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B R I E F R E P O R T

INTERIOR WORKS APPROPRIATE FOR RECYCLING OF BUILDING MATERIALS

Project B I 5 - 80 01 90 - 3

by order of the
Federal Ministry for Regional Planning, Building and Urban Development

carried out by the
Institut für Industrialisierung des Bauens,
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1. Objective

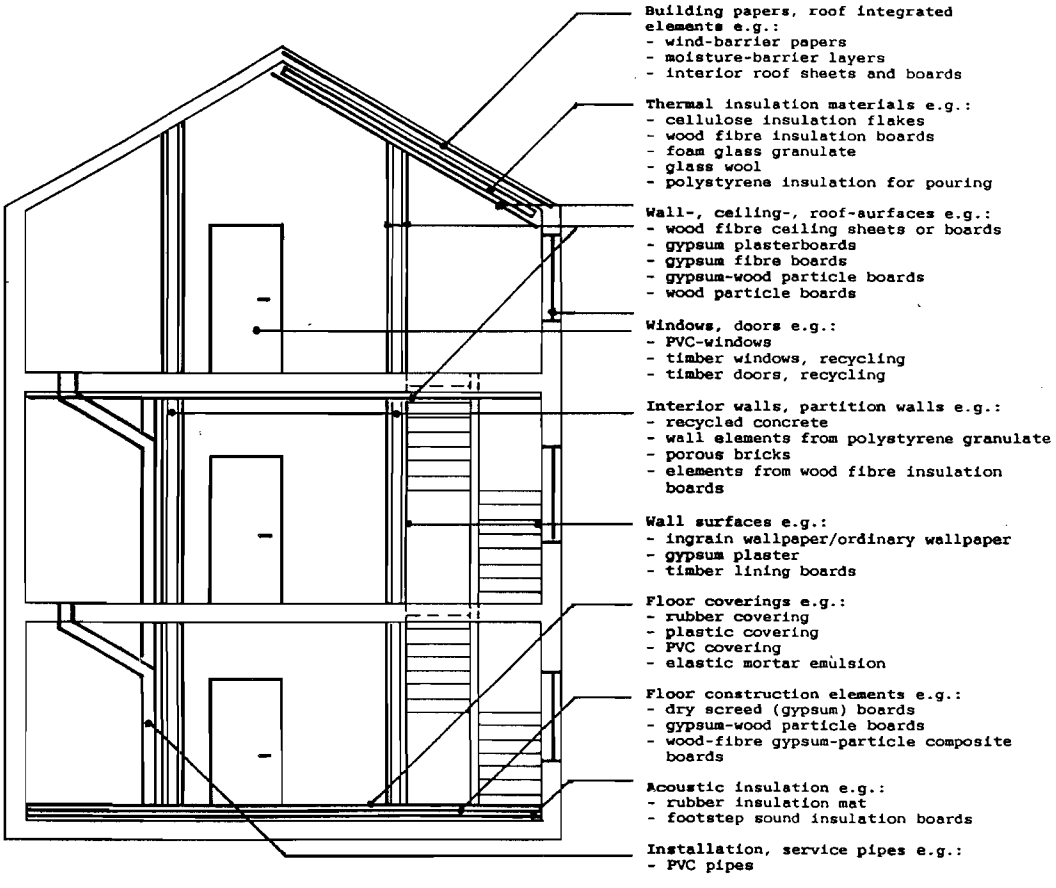
The main objective of this research project is to develop design aid and to illustrate possibilities for enhanced waste reduction by measures, which allow the immediate application of recycling materials now and on the other side the future separation into different recycable material. The focal point hereby are the very heterogenous materials for interior works, which create recycling problems especially due to the usual mixture of interior materials with each other and with the structural materials.

2. Implementation

The analysis of interior works appropriate for recycling of building materials was carried out under the following topics:

- description of the actual situation and the legal background
- pre-assessment of the relevance of different interior works for recycling with the help of quantity and cost data and the evaluation of bills of quantities and questionaires of producers
- illustration of interior works appropriate for the application of recycling materials with a catalogue of existing recycling products and a description of the conditions for their integration and for the possibilities of reuse of building components
- illustration of interior works appropriate for the future reutilization of the materials with a description of the conditions of respective upgrading processes and a description of possible modifications for better upgrading chances

- summary of the results with short term possibilities for immediate action and long term possibilities for further development; preparation of checklists as design and execution aid and of a basic description pattern for recycling products



Application of recycling materials in interior building works

3. Summary of the results

In many sectors of interior works already recycling products are on the market. They include secondary raw materials from the building industry and from other production branches as well. So it is already possible to realize quite a significant part of interior works with the help of recycling materials. A synopsis of material groups is shown in a catalogue of examples summarized for this project. The variety of application shows a scheme (figure).

For better possibilities of reutilization of building materials the highest priority under the aspect of upgrading processes has to be given to avoiding the mixture of materials. The optimum qualities of recycling-appropriate interior works can be summarized as follows:

- **destruction-free disassembly** into reusable components without extensive upgrading process
- **connections of building components and materials with long term dismountability,** easy displaceable wear-out-parts for a longer life-span and disassembly into different material types
- **connections with point- and edge fixture** instead of full surface connection (e.g. gene), physical and formal connection instead of chemical connection of materials and components
- **separation of different materials** into functional layers within the structure to facilitate disassembly of different materials and components for different upgrading processes
- **detailed specification of all integrated materials** of a building product for better identification of recycling possibilities and risks for upgrading processes

- **reduction of material variety** to facilitate upgrading processes

- wide reutilization possibilities for dismounted components through **standard dimensions and modular combination**

The most important condition for long term recycling concepts is the strengthening of responsibility of producers, planners, clients and executers of interior works for the disposal of waste materials created by them.

The following developments seem to be adequate to encourage this:

- Quick and efficient implementation of the legal requirements into practice, e.g. through the **exemplary function of official clients and planners by their choice of products** and a publication of exemplary decisions with the following priorities:

  1. **products with long life-span, which can be repaired without material wastes and destruction**
  2. **recycling products and products, which can be reutilized in future.**

- **Creation of stimulations for producers to** participate in self obligations for the back-flow of rest materials, e.g. by official promotion of such strategies or by officially announced and compulsory reutilization figures for a whole production branch.

- Promotion of measures, **which integrate already during the planning and execution stage strategies for reutilization in future.** A possibility could be the illustration of future dismounting and upgrading processes for the chosen construction in the phase of design approval and a separate identification of costs for execution and for waste disposal or recycling in the phase of cost planning.

- Enforcement of the creator principle, especially of contamination of building components during the phase of building utilization, to avoid disposal risks for the demolition or recycling company. The responsibility for such problems in the recycling circle has to be on the side of the building user. It has to be mentioned that already a quality control for recycled de-contaminated building material exists (RAL RG 501/2).

Examples for possibilities of action by planners to promote the application of recycling products and recycling-appropriate interior works are summarized in the following checklists No. 1 and 2.

- **Brief checklist 1: Application of recycling-products in interior building works**

  - o establish and up-date a locally based market synopsis of recycling products and traders
  - o establish and up-date a list of executing firms with experience on this field
  - o establish and up-date a list of reference projects (your own and others) with application of recycling materials
  - o advise the client to consider recycling materials (with the help of the above mentioned lists)
  - o ask producers and executing firm for standard work-specifications with recycling products
  - o indicate in the work-specifications the possibility to diverge from the general rule (VOB part C, DIN 18299) of application of unused new materials

- o differentiate during the planning stage between load-bearing and non-load-bearing components to promote the possibilities of application for mineral recycling materials with lower structural potential (e.g. concrete with brick- or concrete-granulate)

- o create light-weight structures (e.g. partition-walls) for the application of recycling insulation material and boards or panels

- o check possibilities for project integrated recycling of existing components in modernization projects (protection of components in situ or dismounting, upgrading and remounting)

- o check possibilities for the integration of upgraded used component from other projects or component stores

- **Brief checklist 2: Planning of future reutilization**

  - o demand declaration of material contents and dismounting and recycling conditions from producers of components and building materials

  - o establish and up-date a list of local producers and firms who take back their used products

  - o establish and up-date a list of local collecting systems for material recycling

  - o establish and up-date a list of local firms or organizations for upgrading of building components, which sometimes take over the dismounting of used components before demolition or modernization works free of charge

- advise the client to consider products with long life-span, easy repair and/or possibilities for recycling through the manufacturer or above mentioned collecting systems
- assessment of waste material quantities and qualities of different construction types
- create separate repair- and replace-possibilities for single components with different life-span
- create separate functional layers and easy dismountable connection techniques for different components and materials
- minimize material variety and consider compatibility of materials for future upgrading processes
- integrate adaptable and mobile building elements
- determine a separate collection of materials on site according to local upgrading possibilities
- determine the back-flow of packing materials to their supplier if they cannot be avoided