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From Grid to Box – the Containerization of Modern Architecture

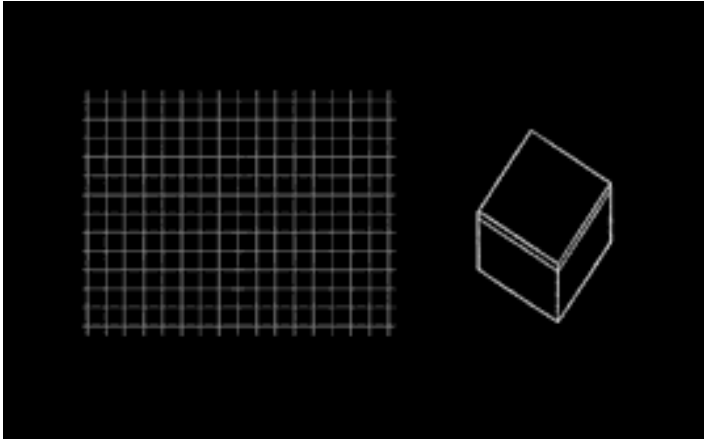
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[structure]

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0. Intro



[picture: elements_praguelecture]

These are the two elements of my research into the structural fundament of modernistic architecture (theory):

1. the grid = the overall structure
2. the cell (or box, or container) = the single (and universal) element.

Research Project: part of my Container research project, entitled "20 Foot Equivalent Unit. Containerization takes command" = „Archeology of Globalisation“ → material culture of today's globalised world → transportlogistics: container.

Container not only in shipping industry, but also in the cities and in the cultural sphere: As architectural and/or cultural phenomenon (on stage, on tv, in artworks) it is starting to become ubiquitous.

Architecture: As a kind of non-architectural housing the container marks a zero point and thus poses radical questions towards today's architecture, such as:

- What is a house?
- When does architecture start?
- What does it need to turn mere housing (Gehäuse, like a snail shell or a box) into house – or even: home?
- What are the minimum requirements for a human dwelling?

Modernism: Questions like those were asked before, by the heralds and heroes of modernistic architecture between the wars and after WWII.

→ for practical reasons: because of overpopulation and especially because of destruction through the wars there was a severe housing problem to be solved;

→ for theoretical reasons: to formulate a new esthetic program for a time which was conceived of by its protagonists as the machine age.

Images: In 1925, Walter Gropius described the first edition of his highly influential publication „Internationale Architektur“ as a „picture book of modern architecture“. Images played a key role in promoting (and constructing) the idea of a modernistic architecture. „Modernity entered into a contract with the image“, as architecture theorist Werner Oechslin puts it. Since within my research project I am trying to describe the container as an epistemological model – that is: a conceptual image – it thus seems appropriate to also develop one line of my

argumentation through the use of images.

Time frame: Containerization of world trade – that means: the implementation of an intermodal land-water-transport system based on the standardized shipping container and its handling devices – only started in the 1960s. But the core ideas of this system already were developed in the first half of 20th century, or even earlier:

- the idea of a standardized multi-usable shipping container,
- the idea of combined traffic and intermodality.

Likewise, the idea of the housing container was there before the actual ubiquitous item of nowadays.

It lay – more or less openly – in the heart of modernistic architecture's concepts.

And that is the starting point for the line of research I am going to present today.

I. Rationalization 1: The Grid

Since ancient times, the grid has been an important instrument and medium of city planning.

It transports and implements both practical reasoning and ideological foundation.

My starting hypothesis is that the geometrical order of the grid functioned as a constitutive pre-modern element of the rationalization process that is considered to be the main aspect of modern architecture, urbanism, and modern life in general.

To develop this hypothesis i will give a very brief history of the grid, by throwing some flashlights on its usages from ancient greece to 20th century globalised everywhere.

1. The idealistic grid



[Picture: Milet]

Instrument of a rational foundation of cities (and states) since ancient Greece: the rationality of a democratic constitution is mirrored in the rational, geometric division (in Greek: *dihairesis*) and the even distribution of space (Greek: *isonomia*) in the *polis*.

→ According to Aristotle, Hippodamos from Milet, who rebuilt his hometown after destruction through

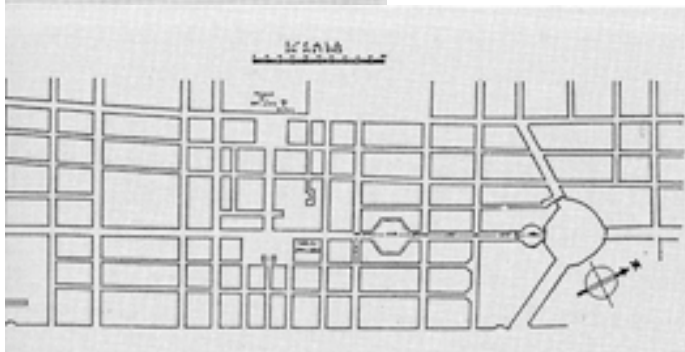
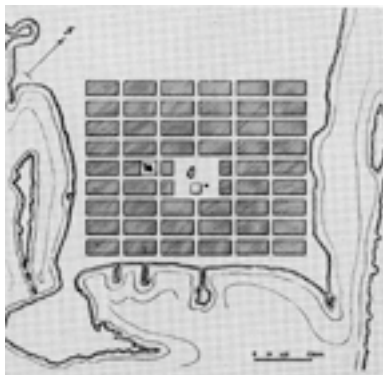
earthquake in 479 B.C. was the first to install this kind of order:

Only through the modelling of philosophical rationality it is possible to bring map and constitution in analogy – in a city which is laid out horizontally in a grid in the plain

=> The grid as a medium of idealistic (and also utopian) city planning: From Milet (and Thurioi, an ideal city, also planned by Hippodamos that has never been built) there goes a track to the ideal (or plan) city of the 16th century and onwards

– to cities that are built on the basis of a governmental ideal or a social utopia which is aesthetically transformed into urban planning and architecture.

2. the disciplinary (or bureaucratic) grid



[Pictures: Kristiansand, La Carolina, Mannheim]

The grid as pattern for absolutistic plan cities and colonial settlements:

- geometric, rational layout of streets (either radial order, like in most of the plan cities, or grid, like in most of the colonial settlements overseas)
- grouped around one prominent center (especially in the case of radiant layouts), or grouped towards it (the city functions as the "backyard" of a residence building)
- fortifications (plan cities)
- standardized definition of different areas / quarters, like in a military camp

→ urbanistic and military intentions go hand in hand: defense against enemies from outside and inside, rational layout of streets and definition of quarters as disciplinary and governmental measures; functionability, subordination of every house and area under one plan leads to certain house types = an early example of standardisation of building; but also an overall artistic approach, the city seen as a work of art (and apotheosis of its founder)

3. the speculative grid



[Picture: New York]

In the process of laying out a new plan for the future development of New York City, the COMMISSIONERS FOR LAYING OUT STREETS

AND ROADS IN THE CITY OF NEW YORK, UNDER THE ACT OF APRIL 3, 1807 remarked on

„... the form and manner in which the business should be conducted; that is to say, whether they should confine themselves to rectilinear and rectangular streets (...). In considering that subject they could not but bear in mind that a city is to be composed principally of the habitations of men, and that straight-sided and right-angled houses are the most cheap to build and the most convenient to live in. The effect of these plain and simple reflections was decisive.“

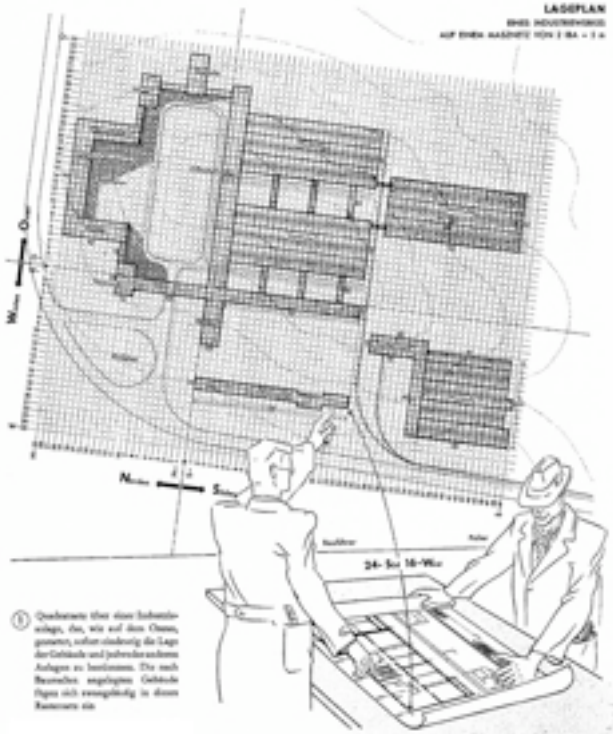
The architect and urbanist Rem Koolhaas points out that the decision for the Manhattan grid, as it was laid out in 1814, was not only the result of pragmatic reasoning, but also and mainly a speculative act since there were no plans for any houses whatsoever, just the grid defining future streets and houses in the by then mainly rural landscape of the island of Manhattan.

He writes:

„... the land it divides, unoccupied; the population it describes, conjectural; the buildings it locates, phantoms; the activities it frames, nonexistant.“

=> The speculative grid is a pure abstraction, a master plan without content. It seems to combine a maximum of planning, that is: standardized segmentation of space, with a maximum of freedom, what actually is built on its space particles.

4. the total grid

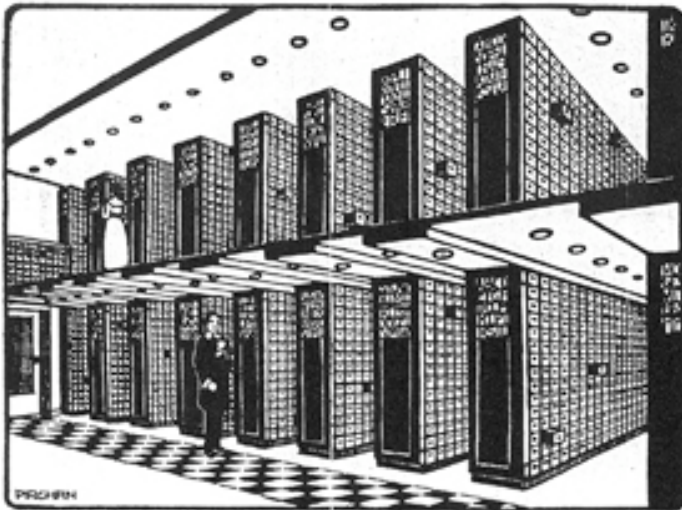


[Picture: Neufert_raster]

Bauhaus architect, Gropius student and author of the very influential architecture book „Bauentwurfslehre“ (Architect’s Data“) (of which i will tell you more later), Ernst Neufert in his book "Bauordnungslehre" (published in 1943 with a foreword by Reichsbauminister Albert Speer) proposed a method for totalization of the grid in the planning and construction process:
A possibly endless grid connects all buildings of the

construction site. Scaled up to the size of the world („like an ocean“, he writes) it potentially makes possible the exact location of buildings (like in reality today's GPS). Scaled down to the proportions of the single buildings and rooms it defines size and location of every particle of the house, from walls to windows to staircases and so on (very much like today's CAD-programs).

This can be interpreted as part of the comprehensive process of standardisation, which started in the first half of the 20th century.



[Picture: weltformat_grossbuecherei]

(Another earlier example for the strive to install a total pattern in architecture would be the plans for a "world format", developed in 1912 by the organisation "Die Brücke":

Starting from a standardized paper format – which

some years later became the DIN-format – "Die Brücke" designed plans for libraries, office rooms, hotel receptions etc.

Note the geometrical layout: the two-dimensional geometrical order of papers folded into three dimensions, their becoming of architecture.)

the three-dimensional grid

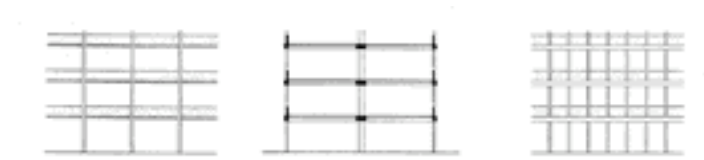


[Picture:gropius_chicagotribune]

Horizontally and vertically arranged cells: Folded up into three dimensions and repeated in horizontal as well as in vertical order, the grid not only defines but becomes architecture itself.

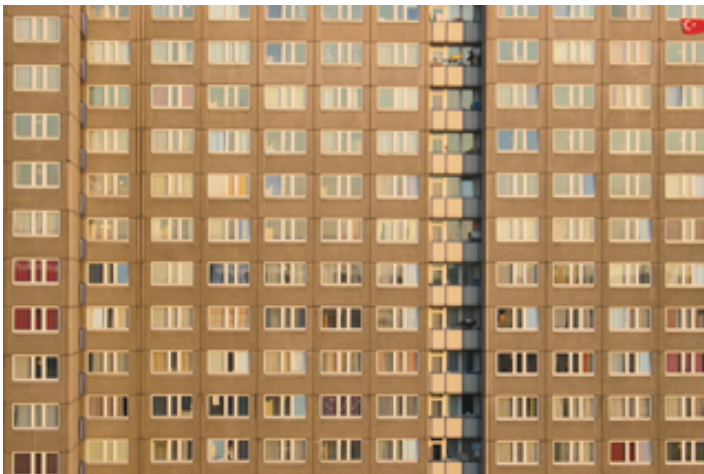
New building techniques, mainly concrete and steelframe constructions make it possible to construct a house from within. One possibility is to develop it

out of its smallest spatial elements – that is: cells;
more about this in the next section. The other, to start
with the skeleton and free floor plans (plan libre, how
Le Corbusier programmatically called this model).
In both cases, the facade is not part of the holding
construction and free to almost any kind of design.



[Picture: raster1]

The most successful facade design of the modernistic
phase of architecture was the grid:
due to financial and practical reasons, because the
single concrete plates which were to be hung on
the facade can be prefabricated in mass production in
factories.



[Picture: Studwohn_fmehring]

Which gave the German name to a whole architectural genre of the post-war area: „Plattenbauten“ (buildings made from prefabricated slabs).

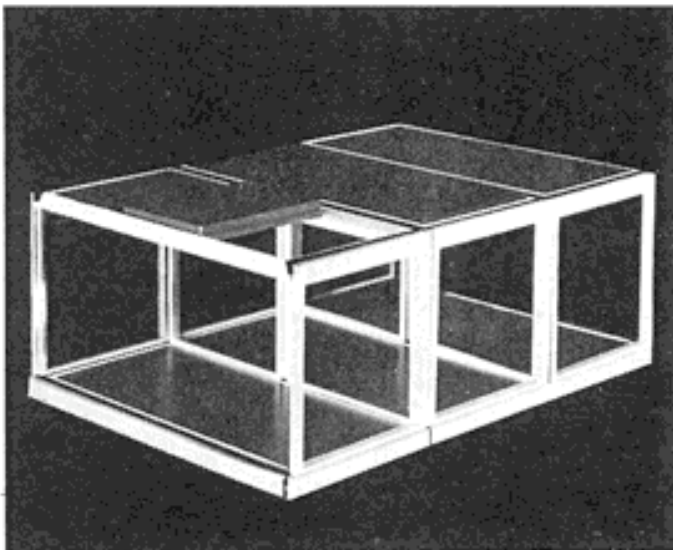
But also due to aesthetic reasons, because the grid facade shows on the outside what the modern building is from the inside:
vertically and horizontally arranged grid, an accumulation of standardized cells.

Intermediary conclusion:

The grid is a strange mixture of contradictions, on one side result of pure functionalism and pragmatism, on the other side driven by idealistic spirit. It can be either a product of the high flying ideals of the (peacetime) architect, or of the functionalistic reasonings of the (wartime) engineer, or both at the same time.

Since modernism programmatically tries to reformulate architecture by listening to the lessons of the engineers – who pick up their wisdom from modern nature itself, that is: technology, the grid seems to be a perfect medium for this reformulation.

II. Rationalization 2: Cells



Steel Frame Construction

[picture: steelframe construction]

Honeycombs

To start with a visionary quote from the time before modernistic architecture really started:

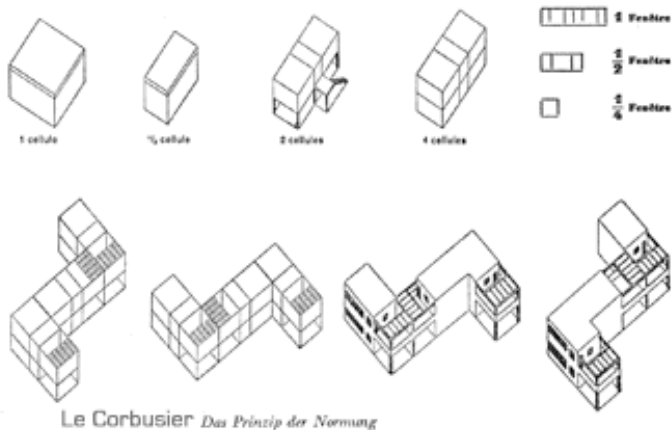
Walther Rathenau, *Zur Kritik der Zeit (A Critique of the Age)*, 1911:

"All larger cities of the western world are identical in their structure and mechanics. Resting in the center of a spider web of railways, they shoot out their petrifying road fibers all over the country. Visible and invisible networks of moving traffic pull and plough through the street ravines and pump human bodies from the extremities to the heart twice a day. Second, third, and fourth networks distribute water, heat, and power; an electrical nerve beam carries the vibrations of the mind. (...) When viewed as a cross section, the stony picture is the same everywhere: honeycombs (...) in sequential order, outwardly supported by iron, stone, glass, concrete (...); the street walls of all countries show the same expression."

Le Corbusier: cellules/cells

While Rathenau stills speaks of bees and honeycombs, the super hero of modern architecture, swiss architect Le Corbusier, dives even deeper into the realm of the very small and speaks of cells (in french: cellules), as the smallest and uniform element of modern housing.

In 1923 he publishes under the title "La Maison standardisé" (the standardized house) reflections and drawings on the modell of a building composed of cells, and their combinatory possibilities.



[picture: LeCorbusier_cellules]

[Interesting for the container researcher: By one time showing cells over empty space and one time cells over filled space LC demonstrates a key element of the container stacking principle: Seen from the side of construction and organisation of a container ship (or other storage and handling devices), it is not

important whether a container is actually there or not there since its space and position(s) is always defined and present. The container principle allocates standardized space, whether just filled with air or precious goods is secondary, it's *space processing*.]



[pictures: zellgerueste, powerstow2]

Since the early 1920s, the cell has remained a persistent element of LC's architecture theory. In 1929, in a series of lectures held in Argentina, he talks about „a cell in human scale“, summing up the development of his cellular concepts from the single house to the planning of a whole city with 3 Mio inhabitants.

He writes:

„A cell in human scale: 15 sqm (...). For the apartment building, the office, the workshop, the factory the new form of standardisation, the industrialization, the taylorisation will be exploited. (...)

The house is constructed in the factory, (...) it is transported on a waggon, no matter where to; construction workers erect it. Countless little customers in countless different places can be served.

[That is the idea of door-to-door-service! first time fully achieved after the installation of the container system; AK]

(...)

These methods of industrialization because of standardisation naturally lead us to the skyscraper: Its shape is determined by stacking the cells in human scale. (...)

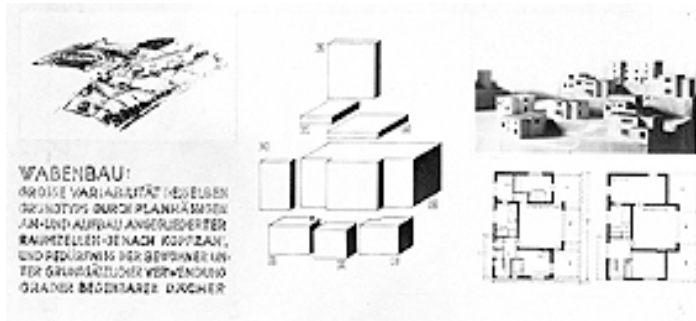
Let's multiply the standard elements of the cell. (...)

The house must not any more be built by meters – it shall be built by kilometers. (...)

These cells must be stackable by millions.“

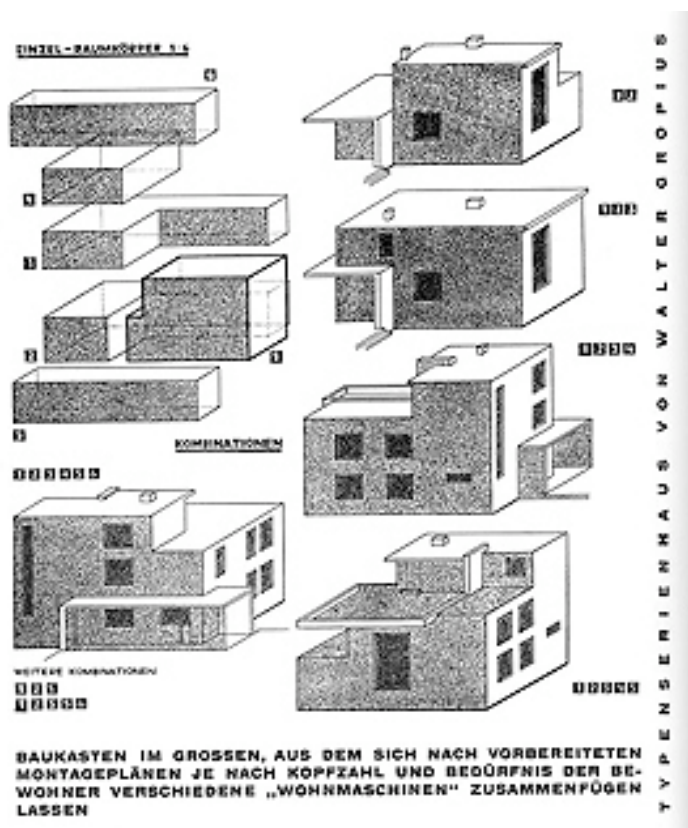
[translation by AK]

Gropius: honeycombs



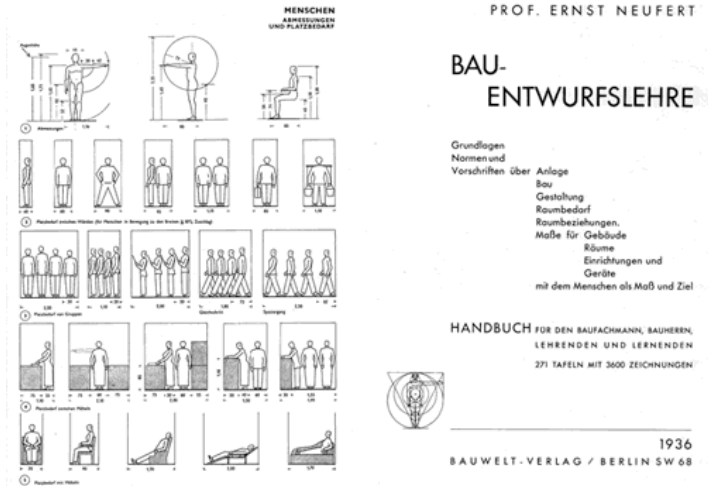
[pictures: gropius_wabenbau]

Inspired by Le Corbusier, German architect Walter Gropius in his Bauhaus years goes in the same direction of cellular order. Maybe in the urge to make strong a german tradition, he calls them honeycombs [*Wabenbau*] like Rathenau. But by explicitly quoting Le Corbusier in using the term "housing machines" – which is probably the most famous concept by Le Corbusier – on another drawing he makes clear where he is heading to.



[picture: gropius_typenbauten]

Neufert: Architects Data (Bauentwurfslehre)



[picture: neufert_bel_titelseite]

An outstanding position in the field of architecture standardisation and rationalization marks Gropius student and Bauhaus Weimar graduate Ernst Neufert. His book „Architects Data“ [*Bauentwurfslehre*], first published in 1936, is the most successful architecture books of all times.

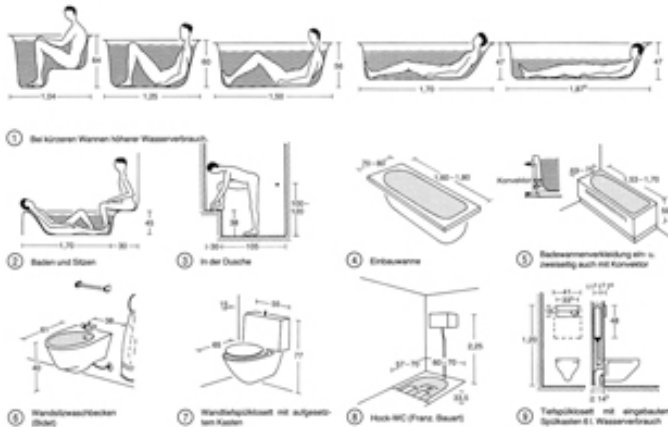


[picture: bel_cover]

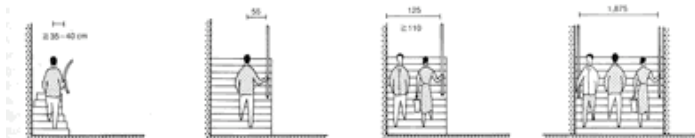
It has been translated into most languages and sold over a million times. Until today, it is common among architects all over the world to look up measurements in „the Neufert“ (often not even realizing that this

name refers to an actual author and architect and not to an institution).

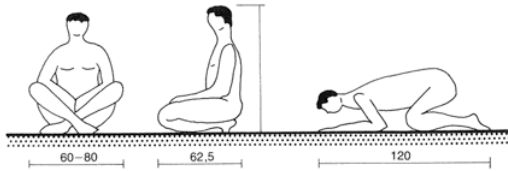
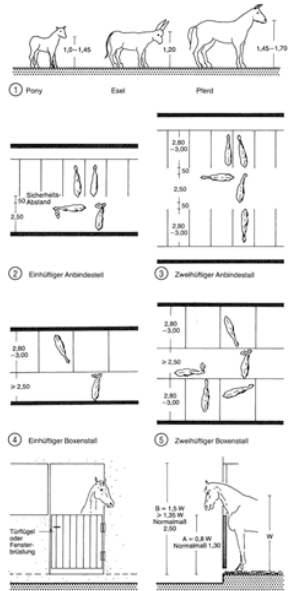
Built upon „the human being as the measure of all things“ it builds up a total system of architectural norms giving the minimal measurements for any thinkable space and occupation, from crib to grave, from staircase to airplane, from bed to bathtub.



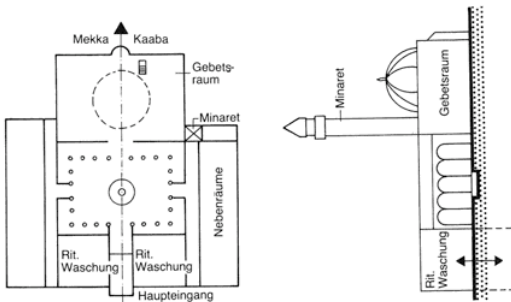
„Architects Data“ by Ernst Neufert reduces architecture to the most concrete of movement and space: to the space requirements of humans in buildings,“ as architecture theorist Walter Prigge puts it.



[pictures: neufert_baeder; neufert_treppen]



① Menschen beim Gebet

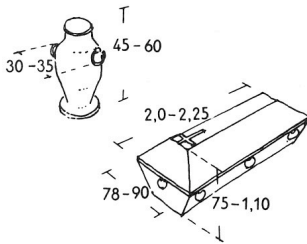


② Historische Bauweise

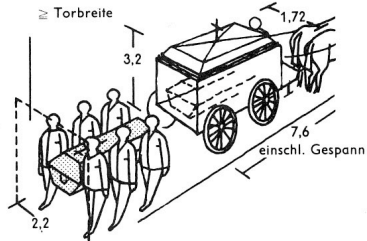
③ Schnitt → ②

[pictures: neufert_stall; neufert_moschee]

Based on floor-plan grids it rationalizes the different types of use and transforms them into serial room schemes.



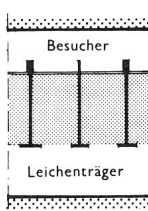
① Aschenurne und Sarg, übliche Abmessungen



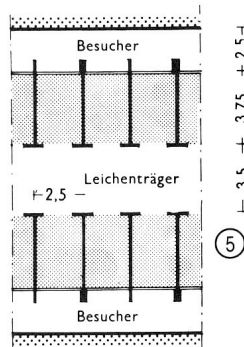
② Leichenbeförderung. Abmessung eines Leichenwagens mit Pferden und \approx Wegbreite für Träger. Leichenauto mit Kuppe 6,3 m lang, 1,95 m breit, 2,35 m hoch



③



④



⑤

③ – ⑤ verschieden übliche Anordnung der Leichenhallen
M. 1:400

[picture: neufert_friedhof]

Industrial norm measures for concrete types of use – all on one scale: from work to leisure time to the fulfillment of basic needs or spiritual service – fill the abstract cellular schemes of modernist architecture with „functionalistic content“.

Ernst Neufert, the Taylor of the construction business, as he is called.

III. Machine Age

Le Corbusier: des yeux qui ne voient pas / eyes that do not see ... traffic



[picture: corbu_augen_dampfer]

Like all modernistic architects Le Corbusier was convinced that the future of architecture was to be found in the functionalistic constructions of the industry and in the mechanisms of the industrial work flow, that is: in machines and logistic.



[pictures: corbu_augen_flugzeuge; corbu_augen_autos]

The modern world should function like a generalised fordistic factory.

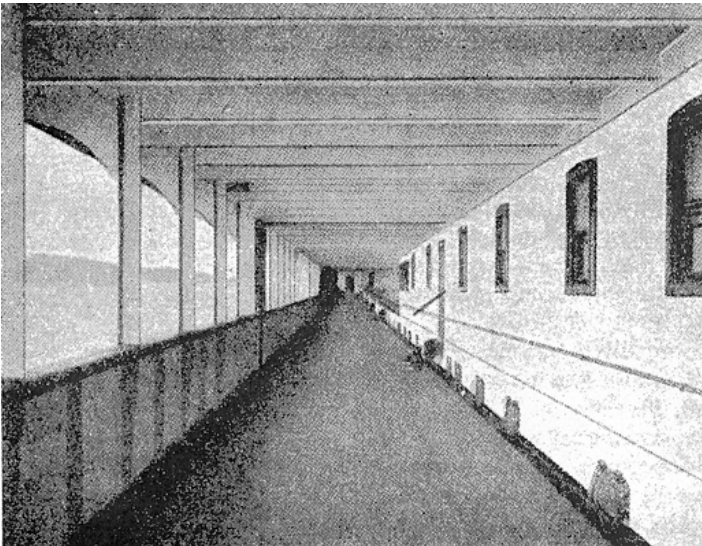
LC's most famous recepy for modernistic architecture consequently is that of the house as a machine (as well as the chair or the table as machines).

In a series of programmatic articles published in the early 1920s in the magazine „L'Esprit Nouveau“ (the new spirit) he showed where he saw the direction architecture should take: in steam ships, planes and automobiles. In other words: towards the rationalistic material worlds of modern transportation.



[picture: corbu_aquitania_notredame]

So, undoubtedly, it is no coincidence that for his beforementioned lecture series in Argentina he drew the inspiration for conceptualizing his „cell in human scale“ from his experience on a ship: 15,75 sqm, his proposed measurements for a cell in human scale, that was the size of his luxury apartment on board the ship on which he journeyed from Europe to South America.



[picture: corbu_aquitania_deck

[And this probably is a coincidence, but the size of a standardized shipping container, nowadays also used for the housing of refugees or construction workers, is only slightly less comfortable: 14,77 sqm ...]

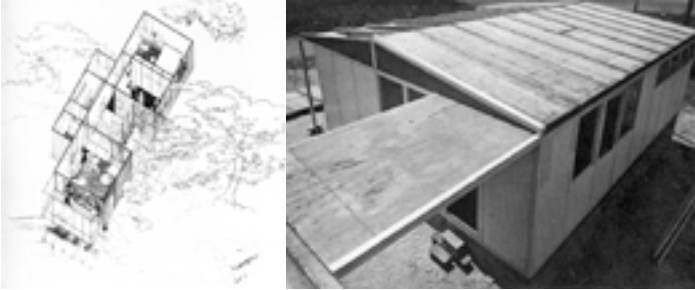
Gropius: Americanism!

Not less obsessed with modern machinery and rationalistic solutions from the factory was Walter Gropius. He was convinced that all good in this line of things came from the U.S. where a new technical pattern [*Technikform*] had been taking shape which, to his understanding, just had to be refined and transformed into an artistic pattern [*Kunstform*] to fulfill it and make it even more valuable. Already when he was still a student at the studio of Peter Behrens in the 1910s, he propagated the affirmation of modern technology and consequent rationalization. Later, beginning in the 1920s, his highest goal was to become the "Ford of Architecture".

Since his student times he had been interested in prefabrication: During the Bauhaus years in Dessau, and later on in his American period he experiments with possibilities for the industrial mass production of houses, explicitly (and much to the disappointment of many of his students and colleagues) putting aesthetic qualities aside and functionalistic, that means: machine work-flow aspects on the top of his experimental designs.

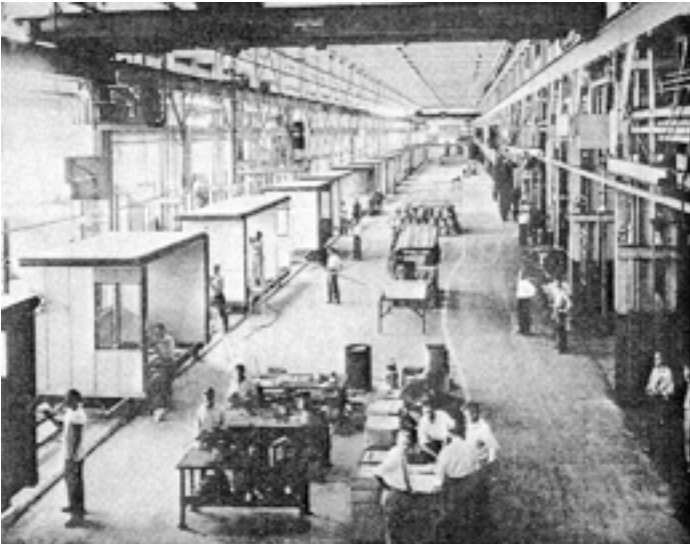
When he came to the U.S. in the late 1930s, prefabrication of houses was already a big issue there (though Gropius always considered himself as the most important propagandist of this kind of architectural development and mostly ignored the things that had already been going on in the U.S. before his arrival). Gropius started a prefabrication line with the also emigrated architect Konrad Wachsmann in 1942, the "packaged house" (based on construction

plans by wood construction specialist Wachsmann).



[pictures: gropius_packagehouse1 +2]

The concept failed eventually, the company founded to develop it went bankrupt in 1952. And this is what mainly happened with most of the concepts of prefabricated houses (as well as the more radical approaches to industrial on-site-building).

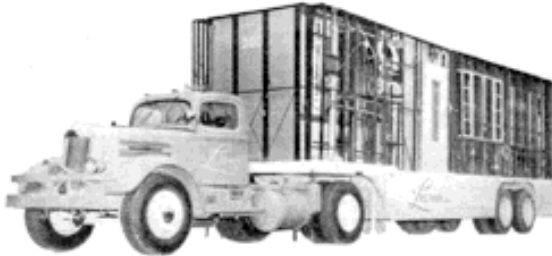


[picture: reliance_plant]

→ Mobilization of Housing

As it turned out, the automobile industry comparison bore a vital mistake: Whereas industrialised car production, despite the fact that there had been cars before, still provided something essentially new – individual motorised mobility – industrialised house production didn't: As far as the records go back houses had been fixed to the ground (in contrast to tents. So the new business ventures for the production and promotion of mobile (or industrial) housing had to compete with very very old traditions.

Lustron house en route

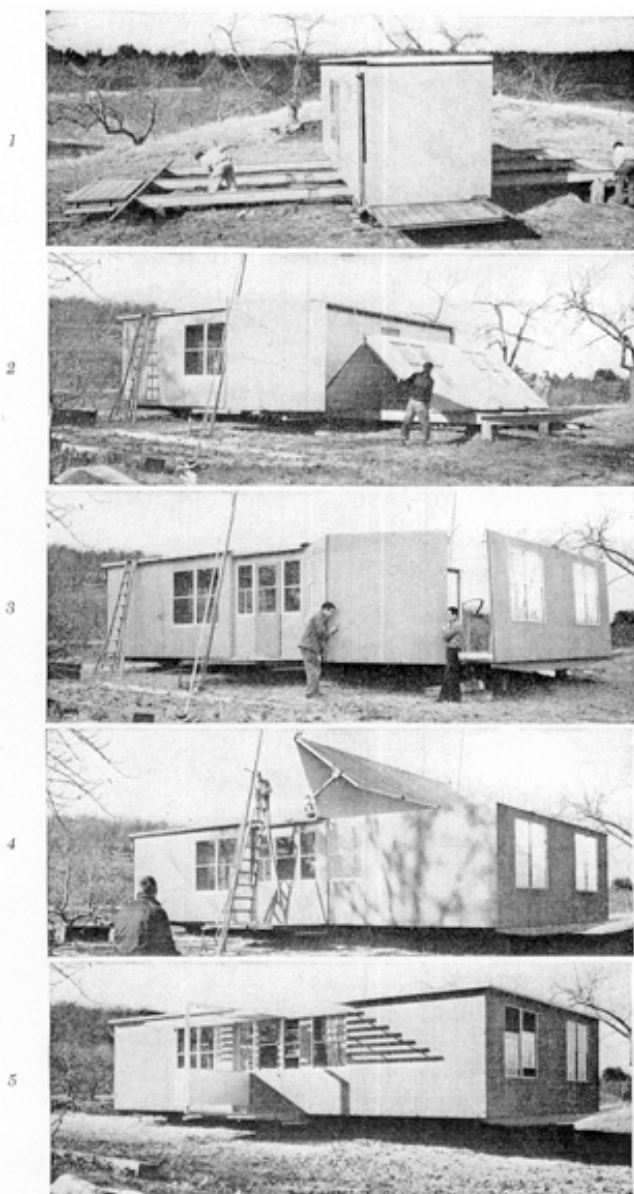


[picture: lustronhouse_ontheroad]

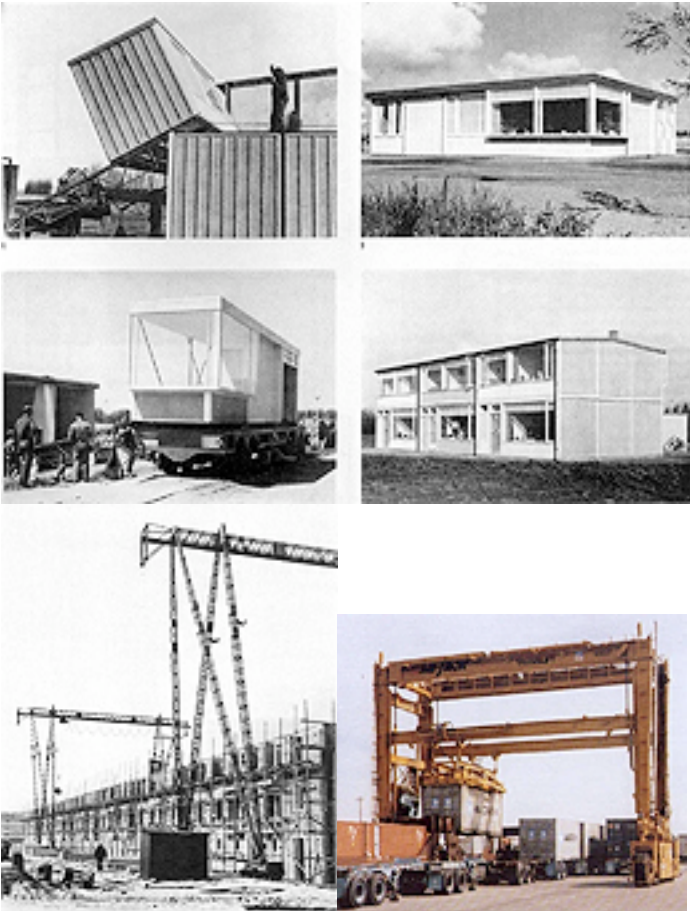
But what is interesting in my line of thought is how close these prefabrication concepts came to nowadays container handling and -housing concepts, in the way they looked like, and often also in the way they functioned.



[picture: pendelkran]



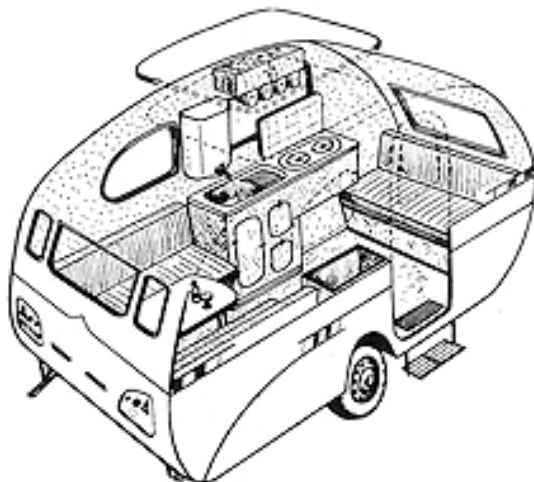
[picture: acron_house]



[pictures: seily_haus, portalkrane1+2]

They were the results of a common ideal of modernistic architecture which mobilized the concept of housing. (And was later picked up by the next generations of avantgarde architecture like Archigram in GB or the Metabolists in Japan).

This is not a house but a car. Why did it start to be a symbol for housing?



[picture: mobiles_haus_wohnwagen]

Despite all mobility hypes it has been staying characteristic for mobile architectural concepts that they never developed beyond the experimental stage. ... Until now, that they are being realized not by architects but by the experts from the logistics industry:



[picture: wohn_buerocontaineranlage]

0₁. Conclusion (sum-up)

Architecture theorist Dieter Hoffmann-Axthelm in an apology for the container as makeshift architecture in the late 1990s pointed out:

„The container is the building type of the near future. While historical buildings took their measure from temple and grave, buildings of today cope with the rationalistic logic of logistics. (...)

The container is a form of construction and thinking at the same time: a materialized procedure.“

[translation by AK]

I hope I could make plausible my proposition that this “container-approach“ towards architecture is in its core modernistic, and that it was already formulated by some of modernism’s main proponents decades before the actual emergence of the container system. In gathering material from the fields of rationalization and industrialization of architecture I tried to give evidence to my starting hypothesis that the „container“ – that is: a standardized box shaped spatial module – was, or is, indeed one of the focal points of modernistic architectural concepts from their beginning.

To sum things up: The „containerization“ of architecture to my understanding happened on three levels:

1 industrial ideal

The industrial workflow and its rationality served as an ideal for modernizing architecture and its construction methods. The inspiration for the use of new materials and new construction methods as well as a new spatial order was directly drawn from the world of industrial production. Architecture's and urban planning's occupation since ancient times with the geometrical ideal of the grid as the perfect realization of a rationalistic concept can be seen as a direct precursor for the implementation of industrial rationality.

2 „cells“

Standardized and serialized room formats as basic construction modules are a key element of modernistic concepts, and thus can be seen as a materialization and implementation of the container principle even before it was formulated properly by logistics industry.

3 mobilization

In merging architectural idealism with the knowledge of the engineers, under the sign of Taylorism and an overall mobilization process (that is characteristic for 20th century modernity), architecture itself is reformulated into something that is not far from logistics: the reason for the obsession with mobile and modular systems which seemingly is lasting until today.

Thank you.

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