

The VTT logo consists of the letters 'VTT' in a bold, white, sans-serif font, centered within a dark grey rectangular box.

Overview of the EU project

PROGRESS

PROVISIONS FOR GREATER REUSE OF STEEL STRUCTURES

Petr Hradil

VTT Technical Research Centre of Finland
Steel Reuse event, 8.10.2019 London

What is reuse?

Products designed to survive harsh conditions in several lifecycles



Picture credits: Arianne Group Holding

15.10.2019 VTT – beyond the obvious

or management of industrial waste ?

February 27, 2014

Construction-waste recycling gets a boost

TECHNOLOGY > CLEANTECH & ENERGY > RECYCLING



The purpose of VTT's project is to look at how used building components and construction waste can be utilised more extensively.

LEHTIKUVA / MATTI BJÖRKMAN

... but steel structures are already reused

Example of consult that supervised relocation and reuse of hundreds of steel halls.

HALY-SKLADY.CZ
 +420 773 100 767
 info@haly-sklady.cz





nabídka hal - archiv

archiv prodaných nabídek / [seznam nových nabídek](#)

č. n.	foto	plocha	šířka	délka	výška	výrobce	cena	okres / kraj	akce
126		840m ²	15m	56m	7m	SVITAP	1 890 000,- Kč	BŘ / JM	
403		840m ²	20m	42m	10m	ZD Lučany	720 000,- Kč	PHV / STČ	

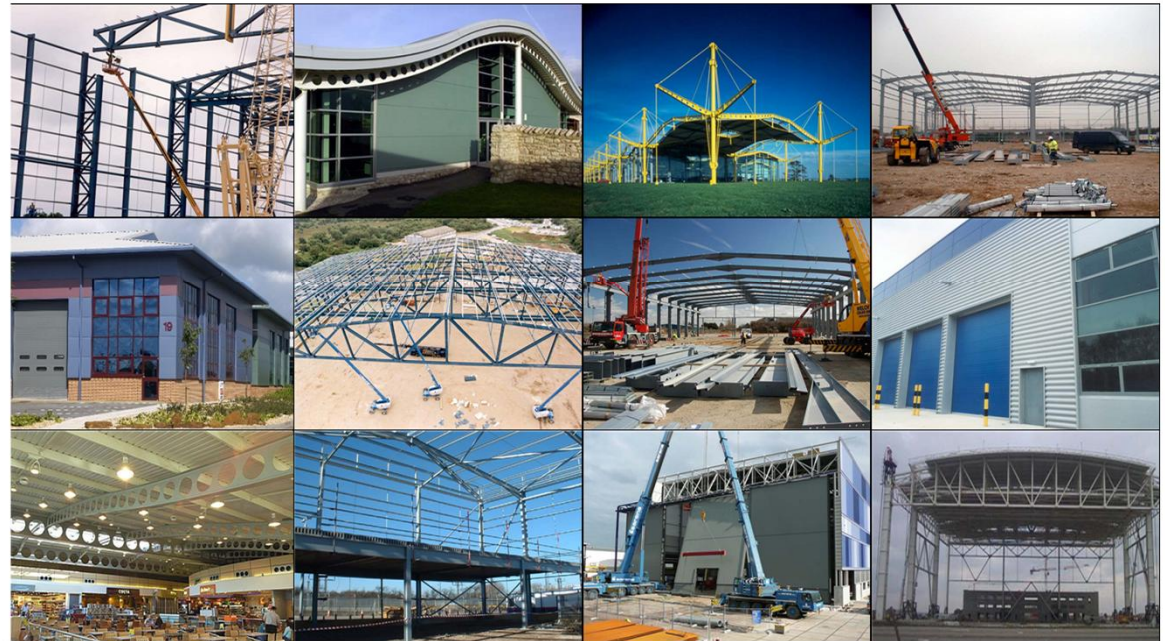
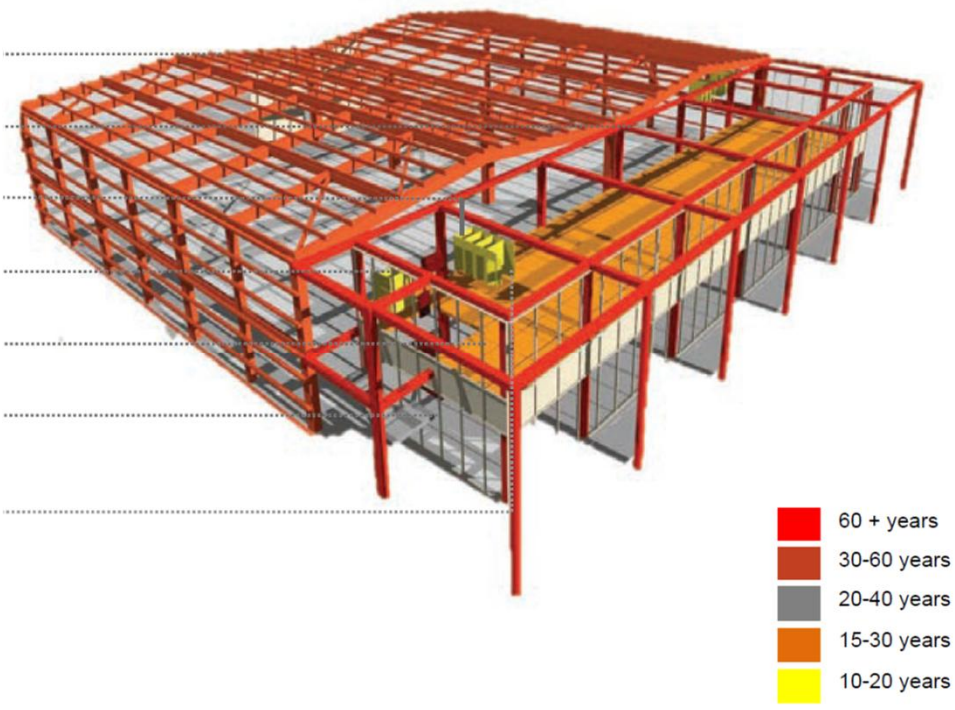
“We need to optimize, to improve and to circularize the built environment as a system”

Martin Stuchtey, World Circular Economy Forum, Helsinki 2019.

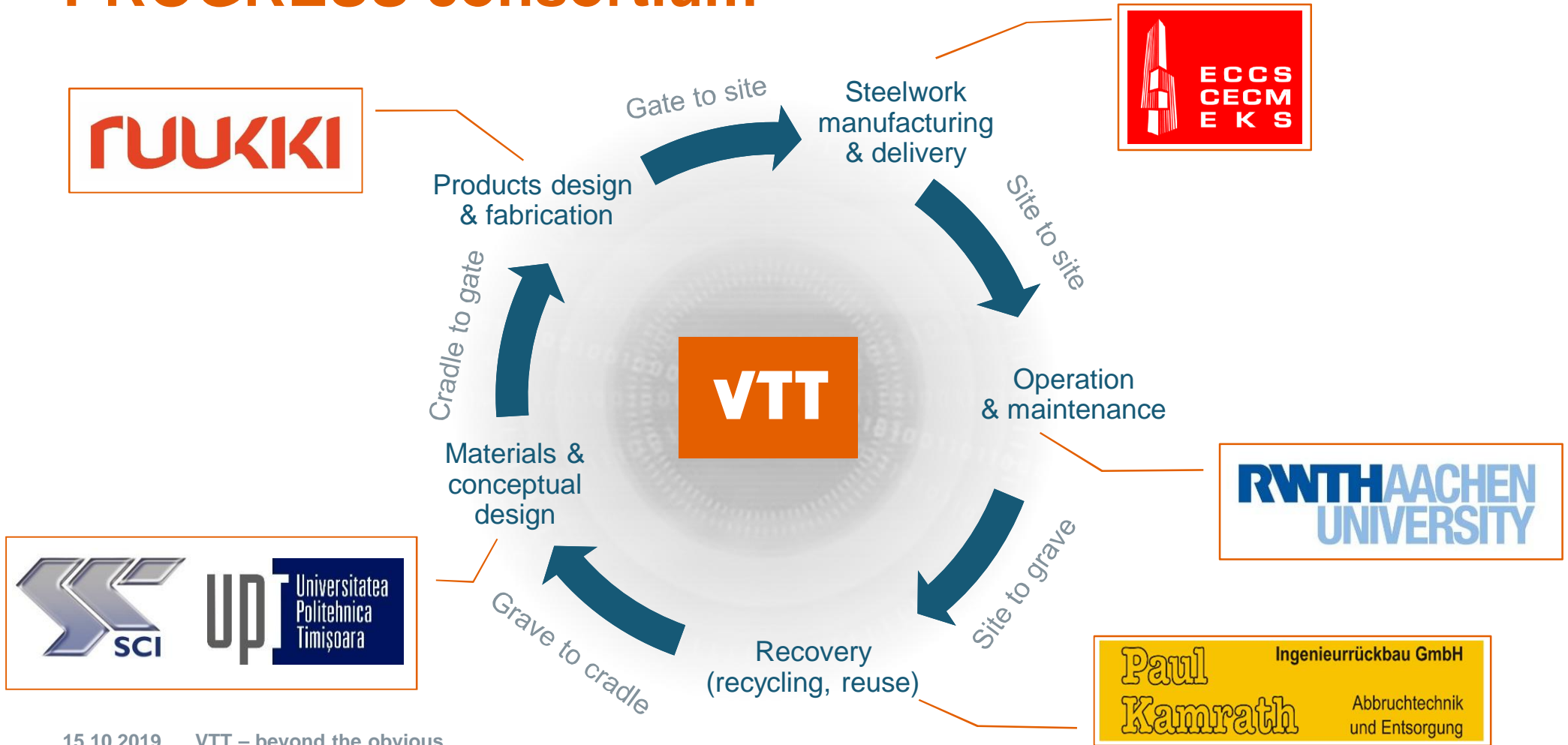
This is not enough as most of the structures clearly miss the opportunity of being reused.

PROGRESS scope

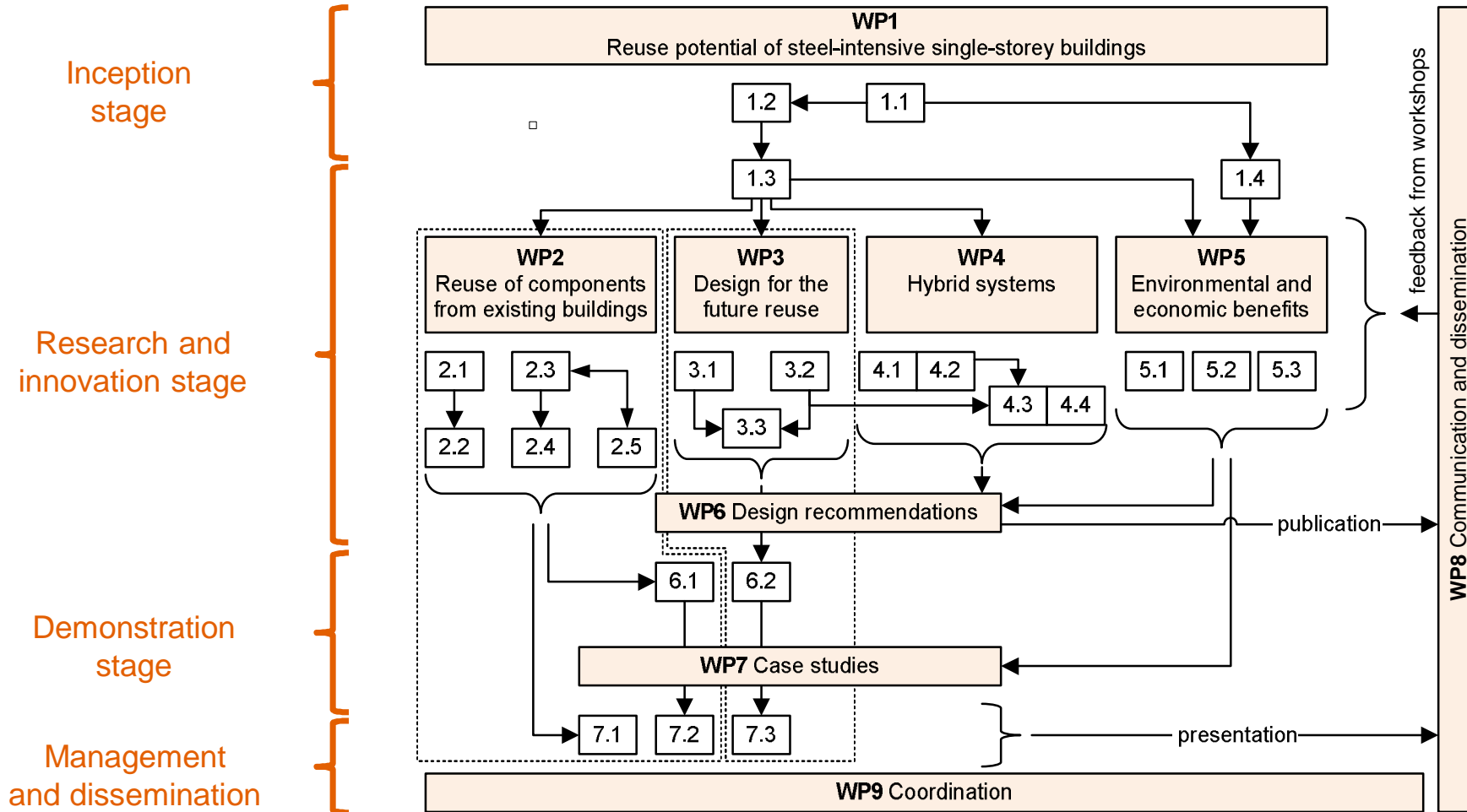
Systemic approach can be easily developed on such structures that are technically fit for reuse. Therefore, PROGRESS focuses on single-storey steel buildings, their primary and secondary steelwork and envelope.



PROGRESS consortium



PROGRESS work description



PROGRESS outcomes

Design guides	Design from reused elements Design for deconstruction and reuse
Methodologies	Assessment of reusability Declaration of environmental impacts Economic assessment
Protocols	Pre-demolition inspection Deconstruction protocol Material testing protocol
Tools	Online trading portal and possibly 1-3 smaller tools
Case studies	Testing of methods and protocols Design for improved reusability Design from reused elements



Highlights from the project

2017-2020

PROGRESS

PROVISIONS FOR GREATER REUSE OF STEEL STRUCTURES

Assessment of reusability

Technical reusability (similar principle to BRE Design for Deconstruction)

Component $r = \sum \rho_i w_i$

Performance assessment result (%) ρ_i

Weighting factor for each performance category (%) w_i

Building $R = \frac{\sum m_i r_i}{\sum m_i}$

Component mass (t) m_i

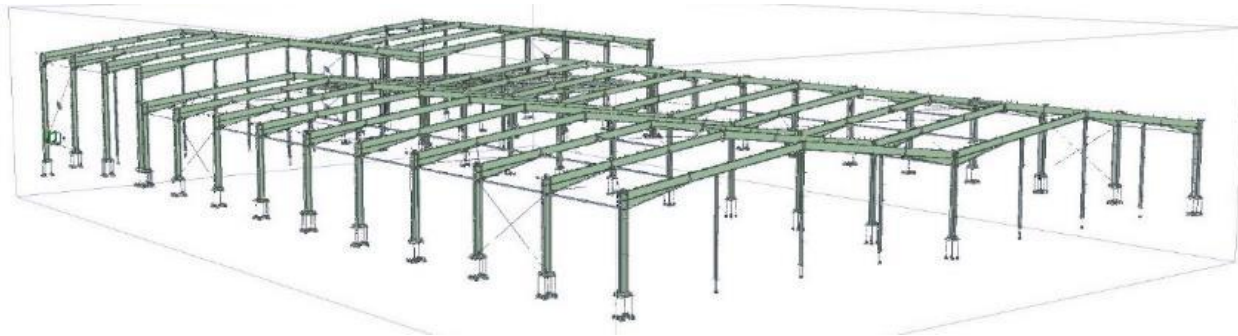
Economic prospect (complementary score based on building statistics)

Component $e = P(c_1 \cap c_2 \cap \dots) n$

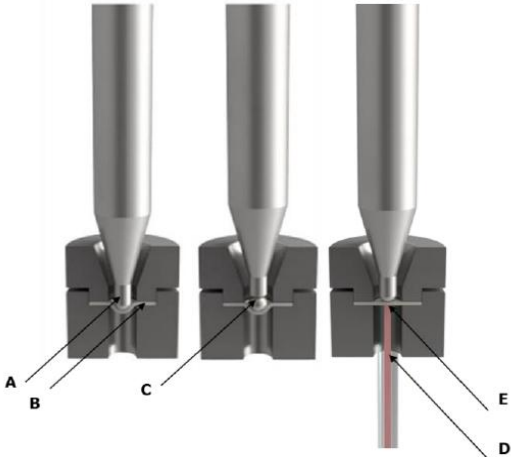
Criteria (e.g. span, height, floor area) c_1, c_2, \dots

Number of new buildings in the selected area and time span n

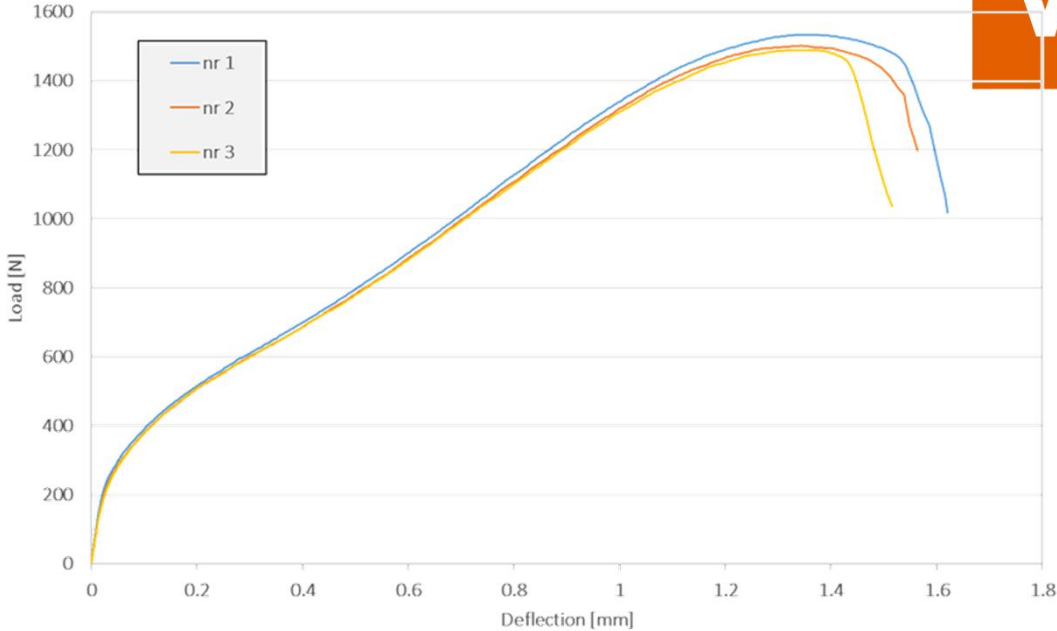
Building $E = \frac{\sum m_i e_i}{\sum m_i}$



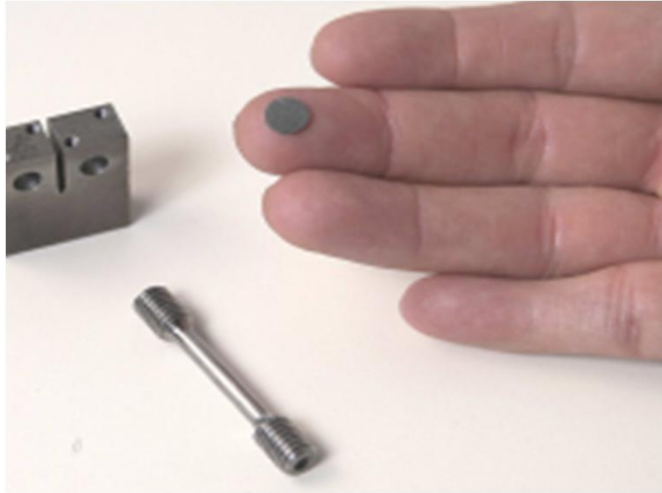
Small punch testing



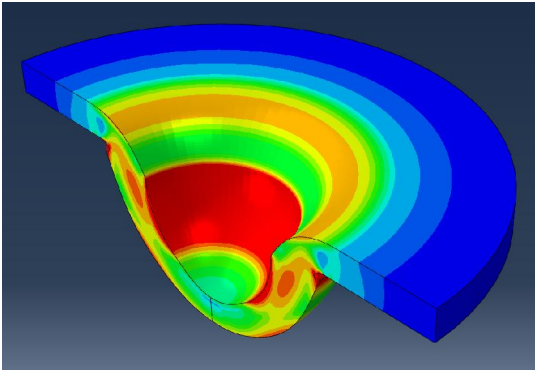
Load-deflection diagram



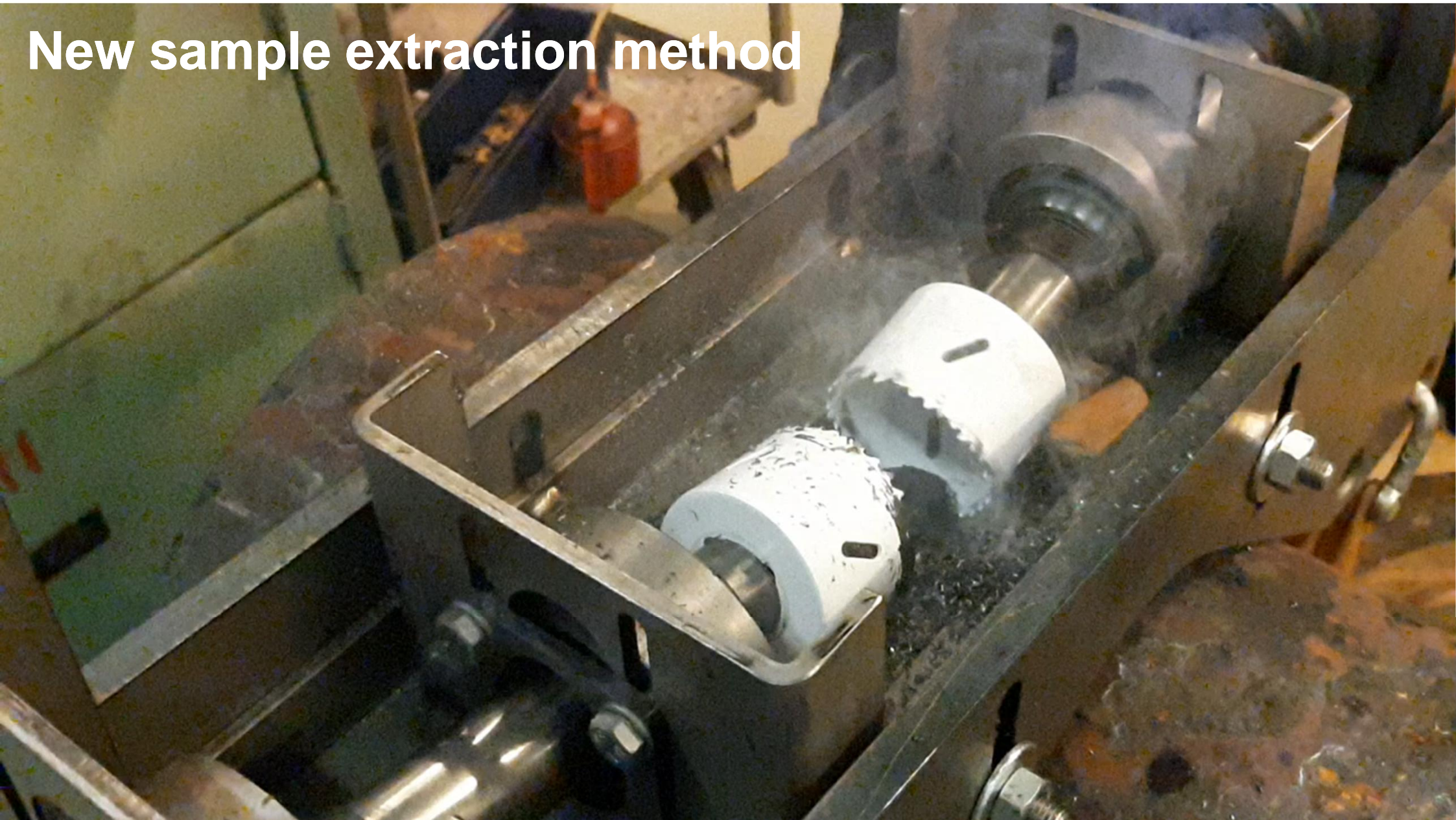
Full material model using reverse FEM calculation



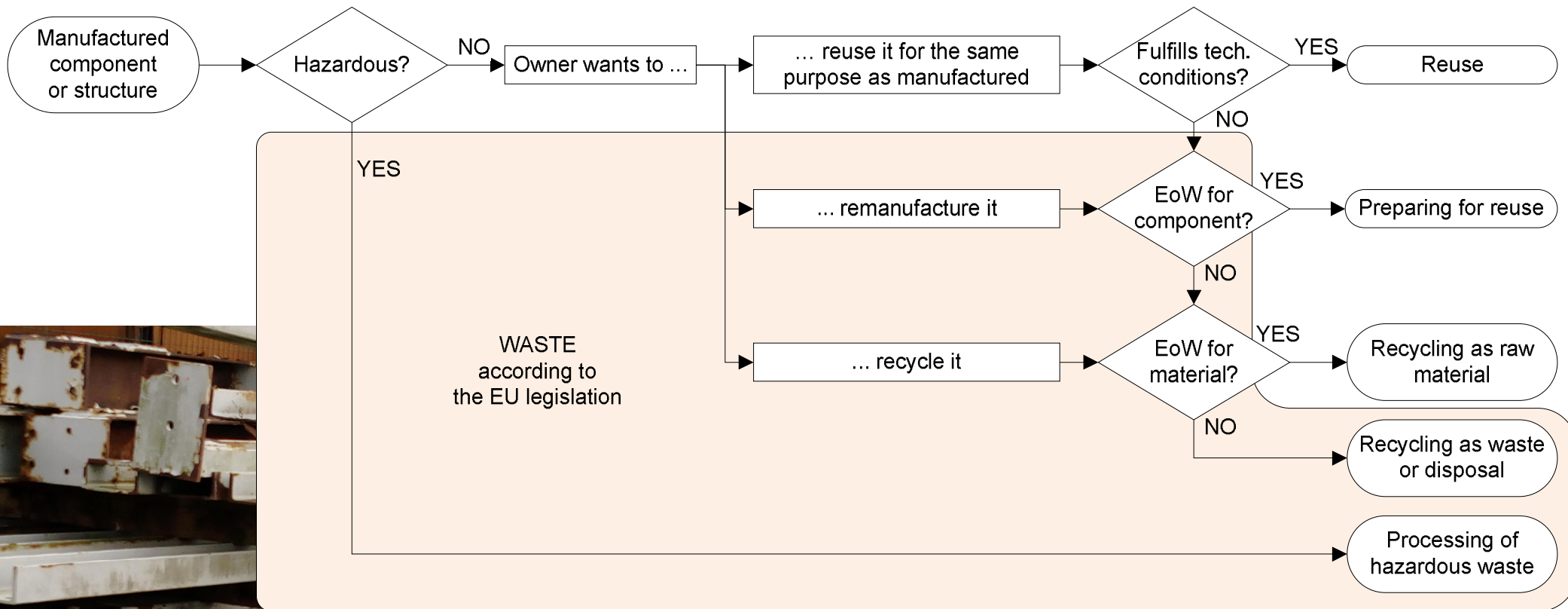
Yield and tensile strength from prEN15627



New sample extraction method



Clear definition of waste and product



Vision of the future reusable buildings



High end-of-life value

Future owners aware of the value of their property at its end of life. Supply chain actors actively offering reusable components for sale before the deconstruction.



Reusable Building Information Models

BIM objects for the new building design equally sourced from the product manufacturers and second-hand material dealers.



Reversible and scalable design

Buildings will be designed for deconstruction and reuse. The evolution of future building requirements (e.g. relocation loads, thermal insulation) will be anticipated.

Acknowledgements

§ Project PROGRESS has received funding from the Research Fund for Coal and Steel under grant agreement No 747847, Ruukki Construction, Ramboll Finland, Peikko Group and Jernkontoret.

