Kalkbreite Cooperative, Zurich, Switzerland
Architecte | Architect: Muller Sigrist Architekten SA
Maître d’ouvrage | Client: Genossenschaft Kalkbreite
Année de construction | Year of construction : 2014

Texte de description | Description text:
The Kalkbreite Cooperative Building was constructed in 2014 after a public competition held in 2010 and won by Muller Sigrist architects. The impetus for the project dates originally back to the 1970s and is a response to the limited supply of affordable living space in the city of Zurich. The building occupies the site of a VBZ train depot which is still active and housed below the central courtyard. A cooperative society manages the building, coordinates shared activities and subsidizes some units. Built with a vision for social, economic, and environmental sustainability, it is a forward-looking example of sustainability in the city of Zurich.

Photographie du projet | Picture of the project

Plan de situation | Site plan
second floor plan: courtyard garden, communal spaces, residential units
third floor plan: residential and communal spaces, roof terrace

sixth floor plan: residential and communal spaces, roof terrace
1.1.1 Society: Communal Life: Integration and Mixity

The Kalkbreite communal living complex goes to great lengths to encourage social, cultural and intergenerational integration and mixity. Its success in this domain is a mixture of both architectural features and institutional policies and systems.

The architectural means of promoting mixity are (1) sizing and distribution of units, (2) integration of a variety of programs, (3) distribution of shared spaces and (4) inclusion of facilities that support those needing assistance. The Kalkbreite functions both as a residential building and a work space, including offices, restaurants, shops, a cinema and a day care in the same building as 88 apartments.[11] A wide range of units sizes permits people with different space requirements, family sizes, and incomes to inhabit the building. Units range from extra small (30 m$^2$) to extra large (200-400m$^2$).[11] Shared spaces for recreation, dining and business are distributed throughout the building and encourage residents to spend time together. Strategic architectural features encourage intergenerational and special-needs inhabitation; for example a certain number of wheel-chair accessible apartments, accessible public spaces, and a shared cafeteria that serves hot meals for those who can not cook for themselves.

Architecture, however, can only achieve so much in terms of mixity, and much of the social and cultural mixity is institutionally managed. Subsidies for low-income renters come from charities and the government. In order to preserve the social mixity of its inhabitants the Cooperative is establishing quotas of low-income renters that will be consulted as renters cycle in and out. The Cooperative has also partnered with local benevolent organizations to identify and integrate renters from low-income areas or marginalized groups. Ultimately up to 25% of the 88 apartments may be subsidized[3, p.22].

By combining architectural features with institutional practices the Kalkbreite cooperative proposes an innovative socially sustainable project. The long-term success of the project is closely linked to the continued ability of the cooperative institutions to function. While the project has functioned well in its first year, final judgement on the social sustainability of the project must be withheld for some time.

1.1.3, 1.1.4 Society: Communal Life: Solidarity, Social Justice and Participation

The Kalkbreite fosters solidarity and participation through institutional self-management. These institutional processes, though not architectural, contribute to the long-term sustainability of the project. Though highly sustainable, we note that these practices entail a certain amount of cost and risk which places an extra burden on the cooperative's inhabitants.

The cooperative supports solidarity with marginalized social groups through (1) cooperation with charity organizations, (2) maintenance of a solidarity fund, and (3) conflict management. Working with charity organizations makes it possible to subsidize the housing of disadvantaged families in the building.[3] A solidarity fund, financed by regular donations from the building's inhabitants is used to help needy residents in emergency situations. The conflict management structure mediates conflicts between residents, especially in situations of social or cultural differences. These measures are management instruments, though they work in combination with the built environment, and further confirm the importance of strong institutional presence in the creation of a socially sustainable building. If any of these measures are not effectively managed, for example through overuse of the solidarity fund they risk becoming a burden on the building's residents and damaging long-term sustainability.

Encouragement of participation at the cooperative, like solidarity, functions largely at the institutional level. The built environment contributes to participation by providing shared spaces for meetings and circulation spaces that promote chance encounter. Participation within the cooperative, however, is dominated by the institutional bodies that manage events and decision making.
Aspects in line with sustainable development principles

The cooperative has developed an organization with five tiers and seventeen distinct bodies. At the highest level is the general assembly which includes the widest range of stakeholders: residents, owners of business located in the building, administrators, etc. [8, p. 54-57] The general meetings take place once a month and focus on discussing and establishing rules for cooperative living, planning the use of communal rooms, and planning activities. Through the use of cooperative institutions to foster participation the Kalkbreite represents an innovative model of social sustainability. This effort, however, does entail the added cost and confusion of an increasingly complex bureaucracy. It must be accepted that the effort to sustain and manage civic participation comes with certain costs, and that these costs are worthwhile considering their socially sustainable impacts.[10]

2.2.3 Economics: Investment Costs: External Costs

SIA 112/1 states that the internalization of external costs is beneficial from an (macro) economic point of view. Sources of external effects might be the construction, the operation, the maintenance, the demolition of buildings, e.g. air pollution due to combustion of fossil fuels, noise or special waste.

As the Kalkbreite building uses a groundwater thermal heat pump and complies with the MINERGIE-P-Eco standard, the building does not use fossil fuels during operation. Additionally, the space used by a single inhabitant is limited to 35 square meters which means that not only energy efficiency per square meter, but also the amount of heated surfaces is reduced. Additionally, inhabitants are not allowed to own a car of their own [3]. This means that use of fossil fuels during operation is further reduced. Due to the excellent connection with public transport [1], it might be assumed that not only external effects due to the combustion of fossil fuels, but also external effects from noise and air pollution during operation are significantly reduced.

For the construction of the building, embodied energy of 30 kWh/m2/a has been used [12] which is in line with SIA 2040 “energy efficiency path”. Therefore the external effects from the combustion of fossil fuels during construction can be assessed as sustainable. No information is available regarding the noise and air pollution caused by the construction of the building. For the construction, many building materials have been used that can be recycled easily [3]. This means, that this material is likely to be reused and that the embodied energy for the reused materials is likely to be low, i.e. that the building contributes to low external effects due to the future demolition of the building and little special waste is created.

3.1.2 Environment: Construction Materials: Environmental Impacts

After the industrial revolution, the use of fossil fuel and production and the pursuit of for-profit enterprise, harmful compounds have been widely produced and released into the environment. The reconsideration of the societal viewpoint on the process of construction and design is increasingly important in to minimize the environmental impact. [12] The Kalkbreit proposes the four ideas of (1) simple structure, (2) low spans of support structure, (3) simple building envelope, (4) short distance of supply to meet the requirement of environmental impact of SIA. Simplicity of structure and building envelope in this project through the use of a hybrid construction consisting of a concrete frame clad with prefabricated PAVATEX DIFFUTHERM wood fibre facade modules [13]. The aim of this building material and technology is to permit not only a jointless facade construction but also to offer energy efficiency with the respect to the thermal performance. It has adhered to Minergie P-ECO standard [14] and has been recognized as an exemplary project in Zurich. The efficiency of this thermal envelope reduces the building’s total energy use and brings its annual emissions of CO2 to just 8.1 kg/m2- below the target value of the SIA leaflet 2032/2010 grey energy of buildings. [15] As a result of these features the Kalkbreite meets the necessary criteria for reducing environmental impacts during construction.
1.1.2 Society: Communal Life: Social Contact

The Kalkbreite building incorporates several physical features that support and even actively create social contact. These spaces function, however, only with the support of the cooperative’s social institutions. The reliance on complex and unique social institutions to regulate the use of social space limits the flexibility of the building to adapt to changing circumstances and may shorten the viable lifespan of the structure.

The building is organized around two systems of circulation: one that, landscape-like, cuts across the building and encourages serendipitous social contact, and a second that provides direct access to a limited number of private units along vertical stairwells. The horizontal network, called an ‘interior street’ connects the major community spaces (community room, laundry room, library, a painting studio for children) to the roof terrace. (see plans p.2-3, diagram p. 4) From the roof terrace it is possible to descend to the level of the city street and connect to the neighborhood. Access to the interior street is also possible from each of the residential cores that intersect it at various elevations within the building. The connection between the two types of circulation make it impossible to segregate any one stair well from any other.

In the sustainability monitoring of the building, the evaluators make the comment that social contact can not be forced and that opportunities for retreat are necessary. In order to have social space, but not to force people to use it, the Kalkbreite building incorporates a second circulation system that allows residents to circumvent spaces of social contact. Unfortunately the merging of these two systems significantly reduces the security of the private system, creating a situation where an undesirable entry at one point in the building compromises the entire circulation system. This type of labyrinthine internal circulation system is not a new invention and has been associated with increases in crime in public housing, notoriously in the Robin Hood Gardens by Alison and Peter Smithson in 1972. Much effort has been devoted to studying these systems of internal circulation and recommending gradations of privacy, ease of surveyability, and control over points of access. A completely connected & complex circulation system can function well only in a situation where the residents of the building form a cohesive and trusting community capable of self-policing. If the group solidarity or institutional support should falter, the circulation system threatens to be a liability by producing pathological contact. Furthermore, the complexity of the circulation system reduces the flexibility of the building and makes it unlikely for it to be possible to re-purpose it over the course of its lifespan thus reducing its sustainability. Allowing residents to control this ‘interior street’ through a system of locally controlled doors or with surveyability from adjacent units would likely improve its long-term viability.

2.1.1 Economics: Building Substance: Location

The SIA 112/1 requires that long-term criteria for the interests of owners, investors and users are respected. The location is considered as the most important factor of an economic assessment of a property.

According to the GIS of the Canton of Zurich, the location class of the Kalkbreite building is 6 out of 7 which is deemed a rather bad location. A further analysis shows that this might be due to high level of NO2-emissions (30-33 µg/m³), noise from the nearby railway and tramway lines as well as road traffic and a high electromagnetic exposure. On the other hand, due to better building materials, better windows and the availability of a controlled ventilation with filtered air, this problems are less relevant for new buildings, although the Kalkbreite building is not optimized toward protection from noise. Regarding natural hazards, no significant risks are known to date. However, due to its proximity to Zurich Main Station as well as Zurich Wiedikon station with eight train connections per hour to Zurich Main Station with a duration of 5 Minutes and a tram stop in
Aspects en contradiction avec les principes du développement durable
Aspects in contradiction with sustainable development principles

front of the building, the public transport rating is A (of A-F) [1, 4].

Overall, the location has several benefits and some weaknesses (air pollution) have been mitigated with technical measures. However, measures against noise are not optimal and the building is not sustainable in this respect.

The location can be considered as mixed with respect to sustainability.

2.2.2. Economics: Investment Costs: Financing

SIA 112/1 requires financing costs that make construction, maintenance and demolition costs affordable in the long run. A high equity ratio is considered as beneficial with regard to interest rates (low counterparty risk) as well as the use of low-interest debts. Interestingly, the Kalkbreite cooperative strived to achieve a high ratio of debt as high as 94% [5]. The remaining share was mainly financed via non-interest bearing participation capital for the cooperative by tenants, proportional to the surface rented. The mortgage to the Kalkbreite cooperative was given by the pension fund of the city of Zurich [6] and the we assume that the interest rate is variable and ¾% below the reference rate of Zurich Cantonal Bank [7]. Therefore, the financing can be assessed as sustainable for the Kalkbreite cooperative regarding the interest rates. This was made possible by the beneficial conditions offered by the pension fund of the City of Zurich. However, the high debt ratio poses a risk for the cooperative. The debt ratio of 94% means that equity will become negative if the value of the assets (i.e. the property) diminishes by only 6% which might be caused by lower than expected rents, unexpected inflation or unexpected depreciations. It can therefore be argued in line with the SIA 112/1 that the high debt ratio is unsustainable.

However, when critically assessing the claim of the SIA 112/1 that a high equity ratio is sustainable as it enables the borrower to pay lower interest rates, we think that the opportunity costs of investing equity are not considered adequately. Usually, the returns on equity are higher than returns on debts, i.e. a certain leverage might be beneficial from a sustainable financing perspective. However, a very high debt ratio, as in the case of the Kalkbreite cooperative, might be too risky. Therefore, an optimal debt ratio needs to be identified which is neither too low nor too high. Given the generous conditions offered by the pension fund of the City of Zurich to the Kalkbreite cooperative, this might have been an incentive to take up a (too) high amount of debt.

3.1.4 Environment: Construction Materials: Deconstruction

Although the Kalkbreite uses a hybrid facade consisting of reusable material with minimal environmental impact, it relies heavily on the use of reinforced concrete which is unsustainable. Looking at the building construction section we can see that all slabs, bearing walls, stairs and foundation elements are constructed with reinforced concrete. (see section, p. 4) Heavy use of concrete is unsustainable- not only because of its high embodied energy- but especially when considering the building lifecycle. Not only can the material not be reused or recycled, but it requires a very high amount of energy to demolish and remove from the site. It ends its lifecycle in the landfill after essentially a single use. Reliance on concrete for construction appears to be a characteristic of Swiss building culture reinforced by Swiss building codes. The Kalkbreite has mitigated this trend slightly by using a hybrid facade assembly. We found no evidence that the architect or project managers sought to permit the reuse or disassembly of the concrete structure or to implement Eco UHPFRC to reduce the use of cement and transport impacts [16]. In this sense the building lacks a sustainable construction perspective.
In reviewing the Kalkbreite building we have seen that, while this building is generally acclaimed for its sustainability, its sustainable aspects often have down-sides as well as upsides. For example, building in cast-in-place concrete produces a very durable and safe architecture, but creates greater costs at the end of the project life-cycle and limits options for re-cycling of materials. Ideally the Kalkbreite building would have been built with a ‘cradle-to-cradle’ strategy, where construction materials are used in a way that permits future re-use.[13] Similarly, creating shared spaces that are well integrated into the building’s circulation system increases social contact but may also permit undesirable activities and a feeling of defenselessness.[9] Financing a building with a high-level of low interest rate debt permits the construction of an excellent building but exposes the investors to greater risk of default.

In each instance we have attempted to weigh the sustainable benefits against their costs and risks. Although we have framed critiques of several aspects- the heavy use of reinforced concrete, complex and continuous circulation, high debt ratio- we wish in conclusion to note that these critiques are made with an overall appreciation of the audacity and innovation that the Kalkbreite represents. What sustainability is and how it works is still being defined, particularly in the case of social sustainability.[10] The Kalkbreite suggest directions for future developments in sustainability, particularly in its emphasis on sustainable building management.[17] Some risks and costs are inevitable when creating a building that functions in ways that have not yet been tested. Over the decades of the building's life-cycle we will develop a better understanding of the viability of the Kalkbreite’s sustainable strategy. Already the Kalkbreite Genossenschaft is planning a new building for the Zollstrasse in Zurich, so perhaps this type of building will become more common in the future.

Références | References

[17] Rutter et al.: Nachhaltiges Immobilienmanagement- Factsheets, IPB, KBOB. BBL Vertrieb Bundespublikationen, Bern 2010