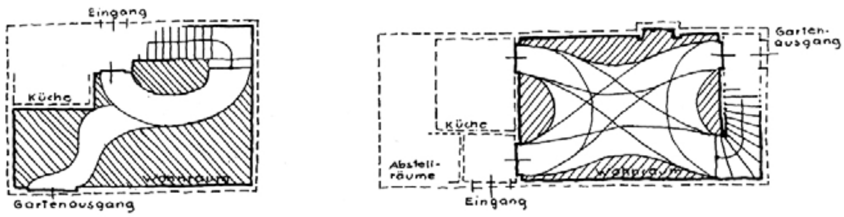


Figure 2.17
Analysis of different layouts of the ground floor in a small single-family house. (Klein, 1934)

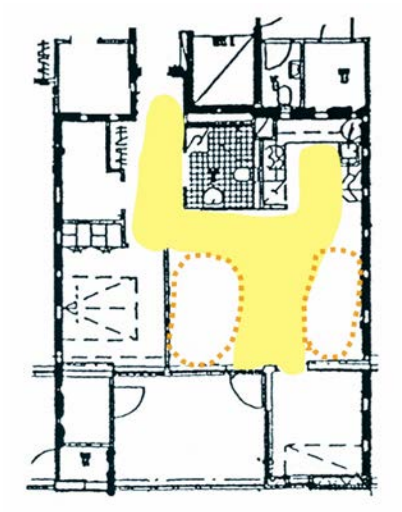


Figure 2.18
An apartment from “Badebakken”, Oslo, where floor-areas required for movement/access are marked similarly to Klein’s drawings in figure 2.17.

A theoretical approach that particularly addresses configurational aspects of space is the one of space syntax. This is a field of architectural research where easily applicable methods for studying spatial configurations have been developed from a consistent theoretical framework. What it focused by space syntax, is how spatial units relate to each other, how such spatial relations correlate to social life and how such relations between spatial units can be identified and analysed. Marcus (2000, p.49-50) describes the importance of spatial configurations in architectural design as follows:

“Of necessity, we construct certain configurative patterns when we build, whether we are aware of it or not. The important thing is that we then also construct potentials for certain functional performances of the building.”

Marcus then describes the nature of spatial configurations more explicitly:

"What configurative descriptions do, as opposed to traditional descriptions of architecture or urban form, is that they focus on the relation between the elements in an architectural system, rather than the elements themselves. ... Qualities in the built environment, whether we talk about an building or a city, are primarily given by the internal relations to one another of the elements of which it is composed, rather than by the qualities of the elements as such. What gives a building its specific character is not so much, for example, the rooms within looked at one at a time, but how they are combined with one another. In other words, the configurative captures how something is composed rather than what it is composed of."

Figure 2.19-1.3.a shows a spatial configuration consisting of two identical elements "a" and "b" that are directly connected, or two rooms connected by a door, if the figure is the floor plan of a building. The situation is symmetrical in the sense that "a" relates to "b" as "b" relates to "a". By introducing access between the room "a" and the outside world "c", as shown in 1.3.c, the situation becomes very different. Room "b" has now achieved access to the outside without itself being changed, and room "b" and room "a" are no longer equal in terms of accessibility. Figure 1.3.e shows a so-called "connectivity graph" of the new configuration.

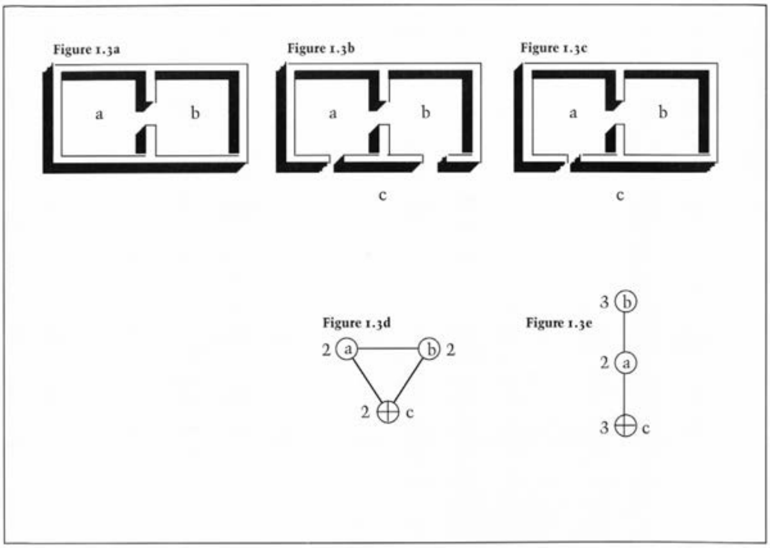


Figure 2.19
Spatial configurations and their connectivity graph representations. (Hillier, 1996)

When it comes to social activities, movement and occupation are two principle kinds of behaviour that relate to basic configurational aspects of space.[47] If we return to the example in figure 2.19 (1.3.c), the spatial configuration will imply movement through space “a” simply due to the situation of “through passage”. Hillier (1996, p. 38) argues that the configurational aspects of real buildings and cities, where the patterns are much harder to see than in the figure above, are “non-discursive” in the sense that they are hard to explain explicitly. In their studies of offices and interaction between the employees, where they have applied space syntax analyses, Blombergsson and Wiklander (2006) have some illustrative results with respect to this “non-discursivity”. They found that the positions in offices mostly preferred as workplaces and the areas where most interaction between employees takes place, correlate strongly to basic configurational characteristic concerning visibility and access. For those familiar with space syntax studies, this alone is not surprising. What is interesting is their further comparison of real behaviour (as registered on site) and the answers given at interviews and questionnaires; the respondents rarely mentioned spatial qualities as important for their choice of workplace or for their ways of working, and their conscious perception of their actions did not correspond to the their actions in reality (as registered on site). The study of Blombergsson and Wiklander illustrates that there are significant correspondences between social activities and spatial configuration and that these patterns are not consciously known. This kind of “non-discursive” knowledge, a knowledge that we apply intuitively, is what Hillier (1996, p. 40) describes as:

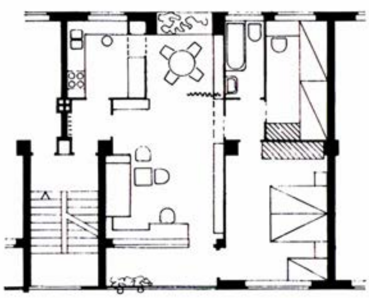
“social knowledge”,-- “which purpose is to create, order and make intelligible the spatio-temporal events through which we recognise the presence of culture in everyday life.”

The aim of the theory and methodology of space syntax is to grasp patterns in spatial configurations, patterns that we, according to Hillier, intuitively perceive and that we, more or less unconsciously, behave in accordance with. The methodology that makes space syntax easily applicable in analyses of architectural space is described in section 3.4. In the course of the recent decade, space syntax has become a well-established field of international architectural research. In the study described by this thesis, space syntax has been essential both in terms of the theoretical approach to architectural space and in terms of methods of analysis.

[47] From this basic distinction between occupation and movement Hillier (1996, p. 317-318) has developed a typology consisting of four kinds of topological positions in a spatial structure. This is explained in section 3.4.7.

Figure 2.20 shows the floor plan of an apartment designed by Scharoun and the corresponding connectivity-graph, which is a notation that represents the internal position of rooms with respect to accessibility. As will be elaborated further in section 3.4, space syntax analysis consists of calculations and comparisons of such graphs or other modelling of spatial configurations. A substantial reference concerning space syntax analyses of dwellings is "Decoding Homes and Houses" by Julienne Hanson (1998), where space syntax analysis is applied in order to examine historic as well as contemporary dwellings. In her analyses of traditional English farmhouses (Hanson, 1998, p. 56-), she has revealed patterns not found by previous studies that have analysed the floor plan drawings only. Studies of dwellings have developed into a "sub-field" within space syntax research, a sub-field where several contemporary studies have parallels to the one described by this thesis.[48]

In this study, where an intention has been to look for patterns in the development of apartments over a period of time, a useful application of space syntax is to describe the spatial configuration of each apartment by graph notations similar to those in figures 2.19 and 2.20, and then analyse and compare these graphs. This is an application of space syntax within the "core" of space syntax methodology. The exact modelling of the rooms and the particular space syntax analysis carried out, are described in section 3.5.



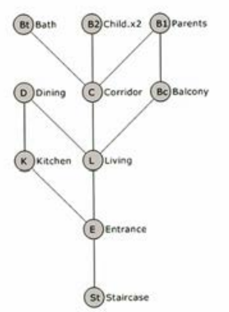


Figure 2.20
An apartment by Hans Scharoun, presented by a floor-plan drawing and by connectivity graph as seen from the staircase. (An apartment from Siemensstadt, Berlin, 1929 - 1931)

[48] Parallel to the study described by this thesis, similar diachronic space syntax analyses of dwellings have been carried out by Cunha and Magalhães (2005) and by Guney (2005). Cunha and Magalhães have examined middle class apartments in Rio de Janeiro built between 1930 and 1970, and compared the historical development of dwellings to economical, social and demographic development during the same period. Guney has examined upper-middle-class apartments in Ankara designed by architects and built in the period 1920 to 1990. Even though these studies differ from mine in terms of sampling as well as of the main subjects of interest, the three studies constitute an empirical basis from which it should be possible to develop some relevant comparisons.

2.4 GENERALITY VERSUS SPECIFICITY

From an overall point of view, the aim of planning, designing and constructing dwellings is to constitute a stock of dwellings appropriate for contemporary as well as future population of households. As buildings last much longer than specific needs and preferences, the challenge of housing is not only to fit the requests or the needs of the moment, but also to be appropriate in the future. Due to the temporality of contemporary needs and the longevity of buildings, the latter is at least as important as the former. Brand (1994, p. 181) argues that all buildings are predictions and that all predictions are wrong, and points out a contradiction between contemporary needs as captured by architectural "programming", and future and unknown requests:

"The great vice of programming is that it over-responds to the immediate needs of the immediate users, leaving future users out of the picture, making the building all too optimal to the present and maladaptive for the future."

According to Brand, there is a conflict inherent in the modern tradition of architects' design-practice; while we attempt to design buildings of permanent excellence by responding to contemporary "programs", the requests that constitute the "programs" are continuously changing. Concerning dwellings, the changes in needs and preferences are due to the individual persons in the household as well as to the society; the need for dwellings corresponds to the phases of life of the individuals as well as to social, cultural, economical and demographic development of the society. Due to the less dominant position of households consisting of two parents and the children they have in common, and to the greater variety of social, cultural and national backgrounds within the population, there is now an increasing diversity of preferences and needs where housing and dwellings are concerned. In such a setting, how do we design our dwellings, dwellings not made only for tomorrow but also for many decades to come? When Klarqvist (1969, p. 81-86) pointed out the need for housing capable of handling the plurality of contemporary households as well as future changes in needs and preferences, he described generality as one out of three relevant strategies for housing design. Generality here means the capacity of a fixed situation to serve a variety of demands or wishes. The other strategies pointed out and exemplified by Klarqvist are flexibility and elasticity.[49] The notion of flexibility describes a situation that is easily changeable while elasticity

[49] Generality, flexibility and elasticity are the same categories as described by Thiberg (1967) and later pointed out by Cold (1984).

means the ability to adapt in accordance with changing demands by modifying size. As these terms are mixed in common language as well as in architectural discussions, they will on the following pages be commented upon in more detail and illustrated by examples.

Figure 2.21 shows a building from about 1890 with a general floor plan in the sense that the main rooms are not specified for particular functions; neither the sizes of the rooms nor the positioning of them relative to each other predict the use of each room.[50] Originally, the use of the rooms changed during the day; from being used for sleeping at night, for living, play, and work during daytime and back to sleeping in the evening. The directors of these never-ending cycles of changes were the women, - the housewives in the workers' families and the maid among those better off; they rearranged the rooms in accordance with the changing activities throughout the day. A post-war example of a general apartment-floor-plan is the one developed by Lennart Holm during the 1950s and presented as "Lägenhet 1960" ("Apartment 1960").[51] This dwelling was designed in order to be appropriate for as varied a daily life as possible and consisted of a kitchen and two rooms that were all of 14 m2 and a living room that was of about 23 m2. Thiberg developed these ideas further by making the rooms even more similar in size. Figure 2.22 shows Thiberg's proposal; an apartment consisting of 6 spatial units of about 12m2, where the units for kitchen and for WC/bath/washing were the only ones with pre-determined use. The other four units could easily be adapted in accordance with the preferences of different households. Figure 2.23 shows a more recent housing project where many of the apartments have general rooms as regards usability: The project is a courtyard house in Amsterdam by the architects Diener and Diener (2002).

Concerning generality and the sizes of rooms, floor areas between 12 and 15 m2 have in different contexts been recommended in order to achieve "general rooms". As mentioned in section 2.1, Guttu, Jørgensen and Nørve (1985) recommended increasing the kitchen area to 15 m2, in order to make it suitable for general daily living.[52] When Lynch (1972, p. 109) discussed adaptability and elaborated upon a concept of modules that should be "permanently useful", he referred to a study of hospitals by Peter Cowan who had found that rooms between 120 and 150 square feet (11-14 m2) were those most easily converted to a wide range of new uses.

[50] The floor areas of the main rooms are about 11 and 18 m2.
[51] In Norway, this apartment was presented in an article by Liv Schjødt (1957).
[52] The average size of Norwegian kitchens was then, in 1985, about 8 m2.

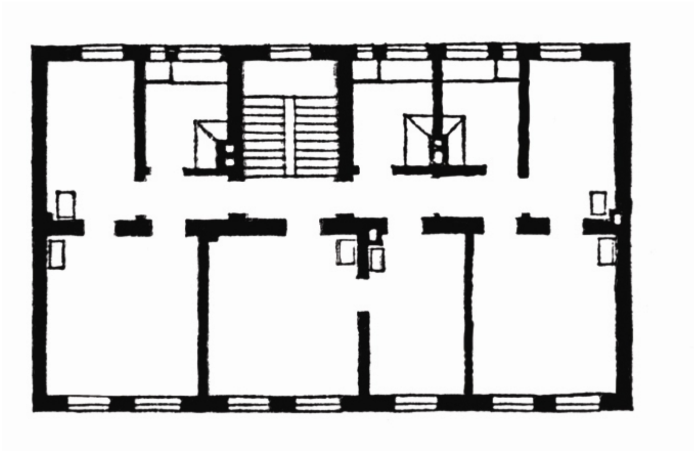


Figure 2.21
Generality.
Seilduksgata 11,
Oslo.
(about 1890)

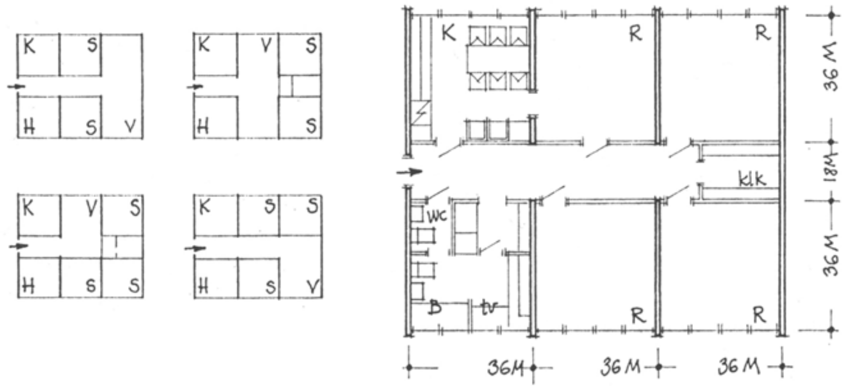


Figure 2.22
Generality.
Sven Thiberg.
(1967)

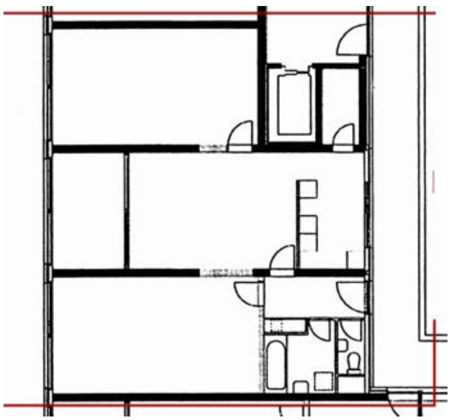


Figure 2.23
Generality.
Apartments in Amsterdam.
Diener & Diener (2002)

Figure 2.24 and 2.25 show two examples of “elastic dwellings”. The first is the Norwegian project “Skjettenbyen” from 1970,[53] which consists of module-based detached houses designed in order to be expanded in correspondence with the needs and economy of the particular households. In despite of the variety of possible layouts in this concept, the dwelling units have ended up rather similar as most dwellings are extended to the maximum version.[54] This is due to the simple fact that parts of the house that are no longer needed are not likely to be torn down. This means that elasticity in such cases is a one-way process only. The other example, shown if figure 2.25, is more a kind of “real elasticity”. This is an apartment that consists of two dwelling-units, where one can be let out as a tiny separate apartment in accordance with the “owner-household’s” economy and need for space. Due to Norwegian tax-legislation, such incomes are tax-free and this kind of dwelling profitable. When the years pass and the children grow up, a family living in such as apartment can occupy also the small unit instead of being forced to move because of cramped living conditions. When more years pass and the children move out, the small unit might be a “guest-dwelling”, a place to stay for grownup children on visit, or it might again be let out. A pamphlet elaborating elasticity with respect to apartment layouts is the Danish research-report “*Elastiske etagebolige”* (Statens Byggeforskningsinstitut, 1978). Figure 2.26 shows how this report categorises kinds of elasticity.

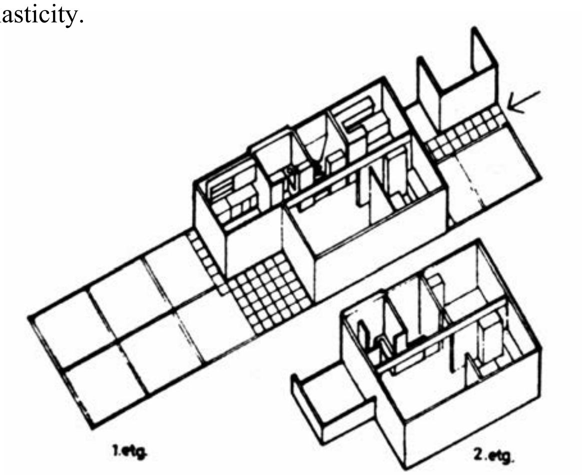


Figure 2.24
Elastisity.
“Skjettenbyen”. Hultberg, Resen and Throne Holst in association with Nils Ole Lund. (1970)

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[53] About ”Skjettenbyen”, see Byggekunst 1970: 4. p. 146-149 and 1979: 6, p. 404-405.
[54] The same results are pointed out by Olivegren and Schulz (1985, p. 250, English version: 1990) as they comment “Kallebäckhuset”, a housing project built in 1960 and designed by the Swedish architect Erik Friberger. This house has a structure of concrete slabs that allowed the residents to build their own dwellings on the floor area between the neighbouring dwellings. Contrary to the variety intended by the architects, the result very soon was “maximum-versions” of most dwelling units, similar to what happened in “Skjettenbyen”.

Figure 2.25
Elastisity.
"Lakkegården", an apartment consisting of two dwelling units.
Arkitektskap. (2003)

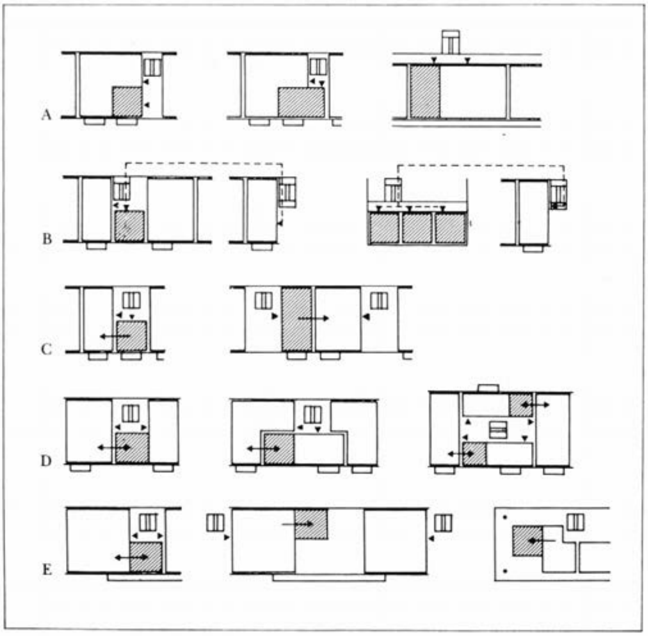

Figure 2.26
Kinds of elasticity, according to Statens Byggeforskningsinstitut, DK (1978). A: a section to let, B: supplemental rooms, C: small units that might be merged, D: movable borders between dwelling units, E: unfinished dwellings to be extended or completed by the residents.

When it comes to the principle of flexibility, an illustrative example is the Schröder House, one of the most famous icons of architecture, designed by Gerrit Rietveld and constructed in 1924. Figure 2.27 shows how the interior space can be changed from an “open” plan to a dwelling consisting of separate rooms that are conventional in sizes as well as in positions. In this case, flexibility is achieved by permanent but easily moveable sliding walls and door-like elements. An alternative strategy of flexibility is to apply lightweight walls; either movable walls or walls made in order to be torn down easily and substituted by new ones in other positions. A housing project that is flexible due to such lightweight internal walls in combination with thoroughly planned positions of fixed elements such as the pipes for kitchens and bathrooms, is “Järnbrottshuset”, a housing project from 1952 designed by Tage and Anders William-Olsson, see figure 2.28.

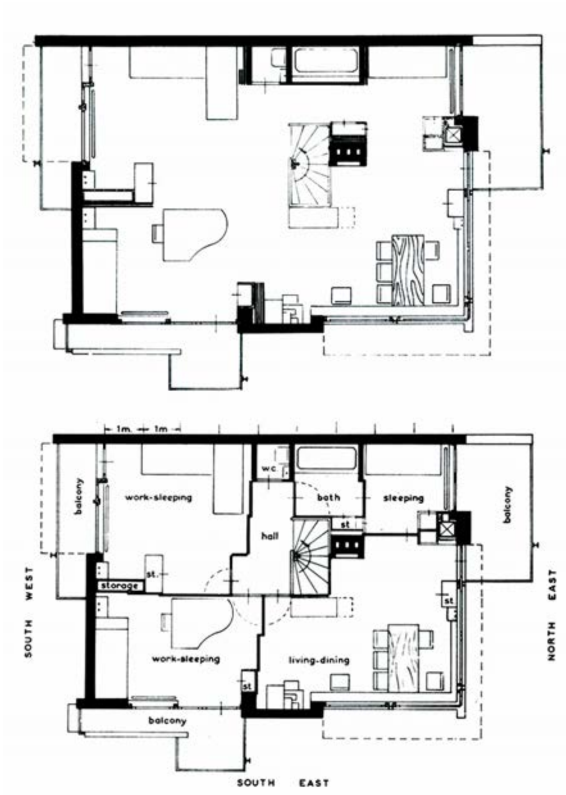

Figure 2.27   Flexibility. First floor of Schröder House. Gerrit Rietveld. (1924)

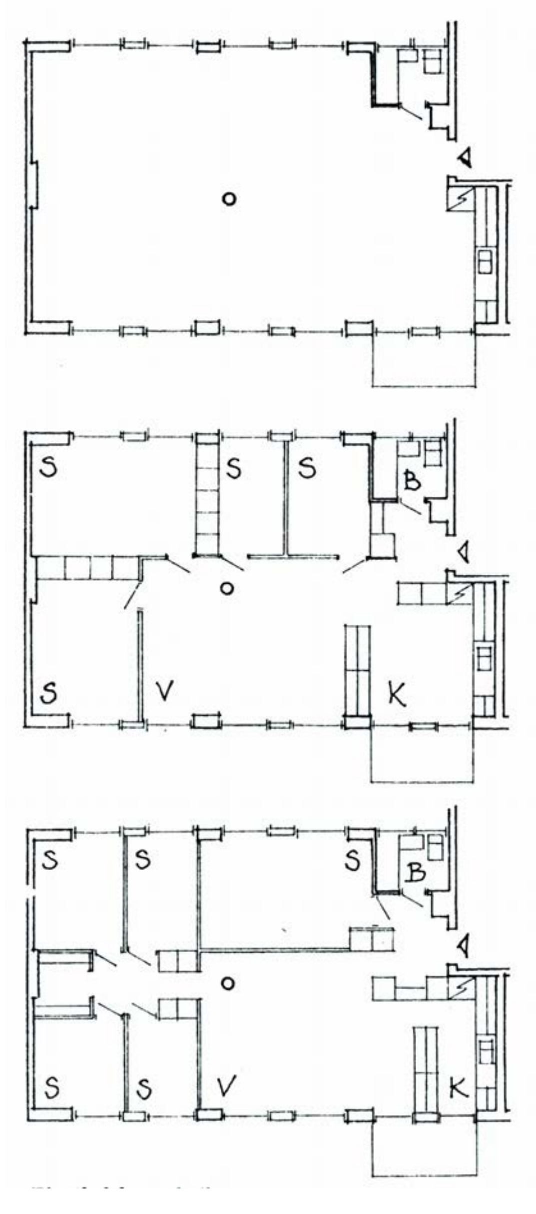

Figure 2.28 Flexibility. Järnbrottshuset. Tage and Anders William-Olsson. (1952)

When comparing these three strategies for achieving the same purpose, generality differs from the strategies of elasticity and flexibility in that the capacity for handling various preferences is permanent; generality does not (or does to a far lesser extent) require the action of making physical changes. This alone is a reason to strive for generality. In a world spending substantial parts of energy and materials on building and construction, buildings that last should be preferred rather than buildings that soon require demolition and rebuilding. Permanence is also relevant as regards architectural qualities. Regardless of the fact that architectural practice consists in responding to particular and time-specific requests, the nature of architectural practice is to construct buildings that should last.[55] Where Norwegian apartment buildings are concerned, architects are involved in the planning and design of most projects. Concerning the changes made after the original construction of the buildings, the situation is different; most such changes are done without the influence of architects. Given that there is some correspondence between architects' influence and the quality of the result, which is hard not to assume as an architect, the strategy of generality is advantageous compared to the alternative strategies that are more likely to imply rebuilding carried out without consulting architects.[56]

Specificity is a strategy contrary to generality in that it aims to satisfy some particular out of the many possible demands; the nature of specificity is to respond precisely to needs or preferences that are explicit and time-specific. As the explicit and time-specific requests captured by the programming in the process of architectural design, are not likely to correspond to long time requests[57], specificity is a risky design strategy if the intention is architecture of long-term usability.[58] An issue particularly focused on in this study, is the dichotomy of generality versus specificity of dwellings concerning functions or use.

Concerning generality versus specificity of dwellings, it is possible to distinguish between two main aspects of the interior space. One aspect is features of the individual room, such as size and shape of the room, daylight conditions and technical equipment. The size of a room is a feature that strongly influences its potential for use; a room of 1.2 m2 metres without a window and containing a WC is highly specific regarding function, whereas a

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[55] Unless buildings are intentionally temporary, demolition of a building is rarely a sign of excellent design.
[56] However, from the residents' point of view, a lack of architects' influence might not be considered a problem!
[57] As argued by Brand (1994) and discussed in the beginning of this section.
[58] In his thesis about "functional performance" of urban space, Marcus (2000, p. 57) points out a similar conflict between actuality and long-term usability. In brief, a conclusion of Marcus is that cities planned in the 20th century have "a high degree of actuality" and "low functional performance" compared with the generality and thereby the long term usability of urban spaces evolved through the previous centuries.

room of 12 m2 with good daylight has a wide range of potential uses. The other aspect is features of the context of the individual room; the surrounding spaces might considerably affect the potential use of a room. These two aspects of space can be distinguished as features internal versus external to the individual room, where the size of the room is of the first kind while the spatial configuration is of the latter.[59] These two, sizes of rooms and spatial configurations[60] are the particular features of space examined in this study, and generality versus specificity are properties of space focused upon.

What characterises this study and distinguishes it from many similar survey-based studies is the attempt at representative sampling and the way that the spatial layout of different apartments is the explicit subject. When the spatial configuration and sizes of rooms are chosen as the particular features to be examined in this study, these parameters are not themselves main subjects of interest but means of identifying and comparing different layouts of dwellings. This differs from most surveys referred to in section 2.1 in the sense that the subjects of the latter are the particular features being analysed. This difference corresponds to the different aims of the studies. While the Swedish survey *Bostadutforming, bostadsanvändning* examined sizes of rooms in order to evaluate normative guidelines about sizes of rooms, the aim of this study is to compare different spatial layouts of apartments; while *Bostadutforming, bostadsanvändning* examines similar dwellings inhabited by similar households (in order not to disturb the focus on the features of particular interest),[61] this study aims at sampling apartments that are representative for larger populations of dwellings.

[59] This is a parallel to the distinction of "global" from "local" properties of space done by Hillier (1996, p. 317) when discussing movement versus occupation. Hillier here distinguishes occupation from movement by describing occupation as a static and local use of space, while movement relates to "global" complexes of spaces. "Occupation uses the local properties of specific spaces, movement the more global properties of the pattern of spaces."

[60] The following quotations shows how Marcus (2000, p. 57) distinguishes speciality from generality:
"... within urban planning and design during the 20th century there is a dominating category, characterised by a high degree of specificity, as opposed to generality, in that it has more categorical differences between spaces, more well-defined differences in the relation of spaces, and in general more definition of what can happen where."

[61] The sample of apartments examined in this Swedish survey was not representative; the apartments were selected in order to compare similar dwellings (by size) inhabited by similar households (families with children). More explicitly, concerning the dwellings, the sample consisted of "large" apartments and "small" houses. Where the households are concerned, all the following categories were excluded: elderly (>70years), singles, foreigners (!!), single parents as well as households where the only child was a baby or older than 17 years. *(Dahlgren and Westerberg, 1979, p. 7)*

2.5 DWELLINGS AND TIME PERIOD

While basic human needs are not that different throughout the world, dwellings as well as domestic lives show an impressive diversity.[62] Out of this diversity of dwellings, this study examines Norwegian apartments. Apartments represent only a minor segment of the Norwegian "stock" of dwellings, as most of our dwellings are single-family houses.[63] Since apartments (as opposed to most single-family houses) are the kind of housing where the design usually is created by architects,[64] apartments are the kind of Norwegian dwellings to analyse when the interest is dwellings that are the results of architectural practice.

The role of the architect designing apartment buildings is different from the traditional role of the architect designing single-family houses. In the latter case, the architect works at the request of the future residents and is paid by them; designing a single-family house is like tailoring a home for one particular household, responding to preferences specific for that household.[65] In contrast to this, future residents rarely have a direct influence on the design process of apartment buildings. Due to the priority of profit, estate-developers, constructors and landowners might very well determine design criteria that differ from the personal preferences of future residents. In apartment housing, the mission of the architect is thereby not only to please the employer but also to advocate the needs of all the residents that are unknown at the time of designing the dwellings. Apartment houses are therefore a kind of dwelling where evaluation in the light of needs and preferences of the population in general is highly relevant.

In order to concentrate the focus of this study, the subject is limited to "urban apartments". This does not imply that apartments, in order to be included in

[62]According to Rapoport (1990) this shows how built environment in general and housing in particular are results of culture specific preferences or "wants" rather than of more basic human "needs".

[63] Only 18 % of Norwegian dwellings are apartments in buildings of three storeys or more. (According to Statistisk sentralbyrå / Statistics Norway, http://www.ssb.no/fobbolig/tab-2002-09-23-01.html)

[64] While architects have central positions throughout the design process of most Norwegian apartment houses, less than 10 % of the single-family houses are actually designed by architects. (According to NAL, The Norwegian Architects Association).

[65] Such "tailoring" might be of several kinds, varying from "making what the owner wants" to challenging or even confronting the expectations of the commissioner. "House III" of Peter Eisenman is an example of the latter. Here the convention of the master bedroom is confronted by a column placed at what would be the expected position of the master bed. (Progressive Architecture 1974: 5) Similar, but less confronting, is the house in Austliveien 30, Oslo, by Carl Viggo Hølmebakk (Byggekunst 2005: 07), a dwelling where tall windows all down to the floor level allow for more "walk-around-movements" within the rooms by restricting the conventional positioning of furniture along the walls.

the study, must be located within city centres. It means that they should be of types found in a dense urban fabric; i.e. they should have layouts appropriate for horizontal and vertical juxtapositions into buildings of a certain density with respect to the ratio of floor area versus site area.[66] The housing concept of such apartment buildings does not have a long history in Norway; even in the cities, such dwellings were not common until the very late 19th century. The layout, the methods of construction as well as the craftsmen were then imported from abroad, - from Germany in particular. As few dwellings were built in Norway between 1900 and the 1920s, it was not until the "boom" of housing construction in the 1930s, that dwellings became a major arena for Norwegian architects. With the intention of studying Norwegian apartments, any period from the late 19th century onwards could have been chosen. However, due to interest in dwellings as a branch of architectural practice and as a pragmatic result of searching for an appropriate sample of apartments, the period examined by this study is limited to the one since 1930.[67]

2.6 THE STANDARD OF HOUSING

The basic aim of architectural practice is to create "good" architecture. Even though there is no consensus on exactly what this "good" architecture should be like, the nature of architectural practice is to strive to improve the man-made physical environment. By this implicit logic of the profession, "bad housing" is bad by nature and something that either should be demolished or improved. However, in a wider perspective, low standard housing is not necessarily bad, at least not in Norway where the dwellings of the lowest standard are fairly good by international comparison.

Within a liberal economic market of dwellings, as is the situation in Norway, the cost of living is closely related to the standard of the dwelling. In such a situation, low quality dwellings represent a positive potential for sub-groups of the population; the existence of dwellings that are considered as unacceptably bad by the majority, is a condition for a preferred way of living for others. An example of such a housing area in Norway is "Svartla´moen" in the city of Trondheim. Due to politically determined demolitions that were never carried out, the dwellings of this area turned out to be municipally owned and of a low standard. The area was not a slum, but consisted of

[66]In Norway, this density is usually described by the floor area of a building as percentage of the site area, as defined in *NBI byggdetaljblad 310.220*, a standard formulated by the Norwegian Building Research Institute.
[67] The sampling of apartments is described in section 4.1.

simple older houses, poorly insulated and of low technical standard. As many of these houses were empty, awaiting demolition, students, artists and others managed, with or without the will of the local authorities, to get permission to live there at low cost. Thanks to this development, “Svartla`moen” has been an oasis for a generation of artists and musicians in Trondheim.[68]

For the majority of the population as well as for politicians, planners and architects, such low standard housing areas are likely to represent problems that should be solved. In order to prevent real and permanent slums, striving for better standards in the worst housing areas is a reasonable aim even in Norway. However, in order to keep the positive potential of low cost dwellings, we should be not to be too eager to make such improvements. A “balanced” municipal strategy in these respects, might be to prevent parts of a town from developing into permanently bad areas without worrying if not all dwellings are of the standard considered decent by the majority; any town should at any time have some areas where different kinds of alternative living are given a chance. Even though this perception of “bad housing” should be born in mind when planning of housing is concerned, the subject of this thesis on architecture adheres to the conventional aim of architects, striving for dwellings that are “good” rather than “bad”.

Figure 2.29
“Svartla’moen”,
Trondheim.

[68] Christiania in Copenhagen is another example of a low standard housing area that for some groups of the population represents positive possibilities while for others it represents the bad and the ugly. Apart from not necessarily being spacious, these kinds of “bad dwellings” have many features in common with what Brand (1994) categorises as “the low road”: *..What these buildings have in common is that they are shabby and spacious. Any change is likely to be an improvement. They are discarded buildings, fairly free of concern from landlords or authorities: “Do what you want. The place can’t get much worse anyway. It’s too much trouble to tear down.”* (Brand, 1994, p. 24) “*Freedom is cheap. Low rent equals high control if you’re comfortable fixing up crude Low Road Space.*” (ibid., p. 32)

3 Methodology

This study is carried out as two empirical surveys, where one has been a diachronic[69] survey of the development of apartment layouts and where the other has been a synchronic[70] survey of contemporary living. The first has been a quantitative inquiry of room-sizes and spatial configurations in a historical sample of apartments, while the second, aiming at shedding light on living in apartments that differ by floor plan layouts, has been carried out as an interview-based and more qualitative survey.

This chapter explains this methodological structure more in detail, the particular methods that have been applied and the choice of case. After commenting upon research methods in general and within studies of architecture more in particular, it will be described how some different methodological approaches are combined. An important approach to the first of the two empirical analyses has been the methods developed within the architectural research field space syntax. This chapter, in section 3.4, reviews basic space syntax methodology, before explaining the application of space syntax in this particular study. Besides applying existing space syntax methods, this study has itself contributed to the methodology of space syntax by developing the software AGRAPH, which is presented in appendix A.3.1.[71] As the two empirical inquiries constitute major parts of this study, this chapter about methodology also contains a section (section 3.5) that sheds some light on the relationships between theory and empirical data by commenting on assumptions, findings and generalisations. The empirical surveys and their results are presented in the following chapters 4 and 5.

[69] Diachronic: through time; study of a historical development, of development through time.
[70] Synchronic: at a given stage; study of a subject at a given time.
[71] This appendix is a paper presented at the software session at "*The 5th Space Syntax Symposium*" at TU-Delft, 2005. (Manum, 2005)

3.1 THE QUANTITATIVE AND THE QUALITATIVE; COMMENTS ON DISCIPLINES AND THEORIES

A distinction frequently applied within research methodology is the one between the quantitative and the qualitative.[72] Where actual research practice is concerned, these stringent categories constitute a theoretical framework rather than being appropriate descriptions of the methods applied. As most research practices contain elements of quantitative as well as qualitative character it is hard to identify "pure" quantitative or "pure" qualitative research; few research questions of quantitative character are without any qualitative aspects and few qualitative research issues are without any quantitative elements.[73] When characterising different academic disciplines or when discussing research methods, a more nuanced characterisation than the dichotomy of the qualitative versus the quantitative is useful.

Based on an understanding of intentionality according to von Wright (1975) the Norwegian civil engineer and scholar Bjørn Sandaker (2000), discusses building structures as intentional objects in his thesis "Reflections on span and space". When he describes different aspects of functions within architecture, Sandaker suggests a "scale" from mere explanation (causality) on the one end, towards mere interpretation (intentionality) on the other. He positions natural sciences at the explanatory end of the scale, studies of icons and meaning at the interpretational end and studies of building structures somewhere in the middle. This principle of ordering according to the applicability of interpretation, or according to potential for interpretation, can be applied in order to discuss methods and data on a detailed level and in order to describe research and academic disciplines in general.[74] As most academic disciplines are constituted by their particular theoretical and methodological framework, the character of these frameworks is a way of describing the disciplines. Even though a fixed potential for interpretation

[72]According to Creswell (1994, p. 1-5) and Patton (1987, p. 9 and 17) a generalised description of the quantitative and the qualitative paradigm, where a paradigm encompasses theories as well as methods, could be as follows: Within the quantitative paradigm the reality is seen as something that can be measured objectively; the researcher is independent of that being researched, while a qualitative paradigm is based on an interpretative approach where the researcher interacts with what is being researched. Quantitative studies are characterised by handling a limited set of questions on large samples, often by numerical data appropriate for statistical analyses, while qualitative studies are more in-depth and detailed, usually on smaller samples or a few cases, emphasising more holistic perspectives.

[73] Glaser and Strauss (1967, p. 17) emphasise that *"there is no fundamental clash between the purposes and capacities of qualitative and quantitative methods and data"*. Yin (1994, p. 15) argues about the same as he writes *"there is a strong and essential common ground between the two"*. Creswell (1994, p. 173) describes the combining of qualitative and quantitative research more in detail.

[74]Rolf Johansson (1997, p. 41) describes the correspondence between kind of data and kind of research methods. Data used in statistical surveys are usually large samples where a few quantitative elements are focused on (elements where the potential for interpretation is low), while anthropological case studies intend to synthesize a wide range of input (allowing for or requiring a high degree of interpretation).

within a discipline is not a perfect conceptualisation of the research character of a discipline, some differences between disciplines can be illustrated by ordering them according to the character of their theoretical and methodological framework, as illustrated in figure 3.1.

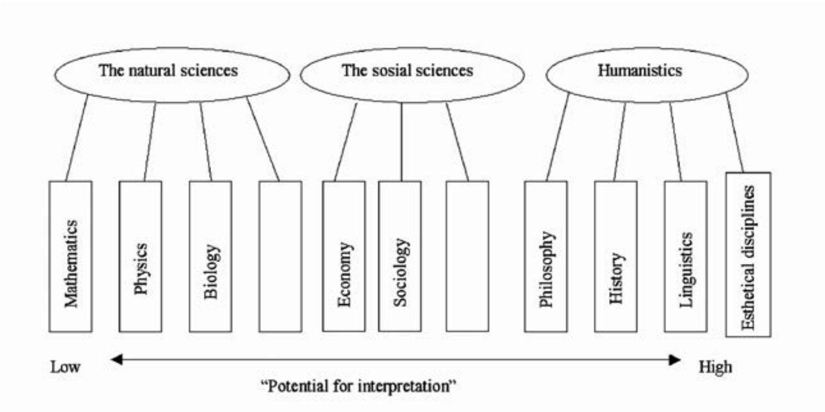

Figure 3.1
Academic disciplines characterised by ”potential for interpretation”

Contrary to what is the case for most well established scholarly practices, the discipline of architecture can hardly be identified by any particular theoretical or methodological framework. What architectural research have in common, is that buildings and cities, or theories about buildings and cities, are studied; architectural research is constituted by the subjects of interest rather than by any consensus about relevant theories or methods for studying these.[75] The kind of theoretical frame that is relevant for a particular research within the field of architecture, depends on the aspect of architecture that is focused on and can therefore be of very different kinds, ranging all along the scale of "potential for interpretation", from the mere quantitative to the mere qualitative. This diverse nature of possible architectural research explains the fact that a theoretical framework relevant for major aspects of practice and research within the field of architecture has still not been found, and probably never will be.

[75] This difference between architecture and the more established academic disciplines can be elaborated by applying the distinction of Hillier (1996, p. 40-42) between ”ideas to think of” and ”ideas to think with”, where Hillier points out that the latter is what constitutes theory. According to Hillier, most theorising about architecture has the character of ”ideas to think of” rather than ”ideas to think with”.

From the situation described above, different conclusions have been drawn. One is to reject the relevance of scientific approaches as they cannot grasp the diverse nature of architecture,[76] another is to dismiss the relevance of theory in general.[77] If the aim is to develop knowledge, a more fruitful strategy is to accept that the field of architectural research consists of a variety of possible research questions with a corresponding variety of relevant theoretical approaches, and then to discuss and develop theories and methods that are appropriate within the different aspects of architectural research. Even in housing research, a minor branch of architectural studies, the possible approaches are diverse; one approach for studying standards of housing can be statistical surveys of floor area per person, while to study the home as a representation of personal identity, would require a very different approach. Even this study, focusing on a few aspects of apartment layouts, shows a wide range wide concerning the quantitative versus the qualitative; the sizes and configurations of interior space, which are the features examined in the diachronic survey, are of the former kind, while the residents' judgements of their homes are of the latter. As the character of relevant methods corresponds to the subject and the data, the methods applied are diverse in accordance with the character of the data, ranging from simple statistics to case studies and interviews. The approach of this study has been that the applied methods might very well be of diverse kinds as long as they are adequate for the subject examined at the specific stage of the study and that this subject relates to the main research question. The following sections describe how this study has combined different methodological approaches.

[76] One example of this is Jan Christiansen who claims scientific criteria to be useless for evaluating quality of housing. *"Der kan ikke opstilles objektive, videnskabelige kriterier for måling af boligkvalitet. Dertil er der for mange irrationelle forhold, der spiller inn. Forhold som ikke altid er målbare og slet ikke med nogen fælles målestok."* (Christensen, 1996, p. 5) Another example is Scruton (1979) who dismisses any theory that does not cover all aspects of architecture, as commented in section 2.3.

[77] It is not rare among architects to regard theorizing on architecture as a "parasite" on the art of architectural design-practice, similarly to the attitude that can be found among artists toward art historians.

3.2 THE RESEARCH STRATEGY

The empirical sections of this study consist in the initial diachronic analysis of the development of apartments through time, followed by the synchronic survey of contemporary living in some particular apartments.

The aim of the initial and diachronic analysis has been to shed some new light on the development of apartment layouts through the recent 75 years. By analysing room sizes and spatial configurations in an appropriate sample of apartments, it should be possible to identify apartments that are different with respect to spatial layout. This has two purposes. If significant changes through time are found, this might itself contribute to the knowledge about Norwegian housing in a historical perceptive. The other purpose is to establish a basis for the synchronic study; the apartment layouts identified through the diachronic analysis is what will be examined and compared in the synchronic survey of different apartments as places for contemporary living.

The diachronic inquiry examines two features of “the physiognomy of the void”; these are the sizes of the rooms and the spatial configuration of the apartments. The assumption is that analysis of these parameters will bring about findings relevant for discussing generality versus specificity. The sizes of rooms are examined by measuring the floor areas of the rooms of the selected apartments, while the spatial configurations are analysed by space syntax methodology. The application of space syntax is particularly explained in section 3.5. The fact that the floor areas as well as the space syntax parameters can be measured or registered without much interpretation, implies that the diachronic analyses of the rooms and the spatial configurations (as these analyses are figured out here), can be carried out without entering the field of qualitative discussions.[78] This is advantageous in the way that it makes it possible to analyse a larger number of apartments, as intended in this study.

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[78] In this way of placing the evaluation of quality at particular stages of the research, I am inspired by Cuff (1995), even though this study otherwise is not very similar to that of hers. Cuff has done a study of excellent architecture without herself making any evaluation of architectural quality. In her study on the premises for creating and producing excellent architecture, she has defined an architectural object to be excellent when it is considered so by three defined “referees”: those involved in the production (the owner included), the public and the architectural profession. By this strategy she manages to place her own research question outside (or more correct: chronologically *after*) the actual evaluation of quality. By the research design of my study I have intended to do the opposite by consciously carrying out a major section of work *prior* to discussions or evaluation of quality.

What has been studied by the initial diachronic analysis is not people's living but some specific features of the interior space. The synchronic and more qualitative study, attempting to examine different kinds of apartments as contemporary dwellings, is carried out by comparing the living in apartments that by the diachronic analysis are found typical or otherwise interesting.[79] To elaborate, the strategy has been to select a few kinds of apartments (which are identified by the initial study), and then to carry out an interview-based survey in some apartments of each kind. By registering who lives in these apartments, how these residents have chosen to use their apartment and ask for their opinions about living there, it should be possible to bring about data relevant for discussing apartment layouts in relation to kinds of households[80] and their preferences of living. Given that sizes, shapes and configurations of interior spaces influence domestic life, which is a basic assumption of this study, there should be some correspondence between spatially significantly different apartments and the contemporary living in them. An assumption is that apartments with layouts characterised as general will house a greater range of households than apartments where the spatial configuration or the individual rooms are more specific as far as functions or use are concerned. The data for examining this will be questionnaires and interviews as well as statistical data on population and demography.[81]

The aim of this methodological strategy, which consists in applying different limited foci at different stages of the study, has been to bring about some knowledge about specific aspects of floor plan layouts and living that would probably not have been found by using approaches of wider scope throughout the work.

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[79] According to Glaser and Strauss (1967, p. 62), the sampling of apartments for the synchronic survey will thereby be "theoretical" rather than statistical. Glaser and Strauss (1967, p. 45) describe "theoretical" sampling as a process where the selection of data is "controlled" by the emerging theory and not by preconceived systematic procedures (as in statistics). They doubt the importance of ensuring statistical sampling unless really intending to apply statistics; if intending to generate theory they claim "theoretical" sampling to be more appropriate.

[80] Different kind of households is here to be understood as differences concerning parameters like age, sex and relationships. Due to Norwegian legislation concerning anonymity of "personal information", parameters like cultural and national background or income are not included in this study. See section 5.2.3 for more detailed information about kinds of households.

[81] The questionnaires and the interviews are explained in the first sections of chapter 5.

3.3 THE CHOICE OF CASE

With the intention of examining the development of the interior space of Norwegian apartments, an initial question was what apartments might be appropriate as the empirical basis. What was looked for, was a sample that was not only a particular case but also a case representing Norwegian housing some more in general. The practical work of getting access to the documents needed in order to select the apartments, had also to be born in mind. After various models of cases and sampling had been evaluated, the decision made was to select OBOS. OBOS, "Oslo Bolig Og Sparelag", is the main co-operative housing company in Oslo, it was founded in 1929 and is the largest co-operative housing company in Norway. They have been in charge of more than the half of the housing production in Oslo for long periods. They are still a major developer of housing in the Oslo-region. Even though a large number of architects have been engaged in the OBOS projects, co-operation with leading and prize-winning architects has by OBOS always been seen as an important strategy for developing quality housing within reasonable cost. When intending to shed light on the development of Norwegian urban housing in general by doing a case study of one single actor, it is hard to find a better candidate than OBOS.[82] Figure 3.2 is a brief review showing the development of their housing projects since the 1930s.

1930s

1950s

Figure 3.2 a, b
A brief pictorial review of housing projects by OBOS.
(Photos : OBOS)

[82] A closer description of OBOS is published in the Norwegian architectural magazine *Byggekunst* (Sjølie, 2004).

1960s

1970s

1980s

2004

Figure 3.2 c- f
A brief pictorial review of housing projects by OBOS. (Photos: OBOS)

When Yin (1994, p. 39) discusses kinds of case studies, he identifies four basic kinds by applying two distinctions, one between holistic / embedded and one between single-case / multiple-case. (See figure 3.3) According to Yin, an embedded case study is advantageous when logical subunits within the case can be defined and examined and when the phenomenon of interest is really about these subunits. The problem might occur, he argues, when the original phenomenon of interest is not about these subunits but about a larger unit. If such a study fails to return from the subunits being examined back to this larger unit, the original phenomenon of interest has become the context instead of being studied.

	single-case	multiple-case
holistic (single unit of analysis)		
embedded (multiple units of analysis)		

Figure 3.3
This study of OBOS positioned according to Yin's basic types of case study designs.

In principle, the methodology of case studies differs fundamentally from statistics. However, as Rolf Johansson (1997, p. 67) points out, this does not mean that they cannot be combined; statistical methods might very well be useful in analysing the subunits within a case.

If this case study of the OBOS-apartments is to be characterised according to Yin and Johansson, it would be as an embedded single-case study where statistics are among the methods applied in order to analyse some of the selected subunits within the case. The study is embedded in the way that the research question concerns only some out of the many possible aspects of OBOS' housing projects. As the interior space of apartments, which is the unit of analysis, really is a subunit of urban housing and of the OBOS projects, this embedded kind of case study should, if using Yin's criteria, be appropriate for the research question. If the research subject had been a more general approach to urban housing, then the case study should have been of the holistic kind. When the single-case/multiple-case distinction is concerned, the particular study of OBOS is of the single-case kind. However, as we will come back to in chapter 6, additional information in terms of a comparative case is useful in order to shed light on the general relevance of the result.

3.4 BASIC SPACE SYNTAX METHODOLOGY

As mentioned in section 2.3, space syntax is theory and methods for studying space and spatial configurations. A basis of space syntax is the works of Bill Hillier and Julienne Hanson at the Bartlett, University College London.[83] Space syntax analyses internal positioning of spatial elements within a spatial configuration. Extensive empirical studies have shown that analyses of spatial configurations carried out by the methods of space syntax correlate convincingly to many aspects of traffic, movements and use of in-door rooms as well as outdoor urban spaces.[84] This section summarises basic space syntax methodology, first by showing how space syntax approaches configurational features of space and how the basic space syntax parameters are defined, then by describing the different kinds of space syntax modelling and how these are applied.

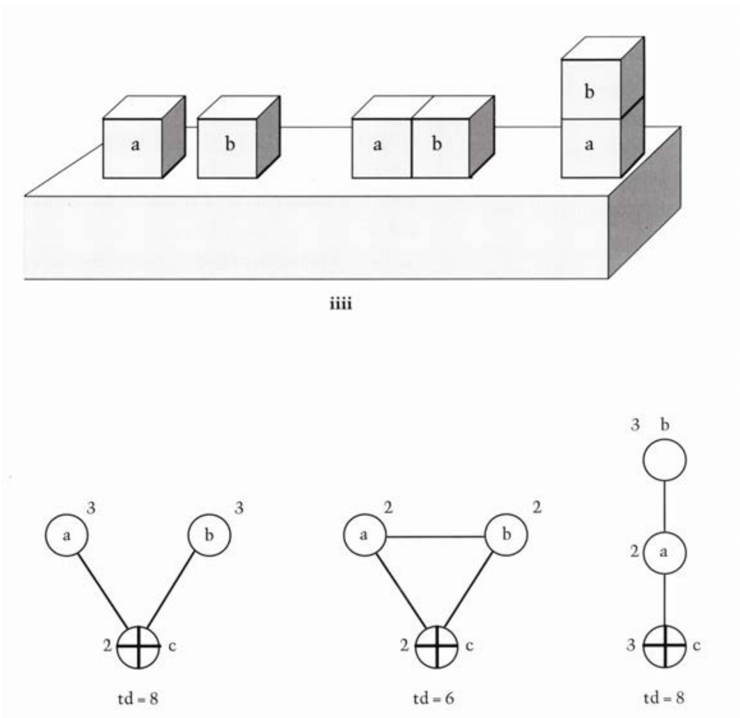

Figure 3.4 Basic configurational properties. (Hillier, 1996)

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[83] The most basic references of space syntax are Hillier and Hanson (1984), Hanson (1998) and Hillier (1996).
[84] Such empirical studies are counting of traffic and movements of people, in cities as well as buildings. Examples of such studies can be found at the web-sites of UCL (http://www.space.bartlett.ucl.ac.uk/) and Space Syntax Limited (http://www.spacesyntax.com/). See also the example in figure 3.23.

Some basic properties of spatial configurations can be represented by graphs consisting of nodes and connections[85] as shown in figure 2.19 and 2.20. Such images of nodes and lines that represent spatial elements and the connections between them, are called “connectivity graphs”. Figure 3.4 shows three different configurations of the same elements a, b and c presented by images of physical objects and by connectivity graphs, similarly to the “floor-plans” of two spatial configurations and the corresponding connectivity graphs in figure 2.19. As pointed out by the connectivity graphs in figure 3.5, the spatial configurations might differ significantly even within a sample of very simple dwellings.

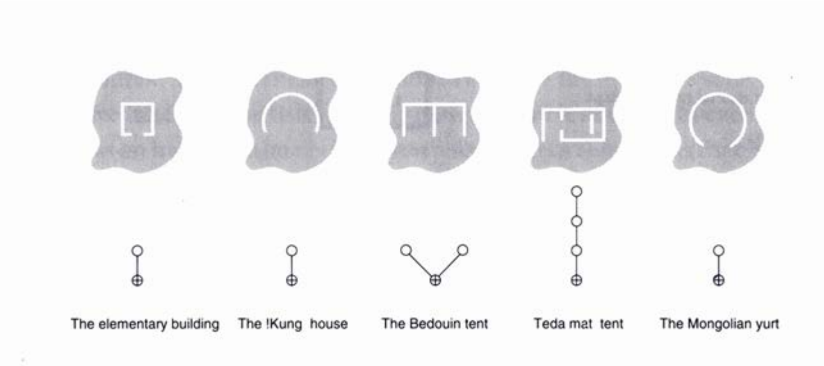


Figure 3.5
Some simple dwellings represented by floor plans and connectivity graphs. (Hansson, 1998)

Numerical parameters describing configurational features of the single elements as well as of the system of connected elements can be determined by “counting” the internal distances between the elements. In space syntax terminology, distance is to be understood as the number of “space-steps” from one element to another, which rarely corresponds to metric distance between the same elements. In basic space syntax, the distance between two elements has the value of one when the elements are directly connected.[86] The very basic space syntax calculation is to determine the shortest such internal distances between all the elements of a system. The further space syntax analyses consist in determining more elaborated space syntax parameters by mathematical and statistical operations on these “internal spatial distances”. For small systems, the space syntax parameters can easily be determined by manual calculations. For systems of more than 5-10 elements the calculations become too time-consuming to be done without

[85] Or ”vertexes” and “edges” according to the terminology of graph theory and combinatorics, which is the mathematical basis of space syntax.
[86] About more advanced modelling: see Figueiredo and Amorim (2005) about axial-line modelling with curved lines or Turner (2005) about taking the angle between intersecting lines into consideration (by introducing other “connection-values” than only 0 and 1).

computer-programs. In “axial-line analyses” of cities and in “visual-field analyses” the numbers of elements easily become thousands. In such analyses efficient computer algorithms are required in order to manage the calculations within a reasonable time. Through elaborating the space syntax parameters and comparing them to empirical studies, several kinds of modelling and analyses have been developed. The major kinds of modelling, which are “nodes and connections”, “axial lines” and “visual-fields”, will be described after explaining the most basic space syntax parameters.

3.4.1 Justified Graphs

“Justified graphs” is a way of picturing a configuration of elements “as seen from one particular element”. The element, from which the configuration is “seen”, is termed the “root” of the justified graph. Figure 3.6 shows four justified graphs for one configuration and points out how one configuration appears significantly different depending on which node that is selected as “root”. Figure 3.7 shows two justified graphs of the same system, one with element A and the other with element B as “root”. Each vertical level of nodes in the justified graphs represents the distance of one “space-step” further away from the root node, i.e. the distance from the root increases by 1.0 for each level, as showed in figure 3.7.

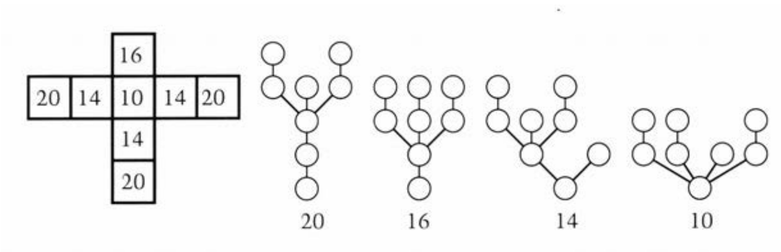


Figure 3.6 Justified graphs as seen from different “root-nodes”. (Hillier,1996)

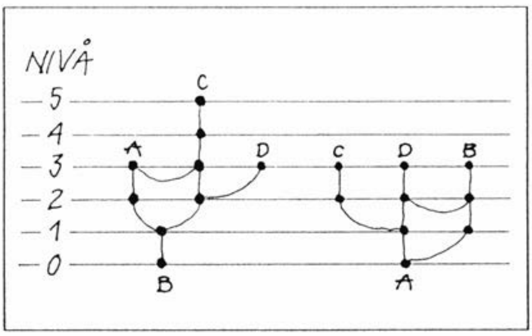


Figure 3.7
”Space-steps” or “depths” from the root-note.
(Klarqvist, 1991)

3.4.2 Total Depth and Mean Depth; Measurements of Space Syntax Integration

Figure 3.8 shows a linear configuration of seven elements where an 8th element is added in different positions. The number within each element shows the “total depth” of each element, TD(n), which summarises the shortest distance from an element to all the other elements. The number listed below each figure is the total depth of the system. This is found by simply summarising the TD(n) of all elements in the system. The figures illustrate how the position of an additional element influences not only the depth of this added element but also the depths of all other elements and the total depth of the system; when adding an element to an existing system, the total depth of the system increases less when the new element is placed in a central position than is the case when it is connected to the far ends of a system. The “mean depth” from an element “n”, MD(n), is the mean of the shortest distance from that element to all the others. If “k” is the number of elements in the configuration, k-1 is the number of internal distances. The mean depth of an element is therefore found by the formula MD(n)=TD(n)/(k-1). In space syntax terminology the positioning according to internal distances is termed “integration”; the element with the lowest depth (with the shortest total distance to all the other elements in the system) is the one most integrated while the element with highest depth is the one least integrated (or the one most segregated).

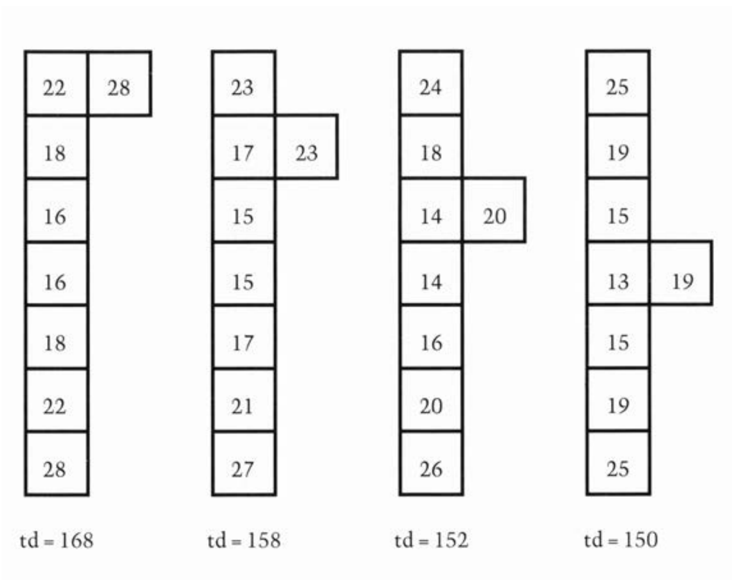
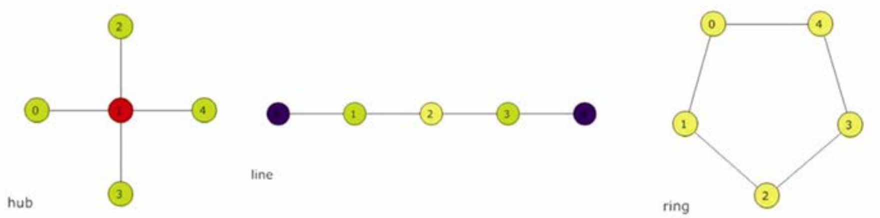


Figure 3.8.
A line of 7 elements where an 8th element is added in different positions. (Hillier, 1996)

3.4.3 "Relativised" Measurement of Space Syntax Integration

As the size of a system in terms of number of element grows, the "depths " between the elements increase. The value of the integration parameter "mean depth" therefore depends on the size of the system. In order to achieve a parameter that describes "integration" without this direct correlation to the number of elements in the system, the parameter "relative asymmetry" (RA) has been developed. RA describes the "mean depth" of an element by a value between (or equal to) 0 and 1, where 0 represents the most integrated position ("the shortest depth") possible and 1.0 represents the most segregated position possible.[87] If "k" still is the number of elements in a system, then such a parameter RA for a node "n" can be described by the formula RA(n)=2*(MD(n)-1)/(k-2).[88] Figure 3.19 shows the TD, the MD and the RA for all elements of the three basic configurations a "hub", a "line" and a "ring". The nodes are coloured in accordance with their integration in the way that red represents the highest integration possible (RA=0.0) and dark blue the lowest integration possible (RA=1.0).



	TDn	MDn	RA
0	7	1,75	0,50
1	4	1,00	0,00
2	7	1,75	0,50
3	7	1,75	0,50
4	7	1,75	0,50
TD (total)	32		

	TDn	MDn	RA
0	10	2,50	1,00
1	7	1,75	0,50
2	6	1,50	0,33
3	7	1,75	0,50
4	10	2,50	1,00
	40		

	TDn	MDn	RA
0	6	1,50	0,33
1	6	1,50	0,33
2	6	1,50	0,33
3	6	1,50	0,33
4	6	1,50	0,33
	30		

Figure 3.9
Three fundamental 5-node-graphs (coloured by integration) and some of their basic space syntax parameters. (Graph-images and tables are output from AGRAPH)

[87] RA=1.0 represents the value of the end node of a linear sequence of elements (which is the most "segregated" position possible), while RA=0.0 represents the value of a node that is directly connected to all other nodes a system (which is the most "integrated" position possible), se figure 3.9.
[88] This formula is explained in appendix A.3.1, note 4.

3.4.4 "Normalised" Measurements of Space Syntax Integration

In theory, the RA-values characterise the integration of an element by a "size-independent scale" ranging from 0.0 to 1.0, which are the maximum and minimum integration possible. However, in despite of the "relativisation" with respect to the size of the system that is captured by the RA, RA-values of real configurations are not directly comparable across systems of different sizes.[89] The reason is that the level and the distribution of RA-values in configurations correlate to the size of the configuration; configurations tend to be relatively less deep as they grow.[90] In order to handle this, the parameter Real Relative Asymmetry, RRA, has been introduced. RRA represents a linear scaling of the RA values, where the scaling factor depends on the number of elements in the system. The scaling factor is defined as the RA-value of the root element in a "reference configuration" of the same size (size in terms of number of elements) as the configuration being analysed. (See figure 3.10.) The RA-values of all elements in a system are scaled into RRA-values (RRA=RA/D), where the value of the scaling factor D is found by a table[91] or by calculation[92]. As the RRA-values represent a linear scaling of the RA-values, the RRA-values capture no information not already present in the RA-values when analysing one particular configuration. In any space syntax study that either concerns on one particular case (which is the case in most urban analyses) or in studies that examine order of integration-value of the elements (which is often the case when studying many dwellings), to apply the RA or the RRA makes no difference. In such studies, nothing is achieved by transforming the easily explainable RA into the less obvious RRA. However, if comparing exact values of space syntax parameters of configurations of different sizes, normalisation must be taken into account.[93]

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[89] This is argued by Hillier and Hanson (1984, p. 111) and Hillier (1996, p. 52).

[90] As the size of configurations grows, it is more likely that an addition element connects to highly integrated elements (elements in the "centre" of the configuration) than to segregated ones; in small systems, the probability for a linear-like configuration (and thereby high RA-values, i.e. close to 1.0) is higher than what is the case for large systems.

[91] A table of D-Values for systems up to 250 elements is shown in Hillier and Hanson, 1984, p. 112.

[92] The reference-configuration for determining the D-value is a "diamond-shaped graph" as shown in figure 3.10. For more about this graph or for the formula of the D-values, see Krüger (1989), Asami, Kubat, Kitagawa and Iida (2003) or (for the formula) see the users guide of the software "Mindstep", by Figueiredo and Amorim, http://www.mindwalk.com.br/papers/Figueiredo_2005_Space_Syntax_Software_en.pdf.

[93] How the levels of RA-values vary according to size of the system, which is the problem intended to be solved, and how this is solved by the D-values, is not easy to find out though the main syntax literature. Space syntax publications usually refer to Krüger (1989), who describes two kinds of "standardisations", one where the scaling factor is the root of a "diamond shaped pattern" and one where it is the "corner of a grid", see figure 3.10. Krüger proposes to apply the latter on RA-values of "node-grid-graphs", while the one to apply on "axial-line-graphs" depends on the "significant level of the difference of their mean RA". (Ibid, p. 33) Among those who are interested in the theoretical details of space syntax, several have questioned the validity of the RRA and have therefore applied or proposed other kinds of normalisations. Thaler (2005) applies normalisation according to Teklenburg (instead of the RRA according to Hillier/Hanson and Krüger), while Park (2005) more in detail discusses measurements of space syntax integration.
The "normalisation" described here, is sometimes termed "standardisation" for instance by Krüger (1989).

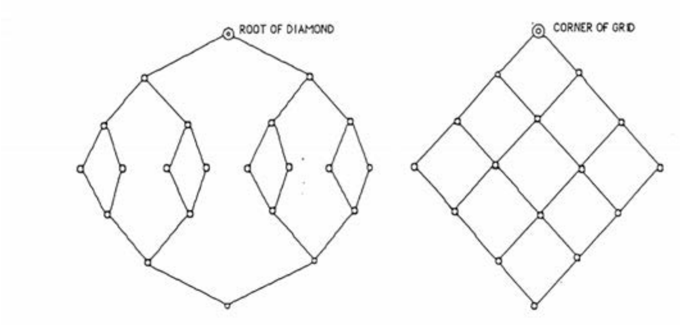

Figure 3.10 The two kinds of “reference configurations” according to Krüger (1989), where the D-value is derived from the “diamond-shaped-pattern” on the left.

3.4.5 Integration Value

The fact that RA (and thereby the RRA) is of low value when an element is highly integrated and vice versa might cause misunderstanding. By introducing the parameter integration-value, “i”, which is defined as the RA (or the RRA) inverted (i=1/RA or i=1/RRA), the logic is more obvious in the sense that a high value means high integration.[94] As all these parameters (RA, RRA, 1/RA and 1/RRA as well as other normalisations of RA) describe the phenomenon space syntax integration, which one that is applied in a particular space syntax analysis should be stated explicitly.[95] The figure 3.11 – 3.13 illustrates the integration value of the elements in a grid; in figure 3.11 all elements are connected to their “grid-neighbours”, in figure 3.12 some connections are cut, while figure 3.13 shows the integration when some new connections are added. This is done by applying the software AGRAPH that automatically generated the coloured images. The nodes are coloured by the option “integration, relative”, which means that the most integrated element is read and the most segregated is dark blue.[96]

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[94] Due to this definition, the integration value (”i”-value) has a disadvantage compared to the RA; in “hub-like” configurations, which is the configuration of many small dwellings, “i-values” might be infinite (as RA=0.0 for a node that is directly connected to all other nodes in a system). This is not elegant and could be avoided by instead defining integration as i(n)=1-RA(n), which means i(n)=(K-2*MD(n))/(k-2); achieving a parameter of integration that (similarly to the RA) ranges between (or equals to) 0 and 1. However, as i(n)=1/RA(n) is the established definition within the space syntax methodology, the i-value proposed above will not be applied here.

[95] Integration (by RA, RRA or “i”) can be calculated within different “radii”. What is described here so far, is “global integration” were the distances “counted” are the shortest ones from one element to <u>all</u> other elements in the system. Other “radii” of integration means to count the distances only to the element within other distances (within other “radii” of space syntax steps), such as radius-3 or radius-10. Integration of various radii is often applied in urban space syntax analysis since the results of calculating within different radii have shown to correlate to different kinds of activities in the city; to put it simple, radius-3 or radius-5 correlates well to pedestrian movements while larger radii correspond better to car-traffic. As this is not the part of space syntax that I know best and is not at all applied in this thesis, details of urban analyses will not be described any further here.

[96] The alternative “integration-colouring” is “integration-absolute”, which implies that red is the highest integrated value possible (RA=0,0) and dark blue is the lowest (RA=1.0).

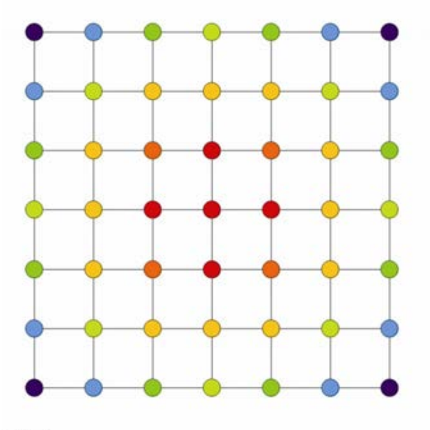


Figure 3.11
A regular 7x7 grid,
all nodes connected
to their “neighbours”.
(“coloured by integration”)

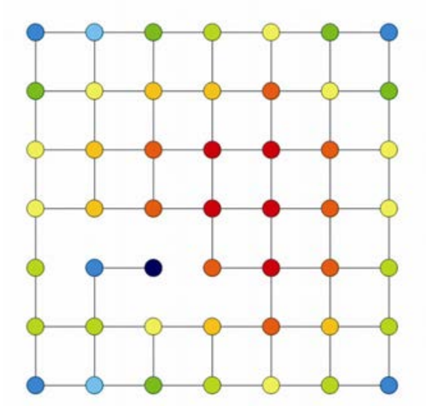


Figure 3.12
Some connections cut.
(“coloured by integration”)

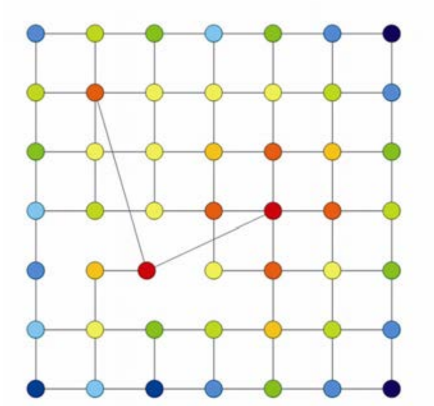


Figure 3.13
Some connections added.
(“coloured by integration”)

3.4.6 Control Value

Control Value (CV) is a parameter describing to what extent one element is "controlling" the access to the elements to which it is connected. The value is found by letting each element "give away" the total value of 1.0 equally distributed to its "neighbouring" elements. The CV-value of a node is the value received by the node through this operation, as showed in figure 3.14. As shown in figure 3.15 control values do not have the "centre-effect" as is the case for integration. (Compare figure 3.11.)

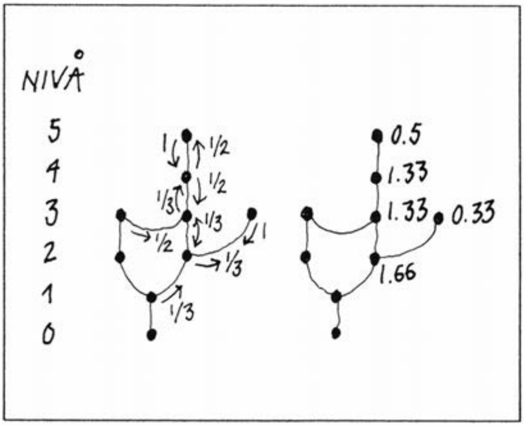


Figure 3.14
Calculating "control values". (Klarqvist, 1991)

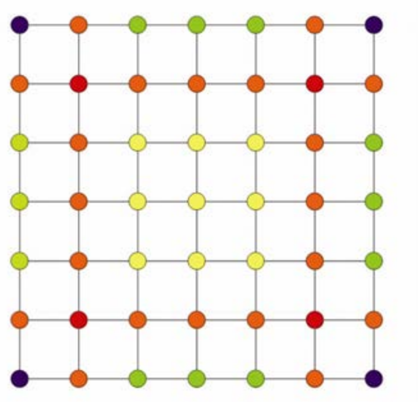


Figure 3.15
7x7 grid "coloured by control-values".
(AGRAPH)

3.4.7 Spatial Topology; Basic Kinds of Positions in a Configuration

When describing positions within a spatial configuration, Hillier (1996, p.318-327) has distinguished between four kinds of positions and termed these A-, B-, C- and D-types of spaces. In short, the A-type is a space connected to one other space only. B is a space that is the connection to a space or a sub-complex of spaces without rings and without itself being on a ring, while C and D categorise different positions on rings. C is positioned on one ring, while D is positioned on two or more rings. (See figure 3.16) This typology of positions captures features of space that are essential concerning movement versus occupation. Generally, when a space B must be passed through in order to access a "dead-end" space A, the use of either of these spaces strongly influences the potential use of the other. The potential use of space A depends on the space B not restricting the passage to A. Similarly, the potential use of space B depends on the kind of through-passage generated by space A. Spaces of C- or D-types differ from B-spaces with respect to through-passage; through passage is not necessary in any particular space on a ring, as there are alternative routes.

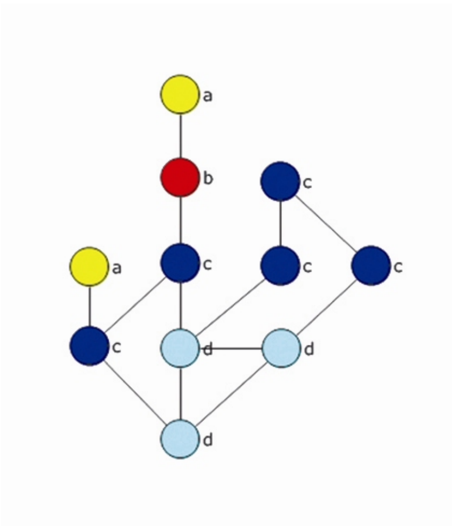


Figure 3.16
Basic topological properties described by basicl positions in a configuration.
(According to Hillier, 1996)

3.4.8 Kinds of Space Syntax Analyses

The modelling of rooms by nodes and connections (or vertices and edges), is one of several ways of modelling spatial configurations when applying space syntax methodology. If we distinguish space syntax analyses according to the spatial units applied in the modelling, there are three kinds or three “modes” of analyses; in addition to the “node-mode”, there are an “axial-line mode” and a “visual-field mode”. Figure 3.17 shows the visual images that are typical for analyses carried out by each of these three kinds of space syntax modelling. Most spaces can be analysed by applying any of these kinds of modelling. However, as the different modelling-modes capture different aspects of space, some modelling is likely to be more relevant than others. Which kind of modelling that might be best in a particular case, depends on the kind of space that is studied as well as on the subject of interest. Regardless of the kind of modelling, a kind of visualisation often applied in order to present the results of space syntax calculations is colouring of the elements according to the value of selected space syntax parameters. The illustrations in figure 3.17 are a node-graph, an axial-line map and a visual-field image. These kinds of coloured images clearly illustrate basic features of spatial configurations and have become the graphic icons of space syntax. (See also the figures 3.9, 3.11, 3.12, 3.13 and 3.15.) In order to communicate results of space syntax analyses to the public or to other professionals these kinds of illustrations are highly useful. When it comes to more detailed space syntax analyses, the data are examined more closely by comparing the exact values, by looking at the rank of integration across the spatial elements or by doing statistical calculations on the space syntax parameters.

Figure 3.17 (a, b, c)
The three modes of space syntax modelling: nodes, axial-lines and visual fields / isovists.

In “node-mode” the modelling is done by identifying the connectivity graphs directly in terms of drawing nodes and connections. The nodes (vertexes) represent spaces while lines (edges) represent connections between the spaces. The figures 3.9, 3.11 and 3.13 are such “node-and-connection” representations. A node might represent a real room in a building (an enclosed space connected to other rooms by doors or door-like openings) or a “subspace” within a room, such as a “convex space”. A “convex space” is a space where no straight line between any two points in the space crosses the surface of the space, or more literally: a space where the entire space is visible from any point in the space. (Hillier and Hanson, 1984, p. 98) Figure 3.18 shows a “convex” and a “concave” space and how a concave space can be subdivided into several convex ones. Due to the shape of the rooms and to the perception of the spaces, node modelling is often applied in analyses of dwellings; as most dwellings consist of enclosed spaces connected by doors or door-like openings, a modelling by nodes (representing enclosed rooms) and connections (representing the access between rooms) is likely to capture relevant features of the spatial configuration. Concerning the conception of space, the residents of a dwelling know the interior space well. This makes node-modelling favourable in most analyses of dwellings, as the alternatives axial-line or visual-field modelling both capture perceptions of space that depend on views rather than on a priori knowledge. Figure 3.19 shows a floor plan drawing, a subdivision of the rooms into “convex-spaces” and the connectivity “node-graph” of the convex spaces as “seen from” the entrance of the dwelling.

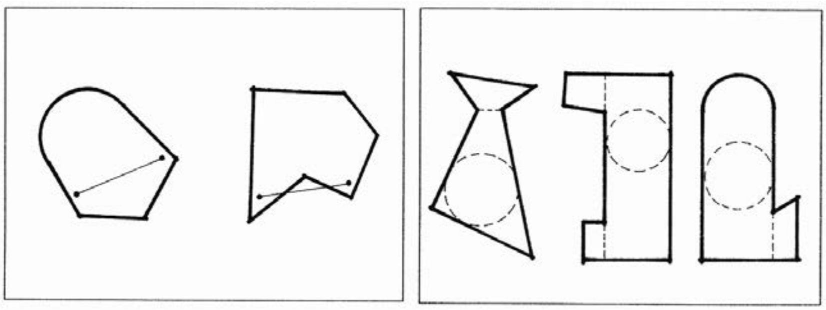


Figure 3.18
Convex spaces. (Klarqvist, 1991)
Left: “convex” and “concave” space.
Right: examples of how to divide a concave space into several convex ones.

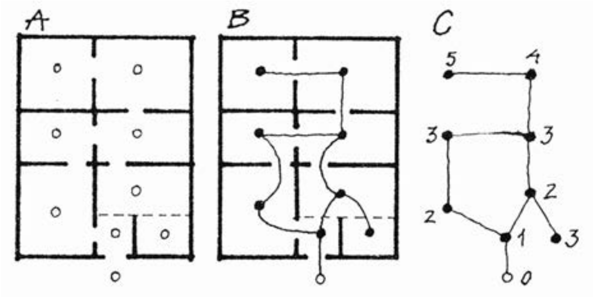


Figure 3.19
Floor plan, convex-space and connectivity graph. (Klarqvist, 1991)

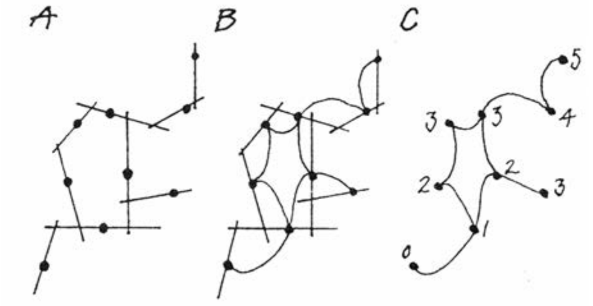


Figure 3.20
Axial lines represented by a "graph". (Klarqvist, 1991)

In the second mode, - the axial-line mode, the space is represented by straight lines. By basic axial-line modelling the space of interest is modelled by "fewest and longest straight lines covering all convex spaces". In the mathematical graph-representation each line is represented by one node. For lines crossing each other, the nodes representing the respective lines are defined as connected. This is shown in figure 3.20. The axial-line modelling captures essential features of the continuous outdoor space between buildings in a city, a spatial configuration where long spaces of streets intersect each other. This is a kind of space very different from enclosed interior rooms connected by doors. The activities of peoples in streets are also very different from the activities taking place in the home; the pattern of human movements in streets has more the character of free-floating movement than is the case inside private dwellings. As such free-floating-movements corresponds very well to space syntax integration of axial line models, this modelling is the one usually applied for analysing continuous spaces such as outdoor urban space. Even though more advanced linear modelling[97] correlates better to real life situations in some particular cases, the basic, very simple axial-line modelling is still the line-modelling most frequently applied. Figure 3.21 shows a map of a town and the corresponding axial-line-map, while figure 3.22 shows a part of an "axial-map" of London.

[97] Such as applying curved line-elements or taking the crossing angle and the length of lines into consideration, see footnote 86.

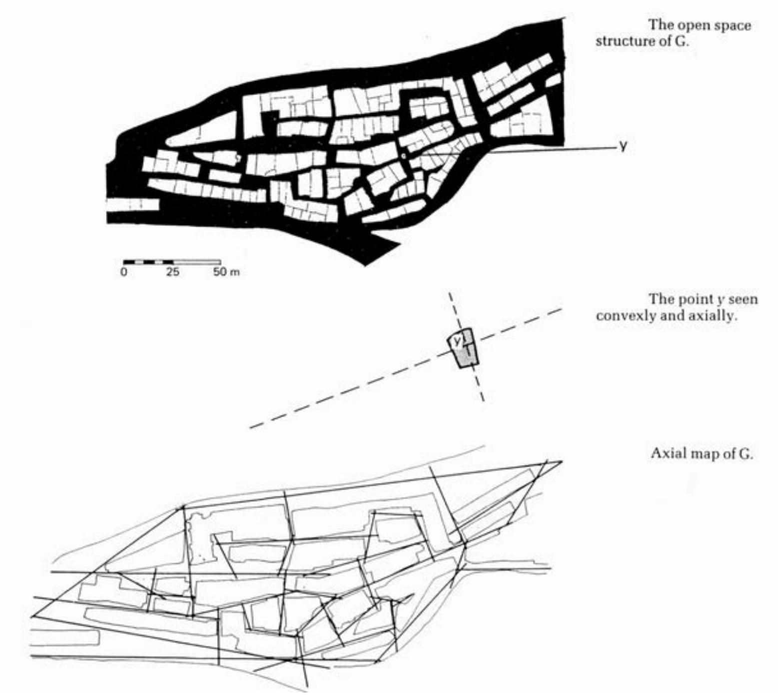


Figure 3.21 Axial-line modelling of streets and public spaces by drawing ”fewest and longest lines covering all convex spaces”. (Hanson and Hillier, 1984)

Figure 3.22 “Axial-map”, part of London, coloured by integration. (Hillier, 1996)

In the third mode, the spatial element on which the calculation is based, is the "visual-field" or the "isovist". The "isovist" of a particular point in a space is the part of the space that is visible from that point. The space that can be seen from all points in this "first isovist" is at "distance one" from the first isovist (being "connected" to the first isovist, if using the terminology earlier applied) and so forth. For spaces not known in advance by the persons being present, "visual fields" are likely to be a relevant modelling; in such spaces, "what you know is what you see". Visual fields analyses are therefore often applied in studies of larger buildings where movements have the character of "free float" of persons, such as museums or shopping malls, where many of the people present are likely to not know the space well in advance. In studies of domestic spaces, visual-fields are less relevant as the consciousness of the space in a dwelling to a far lesser extent depends on what you actually can see from each position in the rooms. Visual-field-analyses are now usually done by the software DEPTHMAP.[98] Figure 3.23 shows how the result of a space syntax visual field analysis of the Tate Gallery corresponds to the movement of visitors as registered on site.

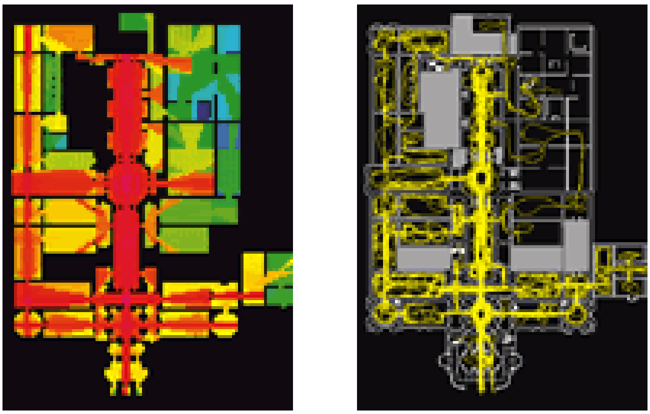


Figure 3.23
Tate Gallary, space syntax visual field analysis (left) and movement of visitors in reality (right). (Space Syntax Ltd.)

[98] DEPTHMAP is available from Space Syntax Limited, http://www.vr.ucl.ac.uk/research/vga/.
A more advanced visual-field-modelling is applied in the software SPATIALIST developed by Peponis and Wineman (See Peponis et al. (1998), http://undertow.arch.gatech.edu/homepages/jpeponis/FormalModels.htm or http://www-personal.umich.edu/~jwineman/formalModels.html), where the visual-fields are subdivided in accordance with their boundary-walls. This kind of modelling captures some essentials of human perception; the modelling captures the fact that a new wall occurring in the isovist of a real person represents an additional step of cognitive information. For more about "visual-field graph analyses" see Do and Gross (1997) or http://depts.washington.edu/dmachine/PAPER/CF97-ISO/spatial.html.

The fact that space syntax parameters correlate well to many kinds of social activities in buildings and cities, does not imply that space syntax is a way of achieving successful studies of architecture without knowledge of architecture. In most cases, it is not obvious what would be the most relevant space syntax modelling. Even what might be the most relevant subdivision of real space into space-elements, for instance how to draw the "axial-lines", is not obvious. Different modelling captures different aspects of space and correlate to different aspects of human lives and activities.[99] Knowledge about both the physical and the social context is important at many stages of a study also when applying methods of space syntax. Firstly, knowledge and creativity are the basis for figuring out the subject to study. Given that space syntax is a relevant approach to the subject, knowledge about the physical situation (the site, the building or the interior) as well as the cultural and social setting is needed in order to do a relevant space syntax modelling. Whether the kind of people's movements most relevant for the subject is on foot, by bicycle, by private car or by public transport and whether the site is a suburb of the 1970s or a dense historical city-centre, influences what kind of space syntax modelling is most likely to be appropriate. Finally, other knowledge than space syntax is necessary in order to interpret the results; whether a new layout that makes a "segregated" street into a highly "integrated" one, is positive or negative, depends on the situation. If the aim is to increase the activity of shopping, then the more integrated street is likely to improve the situation. If the street should rather be kept as a quiet, residential neighbourhood, the change to becoming highly integrated is not likely to be an improvement. Relevant knowledge about space syntax as well as about the cultural and social context is needed in order to achieve space syntax analysis that is relevant for a particular subject in a particular context. The following section explains how space syntax analysis has been applied in this particular study.

[99] When Klarqvist (1998) argue for studying dwellings by space syntax analyses, he shows all the three kinds of space syntax modelling applied on dwellings.

3.5 THE SPACE SYNTAX ANALYSIS OF THIS STUDY

This section describes the kind of space syntax modelling applied in this study and explains how the analyses have been carried out.

3.5.1 The Kind of Space Syntax Modelling

The kind of space syntax analysis applied in this study is a consequence of the kind of space being studied, which is the interior space of apartments, the research question, which is about similarities and differences in a historical sample of floor-plan layouts, and the size of the sample, which is somewhat more than 150 apartments. As elaborated in the previous section, three major kinds of space syntax modelling can be distinguished by the elements applied for representing the space. These three elements are "nodes and connections", "axial-lines" and "visual fields". In this study, where one aim has been to look for patterns in the historical development of apartments, a useful space syntax approach is to apply "nodes and connections" in terms of connectivity graphs. As shown by Hanson in "Decoding Homes and Houses" (Hanson, 1998), these simple figures that represent a higher level of abstraction from the architectural object than the floor plan drawing, makes it possible to discover similarities and differences between spatial layouts that are difficult to identify by comparing floor plan drawings.[100]

When looking at small systems such as the dwellings examined in this study, a node-graph-representation does not capture other information than what can be found by studying a floor-plan-drawing. A node-graph adds no information as to what is present in a floor plan drawing. What it does is to point out the spatial configuration by leaving out many features of space that are captured by the floor plan drawing, features such as metric distances (and thereby size and proportions of rooms), views and daylight conditions. Concerning small apartments, apartments where the spatial configuration can easily be recognised without the closer focus of a connectivity-graph-image, such a graph-image might be considered as a loss of relevant information. The same can be said about doing the further space syntax calculation that consists in determining the values of the space syntax parameters of the rooms. In the case of such small systems, the most interesting feature of space syntax is not to examine one single dwelling, but to compare larger

[100] If we take a floor plan drawing, change the proportions of the individual rooms, and mirror the floor plan, it can be hard to recognise that the spatial configuration is unchanged.

numbers, looking for similarities and differences. Due to the level of abstraction achieved by connectivity graphs and space syntax parameters, features not concerning the spatial configuration are left out with the consequence that patterns of the spatial configuration appear more clearly. The graph-images as well as the space syntax parameters are therefore useful in order to identify fundamental kinds of layouts and in order to reveal similarities and differences among larger samples of dwellings. These are the reasons for applying connectivity graph analysis in this study.

3.5.2 Identifying the Spatial Units

When modelling spatial syntaxes by "nodes and connections", it must be determined what units of the real space are represented by the nodes. As most of the apartments analysed in this study consist of separate convex rooms connected by doors, each room can usually be modelled by one node, without having to discuss whether to subdivide a "concave room" into several convex spaces. By the concept of "Raumplan versus Plan Libre", according to Risselada (1988), distinguishing between "Loos-space" and "Corbusier-space", the great majority of the rooms are of the "Loos-kind". Circulation spaces like entrances and corridors, which because of various kinds of "L-shapes" are often "concave rooms", are not subdivided into several spatial units unless they really are separated by doors. The rooms, of which the modelling has been least obvious, are living rooms that are more openly connected to the kitchen or dining room than by a door. In such cases, the part of the room containing a sink and a cooker is usually termed "the kitchen" by the residents, even in cases where it is hardly separated from the living room. It is difficult to know whether such naming represents the kitchen as furniture or the kitchen as a spatial unit. In the cases, where the kitchen or the dining area is more or less "openly" connected to the living room, such as the apartments 70-2, 76-1 or 04-3 (see figure 3.24) we decided to apply two criteria in order to model the kitchen (or the dining) as a separate node. Firstly, the kitchen (or the dining) area must have the character of being a separate space, i.e. being a space partly enclosed from the rest of the living room. Secondly, it must have daylight otherwise than through the living room, i.e. it must have its own window. By this definition the kitchens of 76-1 and 70-2 are modelled as separate spaces, while the kitchen of 04-3, a kitchen that is neither separated from the living room nor has its own window, is modelled as included in the living room.

Figure 3.24
Examples of node-modelling,
floor plans and space syntax connectivity graphs of 70-2, 76-1 and 04-3.

3.5.3 The Analysis, Applying the Software AGRAPH

Even though the space syntax analysis carried out in this study is of a conventional kind and in the core of space syntax methodology, software appropriate for the task was hard to find. What was particularly needed when intending to analyse more than 150 apartments, was software that made coloured graph-images with the explanative texts required, graph-images that should be suited for visual comparison and for presentation without any further editing. The software should make different calculations of the same configuration, such as calculations with and without exterior, without requiring redrawing the graph. The available software was either only for Mac (not for PC), the calculated values were laborious to handle or the graphs-images were not of the graphical quality needed. The decision made, was therefore to develop the software required, as a part of this PhD-study. This software, AGRAPH, is presented in the paper appended as appendix A.3.1.

The first step of the space syntax analysis was to model the spatial configuration of each apartment by connectivity graphs consisting of nodes and connections. This modelling, which was done by applying the AGRAPH-software, consisted in drawing nodes and connections representing the rooms and their internal connections (by importing the floor plan as "background image" when drawing the graphs of the largest apartments) and then to "code" the nodes by colour as well as by abbreviation.[101] The room, from which the apartment is accessed, is the "root" of the justified graph; i.e. the graph pictures the spatial configuration, as "seen" from the entry into the apartment.[102] (For more about "justified graphs", see section 3.4.1.) For each apartment, the justified and coloured graph was then "exported" from AGRAPH as a picture-image (see figure 3.25 and Appendix A.3.1). Appendix A.4.2 lists these justified graphs of all the apartments in chronologic order, as illustrated in figure 3.26. In order to examine some connections between rooms in detail, two sequences have been extracted from the connectivity graphs and listed individually. The room-sequences examined in this way are the accesses from entrance to kitchen and from bedrooms to bathroom. Figure 3.27 and 3.28 shows examples of some room sequences and some results of the space syntax calculation, respectively.

[101] The colours and the abbreviations are explained in section 4.2.

[102] The justified graphs are topological rather than mathematical in the sense that the positioning of nodes corresponds topologically to the apartment that they represent; i.e. the order of internal positioning of rooms (in terms of left and right) has been kept. This captures some information about the positioning that would not necessarily be kept by a "mathematical" graph. In a "mathematical terms", the graphs of 32-1 and 33-1 would be identical and would not explain internal positioning apart from which rooms are connected.

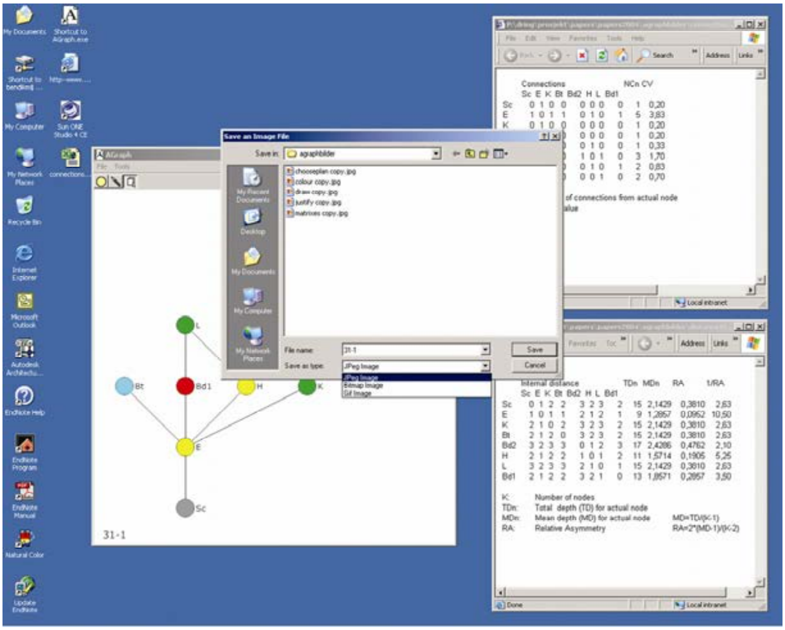


Figure 3.25
Drawing a connectivity graph and doing a space syntax calculation by applying the software AGRAPH. (See Appendix A.3.1 for more about this software.)

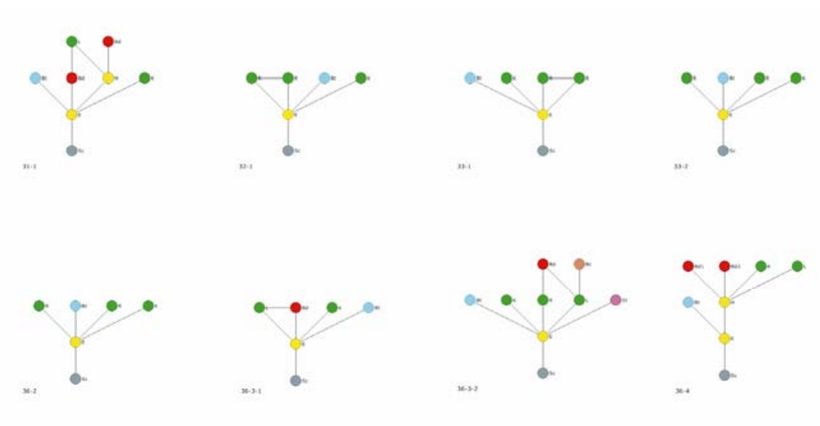


Figure 3.26
A selection of the justified graphs ordered chronologically. (See Appendix A.4.2 for the graphs of all apartments.)

Some room sequences, all apartments

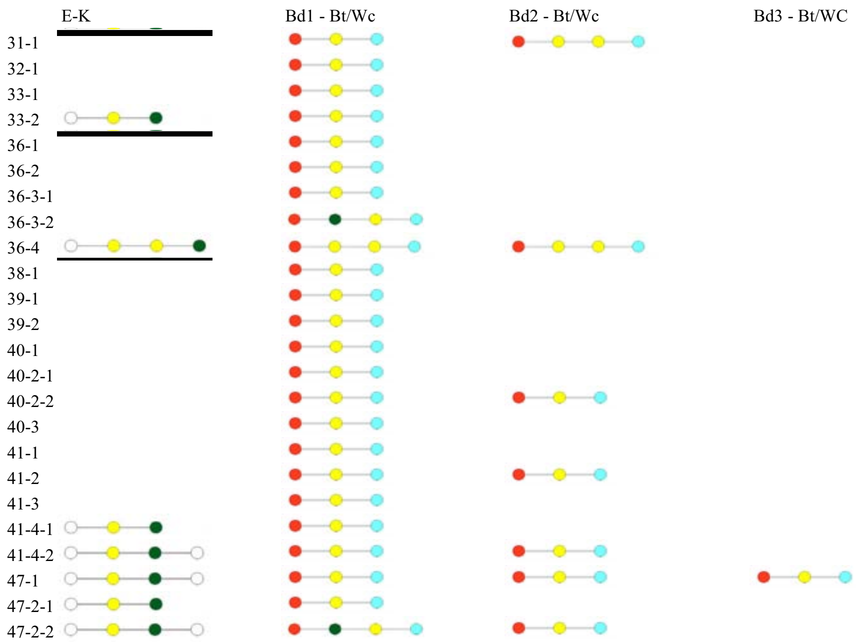


Figure 3.27
Some rooms sequences of some apartments, example.
(See Appendix A.4.3 for all apartments.)

Space Syntax Calculation, Typical Apartments, Every Third Case

Case	R	L	MD(E)	CV	CV	Integration (by Relative Asymmetry, RA)								Order (E-L-K-Bd1)			
				E	L/D												
33-1	1	C	1,16	3,00	0,75	0,00	0,33	0,33	0,50	0,50				0,00	0,33	0,33	0,50
36-2		A	1,16	4,00	0,25	0,00	0,50	0,50	0,50	0,50				0,00	0,50	0,50	0,50
38-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50				0,00	0,50	0,50	0,50
40-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50				0,00	0,50	0,50	0,50
41-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50				0,00	0,50	0,50	0,50
41-4-1	1	C	1,20	2,83	1,75	0,10	0,20	0,30	0,60	0,60	0,80			0,10	0,20	0,30	0,60
48-1-2	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47	0,09	0,19	0,28	0,38
48-5-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70			0,10	0,30	0,50	0,50
49-1	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47	0,09	0,19	0,38	0,38
50-2	1	c	1,42	2,83	1,75	0,14	0,19	0,28	0,33	0,38	0,42	0,42	0,47	0,14	0,19	0,28	0,42
51-2		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53		0,13	0,20	0,46	0,53
52-2-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70			0,10	0,30	0,50	0,50
53-2		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70			0,10	0,30	0,50	0,50
54-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53		0,13	0,20	0,46	0,53
55-1	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47	0,09	0,19	0,38	0,38
56-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53		0,13	0,20	0,46	0,53

Figure 3.28
The space syntax parameters of some apartments, example.
(See Appendix A.4.4 for all apartments.)

When it came to the space syntax calculations, these were done "without the exterior" (which here means without the staircase or the corridor outside the apartment), without storage-rooms (unless the storage room was a through-passage-room) but with the balcony. The reason for including the balconies is that they, at least in the summer, often function as a kind of second living room. Based on the model of nodes and connections AGRAPH generates a table listing the values of the space syntax parameters of all rooms (except those explicitly excluded, as described above). The further analysis consisted in importing these tables in EXCEL and ordering the data by apartment numbers, by kind of rooms and by value of the space syntax parameters. The space syntax parameters examined are the integration-values (by relative asymmetry, RA), the control values (CV), the spatial depths from entrance, the existence of "rings" and the position of the living room according to the room-categories described in section 3.4.7. Figure 3.25 shows the output-files listing the results from the space syntax calculation, while figure 3.28 shows how these results have been order for comparing the sample of apartments.

Despite the application of newly developed software, the space syntax analysis of this study is conventional, using well-known methodology in order to reveal patterns among a sample of spatial layouts. What is less conventional in this study is the extended use of colouring, in space-syntax-graphs (which are made in colours by applying AGRAPH) as well as in tables. The colouring of graphs in accordance with the functions of the rooms, as shown in figure 3.26, made it easy to identify patterns compared to having to read the room-functions as text. Similarly, the colouring by function in the tables of calculated results, as shown in figure 3.25, simplifies the identification of changes through time. The results from analysing these results are described in chapter 4.

3.6 COMMENTS ABOUT ASSUMPTIONS, FINDINGS AND GENERALISATIONS

As a substantial part of this study is the two empirical inquires, this section comments upon the relationship between empirical data, assumptions, findings and generalisations.

Even when intending to analyse empirical data with an open mind, pre-conceptions in terms of assumptions or hypotheses about findings establish a basis for doing the analyses. Findings might be of various characters; they might correspond to expectations, they might lead elsewhere than expected and they might even be contrary to what was expected. The conclusions to be drawn are not obvious in any of these cases.

Findings that are contrary to expectations do not necessarily falsify a hypothesis. There might be relevant explanations other than those captured by the hypothesis, explanations that “overrule” what is assumed by the hypothesis. However, if the findings are contrary to the hypothesis and alternative explanations cannot be found even when they are explicitly looked for, the hypotheses should be reconsidered critically. When various layouts of apartments are compared in the synchronic survey, the location of the apartments represents a bias that might make the effect of the interior space negligible. This has been borne in mind when selecting the apartments to study; in order to make the results comparable, it has been attempted to select apartments located similarly or close to each other.

Even when findings are as expected, the hypothesis might be wrong as the explanations might still be different from those assumed by the hypothesis. This might be the case in several questions studied by the synchronic survey as there are many parameters potentially influencing the results, parameters which due to complex situations are hard to keep separate. The interior space, which is the subject of this study, is only one out of many conditions that influence who lives in the apartment, how these households live, and how they evaluate their homes. Due to a variety of locations in the city, various floors, various views and all other parameters not being equal for any of the apartments examined, the frame of “other conditions being equal” hardly exists among any of the apartments in the selected sample, even when looking only at the apartments as “objects”. When further comparing these non-identical apartments inhabited by households of all kinds, such an ideal methodological framework is even harder to construct. Due to this lack of "other conditions being equal" and to all the relevant parameters that have not been studied, results of the synchronic survey corresponding to the assumptions about general versus specific layouts coming out of the diachronic analysis, indicate that these assumptions and tentative explanations might be right but do not prove them to be true. However, this is not a crucial methodological problem; according to Popper (1959, p. 40) the "criterion of demarcation" is not verification but falsification; a hypothesis cannot be proven to be true, it can only (by falsification) be indicated that a hypothesis is wrong.

In reality, findings are likely to be of various kinds when it comes to their correspondence with a priori assumptions or hypotheses. Whatever the character of the findings might be, analysis consists in comparing the results, the context and explanative hypotheses, looking for patterns of similarities and differences among the results that correspond to the hypothesis, as well as among those that do not. If results of the latter kind are numerous or otherwise convincing, the hypothesis is not likely to be a good one. It might then be falsified, which, even if uncomfortable, is a way of increasing knowledge, or it might be revised. In the latter case, when a hypothesis is replaced by a revised one that also captures findings not corresponding to the earlier hypothesis, the hypothesis has simply become a better one. In this study, the typology of apartments identified in sections 4.3.3 is the result of such a process. The conclusion from the diachronic survey was the identification of an apartment typology consisting of three kinds of floor-plan named the A-, B- and C-type. When analysing the results of the synchronic survey later on, some results of the A- the C-type seemed to be without any patterns.[103] The typology was therefore examined critically. By a closer comparison of the result from the synchronic survey and the typology of apartments, it became clear that some of the apartments had a significant spatial characteristic not captured by the typology developed so far. By "refining" the definition of the A-type of apartments and thereby identifying some apartments as hybrids between this revised A-type and the C-type, being of an "AC-kind", a correspondence between the typology of apartments and distinct categories of results was achieved.[104] This way of developing categories according to empirical data rather than sticking to predefined categories is a major concern of "grounded theory" as described by Glaser and Strauss (1967).

[103] For these results in detail, see table 5.5.c, listing the kinds of households living in apartments of three rooms.
[104]The "revised A-type" of apartments differs from the former one in that all (and not only most) bedrooms have direct access from a "neutral" entrance or corridor, see footnote 127 and section 5.1.1.

When Yin (1994, p. 36) discusses how to generalise from case studies, he makes a distinction between statistical and analytical generalisations. In statistical analyses, the results are considered valid for the total population (or "universe") out of which only a selected sample (a sample that should be statistically representative) is analysed. Yin claims that analogy to statistical samples and "universe" is irrelevant when case studies are concerned; there exists no representative case or set of cases and to add further cases to a case study does not turn a case study into statistics. The generalisation from case studies, named analytical generalisation by Yin, is different from statistical generalisations and works by generating theory from the findings of one or a few particular cases.[105] The analyses in this thesis are of both these kinds; for some subjects statistical generalisations should be valid while for others, due both to the questions asked and to the data that are analysed, generalisations are of the "analytical" kind according to Yin. An example where the subject as well as the available data is appropriate for simple statistics is the floor area of rooms.[106] However, in most questions of this study the size of the sample (by numbers of apartments) is not large enough for hypotheses to be made probable through statistics; as there are many dependent variables the sample is rarely of the size needed to constitute statistical representations of the total population. This does not imply that the explanations and hypotheses are of little interest nor that they are wrong; in such cases, the purpose of a hypothesis is not to claim truths by the means of probability but to develop tentative explanations. Such generalisations are of the analytical kind according to Yin.

In this study, kinds of generalisations vary in accordance with the questions focused upon and the data being analysed. Some conclusions are based on simple statistics while others come from analyses of a few particular cases. The kind of generalisation will not be commented upon explicitly for every question discussed through the thesis; having the comments above in mind, it should be possible to have an understanding of the kinds of generalisation behind the hypotheses and explanations that are offered through the following chapters.

[105] This is a parallel to the distinction made by Glaser and Strauss between statistical and theoretical sampling. (Glaser and Strauss, 1967, p. 45-.)
[106] Simple statistics is here to be understood as very basic statistics, such as average values and percentages of a limited sample to be representative for the population out of which the sample is selected.

3.7 SUMMARY

The methodological strategy of this study has been to do a "quantitative" inquiry of the development of apartment layouts through time prior to a more qualitative survey on contemporary living in selected apartments of different layouts. Due to the different time-perspectives, these two empirical studies can be distinguished as diachronic and synchronic, respectively. The diachronic inquiry, where the co-operative housing company OBOS is the case examined, consists of analysing floor areas and spatial layouts, the latter by applying space syntax methods. This diachronic inquiry has two aims. The first is to identify significant changes in Norwegian apartments built during the period 1930-2005, findings that themselves might represent a contribution to the knowledge about Norwegian dwellings in a historic perspective. The second aim is to establish an empirical basis for selecting the apartments to examine in the following, more qualitative synchronic survey. The latter is an in-depth study of a few typical or otherwise interesting apartments, a study carried out by visits and interviews, asking about kinds of households, the use of room and the residents' preferences and evaluations about their dwelling. The main aim of this synchronic survey is to find out about the potential usability, or generality versus specificity, of different floor plan layouts. By doing so, this PhD-project might provide some informed premises for further discussions about dwelling layouts with respect to the population's preferences and needs.

The research strategy described through this chapter has been clarifying for planning as well as for carrying out the work. However, when looking at the work in retrospect, the diachronic and the synchronic surveys have been carried out less separately than intended. As the diachronic study was only half-complete at the time when the synchronic survey had to start due to its own tight schedule, the selection of apartments for the synchronic survey had to be based on a brief look at results from the diachronic study rather than on sure findings. However, this lack of clear division between the initial quantitative diachronic study and the following more qualitative synchronic survey has not been disadvantageous; being forced (by lack of time) to start the latter before the first was finished had some positive effects. One example is the typology of apartments where findings from the interviews made it possible to distinguish between different apartment layouts more clearly. [107]

[107] This is explained in section 5.1.1.

The conclusion to draw from this is that a consistent “a priori” strategy is a useful guideline. However, when carrying out a job in reality, the pragmatic adaptations needed in order to solve problems that turn up, do not necessarily weaken the work. Unpredicted adjustments of direction might bring the work into important fields that would not have been discovered if sticking to the planned course. [108]

As regards the space syntax analysis, which is the major section of the diachronic inquiry, this differs from most otherwise similar space syntax studies by the sample of apartments and by the rather extensive interview-based survey that has been carried out on the basis of the space syntax analysis. Due to the large sample of apartments, the results of the space syntax analysis are likely to have a greater extent of general validity than is the case in studies of smaller or less representative samples. Where the synchronic and interview-based survey is concerned, this might not only shed light on the apartment layouts identified by the space syntax analysis, it might also provide general knowledge about correspondences between particular space syntax features and real domestic lives. Concerning the diachronic analysis as well as the synchronic survey, further information about samples, data and results is given in the respective chapters: in chapter 4 about the diachronic study of apartment layouts and in chapter 5 about the synchronic survey of contemporary living.

[108] According to Glaser and Strauss (1967, p. 61) analyses of data should not be rigorously predetermined; when saturation is reached (i.e. the moment has come when further analyses of the data only confirm what is already found), the best use of time is not to go on analysing more of the same data, but to look for other kinds of data or to examine data that do not correspond to the patterns found or the hypotheses developed so far.

4 Apartment Layouts; a Diachronic Inquiry

The basis of this thesis is the two empirical inquiries, where the first, which is the subject of this chapter, is an analysis of the interior spaces of a chronological sample of apartments. The aim of this analysis is to identify changes of the apartment layouts through time; to find out what the changes have been and when they have happened. By studying a presumably representative sample of apartments, the findings might also bring about knowledge about the total stock of dwellings.

4.1 THE CASE AND THE SAMPLE

As explained in section 3.3, the co-operative housing company OBOS is the particular case examined by this study. With the intention of studying a kind of representative sample of apartments, the next question was how many apartments to examine and how to select them. On the one hand, bearing in mind the intention of capturing some general tendencies and not only information about a few particular apartments, the number of apartments could not be too restricted. On the other hand, in order to carry out the analysis within a reasonable time, there could not be too many apartments. The decision made was to select three OBOS-projects from every year of the period 1930-2005.[109] The selection was done according to two parameters; size, looking for projects containing the largest number of apartments, and location, trying to achieve a sample representing most parts of town.

The information needed in order to do this selection was found in the archives of OBOS. Figure 4.1 shows all the selected projects marked on a map of Oslo. When deciding which apartment to select from each project,

[109] As there are years, such as during the Second World War, where very few dwellings were built, the number of apartment selected by this strategy of sampling, are less than number of years multiplied by three.

this was done by looking for the typical[110] apartment within each project. In most projects, this was an apartment of three rooms, while in some cases it was of two or four rooms.[111] In the projects where the typical apartment is not of three-rooms but where there are apartments of three-rooms, the most typical three-room apartment was selected as a second apartment from the project. This was done in order to have a possibility to compare equally sized apartments from as many projects as possible. [112] Each apartment is identified by a number according to the following system:

33-1 - the year of finishing construction is 1933
33-1 - number distinguishing projects built in the same year

In the projects where two apartments are selected, a third number is added in order to distinguish apartments from the same project:

31-1-2 -number distinguishing apartments from the same project

Figure 4.1 Map of Oslo showing the OBOS-projects examined.

[110] Most typical apartment here means the most numerous apartment-floor-plan in the project, considering mirrored floor plans being equal.
[111] When describing apartment sizes by the number of rooms, this is done according to Norwegian terminology where the rooms being counted are the "habitable rooms", i.e. rooms for living and sleeping except the kitchen.
[112] Such a study of three-room-apartments has not yet been carried out, but is among the more detailed analyses that can be done with the data collected.

As already pointed out, one aim of this study is to examine the development of Norwegian dwellings. This is different from studying “interesting”, “nice”, “excellent” or other categories of dwellings where the samplings are based on qualitative evaluations. What characterises the sample of this study is that it has been selected in order to represent a “population of dwellings” rather than qualitative categories. Due to this representativeness, the sample of apartments should be relevant as data also for studies other than the one carried out here.[113] This distinguishes the sample of this study from most samples of apartments presented in existing publications of Norwegian dwellings and is the reason for presenting the apartments in a separate catalogue-like volume.

[113] A Norwegian publication that appears similar to the appendix of this thesis but is very different in terms of representativeness is *“Århundrets norske boligprosjekter 1900-2000”* (Ditlef-Martens, 2000). The book presents 156 housing projects from all over Norway by photos, drawings and some further information and represents thereby an interesting documentation of Norwegian dwellings. However, due to the open criteria of sampling, the publication is not very useful if intending to study Norwegian dwellings in general. (The criteria for projects to be selected are diverse; the dwelling should be particularly excellent with respect to functional or architectural qualities or they should be typical for particular time-periods or they should otherwise be important with respect to Norwegian cultural history.)

4.2 THE DATA; COLLECTING, EDITING AND ANALYSING FLOOR PLANS

Floor plan drawings have been the main source of information for the space syntax analysis as well as for the analysis of the sizes of rooms. Concerning the potential of the floor plan drawing in representing architecture, Bruno Taut has made the following statement:

"Wer Sinn dafür hat, kann die Architektur am Grundriss ablesen, ohne den Bau zu sehen, so wie ein Musiker die Noten liest." (Taut, 1927, p. 68) [114]

Even if one might doubt such a belief in the potential of the floor plan drawing, it is hard to dismiss it from being an abstraction of the building that captures essential features of the interior space. Even though drawings are secondary sources, as the apartments built would be the primary ones, they are a reliable source. As long as there have not been any illegal building constructions, which are rare where Norwegian apartment housing is concerned, the drawings in the municipal archives illustrate the apartments as they were when built. With few exceptions, the municipal archive contains floor plan drawings of all dwellings in Oslo. Floor plan drawings are therefore a relevant, reliable and easily accessible source for this study.

After selecting the projects by using the archives of OBOS, information and drawings for each project were gathered at the Oslo municipal archives and in some cases from the architects of the projects. Based on this information, projects that did not fit the criteria for being examined, such as those consisting of detached houses, were excluded.[115] Appendix 4.1 lists the projects finally selected. The projects are presented more extensively in a volume separate from this thesis, a volume that presents every apartment with copies of the original drawings and with key data such as the year of construction, address, architect and number of apartments. In order to make the apartment floor plans easily comparable, they have been drawn by CAD and printed in identical typography.[116] From these floor plan drawings, the sizes of the rooms and the spatial configuration of the apartments have been analysed.

[114] This in English would be something like "Those who have the skill, are able to read the architecture from the floor-plan drawing, without watching the building, similarly to how a musician read notes."
[115] See section 2.5 about the kind of dwellings examined.
[116] The original drawings are not only of different kinds, some of them are also discoloured or for other reasons hard to read.

The analysis of the room sizes has been done by looking at the development through time of the floor areas of the individual rooms, while the spatial configuration has been examined by space syntax analysis consisting in drawing the connectivity graphs and doing some basic space syntax calculations on these by applying the software AGRAPH, as explained in section 3.5. The appendix A.4.2 presents the space syntax representations of all the apartments. The nodes, which represent the rooms of the apartment, are "coded" by colour as well as by abbreviation in accordance with the function (or presumed use) as listed below. The same colours are applied in the table of the room-sequences in appendix A-4-3 and in the tables that list the space syntax parameters (the tables 4.2 and 4.3 and appendix A.4.4).

Room	In short	Colour
Entrance Corridor Hall	**E** **C** **H**	yellow
Staircase (internal)	**Sc**	light yellow
Living room Dining room "Room" (un-specified habitable room)	**L** **D** **R**	yellow-green
Kitchen	**K**	green
Lagest bedroom	**Bd1**	red-orange
Second largest bedroom Third largest bedroom	**Bd2** **Bd3**	orange
Bathroom	**Bt**	light blue
Wc Washing room	**Wc** **Wr**	blue
Balcony	**Bc**	pink

Table 4.1
Legend (Rooms, abbreviation and colours)

4.3 RESULTS

This section summarises the results of the diachronic survey, first the results from the analysis of room sizes across the sample of apartments and then the results from the space syntax analysis of the same apartments. As a conclusion, section 4.3.3 identifies three "generations" of apartments that differ significantly with respect to the principle layout of the floor plans.

4.3.1 Sizes of Rooms and Apartments

Figure 4.2 illustrates the floor areas of some main rooms in the sample of apartments examined. Concerning the development of floor areas over time, it is possible to distinguish between two categories of rooms. The first category is living rooms and bathrooms[117]. These rooms follow the development of the apartments' total floor areas with increasing areas until about 1980 followed by a decrease. Concerning the size of the living rooms, there is a recent tendency that deserves some elaboration. Subsequent to the declining tendency since 1980, the size of the living room has been increasing since about the year 2000. However, contrary to this recent increase in the size of the living room, the total floor area of living+dining+kitchen has decreased continuously since the early 1980s. As the increase in floor-area of the living rooms is far less than the floor-area lost by no longer having separate kitchens and dining rooms, the recent larger living rooms do not imply increased space for daytime living.[118] As we will come back to in section 6.3, this reduction in the total floor areas of the individual apartments is likely to be a main reason for merging previously separate rooms for living, cooking and dining into one room.

The total area of WC, washing and bathroom shows a development similar to the area of living+dining+kitchen just described. Since the period around 1970-1980, when these functions were usually separated into three separate rooms and their floor areas thereby were the largest, the situation is now similar to what was the case until the mid-1950s. Within the sample being analysed here, only 3 out of the 27 apartments built during the last 15 years have a WC separate from the bathroom and there is no apartment with a separate washing room. The floor area of bathroom/WC/washing-room was

[117] When WCs or washing-rooms are separate rooms, the floor areas of these rooms are added to the floor area of the bathroom.

[118] However, as the numbers of bedrooms as well as the number of persons in the household are lower in these new apartments than it was in the large apartments of the 1960s and -70s when these were new, the decreasing floor area of "living+dining+kitchen-room" does not necessarily imply that living in new apartments has developed towards becoming more cramped.

3.5 m2 on average in the period 1940-1949. From the peak of 8.1 m2 in the 1980s, the size has decreased rapidly towards 6.3 m2 in the 1990s, down to 4.7 m2 on average since the year 2000. When comparing these new apartments with those built as much as 50 years ago, the new ones have only slightly more space for WC and bathroom. But there is one major difference between the new and the 50-year-old apartments where floor areas and usability are concerned: in recently built apartments, the tiny bathrooms are also the place for washing and drying clothes, while the pre-war apartments had (and still have) separate rooms for laundry. These laundries, which were for common use for several apartments, were located in the basements and were well equipped for washing as well as for drying clothes. The recent decrease in standards in these respects is remarkable considering how advertisements emphasise the new housing projects as modern, functional and of high technical standard.

The second category of rooms concerning the development of size through the period of time, is the bedrooms and differs significantly from the first as the average size of the bedrooms has declined more or less continuously throughout the whole period.[119] The change towards more differentiated and less “general” rooms is most significant when comparing the size of the living room with the size of the “main bedroom” (or the second largest room of the apartment, not necessarily being used as bedroom). Between 1930 and 1940 the average floor area of the “main bedroom” was 15 m2 while the largest room, the living room, was usually between 18 and 20 m2; with respect to size, the living room and the main bedroom were then of the same category. In recently built apartments, this is very different; the average floor area of the main bedrooms since 1990 is 11.3 m2. This is a kind of space fundamentally different from the recently built living rooms, which are on average 31 m2 and include the kitchen; the bedroom is a room for sleeping while the living room is now the place for all daytime activities.

[119] The sizes of the second and the third largest bedrooms show similar but less significant pattern than the size of the main bedrooms. Because far from all apartments selected for this study have a third or even a second bedroom, a more continuous chronological sample of large apartments is needed in order to generalise about the development of the second and the third bedrooms.

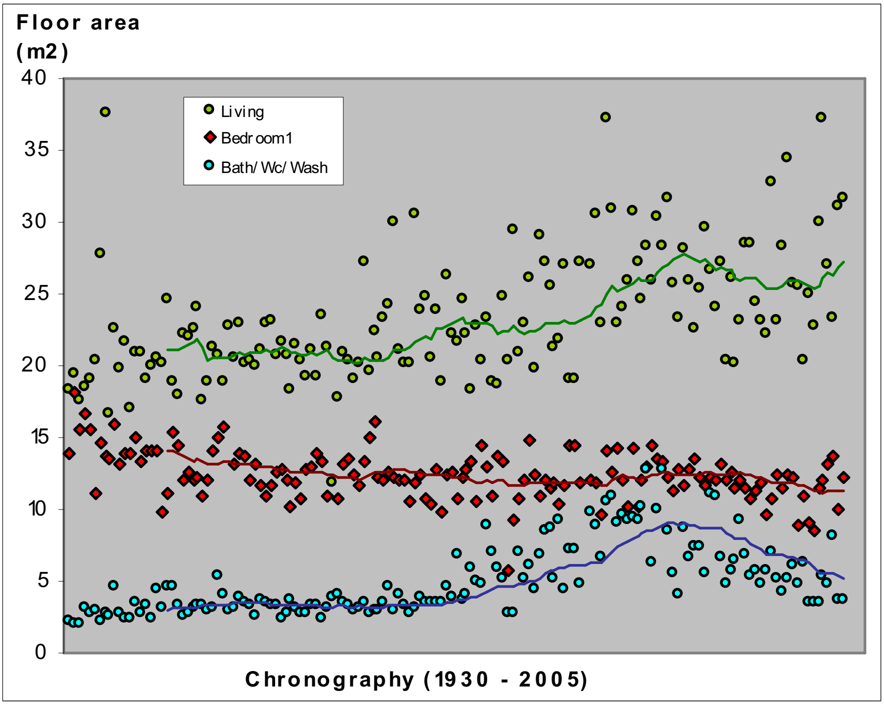


Figure 4.2
Floor areas of living room, largest bedroom and bathroom+WC+washing.

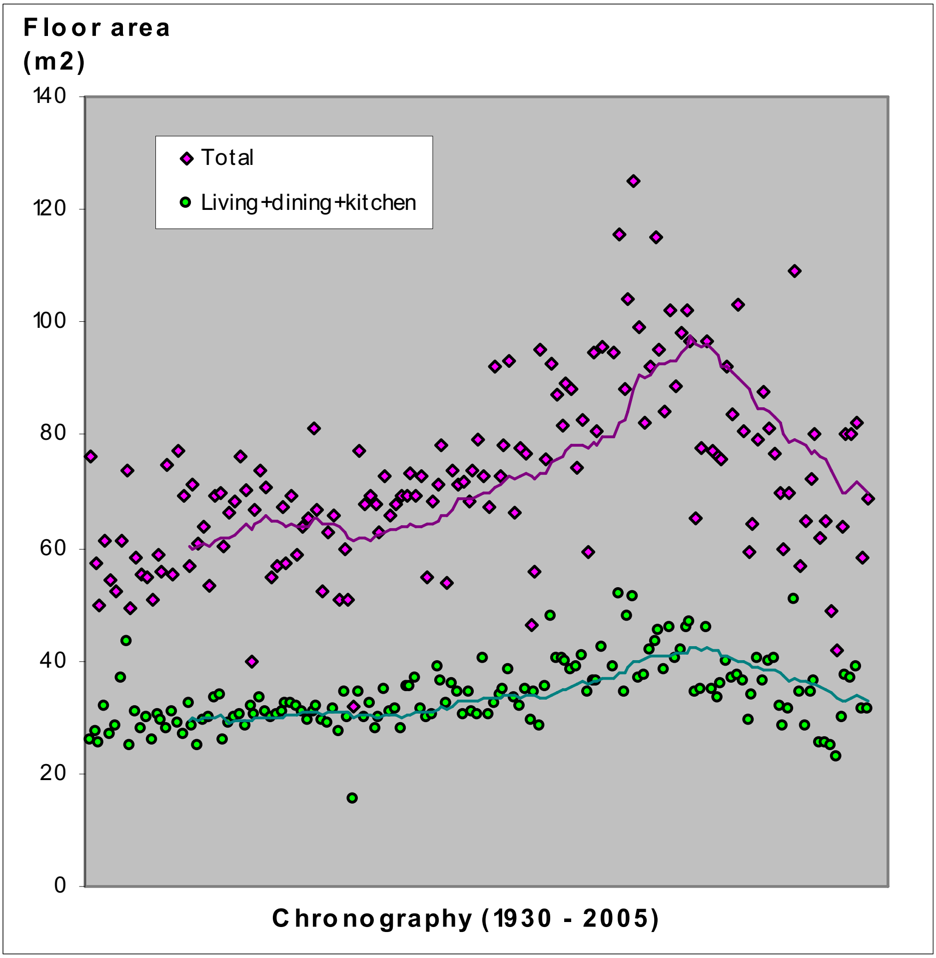


Figure 4.3
Floor areas of the apartment and of living+dining+kitchen.

4.3.2 Spatial Configurations

The spatial configurations are examined by comparing the justified connectivity graphs and the space syntax parameters that are determined by calculation. The following sections describe the results one by one, first by explaining the patterns found by comparing the graph-images and some particular sequences of rooms, then by going in detail into some of the calculated parameters. As presentation of the more than 150 graph-images requires numerous pages, these as well as the tables of the space syntax parameters of all apartments are edited as appendices at the end of this thesis, as appendices A.4.2 and A.4.4, respectively. In order to point out the main patterns, a one-page short version of the space syntax parameters is presented in table 4.2. This table lists the data for every third apartment of the total sample. The results in terms of numbers and percentages (in this text as well as table 4.3) refer to the analyses of the total sample of apartments and might therefore differ slightly from what would be found if analysing the 50 cases in the short-version list only.

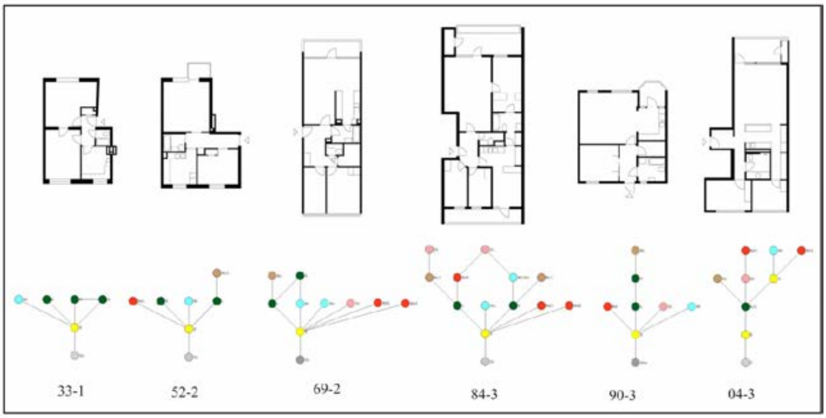


Figure 4.4
A selection of floor plans and their corresponding justified connectivity graphs.

4.3.2.1 The Connectivity Graphs

Figure 4.4 shows a selection of floor plans and the corresponding justified connectivity graphs, while appendix A.4.2 shows the graphs of all apartments. The space from which you enter the apartment is usually a staircase, while in a few cases it is a corridor or an outdoor gallery. Until 1955, the typical graph is a "bush" where all rooms except the balcony (if there is one) have access directly from the entrance. (See 33-1 and 52-2 in figure 4.4.) The main differences among the floor-plan-layouts from this period are whether there is access between the living room and a bedroom as well. From the late 1950s, until the 1970s and -80s, there was a development towards an increasing number of separate rooms organized in a "deeper" spatial layout. A remarkable pattern is how the apartments constructed by the company "Selvaag" differ from others by their very large "rings", rings that might contain as many as 7 rooms and any kind of rooms except the WC. (See 84-3 in figure 4.4.) [120] These rings are a means of achieving access to many rooms with a minimum of space solely for transition, a layout that most architects have probably considered unacceptable due to all through-passing generated. When it comes to more recently built apartments, the number of rooms has decreased and the spatial structure has returned to a simpler type. A pattern that clearly appears from the connectivity graphs is that the space connecting the other rooms no longer has to be the entrance but very often is the combined living-and-kitchen-room. (See 04-3 in figure 4.4.)

4.3.2.2 Some Room Sequences

Some changes in the spatial configuration can be revealed by studying spatial sequences such as the one from the entrance to the kitchen and the one from the main bedroom to the bathroom. Appendix A.4.3 list these room sequences. Until 1965, most apartments (95%) had a kitchen with direct access from the entrance. This changed around 1965. Since then as many as 50% of the apartments have kitchens that can only be accessed through the living room. The spatial sequence from bedroom to bathroom shows a similar development towards less direct access and more through passing. Until the late 1950s, when the connectivity graph was usually a "simple bush", the entrance was the only room linking bathroom and bedroom in 90% of the apartments. In the period 1958-1995, this percentage was reduced to an average of 65. Since 1995, only 55% of the apartments have a main bedroom that can be accessed without passing through the living room.

[120] See also 77-1, 82-2 or 83-2 in appendix A.4.2.

Table 4.2 Space Syntax Calculation, Typical Apartments, Every Third Case

Case	R	L	MD(E)	CV	CV	Integration (by Relative Asymmetry, RA)													Order (E-L-K-Bd1)			
				E	L/D																	
33-1	1	C	1,16	3,00	0,75	0,00	0,33	0,33	0,50	0,50									0,00	0,33	0,33	0,50
36-2		A	1,16	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
38-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
40-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
41-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
41-4-1	1	C	1,20	2,83	1,75	0,10	0,20	0,30	0,60	0,60	0,80								0,10	0,20	0,30	0,60
48-1-2	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,28	0,38
48-5-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
49-1	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,38	0,38
50-2	1	c	1,42	2,83	1,75	0,14	0,19	0,28	0,33	0,38	0,42	0,42	0,47						0,14	0,19	0,28	0,42
51-2		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
52-2-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
53-2		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
54-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
55-1	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,38	0,38
56-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
57-2	1	C	1,20	2,83	1,75	0,10	0,20	0,30	0,50	0,50	0,60								0,10	0,20	0,30	0,50
58-2		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
59-3		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
60-3		A	1,16	4,50	1,20	0,06	0,26	0,40	0,40	0,40	0,40	0,60							0,06	0,26	0,40	0,40
61-3	1	C	1,14	4,83	1,66	0,04	0,19	0,23	0,33	0,33	0,33	0,33	0,47						0,04	0,19	0,23	0,33
62-3		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
64-1	1	C	2,25	0,20	2,70	0,10	0,14	0,28	0,32	0,35	0,35	0,35	0,39	0,39					0,14	0,32	0,35	0,39
65-1	1	C	1,16	3,83	1,70	0,06	0,20	0,26	0,40	0,40	0,40	0,53							0,06	0,20	0,26	0,40
66-1	1	C	1,28	3,66	1,53	0,09	0,19	0,19	0,38	0,38	0,38	0,47	0,47						0,09	0,19	0,19	0,38
66-2-1	1	C	1,42	2,75	2,75	0,14	0,14	0,33	0,33	0,42	0,42	0,42	0,42						0,14	0,14	0,33	0,42
67-2		B	1,42	3,25	3,35	0,14	0,14	0,42	0,42	0,42	0,42	0,42	0,42						0,14	0,14	0,42	0,42
68-2	1	C	1,14	4,83	1,66	0,04	0,19	0,23	0,33	0,33	0,33	0,33	0,47						0,04	0,19	0,23	0,33
69-2	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,38	0,38
70-2		B	1,40	2,33	2,33	0,20	0,20	0,60	0,60	0,60	0,60								0,20	0,20	0,60	0,60
71-3	1	C	1,75	1,75	2,66	0,14	0,21	0,21	0,32	0,32	0,39	0,39	0,46	0,46					0,14	0,21	0,21	0,32
72-3	1	C	1,37	3,66	1,70	0,10	0,21	0,21	0,32	0,35	0,35	0,35	0,46	0,46					0,10	0,21	0,32	0,35
74-1	1	C	2,00	2,16	1,58	0,18	0,21	0,22	0,24	0,24	0,28	0,34	0,37	0,37	0,40	0,45	0,45	0,54	0,18	0,21	0,24	0,34
75-3-1		B	1,62	3,25	2,75	0,14	0,17	0,32	0,39	0,39	0,42	0,42	0,42	0,57					0,14	0,17	0,32	0,39
77-1	1	C	1,80	2,66	1,75	0,17	0,22	0,22	0,31	0,31	0,37	0,37	0,37	0,37	0,42	0,42			0,17	0,22	0,22	0,31
78-1		B	2,11	1,20	2,20	0,11	0,22	0,27	0,27	0,33	0,33	0,44	0,44	0,50	0,50				0,22	0,27	0,33	0,44
81-1	2	C	1,63	1,95	2,25	0,12	0,14	0,18	0,23	0,25	0,27	0,30	0,32	0,32	0,32	0,32	0,36		0,12	0,18	0,32	0,32
82-2	1	C	1,90	2,66	1,75	0,18	0,20	0,23	0,25	0,30	0,32	0,34	0,36	0,36	0,38	0,41	0,43		0,18	0,20	0,23	0,30
83-2	1	C	1,90	2,66	1,75	0,18	0,20	0,23	0,25	0,30	0,32	0,34	0,36	0,36	0,38	0,41	0,43		0,18	0,20	0,23	0,30
84-2		B	2,33	0,20	2,20	0,11	0,22	0,22	0,33	0,33	0,33	0,44	0,44	0,44	0,44				0,22	0,33	0,33	0,44
87-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
88-3		B	1,28	4,33	2,20	0,09	0,19	0,38	0,38	0,38	0,38	0,47	0,47						0,09	0,19	0,38	0,47
90-1	1	C	1,66	0,70	4,00	0,06	0,26	0,26	0,40	0,40	0,40	0,46							0,06	0,26	0,26	0,40
91-4		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
98-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
00-2-2		A	1,90	2,16	1,16	0,08	0,20	0,24	0,24	0,28	0,28	0,28	0,40	0,40	0,44	0,44			0,20	0,24	0,24	0,28
02-2		B	1,40	2,33	2,33	0,20	0,20	0,60	0,60	0,60	0,60								0,20	0,20		0,60
03-3	1	A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30		0,50
04-3		B	2,00	0,20	4,50	0,06	0,26	0,40	0,40	0,40	0,40	0,60							0,06	0,40		0,40
05-3-1		B	2,20	0,33	2,33	0,20	0,20	0,60	0,60	0,60	0,60								0,20	0,60		0,60

Legend

R	Rings (see section 3.4.7)		bedroom 1 / main bedroom
L	Living room's kind of space		other bedrooms
MD(E)	Mean depth from entrance		kitchen
CV	Control Value		living room, dining room (or non-spesified room for daytime living)
			bathroom
			WC, washing room
E	Entrance		entance/corridor/hall
L	Living room		internal staircase
D	Dining room		balcony
		(white)	stortage room (with through-passage)

Table 4.3 Space Syntax Calculation, Some results poited out

Case	R	L	CV E	CV L/D	Order (E-L-K-Bd1)			
33-1	1	C	3,00	0,75	0,00	0,33	0,33	0,50
36-2		A	4,00	0,25	0,00	0,50	0,50	0,50
38-1		A	4,00	0,25	0,00	0,50	0,50	0,50
40-1		A	4,00	0,25	0,00	0,50	0,50	0,50
41-1		A	4,00	0,25	0,00	0,50	0,50	0,50
41-4-1	1	C	2,83	1,75	0,10	0,20	0,30	0,60
48-1-2	1	C	3,83	1,70	0,09	0,19	0,28	0,38
48-5-1		A	3,50	1,25	0,10	0,30	0,50	0,50
49-1	1	C	3,83	1,70	0,09	0,19	0,38	0,38
50-2	1	c	2,83	1,75	0,14	0,19	0,28	0,42
51-2		B	3,33	2,25	0,13	0,20	0,46	0,53
52-2-1		A	3,50	1,25	0,10	0,30	0,50	0,50
53-2		A	3,50	1,25	0,10	0,30	0,50	0,50
54-1		B	3,33	2,25	0,13	0,20	0,46	0,53
55-1	1	C	3,83	1,70	0,09	0,19	0,38	0,38
56-1		B	3,33	2,25	0,13	0,20	0,46	0,53
57-2	1	C	2,83	1,75	0,10	0,20	0,30	0,50
58-2		B	3,33	2,25	0,13	0,20	0,46	0,53
59-3		B	3,33	2,25	0,13	0,20	0,46	0,53
60-3		A	4,50	1,20	0,06	0,26	0,40	0,40
61-3	1	C	4,83	1,66	0,04	0,19	0,23	0,33
62-3		A	3,50	1,25	0,10	0,30	0,50	0,50
64-1	1	C	0,20	2,70	0,14	0,32	0,35	0,39
65-1	1	C	3,83	1,70	0,06	0,20	0,26	0,40
66-1	1	C	3,66	1,53	0,09	0,19	0,19	0,38
66-2-1	1	C	2,75	2,75	0,14	0,14	0,33	0,42
67-2		B	3,25	3,35	0,14	0,14	0,42	0,42
68-2	1	C	4,83	1,66	0,04	0,19	0,23	0,33
69-2	1	C	3,83	1,70	0,09	0,19	0,38	0,38
70-2		B	2,33	2,33	0,20	0,20	0,60	0,60
71-3	1	C	1,75	2,66	0,14	0,21	0,21	0,32
72-3	1	C	3,66	1,70	0,10	0,21	0,32	0,35
74-1	1	C	2,16	1,58	0,18	0,21	0,24	0,34
75-3-1		B	3,25	2,75	0,14	0,17	0,32	0,39
77-1	1	C	2,66	1,75	0,17	0,22	0,22	0,31
78-1		B	1,20	2,20	0,22	0,27	0,33	0,44
81-1	2	C	1,95	2,25	0,12	0,18	0,32	0,32
82-2	1	C	2,66	1,75	0,18	0,20	0,23	0,30
83-2	1	C	2,66	1,75	0,18	0,20	0,23	0,30
84-2		B	0,20	2,20	0,22	0,33	0,33	0,44
87-1		B	3,33	2,25	0,13	0,20	0,46	0,53
88-3		B	4,33	2,20	0,09	0,19	0,38	0,47
90-1	1	C	0,70	4,00	0,06	0,26	0,26	0,40
91-4		B	3,33	2,25	0,13	0,20	0,46	0,53
98-1		B	3,33	2,25	0,13	0,20	0,46	0,53
00-2-2		A	2,16	1,16	0,20	0,24	0,24	0,28
02-2		B	2,33	2,33	0,20	0,20		0,60
03-3	1	A	3,50	1,25	0,10	0,30		0,50
04-3		B	0,20	4,50	0,06	0,40		0,40
05-3-1		B	0,33	2,33	0,20	0,60		0,60

45 % with rings

55 % A-type

CV(E) >> CV(L)

The entrance is most integrated.

70 % with rings

70 % C-type

CV(L)>CV(L) in 50% of the apartments

The living room is often most integrated.

5 % with rings

65 % B-type

Table 4.3
Space syntax calculation, in brief (every 3. case). Some patterns pointed out.

4.3.2.3 The Rooms Characterised According to Spatial Topology

The third column of table 4.2 (and of appendix A.4.4) lists positioning of the living rooms according to Hillier's typology explained in section 3.4.7. Table 4.3 points out the most significant changes through time. Until 1955, about 55% of the living rooms were of the A-type while 35 % were of the C-type.[121] In the early 1960s, the living room changed to being mainly of the C-type; in the period 1965-1985, 70% of the living rooms were C-type space. During the 1980s, there was again a change, and since 1995, the living room has been a B-type space in 65% of the apartments. When the living room is an A-type space entered from a neutral entrance, it is a space without social limitations on use caused by the spatial layout. The C-type of space, which is the common type of the living rooms from the period 1965-1980, is a through-passage-space, but being on a ring, not all movements have to be through the space as there are alternative routes. Concerning the most recent period, where most living rooms are B-type of spaces, the living rooms and the rooms accessible only from the living room are closely dependent on one another where potential use is concerned, similarly to the figure 2.19-1.3.c. This indicates a limited potential use for both the living room and the connected rooms; contemporary apartments can therefore be characterised as less general than the earlier ones.

4.3.2.4 Rings

Not surprisingly, the existence of rings corresponds to the type of rooms described in previous section. The occurrence of rings is listed in the second column of table 4.2 and pointed out in table 4.3. Until 1950, half the apartments in the sample (46%) had an internal ring of rooms. Most of these rings were "short" ones consisting of only three rooms. During the period 1950-1965, the frequency of apartments with internal rings was much lower, only 30% of the apartments from this period had such a ring. About 1965, there was a change again, and as many as 70% of the apartments built between 1965 and 1980 had an internal ring. As commented in section 4.3.2.1, many of these were large rings consisting of 4-7 rooms. The next significant change happened in the early 1980s; the frequency of rings decreased rapidly during few years and among the apartments built since 1990 there is only one that has an internal ring.

[121] The balcony is here defined as an extension of the living room, not as a separate connected space.

4.3.2.5 Rank of Integration

Integration is here described by Relative Asymmetry (RA), which is a value between 0 and 1, where 0 represents the highest possible integration. Table 4.3 lists the rank of integration for all rooms in every third of the apartments. In order to point out the range of integration among the main rooms, the table also lists explicitly the integration-rank of the entrance (E), the kitchen (K), the living room (L) and the main bedroom (B).[122] As expected from the connectivity graphs, the entrance is usually the most integrated room. Until 1955, there was no exception to this. During the entire period until the late 1970s, the dominant order of the main rooms regarding RA was E<L<=K<=Bd1 ; this was the case in 80% of the apartments. Since then, the rank of integration has been more varied. In the period 1980-2000, the main bedroom was more integrated than the kitchen in 50% of the apartments. Concerning the most integrated space, a change seems to be going on just now; in 4 out of the 7 most recently built apartments, the living room is the most integrated space. This rank of integration does not appear in any of the apartments built before 1957 and in only 10% of the apartments built between 1957 and 2000.[123]

4.3.2.6 Depth from Entrance

The fourth column of table 4.2 lists the mean depths from the entrance, MD(E), while figure 4.5 points out the changes through a period of time. In apartments built up to 1950, all rooms except the balcony and the bathroom have direct access from the entrance (or from a hall) in 75% of the apartments. The mean depths were thereby 1.0[124] in many of the apartments from this period. As the number of rooms in the apartments increased towards the 1970s, the spatial configuration became deeper. Whereas the average Mean Depth of the entrance was 1,27 during the period 1930-1965, it was 1,66 in the period 1970-1985. Since then, the number of rooms has decreased and the average MD(E) since 1990 is 1,43. This is significantly higher that the MD(E) in the first period due to the bush-like spatial layout of the first period, where most rooms are directly accessible from the entrance.

[122] This way to compare ranks of integration of selected rooms is a common way of comparing spatial layouts across dwellings of different sizes (in terms of the number of rooms). As shown in tables 4.2 and 4.3, such comparison of selected room makes patterns appear more clearly then the table listing the integration values of all rooms.
[123] This change towards a highly integrated living room, is parallel to the findings of Hanson (1998, p.129) that the previously segregated and representative "parlours" of small traditional London houses have changed into highly integrated living rooms as traditional working-class residents are replaced by the new middle-class.
[124] 1.0 is the lowest mean depth possible, see the "hub" in figure 3.9, section 3.4.3.

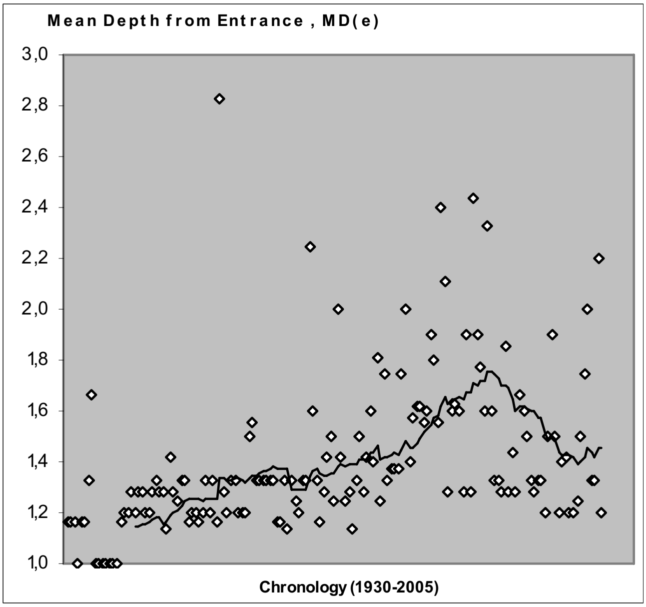


Figure 4.5
Mean depth from entrance, MD(E).

4.3.2.7 Control Value

Where the Control Value (CV) is concerned, the most significant changes are the ones of the living room compared to the entrance. Until 1955, the CV of the entrance was far higher than the CV of any other room. In the whole period of 1930-1960, the entrance was the room with the highest CV in 95 % of the apartments. Since 1960, due to the more central position of the living room, the number of apartments where the entrance has the highest CV is lower (63% of the apartments). The Control Value indicates to what extent a space is “controlling” the access to its neighbouring spaces. However, what “amount of control” this represents in real life depends on the use of the “controlling room”; a corridor having a high CV does not mean that one or some of the residents have much control over what is going on in the apartment. If a living room or a kitchen has the same high CV, the situation is different. As the residents occupy kitchen and living rooms more frequently, one can expect a high CV for these rooms to indicate “high real-life control” of what is happening in the apartment. When the typical CV has changed from 3.0 for the entrance and 0.75 for the living room to being on average more than 2.0 for the living room, the social control of life in the apartment can be assumed to have increased significantly; a change that represents a development from generality to specificity.

4.3.3 Conclusion; Three Generations of Apartments

From the analysis described above, it is possible to distinguish between three kinds of floor plan layouts with respect to the potential usability of the dwellings. Although there are exceptions, these kinds of layouts have a chronological order.

Until about 1955, most apartments had a character of generality with respect to the size of the rooms as well as to the spatial configuration. Compared to newer apartments, the bedrooms were large while the living rooms were small; they both had the potential for various uses. This generality was enforced by the spatial configuration where the kitchen, the living room and the “bedrooms” were similarly situated within a simple spatial configuration, a configuration where all the rooms were accessible from the entrance. This kind of spatial configuration, which has the justified graph figure of a shallow bush (when seen from the entry) is a layout that in principle is general.[125] The fact that the most integrated room is a neutral entrance makes these apartments even more general. The other rooms are usually equally integrated. Where living rooms from this period are more integrated than the kitchens, this is due to the balcony (which is accessed from the living room) or to a “ring” made by a door between the living room and a “bedroom”. The naming of the rooms confirms that generality was intended or at least expected. In many of these apartments, the habitable rooms are not termed by function-specific terms such as living room and bedroom but by the function-independent (and thereby general) Norwegian terms “værelse” or “rom”, which simply mean “room”. (See figure 4.6.)

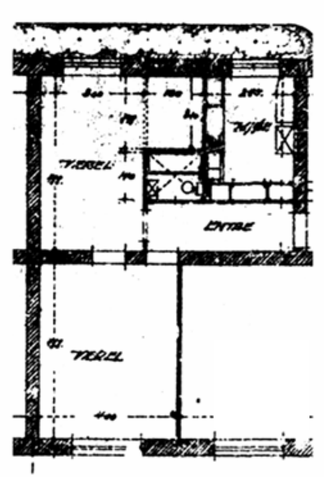


Figure 4.6
The original floor plan drawing of apartment 32-1, where the habitable rooms are termed “værelse” (English “room”) instead of being determined for sleeping or living.

[125] Hillier (1996, p. 314) describes how “depth minimalising forms” (such as a “bush”, which is as “depth-minimalised” as a form can possibly be) seem to be suited to a large number of possible functions.

From the 1950s, there was a change towards thoroughly planned functional specificity; the interior spaces became highly specialised both in terms of the design of the individual rooms and in terms of the spatial configuration. The different rooms were tailored according to specific functions; the number of rooms increased, the size of the rooms became more varied and the apartments became larger. In the period 1970-1980, more than half the apartments had WC, bathroom and washing room as three separate rooms. In most of the large apartments of this period, the kitchen was a space only partly separated from the living room. (See apartment 69-2 in figure 4.4.) Compared to the previous period, the apartments had a "deeper" spatial configuration where each room was situated according to its very specific function. With few exceptions, the entrance was still the most integrated space, but on average the living rooms had nearly the same RA-value as the entrances.

In the 1990s, the typical floor plan changed towards something in-between the two earlier main types. The number of rooms has decreased and the spatial layout is neither strictly general nor strictly specific. Where the living room is concerned, this room is general in the way that it has the size, shape and daylight conditions that make it appropriate for a wide range of activities. In spite of this, the living room is not very general; it is a room specialised for "living". Most living rooms are now through-passage-rooms and do therefore not have the potential for rest and quiet activities as is the case for the living rooms of the typical pre-1950 apartment. Compared to the complex spatial layout of the 1970-1980 apartment type, the spatial configuration has recently become more similar to the early general ones, but due to the much more central positioning of the living room, the apartments are in reality highly specific concerning the use of space. This can be illustrated by the control values listed in table 4.2; in the typical pre-1950 apartment, the neutral entrance had the highest control value, much higher than any other room, while in many of the new apartments the living room has the highest control value. The latter is a feature decisive for usability in the sense that access to (and activities in) other rooms are "controlled" from the living room.[126] Where the kitchen is concerned, the typical recently built apartment does not have a separate kitchen; it is included in the living room.

[126] Hillier (1996, p. 323-324) explicitly points out that the B-type of space, which is the kind of space of the living rooms in these new apartments, is the most constraining, as movements are required to pass the space, which has a powerful effect on the usability. (See section 3.4.7 for more about Hillier's typology of spaces.)

These three generations of apartments are the conclusion of the diachronic analysis.[127] The three generations, which are significantly different in terms of room sizes and spatial layouts, are hereafter labelled the A-, the B- and the C-type of apartments, in chronological order. In brief, the type-A is an apartment consisting of kitchen and 2 or 3 rooms,[128] where all the rooms are accessible from the entrance. This was the usual layout until the 1950s. Compared to the apartments of this A-type, the apartments of the B-type are larger in floor area as well as in number of rooms; most of them have 3 or 4 rooms. Concerning functions or use, the rooms of B-type apartments are more specific than the rooms of A-type apartments; the living rooms are larger, the bedrooms are smaller and the functions of WC, bathing and washing are often separated into three rooms. The B-type is the common layout of suburban housing projects built during the period from the late 1960s until about 1985. The third category, the C-type, is smaller than those of the B-type. They are usually of 2 or 3 rooms, the kitchen is included in the living room and the WC, the bathroom and the washing room are no longer separate rooms. Compared to the A-type, the "living and kitchen room" of the C-type has a more central[129] position in the spatial layout. The "type of space" of the living rooms, according to Hillier's typology of spaces described in section 3.4.7, is significantly different among the three generations or types of apartments. Unfortunately, this correspondence does not follow the labelling; in the A-type of apartment the living room is an **a-type of space**, in the B-type of apartment it is a **c-type of space**, while it in the C-type of apartment the living room is a **b-type of space**. Table 4.4 at next page summarise the characteristics of the three generations of apartments and figure 4.7 shows floor plans and the connectivity graphs for three apartments representing the three generations.

In the diachronic analysis described in this chapter, basic space syntax methods have been applied in order to identify changes in the development of Norwegian apartments built during the last 75 years. Awareness of this historical background as well as of the spatial features that characterise contemporary apartments should constitute a basis of knowledge relevant for further discussions on contemporary and future housing design.

[127] Through the synchronic interview-based survey following this diachronic inquiry, it was found that this typology of apartments could be improved by applying a more precise definition of the A-type, in the sense that all rooms of the apartment, not only most of them, should be directly accessible from the entrance. This improvement of the typology is commented upon in sections 3.6 and 5.1.1.

[128] As described in footnote 111, describing apartment size by the number of rooms is done according to Norwegian terminology where the rooms being counted are the "habitable rooms", i.e. rooms for living and sleeping except the kitchen.

[129] Which means that they are more integrated, if using space syntax terminology.

Table 4.4 The three types (or three generation) of apartments

Type (or generation)	**A**	**B**	**C**
Time period	1930 - 1955	1965 - 1980	2000 - ?
Average floor area (m2)	62	95	59
Number of "bedrooms"	1 - 2	2 - 3	1-2
Living room, kind of space	A	C	B
Internal rings	some -E-L-Bd-	often (large rings usually including washing room)	few
"potential usability"	general	spesific (but some flexible due to lightweight interior walls)	specific
Brief descriptions of the floor plans			
A	The bedroom/second largest room is not much smaller than the living room. All rooms have access from a “neutral” entrance.		
B	The apartments are planned for families with children The rooms are individually tailored to particular functions. The bathroom, washing room and WC are often three separate rooms. The living room is by far the largest room of the apartment. The kitchens are often openly connected to the living room Not one particular layout (due to the many rooms and thereby many possibilities)		
C	There is no separate kitchen; the kitchen is included in the living room. The living room is by far the largest room of the apartment. One bedroom is usually accessible only through the living room.		

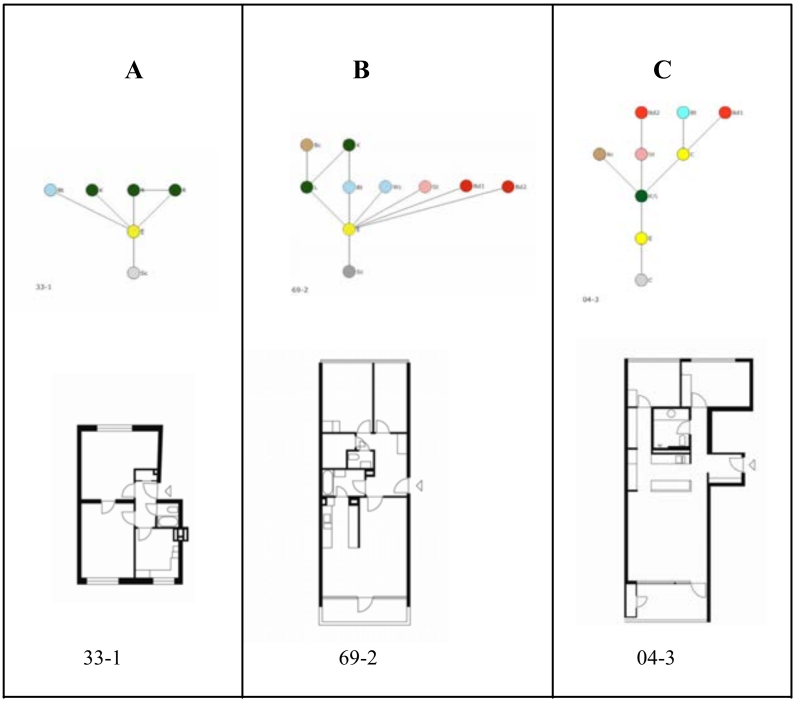


Figure 4.7 Apartments representing the three types of layouts, floor plans and justified connectivity graphs.

5 Spatial Layout and Contemporary Living; a Synchronic Survey

The conclusion of the diachronic inquiry was to describe a historical development of apartments by a typology consisting of three kinds of floor plans. This typology was found by examining the "physiognomy" of interior space and is not based on any empirical data about domestic lives. The synchronic survey, which is the content of this chapter, examines whether this typology of apartments is relevant to the residents' experiences and actions, and not only represents some features of the floor plans. In order to make it possible to grasp the main results of this survey without examining all the details presented through this chapter, the final section 5.2.9 summarises the results.

5.1 THE SURVEY

The typology identified in the diachronic survey consists of the floor plan layouts called the A-, B- and C-type of apartments. The intention of this synchronic survey has been to study and to compare these three layouts with respect to the contemporary domestic lives taking place in them and to the respective households` evaluations of their dwellings. The survey, which has been carried out by ringing on doorbells and visiting people at home, focuses on two hypotheses that emerged from the diachronic study. Firstly, if the A-, B- and C-types of apartments are significantly different concerning the degree of generality, as concluded in the previous chapter, then there should be some correspondence between apartment type and households. Apartments of the general A-type should house a larger variety of households than apartments of types characterised as more specific with respect to functions or use. Secondly, looking closer at the separate rooms, rooms of the kinds characterised as general should house a larger variety of domestic activities than rooms characterised as more specific regarding function or use. This interview-based survey attempts to shed light on these hypotheses.

5.1.1 The Sample

The strategy has been to do a pilot survey of three housing projects first and then, as the main survey, to study nine housing projects, three of each of the apartment types A, B and C. The pilot-survey was done in the spring 2004 and the main survey was carried out during the autumn of the same year. Altogether twelve projects were selected from among the 150 projects that were studied in the diachronic analysis. From each of these twelve projects, a number of identical apartments were selected for the interviews.[130] Based on the experience from the pilot-survey and with the capacity for doing the planning, the fieldwork and the analysis in mind, the intention was to examine about 20 identical apartments from each project.

The subject of interest, or the unit of analysis, is the interior space of apartments. However, when it comes to people's choices of dwellings, the geographic location is a decisive feature. Due to this importance of location, it is hard to study the effect of various floor plans by comparing apartments with very different locations; in such cases the strong influence of the location is likely to make the effect of the spatial layouts negligible. Similarly, if comparing apartments that differ in size as well as in spatial layout, it is hard to point out the influence of the latter. This has some consequences for the survey, both as concerns which projects to compare and which aspects of the apartments to examine. Generally, apartments of the B-type differ from those of the A- and the C-type in size and location, while apartments of the A-type and of the C-type are more often similar in size and location. The latter made it possible to select projects of the A-type and C-type that are comparable. Compared to this, the projects of the B-type have been selected in order to be different and presumably interesting or representative examples of the B-type, not in order to be directly comparable to apartments of the A- or of the C-type; a frame of "other circumstances being equal" between the B-type of apartments and those of the A- and the C-type has not been attempted.

Due to a tight schedule, the projects were selected in advance of finishing the diachronic analysis, at a time when the apartment types A, B and C were not actually distinguished. All the selected apartments are therefore not as typologically clear as intended. The projects 51-3 and 55-1 were selected in order to represent the A-type of apartment, while 00-1 was selected in order

[130]Identical apartment is to be understood as apartments with identical or mirrored floor plans.

to represent the C-type. These three apartments are characterised by direct access from the entrance to all rooms except the largest bedroom where the access is from the living room, see figure 5.1. According to the typology of A, B and C described in section 4.3.3, the apartments 51-3, 55-1 and 00-1 are all hybrids between the A- and the C-type. While the intention was to select one project of each type (A, B and C) for the pilot-survey and three of each type for the main survey (altogether 4 projects of each apartment-type), the types of apartments actually selected came out differently due to these three apartments being hybrids of an "AC-kind". Table 5.1 shows the types and some basis information of the selected apartments, while appendix A.5.1 contains some further information. Figure 5.1 present the floor plan drawings of the apartment, while figure 5.2 lists the space syntax graphs. 32-1, 55-1 and 74-1 are the projects of the pilot-survey while the other 9 have been examined in the main survey. Each apartment is identified similarly to the principle described in section 4.1:

<u>33</u>-1 A4	-the year of completion of construction is 1933
33-<u>1</u> A4	-number distinguishing projects built the same year
33-1 <u>A4</u>	-number distinguishing apartments from the same project, the last number (here: 4) refers to the floor number[131]

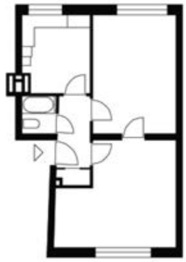
Table 5.1 Apartments selected for the survey

Project	Rooms	Size (m2)	Type *	Name and address	Location (by part of Oslo)	
32-1	*2*	*57*	*A*	*Maridalsveien 64, Maridalsveien 64*	*Ila*	*Centre-N/E*
33-1	2	50	A	Fagerheimen, Fagerheimgata 2-12	Dælenenga	Centre-E
41-2	3	75	A	Bøkkerløkka, Brockmannsgate 8-10	Bjølsen	Outer-centre-N
51-3	3	74	AC	Akersbakken, Frederikke Qvamsgate 13-21	Ila / Gamle Aker	Centre-N
55-1	*3*	*67*	*AC*	*Hovin, St.Jørgens vei 41-47*	*Hovin*	*East*
70-2	2	56	C	Vosseløkka, Vossegate 18, 20, 20B	Torshov / Lilleborg	Outer-centre-N/E
74-1	*4*	*83*	*B*	*Orremyr, Odvar Solbergs vei 28-30*	*Romsås*	*North/East*
76-1	4	95	B	Svarttjern, Odvar Solbergsvei 126-128	Romsås	Nort/East
77-2	4	104	B	Sandaker, Åsengata 2-4-6-8	Sandaker	Outer-centre-N
83-1	4	98	B	Casinetto, Gustav Vigelandsvei 42-44-46	Skøyen	Outer-centre-W
98-2	3	62	C	Frydenlundsgate, Frydenlundsgate 5-7	Bislett	Centre
00-1	3	70	AC	Byhagen, Nordbygata 3-11	Grønland	Centre-E

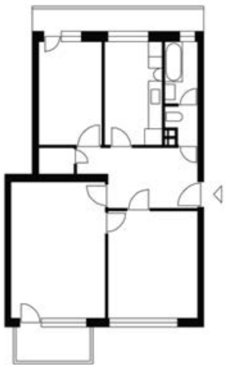
* : Apartment layout according to the typology described in section 4.3.3.
Projects in *italics* are studied by the pilot survey

[131] Floor number counted as in Norwegian, i.e. "ground floor" is floor number one.

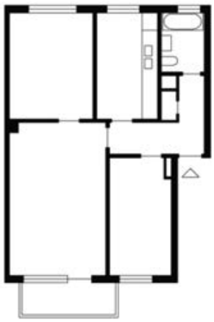
32-1



33-1



41-2

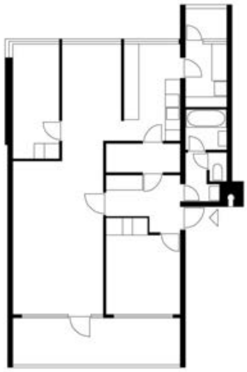


51-3

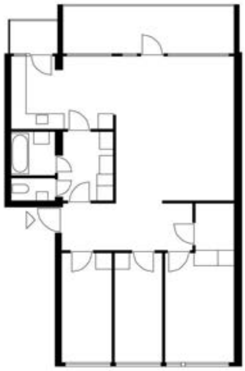
55-1

70-2

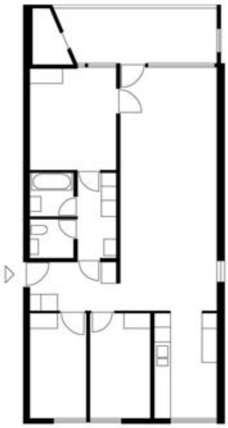
Figure 5.1.a Floor plans of the selected apartments, 1 : 300.



74-1

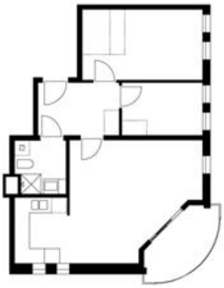


76-1



77-2

83-1



98-2

00-1

Figure 5.1.b Floor plans of the selected apartments, 1 : 300.

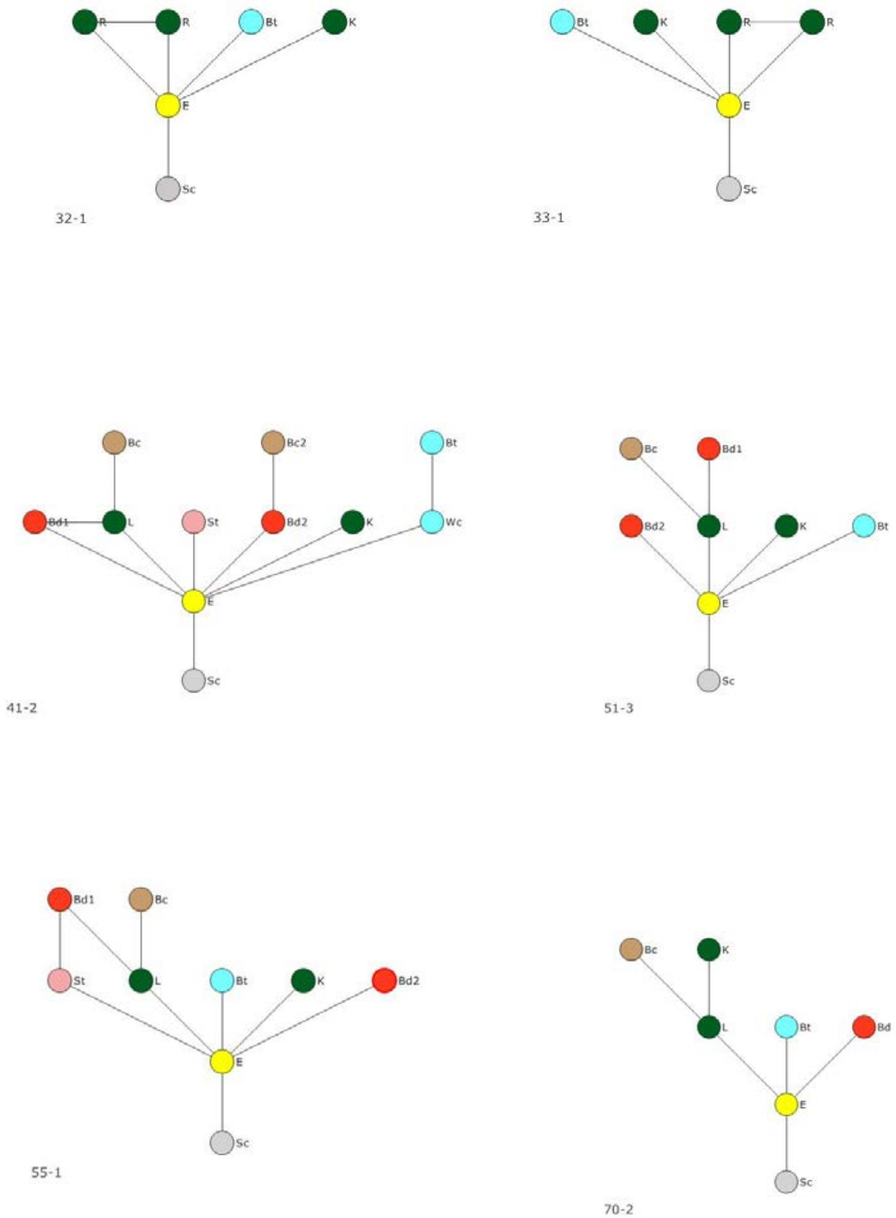


Figure 5.2.a
Connectivity graphs of the selected apartments.

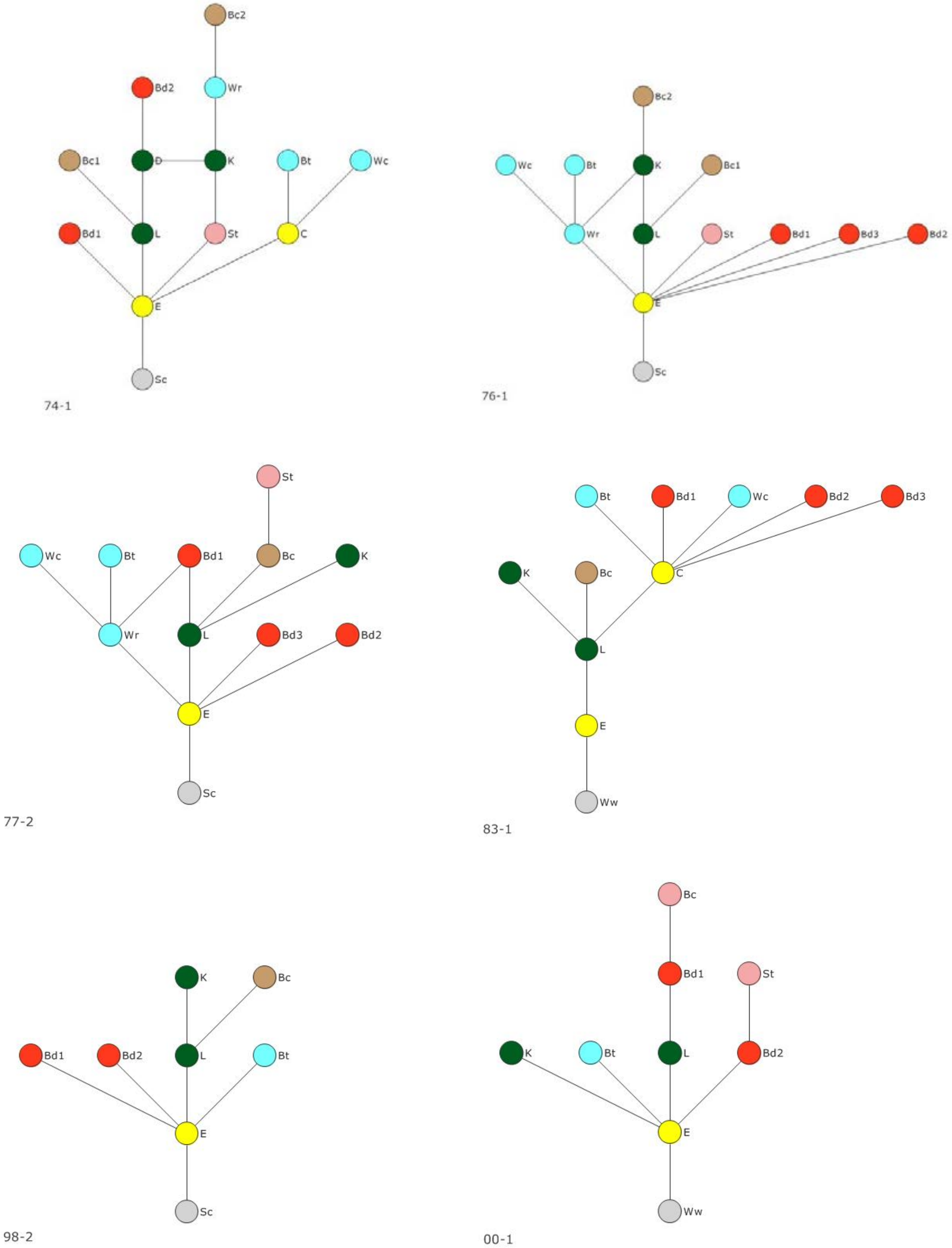


Figure 5.2.b
Connectivity graphs of the selected apartments.

5.1.2 The Interviews and the Questionnaires

When ringing doorbells for interviews or when distributing questionnaires to be returned by post, a feedback percentage higher that 50 is hard to achieve. Since those who give feedback are rarely a representative sample of those receiving the requests, such answers are an unreliable basis for generalisation unless further information is known. Visiting people at home and doing interviews that include looking into all the rooms of their dwelling, is intruding on people's privacy and cannot be expected to give a higher response than usually achieved by simple questionnaires. In order to increase the rate of response on some basic questions, this survey has been carried out as interviews of "two steps".

A few questions were selected for "Step1"-interviews to be done immediately after ringing the door bell; it should be easier to answer the questions than to explain that one has not time to participate. In these Step1-interviews we asked about the kind of household (in terms of number of persons, gender, age and relationship), about having the space needed or not (did the households consider their living cramped, appropriate or spacious) and about well-being in general. Finally, the residents were asked about their inclination to participate in a more in-depth "Step2"-interview. By this strategy, it should be possible to achieve a response rate close to 100% for the Step2-interview, as all households asked for Step2-interviews had declared their willingness to participate in advance. Appendix A.5.2 shows the forms applied for the interviews; page 1 shows a form for the Step1-interview while pages 2-7 show a form for the Step2-interview.

The issues asked about in the Step2-interviews, were the residents' reasons for choosing their apartment, their evaluation of their apartment, their use and disposition of rooms and their preferences about selected issues concerning their dwelling. The interviews were done by visiting people in their homes and consisted of both open questions and questions with predefined categories of answers. Information about the disposition or use of rooms was procured in two ways; firstly, (while being guided through the apartment by one of the residents) by sketching the furniture in on a floor-plan-drawing, and secondly, by asking explicitly where various activities took place. The latter was done by giving each activity a sum of 12, and asking the residents to distribute this sum of 12 among the rooms of the apartment in accordance with the extent to which this particular activity usually took place in each room. In a case where TV was watched only in the living room, the activity of watching TV is described by the value of 12 for the living room. In a case where breakfast was eaten in the kitchen as well as in the living room, and as often in the kitchen as in the living room, the activity of eating breakfast is described by the value of 6 for the kitchen as well as for the living room.[132] Page 4 in the “Step2-form” (see A.5.2) shows this “activity-versus-room-form” of the interview in apartment 83-1-9.

The experience from the pilot-interviews became a basis for planning the number of interviews to be carried out in Step1 and in Step2 of the main interviews. Among the roughly 15-20 identical apartments (from each of the nine projects) selected for the Step1-interview, about six apartments were intended to be studied by the Step2-interviews.[133] This would give a total number of about 200 apartments to visit by ringing doorbells doing the Step1-interviews and about 70 visits into apartments doing the Step2-interviews.

The interviews were done by myself and 4 students of architecture, with two of us working in partnership during each interview. Being two persons working together was important both in order to manage an interview within a reasonable time and in order to reduce the misinterpretations that can easily occur during an interview. Contrary to our expectations; being two did not seem to be an invasion in the apartments or into the privacy of the residents; in fact it was easier to achieve a relaxed atmosphere of conversation being two visitors than being only one. The schedule was to do the interviews for one housing project a week, which means to do 15-20 Step1 interviews and about 6 Step2 interviews a week. The fieldwork for each project was carried out on two evenings between 5 and 9 p.m. Parallel to this fieldwork, we had to summarise and edit the answers of the interviews done the previous week and to prepare for the interviews to be done the following weeks. These preparations consisted in selecting the apartments, getting permission to do the interviews, editing the forms and informing all households in advance by mail. We carried out the fieldwork by doing the Step1-interview in all the selected apartments plus one or two Step2-interviews on the first evening. On the second evening, we did the rest of the Step2-interviews and attempted once again Step1-interviews in the apartments where nobody was at home on the first evening.

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[132] In the pilot-interviews, we only asked whether an activity took place in a room. To achieve more nuanced information, the form was developed into having the possibility of “weighting”. A similar way of analysing domestic activities was applied in the Swedish housing research “Bostadsutformning, bostadsanvändning”.
[133] In the projects where the number of interviews is lower, such as in the project 55-1 (see table 5.2), this is rarely due to people changing their mind about being willing to participate but to our lack of time or to people not being at home.

5.1.3 Response

Table 5.2 lists the number of apartments requested and the response rates in each of the 12 projects. Due to the number of identical apartments really existing in each housing project, the numbers of selected apartments came out somewhat different from the intended 20, being 19 on average. The response rates on the Step1-questions varied from 29 to 81 % and were 57 % on average. As expected, only a few people who were at home did not answer the Step1-questions. Concerning the question about kinds of households, we managed to get the relevant information about more apartments than those with people at home. Because a name-plate picturing and naming mother, father and two children or a house porter describing the households on the third floor as an old widow on the right and a young couple on the left, were sufficient information for determining the categories of the households, we did not depend on people being at home in all apartments. The "response rates" about kinds of household were therefore as high as 91 % on average.

As mentioned in the previous section, the plan was to carry out Step2-interviews in about six apartments of each project and to select these apartments among those where the residents had confirmed their interest in participating when asked about this in the Step1-interview. However, this selection was rarely required as the number of people at home and interested in participating in the Step2-interview exceeded the intended six Step2-interviews only in a few cases.

Table 5.2 Interviews , Step1 and Step2, samples and responses

Project number	Type *	Number of apartments selected	Step 1				Step 2	
			Answers		Kind of households known		Willing to participate	Interviews done
			number	%	number	%		
32-1	*A*	*12*	*8*	*67*	*12*	*100*	*6*	*5*
33-1	**A**	20	10	50	19	95	6	5
41-2	**A**	20	9	45	20	100	7	6
51-3	**AC**	28	8	29	28	100	6	4
55-1	*AC*	*14*	*9*	*64*	*10*	*71*	*8*	*3*
70-2	**C**	24	12	50	20	83	7	4
74-1	*B*	*18*	*8*	*44*	*18*	*100*	*4*	*4*
76-1	**B**	20	14	70	20	100	7	5
77-2	**B**	21	15	71	21	100	5	4
83-1	**B**	21	17	81	19	90	7	6
98-2	**C**	18	6	33	11	61	4	3
00-1	**AC**	15	12	80	14	93	6	6
Total		231	128		212			55
Average		19	11	57		91		5

* : Apartment layout according to the typology described in section 4.3.3.

5.1.4 Questions and Answers

From the time a question is figured out until an answer is received, there are many possibilities for misunderstandings and misinterpretations. Thanks to the pilot-survey, questions that did not work, could be improved or left out in advance of the main survey.

Initially we intended to find out both what had been important for the households when they chose their apartment and what the households` qualitative evaluation of their apartment was.[134] First, we asked about the importance of the apartment, the building and the nearby surroundings, by applying a five-step scale from "no importance" to "very important". Then we asked about qualitative evaluations of the same (the apartment, the building and the nearby surroundings). This did simply not work; just a few persons managed to distinguish between describing the importance and doing a qualitative evaluation. Even in the cases where people understood the difference between the questions, it was hard to find interesting information by analysing the answers. This is due to a very close correlation between the evaluation of quality and the evaluation of importance; features evaluated as of high quality are likely to be considered important.[135] The conclusion to be drawn from this is that there is no reason to separate a question into sub-questions that are neither understood by the person being asked, nor possible to keep separate when analysing the answers. We therefore changed the questions towards more open ones. Such open questions might very well be combined with more guided questions with pre-defined categories of answers. In order to keep an open question open, this open question should be asked in advance of more guided ones on the same subject. By such structured questions, it is possible to capture detailed information about the subjects that are the main focus, without loosing information about the importance of the subject (as perceived by the person being asked). In these interviews the open question "Why did you choose this dwelling?" (question 1.4, see A.5.2) was followed first by some more focused questions such as

[134] Even in cases where the subject is of no importance for the person being interviewed, it is possible to get seemingly informative answers describing the quality by a scale from good to bad when asking explicitly for such an evaluation. In principle, what is interesting is therefore not such an evaluation of quality but the evaluation of quality "weighted" in accordance with the importance of the subject (as considered by the person being asked). This is what we attempted to grasp by distinguishing between the evaluation of importance and the evaluation of quality.

[135] When asking for evaluation of features that are chosen by the person being interviewed, this correspondence is not hard to understand. As such choices often is based on personal judgements, a negative evaluation would imply to disqualify this personal judgement. A reasonable way to make life comfortable is therefore to reduce the importance of the aspects of life where you have made failures and to focus on your more successful choices.

"Was there anything about the apartment that was important for your choice?- If so, please specify" (question 1.4.d) and then, finally, by questions with predefined categories of answers.

The forms applied in order to capture how various activities take place in the different rooms of an apartment were not straightforward to answer.[136] Quite surprisingly, these questions were a section of the interviews that worked very well; almost without exceptions the residents were deeply involved and corrected us immediately if they considered our notes differed from their answers. Our conclusion from this is that the challenge of designing interviews is not the complexity of questions; problems arise when even seemingly simple questions are slightly unclear. Pilot surveys are extremely important in order to identify questions that are easily misunderstood as well as questions on which the answers do not provide information relevant to the subject of interest; a bad working pilot survey might be the best basis for a successful subsequent main survey.

[136] This form is page 4 (side 4) in the Step2-interview-form, see A.5.2. For further explanations see section 5.1.2 and 5.2.5.

5.2 THE RESULTS

5.2.1 General

This section sheds light on the typology of apartments identified in chapter 4 by describing the results from the synchronic survey. The analyses have been carried out by looking for general patterns in the answers as well as by examining some out of the many possible combinations of information concerning kind of household, layout of apartments and the residents' preferences in detail. The main information analysed is as listed below.

Information about apartments and households:
- floor plan of the apartment (by projects, see the floor plans in A.5.1)
- principle layout of the apartment (by the types A, B and C, see 4.3.3)
- apartments size (by number of rooms and by floor area)
- sizes of rooms (by floor area)
- household by kind of households (by category 1-5, see section 5.2.3)
- household by number of persons

Information about use and about the residents' preferences:
- evaluation of well-being
- evaluation of spaciousness (in terms of cramped versus spacious living)
- use of rooms (according to furniture and naming of rooms)
- daytime spent in the different rooms
- kind of activities taking place in the different rooms
- changes of the interior space (made after the building was constructed)

The following sections present a selection of the analyses that have been carried out and are ordered in accordance with the subjects listed below. The results come from the pilot-survey as well as from the main survey.[137]

5.2.2 Spaciousness of living
5.2.3 Kinds of households
5.2.4 Time spent in different rooms
5.2.5 Rooms and activities
5.2.6 Changes made by the residents
5.2.7 Preferences about alternative layouts

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[137] As some questions were improved after the pilot-survey, some data from the pilot-survey are less complete than similar data from the main survey. However, in most questions there have been minor or no changes between the pilot-survey and the main survey, and the data from all twelve projects are comparable. "The distribution of daytime living" is an example of information that is collected only in the main survey. (See 32-1, 55-1 and 74-1 in table 5.3.)

5.2.2 Spaciousness of Living

The size is an important feature of the dwelling as regards floor area as well as number of rooms. The size of dwelling preferred by a particular households depends on the number of persons as well as on the composition of the household. Where Norwegian housing conditions are concerned, Dagfinn Ås (1971) has categorised to what extent living conditions were cramped or spacious. He compared the number of persons to the number of "habitable rooms"[138], and defined the size of a dwelling to be appropriate when the number of persons in the household was equal to the number of habitable rooms.[139] By this definition, a couple lives in an apartment of appropriate size when this has "two rooms", this usually means that the dwelling, in addition to kitchen and "service spaces", has a living room and one bedroom. By the same definition, a couple with one child have an apartment of appropriate size when they have one more room, a room usually used as a bedroom for the child. The data collected in this survey is an opportunity to examine if such an evaluation of spaciousness still makes sense today.

Based on the definitions of Ås, a five level "index of spaciousness", ranging from "very cramped" to "very spacious", would be as follows.

"index"	description	number of persons versus rooms
1	Very cramped[140]	$P>R+1$
2	Cramped	$P=R+1$
3	Appropriate size	$P=R$
4	Spacious	$P=R-1$
5	Very spacious	$P<R-1$

Where P is the number of persons in the household, and R is the number of "habitable rooms" in the apartment.

[138] Number of habitable rooms does not count "service spaces" such as kitchen, bathrooms, washing, storage or circulation.

[139] Ås (1971, p. 25). The same definition is used by Guldbrandsen (1973, p. 8). For another evaluation of cramped living conditions, see footnote 20, which describes the "official definition" in Oslo in 1893.

[140] By this definition single person households live "very cramped" only when the number of rooms is "0". In common terminology there is no such thing as a dwelling of no rooms. However, if the traditional Norwegian terminology is applied (which means that the kitchen is not counted), an apartment where the kitchen is in the living room and where there is no separate bedroom would be an apartment of "0" rooms. Unless such few rooms are compensated by a very large living room, "very cramped" is not an inappropriate description of sleeping in your only room that includes the kitchen, a kind of layout that is common for new apartments now. (As will be commented in chapter 6 and 7.)

Due to the increasing standard of living[141] and the increasing number of single-family households since 1970,[142] one can expect the preferred size of apartments according to Ås to be out of date. Given that the Ås' results were representative in 1973, households of to-day would be expected to describe their apartments as more cramped than indicated by the index above. Particularly where single person households are concerned, evaluations of spaciousness as defined by Ås is likely to differ from evaluations done by residents to-day. According to Guldbrandsen (1973) single-person-households accept "one-room-apartments" (a dwelling with living room and kitchen but without a separate bedroom) only for limited periods; as a student's home or in other temporary phases it is acceptable, while at more permanent stages of life adults were not satisfied with homes without a separate bedroom. According to Guldbrandsen single-person-households can be expected to prefer more space than described by the categories of Ås.

Table 5.3 lists this "index of spaciousness" versus spaciousness as evaluated by the residents of the apartments examined by the Step2 interviews. In the interviews, the residents were asked to characterise the spaciousness of their apartment by the 5-level scale listed on previous page; ranging from very cramped to very spacious. (Question 5 in the Step1-interview, see A.5.2.) When this "real-life-evaluation" by the residents is compared with the "index of spaciousness" according to Ås, the average deviation is "minus 0.4", which in literal terms means that the households evaluate their living as somewhat more cramped than indicated by the index. Such relatively good correspondence between this index and the evaluations means that the simple and 30 years' old definition of what is an appropriate number of rooms is less outdated than expected above.[143] However, the deviations between real life experiences and the index depend on the kind of household. For singles the deviation is -0.7 on average, which means that singles prefer almost one more room than what according to the index should be an apartment of appropriate size. This corresponds well to the above-mentioned conclusions of Guldbrandsen (1973). For couples with children, the average deviation is +0.2, which means that family-households feel comfortable with slightly less place than what would be an appropriate number of rooms according to the index.

[141] Concerning spaciousness of living, the average number of person per room in Norwegian apartments was 0.6 in 2001 compared to 0.8 in 1980. (According to Statistisk Sentralbyrå / Statistics Norway, http://www.ssb.no/fobbolig/tab-2002-09-23-01.html)

[142] In 2001 the number of single-households in Norway was 740 000 (38%) compared to 426 000 (28%) back in 1980. (According to Statistisk Sentralbyrå / Statistics Norway, see table 1.3.

[143] If keeping a scale of integers, the evaluation of spaciousness should differ from the index by more than 0.5 before an adjusted scale (i.e. a scale where P=R+1 was the appropriate size) would be more descriptive.

Table 5.3 Summary of survey

Project	Rooms	Type	Floor area	Apartment	Persons	Age	Area/person	Well being	Spaciousness: Evaluation	Spaciousness: By Index	Spaciousness: Differance	Daytime living: Living	Daytime living: Kitchen	Daytime living: Bedroom1	Daytime living: Bedroom 2	Daytime living: Bedroom 3	Spaciousness (by evaluation and by floor area per person) 1	2	3	4	5
32-1	2	A	57	**A3**		30	29		4	3	1									29	
				A4		30	29		4	3	1									29	
				B1		60	57		2	4	-2							57			
				C1		60	57		5	4	1										57
				C4		40	29		2	3	-1							29			
			Average		1,6	44	40		3,4	3,4	0,0										
33-1	2	A	50	**A4**		30	50	5	5	4	1	7	3	2	-	-					50
				B1		30	25	3	2	3	-1	8	3	1	-	-		25			
				C5		30	50	5	4	4	0	6	3	2	-	-				50	
				D2		30	25	5	3	3	0	8	2	1	-	-			25		
				D5		20	25	5	3	3	0	5	3	4	-	-			25		
			Average		1,6	28	35	4,6	3,4	3,4	0,0	6,8	2,8	2,0							
41-2	3	A	75	**A4**		30	25	5	4	3	1	6	2	1	3	-				25	
				C1		30	37	5	4	4	0	11	0	1	0	-				37	
				C3		40	19	5	2	2	0	5	3	1	2	-		19			
				D1		30	25	4	3	3	0	4	4	2	1	-			25		
				D2		30	37	5	3	4	-1	4	3	2	1	-			37		
				D4		60	25	5	4	3	1	6	1	1	4	-				25	
			Average		2,8	37	28	4,8	3,3	3,2	0,2	6,0	2,2	1,3	1,8						
51-3	3	AC	74	**C2**		30	25	4	4	3	1	5	5	0	0	-				25	
				C5		60	74	5	4	5	-1	2	5	0	5	-				74	
				D2		30	74	5	4	5	-1	10	2	0	0	-				74	
				F1		30	37	5	3	4	-1	6	2	3	1	-			37		
				F4		30	37	5	4	4	0	8	2	1	0	-				37	
			Average		1,8	36	49	4,8	3,8	4,2	-0,4	6,2	3,2	0,8	1,2						
55-1	3	AC	67	**C1**		30	22	4	3	3	0								22		
				C2		70	67	5	4	5	-1									67	
				D2		60	33	5	3	4	-1								33		
			Average		2,0	53	41	4,7	3,3	4,0	-0,7										
70-2	2	C	56	**A4**		60	56	5	4	4	0	8	2	0	-	-				56	
				B1		80	56	5	3	4	-1	12	0	0	-	-			56		
				C3		40	56	5	3	4	-1	10	1	1	-	-			56		
				G2		30	28	5	3	3	0	6	0	4	-	-			28		
			Average		1,3	53	49	5,0	3,3	3,8	-0,5	9,0	0,8	1,3							
74-1	3(4)	B	83	**A2**		20	41	5	5	4	1										41
				B4		60	41	5	3	4	-1								41		
				D3		20	21	4	3	2	1								21		
			Average		2,7	33	34	4,7	3,7	3,3	0,3										
76-1	4	B	95	**A1**		40	19	5	2	2	0	5	3	0	1	2		19			
				A4		80	95	5	4	5	-1	7	2	1	1	0				95	
				B1		30	47	5	4	5	-1	6	3	0	0	2				47	
				B4		30	16	3	3	2	1	4	4	0	0	0			16		
				D4		80	95	5	5	5	0	6	2	0	3	0					95
			Average		3,0	52	54	4,6	3,6	3,8	-0,2	5,6	2,8	0,2	1,0	0,8					
77-2	4	B	104	**A4**		70	52	4	3	5	-2	6	2	0	2	0			52		
				A5		80	104	5	5	5	0	6	2	1	2	0					104
				A7		70	52	5	3	5	-2	4	2	-	2	2			52		
				C6		70	52	4	4	5	-1	4	4	1	1	2				52	
			Average		1,8	73	65	4,5	3,8	5,0	-1,3	5,0	2,5	0,7	1,8	1,0					
83-1	4	B	98	**3**		40	33	5	3	4	-1	7	3	0	1	0			33		
				4		50	49	5	5	5	0	4	3	4	0	1					49
				7		50	49	3	2	5	-3	4	4	0	2	2		49			
				8		40	33	5	3	4	-1	4	2	2	1	2			33		
				9		30	33	4	4	4	0	4	5	0	0	2				33	
			Average		2,6	42	39	4,4	3,4	4,4	-1,0	4,6	3,4	1,2	0,8	1,4					
98-2	3	C	60	**A1**		40	30	5	5	4	1	8	-	4	0	-					30
				A4		50	60	4	4	5	-1	9	-	3	0	-				60	
				B3		30	60	4	3	5	-2	10	-	1	0	-			60		
			Average		1,3	40	50	4,3	4,0	4,7	-0,7	9,0		2,7	0,0						
00-1	3	AC	70	**A2**		30	35	4	4	4	0	5	3	0	3	-				35	
				A4		50	70	4	4	5	-1	2	8	2	0	-				70	
				B3		60	70	5	3	5	-2	8	2	0	0	-			70		
				C2		30	35	5	4	4	0	7	2	3	0	-				35	
				C4		30	35	5	4	4	0	4	2	3	0	-				35	
				E3		50	35	5	4	4	0	4	4	2	1	-				35	
			Average		1,7	42	47	4,7	3,8	4,3	-0,5	5,0	3,5	1,7	0,7						
Average deviation evaluation - index											-0,4			Average of all				33	38	46	61
Average of A type					2,1	36	33,9	4,7	3,4	3,3	0,1							32	28	32	53
Average of B type					2,5	51	48,9	4,5	3,6	4,2	-0,6							34	35	57	72
Average of C type					1,3	47	49,2	4,7	3,6	4,1	-0,6								50	58	30
Average of AC-type					1,8	42	46,3	4,7	3,7	4,2	-0,5								41	49	

If we examine the results listed in table 5.3, we find some correspondence between the principle apartment-layout and the evaluation of spaciousness. As pointed out by table 5.4, households living in the A-type apartments evaluate their living as about as spacious as described by the “index”, while those living in the other types of apartments consider their living significantly more cramped than indicated by the index. We find a similar pattern when comparing the floor areas. Households who consider their living conditions appropriate where spaciousness is concerned, have on average 28 m2 per person in the apartments of the A-type, while those living in the B-type and the C-type apartments need on average 35 and 50 m2, respectively, in order to consider their apartment appropriate. However, as the apartments to compare becomes few when going into such details, it is hard to generalise about the influence of the spatial layout on the evaluation of spaciousness without examining further samples.[144]

In conclusion, returning to the evaluation of spaciousness in general, the very simple index based on Ås (1971) is still relevant. Even though such an index of spaciousness is far from being a scientific measurement, the index still makes sense today as an indicator of real-life experience where the sizes of Norwegian dwellings are concerned. However, the fact that the preferred number of rooms depends on the size of the rooms must be kept in mind. Due to the very different sizes of rooms and the move towards small apartments with tiny rooms apparent now (see section 6.3), evaluations of spaciousness of living by simply comparing the number of persons to the number of rooms, should be done with more care for newer apartments than for older ones.

Table 5.4 Apartment type and spaciousness of living.

Apartment type	Area/ person	Spaciousness by evaluation	by index *	deviation	Area/person in apartments evaluated by the residents to be of "appropriate size"
A	34	3,4	3,3	0,1	28
B	48	3,6	4,2	-0,6	35
C	49	3,6	4,1	-0,5	50
AC	46	3,7	4,2	-0,5	41

* : about "index of spaciousness" , see section 5.2.2

[144] There is for instance a correspondence between “floor area needed” and the age of the households, which need larger samples in order to be examined. (See footnote 175.)

5.2.3 Kinds of Households

In order to examine the distribution of households in different apartments, some categories of households must be determined. The categories should cover the entire "population" of households, they should distinguish between households presumed to be different concerning the subject of interest, they should not be too numerous[145] and they should have some correspondence to the categories applied in official Norwegian statistics of housing and population. The latter makes it possible to compare the results of this survey to existing relevant statistics. The five categories listed below were defined thereafter.[146] Most people pass through many of these categories of households in their lifetime.

1. Single person
2. Couple
3. Single person with children 0-18 years
4. Couple with children 0-18 years
5. Several adults, with or without children
   (more than one adult, where at least one is not part of a couple) [147]

Kinds of households distinguished by five categories.

5.2.3.1 Comparing all apartments

Table 5.5 lists the distribution of households according to the categories just listed. Some patterns appear clearly when comparing the distribution of kind of households in all projects (see table 5.5.a). Most significant and worth further comment is the many "several-adults-households" in projects 41-2, 74-1 and 00-1 and the few couples and many households with children in project 83-1.

[145] When samples are small, the categories should be few. If there are many, even simple statistics such as applying percentages and comparing this to larger populations do not make sense.
[146] This is two categories fewer than those applied in the official Norwegian statistics by the SSB (Statistisk Sentralbyrå / Statistics Norway). However, the categories of SSB can easily be merged into these five.
[147] Category 5 contains households where there are other adults than one single or one couple. Some examples of such households are:

- two (or more) adults (for instance students) sharing an apartment (without being a couple)
- households with adult children living at home
- households with a room for rental
- households with adult relatives other than the mother and father

Table 5.5 Distribution of households, by kind of household

Table 5.5.a All projects, ranked by chronology

Case, by project number	Type of apartment	Number of rooms	Floor area (m2)	Households known (numbers)	Average time of living (**)	Average "well-being" (*)	Kind of households (numbers)						Kind of households (% of known)				
							1	2	3	4	5		1	2	3	4	5
							Single	Couple	Single + child(ren)	Couple + child(ren)	Several adults	Unknown (of sample)	Single	Couple	Single + child(ren)	Couple + child(ren)	Several adults
32-1	**A**	2	57	12			6	4	1		1	0	50	33	8		8
33-1	**A**	2	50	19	3,2	4,6	13	5	1			1	68	26	5		
41-2	**A**	3	75	20	11,4	4,9	6	4	2	5	3	0	30	20	10	25	15
51-3	**AC**	3	74	27	9,4	4,9	13	8	1	3	2	1	48	30	4	11	7
55-1	**AC**	3	67	12		4,5	6	4		2		4	50	33		17	
70-2	**C**	2	56	19	7,0	4,7	15	4				4	79	21			
74-1	**B**	4	83	18		4,3	3	7	3	2	3	0	17	39	17	11	17
76-1	**B**	4	95	19	14,1	4,6	6	5	2	5	1	1	32	26	11	26	5
77-2	**B**	4	104	21	16,9	4,4	12	6		3		0	57	29		14	
83-1	**B**	4	98	19	6,2	4,7	4		4	10	1	2	21		21	53	5
98-2	**C**	3	62	11	3,0	4,3	5	4	1		1	7	45	36	9		9
00-1	**CA**	3	70	14	2,9	4,8	3	6	1	1	3	1	21	43	7	7	21
			Average										43	28	8	14	7
			Total of Oslo (percentage of total population of households)										52	18	5	16	9

Table 5.5.b Apartments of two rooms

32-1	**A**	2	57	12			6	4	1		1	0	50	33	8		8
33-1	**A**	2	50	19	3,2	4,6	13	5	1			1	68	26	5		
70-2	**C**	2	56	19	7,0	4,8	15	4				4	79	21			
											Average		66	27	5	0	3

Table 5.5.c Apartments of three rooms

41-2	**A**	3	75	20	11,4	4,9	6	4	2	5	3	0	30	20	10	25	15
51-3	**AC**	3	74	27	9,4	4,9	13	8	1	3	2	1	48	30	4	11	7
55-1	**AC**	3	67	12		4,5	6	4		2		4	50	33		17	
98-2	**C**	3	62	11	3,0	4,3	5	4	1		1	7	45	36	9		9
00-1	**CA**	3	70	14	2,9	4,8	3	6	1	1	3	1	21	43	7	7	21
											Average		39	32	6	12	11

Table 5.5.d Apartments of four rooms

74-1	**B**	4	83	18		4,3	3	7	3	2	3	0	17	39	17	11	17
76-1	**B**	4	95	19	14,1	4,6	6	5	2	5	1	1	32	26	11	26	5
77-2	**B**	4	104	21	16,9	4,4	12	6		3		0	57	29		14	
83-1	**B**	4	98	19	6,2	4,7	4		4	10	1	2	21		21	53	5
											Average		32	23	12	26	7

(*) : Average well being for all households participating in Step1-interview, the scores are therefore not exactly the same as "well-being" in table 5.3 that summarises the fewer apartments visited by the "Step2-interviews".

(**) : Average time of living in the apartment, among those living there.

The "Several-Adults-Households"

The projects 41-2, 74-1 and 00-1 seem to be particularly preferred by "several-adults-households" as the percentages of such households are 15, 17 and 21 in these projects, while it is less than 10 in all the other projects. Given that the spatial layout strongly influences the kinds of households preferring an apartment, which is a basic assumption of this study, these three apartments should have some features in common that distinguish them from the others. When looking at the layout in terms of the typology distinguished in section 4.3.3, no such pattern is found as the apartment 41-2 is of the A-type, 74-1 is of the B-type while 00-1 is a hybrid of the AC-kind. However, when looking more closely at the rooms and their configurations, some patterns that might be relevant occur. Firstly, all these three apartments are among the five (out of the total twelve) where there are two bedrooms and where there is a kitchen separate from the living room and with direct access from the entrance. Not surprisingly, households consisting of adults that are not couples, prefer apartments with more than one bedroom. Concerning the kitchen separate from the living room, this is an advantage for similar reasons. As such a kitchen can be used without disturbing what goes on in the living room and vice versa, this is a layout likely to be appreciated by households consisting of two (or more) adults not closely related. A look at the positions of the bedrooms reveals another feature being characteristic for these three apartments; the main bedroom (or a large second-largest bedroom, which is the case in 00-1 where a storage room works as an extension of the second largest bedroom) is accessible directly from the entrance and located as far from the other bedroom as possible. (See floor plans in figure 5.1 and connectivity graphs in figure 5.2.) In conclusion, two features of the floor-plan-layouts seem to be important if intending to attract households consisting of adults which are not couples: one is that there should be a large bedroom positioned by the entrance and not close to the other bedroom, the other is that the kitchen and the living room should be separate from each other. By such a floor plan layout, adults not intimately related might have some privacy within the one apartment.

Children or Not; Contradicting Preferences

Where households with children are concerned, the number of such households in the apartments 83-1 is as high as 74 % (21+53). In comparison, the percentage of households with children in the whole of Oslo is 21 (5+16)[148] while the percentages among the other large apartments of this study (74-1, 76-1 and 77-2) are 28 (17+11), 37 (11+26) and 14, respectively. Apartment 83-1 differs from the others in this study by having a spatial layout very similar to common single-family houses, in the way that three bedrooms, the bathroom and the WC constitute a part of the dwelling located farthest from the entrance and separated from the rest of the apartment by a corridor. This spatial layout might explain a higher that average rate of households with children, but hardly an increase to 250 %, which is the rate of households with children in 83-1 compared to 74-1 and 76-1. By looking at the situation outside the apartments, a more plausible explanation of the very high rate of households with children in project 83-1 can be found. This project consists of nearly 300 apartments and is located in the west of Oslo among mainly single family houses and attached houses. It is close to Frognerparken, which is the largest park in Oslo. The areas between the houses have the character of playgrounds, the use of cars is restricted within the area and school as well as kinder garden are located nearby. As long as the apartments were not particularly unsuitable for households with children, anything but a high rate of such households in this project would be surprising. The rate of couples without children is converse to the rate of families with children. Among the 21 households in this project known through this survey, there are no couples without children, while the percentages of such households in the other 11 projects vary between 20 and 43. A likely explanation is that couples without children do not appreciate the crowding inevitable with the numerous children and their equipment; this is simply not a pleasant place to live for people who prefer to sit in peace and quiet on their balconies. The fact that the apartments as well as the out-door areas are preferred by households with children, makes the place unattractive for couples without children. This project shows how the feature of being highly appreciated by one particular kind of household may imply the exclusion of others.

[148] According to Statistisk Sentralbyrå / Statistics Norway, see table 1.3.

5.2.3.2 Comparing Apartments of Similar Sizes

The presumed effect of apartment layout on the kind of households choosing an apartment can be examined more closely when comparing apartments of the same number of rooms. In this study, there are three projects where the typical apartments have “two rooms”. These are 32-1 and 33-1, which are of the A-type, and 70-2, which are of the C-type. (See table 5.5.b.) 70-2 is inhabited by singles and couples only[149], while 32-1 and 33-1 have other categories of households as well. Even though the A-type of apartments house a wider range of households than the apartments of the C-type, the A-type apartments do not have a high frequency of households with children. As mentioned earlier, the number of rooms must be borne in mind when studying the layout of apartments compared with the kinds of households living in the apartments; whatever the spatial layout might be, an apartment with only one bedroom cannot be expected to house many large families. As these apartments have “two rooms”, which usually means only one bedroom, the small number of households with children is not surprising.

Where apartments of three rooms are concerned, the sample contains altogether five cases. 41-2, which is of the A-type, 98-2, which is of the C-type and the cases 51-3, 55-1 and 00-1, which are all hybrids described as being of an AC-kind[150]. (See table 5.5.c.) The A-type apartment 41-2 has the most even distribution of kind of households; all kinds being represented, varying from 10% of the apartments housing singles with children to 30% of the apartments housing single-person households. Looking more closely at the rate of households with children, the percentages among the A-type and the C-type apartment are 35 (10+25) and 9, respectively.[151] The AC-hybrid-type of apartments, which are 51-3, 55-1 and 00-1, have a rate of children families in between the two others; the percentages being respectively 15, 17 and 14.

[149] The C-type apartment 70-2 is the apartment with the highest rate of single person households (79%).
[150]About this AC-kind, see section 4.3.3 and 5.1.1.
[151] This is the same pattern as among the apartments of two rooms. Among the apartments of two rooms, the C-type apartments 70-2 are the only ones where there live no children. (See table 5.5.b.)

When it comes to the apartments of four rooms, all are of the B-type. (See table 5.5.d.) Due to the sizes of the apartments as well as the locations within the city, these apartments differs from the A- and the C-type of apartments; the B-type apartments are larger than the others and are usually located in the suburbs built in the period around the 1970s. 74-1 is the B-type apartment examined by the pilot-survey while 76-1, 77-2 and 83-1 are the B-type apartments selected for the main survey. 74-1 and 76-1 are both located at Romsås, a suburb in the north of Oslo, while 77-2 and 83-1 are located in the north and west of central Oslo, respectively. The sizes of the four B-type apartments vary from 83 to 104 m2. When built, the 74-1 had only two bedrooms, the fourth room of this apartment was in original a dining room. As expected, due to the floor plan of the apartment as well as to the suburban locations, both 74-1 and 76-1 house many families with children; the percentages being respectively 28 (17+11) and 37 (11+26). The distribution of households in the two other projects, 77-2 and 83-1, differs significantly from those in 74-1 and 76-1 in the sense that the rate of households with children is remarkably high in 83-1 and very low in 77-2. The high rate of households with children in project 83-1 is commented upon in the previous section. What therefore should be examined more closely here, is the project 77-2 where the percentage of households with children is as low as 14. 77-2 is the largest apartment in the survey, with a lift, underground car parking and a floor area of 104 m2. Given the layout of the apartments, the case 77-2 has a low rate of households with children and a high rate of singles.[152] However, the explanation is not that the apartment or the building is particularly appropriate for singles or particularly inappropriate for households with children. 77-2 is the case of this survey where the residents have been living in their apartments for the longest time, on average they have been living there for as long as 17 years. Among the 15 households which answered this question, 7 have been living there all the 28 years since the building was constructed. To put it simple; those who bought these apartments as dwellings for family-living back in the 1970s still live here; having no garden to worry about, a spacious apartment, a nice view, access by lift and no more loan to pay, there is no reason to move when getting older. Despite what by first thought might appear to be an apartment preferred by limited categories of households only, 77-2 is appropriate for a large variety of households, ranging from young families with children to elderly.

[152] Only the cases 33-1 and 70-2, which are the smallest apartments in the survey (being only half the size of 77-1), have a higher percentage of single person households.

The results of this section particularly worth further comment, are those found by the comparison of the three-rooms apartments. First, the kinds of households living in the different apartments correspond almost too well with the hypotheses about generality described in section 4.3.3; the A-type of apartment, which is the one characterised as most general, houses the greatest diversity of households, the C-type house the least, while the hybrid-type AC has a diversity of households in between the two. Second, the deviation between the results from the three projects of the latter kind is remarkably low. Larger samples should be examined in order to find out if there really in general is such a significant correspondence between distribution of households (by kinds of households) and the spatial layout of apartments.[153] If this should be the case, the spatial layout is of even higher importance to dwelling preferences than initially assumed in this thesis.

As just described, the survey seems to confirm the assumption that the general A-type of apartments should house a diversity of households. However, this does not imply that such apartments are necessarily better dwellings than those that are more specific with respect to functions or use; apartments chosen by limited kinds of households might be highly appreciated by those particular households preferring them. The project 70-2 is such an example, housing only singles and couples and achieving a high score on well-being, see table 5.6. The distribution of households living in the project 41-2 is very different, representing a wide range with respect to kinds of households. This diversity of households does not imply that the apartment necessarily is highly appreciated by everybody living there. The higher than average rate of households with children might for instance be explained by the fact that many other dwellings and housing areas are not suitable for households with children; giving a higher rate of such households in the kind of dwellings that are fairly suitable. Where singles and couples are concerned, the percentage living in 41-2 is far below the total in Oslo (being 50 % (30+20) compared to 70 % (52+18) in the whole of Oslo, see table 5.5). It could therefore be that this apartment is not suitable for singles and couples, even though some such households live there. A way to examine this more closely is to compare the well-being in 41-2 to the well-being in 70-2. All the ten households in 70-2 participating in the Step1-interview were singles or couples and they evaluated their well-being as 4.7 on average, where score 5.0 is the maximum possible. In the apartments 41-2 two households of singles or couples were interviewed; both evaluated their well-

[153] Among the three-rooms apartment examined here, there is for instance some differences in apartments' floor areas, ranging from 62 to 75 m2, differences that partly corresponds to the apartments types A, C and AC. In order to analyse the spatial configurations more closely, the sample examined should consist of apartments even more equal by size or of apartments were the floor areas (if possible?) do not corresponds with the spatial configuration of the apartment.

being to the score of 5.0. (See table 5.6.) If we compare the well-being in all apartments of all the 12 projects, 41-2 is the one with the highest score, being 4.9 on average. (See table 5.5) The high rate of households with children is therefore unlikely to be explained by the apartment being inappropriate for others; 41-2 is highly appreciated by all the kinds of household living there. Another result indicating that the residents in 41-2 are very well being is how long they have been living there. As shown in table 5.5, 41-2 is the project with the second highest score in this respect, only beaten by the project 77-2 described earlier in this section. This closer look at the apartment 41-2 thereby indicates that generality represents a potential not only for housing a wide range of the existing variety of households, but also for being highly appreciated by such a variety of households.

Table 5.6 Spaciousness of living and well-being in 41-2 and 70-2

Apartment type	Rooms	Spatial layout	Floor area (BRA)	**Nr.**	Age	Area/person	Well being	Spaciousness: Evaluation	Spaciousness: By Index	Spaciousness: Differance	Spaciousness (by evaluation and by floor area per person) 1	2	3	4	5
41-2	3	A	75	**A1**	30	75	5	4	5	-1				75	
				A4	30	25	5	4	3	1				25	
				B3	40	15	5	3	1	2			15		
				C1	30	37	5	4	4	0				37	
				C3	40	19	5	2	2	0		19			
				D1	30	25	4	3	3	0			25		
				D2	30	37	5	3	4	-1			37		
				D3	40	19	5	3	2	1			19		
				D4	60	25	5	4	3	1				25	
			Average		37	31	4,9	3,3	3,0	0,3		19	24	41	
70-2	2	C	56	**A1**	30	56	5	2	4	-2		56			
				B1	80	56	5	3	4	-1			56		
				D1	90	56	5	3	4	-1			56		
				A2	20	28	5	4	3	1				28	
				C2	30	28	4	2	3	-1		28			
				D2	40	56	5	3	4	-1			56		
				G2	30	28	5	3	3	0			28		
				H2	40	56	3	3	4	-1			56		
				C3	40	56	5	3	4	-1			56		
				A4	60	56	5	4	4	0				56	
				E4	40	56	5	3	4	-1			56		
			Average		50	48	4,7	3,0	3,7	-0,7		42	52	42	

5.2.4 Time Spent in Different Rooms

Information about the amount of daytime spent in the different rooms was found similarly to the method applied when asking about the different domestic activities.[154] We asked the households to give their total daytime spent at home the sum of 12 and to distribute this sum among the rooms in accordance with the daytime spent in each room. The results in terms of the "relative amount of daytime spent in different rooms" are listed in table 5.3 and summarised in table 5.7 below. As expected, the living room is the room of all apartments where most daytime is spent. Some more interesting patterns can also be found. If the results are ordered according to the time spent in living rooms, as shown in the lower table in table 5.7, three categories can be distinguished. The first category is the apartments with the lowest scores (varying from 4.7 to 5.6), the second is those with medium score (6.0 and 6.8) while the third is those with by far the highest score (both being 9.0).[155] These categories corresponds with the typology of apartments in the way that the B-type apartments have least daytime spent in the living room, those of the A type have the medium while the C-type apartments have the most. These results are in the following examined more in detail.

Table 5.7 Relative amount of daytime spent in different rooms.

Ranked by project number (= chronography)						
Project	Apartment type	Living room	Kitchen	Bedroom 1	Bedroom 2	Bedroom 3
33-1	A	6,8	2,8	2,0		
41-2	A	6,0	2,2	1,3	1,8	
51-3	AC	6,2	3,2	0,8	1,2	
70-2	C	9,0	0,8	1,3		
76-1	B	5,6	2,8	0,2	1,0	0,8
77-2	B	5,0	2,5	0,7	1,8	1,0
83-1	B	4,7	3,4	1,2	0,8	1,4
98-2	C	9,0		2,7	0,0	
00-1	AC	5,0	3,5	1,7	0,7	

Ranked by time spent in living room		
83-1	B	4,7
77-2	B	5,0
76-1	B	5,6
41-2	A	6,0
33-1	A	6,8
70-2	C	9,0
98-2	C	9,0

[154] See section 5.1.2.

[155] When in the interviews asking about daytime living, the kitchens of 70-2 and 98-2 are "modelled" as a separate room and as included in the living room, respectively. (See the floor plans in A.5.1 and "daytime living" in table 5.3.) This different modelling can theoretically be questioned (as the kitchen in 70-2 is just slightly more separated from the living room than is the case for the kitchen in 98-2) and it is not consistent with the space syntax analysis where both these kitchens are modelled as separate rooms (due to both being partly enclosed from the living and both having windows). However, as there is hardly any daytime living in the kitchen in 70-2, this different modelling has no influence on the results discussed here.

The first category consists of the large apartments 76-1, 77-2 and 83-1, which are the apartments of the B-type. Despite the fact that living room in the B-type of apartments is a room particularly designed for daytime living, these apartments are those with the lowest relative amount of time spent in their living rooms. This can be explained by "demand" as well as by "supply". In 77-2, households consisting of few persons live in large apartments. In such cases, all bedrooms are not needed for sleeping and are thereby available for other purposes. On the other hand, households consisting of many persons (households of which there are several in 76-1 and 83-1) can be expected to have a "demand" for places appropriate for simultaneous and "not easily co-existing activities". As these large apartments have more rooms (compared to the smaller apartments) where such "parallel activities" might possibly take place, daytime living becomes less concentrated in the living room.

The second category, - those where the living rooms have the medium score concerning daytime spent, are 33-1 and 41-2, which are both apartments of the A-type. The relative amount of time spent in the living rooms is greater here than is the case for any of the B-type apartments described above, even though the A-type of apartments is described as most general due to several rooms that should be appropriate for daytime living. Explanations of this are not obvious, but if we take a closer look at the spaciousness of living, some patterns occur. Figure 5.3 shows how the spaciousness of living differs between apartments of different layouts, and particularly between those of the A-type and those of the B-type. The average "spaciousness of living" is "appropriate" for the A-type while it is about "spacious" for the B-type of apartment[156] and the deviation of spaciousness is far smaller among the A-type apartments than among the B-type of apartments.[157] As will be elaborated in section 5.2.5, when examining where different domestic activities take place, spacious living seem to increase the use of the rooms other than the living room. When the apartments of the A-type are compared with those of the B-type, their more "appropriate" size on average, as well as the fact that very few A-type apartments are spacious or cramped, might explain that more time is spent in the living rooms in the apartments of the A-type than in the living rooms of the apartments of the B-type.[158]

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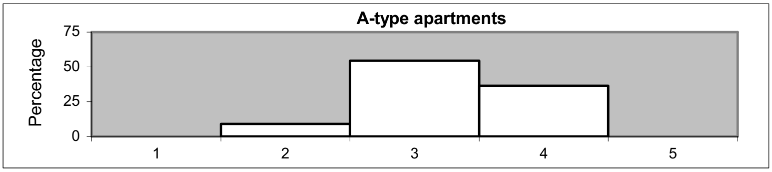
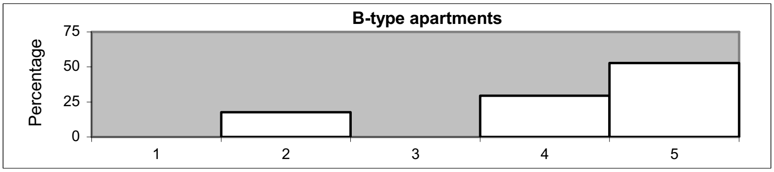
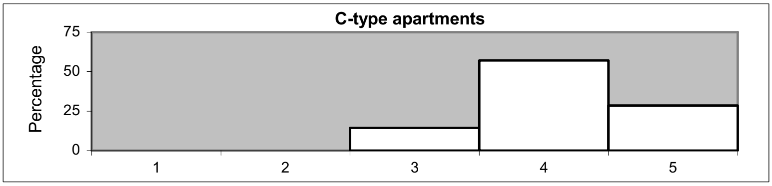
[156] The average "spaciousness by index" for the A- and the B- type of apartments are 3.4 and 3.7, respectively. The "spaciousness by evaluation" shows the same pattern, being 3.3 and 4.2, respectively. (Found from table 5.3, see also figure 5.3 on next page.)

[157] Most apartments of the A-type (9 out of 16) are "appropriate" (which means that they achieved the score of 3 on "index of spaciousness") while only one is "cramped" and not a single apartment is "very cramped" or "very spacious". Out of the 17 B-type apartments there is not one "appropriate" while 2 are "cramped" and as many as 9 are "very spacious", see figure 5.3.

[158] As explained in section 5.1.1, the apartments of the B- type differ from the others by size and by location. Too strong conclusions should therefore not be drawn from direct comparisons of apartments of the B-type and the others, such as the comparison attempted here.







"Spaciousness of living" (by index, see section 5.2.2)	A-type apartments number	%	B-type apartments number	%	C-type apartments number	%
1 very cramped						
2 cramped	1	9	3	18		
3 appropriate	6	55			1	14
4 spacious	4	36	5	29	4	57
5 very spacious			9	53	2	29
total	11	100	17	100	7	100
average "spaciousness"	3,3		4,2		4,1	

Figure 5.3 "Spaciousness of living" in the differnt types of apartments

The third category, - the apartments where the amount of daytime spent in the living rooms is highest, are the projects 70-2 and 98-2. These are the C-type of apartments, where the kitchens are not separate rooms but tiny appendices to the living rooms. In conclusion, these results about time spent in the living rooms correspond to the typology of apartment layouts, but the C-type is the only one where this correspondence can be explained by generality or specificity of the floor plans. The result that the living rooms in the C-type apartments are those with most day-time living is due to the fact that these apartments have few or no other places where daytime living can possibly take place. The pattern that more time is spent in the living room of the “general” A-type apartments than in the living room of the “specific” B-type apartment can be explained by taking into account the effects of spaciousness of living. As will be commented further in the next section, spacious living seems to reduce the time spent in the living room.

5.2.5 Rooms and Activities

When it comes to the use of individual rooms in the apartments, information was found by the "activity-versus-room"-form described in section 5.1.2. The legend of numbers of activities is listed below, where the numbers 1-13 represent daytime activities while numbers from 14 to 17 represent sleeping.

	Activietes, legend
1	"Everyday" breakfast
2	"Everyday" dinner
3	Dinner with guests
4	Other kinds of visits (simple or no serving of food/drink)
5	Children's play
6	Handwork, small repairs
7	Reading for entertainment (newspapers, magazines, books)
8	Reading / studies / work
9	Watching TV
10	Radio / stereo listening
11	PC
12	Children's homework
13	Hobbies
14	Night-time sleeping (except guests)
15	Relaxing / sleeping at daytime, adults
16	Relaxing / sleeping at daytime, children
17	Night-time sleeping, guests

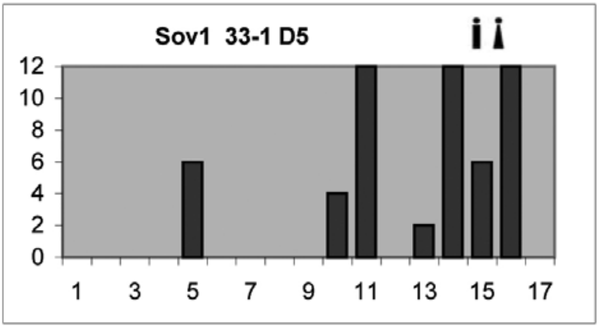


Figure 5.4 Rooms and activities. Legend and example of diagram. Activities in "bedroom" in apartment 33-1-D5.

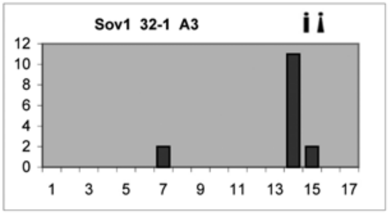
While table 5.3 illustrates daytime spent in different rooms, figures 5.5 – 5.7 summarises some answers about where different activities take place. Two kinds of "table-pages" are applied. The first is one that lists the results of one kind of room across all apartments in one project (such as figure 5.5.a on next page, which shows the use of bedrooms in project 32-1), while the other summarises the results of one particular room across all projects (such as figure 5.6 and 5.7, summarising living rooms and largest bedrooms, respectively). If we look at the first kind (the figures 5.5), the table on the upper left summarises the data from the interview[159], while the diagrams on the right illustrate the results for each apartment visited. Each column in these diagrams represents one activity. As described in section 5.1.2, the value of 12 (which is the maximum value on the Y-axis) represents the total of an activity; a score of 12 means that the activity takes place in one room only. When the columns are few, few activities take place in the room, while many columns means that a wide range of activities takes place there. In order to compare results from several projects, there are two kinds of "summarised diagrams; one showing the "average" and another showing the "maximum" (or "all") scores of each activity. These summarised diagrams, showing the results of particular rooms of all apartments of one project, are shown at the bottom left of the "project-by-project-pages" in figure 5.5. These two show similar patterns but capture somewhat different information; while "average/gj.snitt" illustrates the mean, "all/alle" illustrates the variety of use going on among all apartments in one project better. These summarised diagrams of all projects are what is presented in the second kind of "table-pages", such as the figures 5.6 and 5.7, summarising the results of living rooms and largest bedrooms, respectively.[160]

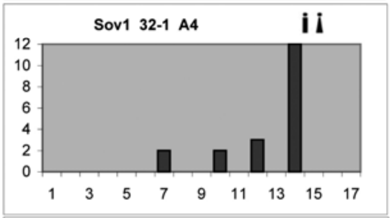
These tables with the results for particular rooms in all projects (figures 5.6 and 5.7) show some patterns. As expected, the range of activities in a room corresponds to the amount of time spent; living rooms where much time is spent are the living rooms where many activities take place.[161] Where the bedrooms are concerned, the apartments of the A-type (32-1, 33-1 and 41-2) have the bedrooms (or the second largest rooms) with the widest range of use (see figure 5.7). This is also as expected since general bedrooms (i.e. bedrooms that may not only be used for sleeping, but are also appropriate for various daytime activities) is a basic characteristic of the A-type of apartments. The two following sections analyse the results more in detail.

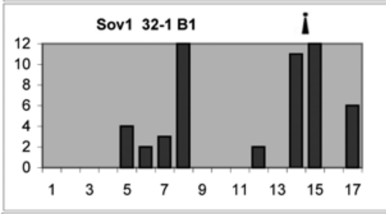
[159]A.5.2 ("side 4" in "skjema 2") shows how the results were captured in the interviews.
[160] Where rooms with much activity are concerned, patterns are most easily found by the "average diagrams" while the "maximum / all" diagram (which lists the maximum values of the activities instead of calculating the mean values) is most useful for rooms with fewer activities. "Average" is therefore applied when examining the living rooms (see figure 5.6) while "all" is applied in order to examine the bedrooms (see figure 5.7).
[161] Compare 33-1, 70-2 and 98-2 in figure 5.6 with table 5.7.

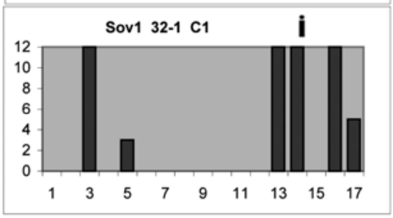
Rom	Soverom 1				
Prosjektnr.	32-1				
Rom areal	18,2				
Himmelretning	vest				
Utsikt	stort lyst gårdsrom				
Leilighetsnr	**A3**	**A4**	**B1**	**C1**	**C4**
Husholdningskategori	1	2	1	1	3
Antall beboere	1	2	1	1	2
1. Hverdagsfrokost (uten gjester)					
2. Hverdagsmiddag (uten gjester)					
3. Middag med gjester				12	
4. Andre besøk av voksne, enkel/ikke servering					2
5. Lek (hvis barn i husholdningen eller på besøk)			4	3	5
6. Håndarbeid / småreparasjoner			2		
7. Lesing, underholdning (aviser/magasiner/bøker..)	2	2	3		4
8. Lesing, faglig (studier , hjemmearbeid...)			12		
9. Se på TV					
10. Høre på musikkanlegg/radio		2			
11. PC					2
12. Lekser (hvis barn i husholdningen)		3	2		11
13. Hobby				12	
14. Sove (natt, husholdningens faste beboere)	11	12	11	12	12
15. Hvile / sove på dagtid, voksne	2		12		
16. Hvile / sove på dagtid, barn				12	12
17. Sove (overnattingsgjester)			6	5	

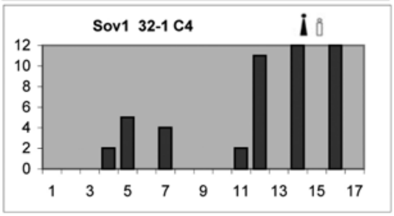
C1: sov1 = "lillestue"

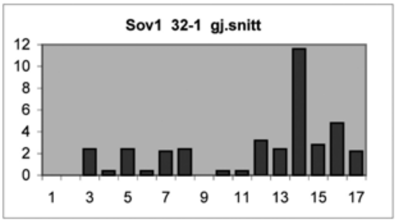












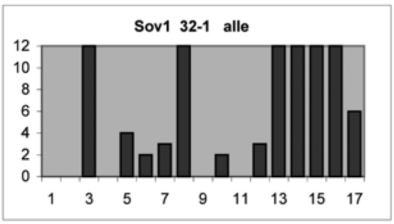
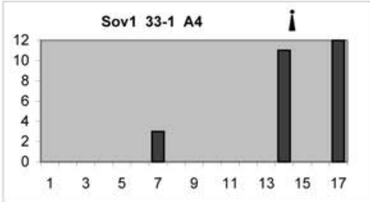
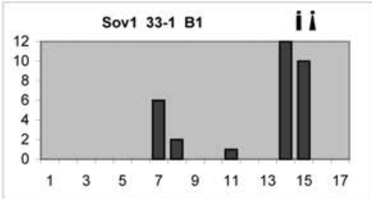
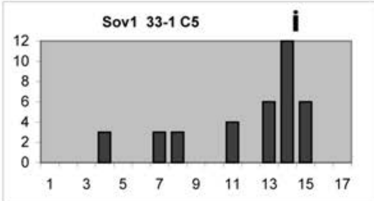


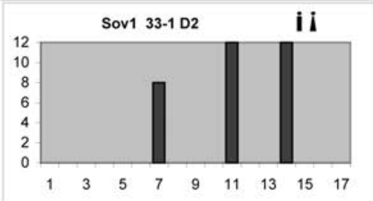
Figure 5.5.a
Bd1-32-1

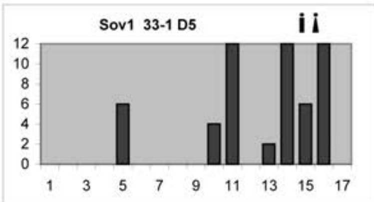
Rom	Soverom 1					
Prosjektnr.	33-1					
Rom areal	15,5					
Himmelretning	nord-vest					
Utsikt	gårdsrom					
Leilighetsnr		**A4**	**B1**	**C5**	**D2**	**D5**
Husholdningskategori		1	2	1	2	2
Antall beboere		1	2	1	2	2
1. Hverdagsfrokost (uten gjester)						
2. Hverdagsmiddag (uten gjester)						
3. Middag med gjester						
4. Andre besøk av voksne, enkel/ikke servering				3		
5. Lek (hvis barn i husholdningen eller på besøk)						6
6. Håndarbeid / småreparasjoner						
7. Lesing, underholdning (aviser/magasiner/bøker..)		3	6	3	8	
8. Lesing, faglig (studier , hjemmearbeid...)			2	3		
9. Se på TV						
10. Høre på musikkanlegg/radio						4
11. PC			1	4	12	12
12. Lekser (hvis barn i husholdningen)						
13. Hobby				6		2
14. Sove (natt, husholdningens faste beboere)		11	12	12	12	12
15. Hvile / sove på dagtid, voksne			10	6		6
16. Hvile / sove på dagtid, barn						12
17. Sove (overnattingsgjester)		12				

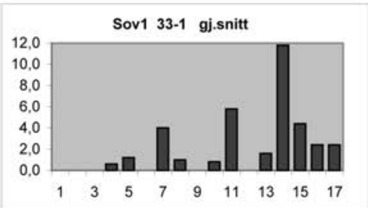












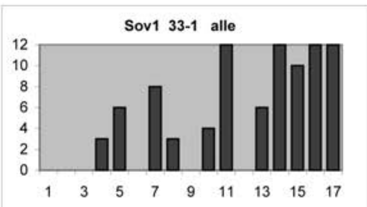
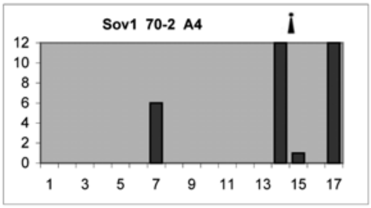
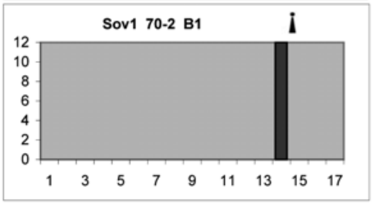
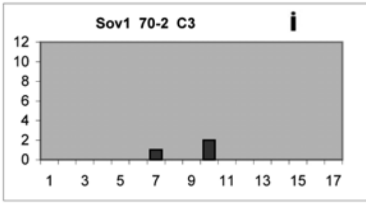


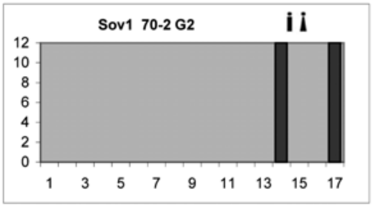
Figure 5.5.b
Bd1-33-1

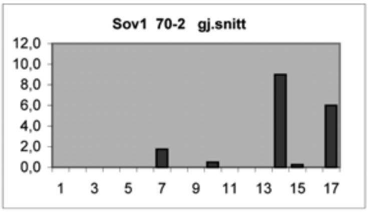
Rom	Soverom 1				
Prosjektnr.	70-2				
Rom areal	9,3				
Himmelretning	øst eller vest				
Utsikt	gate eller hageside				
Leilighetsnr		**A4**	**B1**	**C3**	**G2**
Husholdningskategori		1	1	1	2
Antall beboere		1	1	1	2
1. Hverdagsfrokost (uten gjester)					
2. Hverdagsmiddag (uten gjester)					
3. Middag med gjester					
4. Andre besøk av voksne, enkel/ikke servering					
5. Lek (hvis barn i husholdningen eller på besøk)					
6. Håndarbeid / småreparasjoner					
7. Lesing, underholdning (aviser/magasiner/bøker..)		6		1	
8. Lesing, faglig (studier , hjemmearbeid...)					
9. Se på TV					
10. Høre på musikkanlegg/radio				2	
11. PC					
12. Lekser (hvis barn i husholdningen)					
13. Hobby					
14. Sove (natt, husholdningens faste beboere)		12	12		12
15. Hvile / sove på dagtid, voksne		1			
16. Hvile / sove på dagtid, barn					
17. Sove (overnattingsgjester)		12			12











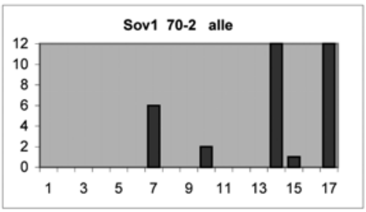
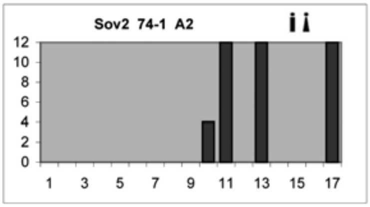
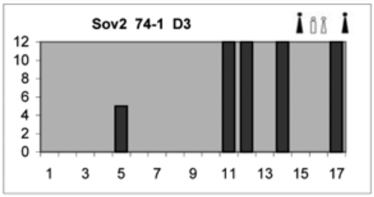
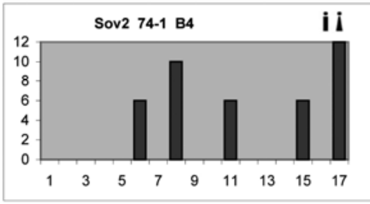


Figure 5.5.c
Bd1-70-2

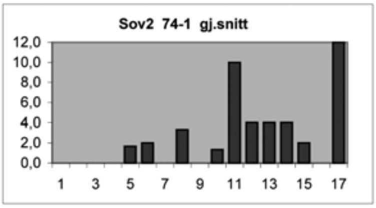
Rom	Soverom 2			
Prosjektnr.	74-1			
Rom areal	8,4			
Himmelretning	øst			
Utsikt	skog/panorama			
Leilighetsnr		**A2**	**D3**	**B4**
Husholdningskategori		2	5	3
Antall beboere		2	4	3
1. Hverdagsfrokost (uten gjester)				
2. Hverdagsmiddag (uten gjester)				
3. Middag med gjester				
4. Andre besøk av voksne, enkel/ikke servering				
5. Lek (hvis barn i husholdningen eller på besøk)			5	
6. Håndarbeid / småreparasjoner				6
7. Lesing, underholdning (aviser/magasiner/bøker..)				
8. Lesing, faglig (studier , hjemmearbeid...)				10
9. Se på TV				
10. Høre på musikkanlegg/radio		4		
11. PC		12	12	6
12. Lekser (hvis barn i husholdningen)			12	
13. Hobby		12		
14. Sove (natt, husholdningens faste beboere)			12	
15. Hvile / sove på dagtid, voksne				6
16. Hvile / sove på dagtid, barn				
17. Sove (overnattingsgjester)		12	12	12







B1: større leilighet, har også rom i u.etg.(kalt .leil nr.x i andre skjema)



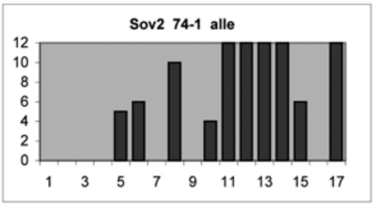
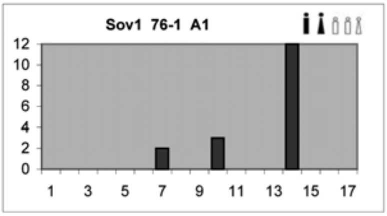
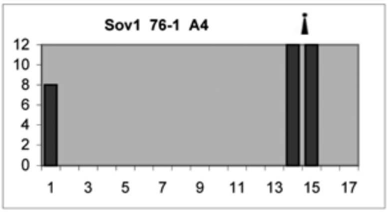
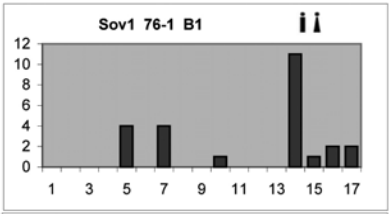


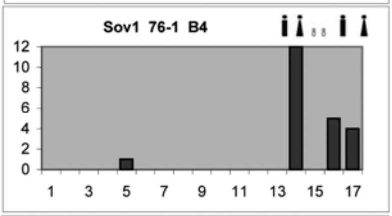
Figure 5.5.d
Bd2-74-1

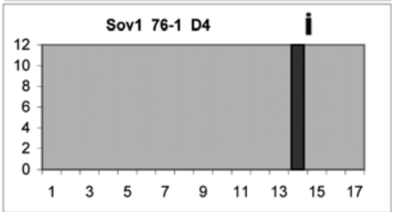
Rom	Soverom 1				
Prosjektnr.	76-1				
Rom areal	12				
Himmelretning	nord				
Utsikt	skog				
Leilighetsnr		**A1**	**A4**	**B1**	**B4**	**D4**
Husholdningskategori		4	1	2	5	1
Antall beboere		5	1	2	6	1
1. Hverdagsfrokost (uten gjester)			8			
2. Hverdagsmiddag (uten gjester)						
3. Middag med gjester						
4. Andre besøk av voksne, enkel/ikke servering						
5. Lek (hvis barn i husholdningen eller på besøk)				4	1	
6. Håndarbeid / småreparasjoner						
7. Lesing, underholdning (aviser/magasiner/bøker..)		2		4		
8. Lesing, faglig (studier , hjemmearbeid...)						
9. Se på TV						
10. Høre på musikkanlegg/radio		3		1		
11. PC						
12. Lekser (hvis barn i husholdningen)						
13. Hobby						
14. Sove (natt, husholdningens faste beboere)		12	12	11	12	12
15. Hvile / sove på dagtid, voksne			12	1		
16. Hvile / sove på dagtid, barn				2	5	
17. Sove (overnattingsgjester)				2	4	

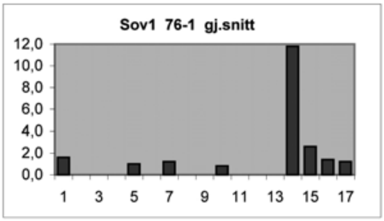












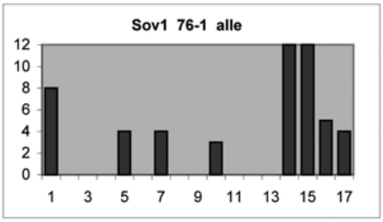
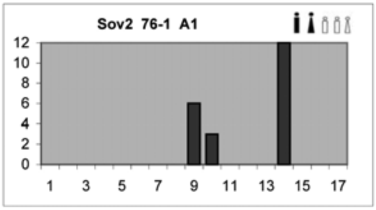
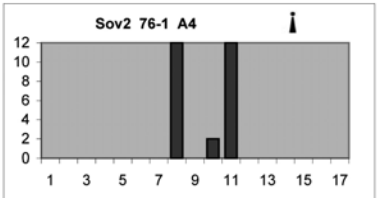


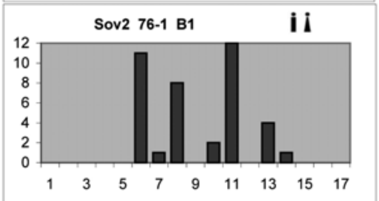
Figure 5.5.e
Bd1-76-1

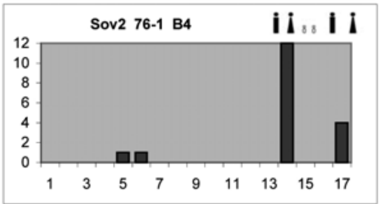
Rom	Soverom 2				
Prosjektnr.	76-1				
Rom areal	8,7				
Himmelretning	nord				
Utsikt	skog				
Leilighetsnr	**A1**	**A4**	**B1**	**B4**	**D4**
Husholdningskategori	4	1	2	5	1
Antall beboere	5	1	2	6	1
			(*)		
1. Hverdagsfrokost (uten gjester)					
2. Hverdagsmiddag (uten gjester)					
3. Middag med gjester					
4. Andre besøk av voksne, enkel/ikke servering					
5. Lek (hvis barn i husholdningen eller på besøk)				1	
6. Håndarbeid / småreparasjoner			11	1	4
7. Lesing, underholdning (aviser/magasiner/bøker..)			1		
8. Lesing, faglig (studier , hjemmearbeid...)		12	8		
9. Se på TV	6				
10. Høre på musikkanlegg/radio	3	2	2		8
11. PC		12	12		12
12. Lekser (hvis barn i husholdningen)					
13. Hobby			4		12
14. Sove (natt, husholdningens faste beboere)	12		1	12	
15. Hvile / sove på dagtid, voksne					
16. Hvile / sove på dagtid, barn					
17. Sove (overnattingsgjester)				4	

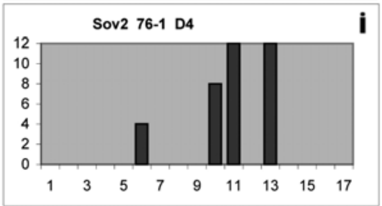
(*) : Bd2 + Bd3 merged into office / library (see table 5.8)

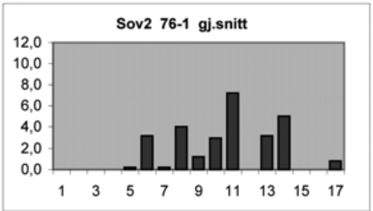












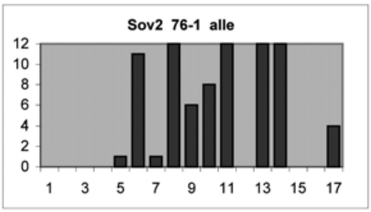
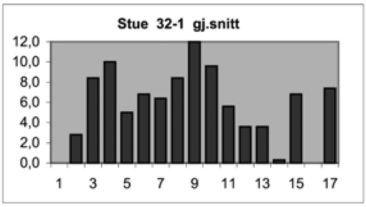
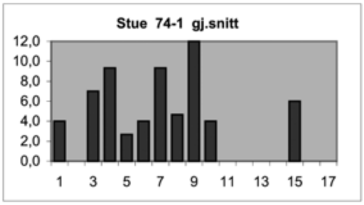


Figure 5.5.f
Bd2-76-1

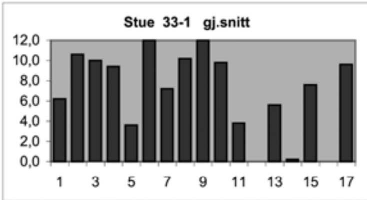
Activities
Living room
"Average"



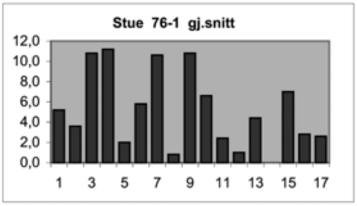
19,5 m2



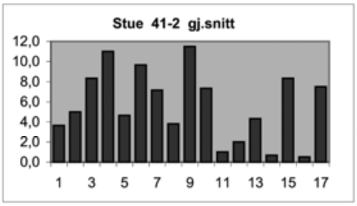
21,8 m2



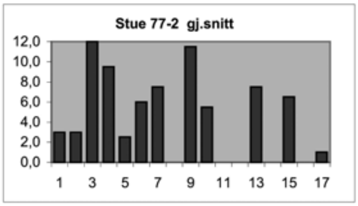
17,6 m2



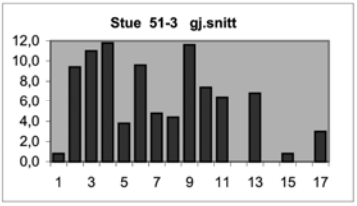
27,0 m2



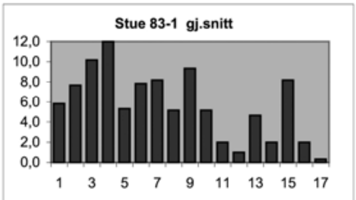
19,1 m2



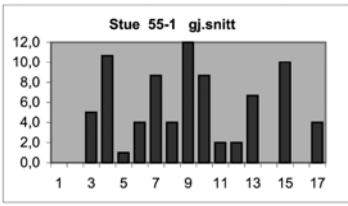
37,3 m2



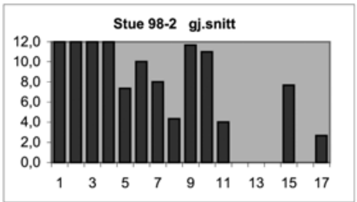
22,9 m2



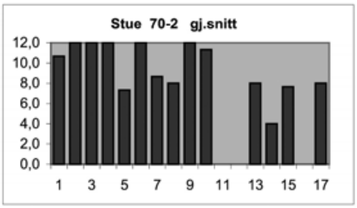
30,4 m2



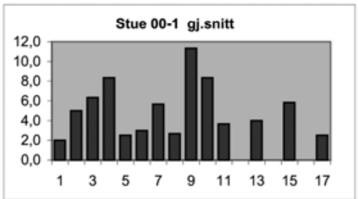
21,5 m2



27,0 m2



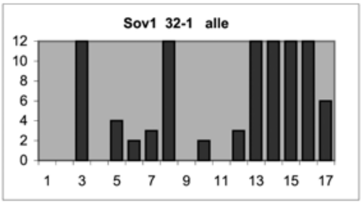
29,4 m2



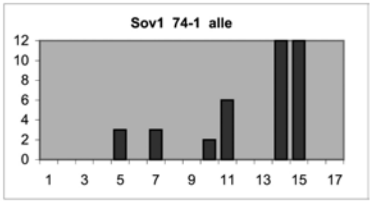
22,6 m2

Figure 5.6 Activities in living rooms - "average"

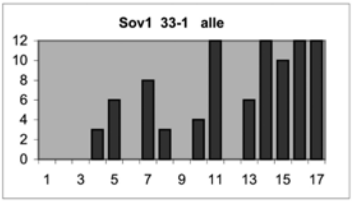
Activities
Bedroom 1
“All”



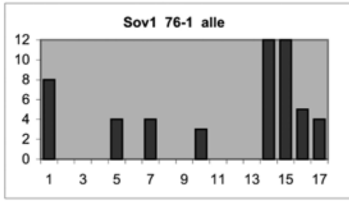
18,2 m2



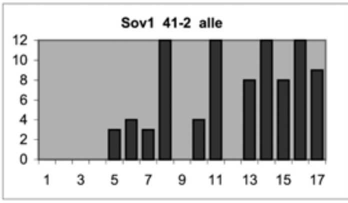
10,3 m2



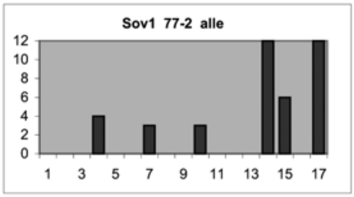
15,5 m2



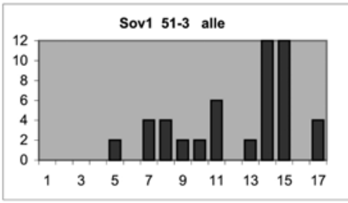
12,0 m2



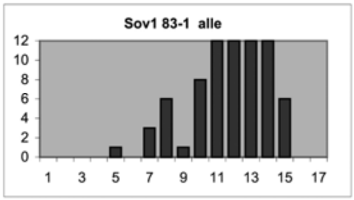
14,0 m2



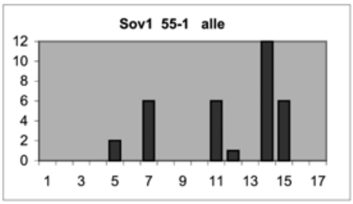
14,1 m2



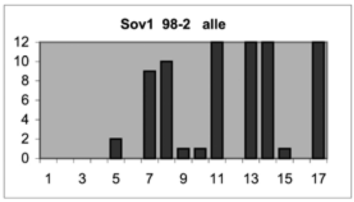
13,9 m2



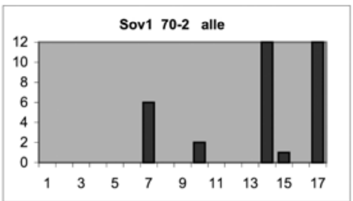
13,5 m2



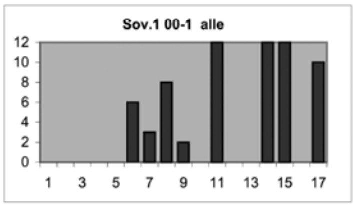
11,9 m2



10,4 m2



9,3 m2



10,8 m2

Figure 5.7 Activities in largest “bedroom”, “all”

5.2.5.1 Activities and Spaciousness of Living

The spaciousness of living affects the use of the rooms and makes it difficult to compare use of rooms where the spaciousness of living differs across the sample of dwellings examined.[162] When looking more closely at the result from the individual projects (the figures 5.5), the widest ranges of activities in the bedrooms seem to occur among the apartments with spacious living.[163] According to the categories of spaciousness described in section 5.2.2, "spacious living" implies that there are more bedrooms than needed as rooms for sleeping; all bedrooms are not occupied as private rooms for the individuals of the household. In dwellings, which in this way house few persons compared to the number of rooms, it is therefore "bedrooms" that are "freed"; they are available for other purposes and a variety of daytime activities can take place in them. Also when the living is cramped, there is examples of many activities in the "bedrooms".[164] However, as the sample of apartments examined here contains few cramped living households, it cannot be generalised about the latter.

5.2.5.2 Activities and Sizes of Rooms

A feature that obviously influences the activities possible in a room is the size of the room. In order to examine particular parameters, it is useful to look for frames of "other conditions being equal". As the number of rooms in a dwelling is another parameter that strongly influences the use of the rooms, a way to focus on room-sizes in particular, is to compare apartments with the same number of rooms.[165] There are three projects where the apartments have the size of "two rooms"; these are 32-1, 33-1 and 70-2, where the two former are apartments of the A-type while the latter is of the C-type. Where the activities in the individual rooms of these apartments are concerned, the bedrooms of 70-2 are rarely in use during daytime, while the bedrooms of 32-1 and 33-1 are rooms where many daytime activities take place.[166] The bedroom-size of 70-2 differs significantly from the size of the bedroom (or

[162] This problem is reduced by the approach of studies like Holm (1955) and "Bostadsutforming bostadsanvändning", both these surveys focus on apartments that house families.
[163] Such as in "bedroom1/Sov1" in 32-1-B1, "bedroom1/Sov1" in 33-1-C5 and "bedroom2/Sov2" in 76-1-D4, see figures.5.5.a, b and e.
[164] See "bedroom2/sov2" in 74-1-B4.
[165] Even more "equal conditions" (giving even closer focus on the spatial configuration and the sizes of rooms) would be achieved by comparing similar households living in apartments of similar size (and of course still in similar locations). Although interesting, such studies on the sample of this survey do not make sense as the number of apartments left to examine becomes few (or none!) as the number of fixed variables increases. For such more detailed studies larger samples have to be selected for the particular purpose.
[166] See 32-1, 33-1, 70-2 in figure 5.7. For data of each project, see A.5.5.a, b and c.

the second largest room) of 32-1 and 33-1, being 9.3 m2 compared with 18.2 and 15.2 m2, respectively. The size of the living room is also likely to be of importance. The living rooms of 32-1 and 33-1 are relatively small, being 19.5 and 17.6 m2, respectively, while the living room of 70-2 has a floor area of 29.4 m2. On the one hand, the wider range of activities in the "bedrooms" of the A-type apartments is a necessity in the sense that the relatively small living rooms result in a demand for other spaces for daytime living. On the other hand, it shows how a larger bedroom has the capacity to become a second living room that increases the potential use of the apartment.

Another example concerning the correspondences between room-sizes and activities is project 98-2 where the second bedroom is as small as 6.8 m2. This room has no "score" at all as concerns daytime activities or daytime living (see table 5.3); a room this small is inappropriate for any kind of daytime activity, very different from the large bedrooms of the A-type apartments (32-1, 33-1 and 42-1) where a variety of daytime activities take place. These results support the ideas of Holm and Thiberg almost 50 years ago, where, in order to achieve dwellings appropriate for a diversity of households and preferences, they argued for increasing the size of the "bedrooms".[167]

[167] About the floor plans of Holm and Thiberg, see the section about generality in 2.4 and figure 2.22.

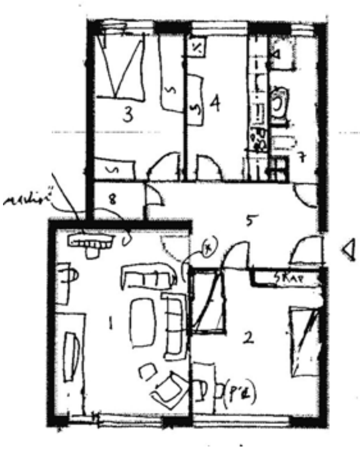
5.2.6 Changes Made by the Residents

During the lifetime of most apartments, the residents have modified the interior spaces in one way or another.[168] Such changes made after the end of construction are of two main categories. One is changes concerning internal connections between rooms; conditions of access are altered by making new doors or by blocking existing ones. The other consists of more structural changes where sizes and shapes of rooms are changed by tearing down existing walls or by constructing new ones. There are at least two parameters that strongly influence the number of changes made after finishing the construction of the building; one is the needs or wishes to make changes (as considered by the residents or by the owner); another is the possibility of carrying out such changes. Regardless of what a household might consider the most preferable spatial layout of their apartments, the existing building determines the potential for making changes. In buildings where walls within the apartments are load-bearing, which is the case in most Norwegian apartments built before the 1970s, extensive changes of interior space are much harder to do than in buildings where such walls are light-weight and not load-bearing.

Whether changes made by the residents indicate positive features of the original floor-plan layout is not obvious. A high rate of change can be considered positive in the way that the apartment is flexible; it has the potential to be easily altered according to various needs and preferences. Alternatively, a high rate of change can be understood as negative because it indicates that the original layout does not function well; the apartment has to be changed in order to satisfy the needs of the residents. More extensive surveys, - in terms of a larger number of apartments as well as more detailed information about the history of each apartment, are needed in order to analyse this in detail. However, even the limited sample of apartments examined in this survey, gives some information about changes made after the apartments were originally built, information about what the changes have been and why they have been done. This section describes and comments upon the most significant changes found by this survey. Table 5.8 summarises the results. The floor plan drawings of the particular apartments referred to in this section are attached in appendix A.5.3.

[168] Whether a change is done by the contemporary or by a previous residents is not known in this survey, as this was not explicitly asked about in the interviews.

Where WCs and bathrooms are concerned, there are two significant changes. One is that separate WC and bathroom are merged into one in the cases where there is “through passage” in bathroom. There are 4 projects where the selected apartments in original had separate WCs and washing-rooms/ laundries, these are 41-2, 74-1, 76-1 and 77-2. In project 41-2 as well as in project 77-2, both with “through passage” in bathroom originally, WC and bathroom are merged into a larger bathroom in all the apartments examined. Where there is no through passage, the number of such merging seems to depend on the sizes of the rooms. In 76-1, where the WC is only 1.5 m2, 2 out of 5 WCs are merged with the bathroom, while in 77-2, where the WC is 2.6 m2, none is merged. The other common change is that bathtubs have been removed and replaced by showers. This has happened in 26 out of the 43 apartments that originally had a bathtub. This is often done in order to achieve space for washing machine in the bathroom.[169] (See table 5.8.)



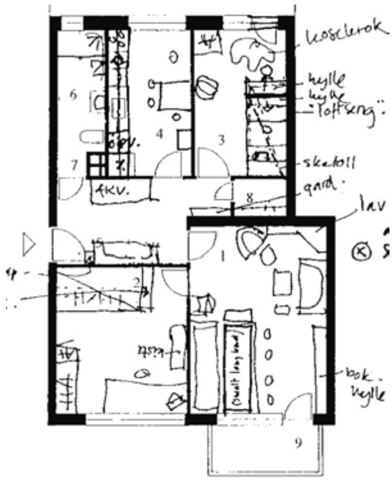


Figure 5.9 (left)
Apartment 41-2-C1, an example where the access between living room and bedroom is no longer in use.

Figure 5.10 (right)
Apartment 41-2-D2 is the exception where “breaking of rings” is concerned. Here, the closed access to “bedroom” is not the one from the living room but the one from the entrance. This particular “three-room-apartment” is exceptional in having as many as five rooms used for daytime living: the living room, the kitchen, the child’s room, the mother’s room and the “library-like” entrance that contains a 500-litre aquarium and a sofa.

[169] Washing machine is installed in 8 out of the 18 apartments where bathtubs are replaced by showers and where there was no place for washing machine in the apartment in advance.

Another significant change made by the residents is the "breaking of rings".[170] Among the 32 apartments that originally had an internal ring, only 14 rings remain. (See table 5.8, showing that 18 rings are broken.) In the projects 41-2 and 55-1, none of the apartments we visited has the internal ring of spaces any longer. Among projects 32-1 and 33-1, two out of five internal rings were "broken".[171] In all cases but one, the "breaking of rings" is done by obstructing the access between "bedroom" and living room. This common preference for breaking the ring in these A-type of apartments, and thereby changing the spatial configuration into a "pure bush"[172] means that the "bush-like" configuration is "general" in terms of being preferred by a wide range of households. By obstructing "unnecessary doors", the residents achieve more walls without openings and (at least where rings consisting of few rooms are concerned) more floor area without through-passage. This gives other possibilities for use and furniture, such as the dining table in the living room and the wardrobe in the bedroom in 33-1-B1. (See A.5.3.) In apartment 41-2-D2, which is the exception from the pattern as the closed access is the one between "bedroom" and entrance, the change makes it possible to use the entrance as a "library-like" hall. As explained in figure 5.10, this particular "three-room-apartment" has as many as 5 rooms used for daily living. Where the apartments of B-type are concerned, the rings are kept more often; they still exist in 8 out of 13 apartments. There are probably two explanations to this difference between the A- and the B-type of apartments concerning the breaking of rings. One is that the access between rooms in the larger apartments becomes long and with much through passing if rings are broken (as opposed to the A-type apartment where there is access from the entrance to all rooms anyway). The other explanation is that the doors in the rings of the B-type apartments are rarely into habitable rooms, which means that blocking them does not improve the usability of habitable rooms (in terms of more walls without doors or more floor area without through passage).

In dwellings where there are internal rings, children without knowledge of the spatial layout are likely to find such rings immediately; for them, rings represent highly appreciated possibilities for endless running and "hide-and-seek" that are impossible in "non-ring-floor-plans". Given that children's play is a parameter relevant to evaluating interior space, the existence of internal rings is an essential feature of a floor plan layout. From an architect's point of view, internal rings can represent positive spatial qualities as they

[170] For more on "rings", see section 4.3.
[171] The size and number of rooms and the effect on the daylight conditions might explain this difference between the cases 32-1/33-1 and the case 41-2. See 5.2.7.1 for more on this.
[172] "A bush" is a spatial configuration where there is one room from which all the other rooms can be accessed.

make the internal movements less restricted.[173] However, despite the popularity among children and at least some architects, this survey indicates that preferences for internal rings are more nuanced and depend on the floor plan layout. In the A-type of apartments, where rings represent a possible rather than a necessary access, the rings are not considered worth keeping, while the rings in the B-type of apartments represent necessary access or a potential for movement that the households seem to appreciate.[174]

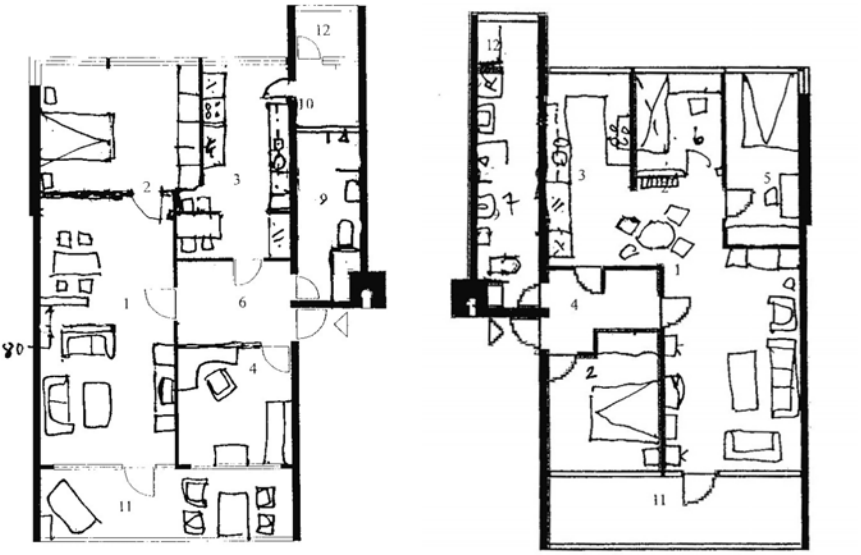


Figure 5.11
Two examples of the changes made in the apartments 74-1 (left: 74-1-A2, right: 74-1-D3).

Due to the lightweight internal walls, it is not surprising that the greater changes are most often found among the apartments of the B-type. These changes are various, with few general tendencies. Depending on the preferences of the households, a variety of changes have been made. A family of four persons, such as in 74-1-D3 (see figure 5.11), has created a third bedroom by enclosing part of the dining room. In 74-1-A2, a couple living in the same kind of apartment, does not need as many separate rooms and has therefore changed the floor plan into a larger master bedroom, a studio/guest-room and a kitchen that includes a dining area. (See figure 5.11.) The apartments in projects 76-1 show a similar variety of layouts

173 Particularly in dwellings where the living is cramped, internal rings reduce obstructions of movements. However, if rings are large and the only possible access, such “through-passage” might be a problem.

174 This preference of “breaking” rings that include habitable rooms was also found by Holm (1955, p. 133-134) and by Lindquist, Orrbeck and Westerberg (1980, p. 130). Holm found that 13 out of 17 households in the two-room apartments of his sample preferred to remove the not-needed-door between living room and bedroom. Lindquist. Orrbeck and Westerberg found that 2/3 of the households in their three-room apartments preferred to remove such not-needed doors to bedroom.

corresponding to the different households. (See A.5.3.) The B-type apartments are originally specific with respect to usability but have some flexibility due to the large floor areas and the lightweight interior walls that can easily be changed.

The frequencies of changes in the projects 77-2 and 83-1 are lower than in 74-1 and 76-1. This might be explained by the kind of households. The households in 74-1 and 76-1 are of various kinds while those living in 77-2 and 83-1 are elderly and families with children, respectively. The elderly in 77-2 have spacious apartments and no immediate need to make improvements[175] while the apartments in 83-1 seem to be appropriate for households with children without making any changes. As changes of the B-type apartments are usually easily made, the fact that such changes are frequent does not prove that the original layout of these apartments is worse than the layout of apartments where changes are more rare but also more difficult to make. However, amongst the apartments examined here, there are some changes indicating that the original layout has not been a success; the kitchens in 74-1 have been altered in one way or another in all the apartments visited.[176] It is not obvious which of the alternative layouts is the best; what seems clear is that the original separation of storage room from kitchen and kitchen from dining areas have not been considered worth keeping.[177]

Among the apartments in 70-2 and in the more recently built projects 98-2 and 00-1, no changes at all have been made. This could have several explanations. Where 98-2 and 00-1 are concerned, one plausible explanation is that these apartments have been built very recently. When you have chosen to buy a brand-new apartment and you have paid the additional price for this, you are less likely to tear it down and pay for alterations than when you buy an older, well-used apartment. However, concerning the interior spaces, it is not easy to imagine that frequent changes of these new apartments will occur even in the future. As all existing connections are needed and possible new ones are few, the potential for the easy kind of changes are limited. Due to the sizes and positions of the rooms, it is also hard to imagine that many changes by merging or dividing existing rooms will be carried out in these newer apartments.

[175] When becoming elderly, people rarely make changes of their apartment due to their own changes in household category; the children's rooms or their husband's office/studio are often kept unchanged even after the children have moved out and after the husband is dead. This corresponds to the evaluation of spaciousness as listed in table 5.3; elderly singles or couples in large apartments rarely consider their dwellings spacious; the rooms for the dead husband or for the children no longer living at home are not considered rooms free for other purposes.
[176] See A.5.1 for the original floor plan and A.5.3 for the altered ones.
[177] However, the original layout might have worked well in the 1970s, when the kitchen was more of a working place for the mother and where there was a mother working full time at home in most households.

Table 5.8 Changes made after construction

Project number	Apartment type	Apartment number	Baths: Wash.mach. in original	Baths: Bathtub in original	Baths: Replaced with shower	Baths: - and wash.machine	Dividing one room into two	Separating rooms: without closing connection	Separating rooms: by obstructing doors	Separating rooms: "ring" broken	New doors made	Merging two rooms into one: WC+Bt > Bt	Merging: Others St	Merging: Others Wr	Merging: Others Bd	Comments/other changes
32-1	A	A3		x	x	x	Bd>Bd+O									
		A4		x	x	x			Bd - L	x						
		B1		x					Bd - L	x						
		C1		x												
		C4		x	x	x										
33-1	A	A4		x	x											
		B1		x					Bd - L	x						
		C5		x	x											
		D2		x	x				Bd - L	x						
		D5		x	x											
41-2	A	A4		x	x	x			Bd - L	x		x				
		C1		x	x				Bd - L	x		x				
		C3		x	x				Bd - L	x		x				
		D1		x	x				Bd - L	x		x				
		D2		x	x				Bd - E	x		x				
		D4		x	x				Bd - L	x		x				
51-3	AC	C2		x	x					-						
		C5		x					Bd2 - E	-	Bd2-L					
		D2		x	x	x				-						
		F1		x						-						
		F4		x	x	x				-						
55-1	AC	C1		x					St - E	x						
		C2		x	x	x			St - Bd1	x					Bd1-L	
		D2		x	x	x			St - Bd1	x						
70-2	C	A4								-						
		B1								-						
		C3								-						
		G2								-						
74-1	B	A2	x	x	x				K - D	x		x	St+K		Bd2+D > Bd1	
		B4	x	x	x				K-Wr			x	St+E	Wr-Bt		
		D3	x	x	x		D>C+Bd3		K-Wr			x	St+K	Wr-Bt		
		B1x	x	x					K-Wr			x				
76-1	B	A1	x	x												
		A4	x	x	x											
		B1	x	x	x				K-Wr	x		x	St+Bd1		Bd2+Bd3 > O	
		B4	x	x					K-L	x		x				
		D4	x	x	x			K-L								2
77-2	B	A4	x	x					Bd1-L	x						
		A5	x	x												
		A7	x	x	x				Wr-Bd1	x					Bd1+L > L	
		C6	x	x	x											
83-1	B	3	x	x						-						
		4	x	x						-						
		7	x	x						-						
		8	x	x						-						
		9	x	x						-						
		12	x	x						-						1
98-2	C	A1	x							-						
		A4	x							-						
		B3	x							-						
00-1	AC	A2	x							-						
		A4	x							-						1
		B3	x							-						
		C2	x							-						
		C4	x							-						
		E3	x							-						

1 : previous "cold loft" made into a second floor of the apartment
2 : still opening (and access) between kitchen and living room

5.2.7 Preferences about Alternative Layouts

5.2.7.1 “Through-Light” or not

The possibility for light to pass through an apartment, from one facade to the other, improves the daylight conditions remarkably. This is a rare layout of recently built apartments for at least two reasons. Firstly, in order to have this possibility the apartment must stretch from one facade to the other. Until around 1980, most Norwegian apartments had such a layout as only two or three apartments on each floor were accessed from the same staircase. As recently built apartments are more often placed towards one facade only, even the theoretical possibility of through-light is lost for many apartments. Secondly, due to the greater depth of new buildings, through-light situations are hard to achieve even for apartments reaching from facade to façade, as storage rooms and other enclosed rooms not necessarily requiring daylight are placed in the middle of the apartment, obstructing the possibility of “through-light”.

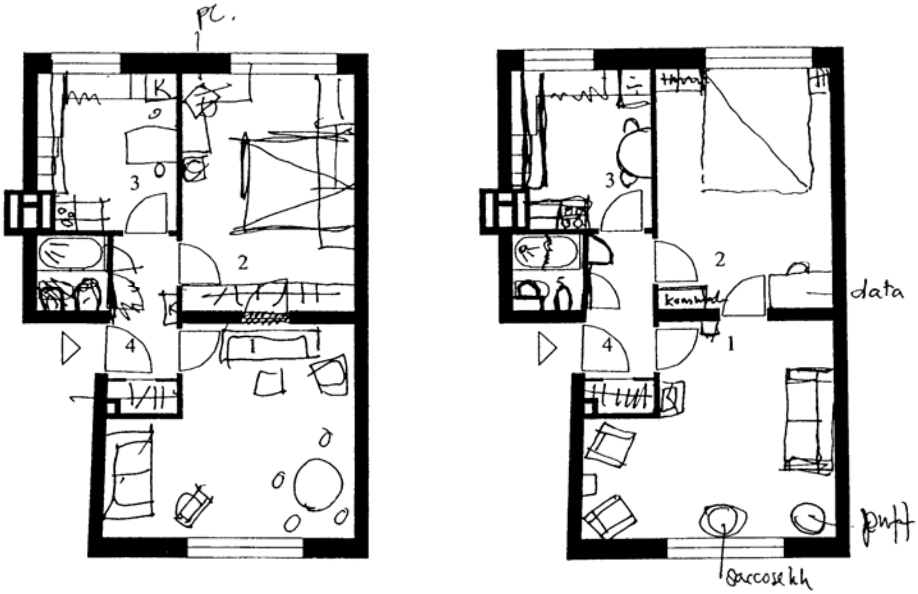


Figure 5.12
Two apartments from project 33-1, with and without “through-light”.

The project 33-1 is interesting where "through-light" or not is concerned. Originally, these apartments consisted of two rooms for daytime living, - two rooms of almost the same size, both accessible directly from the entrance. In addition, there was direct access between the two rooms. Five apartments of project 33-1 have been studied through interviews. In two out of these five, the direct connection between the two rooms is now blocked. Figure 5.12 shows two apartments from 33-1, one with and one without "through-light". Having this door or not, influences the usability of the rooms as well as the daylight conditions; this door makes it easy to connect the activities of the two rooms while not having the door gives more space for furniture and makes the rooms more independent of each other.

Table 5.9 Through-light or not, well-being in apartments 33-1

Households		**Floorplan**		**Satisfaction** (residents' evaluations)					**Daytime living**	
Case **33-1**	Age	Door L-Bd permanently closed	"Through-lit"	Well-being in general	Size of apartment	Floor-plan in general	View	Day-light	L	Bd
A4	30		x	5	5	3	4	4	7	2
B1	30	x		3	4	4	2	3	8	1
C5	30		x	5	5	5	4	5	6	2
D2	30	x		5	3	2	3	4	8	1
D5	20		x	5	3	5	4	5	5	4

Scored that are "filled" : the apartments with the highest scores

The results about well-being in project 33-1 are summarised in table 5.9. Some information showed in this table, for instance that households of singles are more satisfied with the size of the apartment than couples and that the view and daylight conditions achieve higher scores in the upper floors, could be predicted without carrying out interviews.[178] However, there are some interesting and less obvious correspondences between the floor plan (with respect to having or not having direct connections between the "living room" and the "bedroom") and the residents' well-being. Among all answers about well being and satisfaction (see table 5.9) the highest scores are found in the "open" apartments (A4, C5, and D5)[179] while the lowest scores are found among those that are more closed (B1 and D2)[180]. A similar patter is found when looking at the amount of daytime living (table 5.3); the bedroom[181] of B1 and D2 "scores" only 1, while it scores nearly 3 on average

[178] As described in section 5.1.1 the last number in the "apartment-name" refers to the floor number as counted in Norwegian, which means that apartment 33-1-A4 is located at floor number four, where ground floor is counted as floor number one.
[179] The only exception from this is "size of apartment" in apartment D5.
[180] The only exception from this is "well being in general" in apartment D2.
[181] Or the second largest room, not necessarily being used as bedroom.

in the "open" apartments A4, C5 and D5.[182] When answering the more open questions[183] the residents of C5 and D5 commented upon the spatial layout in positive terms. The information given by the residents in addition to answering explicit questions enforces the impression that the households in the "open plan" feel more comfortable about their apartments than those who have similar flats without any direct connection between the two largest rooms. The residents of B1 and D2 (which are the apartments <u>without</u> the direct connection between living room and bedroom) both complained about floor area "spent" in the bedroom. Even though the residents of the "open" apartments also preferred to reduce the area by taking it from the bedroom, (when they in the interviews were "forced to" decide from which room a hypothetic reduction of the floor area should be taken), they expressed fewer complaints about the existing situation.

Among these apartments in project 33-1, there is a correspondence between apartment layout and floor level in that apartments with the open layout (A4, C4 and D5) are on the upper floors, while the others (B1 and D2) are on lower floors. Concerning issues where floor plan as well as floor level matter, it is therefore difficult to distinguish the importance of the two. However, by looking at some of the other interviews, we can find more information about this. While there is a strong correspondence between floor level and satisfaction concerning view and daylight, there is no such correspondence between well-being in general and floor level.[184] It therefore seems that the high scores with respect to well-being in A4, C4 and D5 are affected by the open floor plans allowing the through-light situation rather than by the floor level.

As pointed out when describing spatial configurations in section 2.3, a door between two rooms is a simple physical difference that affects the spatial configuration significantly. Whether or not two adjacent rooms are directly accessible to each other, influences real life situations in terms of the use of the two rooms.[185] From the interviews in project 33-1, access and light across the apartment also seem to influence the residents' well-being.[186]

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[182] This pattern can be seen more in detail when looking at the various activities, see the bedrooms of 33-1 in figure 5.5.b.

[183] For those reading Norwegian, see A.5.2, page 2, questions 1.4 and 1.4.d.

[184] See tables 5.3 and 5.9.

[185] As elaborated in section 3.4.7.

[186] A causality between apartment layout and evaluation of own apartment is not straight forward. It might be that people who are more interested in design have an affinity towards open spatial layouts and that they (as a matter of fashion, rather than of features of the apartment) are more conscious about interior space and therefore tend to value their interior more positive than people less interested in fashion and design. Following this logic, the well-being of the households in A4, C4 and D5 concerning spatial layout might not depend on the features of the spatial layout as such, but might instead be a secondary effect caused by satisfaction of feeling fashionable and updated when interior design is concerned.

5.2.7.2 The Storage Room

Due to building legislation, new Norwegian dwellings must have a minimum area of storage rooms. A certain amount of this area must be in-doors but not necessarily within the apartment.[187] Even though a storage room within the apartment is convenient, there are arguments for placing some of the storage area elsewhere.[188] One argument concerns some basic architectural features of the interior space. The storage room is a closed room. When this "box" is placed within the apartment, it is hard to achieve an open floor plan. Another argument concerns economy. The building cost per floor area apartment is higher than for underground areas of simpler standard. By placing storage rooms underground, some of the more valuable area within the apartment is made available for other purposes than storage. In this survey, the households were asked explicitly about their opinion on storage rooms. There are two categories of apartments in this respect; those with storage rooms inside the apartment and those without. In those with such storage room inside the apartment, we asked whether they were willing to "give away" this storage room, if the area was made available for alternative purposes[189]. Those without such a storage room were asked whether they would have liked to have such a room. Those of the latter answering "yes" were asked if they were willing to give the required floor area away (by taking this area from somewhere in the rest of the apartment) or if they were willing to pay the cost of adding the area of the storage room to the apartment. Table 5.10 lists the answers. Among those <u>with</u> storage inside the apartment, 6 out of 15 [190] would like to convert the storage into other kinds of room (which means that 60% prefer to keep the situation with a separate storage room inside the apartment). Among those <u>without</u> a separate storage room inside the apartment, only 5 out of 33 would like to change the situation (which means that 85% prefer to keep the situation of not having a separate storage room).[191] Having a separate storage room or not, most people wanted the existing situation to continue.[192] However, when we compare having a storage room inside the apartment or not, the interest in keeping the existing

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[187]This size and location of storage-rooms are stated in *"Ren veiledning til teknisk forskrift til plan- og bygningsloven 1997"*, §10-34. Kommunal- og Regionaldepartementet, Oslo, 2003.

[188] My experience from working as architect designing apartments is that housing developers and estate agents advocate storage rooms within the apartment, arguing that this is a preference of the potential buyers.

[189] In the way that the floor area of the storage room hypothetically could be added to any other room.

[190] Out of the 17 apartments with such a storage room, 15 households were asked this question. (Due to changes of questions made during the pilot-survey all 17 were not asked about this.)

[191]This given that the storage room had to either be paid for as an additional area or achieved by taking floor area from existing rooms. Not surprising most households (21 out of 33, or 66 %) would prefer such a storage room if they were given it free, without any costs or disadvantages!

[192] Whether this is because both categories have chosen their dwellings, and they both therefore tend to be satisfied with it, or if it is due to a tendency of adapting to given situation is not known or examined here.

situation is significantly higher among those without such a storage room (being 85 % (36+49) compared to 60 %); among the sample examined by this survey, the layout <u>without</u> a storage room inside the apartment is most preferred. In conclusion, this survey does therefore not support the apparently well established belief that a storage room within the apartment is the most preferable layout.

Table 5.10 Preferences about storage rooms

Case	Number of interviews	Apartments with a separate storage room inside the apartment: Total number	Being willing to remove the storage room? (and threreby increase other floor areas)		Apartments without a separate storage room inside the apartment: Total number	Missing such storage room?		If missing this, willing to change other area into storage (or to pay for additional floor area)?	
			No	Yes		No	Yes	No	Yes
32-1	5				5	1	4	2	2
33-1	5				5	1	4	4	
41-2	0								
51-3	5				5	1	4	4	
55-1	3	3	1	2					
70-2	4				4	2	2	2	
74-1	4	2	(*)	(*)	2	1	1	1	
76-1	5	5	3	2					
77-2	4				4	3	1	1	
83-1	6	1	1		5	2	3	1	2
98-2	3				3	1	2	1	1
00-1	6	6	4	2					
Total	0	17	9	6	33	12	21	16	5
Preferring change				**40,0**					**15,2**
Preferring existing			60,0			36,4		48,5	

(*) : Answers missing as this was not asked about in all cases of the pilot-survey.

5.2.7.3 Access by Gallery

The principle of access to the apartments defines the premises for the layout of the building as well as for the floor plans of each apartment. Due to the fact that indoor rooms are more expensive to build than outdoor galleries, the principle of access by galleries is efficient in terms of building costs and is therefore a layout often argued for by constructors and estate developers. From the point of view of architects, the evaluation of access by galleries is dual; on the one hand, galleries have been argued for by architects and have been applied in highly esteemed projects,[193] on the other hand, external galleries is the principle often applied when building as cheaply as possible.

[193] *Gifu Kitagata Apartments* by Sejima & Associates (GA Architect: 18, 2006) and *Schwitter-building* by Herzog & de Meuron (GG (1989) Herzog & de Meuron. Barcelona) are examples of such projects.

Two projects of this survey, 83-1 and 00-1, have access by galleries. In project 83-1 the households were explicitly asked for their opinion about the galleries. The opinions were very positive; there were no explicit negative remarks. Several considered the gallery a pleasant second balcony and a place for meeting neighbours. However, it cannot be denied that galleries have a disadvantage due to neighbours passing by the windows; two out of six households answered that the gallery was fine as they were living at the end (at the end of the gallery, - where neighbours do not pass). In the project 00-1, we did not explicitly ask about the galleries in the interviews. However, in two out of the six apartments where we did interviews, the residents commented on the galleries when they answered open questions, one was very positive while the other was negative. The fact that the galleries in these two projects look out over park-like backyards and not towards dirty, noisy roads is likely to influence the evaluation of them. In conclusion, the answers of the interviews do not prove that galleries are the best principle of access, but indicate that access by galleries works well and may be highly appreciated if the galleries are well designed and look towards pleasant views.[194]

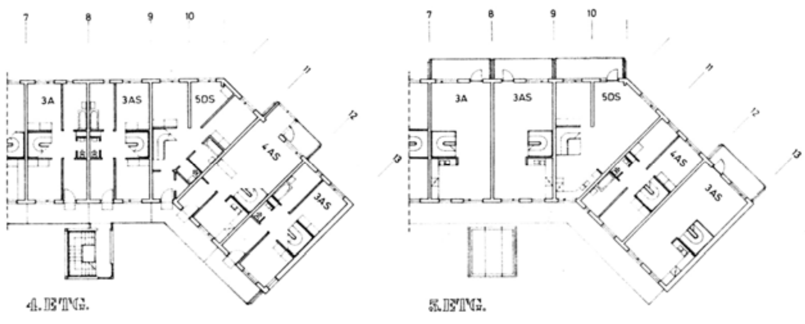


Figure 5.13.
Casinetto (project 83-1 in this survey), a housing project were the residents appreciate the access by galleries.

[194] Due to the disadvantage of passing by windows, too many dwellings should not be accessed from each staircase. In the project 83-1, where the residents appreciate the access by galleries, there are rarely more than two apartments between stairs and any apartment accessed from these stairs.

5.2.8 Some Additional Findings

This survey has captured information about many issues beside what is described in previous pages. This section summarises some of these.

5.2.8.1 Time of Construction

Several results of this survey show how the time of construction might represent a bias with respect to the kind of household living in a particular housing project. The case 77-2, described in section 5.2.3.2, illustrates how the time of construction might affect the contribution of households living in a particular building for a long time. Now, 30 years after construction, many of the households living in this project are elderly people that have lived there since the building was new nearly 30 years ago. If the first residents that move into a new housing project are of similar category and age, which they might well be, the times of moving out are not randomly distributed through time. For housing projects where people are well satisfied, the time of construction might determine whom that are living there for many decades.

By looking more closely at the project 00-1 we can probably see another effect from time of construction upon kinds of households. 00-1 is the project with the highest rate of “several-adults-households”. (See table 5.5.a.) The answers from the interviews indicate that this might be a consequence of the time of construction. Among the six 00-1 apartments where we interviewed the households, four were the first apartment owned by the respective households. Two out of these four households were singles renting out one bedroom for an extra income; both described the rental situation as temporary. By Norwegian tax-legislation, such rental is a favourable way of financing the purchase of a “self-owned” apartment. As times goes by and some loan is paid off, this rental will no longer be necessary for managing the costs. As project 00-1 was built in 2001, all households have bought their apartments recently. As time goes by, the rate of households that have recently moved in will decrease and the number of apartments with a room to let, and thereby the number of “several-adults-households”, can be expected to decrease. However, due to the floor plan that allows for a room to let, as described in section 5.2.3, 00-1 will probably still be among the housing projects with more that average number of “several-adult-households” .

5.2.8.2 Disadvantage of Popularity

The reasons for people's moving are diverse, as for example growing up and moving from the childhood home, having children and needing more rooms or being forced to move because of a new job. Only 2 out of the total 55 households that have been interviewed, explicitly described dissatisfaction with their previous homes as the reason for moving; both lived previously in the part of Oslo named Grünerløkka and have moved because of noise from streets and restaurants at night time. Grünerløkka is a former East-side-working-class-area that has become popular, fashionable and relatively expensive during the last 10 years. The increasing prices of apartments and the fact that many new bars and cafés are doing well, do not imply that the area must be a pleasant place to live. This effect is worth bearing in mind before classifying "popular" parts of town as entirely successful.

5.2.8.3 Annoying New Technology

Technical standard has not been a focus in this survey, but it is a subject complained about by several households when answering the open questions of the interviews. What is remarkable is that the strongest complaints are not from people living in older and well-used apartments. The issue, on which residents most often complain, is the ventilation-system in apartments built during the last 20 years. The problem is the more or less advanced ventilation systems; some cannot be regulated in each apartment, some make a remarkably loud noise and some simply do not work. The most annoying ones have all these features; they do not work as expected, they are noisy and they cannot be turned off. This is interesting as advanced technical systems are an important field of both engineering and business and a feature that has been emphasised in the marketing of new dwellings during the recent couple of decades.

5.2.8.4 The Sizes of New Apartments

The fact that most questions in the interviews concerned the particular apartment where we did the interview did not prevent people from commenting upon housing projects in their neighbourhood or in general. Some such comments shed light on some consequences of the fact that many small apartments are being built now. As small apartments now are the most profitable ones to build and the regulations by government and local authorities are weak, new apartments are small despite intentions of planners and politicians to build apartments for families as well. In areas of Oslo where most existing apartments are small, the small size of new apartments causes some problems worth commenting upon. In project 41-2, the households are very satisfied with their part of town, with their close neighbourhood, with their own building and with their apartments. What several households with children here worry about, is the size of the apartments recently built and of those planned in the neighbourhood. The fact that these new housing projects contain mostly small apartments and rarely any with more than two bedrooms, leads to a high rate of moving; in order to find apartments of appropriate size, households with children must move to other parts of town. For those who prefer to stay, this destabilizes the social lives of children as well as adults. Parents were seriously worried about this on behalf of their children. When children experience their best friends moving to other parts of the town several times (due to lack of larger apartments in the area), the size of new apartments has a negative influence on their socialisation. This illustrates how the size of new apartments is of importance for others than those moving into them. Previously, until the 1980s, the local authorities were in charge of and responsible for the planning of housing. Today, the construction of housing is more usually organized in individual housing projects managed by private companies that have little responsibility for the influence their projects might have upon the existing city. A challenge within the current political and economic framework for planning and building of housing, is how to advocate the interests of all those who are not involved in these privately driven building projects but whose lives are strongly affected by them.

5.2.9 Summary of the Synchronic Survey

The typology of apartments distinguished in chapter 4, was the result of a diachronic study of floor plan drawings, not a result of visiting the sites or of any other specific knowledge about living in the dwellings. The survey of contemporary living described in this chapter, constitutes an empirical basis shedding light on the typology of apartments, a typology consisting of A-, B- and C-types of floor-plans.[195] As the spatial layout is the main subject of this study, this typology of apartments is a frame applied for discussing the results. The survey has focused on three issues; one is the kinds of household preferring the apartment, the second is the activities or the use of the different rooms of the apartments, and the third is changes made by the residents. What characterises this survey and distinguishes it from many similar studies of households and their living conditions,[196] is that the particular parameters examined (such as time spent, activities in rooms and households evaluations) are not the main subjects of interest but means for comparing apartments of different spatial layouts.

Concerning the projects of the A- and of the C-type, these were selected in order to be comparable, trying to achieve some kind of “other conditions being equal”. Among these projects, the variety of households (variety of households living in apartments of identical layouts) corresponds to the generality of the apartment as described by the floor-plan-typology. Apartments of the A-type (which should be the most general type), house the widest range of households, while few others than singles and couples choose the less general apartments of the C-type. The distributions of households in the apartments of the AC-type are in between what is the case for the A- and the C-type apartments.[197] Concerning the apartments of the B-type, which are the four-room apartments from around the 1970s, the projects were selected in order to represent similar spatial layouts in various settings with respect to outdoor-areas, location in the city and time of construction. These apartments function as intended in the sense that they house a large number of families with children. The apparent exception is project 77-2, where a majority of the households are now elderly singles or couples. Contrary to what we might suppose, this shows how apartment 77-2 is appropriate for many kinds of households; those who moved into these apartments as young adults in 1977

[195] Where the A-type is the general apartments common until the 1950s, the B-type is the larger apartments built in the 1970s and -80s, while the C-type is the smaller apartments without separate kitchens that are common now. See section 4.3.3 about this typology in detail.
[196] Such as Holm (1955), Dahlgren and Westerberg (1979) and Guttu, Iversen and Nørve (1985), which have focused on particular kinds or households or particular kinds of apartments, see footnote 61.
[197] See figure 5.3.c.

have been living there throughout their lives. Without moving to other dwellings, they have passed most categories of households, such as being a couple, having children, bringing up teenagers, having grown-up children living at home and now living there as elderly singles or couples.

When it comes to floor plan layouts versus dwellings in use, many other parameters intertwine with these in ways that make it hard to draw conclusions in terms of simplified statements. A parameter that particularly influences the way households use their dwelling, is the spaciousness of living. It is therefore hard to examine effects of the floor-plan-layouts by comparing apartments that differ with respect to spaciousness of living. However, by studying the results in detail, it is possible to reveal some patterns in the effects of "spaciousness of living" and thereby manage to point out some general correspondence between principle floor-plan-layouts and well-being, preferences and domestic activities. If we summarise the results from comparing apartment-sizes (in terms of floor areas as well as numbers of rooms) to spaciousness of living, the households consider apartments of the general A-type more spacious than similarly sized apartments of the C-type. When it comes to the activities taking place in the individual rooms of the apartments, there are correspondences with the typology of apartments in the way that apartments of the A-type have a larger range of activities in "bedrooms"/"second-largest-rooms" than apartments of the C-type. In the latter, the rooms are more specific with respect to functions or use and there are few places for daytime activities other than the living rooms. Concerning changes of the apartment-layouts carried out by residents, the changes in A-type apartments are of a simple kind, usually made by obstructing a door, changes in B-type apartments are more structural ones made by removing walls or constructing new ones, while changes in C-type apartments are rare so far.

In conclusion, the types of apartments defined by the diachronic analysis are not just a theoretical classification of different floor plan layouts but also a typology that captures features of spatial layout that correspond to real domestic lives. The result that kinds of households and use of rooms correspond to basic features of the spatial layout is interesting in light of the fact that very few households explicitly mention the spatial layout as being important when they were asked in interviews about their reasons for choosing their dwelling. This corresponds to the results of Blombergsson and Wiklander (2006), showing that people behave in accordance with configurational features of space without necessarily being aware of them. (See section 2.3.) If applying Hillier's terms this is "the non-discursive social logic of space". (Hillier, 1984 and 1996.)

6 The Contemporary Dwellings

The typology identified by the study of OBOS and described in section 4.3.3 represents a historical development of dwellings and captures aspects of domestic space relevant for peoples' choices of apartments and for their daily living. This chapter 6 focuses on the recent tendencies of apartment layouts found by the study of OBOS and discusses whether these are representative for contemporary dwellings.

6.1 BACKGROUND; OBOS THROUGH 75 YEARS, THE THREE GENERATIONS OF APARTMENTS

By analysing OBOS' apartments built since 1930, this study has identified patterns in the development of apartment layouts through time, patterns described by three generations or three types of apartments according to the apartments' degree of generality concerning functions or use. The first, the A-type, can be described as general due to sizes of the individual rooms as well as the spatial layout. The second, the B-type, is highly specific both in the individual rooms and in the spatial configuration, while the third, the C-type, is by spatial configuration less specific than the second but due to very specific individual rooms; it is still highly specific with respect to functions or use. This history of apartments not only describes a development of layouts, it also gives insight into the contemporary situation as concerns Norwegian housing in that it points out typical features of a large segment of the existing stock of dwellings. The historical development described by the three generations of apartments thereby represents a basis from which contemporary and future apartment design can be discussed. The following sections will more closely examine what is going on at present by comparing the recent changes found in the diachronic study of OBOS to a brief analysis of other apartments recently built.

6.2 A COMPARATIVE CASE

This thesis has so far described a single-case-study examining dwellings of OBOS. Even though OBOS is a case that is likely to shed some light on the development of Norwegian urban housing more in general,[198] it is not obvious to what extent the patterns found can be generalised. Methodologically this can be handled in several ways where the simplest is not to suggest any generalisations outside the particular case of OBOS. Alternatively, the general validity of the results has to by examined more closely. Concerning the validity and relevance of a theory, Glaser and Strauss have distinguished between what they have called "substantial" and "formal" theory. A substantial theory is applicable in limited empirical issues, sometimes only in the case from which it is developed, while a formal theory is conceptual and has a general relevance. They have emphasised the study of comparative cases as the strategy for developing a substantial theory into a formal one. (Glaser and Strauss, 1967, p. 31-35.) For this particular study, such comparative cases might be apartments of co-operatives or companies other than OBOS, apartments located in other places or dwellings of other kinds.[199] As the decision to examine a comparative case was taken at a late stage of this study, there was no time to do comparative studies similar to the diachronic study of the OBOS-apartments. Instead, a minor comparative study has been carried out, a study not at all comparable to the OBOS-survey in terms of strategy of sampling or in terms of number of apartments. Even a small comparative survey, particularly if independent from the main survey in all respects, might give information relevant for discussing the validity of making generalisations from the main survey.

Therefore, before assuming that the patterns captured by the apartment typology described in section 4.3.3 are of general validity, we shall take a look at a minor comparative case. A Saturday in October 2005, the Architects Association of Oslo (OAF) arranged an excursion to some recently built housing projects. The apartments visited on this excursion were chosen as a case comparative to the main diachronic study of the OBOS-apartments. In order to be distinguished from the OBOS-apartments, the apartments visited on the OAF-excursion are hereafter termed the "OAF-apartments". Due to the great difference in the sample (being few; consisting of only 7 housing

[198] As argued in section 3.3.

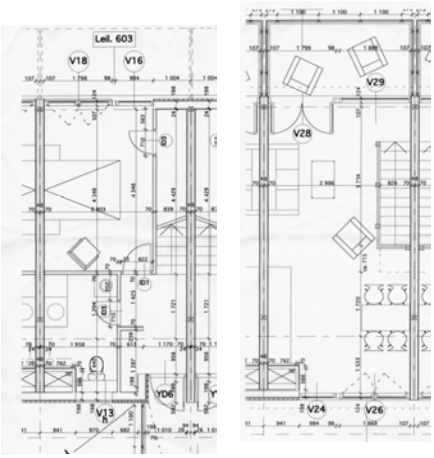
[199] This way of collecting data is by Yin (who further refers to Patton (1987, p. 60)) termed data triangulation (one out of four kinds of triangulation where the other are investigator-, theory- and methodological triangulations). Data triangulation *"— encourage you to collect information from multiple sources but aimed at corroborating the same fact of phenomenon."* (Yin, 1994, p. 92)

projects) as well as the sampling (it is not known to what extent the selected OAF-apartments are representative for contemporary apartments), the OAF-excursion does not represent a case directly comparable to the historical and much wider study of OBOS. However, a brief analysis of the OAF-apartments sheds some light on the layout of contemporary apartments other than those built by OBOS. To what extent the results from examining these OAF-apartments correspond to the recent tendencies found by examining the OBOS-apartments, indicates the validity of drawing general conclusions from the OBOS study.

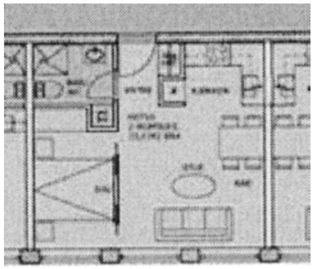
Figure 6.1 shows the floor plan drawings of 6 apartments visited on the OAF-excursion.[200] For projects where the excursion visited several apartments, the one most typical for the respective project has been selected. The apartments are labelled from OAF-1 to OAF-6. Figure 6.2 shows the connectivity graphs of the apartments.

The OAF-apartments have some features in common. Compared to the OBOS-apartments, the OAF-apartments contain fewer enclosed rooms connected by doors. This implies that space syntax modelling by nodes, which is the kind of modelling applied when drawing the connectivity graphs,[201] is less descriptive for the OAF-apartments than for the OBOS-apartments in the main study. OAF-3 and OAF-5 are apartments where it can be discussed whether the narrow space in the middle of the floor plan (by the bathroom) should be modelled as a separate space (as they are now, in the way that they are represented by a node named C for corridor), see the graphs in figure 6.2.[202] The alternative would be to consider these parts of the apartments as extensions of other spatial units of the apartments. If following the latter logic strictly, these two apartments could be modelled as one room and a bathroom. Even though it can be discussed which alternative would be the best modelling of these two apartments, it should be possible to point out some relevant information from the graphs in figure 6.2.[203]

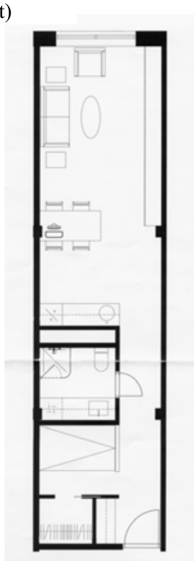
[200] One out of the 7 projects visited by the OAF excursion is not analysed as the floor plan was neither sent from the architect nor available on the web. The total number of projects is therefore 6.
[201] About kinds of space syntax analysis, see section 3.4.8.
[202] This modelling is partly a "convex space modelling", see section 3.4.8, figure 3.18.
[203] How the total space of an apartment is divided into spatial sub-units that are considered separate rooms, does of course also influence the comparison of sizes of rooms.



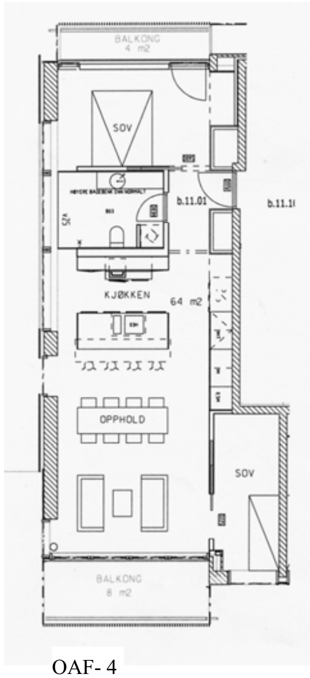
OAF- 1 (a two-floor apartment)



OAF- 2



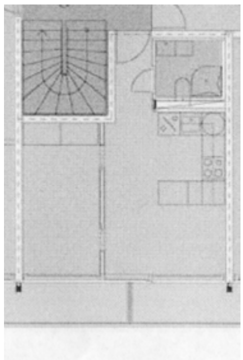
OAF- 3



OAF- 4

Figure 6.1
The “OAF-apartments”
1 : 200

OAF- 5



OAF- 6

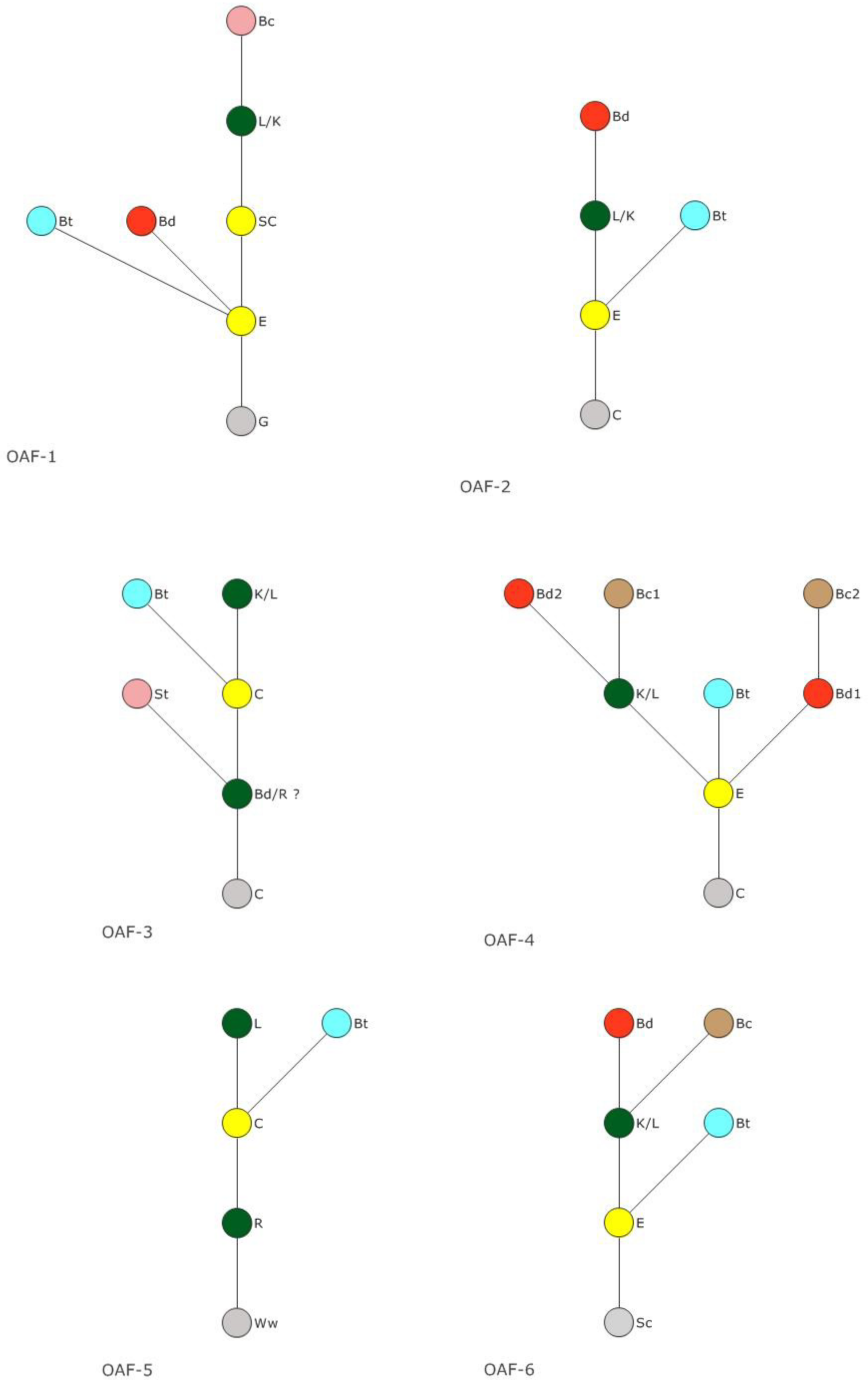


Figure 6.2
The “OAF-apartments”, space syntax connectivity graphs.

A feature that the OAF-apartments have in common is that there are no separate kitchens; all kitchens are included in the living rooms. As regards the spatial configurations, these are presented in terms of connectivity graphs in figure 6.2. In four out of the six OAF-apartments, in all except OAF-1 and OAF-4, the entrance and the habitable rooms are positioned in a linear rather than in a bush-like configuration.[204] In two of the apartments (OAF-3 and OAF-5) a "spatial extension" by the entrance is most likely to be the part of the dwelling used as "bedroom"; if these apartments shall have their beds elsewhere than in the living room, the "bedroom" must be passed through before accessing the "living-and-kitchen area".[205] The apartments OAF-1 and OAF-4 differ from the other four in that their main bedrooms have direct access from the entrance.

Table 6.1 lists the floor areas of the OAF-apartments while table 6.2 lists the average of the OAF-apartments and the averages of the OBOS-apartments for comparison. By a look at the floor areas of each apartment and the floor plan drawings, OAF-1 differ from the others in terms of being somewhat more generous where amount of apace is concerned. This apartment has a large bedroom and a "living-and-kitchen-room" that has the proportions needed in order to be appropriate for two separate groups of furniture. The apartment with the largest "living-and-kitchen-room", which is apartment OAF-4, is different in this respect; due to the layout of the kitchen, it is difficult if not impossible to place conventional furniture.[206]

Table 6.1 OAF-apartments, floor areas

		Floor Areas (m2)				
	Project	Total	L+K	Bt	Bd1	Bd2
OAF-1	H16	54,4	27,4	4,7	12,5	
OAF-2	Grüner Garden	30,0	16,9	3,2	5,9	
OAF-3	CK30	42,6	23,7	3,6	7,0	
OAF-4	Waldemars Hage	64,0	31,2	5,4	10,0	6,8
OAF-5	Waldemar Thranes gate 3	32,5	16,3	2,4	6,7	
OAF-6	Sporveisgata 35	26,1	13,0	2,2	5,2	
	Average	39,0	20,2	3,4	7,0	6,8

[204] The exceptions are OAF-1 and OAF-4.

[205] Such rooms where through-passage is required are B-type of space according to Hillier's room types. Among the OBOS-apartments examined in this study, all bedrooms are separate rooms of the A- or the C- type according to Hillier's room types. This means that the bedroom is a "dead-end-space" or on a ring, implying that there is no through-passage (the A-type of space) or that through-passage can be avoided (the C-type of space). (See 3.4.7 for more about Hillier's typology of spaces. This typology of spaces should not be mixed with the apartment typology identified and applied in this thesis.)

[206] The floor plan drawing is misleading as the sofas are 1.4 meter long and placed without considering common furniture such as television and audio-equipment.

6.3 THE NEW LAYOUT

By comparing the results of the diachronic study of OBOS to the results of the minor contemporary "OAF-case" just described, this section points out what seem to be recent changes and the common layout just now.

Figure 6.3 illustrates the development of room sizes of the OBOS apartments during the period 1930-2005 and the average room sizes of the recently built apartment visited by the OAF-excursion, while table 6.2 lists the average floor areas by numbers. According to figure 6.3, the room sizes of the OAF-apartments seem to "accelerate" the recent tendencies found by the OBOS-study. While the total floor area of the OBOS apartments has decreased towards becoming 70.1 m2 on average for the last 5 years (see table 6.2), the average of the 6 brand new apartments of the OAF-excursion is as small as 41.6 m2. Where the sizes of the individual rooms are concerned, the areas of the living-kitchen-room, the main bedroom and the bathroom are respectively 33.1, 11.4 and 4.7 m2 for the OBOS-apartments built since 2000 while they are 21.4, 7.9 and 3.6 m2 for the OAF-apartments. A significant difference between the OAF- and the OBOS-apartments relates to balconies; among all the OBOS-apartments examined, there are only 2 built after the Second World War that do not have a balcony[207] while 3 out of the 6 OAF-apartments are without balconies. The apartment-type with only one room and a bathroom, such as OAF-3 and OAF-5, is not found among the OBOS-apartments.

Table 6.2 Floor areas, OBOS- and OAF-apartments

		Total	L	K	L+K+D	Bd1	Bd2	Bd3	WC+ Wash.+ Bath	St	Bc
OBOS	1930-1940	60,8	21,8	8,5	30,3	14,7			2,8	1,9	3,6
	1941-1950	66,1	20,4	8,7	28,5	13,0	9,8		3,5	1,8	3,5
	1951-1960	63,7	20,9	9,2	30,6	12,7	9,4		3,3	1,7	2,7
	1961-1970	70,3	22,7	10,4	33,7	11,8	9,3	7,3	4,4	3,0	4,9
	1971-1980	91,1	25,2	12,4	39,8	12,1	9,7	7,9	7,7	3,9	12,5
	1981-1990	86,3	26,6	12,2	38,8	12,6	10,0		8,1	3,6	10,8
	1991-2000	74,9	24,3	11,3	35,6	11,2	9,0		6,3	4,7	5,8
	2001-2001	70,1	28,5	11,8	33,1	11,4	8,9		4,7	2,7	9,0
OAF	2005	41,6	21,4	-	21,4	7,9	6,8	7,0	3,6	-	-

[207]These two OBOS-apartments are 00-2-1, which has a "French-balcony", and 67-3-2, which has no balcony. The project 67-3 consists of several kinds of apartments, where all the large ones, such as 67-3-1, have balconies while the 1- and 2-rooms (such as 67-3-2) have not.

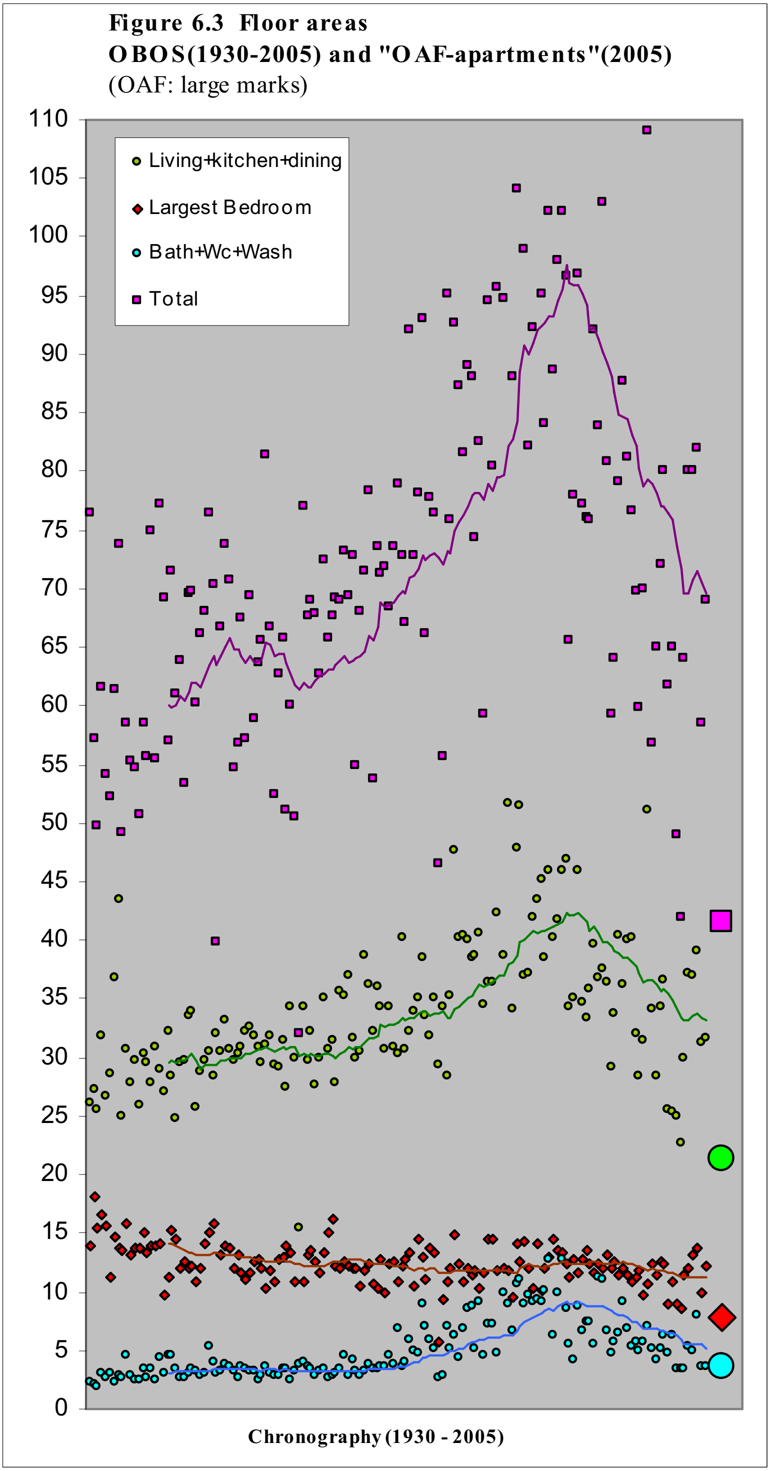


Figure 6.3 Floor areas of the OBOS- and of the OAF-apartments.

If the apartments of the OAF excursion are representative for the urban dwellings now being built, then the features of only one room for general living and tiny bathrooms and bedrooms are much more significant than found by the study of OBOS. The apartments in the OAF-sample, might represent a new generation of Norwegian dwellings, a new generation in terms of the apartments' layouts (such as consisting of only one room in addition to the bathroom) and in terms of layout of the entire buildings (such as apartments facing north or east only and apartments without balconies). These kinds of layouts have previously been rare.[208]

Figure 6.4 shows a sample of new apartments presented by Vegard Ramstad and Kristian Ribe. (Ramstad and Ribe, 2006) According to Ramstad and Ribe, these apartments are typical for new urban dwellings in Oslo. Where their average floor areas are concerned, the total is 40,0 m2, the living/kitchen is 21,9, the bedroom 9,3 and the bathroom 3,9m2. They have almost identical spatial layout and are of the C-type if characterised by the typology of section 4.3.3, with the same spatial configuration as apartment 04-2-1 in this study. (See A.4.2.)

When the OAF-apartments as well as the sample of Ramstad and Riebe are taken into consideration, it can be imagined that the C-type of apartment described in section 4.3.3 is only a predecessor of the "real-C-type", which might be characterised as below.

- The apartments as well as the individual rooms is tiny.[209]
- There is one or no separate bedroom.
- There is no separate kitchen; the kitchen is in the living room.
- There is not necessarily a balcony.
- The apartment has only one façade, which might face any direction.

[208] Small apartments are not new inventions; they are a kind of apartment that have been built previously and that (after evaluation) have been considered unacceptable for permanent dwelling. In Norway the critical report by Guldbrandsen (1973) about small apartments at Ammerud in Oslo, a report that pointed out problems of living within such limited space, has been a foundation for this opinion. A similar survey of living in the small apartments now built should be carried out. These apartments will be likely to achieve a low score concerning the apartments as such, but might in conclusion be evaluated as better than the Ammerud-apartments due to their location closer to the city centre and urban attractions.

[209] The floor areas of the "OAF-apartments" are 42 m2 on average. There are new apartments that are much smaller. In "Living in a box", a housing project that is among the "branded" ones commented upon in section 7.3 ,the floor area of the dwelling unit is 15 m2.

Figure 6.4
Examples of the apartment layout that now is typical. (Ramstad and Ribe, 2006).

The small apartments that seem to be common now, is a subject that can be discussed in many contexts. What will be commented briefly here, is the relation between sizes of the rooms and the principle floor plans.

In theory as well as in practice there are some limits to the minimum sizes of the individual rooms of a dwelling. According to Norwegian legislation, a separate room for sleeping or living must have a volume of no less than 15 m3 and a window allowing a certain amount of daylight into the room. Regardless of such legislation, a room must have a certain amount of space simply due to the intended use of a room; a bedroom should at least have the space needed for a bed and a combined bathroom/WC should be large enough to contain at least a shower, a basin and a WC. The conclusion from this study is that the apartments as well as the individual rooms have continuously become smaller since the 1980s. (See figure 6.3.)[210] When the individual rooms have become as small as possible with respect to legislation as well as to usability, it is no longer possible to reduce the apartment-sizes by means of the size of any individual room. A continuing of the development toward smaller apartments is therefore achieved by another strategy. This strategy is the "open-plan" layout. Instead of dividing the space of the dwelling into rooms individually designed for specific activities such as cooking, dining, relaxing and sleeping, the entire space of the dwelling unit is kept undivided as far as possible. The only functions, for which a separate room is made, are those of the toilet and bath. While the last generation of apartments identified by the OBOS-study consisted of several rooms but only one room appropriate for various domestic activities, the new type of apartment occurring in the OAF-sample has only one room in addition to the bathroom.[211] The future will tell whether the two layouts common among new dwellings, the one in figure 6.4 (similar to OAF-2 and -6) and the one consisting of only one room and a bathroom (OAF-3 and -5), are peculiarities of the years just after 2000 or if they represent a new generation of flats in a historic perspective. If the latter is the case, then their typical time-period has just started.

[210] About the development of apartment sizes and room-sizes more in detail, see section 4.3.1.
[211]Two out of six apartments (OAF-2 and OAF-5) consist of only one room in addition to the bathroom.

7 Final Reflections

On the background of the empirical surveys described in the previous chapters, this chapter reflects upon contemporary housing and its contexts.

7.1 THE HOUSEHOLDS IN THE NEW DWELLINGS

The recent tendency in apartment design is remarkable in that the criteria for design seem to be other than concern for daily domestic life. The floor plans with bedrooms accessed from the living room and no more than one place for daily living differ from the earlier modernist tradition of housing design. The sizes of the apartments as well as of the individual rooms have decreased rapidly since the late 1990s and are now far below the recommendations from the Scandinavian housing research institutions. This discrepancy between the traditional architectural guidelines for housing design and the layouts of new dwellings is not a theoretical mismatch between theory and practice, but a simple fact that has some consequences for who that might live in these new dwellings, - or at least for who that might live well in them. To-days' typical apartments with only one room for general daytime living are well suited for some categories of households. These households are young couples or singles (a category that has been increasing due to a later start of family life) and older couples (whose children no longer live at home) who prefer to sell their house and garden. These households can be termed "uniform" in the meaning that their daily living can go on in one room without necessarily causing conflicts. For other households, households where daily lives consist in a wide range of "not easily co-existing activities", the new apartments are inappropriate. Such "less uniform" households are of many kinds. One is all those who by cultural background prefer separate men and women's spaces, another are the very common but not traditional families (such as couples with small children where one of the parents also has teenagers living at home) and a third is the different kinds of "several-adults-households" (such as students or others sharing one apartment). In the current state of Norwegian economic and demographic conditions, there are enough wealthy people among the households above termed "uniform" as to constitute the entire population of customers purchasing new apartments. As the profit from building and selling four or five apartments of 20 m2 is now far above what can be achieved by selling one apartment of 100 m2, most new apartments are tiny. These "uniform" households do not only influence the size of new apartments becoming small, they also influence the layout of the larger apartments. The pattern, as apartments become larger, seems to be that the "living-and-kitchen-room" becomes larger and that tiny bedrooms are added. Large bedrooms or other rooms for living than the "living-kitchen-dining-room" seem to be unusual even in large apartments; regardless of size, new apartments tend to have only one room for daytime living. [212] This implies that the new larger apartments are not for other kinds of households than the new small apartments, they are for the more wealthy ones among the same kind of households.

7.2 THE EXTENT OF THE RECENT CHANGES

New dwelling layouts are not a change forced upon society by "bad guys" among constructors and estate agents; it is as much a rational response to preferences or requests of the population. What here is pointed out so far is that these requests or preferences are those of some kinds of households and that other households (without being noticed in the liberal market) might have other and even contradictory preferences.[213] The tiny apartments now common, are appropriate for limited kinds of households and differ from what architects until very recently considered good housing design. It might be argued that this new layout, regardless of its quality, does not represent any housing problem, as the dwellings of this new kind are still few compared to the total stock of Norwegian dwellings. Unfortunately, the situation is not this simple, as the change of layouts going on in new built apartments goes on in the existing stock of dwellings as well. Such changes of existing dwellings are carried out by numerous individual residents as well as by professional estate-developers. By buying second-hand apartments, modifying them according to what considered most profitable and then selling them, professionals contribute to the same kind of changes in existing

[212] This description of new larger apartments is based on looking at advertisements and other presentations, not on any case studies or statistical inquiries.
[213] To what extent requests or preferences are guided by basic "needs" or by more luxury "wants" (as distinguished by Rapoport (1990)) is not a subject followed here.

dwelling as in new apartments. Regardless of the exact rate of such changes made to existing dwellings, the changes of apartment layouts pointed out in this study is a phenomenon influencing our total stock of dwellings much more than by the new built dwellings only.

7.3 MARKETING; THE CONCEPT OF BRANDING

A new tendency as concerns Norwegian dwellings is the intensive marketing of specific housing projects as brands.[214] Figure 7.1 shows an advertisement of this kind. Different from the more traditional estate-advertisements, which emphasise inherent properties of the dwelling such as floor areas, number of rooms, views, materials and technical standard, these new and "branded" projects are marketed by fashion-like images that characterise and identify the brand and a lifestyle rather than the dwelling.

Figure 7.1 "Branding" of a housing project, an example.

[214] Examples of such projects from Oslo are "Grüner Garden" and "Living in Box".

The concept of branding is well known in the fields of fashion and design. Branding is a way of distinguishing between otherwise similar products and a way of increasing profit without adding quality to the product itself.[215] Within clothing and accessories there is often little correspondence between technical quality or cost of production and the retail price of a product; the price is determined by the fashion of the brand rather than by inherent properties of the item. In such cases, the price paid for an exclusive product is not primarily for the item as such but for the image of the brand. In other kinds of products such as cars, sporting goods and audio/video-equipment, the identities of the brands relate more to features inherent to the product, features such as performance and reliability. Whether a brand represents "real qualities" of the product or not, the brand is a feature connected to the product. What is worth some attention when it comes to "branding" of specific housing projects is the permanence of the brand. Regardless of whether the brand Mercedes-Benz represents explicit qualities in the Mercedes cars, Mercedes-Benz is likely to be an expensive brand of car also in the future. The added cost and value represented by the brand Mercedes is therefore a permanent feature of a Mercedes; the additional cost of buying a Mercedes represents an additional value of the car, a value that more or less can be realised in the future when selling the car.

The new and branded individual housing projects are very different from the Mercedes in that the value added by the brand cannot be expected a similar permanence. Contrary to what is the case for famous and presumably long-lasting multinational brands, the marketing of a particular housing project lasts only for a limited period of time; the marketing and thereby the maintenance of the brand is completed as soon as the apartments are sold for the first time. As the most speculative "housing-brands" scarcely represent any permanently attractive features inherent to the dwellings, there are few reasons to expect that the additional price achieved by the branding will be a value that endures with the apartment. The value of the brand thereby represents an income for the seller of the apartment when it is new, but not any permanent value that can be realised by the residents when they sell their apartment sometime in the future. Such lack of permanence of a brand is not a problem when clothes and accessories are concerned as these objects have limited costs and are not expected to last long. A dwelling is very different, both because of the amount of money involved and because of the longevity of the item.

[215] As described by Naomi Klein (2000), "branding" is a substantial part of contemporary marketing.

Brands that represent permanent and attractive features inherent to a product are less dependent on marketing. In such cases, the product might keep the value represented by the brand even after the marketing has ended. However, this is not likely to be the case of the "hyped" new housing projects in Oslo. The situation is almost the opposite in that fashion-like branding is a conscious strategy applied in order to take attention away from the low quality of permanent features inherent to the apartments such as daylight conditions, room sizes and different aspects of usability, - features that in the modern tradition of housing design have been considered highly important. The project "Grüner Garden" has been marketed explicitly as "not for your mother"; the feature of not being appreciated by adult households (due to being extremely narrow) is here turned into a positive rebel-like attraction. This kind of apartments has the character of being temporary dwellings except for the eccentric (in terms of not bothering about material goods); living there requires access to the homes and houses of parents or others in order to store common basic belongings. These apartments are not for young people in terms of being tailored particularly for them; they are for young people in the sense that they are unacceptable for most other households.

7.4 SOME SCENARIOS

From the contemporary situation where new apartments are appropriate for limited kinds of households only and where the number of such households is so great as to constitute almost the entire market for new urban dwellings, several scenarios can be imagined. One question is whether to-days' common apartment layouts are likely to be continued. At first glance the answer is no. Unless the number of households for which the contemporary layout is appropriate increases rapidly, a time will soon come when there will be more of these apartments than there are households preferring them. Through basic effects of supply and demand, the layout of apartments would then presumably change towards some that correspond to the needs of other households as well. However, this logic can be questioned. Given that the Norwegian economic wealth continues, the future will continuously "produce" new wealthy households of the same kind as those who now buy most of the new apartments. Given that apartments also in the future will be designed in accordance with continuously updated fashion-preferences of this kind of households, it is hard to see why wealthy singles in the year 2015 should buy a worn out, outdated apartment from 2006 if they are offered a new one corresponding to the trends in 2015. Within a free housing market, it is therefore possible to imagine that most new apartments in the future might be designed for the same kinds of households as they are today.

One argument against the mechanisms of the liberal market continuing as described above concerns the second-hand value of the apartments. Among the households constituting the market for second-hand apartments, many are of the kinds preferring more than one room for daytime living. This represents a limit to the number of potential buyers when the small new apartments are offered for sale as second-hand apartments sometime in the future. Within a free market, it is hard to imagine that this will not influence the price. If this assumption about second hand prices becomes real, then the reputation about low second-hand value will have negative influence on the demand for new ones. When this is added to the effect of branding suggested in the previous section, the kind of apartments now being built are unlikely to be the most profitable ones to buy when they are new.

Regardless of changes in demand and prices as suggested here, estate developers will probably soon offer apartments alternative to the contemporary ones designed for singles and couples in particular. This is due to the simple fact that there are also many wealthy people among other kinds of households; in the long term, it will not be profitable to exclude these from the opportunity of buying new urban dwellings.

As argued in section 2.6, low standard dwellings are not necessarily bad since a consequence of not being appreciated by the majority is that the dwelling might represent positive potentials for subgroups of the population. Most of the small apartments now being built will achieve a low score if traditionally appreciated features such as spaciousness, usability and daylight conditions are evaluated. It is therefore not hard to imagine that these dwellings, within 20 years, when they have lost their attractions of being new and fashionable, will be considered low quality dwellings by most of the population and thereby become less costly compared with other dwellings in the same locations. According to the possibly positive potential of having some low standard dwellings, these apartments might represent a positive contribution to the stock of dwellings in the future; the new and “unacceptable” tiny dwellings might in the future make urban living possible also for people who would never afford ordinary dwellings in central parts of town. To what extent such a scenario would be a problem, - for those who now buy them expensive, or for the neighbourhoods with many such “bad dwellings” are worth further discussions but will not be elaborated upon here. What seems clear, is that the future of these new dwellings are uncertain, and that there are some correspondences between dwelling quality, market and prices that is not mentioned in the marketing of these new dwellings and that have not been discussed much so far.

7.5 DWELLINGS AND GENERALITY

A brief conclusion that can be drawn from this study is that generality works; the apartment characterised as general due to sizes of rooms and spatial configuration are dwellings that house a large variety of households who are well being. When it comes to what to learn from this, or when discussing general versus specific floor plan layouts in general, it should be distinguished between small and larger dwellings. Larger dwellings do not depend on generality in order to house different kinds of households. In the 1970s, a large number of new apartments were function-specific in terms of being designed for a limited range of households; they aimed particularly at housing families with children. However, this specificity with respect to "range of households", is to lesser extent a problem than it is for the small apartments now being built. While the large apartments of the 1970s have the potential for becoming spacious dwellings for other kinds of households than traditional families,[216] it is hard to imagine that the recently built apartments will become attractive for other households than singles and couples. As commented in section 7.4, it might be that these small apartments in the future will not even be attractive for the kinds of household now buying them.

Where smaller apartments that these family apartments of the 1970s are concerned, these are not likely to be appropriate for a diversity of households unless this has been an explicit concern in the design process. The result from this study is that general apartments of "two rooms" house all categories of households except couple with children while those of "three rooms" house many families as well. What characterises the general apartments found and examined in this study is that they have separate kitchen and at least two other rooms appropriate for different kinds of daytime living.[217] The latter means that the "bedrooms" are not too small and that they have access otherwise than through the living room. This layout corresponds to a proposal that has been made in different versions throughout the history of post-war Scandinavian housing research: a dwelling aiming at housing different kinds of households should have at least two habitable rooms where the smallest should be no less than 10 -12 m2.[218] The strategy of designing general

[216] See for instance table 5.3 (in section 5.2.2) about single's and couples' well-being in the B-type apartments or see figure 5.11 (in section 5.2.6), showing how apartment 74-1-A2 has become a spacious dwelling for a couple.
[217] Separate kitchen is an issue that should be examined more closely; is separate kitchen just a feature in common for these general apartments or is a prerequisite for being general (in terms of being preferred by a wide range of households)? This can be examined by comparing kinds of households living in similarly sized apartments with and without separate kitchen.
[218] See Brochmann (1952, p. 165), Holm (1955, p. 222), Thiberg (floor-plan proposal, 1967, see figure 2.2.2), and Guttu, Jørgensen and Nørve (1985, p. 64).

dwellings do not imply to aim at one layout fitting all; it is hard to imagine any particular dwelling that would be the best dwelling through all stages of a person's life. Similar to change of car in accordance with changing needs (sport-cars are rarely customised into station wagons), some moving is necessary in order to achieve a good match between dwelling and the living preferences that alter due to age, health, economy and family circumstances. However, in a stock of housing consisting of apartments designed with generality in mind, people are less forced to move; moving can be a possibility rather than a necessity. A master bedroom with room for a child's bed, allows for years of flexibility as concerns when to move to a larger apartment with a separate room for the child.

The kind of dwellings built in Oslo in the late 19th century (see figure 2.21) represent a kind of spatial layout that deserves to be commented upon where generality is concerned. The generality of these dwellings is remarkable. Regardless of being located in the traditional wealthy centre-west parts of Oslo or in the previous working-class and now popular centre-east, and despite of a low technical standard, these 120 years old buildings are today expensive and attractive for a diversity of purposes, dwelling included. With spacious rooms that are not determined exclusively for particular activities, these old apartments are still highly appreciated dwellings but they might as well be shops, offices or restaurants. Such attractiveness and variety of activities rarely exist in housing projects built during the last 70 years and is even less likely to be found in the ones now being built. In conclusion, there are at least three lessons to learn from the buildings constructed in the 19th century where generality is concerned. The first is that generality not only in theory but also in reality is a permanent feature. The second is about attractiveness. Similarly to the results concerning the general apartments examined in this study, the feature of being appropriate for a diversity of preferences do not prevent a building from being highly appreciated by the different, specific users. The third is about generality on a more overall level. Instead of discussing how to achieve general dwellings, the subject could as well be how to design general buildings, buildings that have the potential to accommodate diverse activities, dwellings included; as shown by these more than 100 years old dwellings, such generality does not prevent the buildings from being highly attractive places to live.

8 Further Research

When it comes to the influence of housing research on architectural practice, the expectations should not be too high. As mentioned in section 2.1, the main references for architectural design are buildings rather than theory in written form. However, assuming that housing research still might affect what dwellings to built, this final section mentions some subjects related to this study that are worth to be examined. These are of two kinds, the first concerns the historical development of dwellings, while the other concerns alternative strategies for dwelling design. As mentioned in chapter 5, many of the detailed subjects discussed there should also be worth further studies. These subjects will not be repeated here.

Where the historical development of dwellings is concerned, several issues are worth examinations similar to what has been carried out in this study. One is other kinds of dwellings, the single-family house in particular. This is the most common kind of dwelling in Norwegian. Regardless of being mass-produced or being individually designed by architects, the layouts of single-family houses seem to have little variations in spatial configuration; very few single-family houses have a spatial layout different from the early modernist template, no matter how fashion or avant-garde the house might appear as a visual image. The first question to examine is whether this is the case. If it is, there are at least two possible explanations. One is that the modernist scheme is still a good one; another is that interior space of the single-family house has not been focused by substantial criticism in the same way as other disciplines of architecture.[219] By both explanations, the development of the interior space of single-family houses should be worth a survey similar to the one of this study. Another issue worth further inquiry is the general relevance

[219] Some of the criticism of urban-scaled functionalism, for instance of the subdivision of human behaviour into functions that in the design process are treated as separate issues, is easily transferable onto dwellings in general and onto the single family house in particular.

of the recent changes identified in this thesis. The new kind of small apartments found in this study of apartments in Oslo, seems to be common elsewhere in Norway as well. If, or to what extent, the same development happens elsewhere has not been looked upon in this study, but should be examined. The small apartments that now are common here, cannot be identified as a general pattern among housing projects published in the international architectural magazines. However, as these magazines are not representative for the dwellings built, this does not imply that the pattern found in this study cannot be found internationally as well.

Where strategies for housing design are concerned, this thesis has focused on the dichotomy of specificity and generality. As elaborated in section 2.4, generality can be considered one out of three alternative strategies for achieving dwellings capable of serving a diversity of preferences, where the other strategies are elasticity and flexibility. A plausible question from the results of this study is how generally works compared to the alternative strategies aiming at the same purpose. Flexibility is briefly touched in this study by the analyses of the B-type of apartments, which are the large apartments built around the 1970s. As described in section 5.2.6, these apartments of the B-type are somewhat flexible due to large floor areas and lightweight internal walls. The kind of dwellings not examined in this thesis but worth analyses is the apartments designed in order to be "elastic". The first question is what elastic dwellings are like after some time have passed; are they elastic in terms of really altering between different layouts, or do they tend to "converge" towards particular layouts?[220] The next question concerns their "functional performance"[221]. By surveys similar to the one carried out here (which would imply to examine different floor-plan alternatives in the "stages of elasticity" and to compare these with the residents and their daily living) it should be possible to compare the alternative strategies for achieving dwelling appropriate for a diversity of preferences. The fact that generality works, which is a conclusion of this study, does not imply that other strategies might not be useful as well. This issue about how to design in order to handle a diversity of requests concerns not only dwellings but also buildings and architecture in general.

The kinds of research really carried out are rarely a result of proposals as those mentioned above; the issues examined by Norwegian housing research are determined by governmental dispositions in terms of founding of research projects. In accordance with the governmental dispositions, a major concern

[220] Similarly to what has happened in the project Skjettenbyen (see figure 2.24) where most dwellings have been extended to the maximum size and thereby become equal.
[221] "Functional performance" is a term applied by Marcus (2000).

for Norwegian housing research is now “universal design”. A conclusion of this thesis is that new apartments differ significantly from what architects, planners and researchers until very recently considered a minimum standard where usability is concerned. As described in section 7.1, a consequence of this is that new apartments are appropriate for a limited range of households only. It is thereby a discrepancy between the ideals about housing (as represented by the issues focused upon in academic research and by governmental institutions) and the reality of dwelling construction. While a large number of new apartments are inappropriate even for people who are functioning fully when health and ability to move are concerned, the governmental focus is set on how to design dwellings appropriate for all. While planners and researchers discuss how to increase the accessibility for persons in wheelchairs, a large number of the apartments actually built do not even have room for physically functional people to sit and eat. The aim in pointing out this is not to disavow “universal design”, but to address that the problem of usability in new dwellings is now of another scale than what is handled by traditional “universal design”. Concerning the quality of Norwegian dwellings in terms of usability, the greatest potential for improvement is not likely to be achieved by studying how dwellings should be designed in order to fit all, but in finding out how to influence a housing production where new apartments are well suited only for a few.

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Appendices

Contents

NOTE:
In originals, these appendices were in A4-format. The floor plans in the printed appendices are therefore not in original sizes and scales. For floor plans in original scales, see the separate appended volume.

AGRAPH,
Software for Drawing and Calculating Space Syntax Graphs

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Keywords: Space Syntax graphs, Space Syntax calculations

Abstract
AGRAPH is a PC-application for drawing Space Syntax graphs and for doing Space Syntax calculations. AGRAPH is made for drawing graphs on the basis of imported background images such as floor plan drawings. By a “snap to grid”-option and “click-and-drag”-commands justified graphs are easily made. AGRAPH calculates the basic Space Syntax parameters of the graph-nodes but has also the option of excluding selected nodes from the calculation. AGRAPH has several colouring modes. One is the “custom mode” that is useful for coding nodes by colour. Another is the mode for colouring nodes according to the Space Syntax parameters Relative Asymmetry or Control Value. By the export-command the graph-image can be stored in formats appropriate for further editing and publishing. The tables containing the Space Syntax parameters of the nodes in the graph can be opened in common software such as EXCEL for further analysis. The program structure of the AGRAPH is designed for further development. At the time of writing this paper, several additions are being developed.

1. Introduction

AGRAPH is developed for being applied to a PhD-study at the Oslo School of Architecture and Design. In this study a PC-application was needed for doing Space Syntax analysis of a large number of apartments. There exist a number of software applications for Space Syntax analysis, ranging from tools for simple analysis of connectivity to advanced visual field analysis. Nevertheless, when in this PhD-study looking for software capable of handling both the Space Syntax calculations (giving easily accessible output data) and the intended drawing and editing of graphs, appropriate software for the PC was not found. It was then decided to develop software for the actual task. The outcome of this is AGRAPH. This paper explains the basic features of the software and describes briefly how it is used.

In the fields of graph-theory and combinatorics, which are the mathematical basis for Space Syntax calculations, the elements of the graphs are usually described as vertexes and edges.[1] In this paper, which is on Space Syntax analysis and not on mathematics, the more literal terms nodes and connections are preferred.

2. The AGRAPH Application in General

AGRAPH is developed in C# using VisualStudio.NET. The compiled .EXE file runs on PCs operated by WINDOWS. AGRAPH works on files of a format named .AGX. This file contains all information of the graph. From the graph-image drawn on the PC-screen, AGRAPH generates a “connectivity matrix” (listing whether nodes are connected or not) and an “internal distance matrix” (listing the shortest distance between the nodes in the graph)[2]. By simple calculations on these matrixes, the Space Syntax parameters of the nodes are determined.

3. The Space Syntax Parameters

AGRAPH calculates the parameters Control Value (CV), Total Depth (TD), Mean Depth (MD), Relative Asymmetry (RA) and the integration value (i).[3]

Control Value
The Control Values (CV) are found by letting each node give the total value of 1 equally distributed to its connected nodes. The Control Value of node n, CV(n), is the total value received by node n during this operation.

Total Depth
Total Depth of a node n, TD(n), is the total of the shortest distances from node n to the other nodes in the systems, i.e. TD(n) is the total of line n (or column n) in the distance matrix.

Mean Depth
Mean Depth for a node n is the average depth (or average shortest distance) from node n to all the other nodes. If k is the total number of nodes in the system, then MD(n)=TD(n)/(k-1).

Relative Asymmetry
The Relative Asymmetry (RA) describes the integration of a node by a value between (or equal to) 0 and 1, where a low value describes high integration. RA is calculated by the formula RA=2*(MD-1)/(k-2).[4]

Integration Value
A parameter that (contrary to RA) describes integration by a high number when a node is highly integrated is the "integration value" (i). The integration value is found by inverting the RA, i=1/RA.[5]

4. Drawing and Justifying the Graph

Unless the spatial structure to be analysed is very simple, a convenient way of drawing the graph is to use an appropriate background image. Such a background-image is imported into AGRAPH as a file of .TIF or .JPG format. In the case of studying apartments this background image would be the floor plan drawing. By setting the "snap to grid" to "off", nodes and connections are easily drawn on the background image. Especially when drawing larger systems it is useful to name the nodes before removing the background image and before justifying the graph. (Naming of nodes is done by "right click" on node and then using the "set node name"-option.) By turning on the "snap to grid", justified graphs are made by simple "click and drag". The nodes are automatically numbered from 0 and upwards in the order they are drawn.[6] The results of the calculation are listed according to node number. As it might be preferred to have the nodes listed in a given order, the numbering of the nodes can be edited after drawing. Having the node numbers visible in the centre of each node is an option that can be turned on/off. The name of the node is placed beside the node on the graph-image and can be edited as text at any stage. The file-name automatically appears at the down left of the graph. (See Figure 2) The graphs-image can be exported in formats such as .JPG or .BITMAP for printing or for further analysis.

5. The Colouring Modes

There are several modes for colouring the nodes. The simplest is to keep the default colour (light grey) and to identify the nodes by name only. One alternative is to use the "custom colour"-mode for coding the nodes by colour. When intending to compare many graphs or to study graphs consisting of a large number of nodes, such coding by colour simplifies the further analysis.

Similar to the well known coloured graphics used for presenting the integration values of axial line analysis, AGRAPH has the option of colouring the nodes according to the integration or to the control value of the individual nodes. When using "Colour by Control Value" or "Colour by RA, relative", the total scale of colour is set to range between the minimum and the maximum value occurring in the graph. Using "Colour by RA, absolute" the range of colour spans from the value RA=0 (red) to RA=1 (dark blue/purple), and the nodes are coloured according to their RA-value within this scale. When applying "Colour by RA" for comparing different graphs, the "Colouring by RA, absolute" is useful. If analysing only one graph the "RA-relative" is better as this gives a larger range of colour and thereby a more differentiated information. In addition to being useful for analysing given architectural spaces, these "colouring by calculation"-modes are helpful for visualising the effects of making changes to a system by deleting or adding nodes and connections.

When nodes are coloured by "custom colour", this information is stored in the .AGX file. This means that different "colour by calculation" can by applied without loosing a previous custom colouring such as nodes coloured by function.

6. The Calculation

For each calculation AGRAPH generates three output files. These are tables in the .HTML-format that are stored in the same file-catalogue as the .AGX file. The file "--summary.HTML" lists the CV, MD, RA and the 1/RA for all nodes of the graph. The files "--connections.HTML" and "--distances.HTML" contain respectively the connectivity matrix and the matrix of the internal distances between nodes. In most cases the summary file is the only information needed for further Space Syntax analysis. All these output files can be opened in common software such as EXCEL for further editing or analysis.

In Space Syntax analysis there are often cases where all of the existing spaces are not included in the calculation. The "calculation without exterior" is a well known such case. Depending on the actual study, it might be relevant to exclude other spaces. AGRAPH has the option of "deactivate node" which excludes the selected nodes from the calculation.

7. Further Development of AGRAPH

AGRAPH now works well as the tool searched for in the on-going PD-study. However, for a wider range of use, some additions to the software would be useful. Some improvements are being developed at the time of writing this paper and several more are planned.

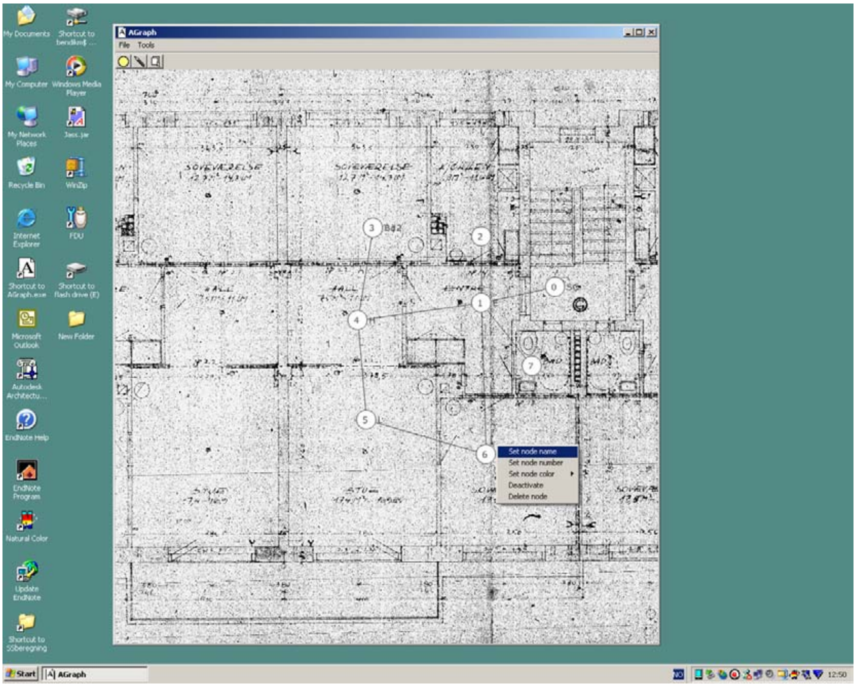

Figure 1. Opening AGRAPH. Choosing Background Image.
Drawing nodes and connections. Naming the nodes.

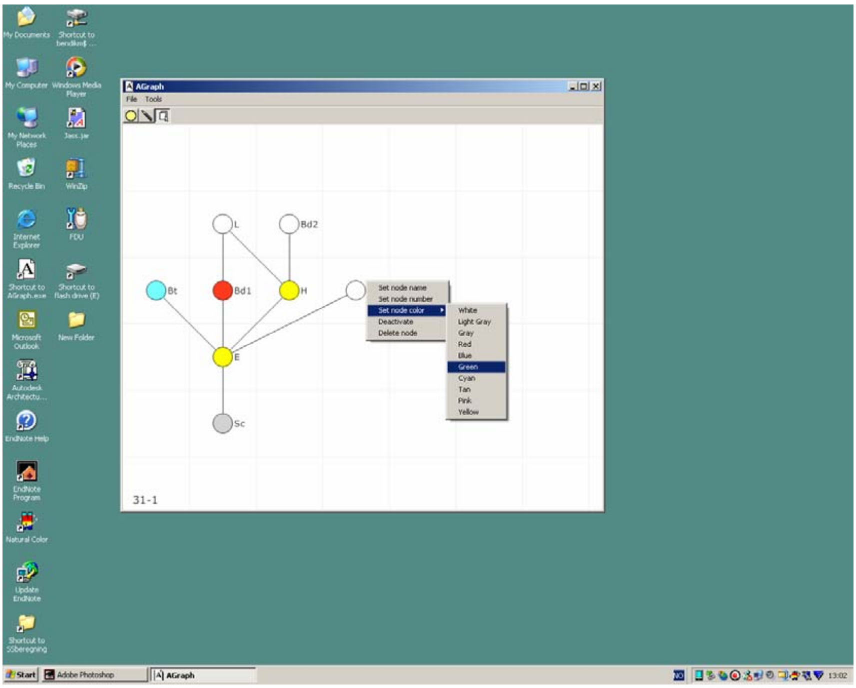

Figure 2. Clearing the background. Justifying the graph. Colouring the nodes.

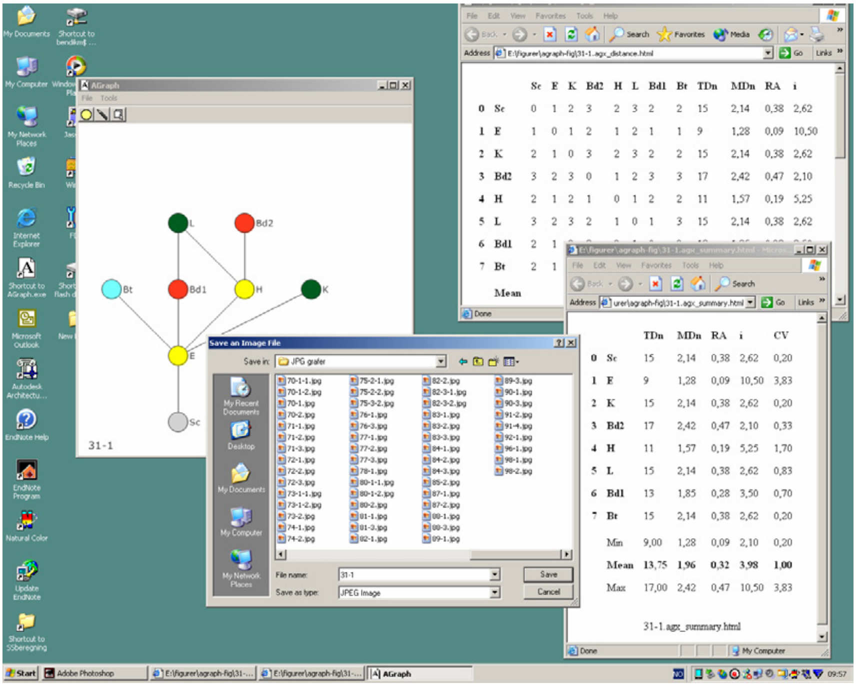

Figure 3. Doing the calculation. Saving the graph in an image-format.

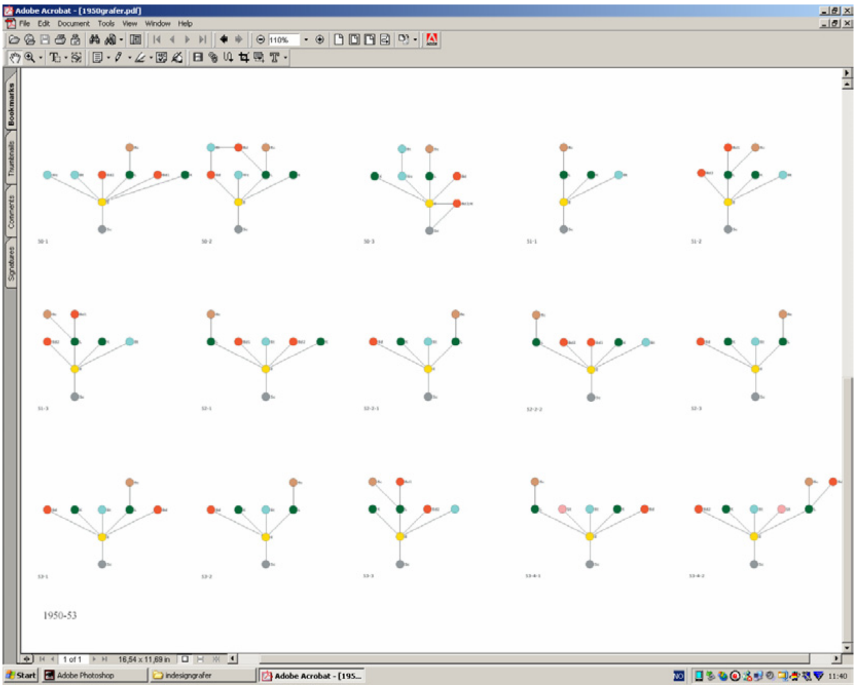

Figure 4. Some AGRAPH-images edited for presentation, an example.

Notes:

[1]For more on the mathematics of graphs, see for instance Tucker (2002).

[2] Distance not as "metric distance", but as "Space Syntax distance" (i.e. number of "space-steps").

[3] For more on the basics of Space Syntax calculations, see:
Hillier, 1996, p.33, p.88-.
Hiller and Hanson, 1984, p. 92-123,p. 147-155.
Hanson, 1998, p. 22-31.
Those who are reading a Scandinavian language might also see Klarqvist (1991).

[4] The RA-value is defined to be 0 when a node is as integrated as possible. The most integrated position possible is the root of a pure "bush"-graph. As all distances from such a root are 1, the MD is 1. By this RA=0 when MD=1. The RA might therefore be of the form RA= a*(MD-1). Contrary, RA is defined to be 1 when a node is as segregated as possible. The most segregated positions possible are the end nodes in a pure linear sequence. For a linear sequence of k nodes the MD for the end nodes is half the number of nodes in the line, MD=k/2. By this: RA=1 when MD=k/2. This implies 1=a*(k/2-1) which gives a=2/(k-2). By this RA=2*(MD-1)/(k-2).

[5] This is the integration value of RA. Integration might be defined as the inverse of other asymmetry parameters than the RA. The most usual is to invert the RRA, the Real Relative Asymmetry, as described by Hillier and Hanson, 1984, p.111-113.

[6] By this the highest node number is one less than the total number of nodes in the graph.

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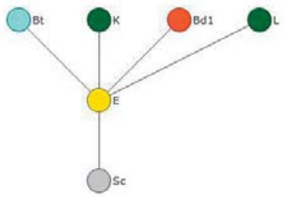
Appenix A.4.1 Total sample of apartments

Number	Name	Address	Apartment m2	rooms	Architects
31-1-1	Etterstad I BRL	Etterstadsletta 4	55	2	Jacob Christie Kielland
31-1-2	Etterstad I BRL	Etterstadsletta 4	76	3	Jacob Christie Kielland
32-1	Maridalsveien 64 BRL	Maridalsveien 64	57	2	Einar Engelstad
33-1	Fagerheimen BRL	Christies gt. 7-13/ Fagerheimgt. 2-14	50	2	Henrik Nissen og Gunnar Brynning
33-2	Bentsebakken BRL	Bentsegata 15, 17, 19	62	2	H. E.Brevik
36-1	Galgeberget BRL	Galgeberget 3	54	2	Fritjof Rojahn
36-2	Trondheimsveien 170 BRL	Trondheimsveien 170	52	2	Andreas Nygaard
36-3-1	Frydenberg BRL	Grenseveien 9	61	2	Victor Schaulund
36-3-2	Frydenberg BRL	Grenseveien 9	81	3	Victor Schaulund
36-4	Munkegården BRL	Munkedamsveien 86B	74	3	Ernst Motzfeldt og Leif Wiersholm
38-1	Myrahagen BRL	Bentsebrugata 16C	49	2	Jens Dunker og Georg Rohde
39-1	Øvre Tøyen BRL	Frydensgate 5	59	2	Sverre Wiik
39-1	Presidentgaten BRL	Anna Sethnesgate 2	55	2	Klingenberg & Klingenberg arkitekter
40-1	Tøyenhus BRL	Sarsgate 44-62	55	2	Th. Chr. Hauff
40-2-1	Trasopløkken BRL	Treschows gate 17	51	2	Ragnvald Tønsager
40-2-2	Trasopløkken BRL	Treschows gate 15	79	3	Ragnvald Tønsager
40-3	Maridalsveien BRL	Maridalsveien 225-237	59	2	Einar Engelstad
41-1	Engelsborg BRL	Sarsgate 64-80	56	2	Thr. Chr. Hauff
41-2	Bøkkerløkka BRL	Brockmannsgate 8-10	75	3	Gunnar Gregaard Jørgen
41-3	Sandefjordgaten BRL	Sandefjordgata 5	55	2	Victor Schaulund
41-4-1	Tøyen II BRL	Helgesensgate 76	77	2	Victor Schaulund
41-4-2	Tøyen II BRL	Helgesensgate 78	70	3	Jens Selmer
47-1	Brockmannsgata BRL	Brockmannsgate 14	69	4	Arne Pedersen & Reidar Lund
47-2-1	Flaen BRL	Nordtvetveien 44-46	57	2	S.Narve Ludvigsen
47-2-2	Flaen BRL	Flaengrenda 1, 3, - - -, 15	67	3	S. Narve Ludvigsen
48-1-1	Nordre Tøyen BRL	Frydensgate 1, 3	70	3	Hougen, Pedersen & Viksjø
48-1-2	Nordre Tøyen BRL	Frydensgate 1, 3	71	3	Hougen, Pedersen & Viksjø
48-2	Gløtt BRL	Søren Jaabæks gate 10	61	3	Ragnar Nilsen
48-4	Utsyn BRL	Valhallveien 63-65	64	3	Ulf Nyquist
48-5-1	Storo BRL	Birch Reichenwaldsgate 3	53	2	Hoel, Mugaas og Aastorp
48-5-2	Storo BRL	Birch Reichenwaldsgate 35-45	62	3	Hoel, Mugaas og Aastorp
48-7	Høybråten BRL	Slåttenveien 2	70	3	Ola M. Sandvik & co
48-8	Gaustadfunksjonærenes BRL	Gaustadveien 15	70	3	H. D. Elgethun
49-1	Etterstad Nord BRL	Etterstadsletta 7, 9, 11	60	3	Morseth & Wiel Gedde
49-2	Lille Ekeberg BRL	Enoksvei 2-8	66	3	S. Narve Ludvigsen
50-1	Keyserløkka Nord BRL	Bergljotsvei 9 A, B, C	68	3	Rinnan,Tveten & Colbjørnsen
50-2	Etterstad Øst BRL	Etterstadsletta 47-49	76	3	Morseth & Wiel Gedde
50-3	Nygård BRL	Nygård Terrasse 2-4	70	3	Henrik Nissen & Gunnar Brynning
51-1	Nordre Åsen BRL	Kjelsåsveien 10 A, B, C	40	1	Rinnan,Tveten & Colbjørnsen
51-2	Etterstad Sør BRL	Etterstadsletta 55	67	3	Morseth & Wiel Gedde
51-3	Akersbakken BRL	Fredrikke Qvamsgate 13-21	74	3	Edgar Smith Berentsen
52-1	Søndre Åsen BRL	Edvard Griegs allé	71	3	Oslo byarkitektkontor
52-2-1	Keyserløkka Øst BRL	Einars vei 2-4	55	2	Rinnan,Tveten & Colbjørnsen
52-2-2	Keyserløkka Øst BRL	Einars vei 2-4	70	3	Rinnan,Tveten & Colbjørnsen
52-3	Ensjøsvingen BRL	Ensjøsvingen 4	57	2	Victor Schaulund

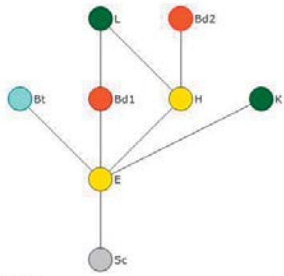
Number	Name	Address	Apartment m2	rooms	Architects
53-1	Teisen BRL	Klosterheimveien 16, 18, 20	68	3	Rinnan,Tveten & Colbjørnsen
53-2	Myrer BRL	Kurvveien 50, 52, - - , 60	57	2	T. Narve Ludvigsen
53-3	Stjerneblokkveien BRL	Stjerneblokkveien 16-18	69	3	Bernt Heiberg & Ola Mørk Sandvik
53-4-1	Mogata 11 BRL	Mogata 11	59	2	H. D. Elgethun
53-4-2	Mogata 11 BRL	Mogata 11	73	3	H. D. Elgethun
54-1	Marmorberget BRL	Antenneveien 34, 36, 38	64	3	Erling Viksjø
54-2	Valle BRL	Vallefaret 1 - 11	66	3	Thams & Gaare arkitekter
54-3-1	Vetlandsveien BRL	Vetlandsveien 81	81	4	Torgeir Alvsaker & E. Vaardal Lunde
54-3-2	Vetlandsveien BRL	Vetlandsveien 81	74	3	Torgeir Alvsaker & E. Vaardal Lunde
55-1	Hovin BRL	St.Jørgensvei 41-47	67	3	Rinnan,Tveten & Colbjørnsen
55-2	Oppsal BRL	Håkon Tvetersvei 38, 40, 42	52	2	Helge Thams & Arne Bjønness
55-3	Engsletta BRL	Kalbakkstubben 1-9	63	3	S.Narve Ludvigsen
56-1	Blåfjellet BRL	Gråsteinsveien 8, 10, 12	66	3	Knut Knutsen
56-2	Åsenbygg BRL	Borger Withsgate 19-25	51	2	Th. Chr. Hauff
57-1	Frederik Gladsgate BRL	Frederik Gladsgate 23 B, C	60	2	Hoel, Mugaas og Aastorp
57-2	Etterstad Vest BRL	Biskop Jens Nielsensgate 14	51	2	Morseth & Wiel Gedde
57-3-1	Husebybakken BRL	Ullernschausseen 46A	32	1	Morseth & Wiel Gedde
57-3-2	Husebybakken BRL	Ullernschausseen 46A	66	3	Morseth & Wiel Gedde
58-1	Manglerudjordet BRL	Plogveien 33, 35, 37	77	4	Engh & Qvam
58-2	Mogaten BRL	Mogata 12 A, B, C	68	3	Chr. Fredrik Størmer
59-1	Nils Huusgate	Birch Reichenwaldsgate 29	69	3	S. Narve Ludvigsen
59-2	Nylænde BRL	Nylænde 6	68	3	Byarkitekten i Oslo
59-3	Skøyenåsen BRL	Solbergliveien 104	63	3	Helge B. Thams
60-1	Storgården BRL	Byggveien 1, 3, 5, 7	73	3	Rinnan,Tveten & Colbjørnsen
60-2	Lillo Terrasse BRL	Betzy Kjeldsbergsvei 15	66	2	Christiansen & Rosland
60-3	Vossegata BRL	Vossegata 46	68	3	Ragnar Nilsen
61-1	Fuglemyra BRL	Kampheimveien 28	69	3	T. Alvsaker & E. Vaardal Lunde
61-2	Hauktjern BRL	Nøkleveien 2-8	69	3	Helge B. Thams
61-3	Rognerud BRL	Otto Sognsvei 11-17	73	3	S. Narve Ludvigsen
62-1	Manglerudvangen BRL	Rugveien 38-44, 53-87	69	3	Engh & Qvam
62-2	Bjerke BRL	Refstadsvingen 7	73	4	Heiberg & Sandvik
62-3	Laura Gundersensgate 3 BRL	Laura Gundersensgate 3	55	2	Kjell Colbjørnsen & Ulf Colbjørnsen
63-1	Pynten BRL	Mellombølgen 50-52-54	68	3	Frode Rinnan & Olav Tveten
63-2	Solrabben BRL	Kranveien 20-24	71	3	Engh & Qvam
64-1	Enerhaugen BRL	Enerhauggaten 7	78	3	Sofus Hougen
64-2	Stallerudåsen BRL	Stallerudveien 91	54	2	Preben Krag & Jens Selmer
64-3	Stormyra BRL	Solbergliveien 101-103	74	4	Helge Thams
65-1	Rustadåsen BRL	Rustadsaga 4-6	71	3	E. S. Berentsen & E. A. Berentsen
66-1	Bogerud BRL	Martin Lingesvei 1, 3, 5	72	4	USBL
66-2-1	Rustad BRL	Welding Olsensvei 5-7- -19	69	3	E. S. Berentsen & E. A. Berentsen
66-2-2	Rustad BRL	Rustadgrenda 27-29	74	3	Preben Krag & Jens Selmer
66-3-1	Lønnealleen BRL	Sigrid Undsetsvei 3	79	3	John Engh
66-3-2	Lønnealleen BRL	Sigrid Undsetsvei 3	61	2	John Engh
67-1	Munkelia BRL	Langbølgen 56	73	3	Helge Thams
67-2	Smalvollskogen BRL	Lavransvei 10, 12, 14	67	3	Preben Krag & Jens Selmer

Number	Name	Address	Apartment m2	rooms	Architects
67-3-1	Ammerudlia BRL	Ammerudgrenda 166-176	92	4	USBL v/ Th. Tostrup
67-3-2	Ammerudlia BRL	Ammerudgrenda 166-176	49	2	USBL v/ Th. Tostrup
68-1	Lohøgda BRL	Kristinsvei 36-42	73	3	Odd Brochmann
68-2	Ammerudfaret BRL	Ammerudhellinga 26-50	78	3	Håkon Mjelva
68-3	Haugerud BRL	Haugerudveien 38, 40, 42	93	4	Frode Rinnan & Olav Tveten
69-1	Tveita BRL	Nåkkvesvei 1	66	2	Hans Backer Fürst
69-2	Haugenstua BRL	Ole Brumms vei 18-24	78	3	Ungdommens selvbyggerlag
69-3	Smedstua BRL	Kristoffer Robins vei 38-40	77	3	Preben Krag & Jens Selmer
70-1-1	Solfjellet BRL	Haugerudveien 82	47	2	Frode Rinnan & Olav Tveten
70,1,2			81	3	
70-2	Vosseløkka BRL	Vossegata 18, 20, 20B	56	2	S. Narve Ludvigsen
71-1	Ravnkollen BRL	Ravnkollbakken 72, 74	95	4	Alex Christiansen
71-2	Sandbakken BRL	Selvbyggerveien 124-128	76	4	Alex Christiansen
71-3	Karihaugen BRL	Harald Sohlbergsvei 14	93	3	Helge Thams & Per Gaare
72-1	Etterstadsletta 46 BRL	Etterstadsletta 46	87	4	Kjell Colbjørnsen & Ulf Colbjørnsen
72-2	Fagerholt BRL	Dr. Dedichensvei 38-46	82	4	Frode Rinnan & Olav Tveten
72-3	Meklenborg BRL	Hovseterveien 48 A-B	89	3	A/S Ungdombygg
73-1	Karlstua BRL	Hagapynten 9-11	99	4	A/S Ungdombygg
73-2	Ellingsrudåsen BRL	Henrik Sørensensvei 32	74	3	Helge Thams & Per Gaare
74-1	Orremyr BRL	Odvar Solbergsvei 28-30	83	3(4)	Alex Christiansen
74-2	Stubberudlia BRL	Tvetenveien 231	59	2	Frode Rinnan & Olav Tveten
75-2-1	Setra BRL	Hovseterveien 66	80	3	Frode Rinnan & Olav Tveten
75-2-2	Setra BRL	Hovseterveien 66	95	4	Frode Rinnan & Olav Tveten
75-3-1	Orebakken BRL	Landingsveien 74-78	87	3	Preben Krag & Jens Selmer
75-3-2	Orebakken BRL	Landingsveien 74-78	96	4	Preben Krag & Jens Selmer
76-1	Svarttjern BRL	Odvar Solbergsvei 126-128	95	4	Alex Christiansen
76-3	Bjørnheim BRL	Høybråtenveien 21 A, B, C	112	4(5)	Klippgen, Holm & Halvorsen
77-1	Lindebergskogen BRL	Lindebergveien 45 A, B	88	4	Selvaag-Bygg
77-2	Sandaker BRL	Åsengata 2, 4, 6, 8	104	4	John Enghs arkitektkontor
77-3	Østre Lindeberg BRL	Jerikoveien 57	125	4	Selvaag-Bygg
78-1	Lutvannkollen BRL	Ole Reistadsvei 5 A, B, C	99	4	Frode Rinnan & Olav Tveten
80-1-1	Frydenlund BRL	Pionerstien 8	82	3	Helge Thams & Per Gaare
80-1-2	Frydenlund BRL	Pionerstien 8	99	4	Helge Thams & Per Gaare
80-2	Sloreåsen BRL	Sloreåsen 16	92	4	Selvaag-Bygg
81-1	Valdresgata BRL	Valdresgata 13 A-D	115	5	F. S. Platou A/S
81-3	Hoffsgrenda BRL	Skøyen Terrasse 25, 26, 27	95	4	Selvaag-Bygg
82-1	Skansen BRL	Dragonstien 5 A, B	84	3	Helge Thams & Per Gaare
82-2	Nordskrenten BRL	Lusetjernveien 42, 44, 46	102	4	Selvaag-Bygg
82-3-1	Nedre Silkestrå BRL	Nedre Silkestrå 24	98	4	Anker & Hølaas
82-3-2	Nedre Silkestrå BRL	Nedre Silkestrå 24	89	3	Anker & Hølaas
83-1	Casinetto BRL	Gustav Vigelandsvei 42, 44, 46	98	4	Telje- Torp- Aasen
83-2	Vestskrenten BRL	Nordåssløyfa 14-16	102	4	Selvaag-Bygg
83-3	Verksgata BRL	Fjellgata 2 A-E	97	4	Borgen & Bing Lorentzen
84-1	Øvre Ravnåsen BRL	Ravnåsveien 71-79	66	2	P. J. Eriksen & B. E. Knutsen
84-2	Stolmakergata BRL	Stolmakergata 9	78	3	Truls Thorenfeldt

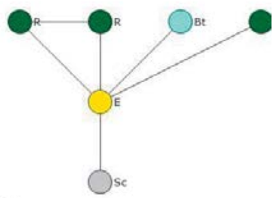
Number	Name	Address	Apartment m2	rooms	Architects
84-3	Måltrostskogen BRL	Arnulf Øverlandsvei 1-5	97	4	Selvaag-Bygg
85-2	Korsgata BRL	Korsgata 12 B	77	3	Truls Thorenfeldt
87-1	Beverlia BRL	Østmarkveien 62-102	76	3	Asplan prosjekt
87-2	Jordal BRL	Totengata 12, 14, 16	76	3	Alf Bastiansen
88-1	Nordbygata 3-9-13 Boligsamei	Nordbygata 3, 9, 13	92	3	Anker & Hølaas
88-3	Tirillsletta BRL	Høgåsveien 37-41	84	3	Klippgen, holm & Halvorsen
89-1	Smestaddammen BRL	Hoffsveien 60 B	103	4	Helge Thams & Per Gaare
89-2	Lilleparken BRL	Pilestredet 53	65	2(3)	4B Arkitekter v/ Henrik Poppe
89-3	Leirfallsgata BRL	Leirfallsgata 9-11	81	3(4)	Truls Thorenfeldt
90-1	Sportveien BRL	Lysehagen 50	59	3	Arkitektskap
90-3	Nittedalsgata 1-7 BRL	Nittedalsgata 1-7	64	2	Terjesen, Kjellstad, Horn
91-2	Sætrehjørnet BRL	Østerdalsgata 2 A-C	79	3	Gasa
91-4	Liakollen BRL	Høgåsveien 50-148	88	4	HRTB
92-1	Welhavensgate 10 BRL	Welhavensgate 10-14	81	3	Fosse & Aasen
96-1	Wesselsgate 16 BRL	Wesselsgate 16	77	3	Dahl & Myrhol
98-1	Pontoppidan BRL	Pontoppidansgate 9B	70	3	Arcasa
98-2	Frydenlundsgata 5/7 BRL	Frydenlundsgate 5-7	62	3	Thorenfeldt
00-1	Byhagen BRL	Tøyengata 3-11	70	3	Dahl & Myrhol ANS
00-2-1	Gøteborggata BRL	Gøtebotggata 31 B-C	59	2	Selvaagbygg AS
00-2-2	Gøteborggata BRL	Gøtebotggata 31 B-C	109	4	Selvaagbygg AS
01-1-1	Jacob Meyer BRL	Wesselsgate 15	57	2	Dahl & Myrhol ANS
01-1-2	Jacob Meyer BRL	Wesselsgate 15	90	4	Dahl & Myrhol ANS
02-1	Nedre Steensgaarden BRL	Stensgata 30	65	3	Thorenfeldt AS
02-2	Øvre Steensgaarden BRL	Stensgate 34, 36	72	3	Thorenfeldt AS
03-1	Høgåsen BRL	Høgåsveien 74-94	80	3	Spor Arkitekter AS
03-2	Hospitalhaven Boligsameie	Pilestredet Park 25	62	3	Lund og Slaato / GASA
03-3	Lakkegården BRL	Heimdalsgata 19-23	65	3	Arkitektskap AS
04-1-1	Vålen BRL	Biskop Jens Nilsensgate 13-19	49	2	Arkitektskap AS
04-1-2	Vålen BRL	Biskop Jens Nilsensgate 13-19	78	3	Arkitektskap AS
04-2-1	Hausmann BRL	Hausmannsgate 10-14	42	2	Dyrvik Arkitekter AS
04-2-2	Hausmann BRL	Hausmannsgate 10-14	64	3	Dyrvik Arkitekter AS
04-3	Marienlyst Park Boligsameie	Gydas vei 16-28	80	3	Lund/Hagem Arkitekter AS
05-1	Freidigkollen BRL	Gamle Bygdevei 168-204	80	3	Alex Christiansen AS
05-2	Sogn Terrasse BRL	Klaus Torgårdsvei 10 A-B	82	3	Selvaagbygg AS
05-3-1	Karenlyst Plass Boligsameie	Drammensveien 154	59	2	LPO og 4B Arkitekter
05-3-2	Karenlyst Plass Boligsameie	Drammensveien 154	69	3	LPO og 4B Arkitekter



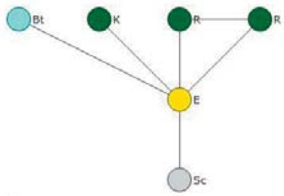
31-1-1



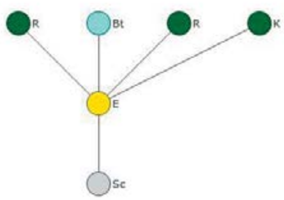
31-1-2



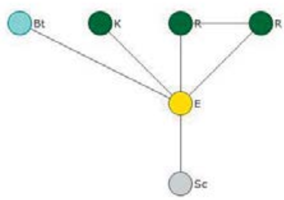
32-1



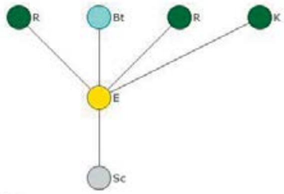
33-1



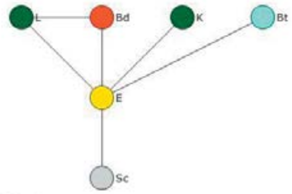
33-2



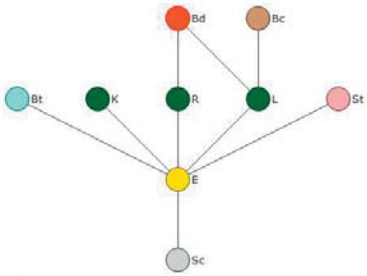
36-1



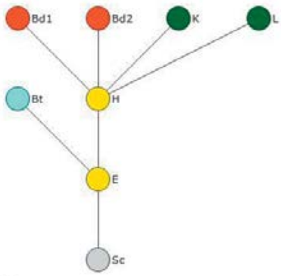
36-2



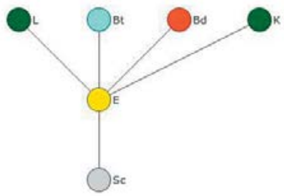
36-3-1



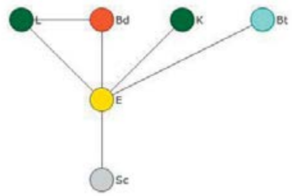
36-3-2



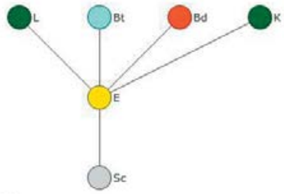
36-4



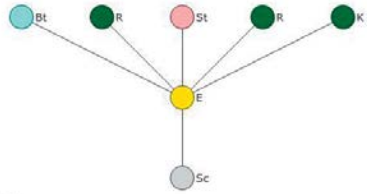
38-1



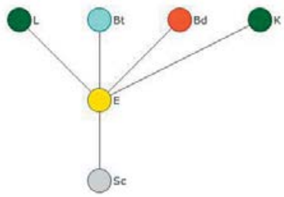
39-1



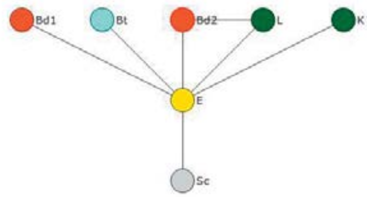
39-2



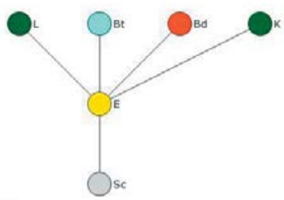
40-1



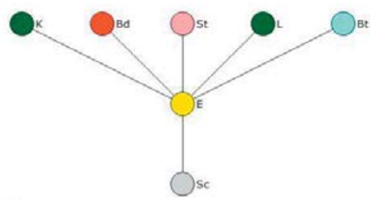
40-2-1



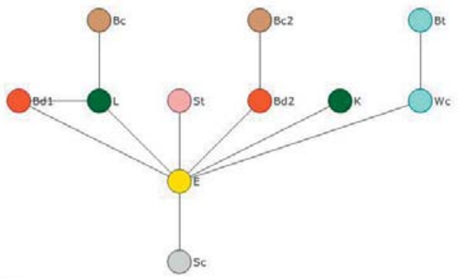
40-2-2



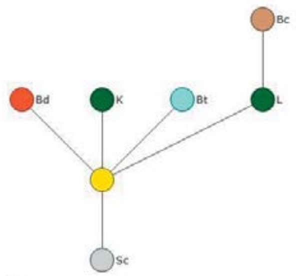
40-3



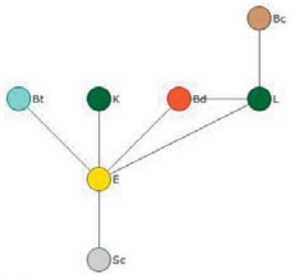
41-1



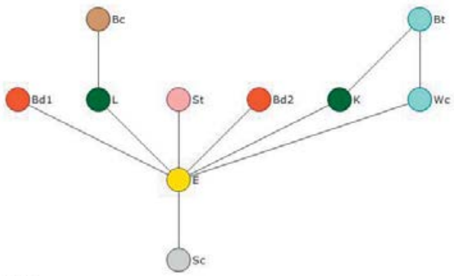
41-2



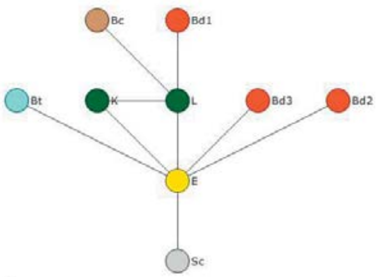
41-3



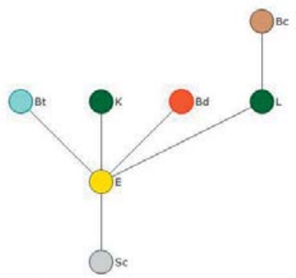
41-4-1



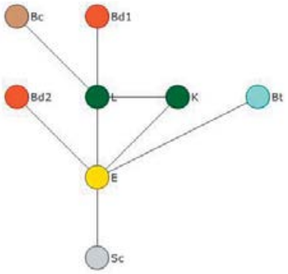
41-4-2



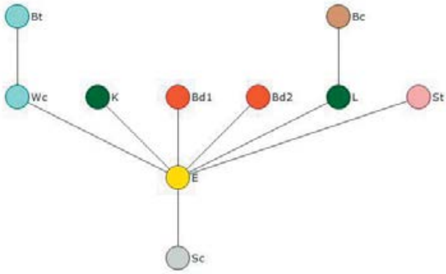
47-1



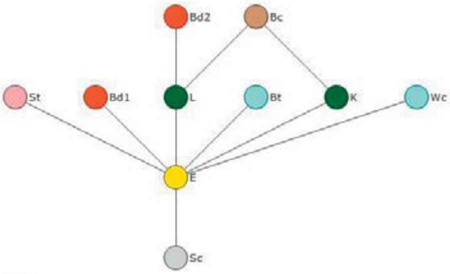
47-2-1



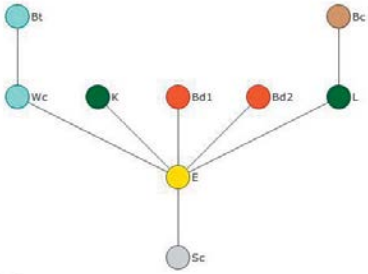
47-2-2



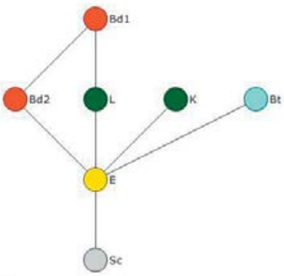
48-1-1



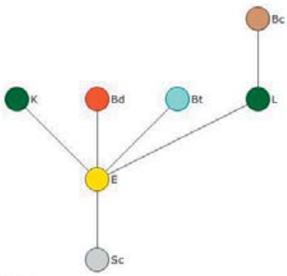
48-1-2



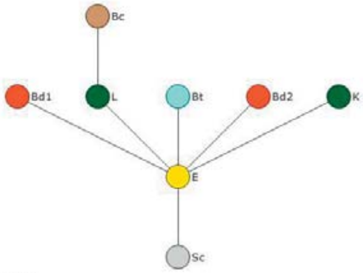
48-2



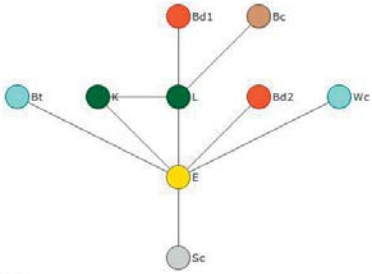
48-4



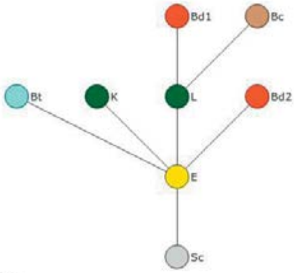
48-5-1



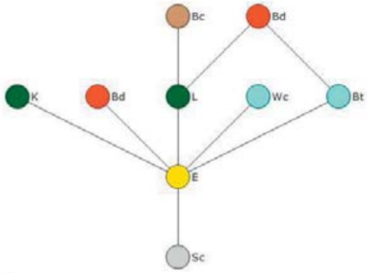
48-5-2



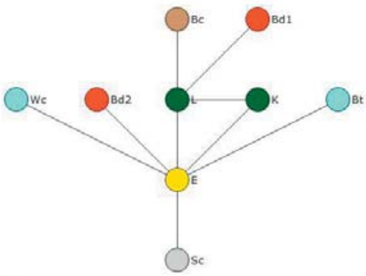
48-7



48-8



49-1



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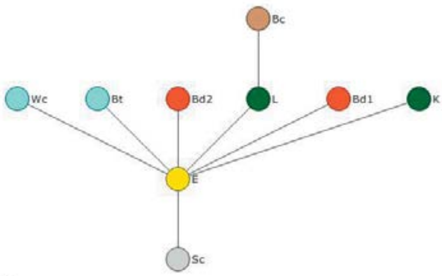
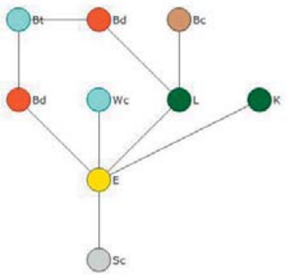


50-1



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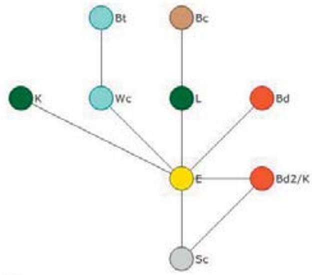

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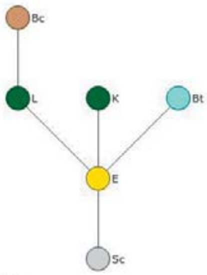
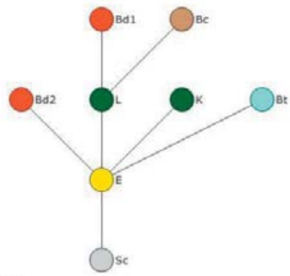


51-1



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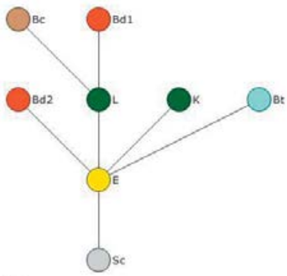

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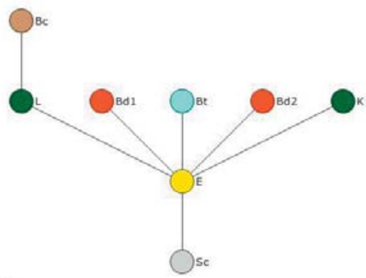
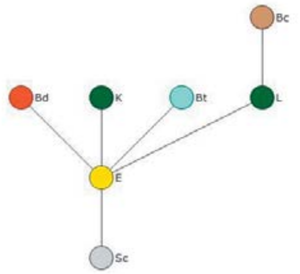
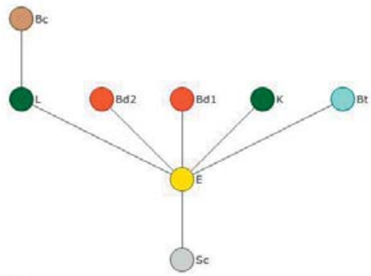


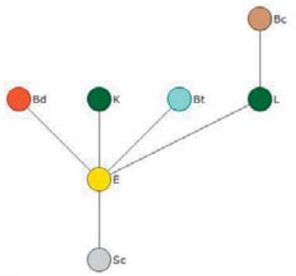
52-1



52-2-1



52-2-2



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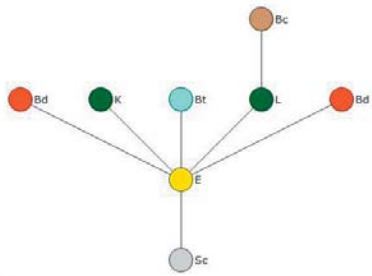
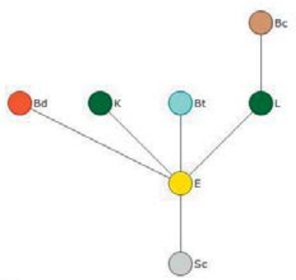


53-1



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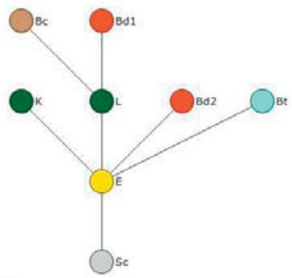

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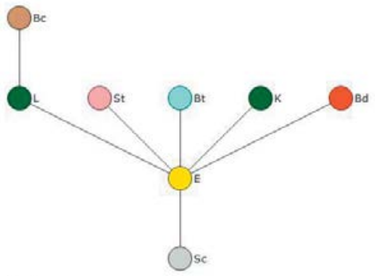
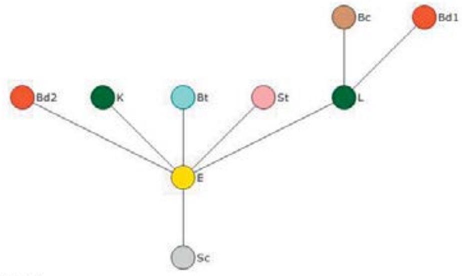
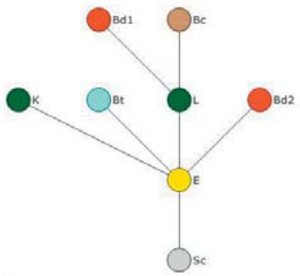


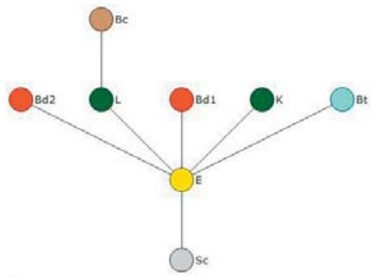
53-4-1



53-4-2



54-1



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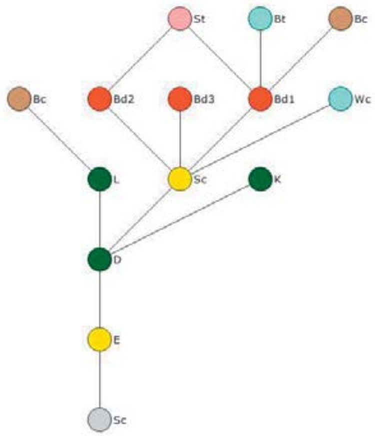
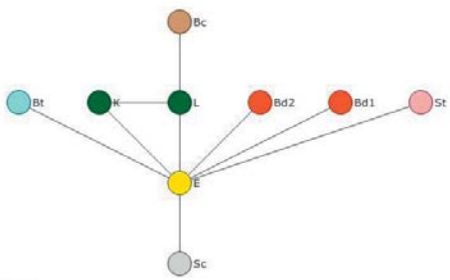


54-3-1



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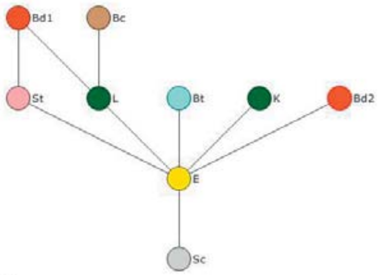
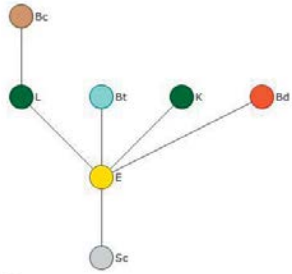


55-1



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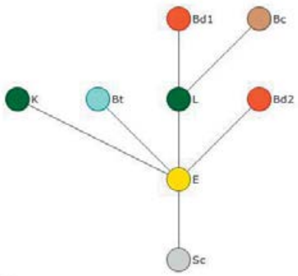

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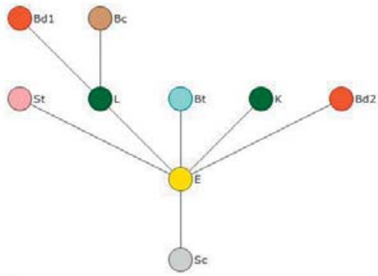
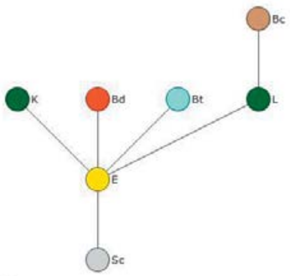


56-1



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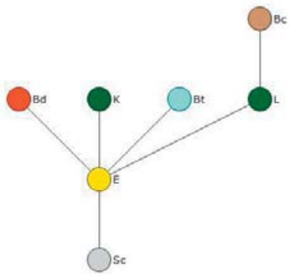

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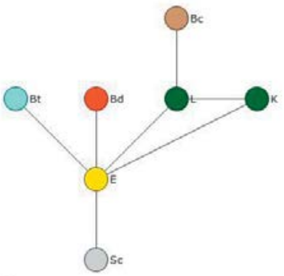

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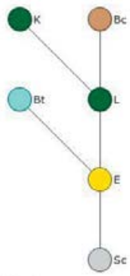
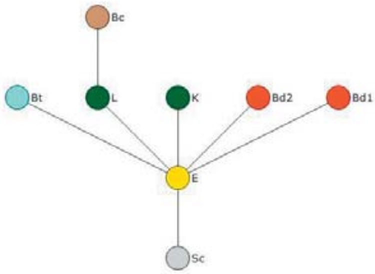
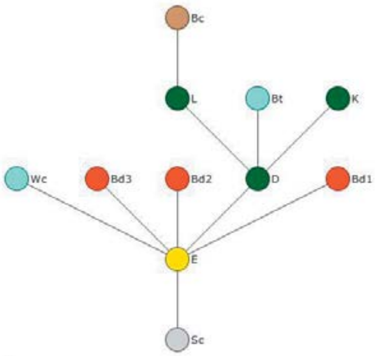


57-3-1



57-3-2



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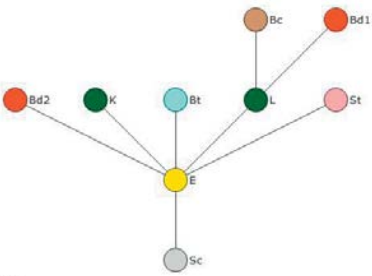

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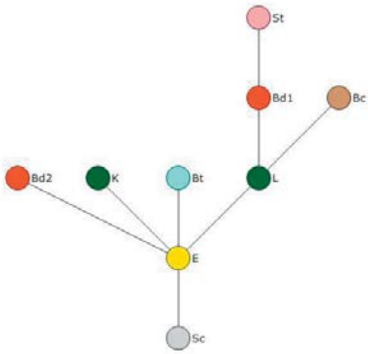

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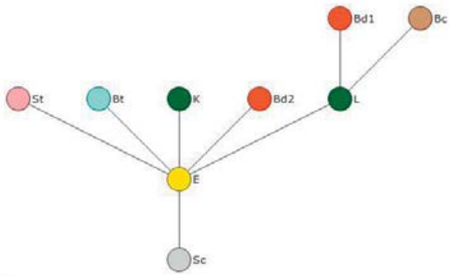

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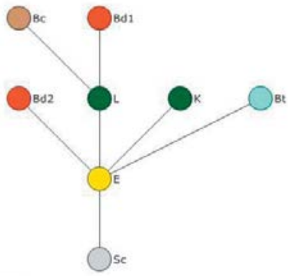

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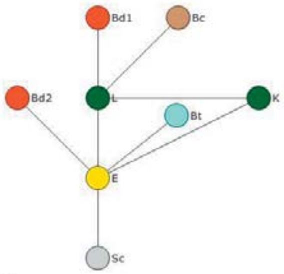

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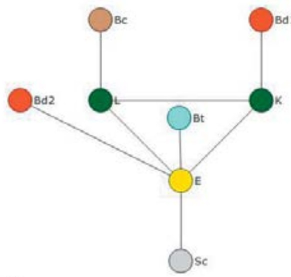

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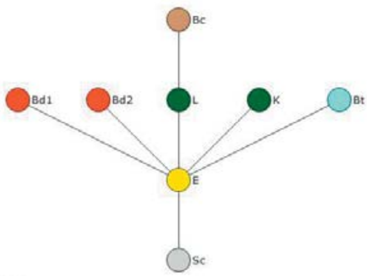

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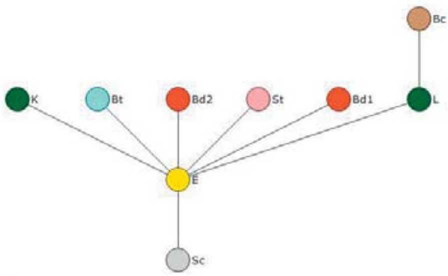
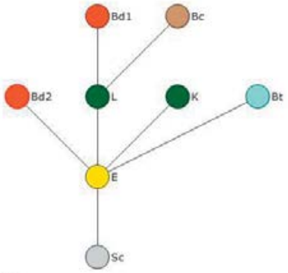


61-1



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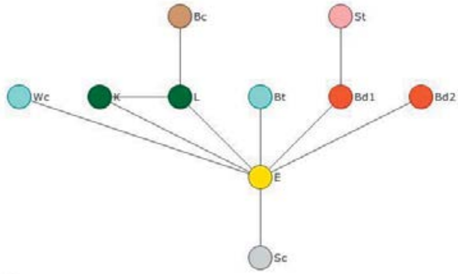

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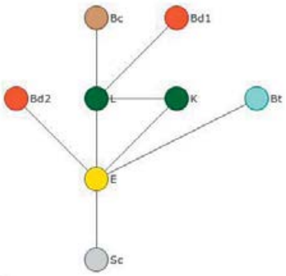

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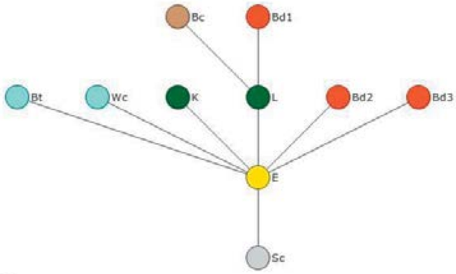

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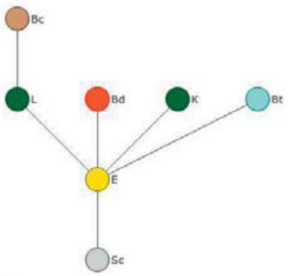

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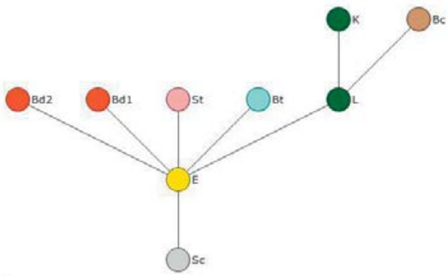

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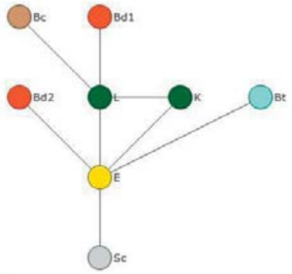

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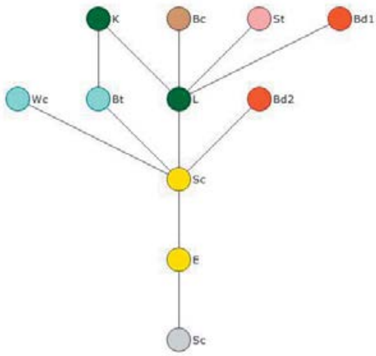

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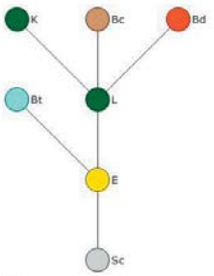

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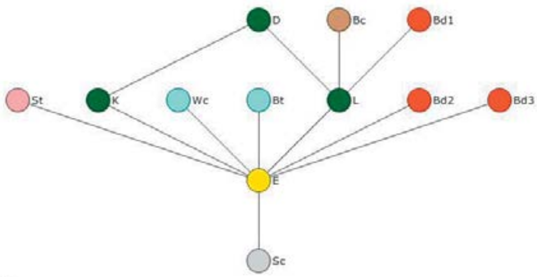

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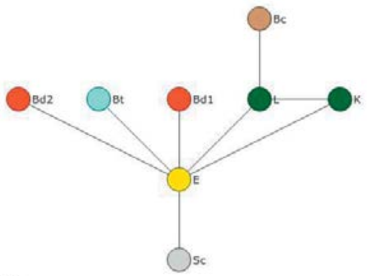

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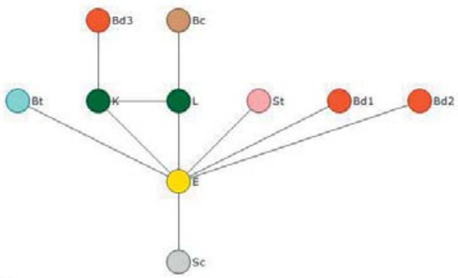
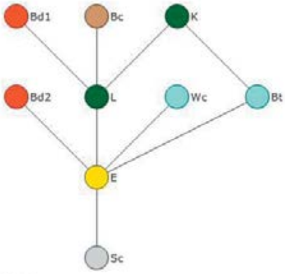


66-1



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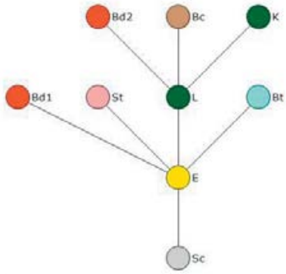
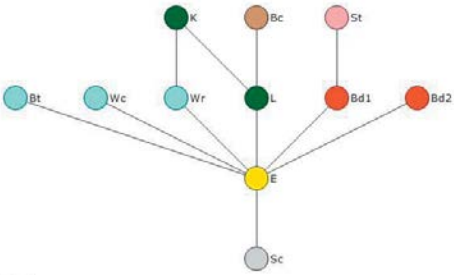
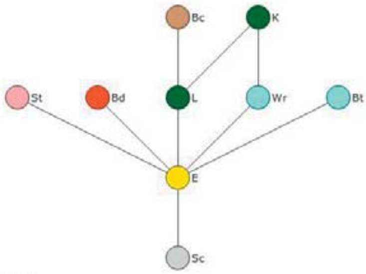


66-2-2



66-3-1



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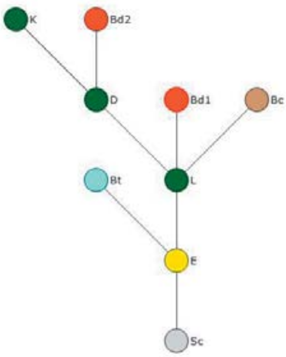
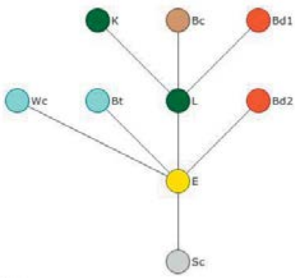
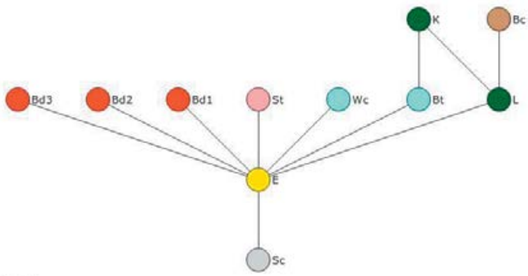


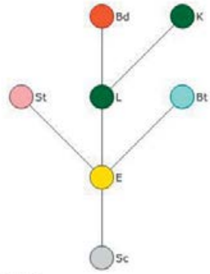
67-1



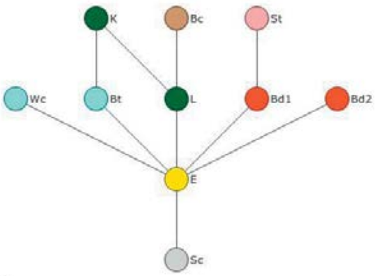
67-2



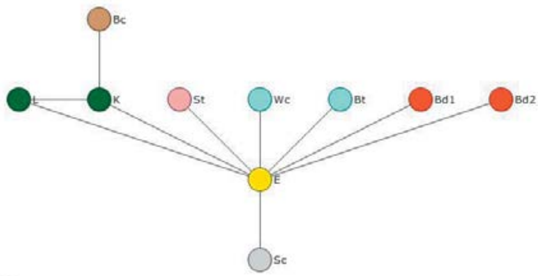
67-3-1



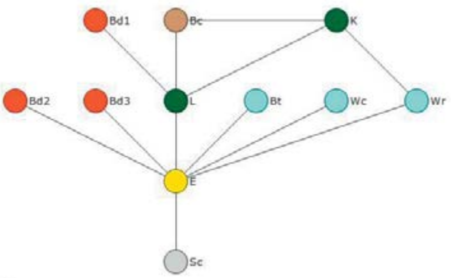
67-3-2



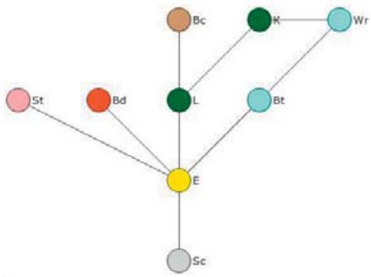
68-1



68-2



68-3



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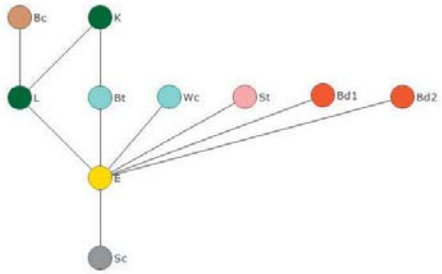
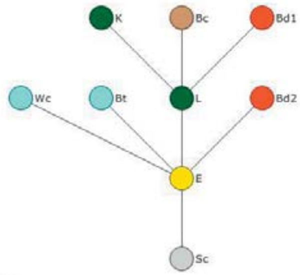
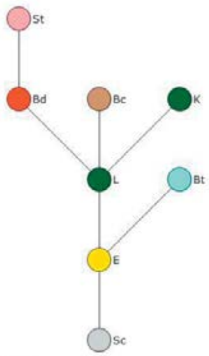


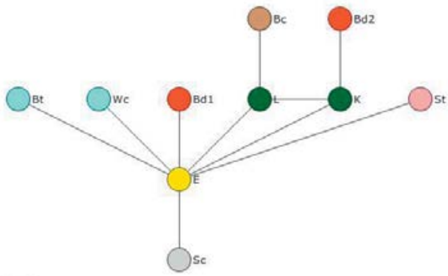
69-2



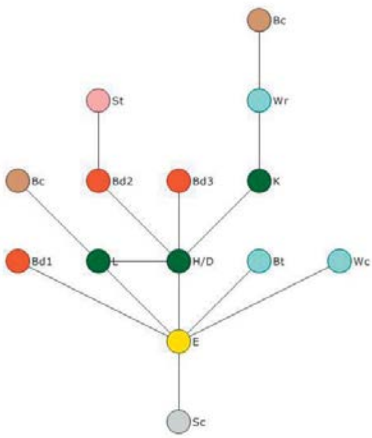
69-3



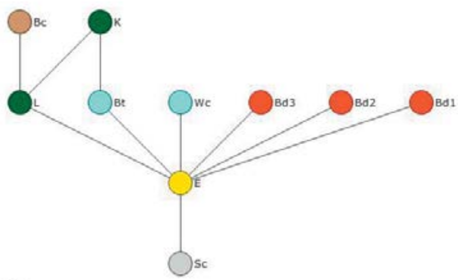
70-1-1



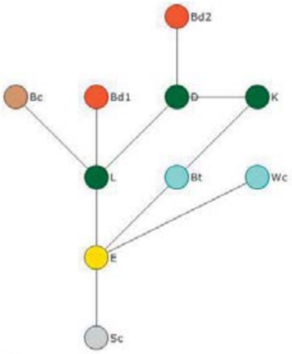
70-1-2



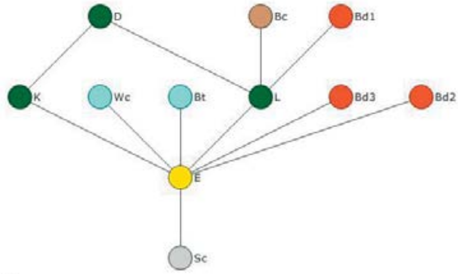
71-1



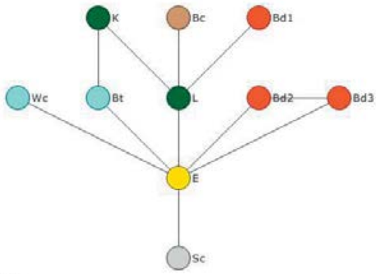
71-2



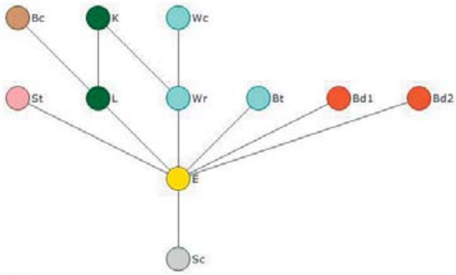
71-3



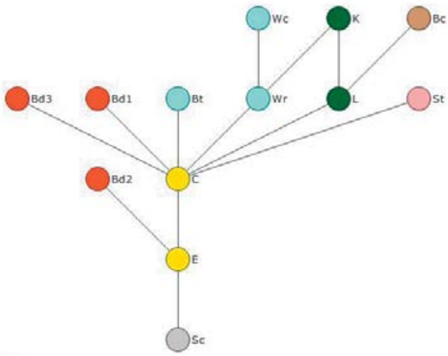
72-1



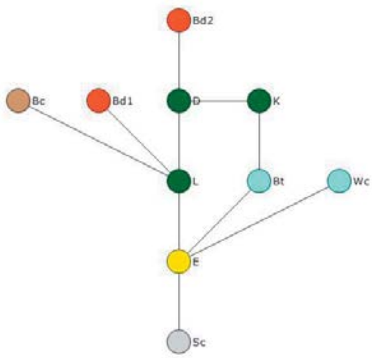
72-2



72-3



73-1



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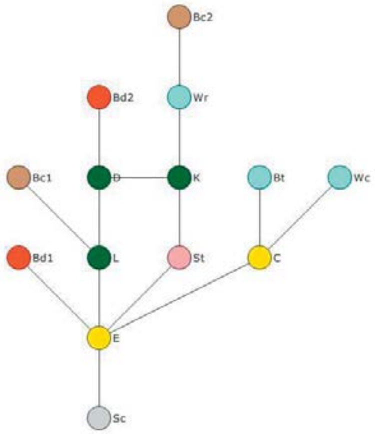

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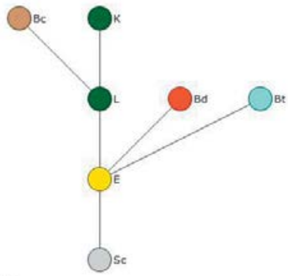

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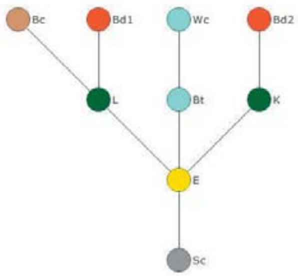

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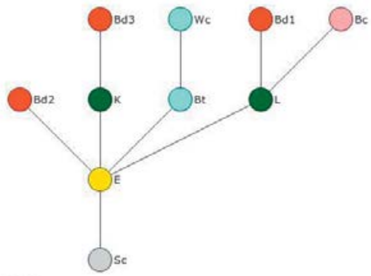

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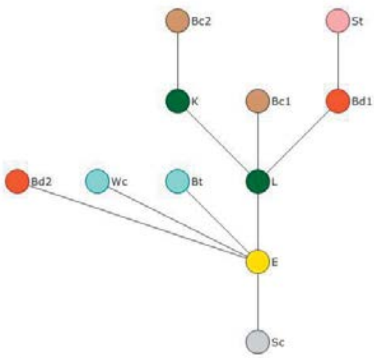

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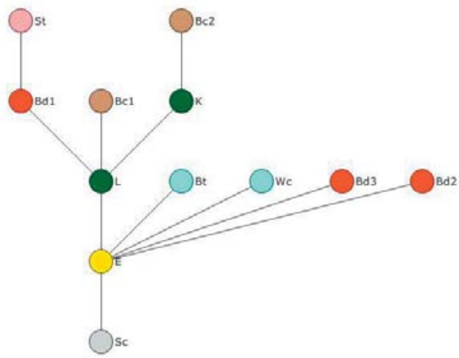

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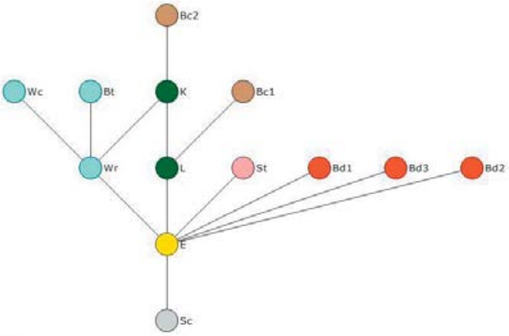

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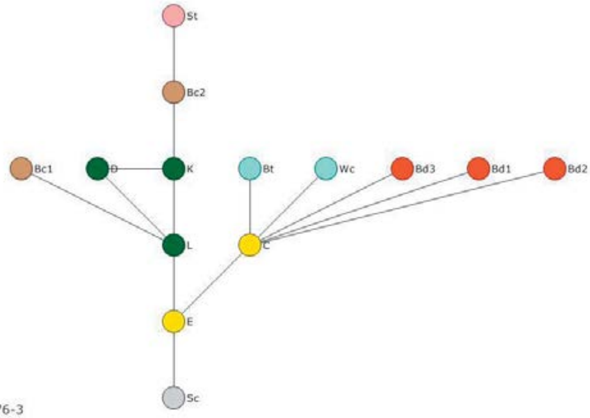

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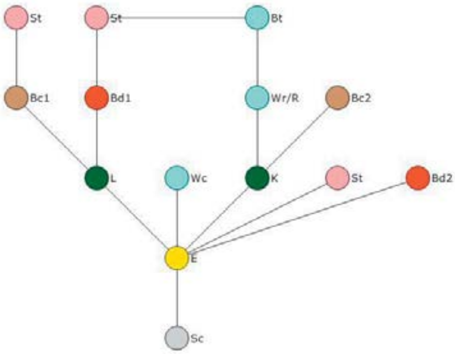

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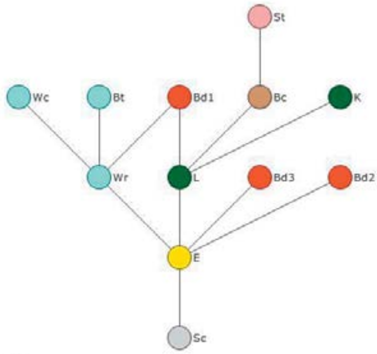

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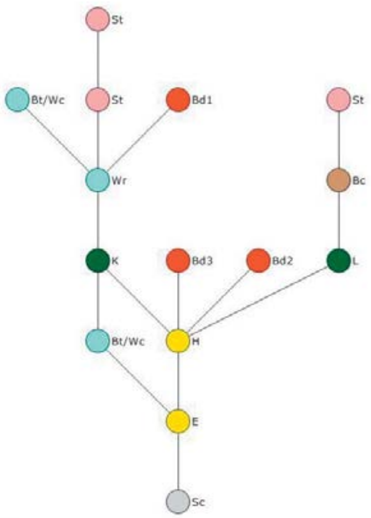

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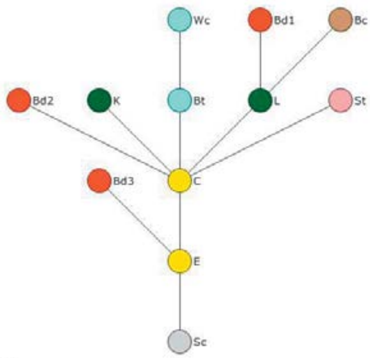

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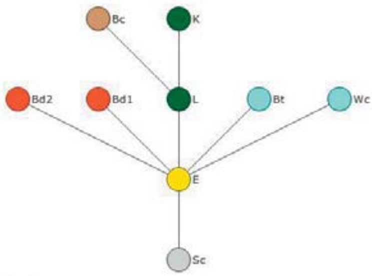

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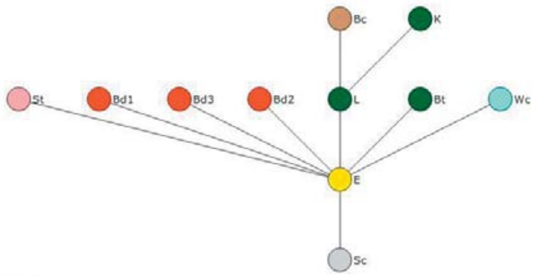

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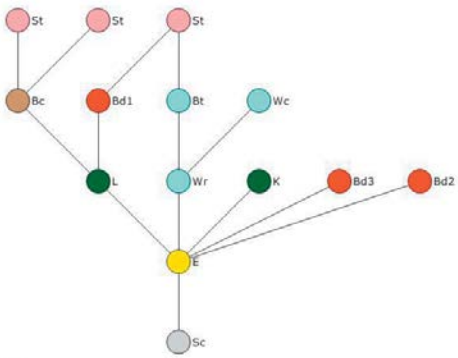

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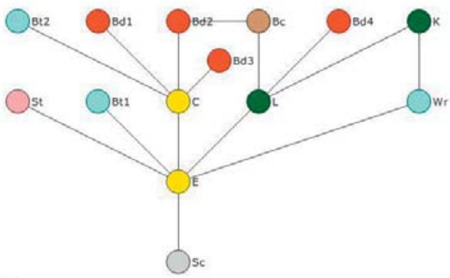

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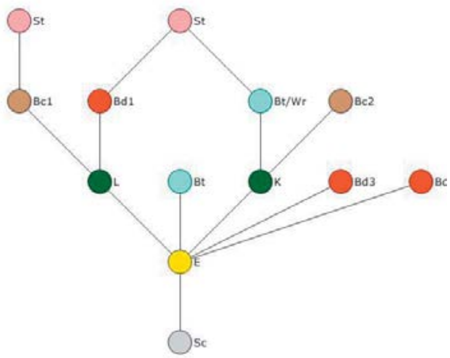
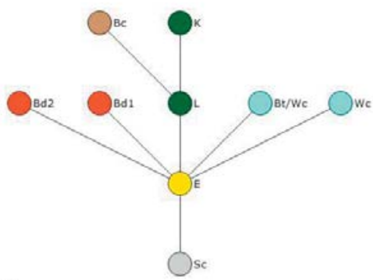
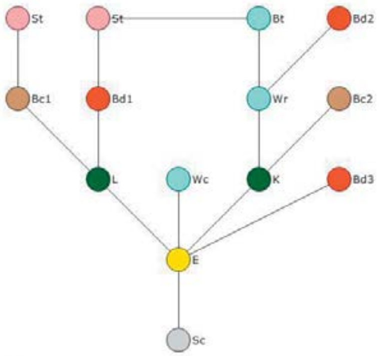




82-1

81-3



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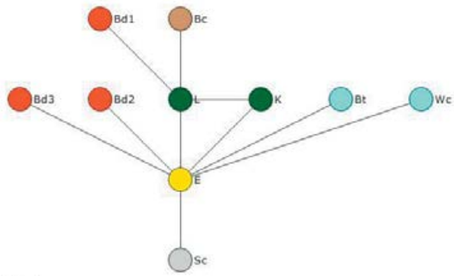

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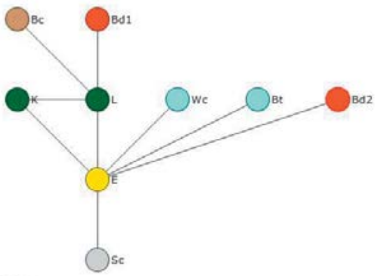

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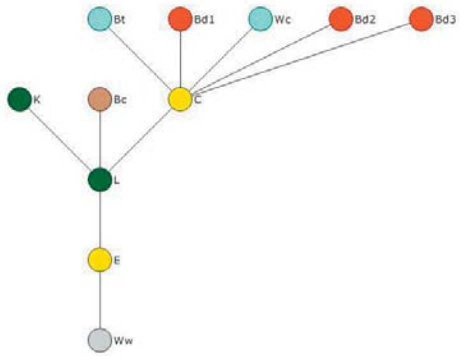

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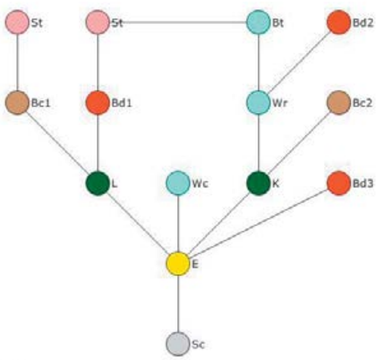

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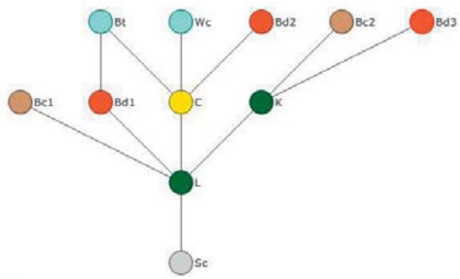

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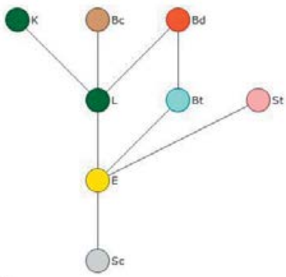

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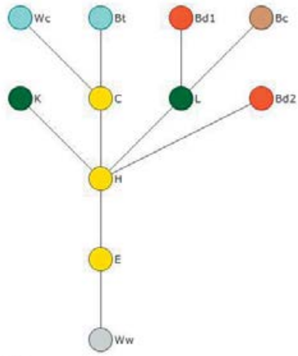

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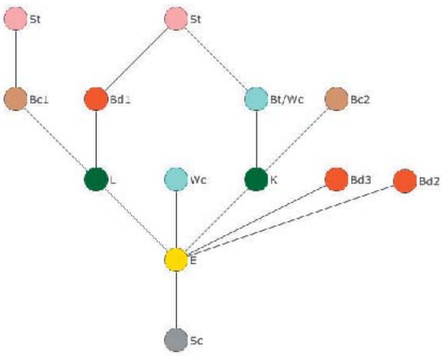

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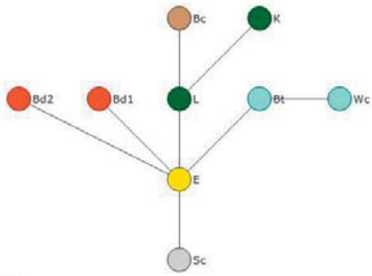

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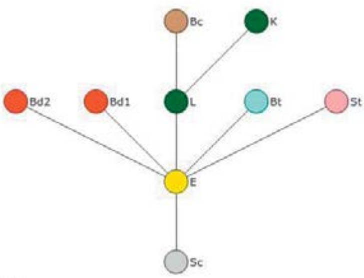

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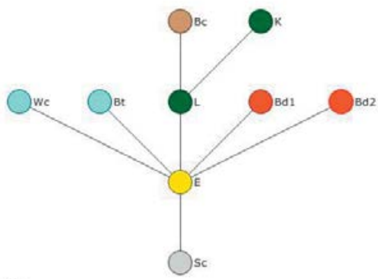

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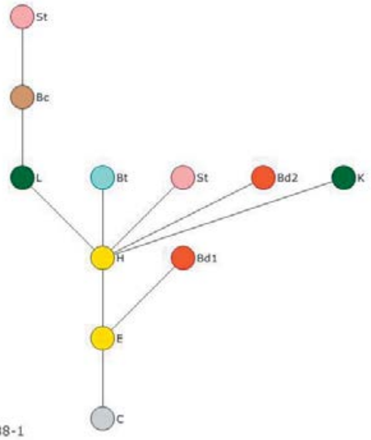

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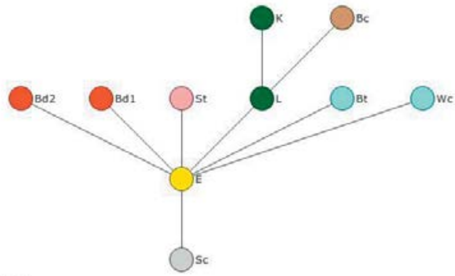

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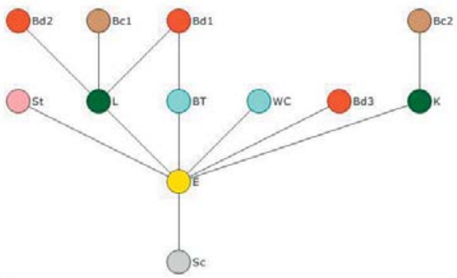

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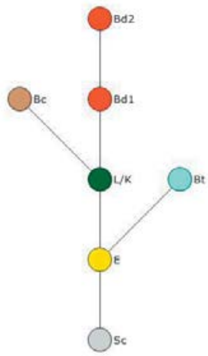

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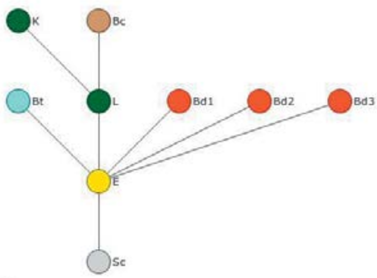

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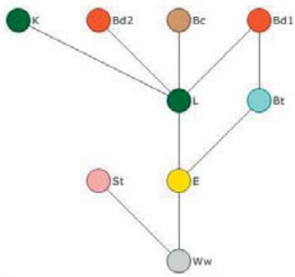

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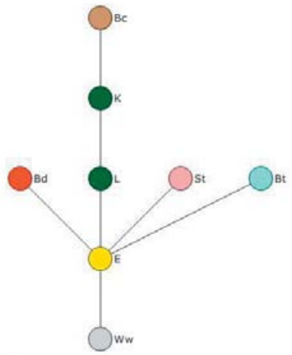

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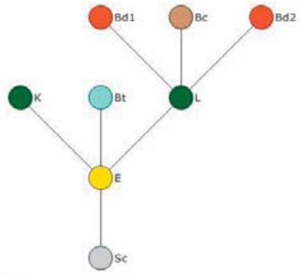

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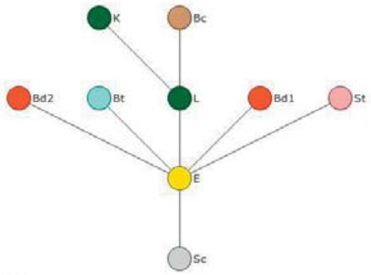

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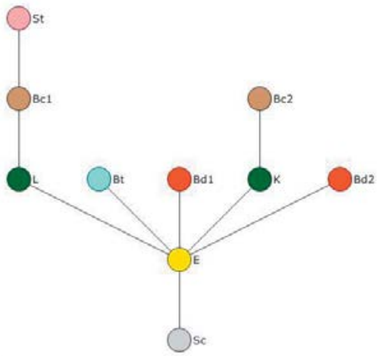

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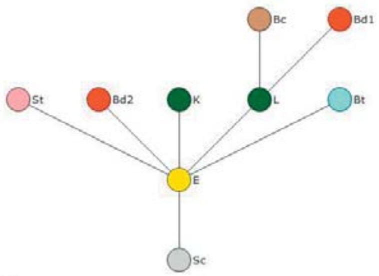

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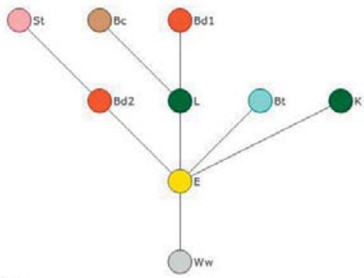

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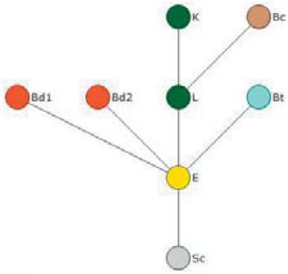

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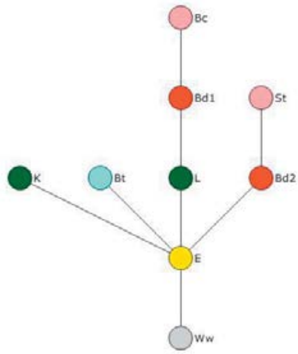

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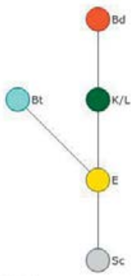

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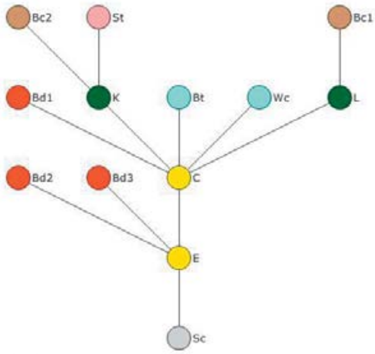

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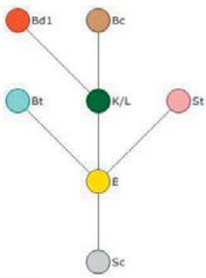

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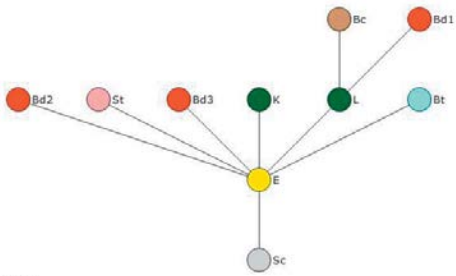

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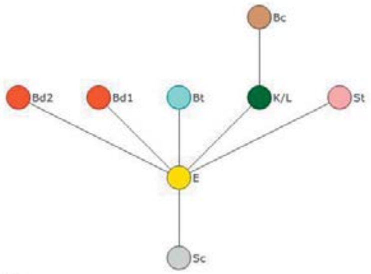

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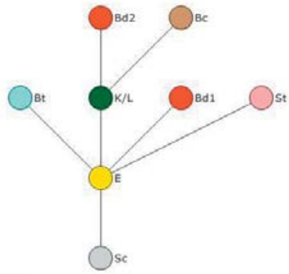

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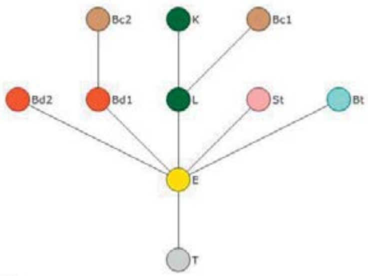

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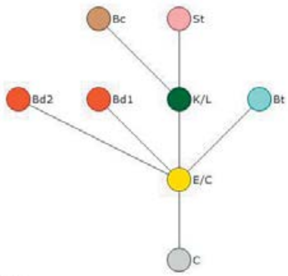

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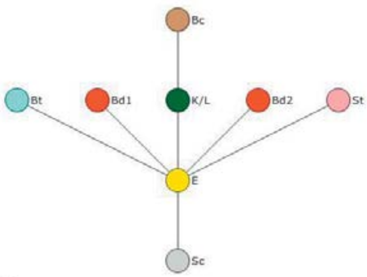

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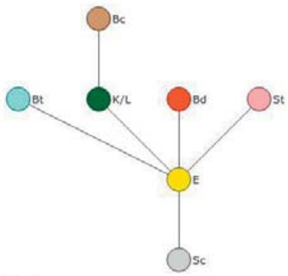

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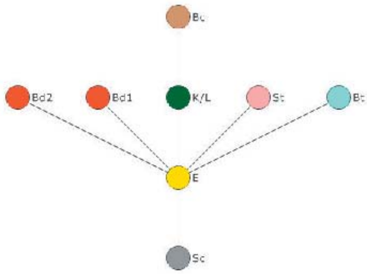

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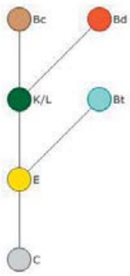

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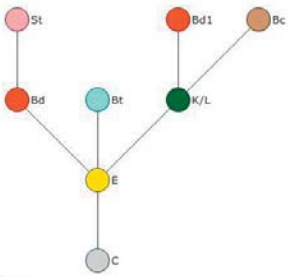

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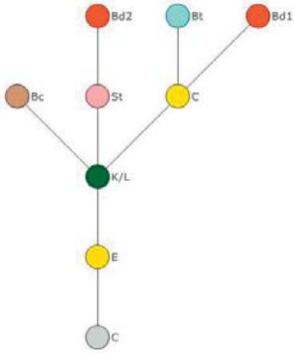

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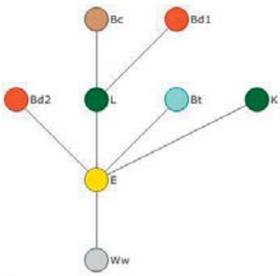

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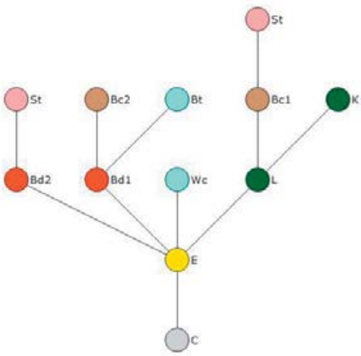

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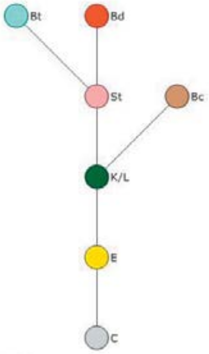

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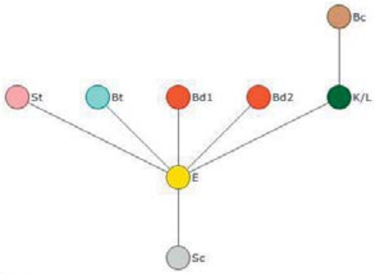
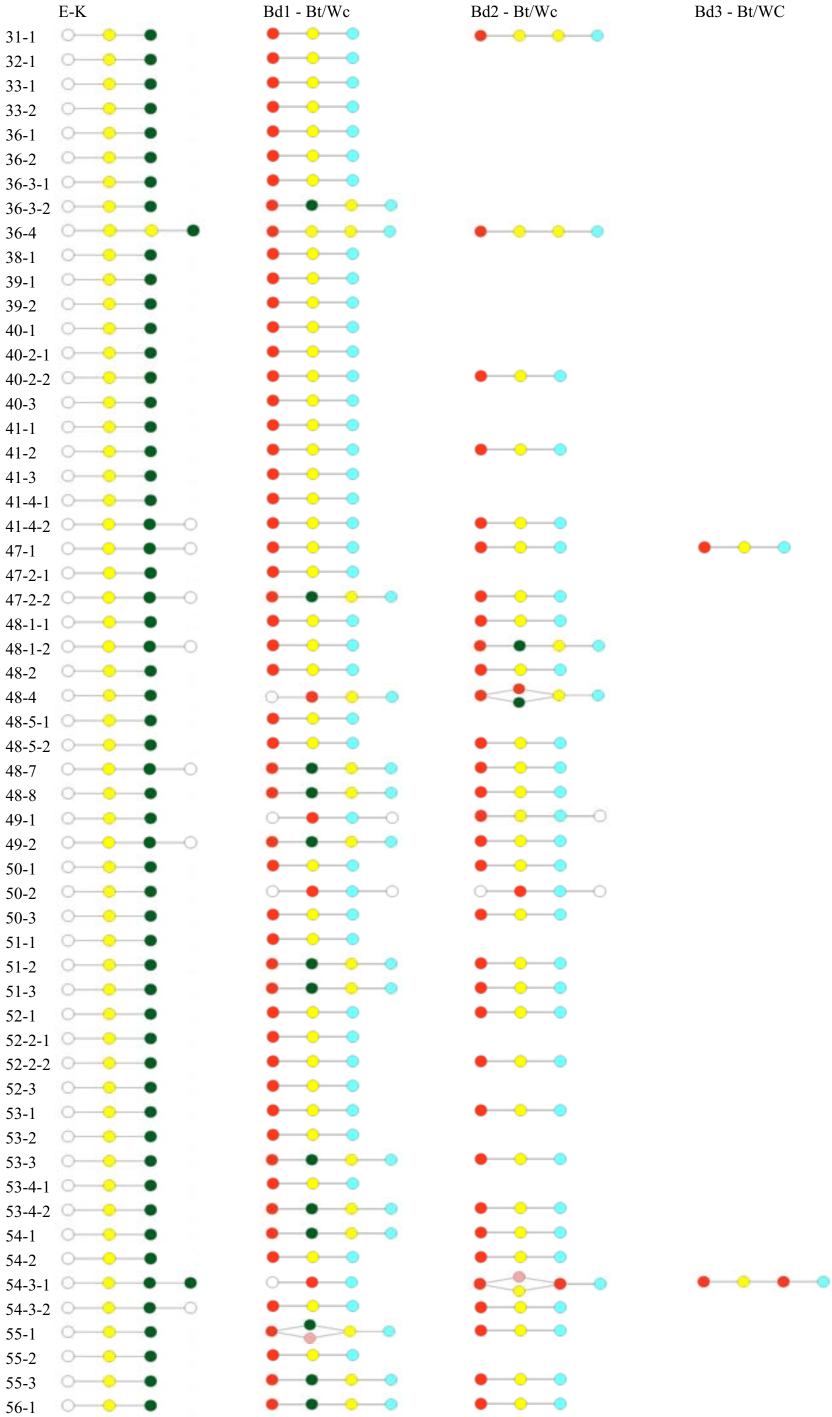
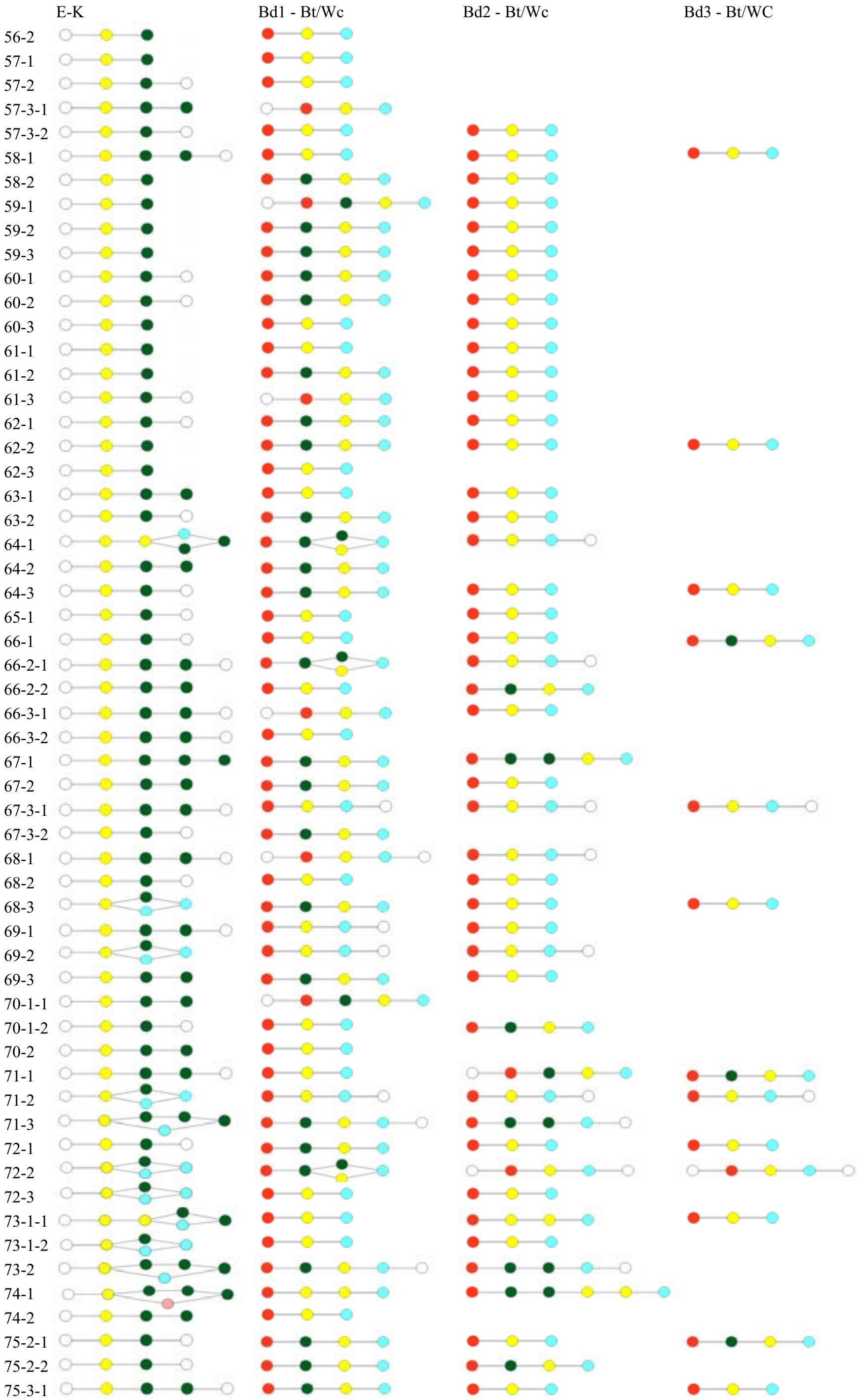


05-3-2

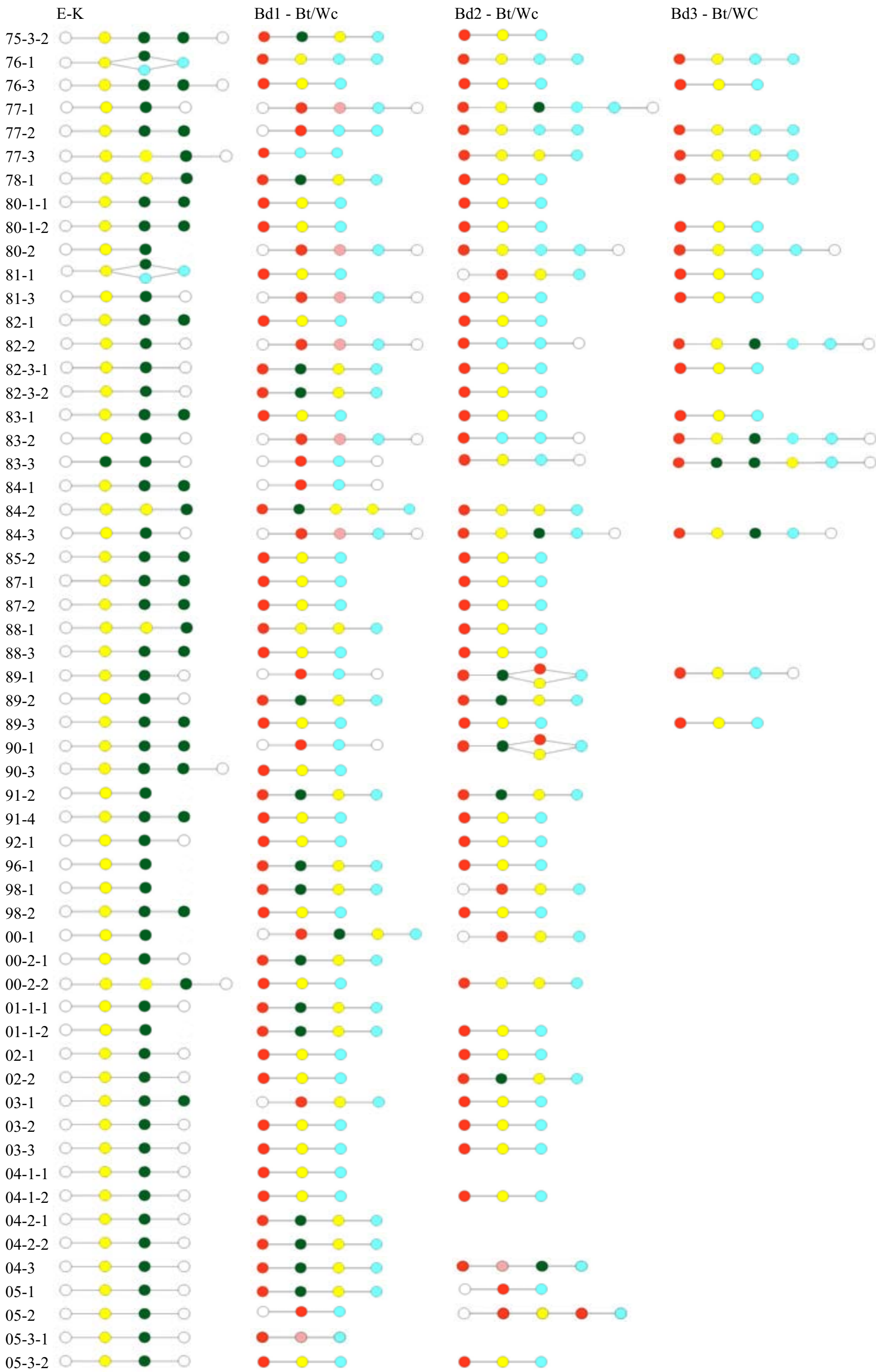
A.4.3 Some room sequences, all apartments



A.4.3 Some room sequences, all apartments



A.4.3 Some room sequences, all apartments



Appendix A.4.4 Space Syntax Calculation, Typical Apartments, All

Case	R	L	MD(E)	CV E	CV L/D	Integration (by Relative Asymmetry, RA)													Order (E-L-K-Bd1)			
31-1-1	1	C	1,16	3,00	0,75	0,00	0,33	0,33	0,50	0,50									0,00	0,33	0,33	0,50
32-1	1	C	1,16	3,00	0,75	0,00	0,33	0,33	0,50	0,50									0,00	0,33	0,33	0,50
33-1	1	C	1,16	3,00	0,75	0,00	0,33	0,33	0,50	0,50									0,00	0,33	0,33	0,50
33-2		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
36-1	1	C	1,16	3,00	0,75	0,00	0,33	0,33	0,50	0,50									0,00	0,33	0,33	0,50
36-2		A	1,16	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
36-3-1	1	C	1,33	3,00	0,75	0,00	0,33	0,33	0,50	0,50									0,00	0,33	0,33	0,50
36-4		A	1,66	1,20	0,20	0,06	0,26	0,40	0,40	0,40	0,40	0,60							0,06	0,40	0,40	0,40
38-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
39-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
39-2		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
40-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
40-2-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
40-3		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
41-1		A	1,00	4,00	0,25	0,00	0,50	0,50	0,50	0,50									0,00	0,50	0,50	0,50
41-2	1	C	1,16	2,83	1,70	0,10	0,25	0,28	0,28	0,28	0,35	0,50	0,53	0,53					0,10	0,25	0,28	0,35
41-3		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
41-4-1	1	C	1,20	2,83	1,75	0,10	0,20	0,30	0,60	0,60	0,80								0,10	0,20	0,30	0,60
47-1	1	C	1,28	3,75	2,70	0,09	0,14	0,23	0,38	0,38	0,38	0,42	0,42						0,09	0,14	0,23	0,42
47-2-2	1	C	1,20	2,75	2,75	0,13	0,13	0,26	0,46	0,46	0,46	0,46							0,13	0,13	0,26	0,46
48-1-2	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,28	0,38
48-2		A	1,28	4,00	1,20	0,09	0,28	0,28	0,38	0,38	0,38	0,57	0,57						0,09	0,28	0,38	0,38
48-4	1	C	1,20	3,00	0,75	0,10	0,30	0,30	0,50	0,50	0,50								0,10	0,30	0,30	0,50
48-5-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
48-7	1	C	1,28	3,75	2,70	0,09	0,14	0,23	0,38	0,38	0,38	0,42	0,42						0,09	0,14	0,23	0,38
48-8		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
49-1	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,38	0,38
49-2	1	C	1,28	3,75	2,70	0,09	0,14	0,23	0,38	0,38	0,38	0,42	0,42						0,09	0,14	0,23	0,38
50-1		A	1,14	5,50	1,16	0,04	0,23	0,33	0,33	0,33	0,33	0,33	0,52						0,04	0,23	0,33	0,33
50-2	1	c	1,42	2,83	1,75	0,14	0,19	0,28	0,33	0,38	0,42	0,42	0,47						0,14	0,19	0,28	0,42
50-3	1x	A	1,28	4,00	1,20	0,09	0,28	0,28	0,38	0,38	0,38	0,57	0,57						0,09	0,28	0,38	0,38
51-1		A	1,25	2,50	1,33	0,16	0,33	0,66	0,66	0,83									0,16	0,33	0,66	
51-2		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
51-3		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
52-1		A	1,16	4,50	1,20	0,06	0,26	0,40	0,40	0,40	0,40	0,60							0,06	0,26	0,40	0,40
52-2-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
52-3		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
53-1		A	1,16	4,50	1,20	0,06	0,26	0,40	0,40	0,40	0,40	0,60							0,06	0,26	0,40	0,40
53-2		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
53-3		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
53-4-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
54-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
54-2		A	1,16	4,50	1,20	0,06	0,26	0,40	0,40	0,40	0,40	0,60							0,06	0,26	0,40	0,40
54-3-1	1	A	2,83	0,25	1,25	0,12	0,16	0,19	0,25	0,28	0,28	0,30	0,33	0,33	0,33	0,36	0,36	0,46	0,16	0,19	0,25	0,33
55-1	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,38	0,38
55-2		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
55-3		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
56-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
56-2		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
57-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
57-2	1	C	1,20	2,83	1,75	0,10	0,20	0,30	0,50	0,50	0,60								0,10	0,20	0,30	0,50
57-3-1		B	1,50	1,33	2,50	0,16	0,33	0,66	0,66	0,83									0,16	0,33	0,66	
58-1		A	1,55	4,25	2,70	0,13	0,13	0,30	0,36	0,36	0,36	0,36	0,36	0,36	0,52				0,13	0,30	0,36	0,36
58-2		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
59-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
59-2		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
59-3		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53

Case	R	L	MD(E)	CV E	CV L/D	Integration (by Relative Asymmetry, RA)													Order (E-L-K-Bd1)			
60-1	1	C	1,33	2,75	2,75	0,13	0,13	0,26	0,46	0,46	0,46	0,46							0,13	0,13	0,26	0,46
60-2	1	C	1,33	2,66	1,58	0,13	0,20	0,22	0,46	0,46	0,53	0,53							0,13	0,20	0,22	0,53
60-3		A	1,16	4,50	1,20	0,06	0,26	0,40	0,40	0,40	0,40	0,60							0,06	0,26	0,40	0,40
61-1		A	1,16	4,50	1,20	0,06	0,26	0,40	0,40	0,40	0,40	0,60							0,06	0,26	0,40	0,40
61-2		A	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
61-3	1	C	1,14	4,83	1,66	0,04	0,19	0,23	0,33	0,33	0,33	0,33	0,47						0,04	0,19	0,23	0,33
62-1	1	C	1,33	2,75	2,75	0,13	0,13	0,26	0,46	0,46	0,46	0,46							0,13	0,13	0,26	0,46
62-2		A	1,25	5,33	2,16	0,07	0,17	0,32	0,32	0,32	0,32	0,32	0,42	0,42					0,07	0,17	0,32	0,42
62-3		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
63-1		A	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
63-2	1	C	1,33	2,75	2,75	0,13	0,13	0,26	0,46	0,46	0,46	0,46							0,14	0,32	0,35	0,39
64-1	1	C	2,25	0,20	2,70	0,10	0,14	0,28	0,32	0,35	0,35	0,35	0,39	0,39					0,14	0,32	0,35	0,39
64-2		B	1,60	1,25	3,50	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
64-3	1	C	1,33	4,75	2,66	0,08	0,13	0,25	0,30	0,30	0,30	0,30	0,30	0,36	0,36				0,08	0,13	0,25	0,36
65-1	1	C	1,16	3,83	1,70	0,06	0,20	0,26	0,40	0,40	0,40	0,53							0,06	0,20	0,26	0,40
66-1	1	C	1,28	3,66	1,53	0,09	0,19	0,19	0,38	0,38	0,38	0,47	0,47						0,09	0,19	0,19	0,38
66-2-1	1	C	1,42	2,75	2,75	0,14	0,14	0,33	0,33	0,42	0,42	0,42	0,42						0,14	0,14	0,33	0,42
66-2-2		B	1,50	2,25	3,33	0,13	0,20	0,46	0,46	0,46	0,53	0,53							0,13	0,20	0,46	0,53
66-3-1	1	C	1,25	4,83	1,66	0,07	0,17	0,25	0,32	0,32	0,32	0,32	0,35	0,42					0,07	0,17	0,32	0,35
67-1		B	2,00	1,25	2,83	0,14	0,23	0,33	0,42	0,42	0,52	0,52	0,61						0,23	0,33	0,42	0,52
67-2		B	1,42	3,25	3,35	0,14	0,14	0,42	0,42	0,42	0,42	0,42	0,42						0,14	0,14	0,42	0,42
67-3-1	1	C	1,25	4,83	1,66	0,07	0,17	0,25	0,32	0,32	0,32	0,32	0,35	0,42					0,07	0,17	0,32	0,35
68-1	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,38	0,38
68-2	1	C	1,14	4,83	1,66	0,04	0,19	0,23	0,33	0,33	0,33	0,33	0,47						0,04	0,19	0,23	0,33
68-3	1	C	1,33	4,75	2,66	0.08	0,13	0,25	0,30	0,30	0,30	0,30	0,30	0,36	0,36				0.08	0,13	0,30	0,36
69-1	1	C	1,50	1,83	1,83	0,20	0,20	0,33	0,33	0,40	0,53	0,53							0,20	0,20	0,33	0,53
69-2	1	C	1,28	3,83	1,70	0,09	0,19	0,28	0,38	0,38	0,38	0,38	0,47						0,09	0,19	0,38	0,38
69-3		B	1,42	3,25	3,25	0,14	0,14	0,42	0,42	0,42		0,42							0,14	0,14	0,42	0,42
70-1-1		B	1,60	1,25	3,50	0,10	0,30	0,50	0,50	0,50	0,70								0,10	0,30	0,50	0,50
70-2		B	1,40	2,33	2,33	0,20	0,20	0,60	0,60	0,60	0,60								0,20	0,20	0,60	0,60
71-1	1	C	1,81	3,53	3,03	0,12	0,16	0,20	0,23	0,30	0,30	0,34	0,34	0,34	0,38	0,38	0,56		0,16	0,20	0,23	0,34
71-2	1	C	1,25	4,83	1,66	0,07	0,17	0,25	0,32	0,32	0,32	0,32	0,35	0,42					0,07	0,17	0,32	0,35
71-3	1	C	1,75	1,75	2,66	0,14	0,21	0,21	0,32	0,32	0,39	0,39	0,46	0,46					0,14	0,21	0,21	0,32
72-1	1	C	1,33	4,75	2,66	0,08	0,13	0,25	0,30	0,30	0,30	0,30	0,30	0,36	0,36				0,08	0,13	0,25	0,36
72-2	2	C	1,37	2,75	2,70	0,10	0,14	0,28	0,32	0,32	0,32	0,35	0,39	0,39					0,10	0,14	0,32	0,39
72-3	1	C	1,37	3,66	1,70	0,10	0,21	0,21	0,32	0,35	0,35	0,35	0,46	0,46					0,10	0,21	0,32	0,35
73-1-2	1	C	1,37	3,66	1,70	0,10	0,21	0,21	0,32	0,35	0,35	0,35	0,46	0,46					0,10	0,21	0,32	0,35
73-2	1	C	1,75	1,75	2,66	0,14	0,21	0,21	0,32	0,32	0,39	0,39	0,46	0,46					0,21	0,14	0,32	0,39
74-1	1	C	2,00	2,16	1,58	0,18	0,21	0,22	0,24	0,24	0,28	0,34	0,37	0,37	0,40	0,45	0,45	0,54	0,18	0,21	0,24	0,34
74-2		B	1,40	2,33	2,33	0,20	0,20	0,60	0,60	0,60	0,60								0,20	0,20	0,60	0,60
75-2-1		B	1,57	1,33	2,33	0,19	0,28	0,38	0,38	0,57	0,57	0,66	0,66						0,19	0,28	0,38	0,57
75-3-1		B	1,62	3,25	2,75	0,14	0,17	0,32	0,39	0,39	0,42	0,42	0,42	0,57					0,14	0,17	0,32	0,39
76-1	1	C	1,60	3,58	1,53	0,13	0,15	0,20	0,22	0,33	0,33	0,33	0,35	0,35	0,40	0,42			0,13	0,20	0,22	0,33
76-3	1	C	1,90	0,41	2,33	0,18	0,18	0,21	0,34	0,36	0,36	0,36	0,36	0,36	0,36	0,40	0,52		0,18	0,21	0,34	0,36
77-1	1	C	1,80	2,66	1,75	0,17	0,22	0,22	0,31	0,31	0,37	0,37	0,37	0,37	0,42	0,42			0,17	0,22	0,22	0,31
77-2	1	C	1,55	2,50	2,75	0,13	0,19	0,19	0,25	0,36	0,36	0,41	0,41	0,41	0,41				0,13	0,19	0,25	0,41
77-3		A	2,40	1,20	1,20	0,15	0,22	0,31	0,31	0,33	0,35	0,35	0,51	0,51	0,53	0,53			0,22	0,31	0,31	0,35
78-1		B	2,11	1,20	2,20	0,11	0,22	0,27	0,27	0,33	0,33	0,44	0,44	0,50	0,50				0,22	0,27	0,33	0,44
80-1-1		B	1,28	4,33	2,20	0,09	0,19	0,38	0,38	0,38	0,38	0,47	0,47						0,09	0,19	0,38	0,47
80-2	1	C	1,60	3,66	1,70	0,13	0,20	0,20	0,31	0,31	0,33	0,33	0,33	0,37	0,40	0,40			0,13	0,20	0,31	0,33
81-1	2	C	1,63	1,95	2,25	0,12	0,14	0,18	0,23	0,25	0,27	0,30	0,32	0,32	0,32	0,32	0,36		0,12	0,18	0,32	0,32
81-3	1	C	1,60	3,66	1,70	0,13	0,20	0,20	0,31	0,31	0,33	0,33	0,33	0,37	0,40	0,40			0,13	0,20	0,20	0,31
82-1		B	1,28	4,33	2,20	0,09	0,19	0,38	0,38	0,38	0,38	0,47	0,47						0,09	0,19	0,38	0,47
82-2	1	C	1,90	2,66	1,75	0,18	0,20	0,23	0,25	0,30	0,32	0,34	0,36	0,36	0,38	0,41	0,43		0,18	0,20	0,23	0,30
82-3-2	1	C	1,28	3,75	2,70	0,09	0,14	0,23	0,38	0,38	0,38	0,42	0,42						0,09	0,14	0,23	0,42
83-1		B	2,44	0,25	3,16	0,08	0,13	0,30	0,30	0,30	0,30	0,30	0,36	0,36	0,36				0,13	0,30	0,36	0,36
83-2	1	C	1,90	2,66	1,75	0,18	0,20	0,23	0,25	0,30	0,32	0,34	0,36	0,36	0,38	0,41	0,43		0,18	0,20	0,23	0,30
83-3		C	1,77	2,75	2,08	0,13	0,19	0,25	0,30	0,36	0,36	0,41	0,41	0,47	0,47				0,13	0,19	0,25	0,30

Appendix A.4.2 Space Syntax Calculation, Typical Apartments, All

Case	R	L	MD(E)	CV E	CV L/D	Integration (by Relative Asymmetry, RA)											Order (E-L-K-Bd1)			
84-1	1	C	1,60	0,75	3,00	0,10	0,30	0,30	0,50	0,50	0,50						0,10	0,30	0,30	0,50
84-2		B	2,33	0,20	2,20	0,11	0,22	0,22	0,33	0,33	0,33	0,44	0,44	0,44	0,44		0,22	0,33	0,33	0,44
84-3	1	C	1,60	3,66	1,70	0,13	0,20	0,20	0,31	0,31	0,33	0,33	0,33	0,37	0,40	0,40	0,13	0,20	0,20	0,31
85-2		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53					0,13	0,20	0,46	0,53
87-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53					0,13	0,20	0,46	0,53
87-2		B	1,28	4,33	2,20	0,09	0,19	0,38	0,38	0,38	0,38	0,47	0,47				0,09	0,19	0,38	0,47
88-1		A	1,85	1,20	1,20	0,09	0,28	0,28	0,38	0,38	0,38	0,57	0,57				0,28	0,28	0,38	0,57
88-3		B	1,28	4,33	2,20	0,09	0,19	0,38	0,38	0,38	0,38	0,47	0,47				0,09	0,19	0,38	0,47
89-1	1	C	1,44	3,25	2,70	0,11	0,16	0,27	0,27	0,33	0,33	0,33	0,38	0,38	0,50		0,11	0,16	0,27	0,33
89-3		B	1,28	4,33	2,22	0,09	0,19	0,38	0,38	0,38	0,38	0,47	0,47				0,09	0,19	0,38	0,47
90-1	1	C	1,66	0,70	4,00	0,06	0,26	0,26	0,40	0,40	0,40	0,46					0,06	0,26	0,26	0,40
90-3		B	1,60	2,40	0,83	0,30	0,30	0,50	0,70	0,70	0,90						0,30	0,30	0,50	0,70
91-2		B	1,50	2,25	3,33	0,13	0,20	0,46	0,46	0,46	0,53	0,53					0,13	0,20	0,46	0,53
91-4		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53					0,13	0,20	0,46	0,53
92-1		A	1,28	4,00	1,20	0,09	0,28	0,28	0,38	0,38	0,38	0,57	0,57				0,09	0,28	0,28	0,38
96-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53					0,13	0,20	0,46	0,53
98-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53					0,13	0,20	0,46	0,53
98-2		B	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70						0,10	0,30	0,50	0,70
00-1		B	1,50	3,50	0,75	0,20	0,26	0,46	0,53	0,53	0,53	0,80					0,20	0,26	0,46	0,53
00-2-2		A	1,90	2,16	1,16	0,08	0,20	0,24	0,24	0,28	0,28	0,28	0,40	0,40	0,44	0,44	0,20	0,24	0,24	0,28
01-1-1		B	1,50	1,33	2,50	0,16	0,33	0,66	0,66	0,83							0,16	0,33		0,66
02-1		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70						0,10	0,30		0,50
02-2		B	1,40	2,33	2,33	0,20	0,20	0,60	0,60	0,60	0,60						0,20	0,20		0,60
03-1		B	1,42	2,83	2,25	0,14	0,23	0,33	0,42	0,42	0,52	0,52	0,61				0,14	0,23		0,33
03-2		A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70						0,10	0,30		0,50
03-3	1	A	1,20	3,50	1,25	0,10	0,30	0,50	0,50	0,50	0,70						0,10	0,30		0,50
04-1-1		A	1,25	2,50	1,33	0,16	0,33	0,66	0,66	0,83							0,16	0,33		0,66
04-2-1		B	1,50	1,33	2,50	0,16	0,33	0,66	0,66	0,83							0,16	0,33		0,66
04-3		B	2,00	0,20	4,50	0,06	0,26	0,40	0,40	0,40	0,40	0,60					0,06	0,40		0,40
05-1		B	1,33	3,33	2,25	0,13	0,20	0,46	0,46	0,46	0,53	0,53					0,13	0,20	0,46	0,46
05-2		A	1,33	3,00	1,25	0,13	0,33	0,33	0,46	0,46	0,66	0,66					0,13	0,33	0,33	0,46
05-3-1		B	2,20	0,33	2,33	0,20	0,20	0,60	0,60	0,60	0,60						0,20	0,60		0,60

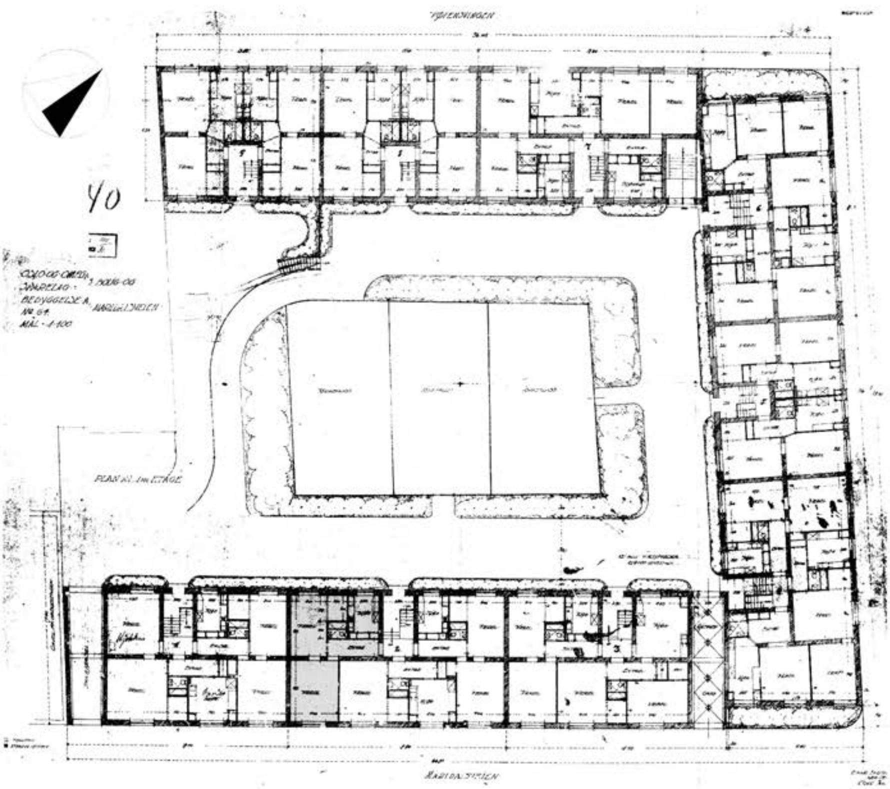
Legend

R	Rings (see section 3.4.7)
L	Living room's kind of space
MD(E)	Mean depth from entrance
CV	Control Value
E	Entrance
L	Living room
D	Dining room

	bedroom 1 / main bedroom
	other bedrooms
	kitchen
	living room, dining room (or non-spesified room for daytime living)
	bathroom
	WC, washing room
	entance/corridor/hall
	internal staircase
	balcony
(white)	stortage room (with through-passage)

Maridalsveien 64 BRL

Adresse (g.nr./b.nr.) : Maridalsveien 64, Ila (219/166)
Arkitekt : Einar Engelstad
Leilighetsfordeling : 98 : 72/2 - 26/1
Tegnet/byggemeldt : 1931
Typisk leilighet - BRA : 2 rom - 57,1 m^2



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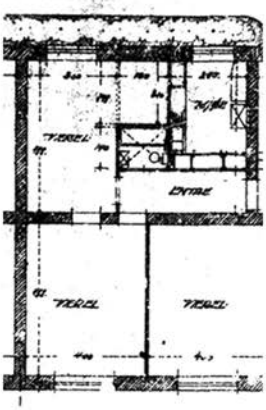
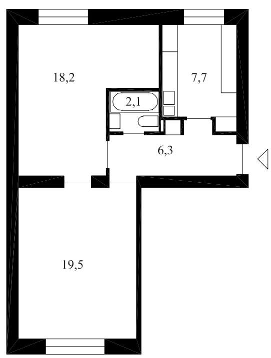
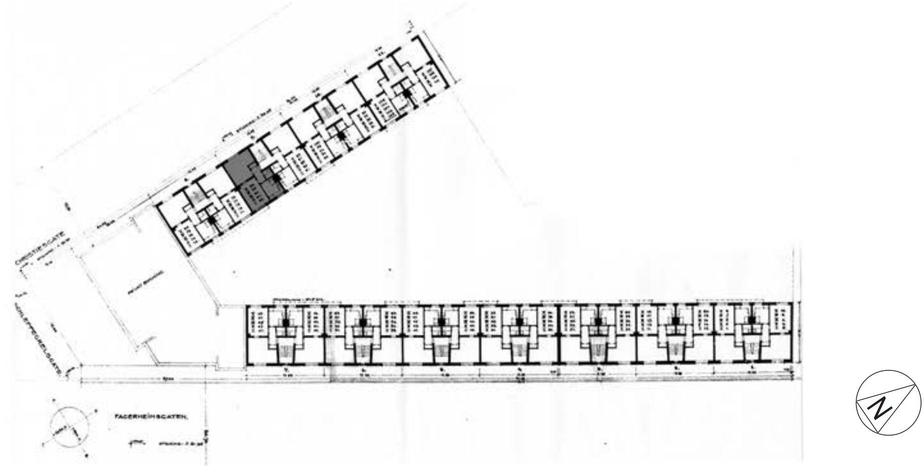




1:200

A/S Fagerheimen 33-1

Adresse (g.nr./b.nr.) : Christies gate 7-13 / Fagerheimgata 2-14, Dælenenga (227/61)
Arkitekt : Henrik Nissen & Gunnar Brynning
Leilighetsfordeling : 109 : 1/3 - 108/2
Tegnet/byggemeldt : 1931
Typisk leilighet - BRA : 2 rom - 49,8 m^2



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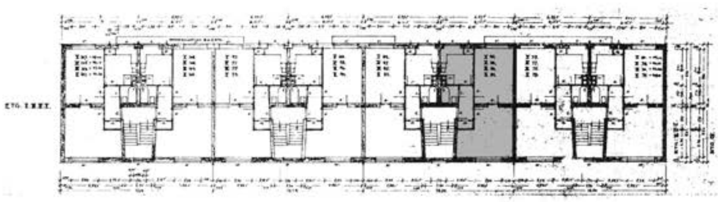

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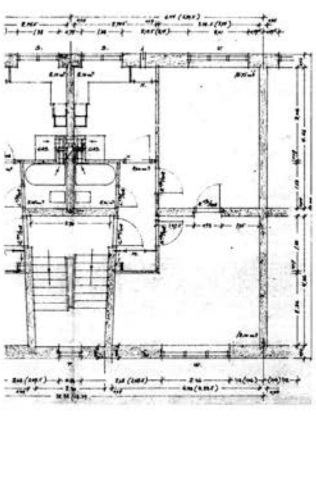

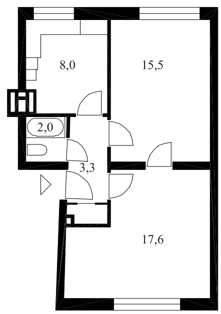

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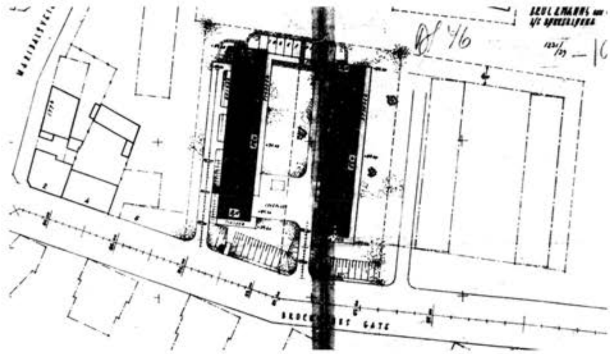
Bøkkerløkka BRL

Adresse (g.nr./b.nr.) : Brockmannsgate 8-10, Bjølsen (222/63-65)
Arkitekt : Gunnar Gregaard Jørgen
Leilighetsfordeling : 40 : 5/4 - 15/3 - 20/2
Tegnet/byggemeldt : 1939
Typisk leilighet - BRA : 3 rom - 74,9 m^2



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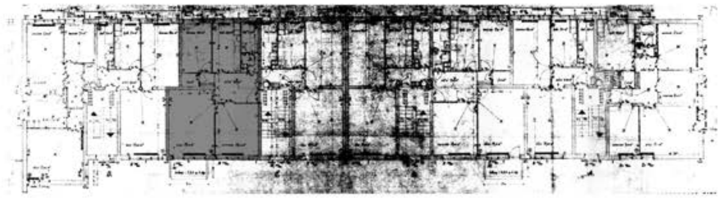

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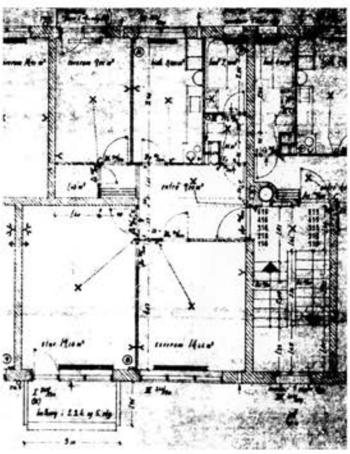

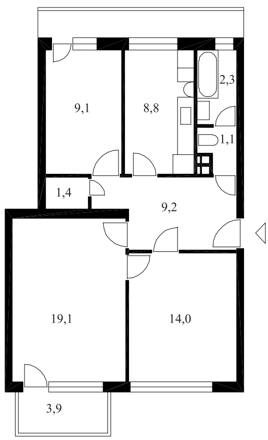

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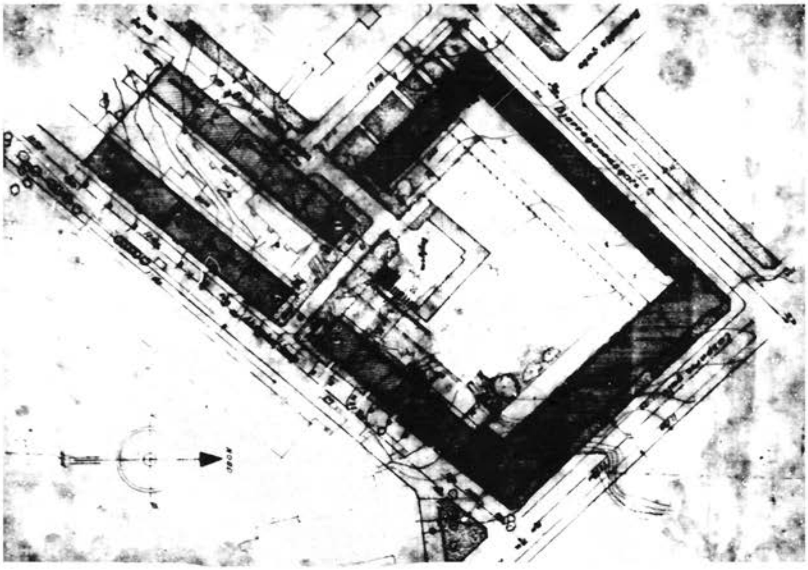
Akersbakken BRL

Adresse (g.nr./b.nr.) : Frederikke Qvamsgate 13-21, Ila / Gamle Aker (218/3)
Arkitekt : Edgar Smith Berentsen
Leilighetsfordeling : 43 : 43/3
Tegnet/byggemeldt : 1949
Typisk leilighet - BRA : 3 rom - 73,8 m^2



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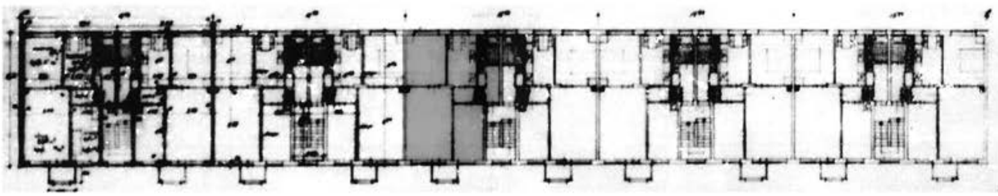

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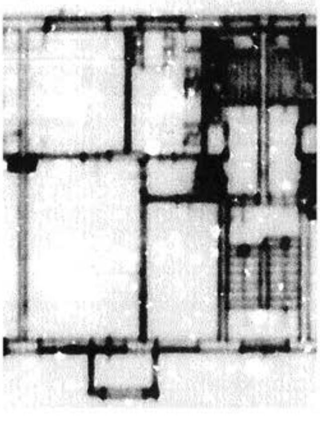
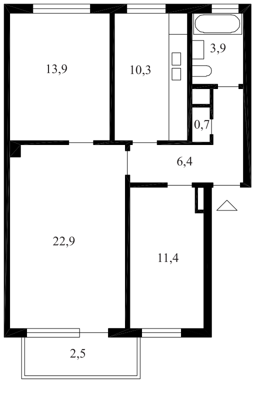


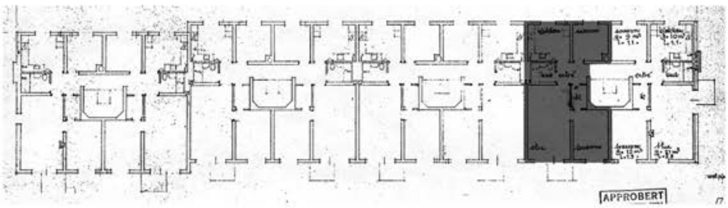


1:200

Hovin BRL

Adresse (g.nr./b.nr.)	:	St. Jørgensvei 41-47, Hovin (122/148)
Arkitekt	:	Rinnan - Tveten - Colbjørnsen
Leilighetsfordeling	:	34 : 28/3 - 4/2 - 2 hybelleiligheter
Tegnet/byggemeldt	:	1952
Typisk leilighet - BRA	:	3 rom - 66,7 m^2

1:2000



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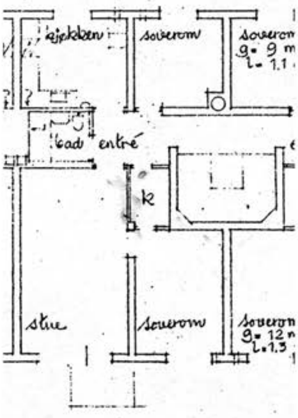

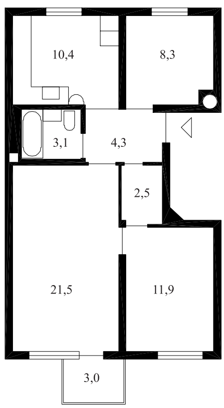

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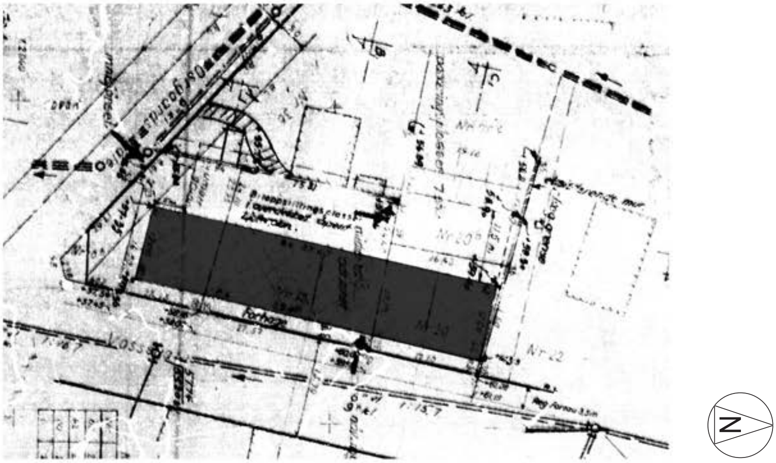
Vosseløkka BRL

Adresse (g.nr./b.nr.) : Vossegata 18, 20 & 20B, Torshov / Lilleborg (225/377)
Arkitekt : S. Narve Ludvigsen
Leilighetsfordeling : 48 : 42/2 - 6/1
Tegnet/byggemeldt : 1968
Typisk leilighet - BRA : 2 rom - 55,6 m^2



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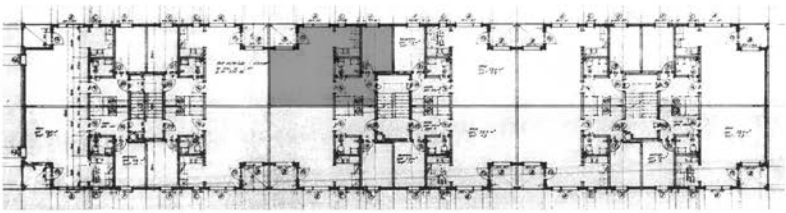

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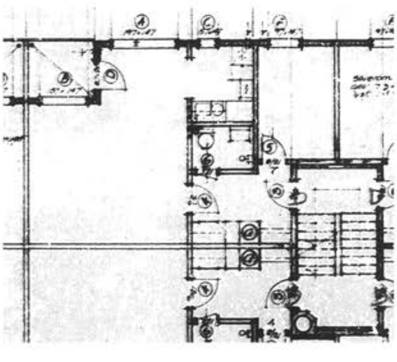

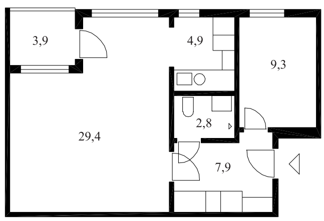

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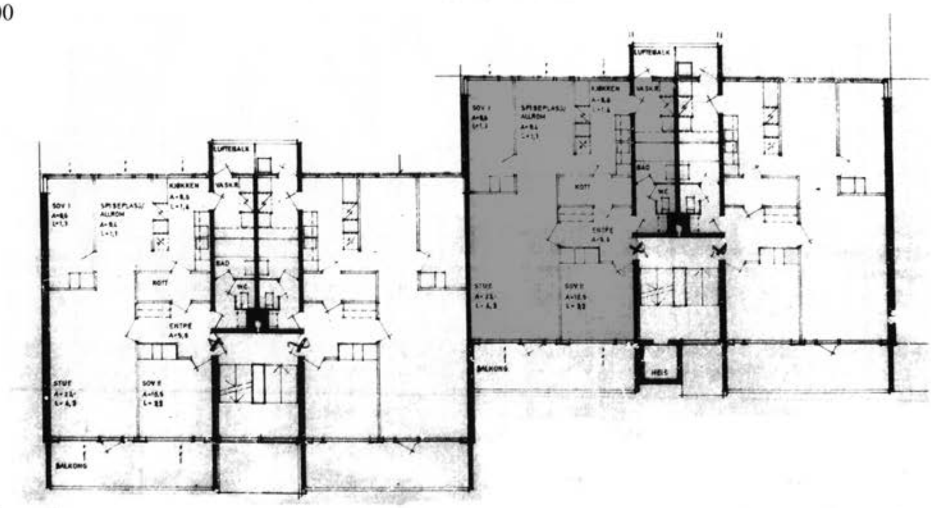
Orremyr BRL

Adresse (g.nr./b.nr.) : Odvar Solbergsvei 28-30, Romsås (96/64)
Arkitekt : Alex Christiansen
Leilighetsfordeling : 20 : 4/5 - 16/3
Tegnet/byggemeldt : 1970
Typisk leilighet - BRA : 3(4) rom - 82,5 m^2

1:5000



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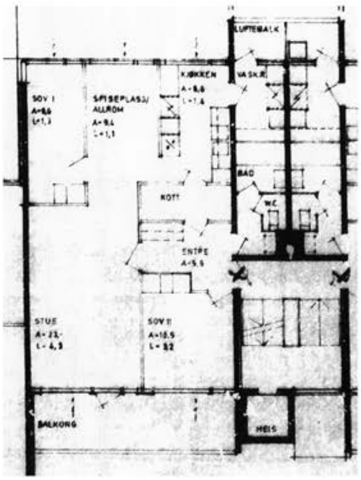

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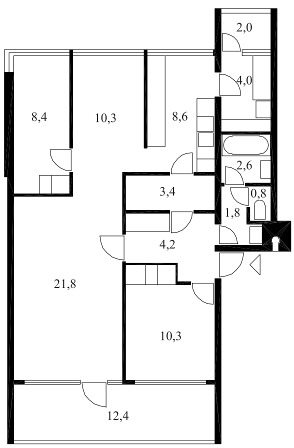
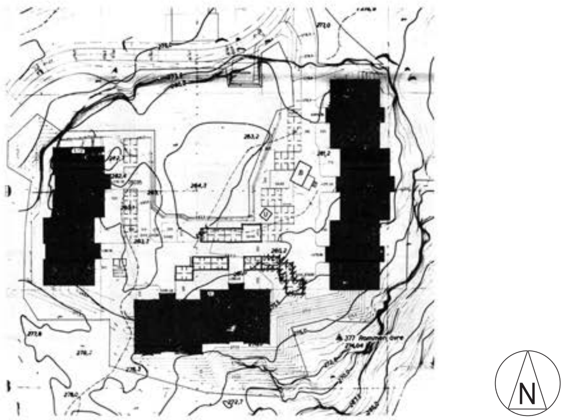


Svarttjern BRL

Adresse (g.nr./b.nr.)	:	Odvar Solbergs vei 126-128 - blokk 401 & 402, Romsås (97/148)
Arkitekt	:	Alex Christiansen (Romsås teamet)
Leilighetsfordeling	:	24 : 20/4 - 4/2
Tegnet/byggemeldt	:	1972
Typisk leilighet - BRA	:	4 rom - 94,7 m^2



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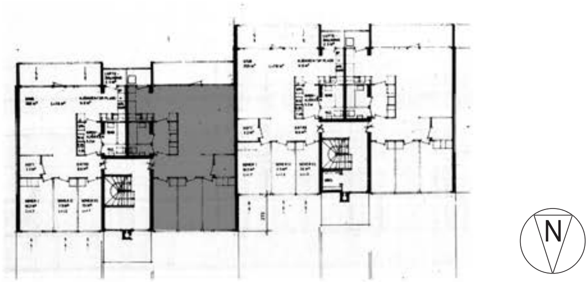

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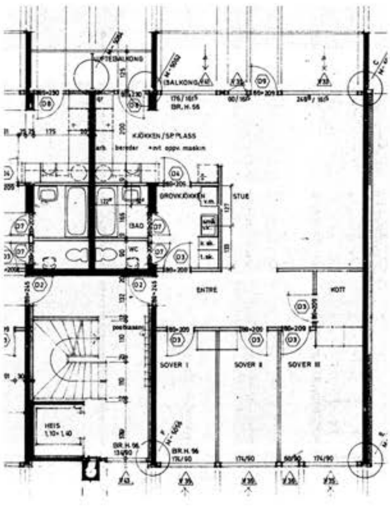

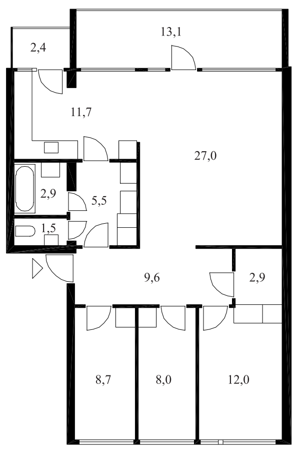

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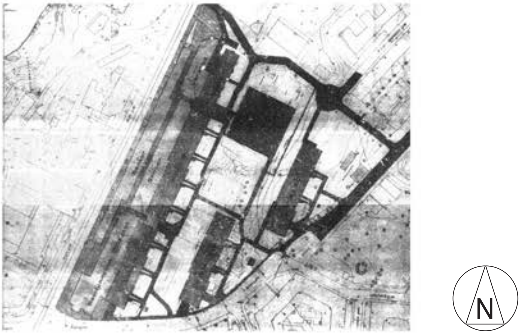
Adresse (g.nr./b.nr.) : Åsengata 2-4-6-8, A, B & C, Sandaker (224/369)
Arkitekt : John Enghs arkitektkontor
Leilighetsfordeling : 88 : 14/5 - 34/4 - 39/2 - 1/1 + 17 enkeltrom (pr. blokk)
Tegnet/byggemeldt : 1975
Typisk leilighet - BRA : 4 rom - 104,0 m^2



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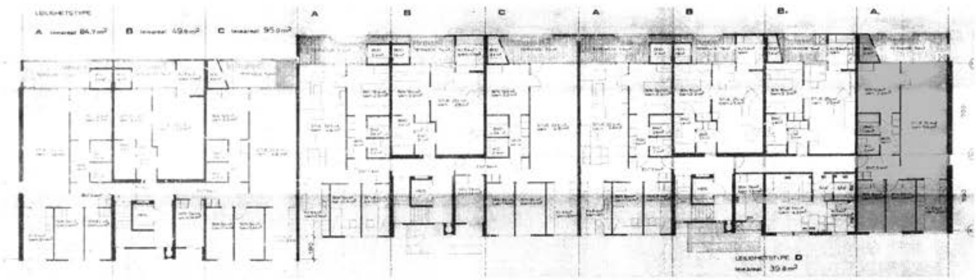

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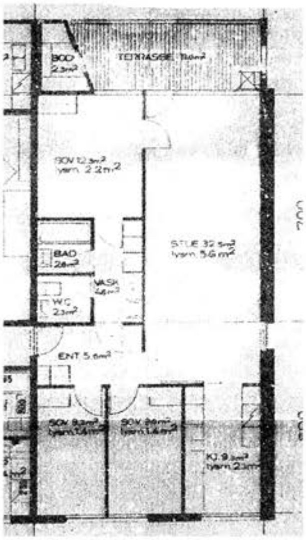
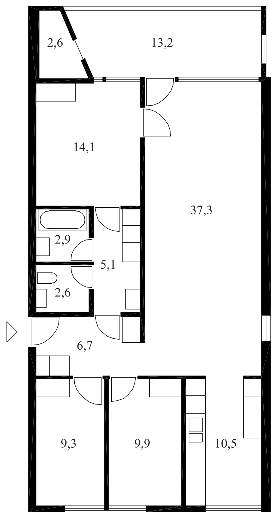


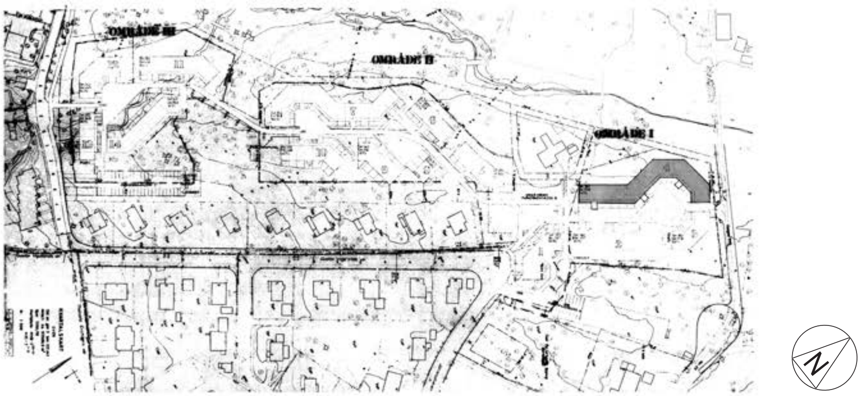


(vindu kun i endeleilighet)

1:200

Casinetto BRL 83-1

Adresse (g.nr./b.nr.) : Gustav Vigelandsvei 42, 44 & 46, Skøyen (3/481)
Arkitekt : Telje - Torp - Aasen
Leilighetsfordeling : 50 : 7/5 - 25/4 -13/3 - 5/2
Tegnet/byggemeldt : 1980
Typisk leilighet - BRA : 4 rom - 98 m^2



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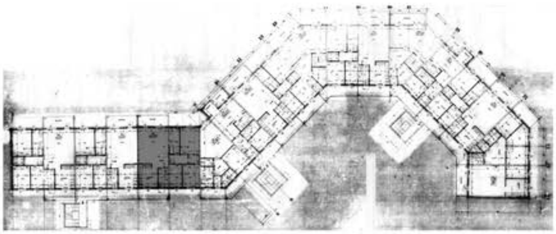

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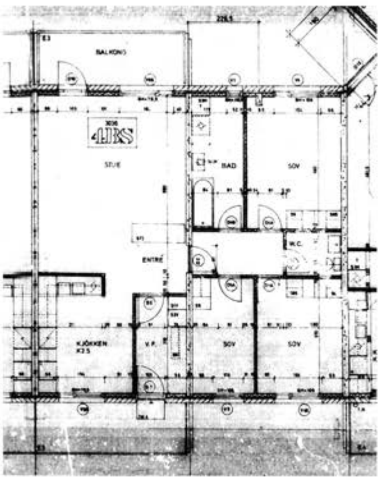

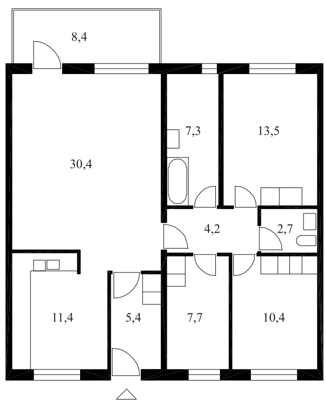

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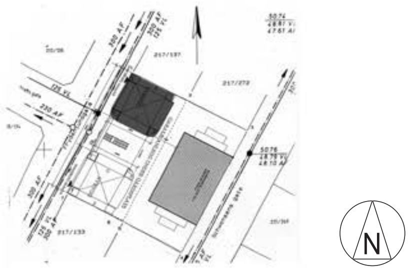
Frydenlundsgate BRL

Adresse (g.nr./b.nr.) : Frydenlundsgate 5-7, Bislett / St. Hanshaugen (217/518)
Arkitekt : Thorenfeldt
Leilighetsfordeling : 36 : 8/4 - 20/3 - 8/2
Tegnet/byggemeldt : 1997
Typisk leilighet - BRA : 3 rom - 62 m^2



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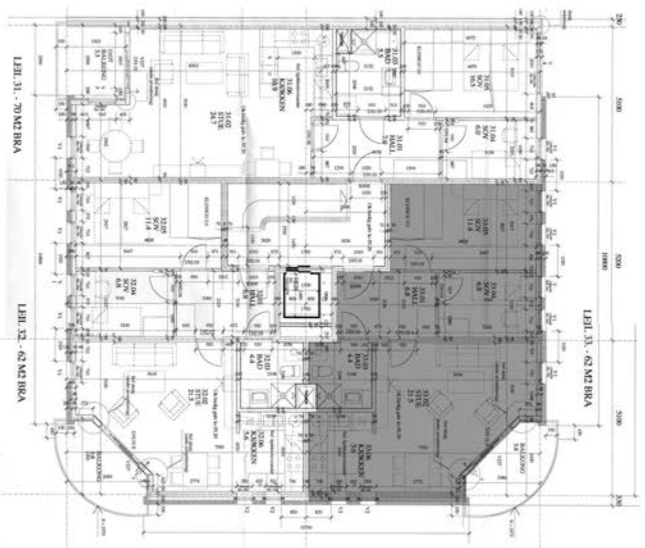

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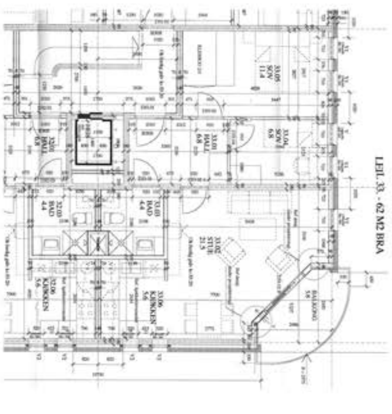

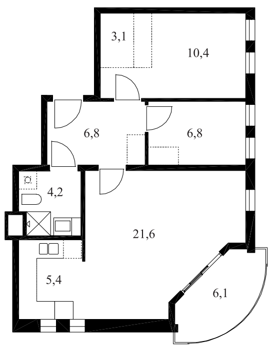

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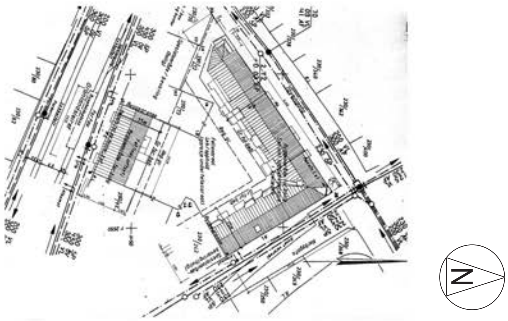
Byhagen BRL

Adresse (g.nr./b.nr.)	:	Tøyengata / Nordbygata 3-11, Grønland (230/237)
Arkitekt	:	Dahl & Myrhol ANS
Leilighetsfordeling	:	45 : 1/5 - 10/4 - 24/3 - 10/2
Tegnet/byggemeldt	:	1997
Typisk leilighet - BRA	:	3 rom - 69,9 m^2



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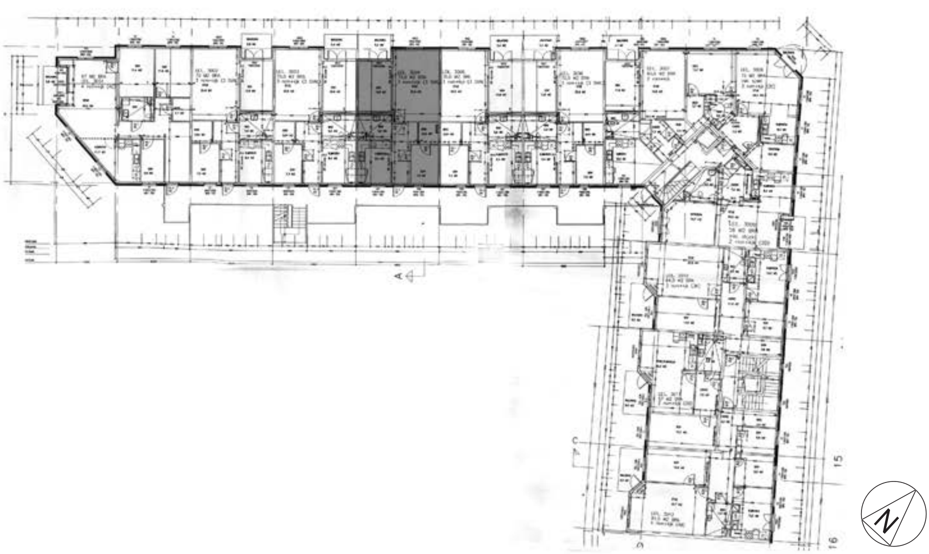

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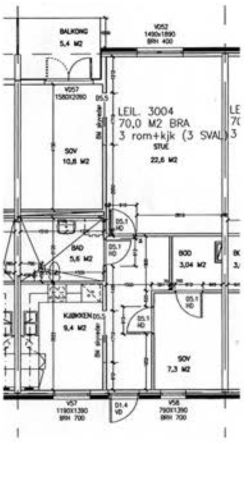

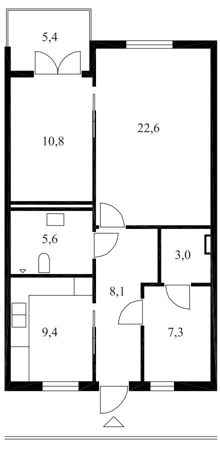

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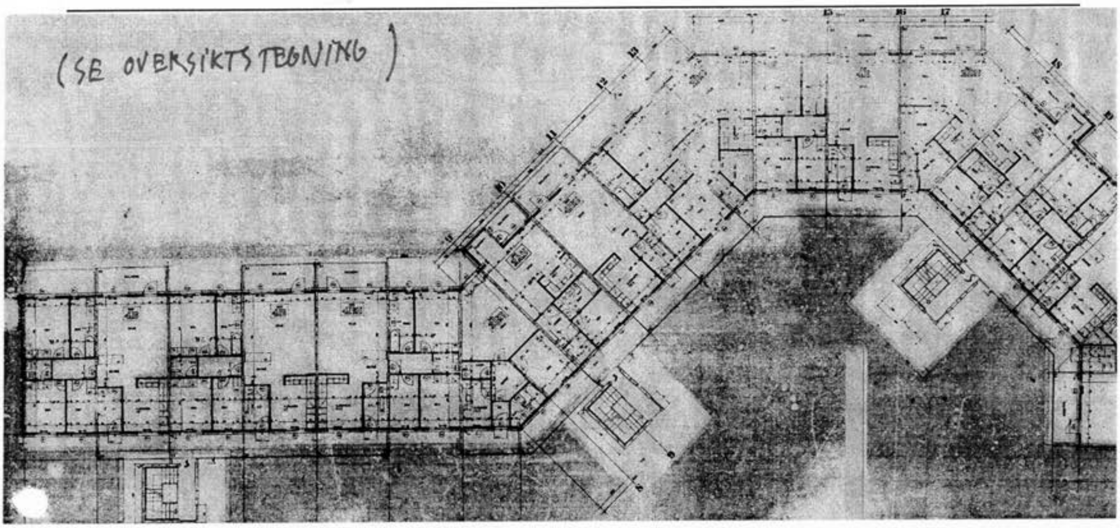
Skjema 1 **Husholdningssammensetning** **Leil.nr: 83-1-** 9



1. Hvem svarer: Mann / kvinne

2. Husholdningens sammensetning

Voksne (over 18 år) (mann/kvinne)	Alder	Kommentar (Personenes rolle/status i husholdningen kan angis her dersom det ikke framgår i venstre kolonne, for eksempel mor/far/mormor/hybelboer)	For beboere som bor mer enn 50% av tiden annet sted, kryss av her
kvinne	30	gifte	
mann	34		
Barn (gutt / jente)			
gutt	8mnd		

3. Hvor lenge har dere bodd her? 1 år

4. Hvordan trives du/dere med å bo her? (med egne ord: bra)

Meget bra	Bra	Både og	Dårlig	Meget dårlig
	X			

5. Hvordan er denne leiligheten for deg/dere med hensyn til plass:

Meget romslig	Romslig	Passende	Trang	Meget trang
	X			

			Ja	Nei
			X	

(SE OVERSIKTS TEGNING)

Leilighet markert på plantegning: X Registrert dato: 03.11.04 Sign: Håvard Breivik
Leilighetsnr. påført : X

Skjema 2 **Bakgrunn / boligvalg** **Intervju nr: 83-1-** 9
Intervju **Hvem svarer:** mann & kvinne
Side 1

1.1 Hvor lenge har du/dere bodd her?

1 år

1.2 Hva slags bolig hadde du/dere tidligere? (type og beliggenhet)

57 kvm selveier på Vålerenga

1.3 Hvorfor flyttet du/dere fra forrige bolig?

For å få større plass - på sikt
Barnevennlighet bedre

1.4 Hvorfor valgte du/dere den boligen dere nå bor i ?

Barnevennlig
Effektiv planløsning [sett leil. med "mye rare hjørner"]

1.4b Var det noe ved området som hadde spesiell betydning for at du/dere valgte å bo her? (spesifiser, f.eks. avstand til sentrum eller marka, parker, lekeplasser, arbeidsreise, butikker etc)

Nær jobb, nær sentrum, Frognerparken
Bilfritt, kollektiv trafikk

1.4c Hadde du/dere tilknytning til området fra tidligere (hvis ja spesifiser)?

Nei

1.4d Var det noe ved **selve leiligheten** som hadde betydning for at du/dere valgte å bo her? (spesifiser)

Grei planløsning - trengte lite oppussing i første omgang

1.5 Etter nå å ha bodd her i 1 år, er det noen andre forhold ved leiligheten du/dere er spesielt fornøyd med?

Ingen gjenboere. Balkong på begge sider

1.6 Er det noe ved leiligheten du/dere er spesielt misfornøyde med?

Oppbevaringsplass i leiligheten ,
Hermetisk tett - ventilasjonen

1.7 Har du/dere planer om å flytte innen ett år? (I tilfelle hvorfor og hvor?)

Nei

 Hva er viktig? **Intervju nr: 83-1-** 9

2.1 Hva har vært viktig for ditt/deres valg at denne bolig?

(Angi viktigheten av følgende forhold med en skala på 1-5, 1=ingen betydning, 5=meget viktig)

	1 Ingen betydning	2 Liten betydning	3 Litt viktig	4 Viktig	5 Meget viktig	Kommentarer (spesifiser)
Beliggenhet i byen (bydel, avstand til sentrum/marka osv.)				X		
De nære omgivelser (gatemiljø, uteområde, nærbutikk, osv)					X	
Selve leiligheten				X		

2.2 Hvor fornøyd(/-e) er du/dere med følgende forhold ved leiligheten?

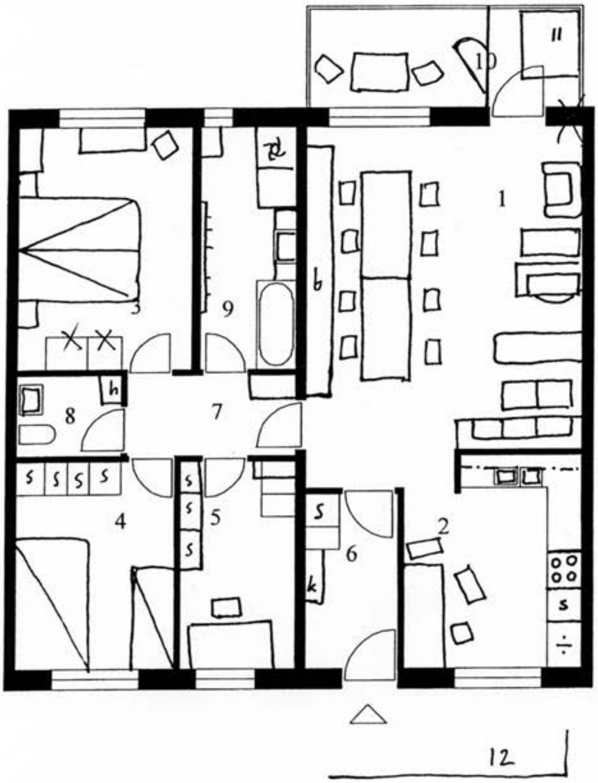
(Angi dette med en skala på 1-5 , 1=meget misfornøyd, 5=meget fornøyd)

	1 Meget misfornøyd	2 Misfornøyd	3 Greit / passe fornøyd	4 Godt fornøyd	5 Meget fornøyd	Kommentarer (hvis misfornøyd, presiser)
Leilighetens størrelse				X		
Leilighetens planløsning generelt (størrelse og form på de enkelte rom og hvordan rommene ligger i forhold til hverandre)			X			
Møblerbarhet (får dere plass til ønsket møblering)				X		
(hvis misfornøyd med spesielle rom, spesifiser:)						
De to soverommene						for ujevn størrelse
Utsikt fra leiligheten			X			
Solforhold og dagslysforhold i leiligheten				X		

2.3 Hvilken betyding hadde det for deg/dere at boligkjøpet skulle være en god investering?

	Ingen betydning	Liten betydning	Litt viktig	Viktig	Meget viktig
				X	

Side 3 **Møblering** **Intervju nr: 83-1-** 9



(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1	Stue	Rom 8	toalett / do
Rom 2	Kjøkken	Rom 9	bad
Rom 3	Soverom	Rom 10	balkong
Rom 4	Isak sitt rom	11	Karnapp
Rom 5	Kontor	12	Svalgang
Rom 6	Gang / Entre		
Rom 7	Gang		

Bruk av de enkelte rom

Intervju nr: 83-1- 9

Aktivitet / Rombetegnelse	1 Stue	2 kjøkken	3 Soverom	4 Isak sittrom	5 Kontor	6 Entre	7 Gang	8 Toalett	9 bad	10 balkong	11 Karnapp	12 Svalgang
Hverdagsfrokost (uten gjester)		12										
Hverdagsmiddag (uten gjester)	1	~~12~~ 11										
Middag med gjester — **Max. antall til middag:** 14	12											
Andre besøk av voksne, enkel serverering eller ikke servering	12											
Lek (hvis barn i husholdningen eller barn på besøk)	6	6										
Klesvask									12			
Tørk av klesvask					8				4			
Håndarbeid / småreparasjoner		6			6							
Lesing (underholdning, f.eks. aviser/magasiner/bøker)	6	4	2									
Lesing (faglig, dvs. studier eller hjemmearbeid)	2				10							
Se på TV	12											
Høre på musikkanlegg/radio	6	6										
PC	1				11							
~~Lekser (hvis barn i husholdningen)~~												
Hobby — **Hvilke:** data / tango	4				8							
Sove (natt, husholdningens faste beboere)	12			12								
Hvile / sove på dagtid, voksne	6		6									
Hvile / sove på dagtid, barn				9						3		
Sove (overnattingsgjester)				10	2							
Opphold i det hel tatt (i våken tilstand), tidsmessig fordelt på de enkelte rom ("sum persontimer"=12, som fordeles)	4	5			~~3~~2				1			

Kommentarer:

Skjemaet fylles ut horisontalt, dvs, "aktivitetsvis" og ikke "romvis".
For hver aktivitet fordeles en samlet sum på 12 "poeng" på de aktuelle rom, se nedenfor.
For soverom: 12 hvis vedkommende med seng i rommet alltid sover i denne.

Alltid	12
Ofte	
Av og til	
Aldri	ingen markering (0 "poeng")

NB
Relativ hyppighet for aktuell aktivitet,
(hva som er "ofte" er altså ikke absolutt men avhengig av funksjon)

4.1 Hvordan brukes balkongen? (til hva og hvor mye) (tidligere spørsmål 6.5)
(hvis ikke balkong: Leiligheten har ikke balkong, er det et savn? nei - ja litt - ja mye)

Brukes mindre enn trodd.
Brukes til middag, lesing
soving for barn

Ønsker og preferanser

5.1 Hvis du/dere måtte fjerne 3m2 av leiligheten, fra hvilke(t) rom skulle det vært tatt?
(kan altså fordeles på flere rom)

Stue – karnapp

5.2 Hvis du/dere kunne økt boligens areal med 3m2, hvilke(t) rom skulle fått dem?
(kan altså fordeles på flere rom)

Kontoret – jevne ut de to rommene ved siden av hverandre

5.3 Hvis du/dere kunne fått ett ekstra rom, hva skulle det vært brukt til?

Føler at de har et ekstra rom
Lager – Innebod

5.4 Dersom boligen skulle vært større, hva ville du/dere foretrekke, større rom eller flere rom?

Flere rom – eget PC-rom ved. evt. flere barn

5.5 Kunne noen av dine/deres ønsker eller behov vært løst ved nye fellesrom for borettslaget, huset eller oppgangen? (I tilfelle, hvilke?)

Gjesteleilighet [f.eks ved langveisgjester som kan være uavhengig]

I forhold til vanlige dager har man ikke råd til å kjøpe ekstra plass for besøk

5.7 Hvis du/dere skulle velge en mer kostbar bolig, hva ville du/dere foretrekke :
en større bolig, høyere standard eller mer kostbar beliggenhet
(strek under svaret og spesifiser nærmere, f.eks. hva slags større bolig eller hvilken dyrere beliggenhet)

Evt. rekkehus

5.8 Hvis du/dere måtte bytte til en rimeligere bolig, hva ville du/dere foretrekke:
en mindre bolig, enklere/rimeligere standard eller en rimeligere beliggenhet?
(strek under svaret og spesifiser nærmere)

Side 6	Oppbevaring og diverse	Intervju nr: 83-1- 9

6. 11 Boder, hva finnes og hvordan brukes de. (Hva oppbevares hvor?)

Bod i leiligheten	
Kjellerbod X	Sportsutstyr, sykler, soveposer, bøker, madrasser, verktøy
Loftsbod	
Annet	

6. 12 Denne leiligheten har ikke bod i selve leiligheten. Er dette noe dere savner?
(nei, ja litt, $\boxed{\text{ja mye}}$)

6.13 Kunne du/dere tenkt deg/dere bod i selve leiligheten mot å bytte bort noe av plassen ellers i leiligheten, (altså at leiligheten ellers ble tilsvarende mindre?) (i tilfelle: hvilken plass?)

Ja – karnappen kunne vært brukt til det

6.14 Er du/dere fornøyd med oppbevaringsplassen? (skap+boder)
Hvis ikke, hva skulle vært annerledes?

Nei – gjerne bod i direkte tilknytning til leil.
tilpassede skap til rommene

Supplerende spørsmål :

6.3 Disponerer du/dere bil? (hvis ja, hvor ofte brukes den?)

Nei

6.4 Disponerer du/dere hytte? (hvis ja, hvor ofte brukes den)

Nei

6.5 Hva synes du/dere om svalgangsløsning (sammenliknet med alternativet innendørs trapperom) ?

Fint å slippe å gå opp en mørk sjakt.
Fint med ekstra plass. Lett å ringe på hos naboer

7 Til slutt:
Er det noe annet ved leiligheten eller boligsituasjonen du/dere ønsker å kommentere?

Bilfritt tun
Tunet er hyggelig
Få etasjer
Rør på utsiden – OBOS har spart – gjort billigste
løsninger, synd med hensyn til potensialet
Elektriske uttak er dumt plassert

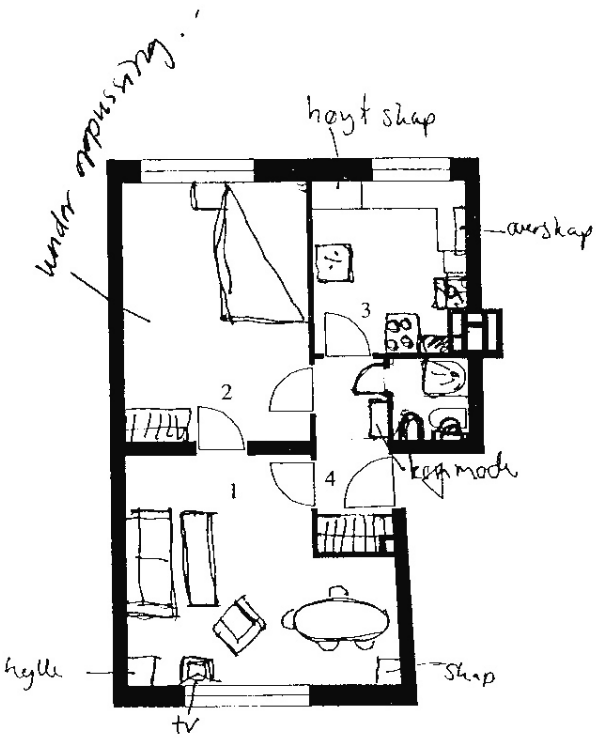
Side 7 **Intervjuers kommentarer** **Intervju nr: 83-1-9**

Supplerende informasjon om intervju-svar, f.eks. når utfyllende svar / ikke plass i skjema (hvis kommentarer til konkrete spørsmål, angi hvilket)

Intervjuers egne kommentarer

Kontroll:		Intervju gjennomført dato:	03.11.04
Intervju nr. er påført alle sider:	X		
Møblering er tegnet på side 3:	X	Sign:	Håvard Breivik

Side 3 Møblering Intervju nr: 33-1-4 A



(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1 stua

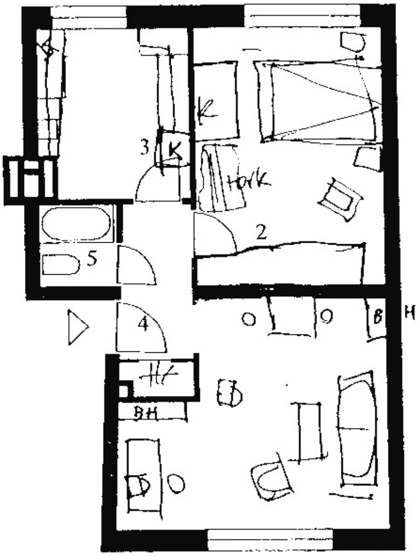
Rom 2 soverom

Rom 3 kjøkken

Rom 4 gang

Rom 5 bad

A.5.3



(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1 stue

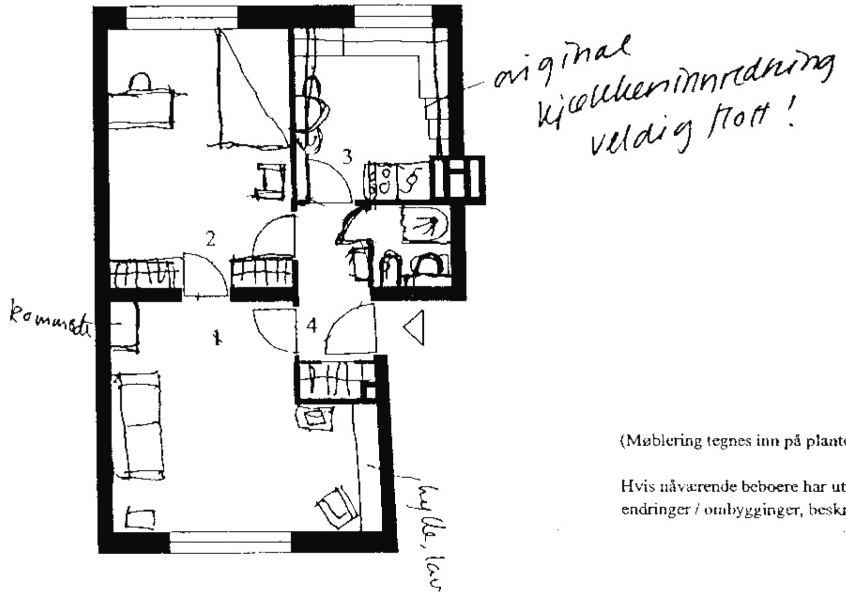
Rom 2 soverom

Rom 3 kjøkken

Rom 4 ~~badet~~ gangen

Rom 5 badet

A.5.3



(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1 Stuen

Rom 2 soverom/hobbyrom

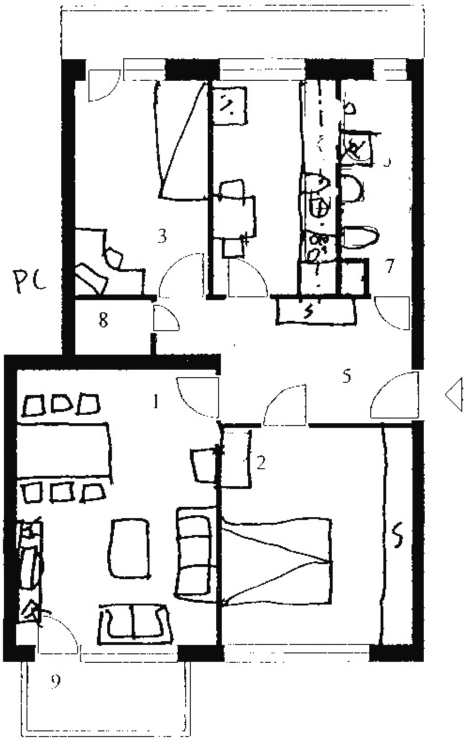
Rom 3 kjøkken

Rom 4 gang

Rom 5 bad

A. 5.3

Side 3	Møblering	Intervju nr:41-2-A4



(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

X: dør stengt fra tidligere

Rombetegnelser

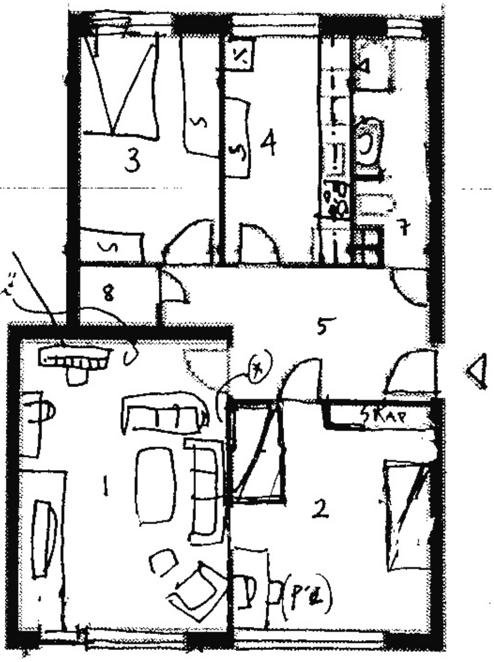
Rom 1	stue	Rom 8	bod
Rom 2	soverom	Rom 9	balkong
Rom 3	gjesterom	Rom 10	brannbalkong
Rom 4	kjøkken		
Rom 5	gang		
Rom 6	} bad		
Rom 7			

mine kommentar:
spør "fornøyde med stua.
meget velfungerende møblering.
stort meget anvendbart bord.
+TV salong Bm

Side 3 **Møblering** **Intervju nr:** 41-2-C1

(1. etg)

høybord
'vannstasjon'



1 etg.
ikke balkong

(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

⊗: dør,
men ikke i bruk
(blokkert av sofa)

Rombetegnelser

Rom 1 stue

Rom 2 ~~40~~ gjesterom / soverom (hennes rom)

Rom 3 hans rom / soverom

Rom 4 kjøkken

Rom 5 gang

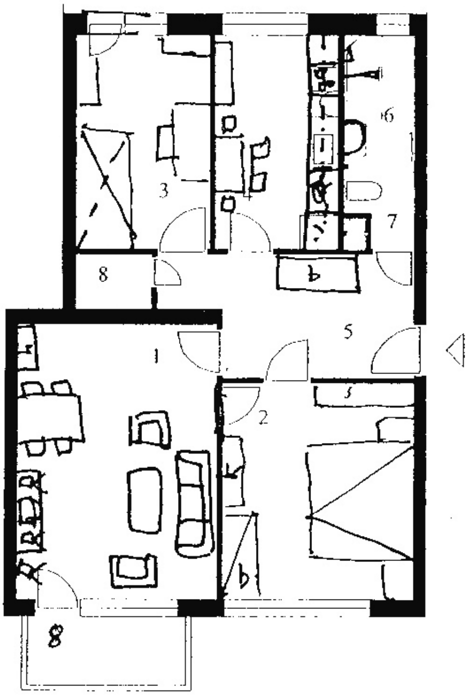
Rom 6 bad

Rom 7

Rom 8 bod

Rom 9

 Møblering **Intervju nr:41-2-43**



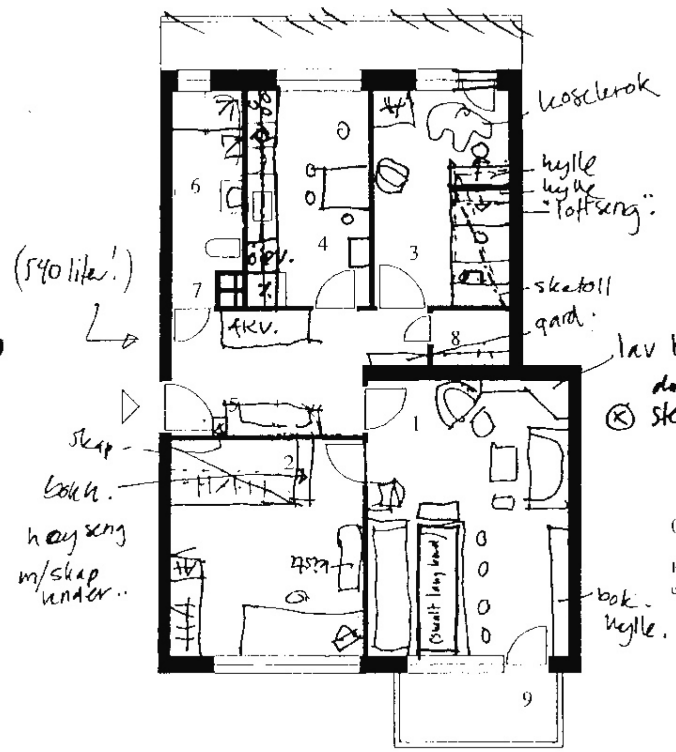
(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1 stue
Rom 2 hovedsoverom
Rom 3 barneværelse
Rom 4 kjøkken
Rom 5 gang
Rom 6 bad
Rom 7
Rom 8 Balkong
~~Rom 9~~

Side 3 Møblering Intervju nr:41-2- D2



dør (X) stengt av nåværende eier.

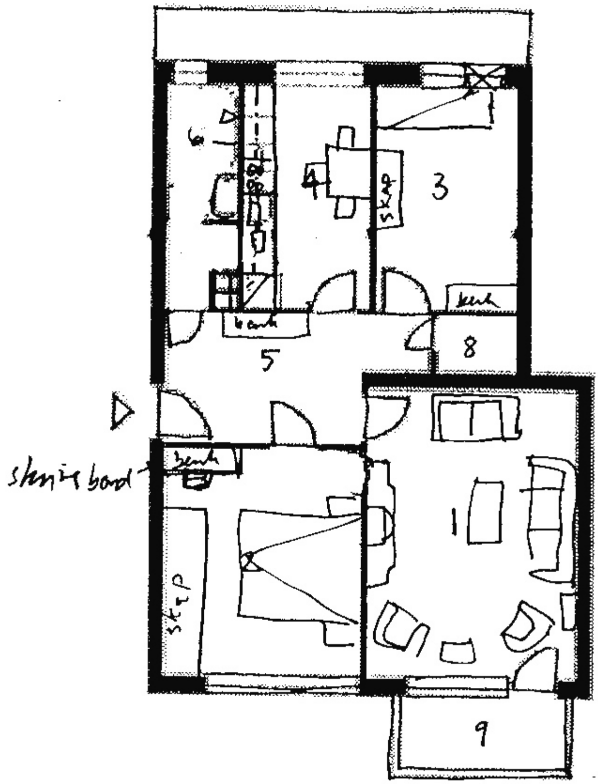
(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke.

Rombetegnelser

Rom 1	stua.	Rom 8	kott
Rom 2	rommet mitt.	Rom 9	~~veranda~~ balkong
Rom 3	barnerommet.		
Rom 4	kjøkkenet.		
Rom 5	gangen.		
Rom 6	bad		
Rom 7			

Side 3 Møblering Intervju nr: 41-2- D4



(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

dør
Q: Avstengt av nåværende beboer i 1972

Rombetegnelser

Rom 1 stue

Rom 2 Soverom

Rom 3 barnerom / soverom ⇒ planlegger en dør til spiserom, evnt. utvidet kjøkken

Rom 4 kjøkken

Rom 5 ~~Bad~~ entré

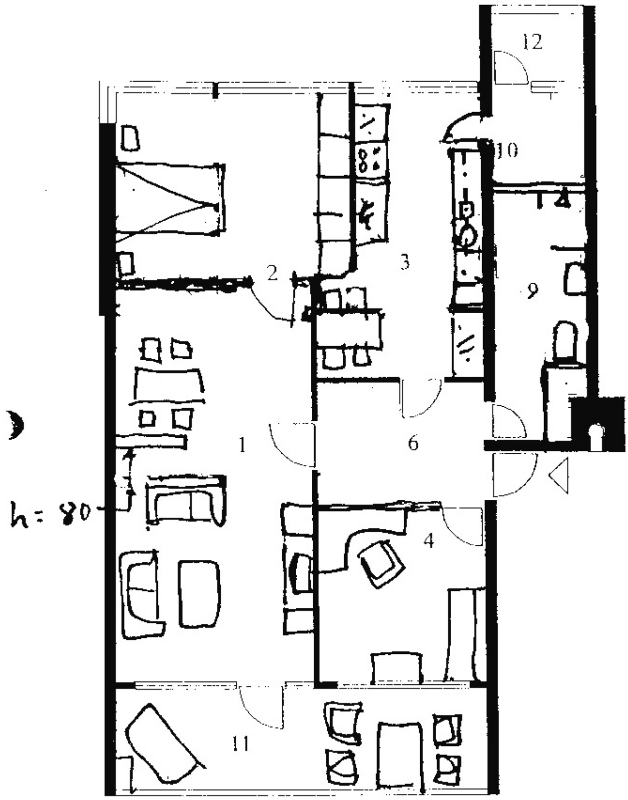
Rom 6 } bad

Rom 7

Rom 8 kott

Rom 9 veranda

Side 3 **Møblering** **Intervju nr: 74-1-A2**



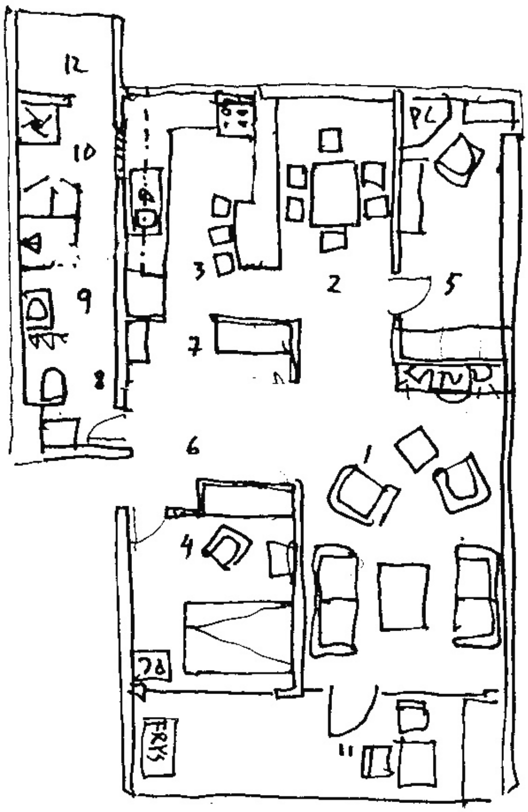
(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesnetlige endringer / ombygginger, beskriv hvilke:

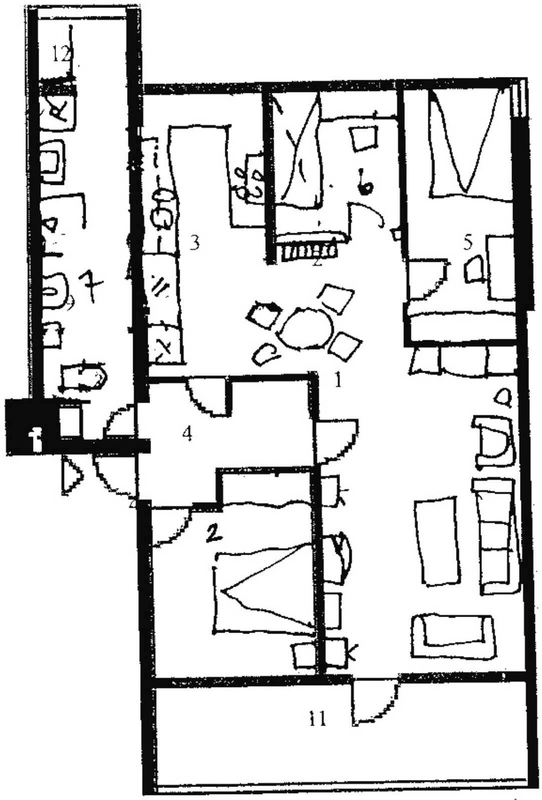
Rombetegnelser

Rom 1	stue	~~Rom 7~~	
Rom 2	soverom	~~Rom 8~~	
Rom 3	kjøkken	~~Rom 9~~	Bad
Rom 4	gjesterom/studio	Rom 10	Vaskerom
~~Rom 5~~		Rom 11	Veranda
Rom 6	gang	Rom 12	Luftebalkong

74-1-B4



Side 3 Møblering Intervju nr: 74-1-D3



(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesnetlige endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1	stue	Rom 7	bad / vaskerom
Rom 2	voksen soverom	~~Rom 8~~	
Rom 3	kjøkken	~~Rom 9~~	
Rom 4	gang	~~Rom 10~~	
Rom 5	barnerom	Rom 11	balkong
Rom 6	barnerom	Rom 12	balkong

Side 3 **Møblering** **Intervju nr: 76-1-A1**

(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1 Stua

Rom 2 ~~soverom~~ kjøkken

Rom 3 Soverom

Rom 4 Soverom

Rom 5 Soverom

Rom 6 gang

Rom 7 vaskerom

Rom 8 bad

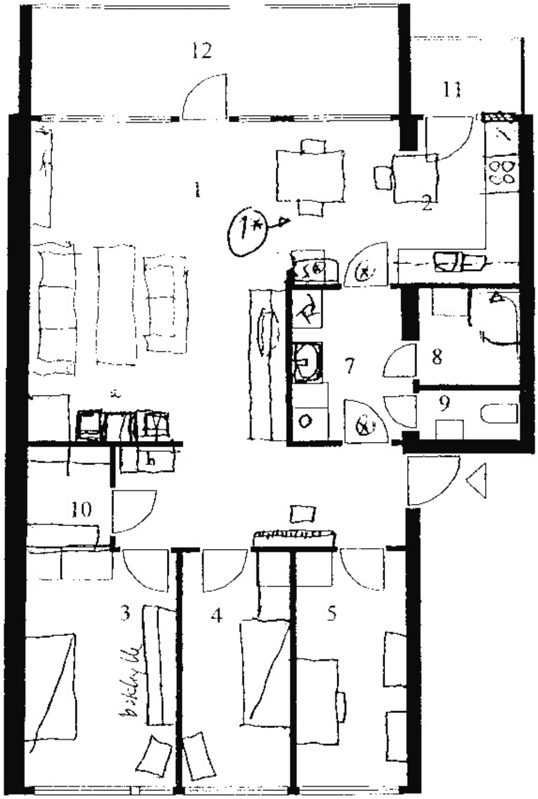
Rom 9 toalettet

Rom 10 bod

Rom 11 Luftebalkong

Rom 12 balkong

Side 3 **Møblering** **Intervju nr: 76-1-ØAY**



* Har satt inn glass i to dører, de i tilknytning til vaskerom.

s = sjenk
a bord + 2 stoler
b telefonbenk

For å få gjennomlyst i våtkjernen

(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

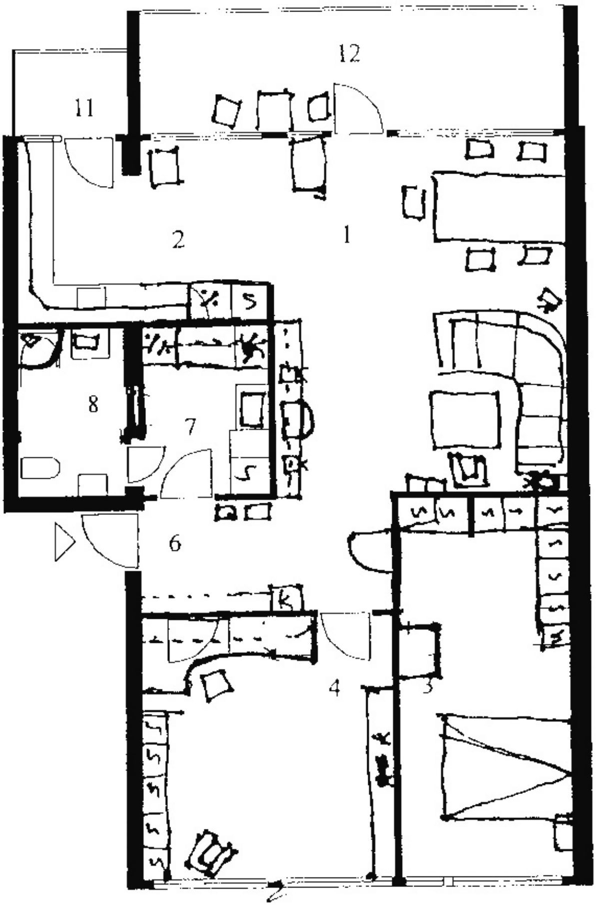
o = fotteskap, veldig fornøyd med
x = piano

Rombetegnelser

Rom 1	Stuen	Rom 8	bad
Rom 2	kjøkkenet	Rom 9	toalett
Rom 3	soverom	Rom 10	kott
Rom 4	soverom	Rom 11	balkong
Rom 5	arbeidsrom	Rom 12	veranda
Rom 6	gangen		
Rom 7	våt-kjerne		

1* "spisestue"

 Møblering **Intervju nr: 76-1- b1**



Nb - mye forandringer

(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlig endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1 stua

Rom 2 kjøkken

Rom 3 soverom

Rom 4 } arbeidsrom
Rom 5 }

Rom 6 gangen

Rom 7 vaskerom

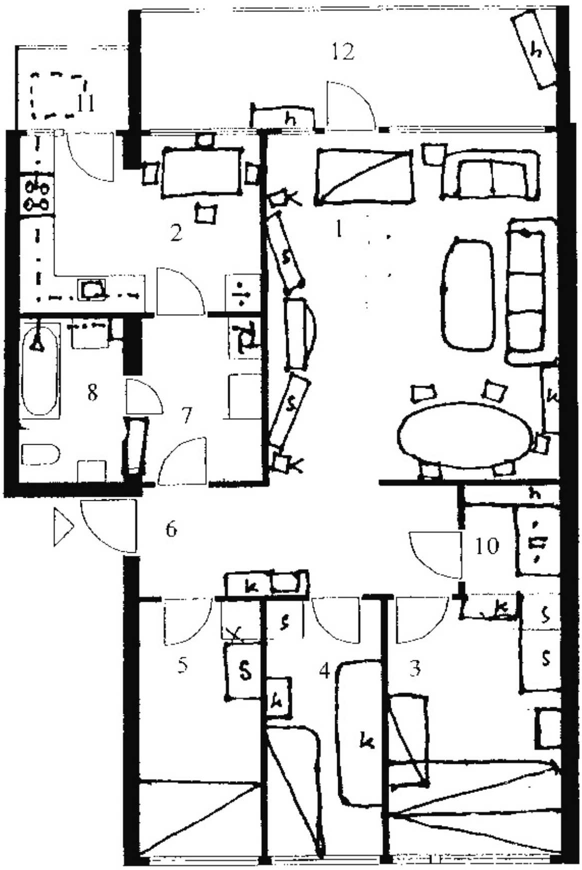
Rom 8 } bad
Rom 9 }

Rom 10 → sammen med 3

Rom 11 tørke balkong

Rom 12 veranda/balkongen.

Side 3 **Møblering** **Intervju nr: 76-1-** B4



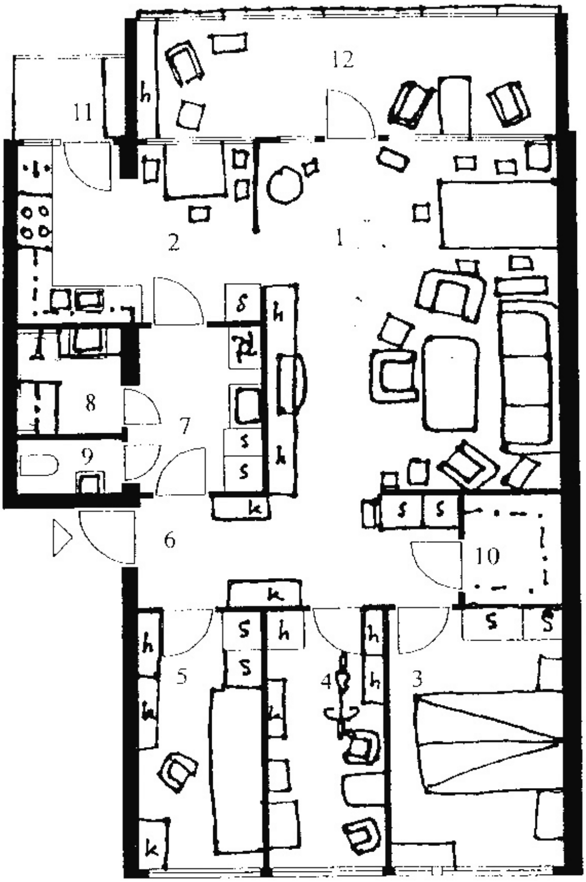
(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

Rombetegnelser

Rom 1	Stue	Rom 8	Bad
Rom 2	Kjøkken	Rom 9	
Rom 3	Soverom ["mitt"]	Rom 10	[Mat]bod
Rom 4	Soverom ["mitt"]	Rom 11	Kjøkkenveranda m/ branntrapp
Rom 5	Soverom ["mitt"]	Rom 12	Balkong
Rom 6	Entre		
Rom 7	Mellomgang		

Side 3 **Møblering** **Intervju nr: 76-1-D4**



(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:

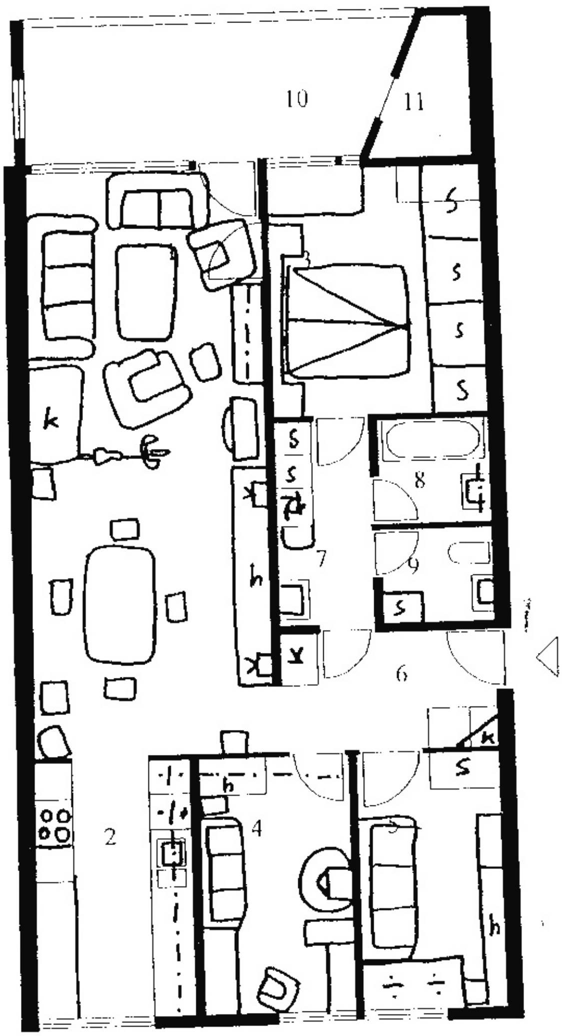
Rombetegnelser

Rom 1	Stue	Rom 8	Bad
Rom 2	Kjøkken	Rom 9	Vannklosett
Rom 3	Soverom	Rom 10	Kott
Rom 4	Marits rom	Rom 11	Tørkebalkong
Rom 5	Gutterommet [Øyvinds rom]	Rom 12	Balkong [inglasset]
Rom 6	Entre		
Rom 7	Vaskerom		

Side 3 **Møblering** **Intervju nr: 77-2-** A4

(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:



Rombetegnelser

Rom 1	Stue
Rom 2	Kjøkken
Rom 3	Soverom
Rom 4	Rommet til Mort
Rom 5	Rommet til Nin
Rom 6	Entre
Rom 7	vaskerom
Rom 8	Bad
Rom 9	WC
Rom 10	Balkong
Rom 11	Bod

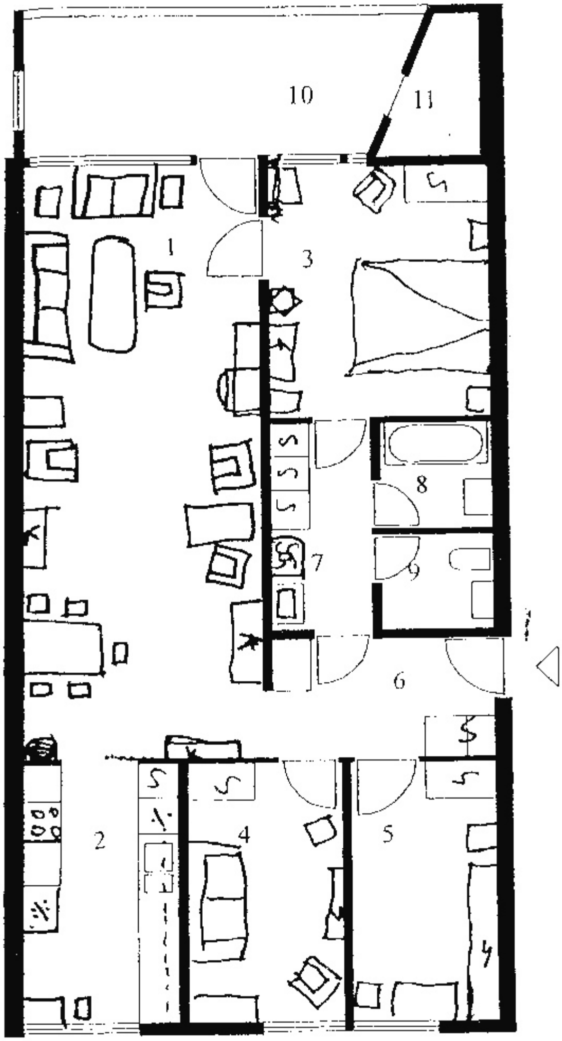
Ikke tilgang til

* Fryser pga. ombyggi

 Møblering **Intervju nr: 77-2- AS**

(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:



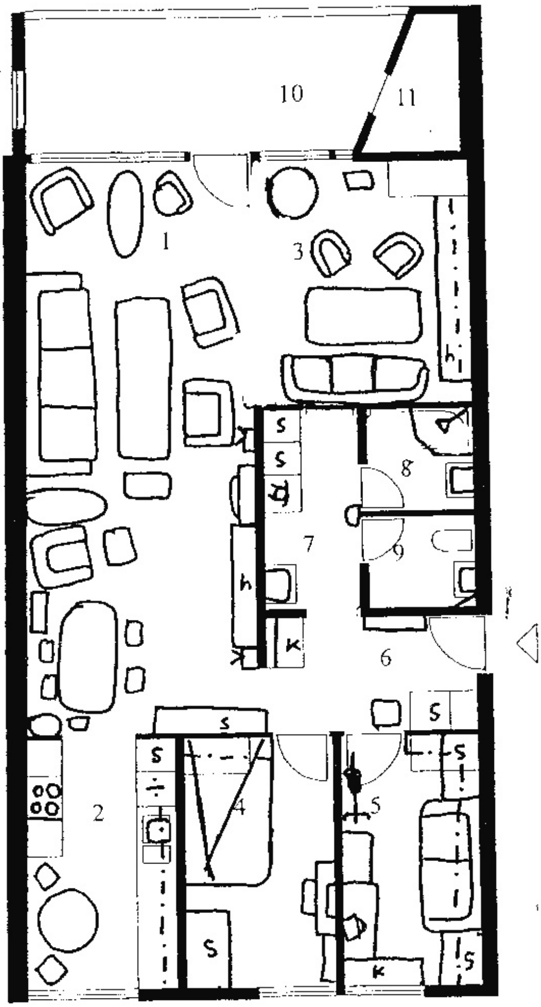
Rombetegnelser

Rom 1	stue/spisestue
Rom 2	kjøkken
Rom 3	~~småggen~~ soverom
Rom 4	smårom
Rom 5	smårom
Rom 6	entreen
Rom 7	vaskegangen
Rom 8	bad
Rom 9	toalett
Rom 10	verandaen
Rom 11	bod

 Møblering **Intervju nr: 77-2-** A7

(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:



Rombetegnelser

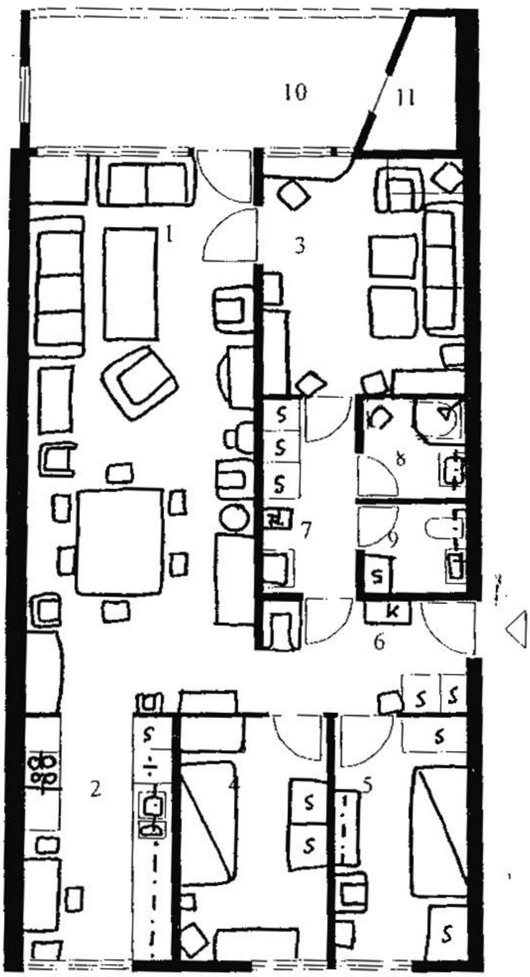
Rom 1	Stue
Rom 2	Kjøkken
Rom 3	[stue og spisest
Rom 4	Soverom
Rom 5	"Furterom" / gjeste- pc-rom, roterom
Rom 6	Entré
Rom 7	Vaskerom
Rom 8	Bad
Rom 9	Dos
Rom 10	Sommerstua
Rom 11	Kott

[kunne ikke komme ut pga. ombygging.

Side 3 **Møblering** **Intervju nr: 77-2-** C 6

(Møblering tegnes inn på plantegning.)

Hvis nåværende beboere har utført vesentlige endringer / ombygginger, beskriv hvilke:



Rombetegnelser

Rom 1 stue

Rom 2 Kjøkken

Rom 3 "~~Soverom~~" Lill stu

Rom 4 Kones rom

Rom 5 Manns rom

Rom 6 Gang

Rom 7 vaskerom m/ torkes

Rom 8 bad m/dusj

Rom 9 toalett

Rom 10 veranda / terass

Rom 11 kott

X = tatt bort

Bendik Manum

Apartment Layouts and Domestic Life; The Interior Space and its Usability

During recent years, urban housing has developed into a major section of Norwegian building construction. Where apartments' floor plans are concerned, these new dwellings seem to differ significantly from what previously has been built. This thesis summarises a study that has examined more closely how apartments' spatial layouts have developed through a period of time and how different layouts correspond to residents and their daily living.

The study is based on two research traditions; one is the housing research developed within the field of architectural research named space syntax, the other is the Scandinavian tradition of survey-based housing research, and is carried out as two empirical surveys. The first is a diachronic inquiry examining a sample of Norwegian dwellings built in the period 1930 - 2005, while the second is a synchronic interview-based survey examining and comparing contemporary living in apartments with different floor plans. The conclusion of the diachronic inquiry is the identification of three types, - or three generations, of apartments that differ significantly where spatial layout is concerned. The interview-based survey compares these three types of apartments and reveals several correspondences between an apartment's spatial layout and the kinds of household living there, the residents' use of their rooms and their evaluations of their dwelling. Among the results is that apartments of the first generation, apartments that are general by fundamental spatial layout as well as by the sizes of the individual rooms, house the widest range of "kinds of households".

In conclusion, the study has identified a spatial typology of apartments that is not only a theoretical classification of floor plans but also corresponds to real domestic lives. Apart from describing a historical development of dwellings, this thesis sheds light on these correspondences and provides some explicit knowledge that should be relevant to architectural practice.

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