Event and background
THE THEORY OF BLIND DESIGN
An introduction into transmission and reception of information in industrialized building

By

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Introduction

This short survey of a many years' theoretical research work introduces a method for making designs, or more accurately said: a method for the transmission and reception of information in industrialized building. In this method for the conveyance of architectural thought the design is not represented pictorially but symbolically by means of a system of elementary codes composed of grids and signs. This briefly means that *blind design is a method for coding designs.*

The method has arisen as a singular theoretical by-product of the technological-experimental research carried out at the Institute since 1971 [17] in the field of silicate-based non-tectonic building methods.*

The question where science or knowledge starts from may be answered with K. R. POPPER [7] as follows: "... Knowledge does not start with observations, nor with the compilation of data, or facts, but it starts with the problems. These may be theoretical, or practical, but anyway they urge us to think them over, to search for causes, connections, relations, conformities to the rules and so they induce us to create theory. The problems, namely, if they are really noteworthy and significant, take us by surprise, call our attention to the fact that — in our theory and practice — there is a hitch somewhere, there is something wrong *in our knowledge*. This "something" — *the problem* —

* The silicate-based, non-tectonic building method is a specific building process where additivity (the axiom of building) makes use of the non-load-bearing properties and temporary instability of semantically meaningless (Gutenberg-principled) surface units. In this building method, the direct product of manufacture is not the load-bearing structure but its surface. Alignment of surface units of vertical and horizontal structures does not lead to immediately load-supporting, load-transferring (tectonic) joints between the surface units.

contradicting our knowledge, falling short of our expectations, this will now become the starting point of the scientific work and the method of sciences lies in the search for trying to find solutions to these problems . . .”

The problem we came across was that the “*Monge-type*” graphical representation turned out to be inadequate for thin, delicate, composite building structures basically different from the usual ones, and this fact finally led us to bypass graphical representation.

When making our first experimental non-tectonic structure in 1971 [16], no unambiguous representation was possible else than by modelling full-size, in wood.

Two years later, when preparing the plans for the experimental maisonette [17], in order to achieve an adequate graphical representation of the structure, the scale of the work drawings had to be increased from the traditional 1 : 50 to 1 : 20. As a result, more than fifty very large-size drawings were made.

In 1974, in a case study of an 80 m^2 experimental family house the size of the drawings could already be reduced to format A/4, but even so the documentation contained more than fifty pages.

These difficulties induced us to discard graphical representation in the 1975 experimental work [18] and — adapting the method of blind design — the documentation of a building of approximately 300 m^2 floor area could be condensed to eight A/4 format pages through coding.

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This short study is naturally no detailed description of the method to be outlined in three Parts:

Part I stating the problem and expounding the theorems involved in its solution.

Part II recapitulating the method in 24 theses on the theory of blind design.

Part III finally illustrating practical application of the theory on coded designs for an experimental building.

Part I

Stating the problem and theorems applied for its solution

The problem, the inadequacy of the *Monge-type* graphical representation emerged with our first experimental work immediately in its total spectrum. It was surprising, because the experiment involved a single thesis to be proven scientifically, namely that the non-tectonic building method leads to the lightest-weight structures producible on silicate basis, and no idea to have problems with graphical representation came across our mind.

To prove the thesis, two structural and technological alternatives of the same principle of construction have been elaborated, both presenting a method suggested for erecting a repetitive unit of the structural system (Figs 1 and 2).

The *first alternative* was a structural unit constructed of folded tissue-structural pillars, reinforced concrete shell beams and tissue-structural floors composed of three materials (gypsum, polystyrene and reinforced concrete).

The *second alternative* combined two materials (gypsum and reinforced concrete) into a structural unit of folded reinforced concrete shell pillars, reinforced concrete shell beams and tissue-structural floors. (This alternative got later realized.)

It is quite a different thing, however, to know and create a structure, or to make someone else acquainted with it, that is, *to make the structure perceivable for someone else.* The structure so well known to us revealed another aspect. In non-tectonic structures, the dimensions of reinforced concrete turned out to be shifted in a peculiar way by two orders of magnitude, from ten centimeters to millimeters; in case of tissue-structures the problems of structural interference, interlacing to be quite different from those for traditional reinforced concrete constructions; the solutions of jointing to be only expressible in millimeters, etc., so that in final account the traditional method of graphical representation, exactly spoken: *the Monge-type projective geometry proved to be inadequate.*

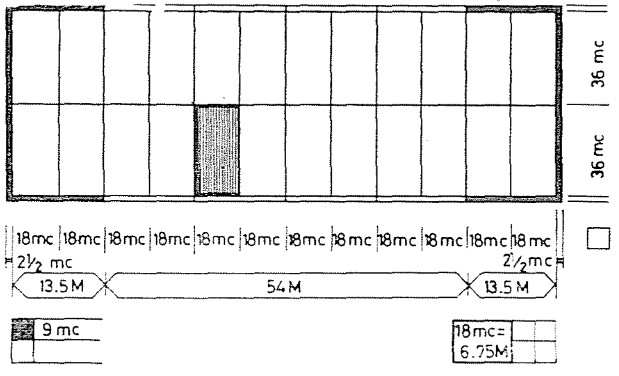


Fig. 1

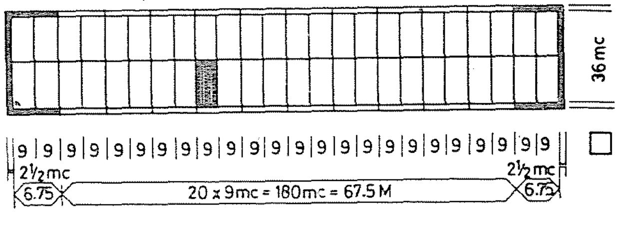


Fig. 2

Now, a quite unexpected problem faced us of how to report on a structural concept to an *ad hoc* committee if it does not fit the traditional method of representation. It became soon clear that as long as no adequate methods of representation are invented, documentation by graphical representation has to be replaced by a full-size *model.*

Replacement of the pictorial documentation by full-scale "physical" models of the structure cannot of course be generalized since it simply bypasses the solution of the problem. In research, however, such a "compromise" may be useful and justifiable, as seen from the comparison of each alternative of the same type of basic (e.g. floor) unit represented in a traditional way and to a rather "large" scale.

In scientific research, particularly if it involves laboratory tests, difficulty enough is caused by the fact that the very object of research, the structural and technological variation is a novelty. Advent of a new problem adding to

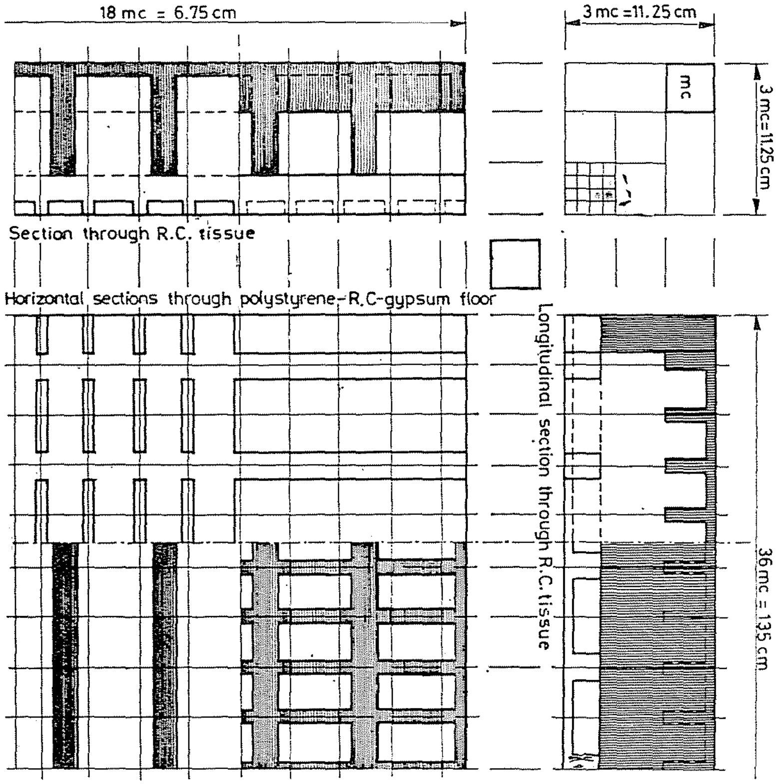


Fig. 3. Basic floor of the structural unit combined of three materials (Alternative I). The basic element is of polystyrene milled on both sides to reduce the weight of the floor and to mark out the channel system of the tissue. The two-way channel system on the one side determines the tissue of the gypsum, and on the other side, that of the reinforced concrete. The traditional graphical representation of such structures to the usual (1 : 50) scale of the working drawings is simply unthinkable. [17]

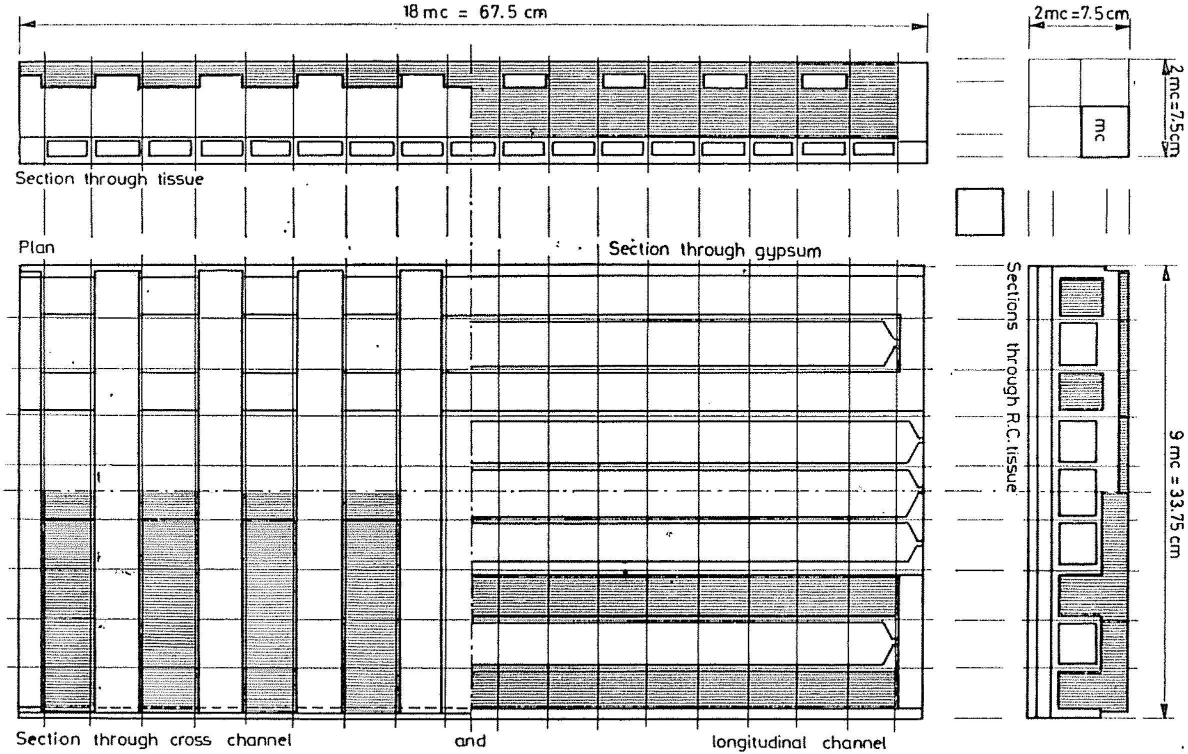


Fig. 4. Basic floor unit of the structure made of combination of two materials (Alternative II). The situation may still be worse in the case of structural units combined of two materials. Namely, here the gypsum basic floor element has an interior two-way channel system producible only by casting and interior forming. The adequate graphical representation of such element requires — beside the ground plan — to take up three sections each in both directions. On the other hand, correct spatial reconstruction of this graphic material means a rather hard brainwork even for experienced specialists, again argueing for modelling. (See p. 143 in [17].)

the work with no concern in the essence of the experiment is decidedly a drawback. The perfect unsuitability of the traditional graphical method, more accurately: of the "Monge-type" projective geometry for the representation as required was felt to be rather distressing since it inhibited to illustrate exactly what was original in structure and technology. For instance, in the case of *Alternative I*, the 18.75 mm × 94.00 mm tissue-threads spanning 2.70 m traced to the usual scale 1 : 50 of working drawings (meaning to reduce 18.75 mm to 0.0375 mm, less than the smallest nib of the rapidograph). Some kind of mathematical or informational language will simply become indispensable as an alternative to Monge's projective geometry. *Pictorial* representation will have to be translated into the language of some *coding system*. The conception had to demonstrate simultaneously and efficiently the principle of construction (double co-ordination), the school of thought (the adaptation of the Gutenberg-principle), and the method of design (the system of non-tectonic structures). We decided to make a step backwards and — renouncing of pictorial representation — to model the structure of timber, *to full scale*.

Unfeasibility of graphical representation has led with inexorable logic to the conclusion: the construction of the exact copy of the structure. In order

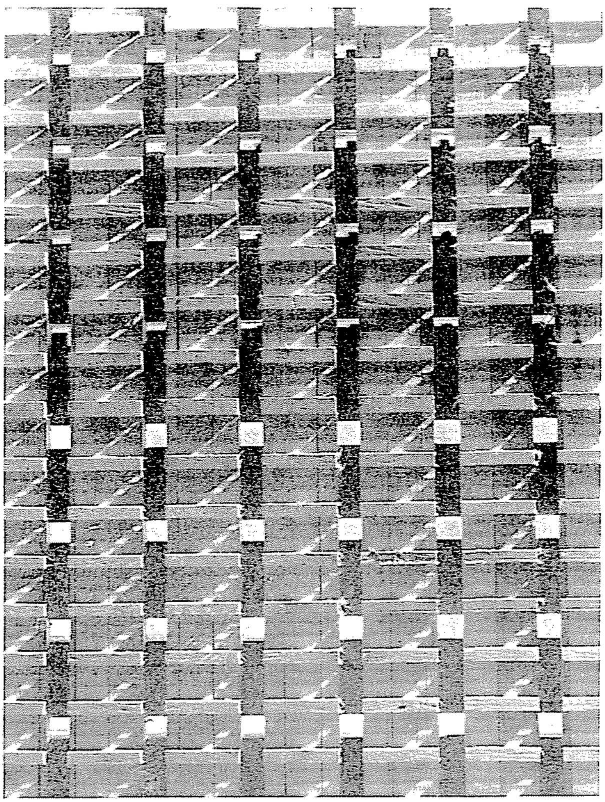


Fig. 5. Full-size wooden model of the basic polystyrene floor element of the structural unit combined of three materials (Alternative I). The two-way channel system determining the tissue on both sides is a basic monotonous submodular (mc = 37.5 mm) grid. It is featured by endless repeatable, boring identity.

to simultaneously explain the structural system and the method of construction, the experimental unit was divided into two parts: the structural unit itself, and its full-size wooden model directly showing the interior structure and thus exhibiting the non-tectonic principle of construction.

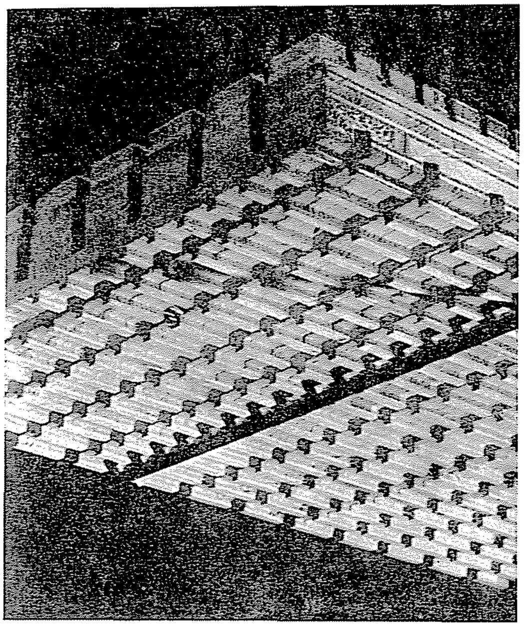


Fig. 6. Detail of Fig. 5. Axonometric representation of structures of this kind is rather laborious and nobody could find much pleasure in such a work. Clear periodicity, namely, spells no architecture just as rhythm is not yet music in itself

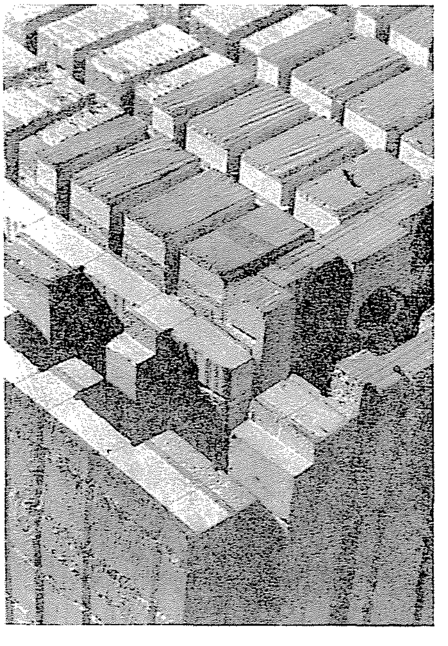


Fig. 7. Wooden model of corner junction of Alternative I. Interference of the two-way periodicities. There is no monotony any more but change and event. For making the essence understood, the model here is superior to any drawing

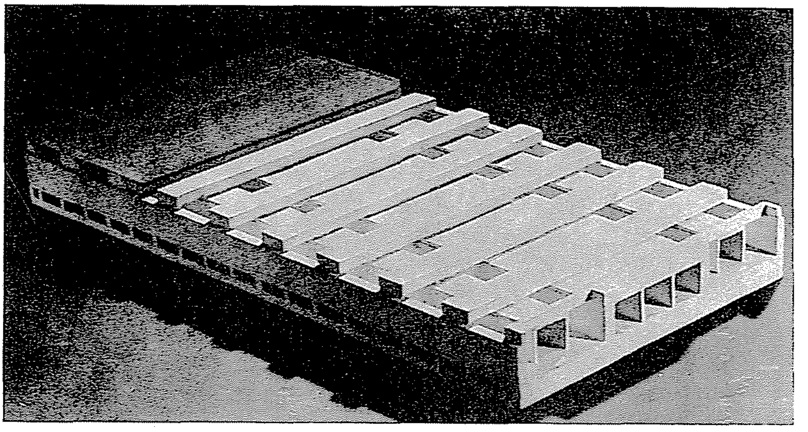


Fig. 8. Basic gypsum-reinforced concrete floor element, Alternative II (structural unit with combination of two materials, modelled of timber and plexiglass). The system composed here of closed and open two-way channels is again constructed on the mc = 37.5 mm basic submodular grid. (Wooden models and erection see on Photos 2 and 1 in [17].)

Analysis of the problem

The problem could not be analyzed "purely theoretically", isolated, in itself. As a matter of fact, the complex of non-graphical representation is not *object* of our research but only *concomitant* to it, the analysis of the problem had therefore to join our actual task. Also, the non-graphical representation is a technology itself (since it bears all the marks of systematic knowledge and action) and as such, it will raise not only scientific (theoretical) problems but technical (practical) ones as well, to be cleared experimentally, involving the elements of "trial and error", just as do structural and technological experiments.

Three starting theses

The problem was to be solved as a by-product of tests. We set out from three theses.

The first thesis was deduced from *Engels'* law. According to this axiom of dialectics, the necessary concomitant to every change is that quantitative and qualitative changes are mutually transformed to one another. It is not only quantity that passes over to a new quality but also quality is converted into a new quantity.

The *replacement of graphical representation by coding* is evidently equivalent to qualitatively changing the present system of conveyance of architectural thought.

Coding is technique. As such, it transforms a kind of quality into a kind of quantity: this is the axiom of every technique.

The really qualitative change in technology follows the principle of doing "*the same thing in a different way*", of translating a kind of organic knowledge to the language of precision and reproducibility, to the language of mechanical production; decomposing the original, integer process into elementary part-processes, and then, reintegrating them. Thus, it is not the further development but the transformation of the old that characterizes the qualitative change. Accordingly, the *Gutenberg*-typography, the printing with movable types is not a further development of handwriting as an aeroplane is not a "development" of the bird either.

The subject of *Whitehead's* ingeniously paradoxical thesis is the technique of technological invention, the inventive process, which according to him does not proceed from the unknown toward a desired outcome but on the contrary, in a curious way it departs from the very thing to be invented and works backwards as if following a thread — to the starting point to set out from to reach the goal requested. This regress performs the minute decomposition of the not necessarily straight way of invention, whereas fragmentation, the indispensable discipline of invention is given by the integration of this way. This is what gave humanity the clockwork, the press, the loom, the "mechanical" automaton, and in the last analysis the industrial assembly line as well.

Russell's requirement about the elimination of the unwanted repercussions of the problem solved — the principle of *suspended judgement* — is actually a consistent continuation of Whitehead's thesis. This concise definition means that the process of invention does not end at the event of the invention, but the judgement has to be suspended here. The process can only be regarded as terminated if its acceptance and adaptation involve the preliminary recognition and elimination of the unwanted or harmful repercussions.

Applications of the theorems

Replacement of pictorial representation. The three theses treated as premisses in our train of thought turned out to be extremely generative for the methodology. In accordance with the theorem reduced from *Engels*' law, *automated drawing* could be ruled out well in advance from the possible range of solutions since its destination is completely different, and its aim is not to replace graphical representation but — on the contrary — to further develop it: to automate an operation originally organic being bound to the hand. Our problem was *the inadequacy of the traditional graphical representation*, or rather, how to do the same thing (that is, pictorial representation) in a different way, to translate the drawings into the language of some *coding system* but in a way that later the solution be applicable in the computer-aided design.

Miniaturization of documentation. The next step started from *Whitehead*'s thesis. First, the wanted final result of the inventive process had to be stated, since the way leading to the solution of the problem can only be found if the result requested is *a priori* known. It was decided that the thing to be invented was *the miniaturization of documentation*, which — in the language of information theory — means maximum information on the minimum area.

The use of intermediate extrapolation in general, and in the representation of buildings. The grasping of problems of representation of buildings on the basis of information theory seemed to us very suitable since it is in harmony with the requirement of interdisciplinarity fitting the age of scientific-technical revolution. In building industry these endeavours typically conceive the building integrating the three phases of *design — manufacture — assembly* as part of the universe of technique. According to this, when judging the nature of future, industrialized building is not concluded on immediately, exclusively from the very building, but intermediate conclusions are drawn by analyzing different other techniques, technologies as well and pointing out characteristic tendencies in them which are — by analogy — likely to crop out.

Application of such scientific extrapolations in the building industry is almost unexplored yet, but the inherent possibilities are quite promising. We cherished the conviction that *the adaptation of methods of information theory and telecommunication to the representation of buildings* could be regarded as well-founded from every point of view and so much the more because — as a result of the earlier enthusiastic tendencies to over-rationalize — a real deluge of paper is created day by day in design, clearly showing that there is something wrong with the graphical representation of building. The amount of drawings required goes on increasing and this is simply inconsistent with an industrialized building technology. Thus, a new method for the graphical representation of building, or better: the invention of a new *coding system* is almost a must for development.

Aim of the coding system. Evidently, the new comprehensive coding system has to know at least as much as the old graphical representation but it has to know the *same* thing in a *different* way: it has to be universal (just like the *Monge-type* representation) but in a different way, so — as opposed to the graphical representation — it has to embrace the whole of the building process in a different way. First of all, it has to radically reduce the time for drawing operations and thereby prevent drawing works from overbearing planning. It has to enable the architect to free his energies from the routine tracing work and concentrate rather on intuitive work, finally, it has to create a tool for the building industrial application of computer methods.

Preconditions of universality of coding system in design-manufacture-assembly. To postulate the requirements of the coding system is a relatively "simple" task; the basic difficulty in technology spells problem-solving, that is, to reply the question of how to reach the aim requested, what the likely technical preconditions of the universality of a coding system are, in other words, how can the coding system be extended throughout the building process, over the three phases of design — manufacture — assembly.

In *design*, as we have seen, the fundamental task is to replace graphical representation by other, non-pictorial methods of representation. The situation in manufacture and assembly is quite different.

In the field of *manufacture* we inevitably have to take into consideration that the tendency to mass produce increasingly open structures is in the last analysis incompatible with the present closed systems of co-ordination and construction with building elements bound to a definite final product and thereby — in production — bound to definite dimensions. In building industry tending to automation, namely, the actual bearer of the variability of final product is not the element any more, but the convertible apparatus manufacturing these elements and the changeable technology based on the apparatus.

In *assembly*, that is, in site-work, the marking of dimensions, more precisely: building based on numerically marked dimensions must cease to exist. In the age of mass production of open structures, namely, the task of measuring changes, its method is transformed, its function very often becomes redundant since it can be replaced by the unambiguous location and addition of the elements and auxiliary structures which can also be treated like *etalon*. This altogether means that numerical marking of dimensions on work drawings will be modified, and substituted by some kind of system of grids and signs.

Suspension of judgement. By determining the contents of the coding system to replace graphical representation and its form of appearance as miniaturization of documentation, the final result of the inventive process has actually been defined. The next step in completing the methodology of problem-solving was to analyse *Russell*'s postulate and to answer the question: what are the likely but undesirable repercussions of the final result of the inventive process above, and how to eliminate them.

Problems of loss of quick control. The forecasting of repercussions, that is, the application of the principle of "suspended judgement" caused no particular difficulty in our case. In the new technology — replacement of graphical representation and miniaturization of documentation — the qualitative change, doing "the same thing in a different way" is not realized by further developing the *tool* but — on the contrary — by changing the *medium*. It is not the tool for the drawing, or the tool for the bearer of the message that is further developed, revolutionized through mechanization, automation, or in any other way, but the pictorial representation itself, the very bearer of the message, the very medium of conveyance that is changed. This is an essential circumstance, because as opposed to the tool affecting immediately the material, the media establish contact immediately with our senses. The lesson is drawn from the history of technology, that it is by no chance that every technological change based on changing the medium causes serious perceptual confusions for the bearers of the old technology, since — directly or indirectly — it upsets the already well-established balance of the senses. These confusions, however, disappear according to the law as soon as, in the learning process founded on the *new* practice, the bearers of the *new* technology call into being the *new* balance of senses.

Now, relying upon these findings, it is really not difficult any more to forecast by analogy that — in the beginning — replacement of graphical representation and miniaturized documentation will inevitably cause perceptual confusion since the direct, transferless and immediate recognizability of the architectural thought — conveyed hitherto in the form of drawings — is bound to get lost and with it its concomitant, the possibility of *quick control.* In theory and practice therefore it will be of fundamental importance to follow the Cartesian methodological principle that in solving problems, we have to start from the simplest thing, proceeding towards the ever more complicated. So, in creating our theory, we were prudently trying to find the most practicable way for the intellectual approximation, whereas in practice, in the practical realization of the theory we had to keep in mind the principle of gradualness, meaning in our case the rational planning of the "symbiosis", the period of overlapping between old and new technology.

Part II

The aim of the analysis was to find ways partly of deriving laws from the practice, and partly of introducing them into practice. The new scientific results of the study have been summarized in 24 theses. Theses 1 to 12 give a theoretical outline of blind design, whereas theses 12 to 24 are attempts to fit some notions of informatics into our concept of architecture and building.

The outline of blind design

1. Blind design. Adaptation of the Gutenberg-principle to the representation of building

Blind design is a method for making designs, or more accurately said: a method for the transmission and reception of information in industrialized building. This method does not represent the architectural thought — the design — pictorially but symbolically, using a system of elementary cedes composed of grids and signs.

Thus, blind design is a comprehensive method for coding design (a method equally ranging over operations of design-manufacture-assembly) and for conveying architectural thought through coding. This method essentially extends the Gutenberg principle of fragmentation in industrialized building over the representation of building by translating it to the information language of grids and signs.

Similarly to industrialized building where the final product — the building — can be expressed in the final analysis as a sum total of elementary parts, the final product of the architectural thought — the design itself — can be conveyed as a sum total of elementary codes, and thus explicable through decoding.

Blind design does not reveal the architectural thought in its pictorial respect but in its informational respect for the engineer's perception. For this reason blind design first of all translates, encodes the message (the architectural thought) in order to adapt the message (the conveyance, the designs) to a double channel of grids and signs, to be adapted again on the other end of the channel (i.e. in manufacture and assembly) to human beings, that is to render it — through decoding — intelligible for human perception.

Blind design, this technology of conveyance, translates the message, the design (the architectural thought already translated into graphic language) into a specific language composed of a system of grids and signs such that it will not be visually perceptible, recognizable at once directly (as a drawing) but only by indirect means. This is why this method is called briefly Blind Design.

2. The notion of information in industrialized building

In industrialized building, information is meant in the broadest sense of the word as a conveyance, closer, a comprehensive and coherent system of messages, conveyances and instructions for unambiguously realizing the architectural thought — the design.

3. The law of conveying the architectural thought

The architectural thought is always three-dimensional by character, both material and spiritual by content, and its purpose is to be realized. That is why architectural thought cannot abide by the very conception. The requirement of realization, namely, imposes upon the architect to convey his thought — or, in the language of informatics — to transform the thought into an information. He has quite a score of conveying technologies, conveying methods at his disposal: the spoken, the written or the printed word, the model, the drawings, and finally a system of codes. From these he can choose according to different, mainly efficiency considerations. Whichever he chooses, however, he can never totally eliminate the other forms of conveyance. In architecture no conveying method exists, containing in itself and exclusively all the information necessary for the realization of the thought. This fact is the fundamental law of conveyance of architectural thought.

4. Coding and co-ordination

Transmission and reception of information calls for translation also in industrialized building. Quite apart from how to realize this translation, i.e., coding, to what closed or open system it is to be adapted, it cannot rely but on co-ordination. In industrialized building, namely, the structural components are organized in some way or other by co-ordination into a definite system, their codes into a coding system. The coding system is universal in the sense that the reference system (the one kind of knowledge) already established by co-ordination between the components and grids is translated to the language of codes (the other kind of knowledge), an information language of grids and codes. In industrialized building, coding is preconditioned by co-ordination; thus, codability does not depend on the nature of co-ordination either. Irrespective of whether the co-ordination is simple (modular) or double (modular and submodular), the information always emerges from the monotonous, eventless background of the basic grid of co-ordination. The tendencies toward replacing graphical representation by symbolic reflection of architectural thought — coding — are connected first of all with the mass nature of industrialized building. Thus coding is a technical imperative both in closed and in open systems.

5. The structure of coding. The two channels of information

Forwarding of information requires a suitable carrier. In industrialized building, part of information has to get to the factory, the other part to the building site. For this reason in industrialized building the suitable message carrier will be a two-channel system, one channel referring to the location, the other to the manufacture of components. The two-channel code system is the tool for blind design.

6. The two-channel code system of industrialized building

In order to establish a comprehensive building language equally ranging over the operations of design—manufacture—assembly, the two-channel coding system first of all integrates the pictorial and the written, i.e., graphical and numerical information. For this purpose both in design—assembly and in manufacture it restates the data concerned with the co-ordination, location of the components and with the assembly of the apparatus etc., — common in each plan — in a printed grid system, thereby it eliminates the numerical dimensions from both the plans and the factory work drawings, and replaces them by the system of parameter grids and basic grids. Then it codes the integrated information, that is, it replaces the graphical recognizability by the decodability of signs and connects one part of the codes referring to the location of the components to the parameter grids of design and assembly, and the other part referring to the manufacture of the components to the basic grid of co-ordination.

7. The process of coding: the transmission of information I
The site channel: the coded designs

The channel conveying the architectural thought to the building site is called the site channel of the two-channel coding system. It is the channel for the integrated comprehension of the coded message. This conveys for the builder — in the form of coded plans composed of parameter grids and signs — all the information necessary for realizing the project, the "Whole", involving location of the components, unambiguous assembly of the building. In blind design, these coded plans substituting the graphical representation replace the "*Monge*-type" plans, elevations and sections, and their basic function is to give simultaneous and totally comprehensible signals of the phases of the assembly process, of its consecutive and coherent cycles (location of components, windows, doors, jointing points, reinforcement etc.) to be decoded into direct building instruction.

8. The process of coding: the transmission of information II
The factory channel: the table of codes

The other channel conveying the architectural thought to the workshop, to the manufacturer, is called the factory channel, serving the fragmented comprehension of the coded message. It ensures the "scanning" of the coding, the "spelling" of the message; in the form of the table of codes — systematizing and totalizing all the elementary codes — it conveys all the information necessary for the realization of the "Parts", for the unambiguous manufacture of the components. In blind design, this table of codes substituting the graphical representation replaces the "*Monge*-type" consignation of the elements. Its basic function is to conceivably signalize the least details of the individual cycles of the process of manufacture, to be decoded into direct manufacturing instruction.

9. The process of decoding: the reception of information I
The rules of selection by perception: the code sign and its meaning

The parameter grids of the coded plans and the code signs accompanying this grid are registered, perceived by the reader of the plan. The process of perception is a combination of synthesis and analysis, differentiation and integration, selection and assembly. Perceiving spells selection, registering spells understanding the rules of selection by perception. The rules of selection by perception are always concrete, since they apply to the coded designs of a definite building constructed in a definite structural system. Thus the rules of the selection by perception always have to be formulated in each case separately; as individual pillars, walls, beams, floors etc. The elementary code composed of grid-lines (co-ordinates) and symbols can exclusively obtain its definite and unambiguous meaning from verbally itemized rules of the selection by perception.

10. The process of decoding: the reception of information II
The key to pictorial decoding: micro-grid details

Since according to the fundamental law of the conveyance of architectural thought (Thesis 3) no conveying method exists in architecture such as to contain in itself all the information necessary for the realization of the thought, therefore the totality of the meanings of the signs cannot give in itself the complete decoding of the coding system. The key to decoding will be the minimum of graphical and verbal information still necessary for deciphering and these are practically provided by the microgrid details (more accurately: by the jointing details related to the basic grid of the co-ordination adapted) and the complementary technological, manufacturing instructions and specifications. The microgrid detail — the unavoidable graphical part of the conveyance of the architectural thought — is fundamentally the key to the pictorial decoding of the two-channel coding system, the way of decoding the signs to pictorial recognizability.

11. Superposition of the parameter grids to basic grids and of the grids to the signs

By superimposing parameter grids to basic grids a double reference system is established since the parameter grids provide mutual and unambiguous reference between the grids and the components and so do basic grids between the components and the machine. Thus, by the superposition of grids the relevant coding symbols also get automatically superposed. The two-channel coding system, tool of blind design, also results from the superposition of parameter grids to basic grids.

12. Content, form and significance of blind design

The content of blind design is the replacement of graphical representation; its form of appearance is a miniaturized documentation; whereas its significance is to reduce the volume and the time of the drawing work to a fraction, thus liberating the designer from routine work to the benefit of creativity.

Informatics and architecture

13. Co-ordination and periodicity

In industrialized building, the basis of the transmission and reception of coded information is co-ordination. The medium of co-ordination, the monotonous grid is essentially built upon the mathematical concept of periodicity. From the co-ordination point of view, periodicity is the most elementary form of space in industrialized building.

In industrialized building, phenomena repeated invariably within a spatial rather than a timely interval are called periodic.

Co-ordination postulates periodicity as ideal, having no beginning and no end in space. The work, the architectural creation is somehow adapted to this periodicity and the grid thereby conveys information in some adequate form on the essentials of the work. Thus, the co-ordination approach is opposed to the architectural one. The architect is concerned with the notion of spatial and temporal continuity, whereas the manufacturer and the constructor are interested in periodicity.

14. The visible periodicity and the periodicity inherent in the material

The spatial and temporal continuity involved in the work — the Whole — actually is a configuration, a form embodied in periodicity. Continuity is for the architect an architectonic form, a periodicity that became visible in the work. On the other hand, the constructor, the manufacturer, the technologist are not interested in variability, in the very form, but in its background, the repetition, the periodicity organizing and permeating the Parts from which the Form, not (or not necessarily) manifest in the work, will unfold.

Architecture is featured by variability. The configuration, more precisely said: the form bearing the variability, is informatically nothing but periodicity manifest in the work.

Building industry is featured by repetition. The prefabricated component, part, product etc. exhibiting repetition is informatically nothing but material periodicity. If this semantically meaningless material periodicity becomes visible for the onlooker then it is factual and formal, otherwise it is abstract and metrical.

15. Transmission of information and periodicity

Transmission of information in building/architecture is directly or indirectly related to periodicity. Periodicity, the elementary spatial form of industrialized building, bears no information in itself except of itself, not even of its order of magnitude, thus it does not help the engineer's mind to appreciate periodicity. The industrialized building does not perceive periodicity as an abstract quality, independent of the material, as in mathematics, but it treats it as metric and incidental quality of the material.

In order to make the monotonous grid suitable at all for the conveyance of architectural thought, we have to know the period itself as the mesh of the monotonous grid.

16. Rhythm and repetition

Evidently, the mesh cannot be a too little one (let us say: 1/100 M = 1 mm) because in this case the phenomenon of monotony will be dissolved in continuity for the manufacturer, constructor, technologist, and the notion of periodicity will become meaningless.

Also, this mesh cannot be too big (say 250 M = 25 m), else the engineer's mind does not perceive the spatial and temporal regularities (isochronism, rhythm, repetition etc.), cornerstones of the architectural creation, and thereby the notion of continuity hidden in the work becomes meaningless.

As a conclusion, the periodicity, fundamental spatial form of industrialized building, organizing both the Part and the Whole, can only convey architectural information if it is enforced through the fundamental tools of architecture and building industry, that is: rhythm (architecture) and repetition (manufacture).

17. Architecture as a phenomenon on the high level of periodicity

Under the terms of the classic mathematical ideal, architecture is not a periodic phenomenon, but a phenomenon on the high level of periodicity, since otherwise it could not be the bearer of variability, the fundamental characteristic feature of architecture. This essential difference can thus be reduced to the repetition of forms, to the rhythm embodied in the work and at the same time to the lack of semantical role of the periodicity enclosed into the material (be it visible or invisible, formal or of metrical character) in industrialized building since the onlooker only perceives it as the continuity of the material, as we have already remarked in Thesis 14.

18. Co-ordination as a periodic phenomenon

The situation with co-ordination is quite different. The reference system of co-ordination based on the superposition of several grids is a *par excellence* periodic phenomenon since otherwise it could neither be the bearer of periodicity, the elementary spatial form of industrialized building, nor that of repetition, characteristic of industry, in other words, the channel for the transmission of information.

19. Event and background I
The cast of the grids

The transmission of information in building-architecture was seen to be directly or indirectly connected with periodicity. Let us analyze now how it is connected with periodicity, how periodicity organizes, structures the architectural message, how the grid system becomes the bearer of architectural information, briefly: the cast of the grids.

By reason of their periodicity, the system of grids structurally organizes the architectural message and thereby it becomes a highly differentiated bearer of information. By reason of their "built-in" periodicity, namely, the grids resound upon the co-ordinated architectural work and this is the information-theoretical basis that in industrialized building the plan, the architectural thought can be coded through mediation of the grids that even without graphical transmission can be transformed into direct building and manufacturing instruction.

The grid system now becomes in such a way the means of coding of the message, the highly differentiated bearer of the transmission of architectural information, that the grids share on basis of their periodicity. The cast of the grids is as follows:

Everything that is an *event:* every periodicity which becomes visible in the work, every information which directly or indirectly leads to creation of form, every message necessary for the realization of the work, the Whole, for the location of the components, for the unambiguous assembly of the building will be transmitted by the parameter grids — by way of coded plans — into the site channel, to be forwarded to the building site (see Thesis 7).

Everything that is *background,* boredom, every periodicity enclosed into the material, every information without semantical role in the work, every message necessary for the realization of the Parts, for the unambiguous manufacture of the components will be transmitted by the basic grids — in the form of the table of codes — to the factory channel and forwarded to the manufacturer (see Thesis 8).

What is meant by an "event"?

BERTRAND RUSSELL specifies the notion as follows: "... An 'event', in the statement of the law, is obviously intended to be something that is likely to recur, since otherwise the law becomes trivial. It follows that an 'event' is not a particular, but some universal of which there may be many instances. It follows also that ... if such an event is to recur, it must not be defined too narrowly for then ... our event would occur at most once, and the law would cease to give information. An 'event' then, is a universal defined sufficiently widely to admit of many particular occurrences in time being instances of it ..."

Thus far the definition. *Mutatis mutandis* it is evident that when transmitting architectural information we must consider every occurrence as an "event", an essential information on the nature of structure. It is essential for instance to know whether the concerned component is a floor or a window, what the dimensions of the components are, whether there are differences within the identical components, the location of the components, etc. Thus, everything is meant by "event" that can be qualified as metrical from the point of view of apparent periodicity and as such, relevant to coding.

On the other hand, the quality of the structure, the material, the colour, the brushwork of the element are not essential, thus, the periodicity enclosed in the material is not essential either. Nothing is meant by an event which — from the point of view of apparent periodicity — can be qualified as incidental and as such, irrelevant to coding.

The notion of background does not mean the opposite of an event, the lack of occurrence, but its being uninteresting. Eventlessness might be understood as "nothing" happens in a given place of the work. Actually, there does happen "something", but this "something" is not interesting, it is irrelevant. It is as boring as anything which is periodic and semantically meaningless.

It is important to note here that something irrelevant to coding is not necessarily irrelevant to the realization of the architectural thought.

Of everything that is an event, that is interesting, of everything that is relevant to coding, information will be given by the system of grids and signs.

Of everything that is background, that is uninteresting, boresome, of everything that is irrelevant to coding, unambiguous information will be given by the microgrid details and written instructions.

20. The disintegration of the message. The three methods for the transmission of information

As opposed to Monge's representation technique, blind design reveals the architectural thought not in its pictorial but in its informational respect, thus blind design encodes the spatial and three-dimensional message. Since, however, this coded message will be forwarded to the site and factory channels by the grids themselves (see Thesis 19), therefore the disintegration of the message can be built directly upon the disintegration of the grids determined by the period. There are three possible ways for disintegrating the message and thus for transferring information.

The method of linear disintegration: the space grid is first decomposed into plan grids determined by the period and then into grid-lines determined by co-ordinates, finally, the architectural message is conceived as a co-ordinated system of grid lines supplied with codes and forwarded accordingly.

The method of cartographical disintegration: the plane grids are first decomposed into cartographic units — fields — determined by the co-ordinate and marked by numbers of identification, then the consecutively magnified fields are encoded and finally the architectural thought is conceived as a co-ordinated system of coded area (cartographic) units and forwarded accordingly.

The method of grid-digit disintegration (the digital matrix): the grid plane determined by the period is decomposed directly to grid units, periods, then the periods are encoded by digits expressing simultaneously the quality, location and manufacturing instruction of the component, and finally the architectural thought is conceived as a co-ordinated system of coded periods (grid units) and forwarded accordingly. The form of appearance of the grid-digit disintegration is a digital matrix.

21. Information and redundancy. The economy of conveyance in architecture

In industrialized building, the transmission and reception of information relies on the system of grids of co-ordination that carry the message through the site and factory channels to the building site, and to the factory, respectively (Theses 7 and 8). Since, however, the correspondence between the capacity of the channels and the volume of information to be transmitted is evident, the reception of information will only be undisturbed if the message was coded appropriately, that is, properly translated to the specific language composed of grids and signs to be adapted to the channel. This requirement stresses to explore correlations between the reception of information and the system of codes, hence the role and significance of the redundancy.

Redundancy spells loquacity of message. Redundancy is every surplus sign in the message beyond the information necessary and enough for realizing the thought, that adds to the number of signs without increasing the amount of information. Thus, the degree of redundancy — also depending upon the actual conveying method — is synonymous with the amount of surplus conveyances.

Each method for conveying information — irrespective whether through natural or artificial channel, whether the message is of aesthetic or technical nature — has its specific redundancy. The economy in art and the efficiency of conveyance, the concision in poetry ("Dichtung") and the "style" of the telegraphy — each can individually be conceived as a specific aspect of eliminating redundancy.

As far as the conveyance of architectural thought is concerned, it calls for no proof that a written specification or a model, a graphical representation or a coded design can equally contain redundant elements. From the point of view of realization of thought, the purport of these redundancies may be rather different. Coding is a symbolic reflection of the architectural thought, therefore in blind design it is the graphical representation that spells the redundancy to be eliminated. In architecture, blind design means essentially an economy of conveyance.

According to one of the axioms of informatics, the value of redundancy cannot be reduced to zero in any domain and so neither in building where the last link of chain, the receptor is a human being. Blind design cannot reduce the graphical redundancy to zero either. The law of conveying architectural thought (Theses 3 and 10) justifies the general law of informatics in the specific domain of building.

22. Event and background II
The cast of the signs

The reception of information in industrialized building relies on a system of grids and signs. Let us analyze now how it relies upon, how the system of signs facilitates to receive and decode the architectural — building and manufacturing — message structured already by periodicity into event and background (Thesis 19), how the system of signs becomes a highly differentiated tool for the reception of information, briefly: the cast of the signs.

The signs attached to the grids reintegrate the structured architectural information (the message) borne by the grids according to their unambiguous sign contents (the meaning of the code), that is, they render the message first receivable (perceivable), then understandable (decodable), and thereby they transform the message — according to the grids by which they are borne — into building (locational) and manufacturing (technological) instructions.

The system of signs, thus, becomes the means of decoding the message, the highly differentiated bearer of the reception of architectural information shared by the signs on the corresponding grid.

The cast of the signs is as follows:

Everything that is an event, every periodicity that becomes visible in the work, every information which directly or indirectly leads to the creation of form, that is, every message necessary for the realization of the work, the Whole, for the location of the components, for the unambiguous assembly of the building, will be taken from the site channel on the building site by signs attached to the parameter grids. The signs will thus transform the message — by decoding — into direct locational (assembly) instructions (Theses 7 and 9).

Everything that is background, boredom, every periodicity enclosed into the material, every information with no direct semantical role in the work, that is, every message necessary for the realization of the Parts will be taken from the factory channel in the factory, by signs attached to the basic grids and transformed — by decoding — into direct manufacturing (technological) instructions (Theses 8 and 10).

23. Reintegration of the message: reception of information on the site and in the factory

The message, the architectural information borne, structured and organized by the grids will thus be taken from the site and factory channels of the two-channel coding system by signs attached to the grids.

In the system of signs there are as many site signs as factory signs. Each particular site sign corresponds to a single factory sign. While, however, the site sign, the elementary code attached to the parameter grids of design and assembly simultaneously means location and denomination in itself, the factory sign composed of letters and digits attached to the basic grids of manufacture only means denomination and cannot refer in itself to location.

From this, however, two very important theoretical conclusions can be drawn on the role of grids in the reception of information:

The one is that from the point of view of assembling the building, the Whole, the parameter grids are uneliminable factors of the conveyance. Without the parameter grids, namely, the signs attached to these grids cannot be transformed into unambiguous building (locational) instructions on site; the other is that from the point of view of manufacturing the components, the Parts, the basic grids are eliminable factors of the conveyance. The signs attached to the parameter grids, namely, can be directly transformed in the factory into unambiguous manufacturing (technological) instructions even without the basic grids. (The validity of this conclusion is not offset by the fact that the micro-grid details cannot be eliminated. The micro-grid detail drawing is a key for pictorial decoding and as such it plays no role whatever in the technological decoding of the message.)

This singular role of grids in the reception of information is inseparably connected with the uniqueness of the building as a product since two buildings — even if otherwise identical — cannot be erected on one and the same site. Periodicities that become visible in the work, parameter grids that bear the rhythm have to be staked out in each case individually as the actual basis of reference on the site.

This does not apply to the basic grids. The basic grid, namely, that bears the periodicity enclosed into the material (be it visible or invisible, formal or metrical) is built into the manufacturing apparatus in the strict sense of the word, since this is the actual basis of the repetition on industrial level. Thus, the basic grid may as well be omitted from all the manufacturing messages as we have already proved it in practice.

In the foregoing we have seen how the architectural message structured into event and background can be decoded by means of the system of signs and how these signs become highly differentiated means for the reception of information (Thesis 22). Also we have seen the role of the grids in the reception of information. Let us analyze now how to reconstruct the coded architectural thought, how to reintegrate it from its elements, strictly speaking, let us examine the method for decoding the message for the reception of information.

Since the coded information is taken from the site and factory channels by the signs themselves, the reintegration of the message can be built immediately upon the decomposition, the appropriate "spelling" of the signs that have been given an unambiguous meaning on the basis of the verbally itemized rules of the selection by perceiving (Thesis 9). According to this, there is only one possible way to reintegrate the message composed of the following parts:

— reintegration of the message on the building site, equivalent to transforming the site signs into unambiguous locational instructions;
— reintegration of the message in the factory, equivalent to transforming the factory signs into unambiguous manufacturing instructions.

24. Decoding: the minimum of information necessary for realizing the building in assembly and manufacture

In informatics decoding has a well-known clause, namely the simple, axiomatic requirement that the receptor knows the code of the message condensed by the sender into an elementary sign, how to reintegrate the coded message from its elements, how to retranslate it for the individual receptor.

In industrialized building, information is transmitted through two channels, one to the building site and one to the factory. The decoding of the message thus presupposes two things:

— the receptor (the site architect, the clerk of works) who reads the coded plans on the building site knows and understands the verbally itemized rules of the selection by perceiving, since these written instructions are organic parts of the coded documentation. On this basis, the reader of the plan transforms the site signs attached to the parameter grids into direct locational instructions, which simply means that the builder locates the corresponding component to the place marked unambiguously by the grids such as stated by the rules of selection by perceiving;

— the receptor (the engineer in charge, the foreman) who reads the table of codes in the factory knows the apparatus referred to by the table of codes and therefore he can transform the factory signs into direct manufacturing instructions, that is, he adjusts the apparatus according to the code.

Arranging and forwarding the information is of course the task of the designer (the constructor, the planner, the encoder).

The composition of the minimum of message necessary for realizing the building is as follows:

— *in the assembly (on the site):* coded plans with the system of parameter grids (primary, secondary and tertiary grids) with markings of the modular period (mesh), with indication of the co-ordinates, with the system of site signs attached to the parameter grids indicating the location and denomination of the components within the outlines;

— *in manufacture (in the workshop):* table of codes with the system of site signs (elementary codes) attached to the parameter grids, together with the system of factory signs (denomination codes) unambiguously corresponding to these site signs and with the tabulated system of manufacturing instructions; finally

— the uneliminable *graphical and written part* of the message: the micro-grid details and the technological and other instructions.

Part III

Application of the two-channel coding system

The forthcoming pages give only an indication of how the theory of blind design was first applied in practice. The application of the two-channel coding system is actually exemplified by designs of the "Lift-field" experimental hall [18]. First, the system of parameter grids and signs, that is, the coded plans necessary for the assembly of the building will be presented, then the table of codes necessary for the manufacture of the components, and finally, the micro-grid details, the key for pictorial decoding to illustrate the composition of the minimum of message necessary for realizing the building referred to in **Part II**, *Theses 5 to 8; 19; 22 and 24.*

Let us point to the fact that the few, hardly a couple of format A/4 drawings made up *the entire documentation* [18]. The manufacture, and even the assembly of all the components of the pillars and beam grids were carried out on the basis of these plans, and rather well — as seen by the results [19].

The plans of the "stack reinforcement", the auxiliary structures of the beam-grid, etc. were elaborated and coded in the same way, only engineering plans were made in the traditional way.

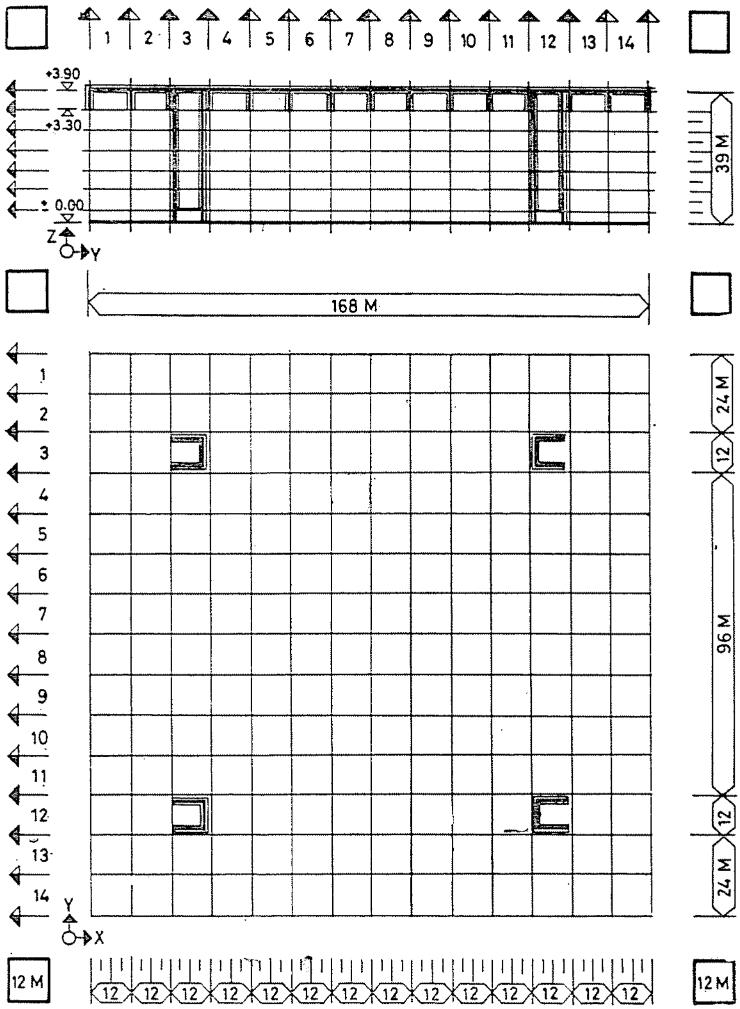


Fig. 9. "Lift-field" experimental hall. The system of parameter grids on plan and in section [19].

The parameter grid is composed of the primary grid (the grid of the structural system) and the secondary grid (the grid of the components of the structural system). Every message necessary for the realization of the work, the Whole, for the location of the components, for the unambiguous assembly of the building will be transmitted by these parameter grids, by way of signs — the codes — attached to them.

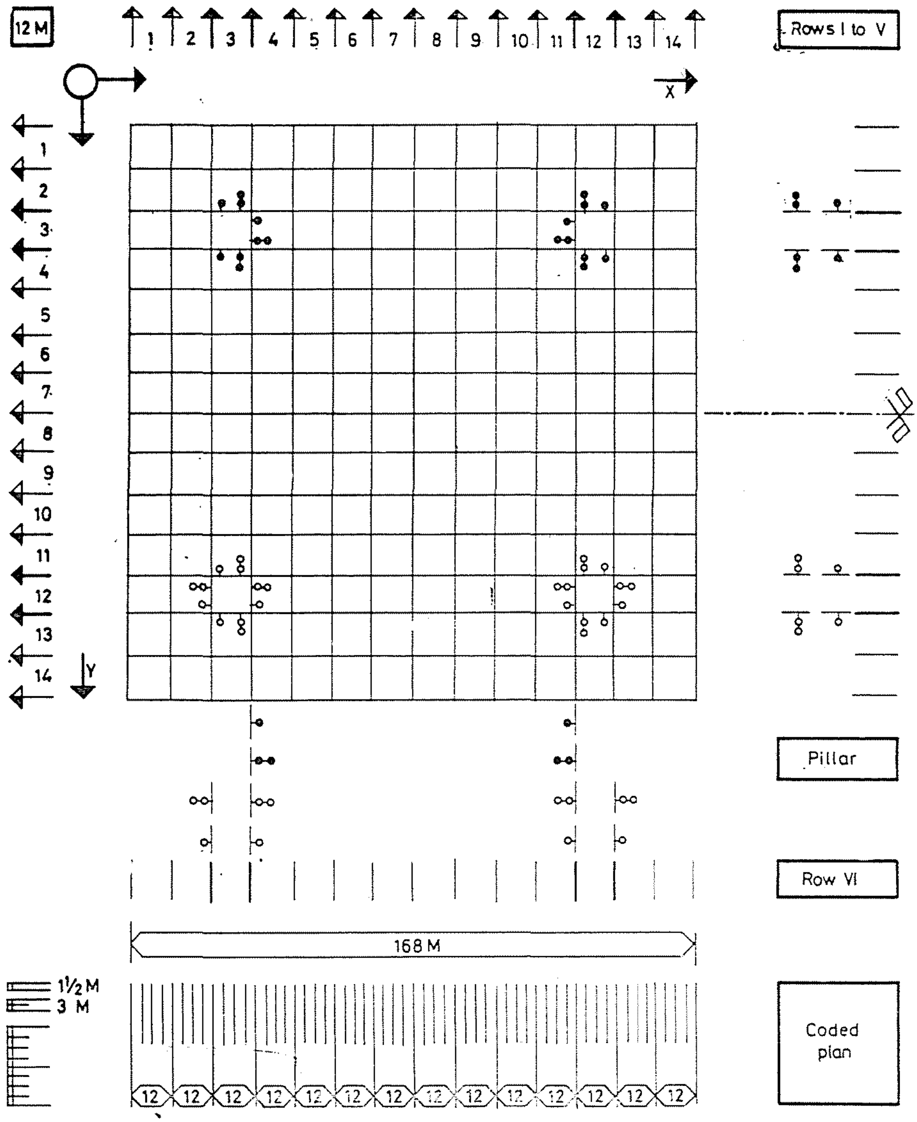


Fig. 10. "Lift-field" experimental hall: coded plan of the pillars

The coded plan actually is nothing but the site channel of the two-channel coding system, the channel communicating with the building site. The place of the folded frozen r.c. pillars within the grid system is determined by the primary grid lines, the site signs (the elementary codes) simultaneously referring to the denomination and location of the components will therefore be attached to these lines. Instructions on the manufacture of the components will be given by the table of codes, whereas the key to pictorial decoding is given by the respective micro-grid detail. Fig. 5 in [19] provides the pictorial decoding of all components LPX and LPY (LPX = surface unit of pillar to be located in direction X, etc.)

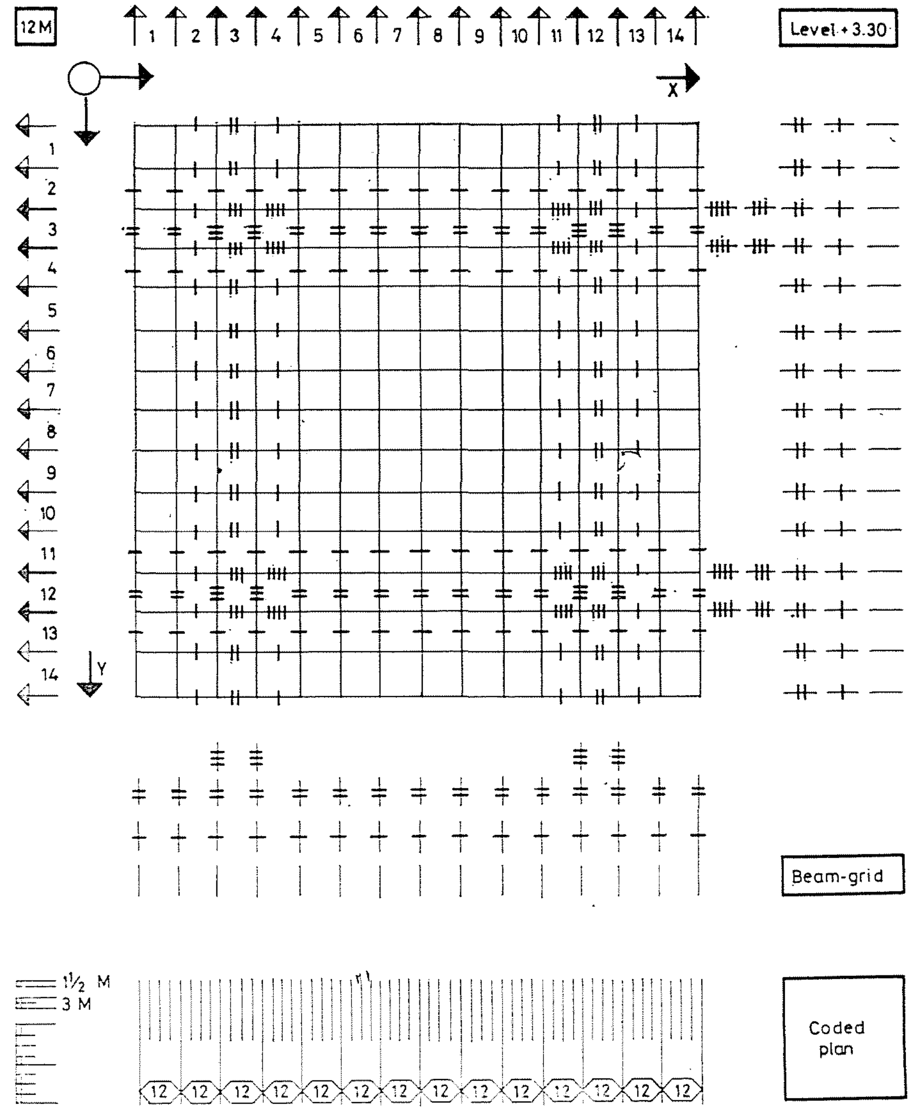
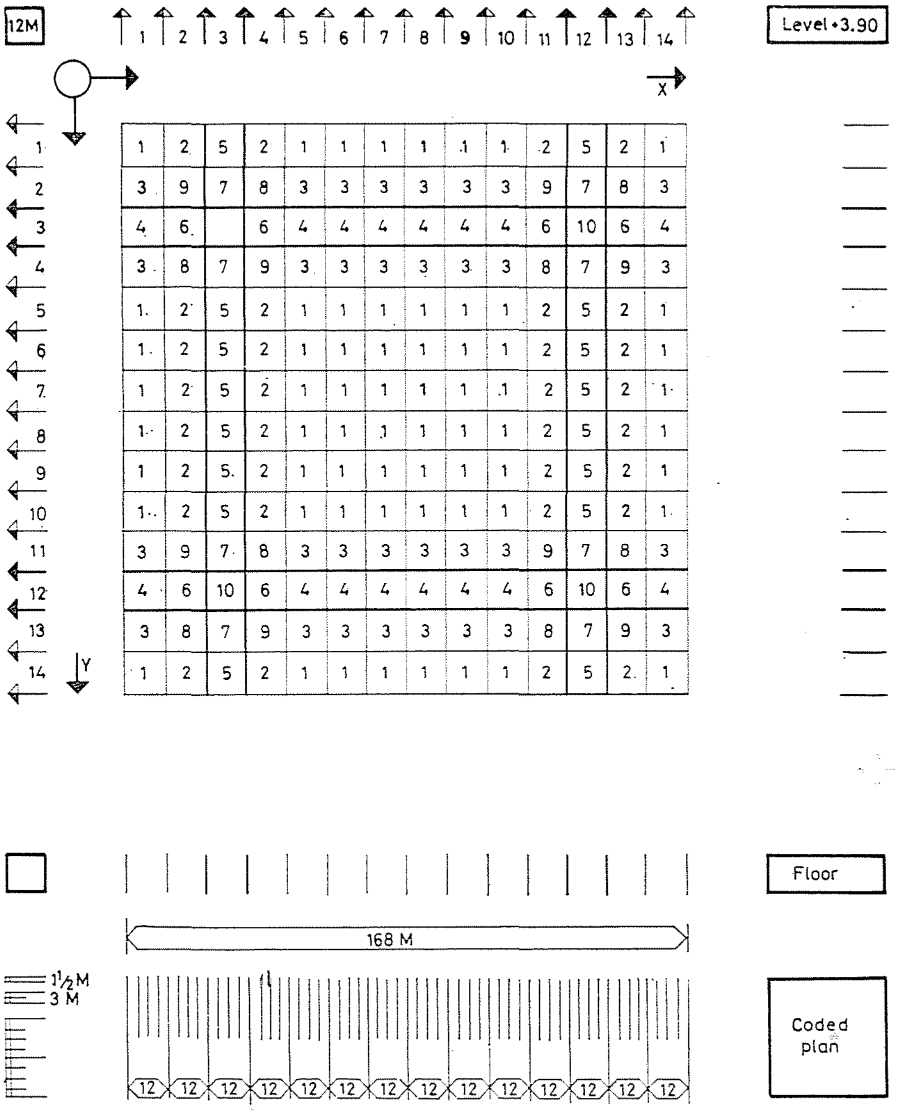


Fig. 11. "Lift-field" experimental hall: coded plan of the beam-grid.

The coded plan of the beam-grid is again the site channel of the two-channel coding system, the channel communicating with the building site. The place of the r.c. frozen shell beam-grid is determined by the lines of the monotonous 12M × 12M parameter grid, the site signs (the elementary codes) will thus be attached to these lines. The code-signs on the parameter grids can even without transmission be transformed here into direct manufacturing information as also shown by the table of codes. The key to pictorial decoding is again given by the respective micro-grid jointing details (see Figs 5, 6, 7 and 8 in [19])



	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	1	2	5	2	1	1	1	1	1	1	2	5	2	1
2	3	9	7	8	3	3	3	3	3	3	9	7	8	3
3	4	6		6	4	4	4	4	4	4	6	10	6	4
4	3	8	7	9	3	3	3	3	3	3	8	7	9	3
5	1	2	5	2	1	1	1	1	1	1	2	5	2	1
6	1	2	5	2	1	1	1	1	1	1	2	5	2	1
7	1	2	5	2	1	1	1	1	1	1	2	5	2	1
8	1	2	5	2	1	1	1	1	1	1	2	5	2	1
9	1	2	5	2	1	1	1	1	1	1	2	5	2	1
10	1	2	5	2	1	1	1	1	1	1	2	5	2	1
11	3	9	7	8	3	3	3	3	3	3	9	7	8	3
12	4	6	10	6	4	4	4	4	4	4	6	10	6	4
13	3	8	7	9	3	3	3	3	3	3	8	7	9	3
14	1	2	5	2	1	1	1	1	1	1	2	5	2	1

Fig. 12. "Lift-field" experimental hall: coded plan of the floors. (Adaptation of the principle of digital matrix)

The place of the tissue-structural floor elements combined of three materials (polystyrene-gypsum-reinforced concrete) is determined by the monotonous 12M × 12M parameter grid. The floor units always keep station within the ribs. The site signs, the elementary codes attached to the fields of the grid are here digits. The signs again simultaneously refer to the denomination, location and manufacture of the components. The order of location can be given either by a digital matrix or by a written specification. The key to pictorial decoding is given by the microgrid details in Fig. 5 of [19]. The coding of the floors illustrates a possible adaptation of the principle of digital matrix. Figs 6, 7, 8 in [19] provide the pictorial decoding of every component LGX, LGY or PGF (LGX = surface unit of beam-grid to be located in direction X; PGF = polystyrene-gypsum floor unit)

"Lift-field" experimental hall: The table of codes

The table of codes is the factory channel of the two-channel coding system. This channel communicating with the workshop (the factory) is the fundamental tool for the manufacture of the elements. The table of codes, which — even without any pictorial transmission — can give direct manufacturing instruction, is essentially a systematized collection of data which eliminates any graphical information, any information transmitted by drawings and grids from the manufacture. The micro-grid details in [19] — keys for pictorial decoding — are organic supplements of the table of codes.

Component code		Number of pieces	Dimensions		Manufacturing instructions	
Site sign: Elementary code	Factory sign: Denomination code		width mm	length mm	Basic position	Inlay elements
	LPX-1	40	600	975	A 1	N 3 + N 1
	LPX-2	8	600	900	A 1	N 3 + N 3 D 1 + D 1
	LPX-3	40	600	1050	A 1	N 1 + N 1
	LPX-4	8	600	1050	A 1	N 1 + N 1 D 1 + D 1
	LPY-1	20	600	862.5	A 1	N 4 + N 4
	LPY-2	8	600	862.5	A 1	N 4 + N 4 D 1 + D 1
	LPY-3	20	600	1012.5	A 1	N 2 + N 2
	LPY-4	8	600	1012.5	A 1	N 2 + N 2 D 1 + D 1
	LGX-1	240	600	1162.5	A 1	V 1 + V 1 + H + H
	LGX-2	104	600	1149	A 1	V 3 + V 1 + H + H
	LGX-3	8	600	1149	A 1	V 3 + V 1 + H + H + D 2
	LGX-4	8	600	1149	A 1	V 1 + V 3 + H + H + D 2
	LGX-5	44	600	1134	A 1	V 3 + V 3 + H + H
	LGX-6	16	600	1134	A 1	V 3 + V 3 + H + H + D 1 + D 1
	LGY-1	240	600	1144	A 1	V 2 + V 2 + H + H
	LGY-2	120	600	1130	A 1	V 4 + V 2 + H + H
	LGY-3	44	600	1115	A 1	V 4 + V 4 + H + H
	LGY-4	16	600	1115	A 1	V 4 + V 4 + H + H + D 1 + D 1
1	PGF-1	64	1133	1133	A 2	U 1 Series VR
2	PGF-2	32	1119	1133	A 2	U 1 Series VR
3	PGF-3	32	1133	1119	A 2	U 2 Series VR
4	PGF-4	16	1133	1105	A 2	U 3 Series VR

Component code		Number of pieces	Dimensions		Manufacturing instructions		
Site sign: Elementary code	Factory sign: Denomination code		width mm	length mm	Basic position	Inlay elements	
5	PGF-5	16	1105	1133	A 2	U 1	Series VR
6	PGF-6	8	1119	1105	A 2	U 3	Series VR
7	PGF-7	8	1105	1119	A 2	U 2	Series VR
8	PGF-8	8	1119	1119	A 2	U 2	Series VR
9	PGF-9	8	1119	1119	A 2	U 2	Series VR
10	PGF-10	3	852	852	A 2	U 2	Series VR

Remark:
A 1 = 11 basic plates + 20 closing elements + closing frame
A 2 = 1 linear + 2 L forming bars + parallel clumper + 8 spacers + 4 bridges

Summary

Blind design is a method for making designs, or better, for the transmission and reception of information in industrialized building. This method does not represent the architectural thought — the design — pictorially but symbolically, by using a system of elementary codes composed of grids and signs. This method essentially extends the Gutenberg principle of fragmentation in industrialized building over the representation of building by translating it to the information language of grids and signs.

Blind design translates the design (the architectural thought already translated into graphic language) into a specific language of grids and signs, so that it will not be visually perceptible, directly recognizable (as a drawing) but only by indirect means, hence its name.

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