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Alexander Klein (1879 – 1960)

Research

*Alexander Klein and the  
Existenzminimum:  
A 'Scientific' Approach to Design  
Techniques*

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**Abstract.** The urgent need for housing for the working class following World War I led to a search to determine new standards for housing to ensure that minimum requirements for living, or *Existenzminimum*, would be respected while costs were kept low. Overshadowed by more famous architects such as Gropius, Taut, and Le Corbusier, Alexander Klein's important role in this search is often neglected. Klein's remarkably innovative and mathematically rigorous design methodology began with the comparison of various types of dwellings, aimed at the determination of objective terms for the valuation of the design quality. Klein studied the problem of dwelling in its complexity, even considering the effects induced by conditions of living to the human psyche. His points of reference were the needs of the family and the individual, rather than impersonal hygienic-sanitary parameters. Klein's methodological research may still be considered an important point of reference.

**Introduction**

The figure of architect Alexander Klein is often relegated to the margins of the official historical studies, where he is cited without highlighting the important role his work played in the search for new housing standards during the first half of the twentieth century. Owing to the specific nature of his works and the limited amount of his designs actually built in Europe, his name is overshadowed by the most famous rationalist architects.

Born in Odessa in 1879, Klein took his degree at the St. Petersburg's School of Arts in 1904. In 1920 he decided to move to Germany. Tied to the principles of symmetry, 'equilibrium' and orderliness of the *Beaux Arts* tradition, he remained on the sidelines of the European cultural debate on the Modern Architecture until 1927, when he was nominated a *Baurat*, councilman for the Berlin's town planning. At that point his work was suddenly centered on the necessity to determine, in as short a time as possible, new housing standards for the working class, in order to ensure, at low costs, respect for the minimum requirements for living.

Klein therefore began a long period of study and research on the economic and typological problems related to the development of residential buildings, which led him to carry out assignments of management and research in the *Reichsforschungsgesellschaft für Wirtschaftlichkeit im Bau-und Wohnungswesen* (RFG, the government research

agency for the economic and constructive problems of the residential buildings), instituted in 1927 in order to encourage new experiments in model-house projects.

His new theoretical principles were applied in several projects of new urban areas near Berlin – Wilmersdorf in 1927 and Zehlendorf in 1928-29 – and in the project of the *Gross-Siedlung* of Bad-Dürrenberg in Leipzig in 1927.

With the enactment of racial laws in Nazi Germany, owing to his Jewish origin, Klein was forced to leave Germany in 1933, moving to France. Two years later he went to Palestine, where he worked as a teacher at the *Technion*, the Institute of Technology of Haifa, and continued his studies on urban planning; he also designed several projects for new cities.<sup>1</sup>

The urban nature of his projects, his in-depth analysis of the relationship between man and the city, his addressing the problem of housing on scales ranging from that of the individual house to that of an entire urban area, permit us to place Klein in direct comparison with the most famous modern architects who worked on housing, such as Walter Gropius, Bruno Taut, Martin Wagner and Le Corbusier.

Klein died in New York in 1960.

### ***The problem of the house in the Weimar Republic***

The second half of the nineteenth century saw a remarkable increase in the population of Berlin, which quickly grew from 170,000 to 1,950,000 inhabitants. In 1920 Berlin was one of the most densely populated cities in the Western world.

At the end of the nineteenth century, the *Polizeiverordnung*, “Regulations of police” enacted in 1853, was the only instrument Berlin had for controlling residential expansion. Its prescriptions were limited exclusively to the minimum dimensions for interior courtyards, based on the overall dimensions of a fireman’s wagon, and the maximum height of the buildings in relation to the width of the street. Successive regulations of 1887 and 1897 were integrated into these regulations, introducing hygienic norms for the aeration of rooms and limiting the use of basements as spaces for living.

In working class quarters, high rent for houses, often reaching a value equivalent to the 40% of a medium worker’s salary, forced two or more families to share a single house (fig. 1).



Fig. 1. Berliner Mietskasernen. Exterior and interior views of tenement building development in the early years of the twentieth century

During the first world war the situation was aggravated by a paralysis in the construction of new housing. At the end of the war in Germany, the problem of housing shortages for the proletariat – exacerbated by the precarious economic situation, the shortage of labour, inflation and the consequent increase in the price of raw materials – reached a level never before seen.

Finally, with the Republic of Weimar, the social-democratic government decided to grapple seriously with the problem of the housing requirements. After several transitory provisions, aimed at controlling the prices of building materials and rents, in 1924 the government, encouraged by the stabilization of the mark and the influx of foreign capital, began to promote interventions on a vast scale.

The resumption of building and public financing for mass-production housing favored the formation of the cooperative societies, which in those years realized the majority of the constructions.<sup>2</sup>

Building production was strictly tied to the decisions of the public administration, which gave power to some “technicians” in the field of town planning: the role of the *Stadtbauten*, architect-administrator, was a significant one in politics. This was Klein’s role in the public administration and in the RFG.

In 1932 the advent of National Socialism put a stop to any form of initiative, causing more serious problems and hurling Europe towards a second world war.

### ***Alexander Klein and rationalism***

The deep economic crisis into which all European nations fell after World War I fostered a sense of deep social and political responsibility in architects: architecture was viewed as a social service. It was clear that it was necessary to go beyond the cultural and social-bourgeois tradition of the late nineteenth century, which had begun to show its inadequacy to face the new problems that went hand-in-hand with scientific, economic and industrial progress.

From this point of view, the rationalist movement in architecture developed autonomously with respect to the artistic vanguards: starting from the principle of “art for everybody”, it elaborated a planning method that placed architecture in service of the society, recognizing in it the capacity to impact the political order deeply and bring about the resolution of social problems. The problem of housing requirements for the working class was a priority. In his 1934 *Das Einfamilienhaus – Südtyp. Studien und Entwürfe mit grundsätzlichen Betrachtungen*, Alexander Klein wrote:

Every age has its great architectonic themes; in ancient times they were above all temples and public buildings, in the Middle Ages churches and castles, in the Renaissance villas and palaces, then bourgeois mansions, and today the mass-production houses, together with the industrial buildings. As in the past dominant ideas found an adequate architectural expression, so today the mass-production house, with its economic-social requirements, cannot help but influence the architectonic expression [Baffa Rivolta and Rossari 1975: 141].

In regards to this, Giuseppe Samonà wrote:

The rationalist architects saw the house as an ethical symbol, and at the same time it led them to act with logical rigour. The house and the

neighborhood were at the center of the moral exigency ... to reach, with the coherence between function and form, a harmony that operated from inside the “cell” in which man lives, indicating a way to solve all social conflicts [Samonà 1959: 83].

The faith in “logic” distinguished all the rationalist architects: in the attempt to plan architectural spaces as rationally as possible, all exigencies were definable as a measurable requirement; for any given exigency, architects could propose a solution considered as the most advantageous and profitable from many points of view.

The determination of the *Existenzminimum*, which was the focus of the intense activities of Gropius, May and Klein, started by dimensioning the habitation cell on the basis of what was necessary to satisfy men’s exigencies, in a socialist vision that considered all men equal, regardless of their social class.

This task led to the formulation of universal standards for building, which also served to promote the process of industrialization, “the outgrowth of all the rationalist technique’s logic, that is, obtaining the maximum social result with the minimum economic effort” [De Fusco 1982: 219].

Le Corbusier wrote in this regard:

We must see to the establishment of *standards* so we can face up to the problem of *perfection*. ... Architecture works on standards. Standards are a matter of logic, of analysis, of scrupulous study: they are based on a problem well posed. Experimentation definitely fixes the standard. ... To establish a standard is to exhaust all the practical and reasonable possibilities, to deduce a recognized type consistent with function, maximal return with minimum expenditure of means, manpower, and materials, words, forms, colors, sounds [Le Corbusier 2008: 182-186].

Having defined the typological characters of the habitation cells, attention was extended from the individual dwelling to the building, as a combination of the several units based on the same conforming principles; several buildings, arranged on the basis of principles of orientation, means of communication and infrastructures, determined the neighborhood; several neighborhoods constituted the city. A feeling of optimism deeply permeated the rationalist architects’ treatises; Klein wrote: “we think that a city conceived in this way and based on scientific and human principles will help the community to form better citizens who will consequently create a better community” [Klein 1947; cited in Baffi Rivolta and Rossari 1975: 184].

### ***The method of analysis in the minimum design of a lodging***

Klein’s works on *Kleinwohnungen*, “little lodgings”, were shown in 1928 at the Housing Exposition, on the occasion of International Congress for Housing and Planning in Paris.

The works, which proposed a comparison between models for several houses, aimed at determining objective terms for the evaluation of a design’s quality, in order to find what arrangement best defined minimum lodging.

At the time when Klein exhibited his works, the Berlin building regulation prescribed only a few limitations on the areas of rooms for the mass-production houses, leading to excessively large areas for the houses. The consequent high building costs meant that they were too expensive for the working class.<sup>3</sup>

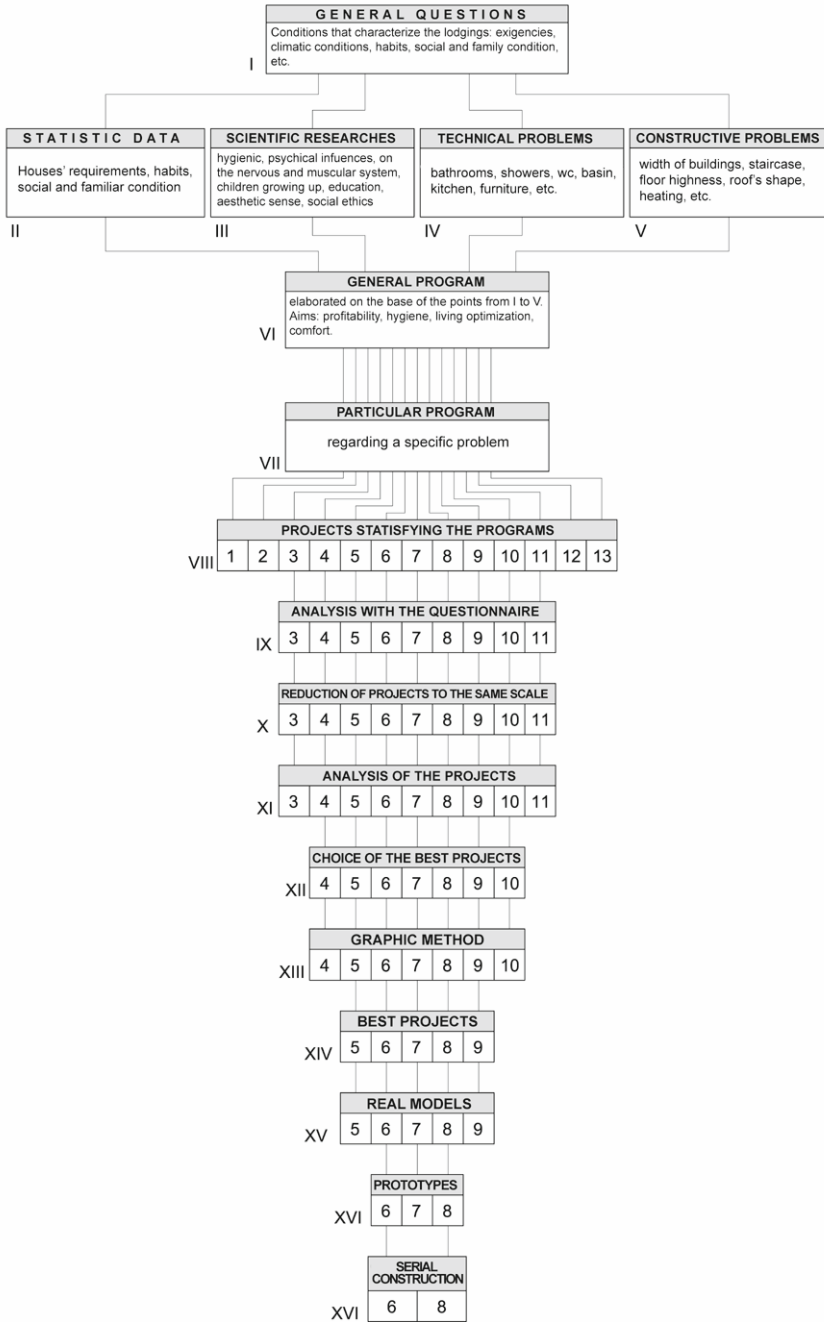


Fig. 2. General scheme of the method for planning rational residential typologies

										PROJECT NR.		ECONOMIC ASPECTS				HYGIENIC ASPECTS		CHARACTERISTICS REGARDING THE HABITABILITY							SPATIAL AND DISTRIBUTIVE CHARACTERISTICS				
11	10	9	8	7	6	5	4	3			MAIN CHARACTERS OF THE HOUSE				MAIN ROOMS		SECONDARY ROOMS		COEFF.										
65.76	75.46	73.14	89.40	90.00	80.94	88.00	66.82	74.18	1	BUILT AREA																			
274	324	314	393	387	360	392	283	319	2	BUILT VOLUME																			
51.47	53.18	64.45	63.02	65.45	61.33	65.90	51.10	58.35	3	USED AREA																			
2	1.5	2.5	2.5	2.5	2.5	2.5	2	2	4	AMOUNT OF ROOMS																			
2	3	3	4	3	3	2.5	2	2	5	AMOUNT OF BEDS																			
32.90	25.15	29.76	22.26	30.00	26.98	29.33	33.41	37.09	6	BETTEFFEKT: 1/5																			
137	108	128	98	129	120	131	141	159	7	BUILT VOLUME PER BED 2/5																			
16.40		20.60	20.00	17.30	20.00	21.00	20.25	24.10	8	LIVING ROOM'S AREA																			
13.50	32.60	22.60	26.45	28.95	22.75	24.40	14.00	13.90	9	BEDROOM'S AREA																			
29.90	32.60	43.20	46.45	46.25	42.75	45.40	34.25	38.00	10	RESULTING AREA 8+9																			
15.30	11.40	11.30	8.70	10.60	10.80	11.20	9.80	9.75	11	KITCHEN'S AREA																			
3.85	4.32	4.75	3.92	4.30	4.00	5.00	3.65	4.20	12	BATHROOM'S AREA																			
2.42	4.86	5.20	3.95	4.30	3.78	4.30	3.40	6.40	13	SERVICE AREA																			
21.57	20.58	21.25	16.57	19.20	18.58	20.50	16.85	20.35	14	RESULTING SERVICE AREA 11+12+13																			
0.783	0.705	0.722	0.705	0.727	0.758	0.749	0.765	0.787	15	NUTZEFFEKT: 3/1																			
0.455	0.432	0.483	0.520	0.514	0.528	0.516	0.512	0.512	16	WOHNEFFEKT: (8+9)/1																			
+	+	'	+	'	'	'	+	+	17	Is the orientation homogeneous both in the living and in the bedrooms?																			
'	'	'	+	'	+	'	'	+	18	shadows avoided in living and bedrooms ?																			
'	'	'	+	'	+	'	'	+	19	Is the light sufficient ?																			
+	'	+	+	+	+	+	+	+	20	not-served rooms avoided?																			
'	'	'	'	'	'	'	'	'	21	may children be divided in base of the their sex ?																			
'	'	'	'	'	'	'	'	'	22	Is the rooms' dislocation good for the habitibility?																			
'	'	'	'	'	'	'	+	'	23	Is the bathroom separated from the toilette?																			
'	+	+	+	+	+	'	'	+	24	Is the access to the loggia independent from bedrooms?																			
+	+	'	'	'	+	'	'	'	25	Is the position of doors and windows good for the furniture's disposition?																			
'	'	'	'	'	'	'	'	'	26	Are bathroom and w.c. adjacent to bedrooms and independent of them?																			
'	'	'	'	'	'	'	'	'	27	Are there spaces for wardrobes?																			
+	'	'	'	'	+	'	'	+	28	Are movement areas concentrated?																			
'	'	+	+	+	+	'	+	'	29	Are rooms differentiated in base of use and dimensions?																			
+	'	'	+	'	+	+	+	'	30	Disadvantageous connections between rooms avoided?																			
'	'	'	'	'	'	'	'	'	31	Are rooms well connected?																			
'	'	'	'	'	+	'	'	+	32	Is the light aesthetically good?																			
'	'	'	'	'	'	'	'	'	33	Are encumbrances reduced using wall-wardrobes?																			
+5	+3	+3	+7	+3	+9	+2	+5	+7	SCORE																				

Fig. 3. Example of application of the "score method" to nine models of lodgings

Klein singled out the limitations of the Berlin regulations in considering the surface area as a unitary reference parameter, which reflected the permanence of traditional models both for the determination of spaces and for the arrangement of furniture.

Gropius had defined *Existenzminimum* as the “minimum of space, air, light and heat necessary to men for developing their own vital functions without restrictions due to the lodging” [Gropius 1959: 126]. Klein added psychological aims as well: “we must keep in mind the influence of symptoms of psychological fatigue that negatively influences man’s nervous system, caused by unpleasant feelings generated by an accidental disposition of the elements of the plan” [Baffa Rivolta and Rossari 1975: 40].

Klein set forth the problem of housing in all its complexity, enriching the analysis with parameters for evaluating the psychological effects on men. Thus he referred the lodging’s dimensions, not to the areas of the rooms, but to the number of beds contained, that is, to the family to which the lodging was assigned.

The number of beds became the unit of measurement for all the exigencies of living, and consequently determined the amount of space needed for the living and dining rooms, kitchen and bathrooms.

Fig. 2 shows the levels and phases of analysis necessary for to determine the rational types of lodgings according to the model proposed by Klein.

In the first phase, the research was carried out without regard to problems of construction or building materials, in order to limit the amount of variables in this level.

Once the general problems regarding the geographic and cultural context (localization of lodgings, climatic conditions, local customs, familiar and social conditions, etc.) had been brought into focus, and the statistical data on the requirement for actual lodgings and the income of the population collected, the program then continued with in-depth research on the influences of the lodging on the inhabitants (influences related to hygiene, psychology, influences on the nervous and muscular systems, the increase in the number of children, education, the aesthetic sense, the social ethic). This level continued with the analysis of different possibilities for the design of the technological system, followed by the research on problems of construction (depth of the building, amount of flats for each staircase, height of the first floor, organization of the basement, shape of the roof, central or individual heating system). The result of this phase was the formulation of the “General Program”.

The “General Program” can be synthesized in four points:

1. the lodging must be inexpensive and every unitary parameter that defines the lodging’s value must be minimized;<sup>4</sup>
2. the lodging must be hygienic, that is, complete with sanitary fixtures and rooms that are adequately sunny and ventilated;
3. the lodging must be without defects; its arrangement must guarantee that family life is carried out in the best conditions, making it possible to do different tasks without spending too much energy and time;<sup>5</sup>
4. the lodging must invoke a pleasant impression of spaciousness, with spaces harmonizing in form, light and colors.<sup>6</sup>

Klein maintained the necessity of involving different areas of knowledge in the elaboration of the general program, which are those of the architect, the public agencies

and all the various scientific and technical experts, anticipating what came to be the established conviction that architectural planning demands the collaboration of various professional figures.

After the elaboration of the general program, it was the exclusive responsibility of the architect to plan the typologies that efficiently satisfied all the highlighted requirements while keeping costs low. At this point, the program formulated a sort of questionnaire for evaluating the designs in relation with the quality of living provided. Klein introduced the “Score Method” (fig. 3): a certain number of characteristics were fixed on the basis of the general program, so the comparison between models for different lodgings was possible, assigning a positive or a negative score according to their correspondence to the requirements. The models that achieved a mainly positive score were obviously preferred to the others. Understanding that objectivity depended on the choice of the questions and the importance attributed to any of these, Klein introduced some corrective coefficients, in order to confer objectivity to his method. The coefficients were: the *Betteffekt* or “bed effect”, the ratio between the total built area and the number of beds; the *Nutzeffekt*, the ratio between the used area and the total built area; the *Wohneffekt*, the ratio between the area of the living room, the bedrooms and the total built area.<sup>7</sup>

Following this phase, there was one called the “Method of the Successive Increments”. Here the plans previously selected were grouped on the basis of some dimensional parameters and the distributive scheme, so as to be “reduced to the same scale”, that is, to be comparable on the basis of the number of beds. The planimetric diagrams were therefore modified by increasing the length and the width of the building by constant amounts; they were disposed in a grid, where the rows represented the increase in depth, the columns the increase of the width (fig. 4). The result was that the best plans, both in terms of profitability and habitability, were those located along the diagonal of the grid. The plans in the upper half of the grid were neither profitable, hygienic nor practical, while those placed in the lower half were hygienic but not profitable, due to their excessive length.

The third phase was the “Graphic Method” (fig. 5). Klein thought that this was the most reliable and rigorous of all the “methods”, because it was more objective and not very susceptible to personal interpretations. The graphic method allowed numerous analyses to be made on the selected plans, making it possible to see the internal connections, the shape of the area engaged by the movements, the space not occupied by the furniture, the area of shadow projected by the walls and the furniture when caught by the sunlight. Designing the interior elevations of any single space, it was also possible to evaluate the correct use of the internal walls and the effects of the position of furniture and openings on the user’s psychological conditions. The use of these parameters in the comparison of the selected solutions made it possible to identify the optimal residential typology that satisfied all the requirements.




















































































		DEPTH								
		8.50	8.89	9.28	9.67	10.06	10.45	10.84	11.23	11.62
WIDTH	7.70	 1 65.5	 2 68.38							
	8.20	 3 69.3	 4 72.88	 5 74.38						
	8.70	 6 75.38	 7 80.38	 8 83.68						
	9.20	 9 85.18	 10 88.88	 11 92.38						
	9.70	 12 93.38	 13 97.18	 14 100.38						
	10.20	 15 102.38	 16 105.88	 17 109.88						
	10.70	 18 112.88	 19 116.88	 20 120.88						
	11.20	 21 121.38	 22 125.88	 23 129.38						
	11.70	 24 129.88	 25 134.88							

Fig. 4. Method of the successive increments. Example of comparison and evaluation of several plan diagrams reduced to the same scale (1 living room, 1 bedroom for parents, 1 bedroom for children)

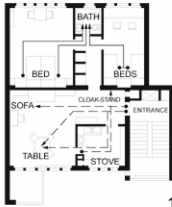


1)



2)

Two Klein's models proposed for a four-beds lodging.



1)

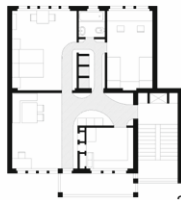


2)

Graphic analysis of the connections  
In both the examples, the connections are short and do not intersect

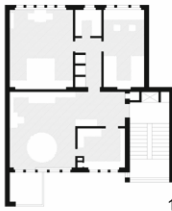


1)



2)

Graphic analysis of the way to the loggia  
The model n.2 is better because the way is shorter, straight and people do not avoid furniture



1)



2)

Graphic analysis of the free areas  
In both the examples, the free areas are concentrated and placed in well-lighted parts of the rooms



1)



2)

Graphic analysis of shadows projected on the floor  
In the model n.2, the furniture's position allows to reduce the shadows projected on the floor.

Fig. 5. Graphic method. Comparison between two plan models for four beds, published by Alexander Klein in “*Grundrissbildung und Raumgestaltung von Kleinwohnungen und neue Auswertungsmethoden*”, Berlin 1928

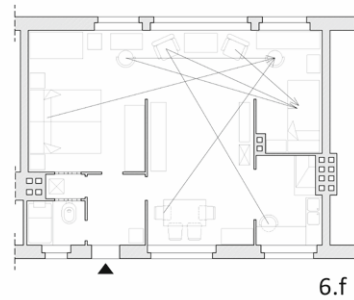
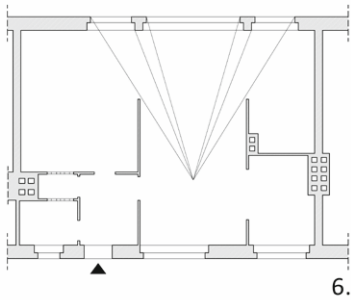
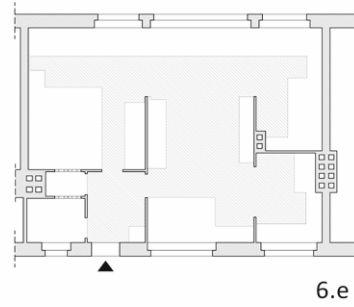
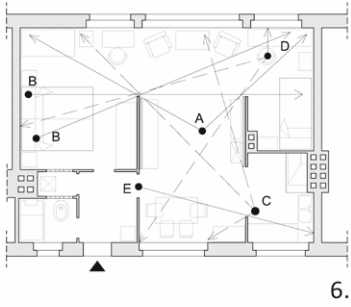
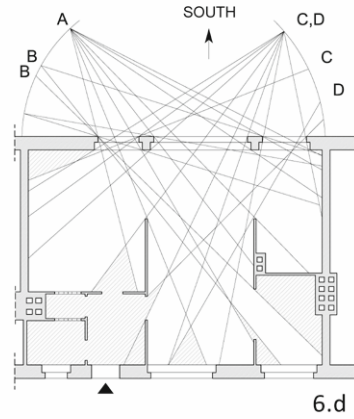
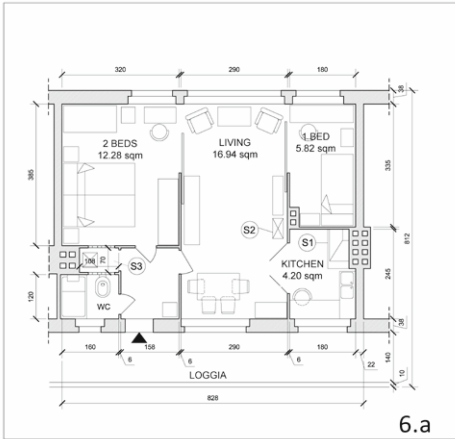


Fig. 6. Example of minimal lodging, planned by Alexander Klein for a loggia house typology (type IIB) and published in the “Zu dem zusätzlichen Bauprogramm der Reichsregierung”, Berlin 1931

The project for a “loggia house” typology, published by Klein in “*Zu dem zusätzlichen Bauprogramm der Reichsregierung*” in 1931 (fig. 6) clearly shows how the author contrived some expedients in order to limit the disadvantageous effects of the minimal area. These can be synthesized as:

- wide sliding doors make it possible to extend the air-volume of the bedrooms into the living room (fig. 6a);
- the heating system is differentiated on the basis of the seasons: one coal stove for mid-seasons (S1), one stove in the living room for the normal winter days (S2), an additional stove (S3) for the coldest days (fig. 6a).
- having wide views from every point of the lodging makes it possible to avoid the unpleasant impression of too-narrow spaces (fig. 6b);
- the interior space is placed in visual connection with the exterior environment by using wide sliding doors placed orthogonal to the wall of the windows (fig. 6c);
- the correct positioning and dimensioning of windows allow sunlight to enter all areas of the house (fig. 6d);
- the layout of the space and the arrangement of the furniture are conceived so that the areas left free are concentrated and compact (fig. 6e);
- the interior views are conceived in order to make it easy for parents to watch their children (fig. 6f);
- the glass door between the kitchen and the living room, together with careful arrangement of the furniture, allows mothers to watch their children while they cook (fig. 6g);

The lodging appears to have been designed with the woman of the house in mind. Klein recognized how hard housework is, and conceived the house in order to allow women to carry out their household duties easily, with less waste of energy and time, while at the same time being able to watch over their children, in a welcoming and sunny house.

### ***The Gross-Siedlung of Bad Dürrenberg in Leipzig***

Alexander Klein was the designer of many projects ranging in scale from the single building to entire urban areas, but just few of them were realized. A chronology of Klein’s projects is given in the Appendix.

In the project for the Gross-Siedlung at Bad Dürrenberg in Leipzig in 1930 (fig. 7), Klein finally had the opportunity to test the design method theorized in the years before. The program called for 1000 lodgings laid out in a plot of land 185,769 square meters wide, with an incidence of approximately one lodging each 200 square meters, subdivided in (fig. 8):

- 1 Loggia house typology
  - 187 apartments with 2 ½ beds (type L);
- 2 Apartment blocks
  - 420 apartments with 3 ½ beds (type C 2);
  - 118 apartments with 4 ½ beds, with the possibility to separate children on the basis of gender (type C7);
  - 48 apartments with 5 ½ beds (type C 13);
- 3 Single family houses
  - 120 houses with 4 ½ beds, without the possibility to separate children on the basis of gender (type E1);
  - 21 houses with 5 ½ beds (type E2).



Fig. 7. The Gross-Siedlung of Bad Dürrenberg in Leipzig. View of the area

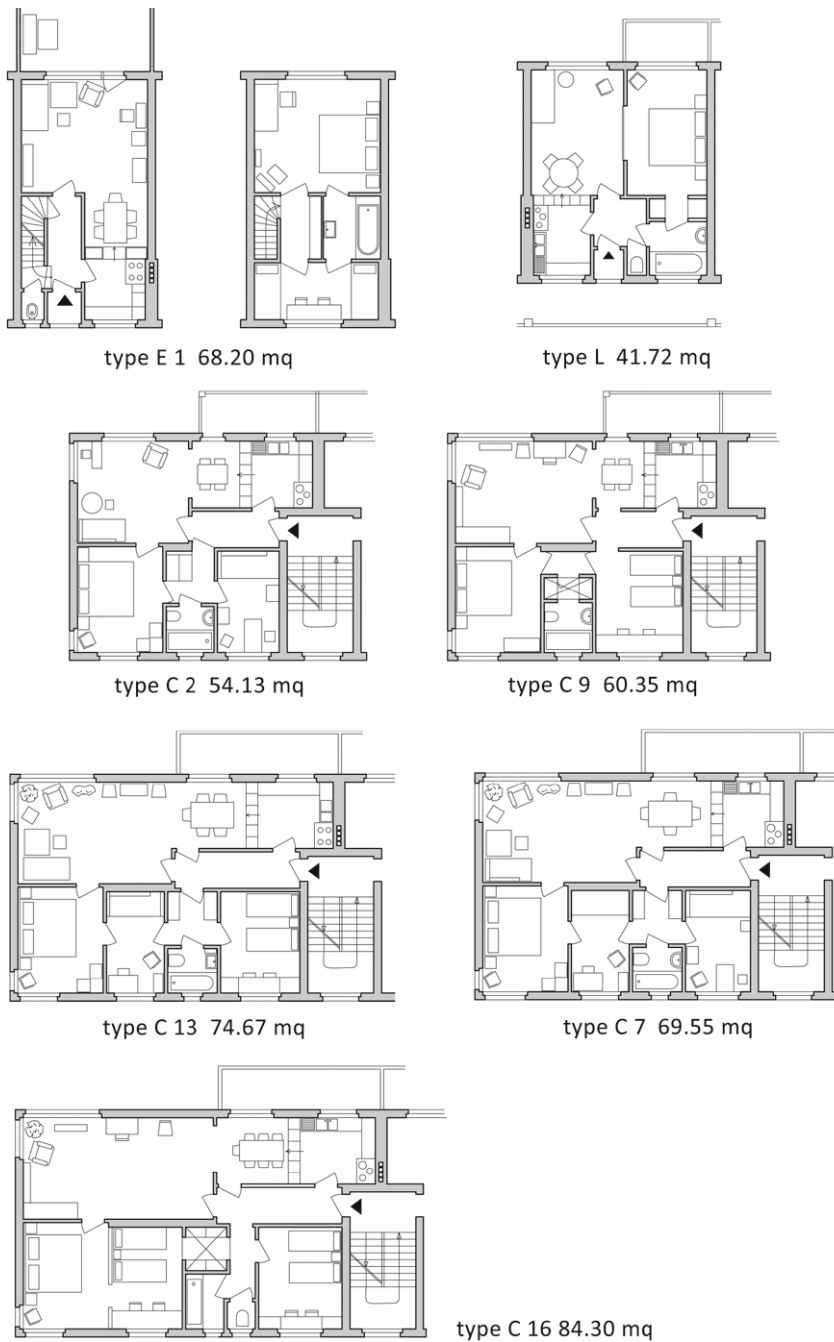


Fig. 8. Plans of typological lodgings for the Gross-Siedlung of Bad Dürrenberg

All the blocks are arrayed along the north-south axis, in order to have the rooms destined for daytime use exposed to the west and those destined for nighttime use exposed the east. Only in the loggia types are blocks arrayed along the east-west axis, with all the service rooms exposed to the north and the living spaces opened to the south.

Blocks of house with two floors are situated orthogonally to the loggia types and are separated from the main road – the Lützenstrasse – by a wide, triangular-shaped open space, with sport areas and playgrounds.

In the eastern corner of the area, the square where the station is located represents the main traffic node and is, at the same time, the terminal of the tramway connecting to the Leuna Factory nearby. The single family houses, with two or three living floors, are located near the square of the station.

The main axis of the whole area is marked by a wide, linear park laid out in an east-west direction, with stretches of water, pedestrian ways, trees and benches. At its eastern end, rows of poplars separate the central green park from the blocks of three-floor apartments; playgrounds and sand boxes are provided between the blocks. Roads for cars are relegated to the boundary of the area, and terminate in little squares for the u-turns; only narrow pedestrian pathways – ranging in width from 1.60 to 2.25 meters – arrive to the entrances to the blocks. Places for garbage collection are located between the blocks and the boundary streets.

### ***Conclusions***

Unfortunately, the results of Klein's studies have been often disregarded in the rush to build speculatively, to increase the building contractors' profits and earnings from sales of real estate. In neglecting the social ideals of the *Existenzminimum*, the mass-production lodgings failed to provide "the function of shelter from the contradictions and the conflicts of the city ... privileged place for the privacy, rest and the regeneration of the labourer" [Baffa Rivolta and Rossari 1975: 40]. Given the choice between Gropius's "minimum vivendi" and "modus non moriendi", that is, between the minimum conditions for an optimal quality of life and the limit conditions for survival, the latter was often preferred.

However, Alexander Klein's lessons may be considered as universal and continue to play an important role in architecture. According with De Carlo, the fact that architecture then went beyond the methodological bounds of Klein, and of rationalism in general, is proof of the validity of a method "that made the research concrete and, at the same time, made it possible to go beyond it" [De Carlo 1965: 324]. Klein's scientific rigor has not be interpreted as rigidity of his method, but forms an important foundation for the affirmation of a culture, and helped lead architecture out from the dogmatic reiterance of traditional models.

### ***Appendix: Klein's project list***

1909-1916 Peter the Great Hospital, Petersburg;

1913-1914 Apartments in Petersburg;

1922-1925 Houses for rent in Berlin-Wilmersdorf;

1925 Houses in Tempelhofer Felde, Berlin (project);

1925 Houses for the Moscow Soviet Prize (project);

1926 Five residential buildings and cotton factory in Iwanowo Wosnessensk (project);  
 1926 Terrace in Berlin-Dahlem (project);  
 1926-27 Residential building in Berlin-Wilmersdorf (project);  
 1927 Gross Siedlung Bad Durrenberg a Merseburg, Leipzig;  
 1927 Schultz House in Berlin-Dahlem;  
 1928 GAGFAH Siedlung Onkel Tom's Hutte in Berlin-Zehlendorf (urban plan);  
 1928 three buildings in the GAGFA Siedlung Fischtalgrund in Berlin-Zehlendorf;  
 1928 Lodge for the Heim und Tecnick Competition in Munchen (project);  
 1929 Klinke House in Berlin-Dahlem;  
 1930 Residential building at the Kornerpark in Berlin-Neukoll;  
 1931 Apartments for single workers in Berlin (project);  
 1931 Enlargeable house for unoccupied workers (project);  
 1932 House for the Zuruck zum Haushalt in Berlin-zoo (project);  
 1938-47 Residential quarter near Tiberias (project);  
 1938-50 Residential quarter Kiriat Yam, Haifa;  
 1940-50 Residential quarter Tivon, Haifa (project);  
 1940-50 Residential quarter Mount Carmel-Rushmiah, Haifa (project);  
 1953-54 Urban Plan for the Technion Campus, Haifa;  
 1957 Residential building for the Interbau Exposition (project);

### **Notes**

1. Residential quarter near Tiberias (1938-1947); residential quarter *Kiriat Yam*, Bay of Haifa (1938-1950); residential quarter *Tivon* near Haifa (1940-1950); residential quarter *Mount Carmel-Rushmiah* near Haifa (1940-1950); urban plan of the Technion's campus, Mount Carmel near Haifa (1953-1954); see the Appendix for a chronology of Klein's projects.
2. The most important cooperative societies were the GEHAG and the GAGFAH. Martin Wagner and Bruno Taut worked for the GEHAG; Heinrich Tessenow worked for the GAGFAH. The public administration obliged the cooperative societies to respect rules for the dimensioning of spaces in order to be entitled to public subventions and to fiscal privileges [Baffa Rivolta and Rossari 1975: 13].
3. A house had to be provided with a room of at least 20 square meters; for the other rooms the minimum area had to be equal to 14 square meters, 10 square meters for the kitchen, 6 square meters for the *Kammer*, an unspecified room that could be used either as a storeroom or as single bedroom. Thus, the mean area was 100 square meters for a three-room house and 130 square meters for a four-room house, with costs fluctuating between 12,500 and 16,000 marks, urbanization costs excluded.
4. The unitary parameters identified by Klein were: the ratio between the total built area and the number of beds, the ratio between the sum of living-room's areas with the bedrooms' ones and the total built area.
5. "...the amount of rooms must correspond to the family composition without sub-renters ... the bedroom for parents must be separated from children's rooms; it should be possible to separate children on the basis of gender; living-room must be separated from bedrooms;



kitchen must be separated from dining-room ... doors and windows must be arranged for leaving sufficient space for placing the indispensable furniture”, [Klein 1928], quoted in [Baffa Rivolta and Rossari 1975: 82]. The fact that Klein felt the necessity to emphasize some requirements that currently belong to the residential building’s planning, evidences the deep state of precariousness of the German mass-production housing in the first post-war period and marks the importance of his works for our architectonic culture.

6. This is the concept of the “calm house”, that is, the importance that the perception of the spaces does not induce unpleasant and anxious feelings in the residents.
7. From the study of the questionnaires, the corrective coefficients do not seem to affect the evaluation by means of an algorithm that justifies the formal rigor. Instead it is more likely that the corrective terms were used by Klein in order to estimate the validity of the judgment on the basis of unavoidably subjective considerations. This limit was however clear to Klein, who admitted that a certain objectivity was only possible in the successive phase of the graphic method.

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## ***About the author***

Marco Giorgio Bevilacqua is an Italian engineer living and working in Pisa. He received his degree in civil engineering from the University of Pisa, where he also earned his Ph.D., with research concerning the architectural survey of the fortifications built in Pisa in the sixteenth century. He teaches architectural drawing in the Faculty of Engineering at the University of Pisa. He also teaches architectural design at the UFO University of Tirane (Albania) and digital drawing at the Naval Academy of Lebourg (Italy). He has participated in various national and international projects with research in the field of architectural surveying of monuments and urban landscapes. In the same area, he has published many articles in journals and books and has presented papers at numerous national and international conferences. He is the author of “The conception of Ramparts in the Sixteenth Century: Architecture, Mathematics and Urban Design” (*Nexus Network Journal* vol. 9, no. 2, Autumn 2007) and, with Roberto Castiglia, “The Turkish baths in Elbasan, Albania” (*Nexus Network Journal* vol.10, no. 2, Autumn 2008).