THE QUALITIES OF THE BASICS: BASE BUILDING DESIGN

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ABSTRACT

A building can be understood as an integration of two parts, a base including structures serving multiple users and frame physical conditions for inhabitation, and an attachment including all the elements changing in times and determined by users. The skills of designing a base, rather than a complete building is beyond traditional architectural discourse and yet to be understood. The paper firstly introduced the concept of base building, the significance and its relation with the separate components – the Infill. Then it describes the qualities of the base buildings characterized by permanency, adaptability, simplicity, organized public spaces, and efficient service systems. The paper analyzes buildings designed by Baumschlager Eberle (BE) by focusing on four base systems, namely the structure, operable facade, common spaces in hierarchies, and low energy service system. It demonstrates the sustainable approaches of architecture: long lasting, high comfort with low energy. It concludes that the qualities of the architecture ensured by the initial design are mainly embedded in the base buildings. A skillful base building design with high quality opens a new horizon for the architecture.

Keywords: base building, support, architectural quality
1. INTRODUCTION

The base building concept is derived from the concept of Support. “A support structure is a construction which allows the provision of dwellings which can be built, altered and taken down, in dependently of the others.” (Habraken 1972:59-60) A Support is an unfinished building, ready to be occupied by variable infill. However, the layout and size of individual occupancies – dwellings, offices, etc. – are not pre-determined. The Support is the permanent, shared part of a building which provides serviced space for occupancy. (Kendall and Teicher 2000:32)

A Support can not be inhabited, or become a building without Infill. “Supports” are the shared and serviced structures that would contain dwellings made out of “infill”, much as a bookcase (a shared infrastructure) contains books (decided independently) that can be taken out and put in separately. “Typical support elements include building structure and facade, entrances, staircases, corridors, elevators and trunk (main) lines for electricity, communications, water, gas, and drainage.” (Kendall and Teicher 2000: 33), While typical Infill elements include external wall elements, internal partition elements, floor elements, storage elements, doors, kitchen elements, bathroom elements, and so on. (1972: P 63) Age van Randen provided four categories for Infill: (1) spatial layout, (2) partition walls, frames, doors etc., (3) equipment found in the kitchen, sanitary fittings and appliances, and (4) installation determined by the layout. (1992: 82)

By separating Support from Infill, a building may have larger capacity to adapted different functions and changes of needs through out the life span of the building. A building, particularly the element of Support can last longer than other buildings. It is especially significant for the sustainable development with understanding that long life structure can reduced the energy and resource consumptions for constructing new buildings, and reducing the waste output caused by demolishing of the old buildings. Among other significances, Habraken addressed that such building may reestablish the traditional relationship between building and people: “Dwelling is after all doing something; it is the sum of human actions within a certain framework, within the protective environment created by man…”(1972: P18 a)

Inspired by the conceptual division of Support and Infill in Habraken’s theory, there has been a great deal of work done, focusing on Infill development and experiments in the Open Building movement (Kendall and Teicher 2000). There is relatively less development and less understanding on the subject of Support, with the exception of a few studies on pre-fabrication technology. In contrast, Baumschlager Eberle (BE) work intensively and exclusively on the issue of Support, whilst leaving the issue of Infill, as a technique, almost untouched: “Since I don’t know the actual floor plans of any building I have designed, my interest is in the staircase, and the common space.” These two opposing, strategic directions – Infill development and Support development not surprisingly, are based on the same understanding of the diverse and changing needs and circumstances of our world today. Both recognize that it is the responsibility of the architectural profession to take this diversity and change into consideration. (Jia 2007:9-10)

BE architects focus strongly on the issue of Support, whereas Open Building research focuses on the issue of Infill. This fact may suggest that whilst the architectural practice and research in Open Building appear to be proceeding in differing directions, they remain complementary to each other. It also suggests that the research sphere in respect of Open Building can be widened to include Support, or the base building.
2. BASE BUILDING QUALITIES

2.1 The quality of form

Base building is a form connecting urban and/or planning quality at one hand, and architecture on the other. While Habraken addressed the urban quality of the base building, similar to the streets, plot for constructions, Kendall and Teicher tend to demonstrate the architectural quality of the base building: “a Support is not a mere skeleton. It is not neutral, but is rather enabling architecture” (2000:34). Habraken in his early book “Support: an alternative way to mass housing” suggest that a base building may look like an infrastructure, because the design approach these structures will not via their forms but via their function. Kendall and Teicher argues that the Support is dominated by the local market, architectural styles, climate, building codes and land use rules, investment requirements and other local conditions. “Thus, within its specific social and technical setting, the Support is built using locally appropriate means of design and construction.” (Kendall and Teicher 2000: 34). The building facade, which normally considered as part of the Support in at least Western culture, “reflects cultural conventions (having to do with displays of territory, identity and control) and enclosure integrity” (Kendall and Teicher 2000: 187)

As a base building is to support diversity of functions and events changing in time, the form of the base building is not determined by particular function. It does not mean a base building should not have a particular identity. The quality of the base building has a close relationship with the particular social, cultural and technological background of the specific area in which a building is situated. (Fig.1a) The particularity of form of a base building is still important.

Permanency

“In the first place, there is the fact that support structures will have a very long existence.”(Habraken 1972.84) They provide building ground up in the air, and are permanent like streets. Kendall and Teicher also say that Supports can be constructed in any durable capacity to satisfy diverse and changing demands throughout their useful life. (2000 p. 32)

The permanency of based building should not be confused with traditional architectural conceptions, which depict a building a monumental rather than a changing process. A building constructed with division of support and infill changes faster than traditional building. It is comparatively “short life”, because the continuous adaptation to the changing of needs and interaction with people make the building appear as temporary phenomenon. It is only the Support, not the Infill, remains stable and are expected to last as long as possible.

Adaptability

A base building is built in the knowledge that we cannot predict what is going to happen to it. The more variety can assume in the support structure, the better. (Habraken 1972.61) Therefore a base building design is not a load-bearing structure skeleton design. The skeleton is entirely tied to the single architectural project, and single predetermined functional scheme of a building. While a base building is largely designed for variety of uses and changes. The capacity of adaptation to undetermined programs is the key dominating the quality of design. “The most important thing in this respect is that the support dwelling offers an endless range of possibilities….a dwelling
is no motor car and no dwelling need be the same as any other. The motor car allows us perform a single act: we move from place to place. But a dwelling contains at least one whole life. (Habraken 1972:65)

**Simplicity**

From and construction of a base building must be of the utmost simplicity (Habraken 1972:62). Habraken suggested a most primitive base building structure with parallel planes running one above the other and carried on columns. A simple and consistent structure is stronger. A neutral form is more adaptable than a specified one. An economic consideration also requests simple structure. (Fig.1b) In contrast to completed buildings, a base building “should not have the complicated detailing, nor the precise finish, nor the short-term existence of the factory product”.

**The quality of the public space**

In contrast to the infill elements which largely controlled by the individuals, the base building is in public domain with a quality that architectural design plays important role. In a building complex, the public space may include the in-between out door space, staircase, entrance of building, corridors, etc, and the sequence of all these spaces. (Fig. 1 c) As the quality these spaces may attach to particular context, there is not much writing from the researches in Open Building. However, Habraken did remind that the location of these spaces should not undermined the capacity of private domain. He suggested that all vertical circulation should preferably be on the outside of the structure. (Fig. 1 d) The support structure will produce long ribbon-like forms. “If we try to achieve the greatest freedom of use, staircases and lift shafts would be obstacles when placed inside the structure.” (Habraken 1972:67)

**The quality of Mechanical system and Energy saving**

In OB projects studied by Kendall and Teicher, the building mechanical systems are organized both on Support level and Infill level. The horizontal distribution of pipes and electricity are found more in the infill level. The vertical ducts are most likely in support level. (2000: 188) It is true, that they even pointed out that the dwelling unit heating and air conditioning equipment is not generally part of the Support (Kendall and 2000: 33).

![a. The form of the base building showing local context and users’ input on the construction of the facade panels](image1)

![c. Base building form the public spaces](image2)
3. ANALYSIS ON THE BASE BUILDINGS DESIGNED BY BE

The Austria based company Baumschlager Eberle started by designing small, reasonably-priced, detached houses, in 1980s, and slowly developed a typology for mass housing developments with compact, flat-roofed buildings, with which the team distinguished themselves in Vorarlberg. Today, they are involved in the construction of many, large, multi-storied buildings, including, hospitals, office blocks and industrial buildings, schools, community centers, and shopping centers, throughout many European countries and now in China. Their buildings, especially mass housing projects, represent a clear and matured combination of two distinct systems with a high architectural quality, the base building and infill, which constructed in two phases.

3.1 The quality of form

Their architectural characteristics can be summarized as having a “strict economy with respect to material and artistic/architectonic means and a keen of cultural and social responsibility.” (Frampton 2003: 19) They paid strict attention to ensuring that highly skilled of craftsmanship was employed, in respect of the materials used and the quality of construction. Actually, their tectonic achievement deserves the highest recognition on a world-wide scale. (Frampton 2003: 19)

Their architectural characteristics can be summarized as having a “strict economy with respect to material and artistic/architectonic means and a keen of cultural and social responsibility.” (Frampton: 19) In their own words, they gained a wide knowledge of buildings, especially in respect of housing and they paid strict attention to ensuring that highly skilled of craftsmanship was employed, in respect of the materials used and the quality of construction. (Fig. 2a)

In respect of the urban site, that is already functioning well and contextually supplying an appropriate, useable vocabulary, then they see there is no point in creating something absolutely new. Their objective is to maintain the existing structures and to re-interpret them. However, in an open context, in which there are no suitable points of reference, a much more subtle set of instruments are employed to arrive at a viable solution. Through the careful comparison of all the residential buildings they designed
in Vorarlberg, it was found that variations to compact floor plans, a typology used in many buildings, are simply the result of particular circumstances, ranging from the type of site, the clients, the users the objective and the function of the building.

3.2 Permanency

BE is also known for winning several important green architecture awards in Europe. “What does sustainable architecture mean? … it is clear to me that design is not about creating new things, but rather about creating a building, which will last at least 200 years.” (Dietmar Eberle, Lecture delivered at HKU on the 24th October: 2003)

In order to achieve a sustainable building (‘lasting at least 200 years,’ to quote Eberle) with the efficiency of embodied energy, the building should be conceptually and technologically separated into five systems according to the life cycle of materials, the spatial and structural hierarchies, and social responsibility. This conception echoes Habraken's thinking on the separation of ‘Support’ and “Infill”, although Eberle has never used the term, Open Building, per se. Life cycle is the key issue to separate systems (Table 1) Organize the building in such a way that we don’t mix up these systems, changes are easy with a large flexibility when we integrate separate systems.

3.3 Adaptability

The concept of support in respect of the two architects already mentioned, includes the outer wall, the inner access (staircase, landing, and corridor) and the utilities (kitchen and bathroom) in a building structure.

Basically there are two very simple built structures in the plan. In the middle of building there is a stairwell surrounded by closets and ancillary rooms. On the outer fringe there is a surrounding wall, which serves as structural as well as an enclosure. There are no divisions of rooms between these two structures. To omit or to add a room, all one has to do is to remove or insert a partition wall. This is a highly significant development in respect of ground-plan typologies: there is a fixed service zone and there is also the possibility of adapting the living area to individual requirements. Very diverse domestic arrangements can be realized in such an apartment. It is left entirely up to the individual to decide whether he or she wants to have any room at all, or a number of rooms of equal size.

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a. Situated in a Austria Alpine context, the shading devise on the facade is carefully by constantly changing by the users pending on climate and needs of privacy.

b. Buildings were grouped making vistas and in between public spaces
3.4 Simplicity

Most of their projects are found in a simple compact form which successfully bringing ecology, economy, beauty and high craftsmanship into a whole. A compact form (Fig. 2b) is ecological and economical firstly because it has less façade. Less façade uses less material and it means it embodies less energy. Less façade and a compact form also mean better insulation, the loss of energy for heating can be minimized. The compact form provides a convenient solution to the problem of constructing many apartments, and permits an optimal ratio between the area of the internal space and the area of the façade.

The facade is neutral and independent from the functional diversity of the interior spaces. Structure layouts are simply repetitive with carefully articulated dimensions for in-between spaces consistently running through out all the plans and building blocks. A typological plan form consists of a service and vertical circulation core in the middle of the plan, a structure outer wall and a continuous open space in between, is implemented in many projects with adjustments to fit particular context.

3.5 The quality of the public space

Normally staircases with semi-public space had to be constructed in an extremely economical style, for very compact typologies. In Baumschlager and Eberle’s work, this aspect receives particular attention. They saw it as an area of great potential for architects – that of substantially improving the inner zone of a building by creating an atmosphere that delineates the transition from the public to the private spheres. (Fig. 2c) The staircase has a skylight and a small, enlarged, landing through which each apartment can be accessed. (Fig. 2d) With careful detailing of the space, choice of material, and type of construction, a simple economic social housing scheme, can be transformed into a sophisticated dwelling of greatly improved ambience.

These architects see the façade of a building as being of particular importance, since it is the structure, which provides the key to saving energy, the complicated inter-relationship between the exterior and the interior, the private and the public, as well as being responsible for creating the crucial syntactical enrichment of the public outdoor space. It is expensive to build, with high embodied energy, technically complicated and difficult to maintain. Therefore, it is treated as part of the support, which according to
Habraken, is designed by the architects according to the collective decision made by community. It is not an area where individual or private needs dominate. However, they also see that it is important and crucial for the users to be able to operate and be in control of part of the façade, i.e. to adjust the lighting, ventilation, shading, and views. Consequently the outlook of the building changes according to the actions and the wishes of the buildings’ occupants. In this sense the façade accommodates the most flexible elements in the building and changes constantly. A variety of technologies and materials have been applied, which have resulted in intensifying this flexibility.

### 3.6 The quality of Mechanical system and Energy saving

Because architects have to deal with the particularity of each project, they prefer to have a wider choice of technological solutions. They are interested in the integration of a technology, which has multiple possibilities. It may suggest that research carried out on a specific technology, or on a specific method of integrating that technology may have its implementation limitations. An instrument or tool for multiple purposes may be an alternative for Open Building research. (Jia 2007:14)

BE is also well known for its green building design. Although the energy saving effect is largely derived from the architectural design, new technology device are also implied and improved the comforts of living on the one hand, reduced the heating and cooling energy consumption on the other. The technical system used the heat stored by the people living in apartments, and utilities -which contain or release heat, thereby reducing the need for additional heating. Ventilation is regulated by mechanical means; the heat extracted from the exhausted air is used to heat the fresh, but cold air blown into the building. The system also contains heat “conductors” which can harness heat energy from the earth. It is also used to cool the air in summer. Whenever necessary, this basic heating system is augmented by conventional heating systems so that the desired room temperature is actually achieved. Using this system the level of energy consumption required for heating can be reduced by up to 70%. (Waechter-Böhm 2000:29) The Pop Moma in Beijing uses active ceilings for heating and cooling purposes as well as the controlled ventilation of the buildings are based on state-of-the-art technologies. In combination with a specially designed façade designed to enhance exposure to daylight. (Fig. 3)

![Fig.3 The heating and cooling system based on earth heat, and performance of energy saving in Moma Beijing](image)
4. CONCLUDING: TOWARDS SKILLFULLY DESIGNED BASE BUILDINGS

Open Building is going to change the concept, techniques and methodology of architecture. Distinction of base building systems from the infill sets the significant departure from the traditional perception of building as scenographical monuments. The base building is the platform where varieties and changes and interaction with people in the life time of the building can take place. According to the theory of Open Building, the quality of base building includes, if not limited to, architectural and tectonic quality, permanency, adaptability, simplicity, public spaces, energy saving service systems. Among them the architectural and technical quality, and the design of the public space requires design skills partially borrowed from traditional architectural discipline. “As a result, it will become far easier for architects designing Supports to refocus on traditional; aspect of architectural; for and public space, on the building’s tectonic qualities, spatial experience, facade and definition of public space and urban character.” (Kendall and Teicher 2000: 191) However, the energy saving systems integrated with the buildings in both Support and Infill levels requires also new knowledge and skills to order to achieve a sustainable future. Baumschalger Eberle (BE) provided meaningful cases for further study.

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