Zeitschrift: IABSE reports = Rapports AIPC = IVBH Berichte
Band: 77 (1998)

Artikel: Recyclable housing: the challenge lies in design
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DOI: https://doi.org/10.5169/seals-58220

Recyclable Housing: The Challenge lies in Design

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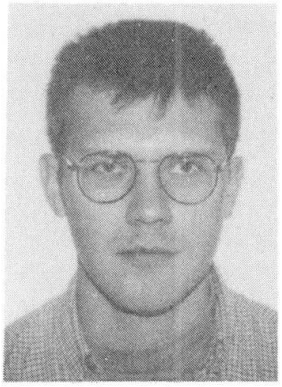

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Summary

Many misfits in our built environment come from the fact that building consumption is not acknowledged in architectural discipline. Recycling studies include the study of consumption and production and are therefore challenging as a 'locus' for future urban solutions.Legislation on design that includes recycling and re-use can change design procedures, the building process and materials production. To demonstrate some perspectives, a no-cost growing structure and novel fully recyclable and dismountable sandwich composites were constructed.

1. Introduction

The exponential increase of housing and building costs has a tremendous effect on social and city structures in Europe. People tend to stick to their heritage and thus increase traffic problems because of required work flexibility. Because of increased congestion and financial speculation, city cancers ruin previously healthy cities. Urban violence grows because of an urban poverty that is willing to live concentrated in city cancers. Many people are obliged to move into healthier regions. For those who can find some room to live in, building promoters and architects continue to impose non-existing social relations with building comfortable ruins around highways and airports. Displaced persons thus also voluntarily change more often from habitat and environment. Alternative co-habitation structures appear because of increasing costs. Building a house, i.e., the measure of a healthy economy, becomes rare. The building industry in cities becomes mainly employed in renovation. Most of the existing buildings are not adapted for integration of contemporary equipment, giving rise to further increases in building and labour costs.

This awareness also influences politicians and architects. Novel legislation appears on financial punishment of empty habitats. Current deconstructivist architecture is an expression of uncertainty. The only certainty we have is that what we build now, will block our future. The answer is to provide a possibility for change. In this paper it is examined how this can be done through development of recycling legislation. Because the construction industry in one of the largest producers of waste materials, the recycling and re-use of building materials is high on the political agenda. In practice, many building products and systems exist that have a potential for recyclability and dismountability. However, traditional irreversible building techniques continue to produce even more waste for the future. The recycling of these buildings can only lead to degraded products, because of contamination and ineffective design.

2. The End of Recycling

Stressing recyclability as a political prerogative did not lead to innovation in construction. The recycling business in the building industry tends to protect traditional building patterns. In Western Europe, recycling legislation has been directed towards concrete and masonry grinding. In Belgium, after the introduction of recycling legislation, exponential increases were observed in the number of concrete and masonry crushers, all of them at a relatively large distance outside of the city centre. Recycled granulates are used in road-building and concrete, creating a protective loop.

Other waste building materials are now seen as unwanted contaminants of the grinding process. However, in the near future, waste fractions from demolition waste will change, especially because of fast changing office and industrial constructions. For example, in Europe today, more than five million tonnes of plastic materials are used in construction each year and experts predict that this figure will rise to almost eight million tonnes by the year 2010 (APME 1995). Today only about 10% of the plastic consumption in the (re)construction industry is found back in construction and demolition waste (United Nations 1992, Casamassima et al. 1993).

Non-conventional building materials are usually carefully hidden in walls, roofs and floors. Think for example about cables, roofing, insulation, adhesives, furniture, polymer concretes and cements, and so on. In future recycling, today's recycling incentives will make less sense due to the fact that such materials are irreversibly connected to the main waste stream. For example, contamination of concrete and masonry rubble with more than 10% of gypsum, cellular concrete, lime stone, fibre containing concrete and/or other materials will lead to a refusal of the waste by the concrete and masonry crusher. Metals that are for more than 30% contaminated with concrete or organic products will be refused at the metal recycler. Insulated glass and mirror glass are refused by the glass recycler. Paper contaminated with plastic, glass or fibres will not be accepted at the paper recycler (Van Breusegem et al. 1995). Preserved and painted wood will mostly be denied as chemical waste (BW 1994). Polymers are put to disposal or burnt. Another consequence is that some these novel building products, being re-usable, will be damaged or irreversibly contaminated when they have to be dismounted and recycled. Pretending that future technology will manage the highly contaminated building waste streams is asking for a waste of energy. Many cleaning technologies have proved to be contaminating for the environment. Contamination should and can be avoided at the production stage, this is by the designer, the architect or the city planner. Building lords and contractors should promote the production of dismountable consumer buildings.

3. Towards Dismountability

Unlike recyclability obligations, dismountability and re-use obligations can lead to important changes in the way we design and build. Dismountability obligations might bring some solutions for current building problems, but also innovation in the building (product) industry.

Once the building is constructed, maintenance is now often forgotten. Maintenance is however an important economic issue. For habitats in Belgium yearly maintenance costs are about 1,27 - 1,60% of the initial building costs (Delrue 1982). This means that in 60 to 80 years a capital equal to the initial cost has to be spent on maintenance. These costs are higher for public buildings.