CIRCULAR DESIGN: REUSED MATERIALS AND THE FUTURE REUSE OF BUILDING ELEMENTS IN ARCHITECTURE. PROCESS, CHALLENGES AND CASE STUDIES.

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INTRODUCTION

Presentation plan:
• Design process
• Challenges
• Case studies
• Conclusions
DESIGN PROCESS: THE REUSE OF MATERIALS

- interdisciplinary and flexible design process
- elongated introductory phase
- detailed assessments of materials
- specialist consultations
- material tests
- expertise to meet obligatory standards
- flexible cost plan and project schedule
- defined environmental goals
- additional research, data collection
- defining optimal ways of materials’ sourcing, processing and adapting for the new use
- iterative modifications of the project and specifications during the whole design and construction process (non-linear design process)
DESIGN PROCESS: DESIGNING FOR REUSE

- interdisciplinary and flexible design process
- extended introductory phase
- specialist consultations
- material tests
- lifecycle analysis
- defined environmental goals
- additional research, data collection
- guidelines for future users of the building, for its maintenance and disassembly
- defining future waste streams and optimal ways of the future reuse of building materials
DESIGN PROCESS: MAIN DIFFERENCES

• the standard design and construction process

  Data and information for new materials

  Introductory project

  Detailed project

  Specification

  Purchase of building materials

  Construction

• the design and construction process with reused materials

  Introductory project

  Detailed project (redesigning)

  Detailed project and specifications

  Purchase of reused materials

  Construction

  Possible modifications

• the design and construction process for future reuse

  Design for disassembly (DfD)

  Construction

  Use

  Disassembly

  Reuse / Recycling of building materials

  Design process
# Reuse and Design for Reuse (DFR) in Comparison to the Standard Design Process

Table 1. Reuse and design for reuse (DFR) in comparison to the standard design process

| Introductory design phase | Reuse and DfR: elongated time framework, additional data collection, research, consultations, interdisciplinary collaboration, environmental goals definition  
|                          | Reuse: materials sourcing, storing, testing and processing; application for permits for the use of non-standard solutions and materials  
|                          | DfR: future waste streams definition; disassembly and reuse scenarios plan  
| Project and specification | Reuse: flexible and modifiable cost plan, project schedule and specification  
|                          | DfR: identification and signage of material content; identification of waste streams, disassembly procedures and reuse scenarios; guidelines for maintenance, servicing and disassembly  
| Education                | Reuse and DfR: necessary educational programmes (university level) and reuse-oriented training for professionals  
| Absence of standardised processes and construction methods | Reuse and DfR: necessary development of standardised tools and technologies for materials sourcing, processing and construction  
|                          | DfR: definition of future sourcing, processing and construction methods |
CHALLENGES

• lack of data about materials’ availability, amount, quality and ways of sourcing or processing
• lack of adequate education for designers
• no demand for such projects among the general public
• ineffective/insufficient collection, segregation, processing and transport infrastructure
• inadequate disassembly procedures
• contamination of secondary resources
• unstable properties of reused materials
• lack of material certification
• difficult identification of material content
• debatable aesthetic
• higher cost of construction/ regarded as a more expensive solution
• lack of adequate business model framework
CHALLENGES

• economic aspects: level of economic development, the demand for reused materials, the presence of economic incentives
• existence of adequate spatial and pro-environmental policies
• flexible and holistic approach to regulations and codes
• urban planning (urban density, typology, function)
• adequate building design
• adequate choice of building materials (forms, dimensions, volume, age, technical properties, aesthetic condition recycling potential)
• amount of waste, the frequency of renovation, the lifespan of a building
• environmental impacts: energy, water consumption, air pollution
• impact on human health
• social determinants: human customs, behaviours and daily practices, environmental awareness, social perception, authorities’ awareness, social status and engagement
Plattenpalast, Berlin, by Wiewiorra Hopp Architekten

Source: U. Kozminska
Warssawa Manufacture, Konstancin-Jeziorna, by Mech.Build
Resource Rows, Copenhagen, by Lendager Group

Source: U.Kozminska
CONCLUSIONS

The architects are working with construction waste, or they design for further reuse despite **limited access to related knowledge** and data. They **educate** themselves, **source** materials and **experiment** with them, consult architectural solutions with experts, participate in **collaborative** processes, learn from the engineers, contractors, demolition companies, or local artisans. They **look beyond tested solutions** and question standard practices.

The emerging role of the architect, who participates in the circular design process, requires **extended knowledge to negotiate between often contradicting circumstances** without compromising the quality of created sustainable architecture.

The transition towards **more circular practices in architecture requires multi-level actions** concerning development strategies, policies, legal regulations, planning procedures, institutions, economic incentives and education.
THANK YOU