



CoLab

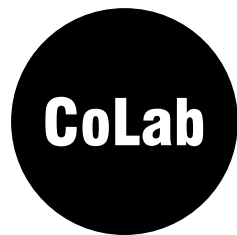
DESIGN MATTER

Designing materials made of waste

WS22-23 | FG Borrego

Collaborative Design Laboratory
Architekturdarstellung und Gestaltung

We are



Collaborative Design Laboratory
info@colab.tu-berlin.de
www.colab.tu-berlin.de

Technische Universität Berlin
Fak. VI - Institut für Architektur
FG Architekturdarstellung und Gestaltung

Sekr. A28, Raum A812
T: +49 [0] 30-314-72730
Straße des 17. Juni 152, 10623 Berlin

CoLab is a collaborative design laboratory whose aim is to examine certain interfaces that exist between design strategies and design processes in contemporary industry in order to apply a model - based on collective work in design practice and architectural representation.

Between designers and the manufacturing trades there is still a lack of communication and interaction. In order to bridge this gap and to promote good cooperation, design practice, architectural representation and production processes are included in projects, the success of which is based on working together.

CoLab Berlin is part of a larger network that also includes a team in Madrid where it was founded in 2009. CoLab Berlin is based in the department of architectural representation and design at TU Berlin.

Director	Prof. Dr. Ignacio Borrego	borrego@tu-berlin.de
Wissenschaftliche Mitarbeiter	Dr. Gaizka Altuna Andreas Woyke	altunacharterina@tu-berlin.de andreas.woyke@tu-berlin.de
Studentische Mitarbeiter	Karolina Rysava Katerina Tzouvala Clemens Trautwein	karolina.rysava@tu-berlin.de tzouvala@campus.tu-berlin.de clemens.trautwein@campus.tu-berlin.de
Office	Shanice Zimon	shanice.a.zimon@tu-berlin.de

Introduction

DESIGNING A MORE SUSTAINABLE FUTURE

We live in a dramatic environmental situation where climatic change and abuse of natural resources is overtaking all future agendas.

The building industry is responsible for a relevant contribution to the CO2 emissions and any sustainable initiative has become a necessity.

We should not produce waste and we need a new approach to our resources. Waste has to become our new material. We are in the time of recycled materials and renewable energies. How can we build with our own waste?

This necessity of reducing our waste is a process that needs technical solutions and general consciousness, so we should focus both on the scientific research to make it feasible and at the same time communicating this necessity to the society to be able to accelerate the change of paradigm.

In this context any teaching experience where students face a real construction is an opportunity, and at the same time a responsibility, to introduce these sustainable requirements and make them part as a manifesto to complement the learning contents of the experience.

This is why we have started researching the potential of building with the waste , taking advantage of the new digital fabrication tools.



Students building the Crush Up pavilion. July 2022.

Background

PREVIOUS EXPERIENCES: CRUSH UP!, RECYCLING OUR OWN WASTE

Building from recycled materials is not a new topic in our department. We have been researching and organizing seminars on the subject for several years.

Our latest milestone was the Crush Up! pavilion, a 6.00m diameter hemispherical construction that was made from the waste generated by TU Berlin's own Institut für Architektur.

This pavilion was designed and fabricated over the course of three seminars and finally built in July 2022. A total of almost one hundred students participated in this collaborative project.

More than half a ton of waste was recycled, where it was possible to find materials of all kinds such as: student models, packaging, plans, scraps of wood and cardboard, old prototypes, sawdust produced by the workshop's cutting machines... To process all this waste into a building material, less than 30 kilos of paste were used. More than 230 components were made from this material.

The construction of the Crush Up pavilion was the conclusion of a phase, so now we are ready to start a new stage of our research, where we will address new challenges.



Detail of the Crush UP Pavilion built for IFA Ausstellung 2022. Photo by Ignacio Borrego

Task

A NEW AIM. RECYCLING AARHUS' WASTE.

Can we turn a problem into an opportunity?

Could our own waste be a potential resource to improve our environment?

It is necessary to reduce our energetic and material consumption and this balance could be improved if we can give our waste a new life.

Last semester we have successfully built a pavilion for the exhibition at the end of the year with the collaboration of 90 students along three semesters. During that time, we have analyzed the waste that we produce; we have developed a research on the way we could recycle our waste in a sustainable and reversible way; we have collected the waste of our Institute for Architecture for the last two semesters (models, prototypes and office and workshops waste) and we have finally built the pavilion in the foyer of the Institute for Architecture in July 2022.

We would like to transfer this experience to the scale of the city of Aarhus, through a real collaboration with its municipality. We could analyze the waste that is produced in some selected neighborhoods and find the way to recycle some of it to produce urban furniture that could improve the public space and at the same time send an awareness message to the inhabitants of each neighborhood about the need to value all our resources, save energy and ultimately take care of our environment. This message could be even more effective if the target of the space are the children: awareness and education. We propose to provide each analyzed neighborhood with a public playground that answers both to the population and to the recycling process.

Our research has two main research lines: on the one hand we have to analyze and select the waste we are going to work with and the way we can

recycle it, on the other hand we want to imagine how this recycling process could provide a neighborhoods with real interventions on the public space. This two approaches should be connected and therefore the final products shall be influenced both by the spatial and functional requirements of a specific neighborhood, but also by the properties of the waste to be recycled.

Ideally, we are looking for a set of systematic interventions that are adapted to the site in a very deep meaning of the context, considering also the kind of waste that is produced at each place. The final variety of projects could be a catalogue of interventions revealing the awareness of the local population but also the characteristics of each neighborhood.

In this first semester we aim to define the waste resources and start a brainstorm of possible playgrounds to be developed and built in further academic semesters.



Aarhus. Source: <https://marketplace.intelligentcitieschallenge.eu/en/cities/aarhus>

Structure

KNOWLEDGE COORDINATION AND INTEGRATION

During this seminar we will work in groups of 3 to 5 members (depending on the total number of students). It will be necessary to approach the project from different areas of knowledge: urban design, material science and manufacturing. The success of the project will depend to a great extent on the correct integration of these three areas of knowledge. That is why each member of the group will have to adopt the role of a specialist in one of these areas.

- The **urban design** specialist will be responsible for integrating the design into the city and making sure that it meets the needs of the citizens of Aarhus.
- The **materials science** specialist shall be responsible for the circular transformation processes to produce building materials from the waste of the city of Aarhus.
- The **manufacturing** specialist should be responsible for the manufacturing processes and assemblies that must be carried out to manufacture all the elements that make up the final product.

However, even if there are different specialists in each group, the final work will be evaluated as a single collective work, so it will be fundamental that all the specialists work together to integrate their knowledge.



RUS Lima by Basurama. Source: <https://basurama.org/proyecto/rus-lima-autoparque-de-atracciones/>



Precious Plastic. Source: <https://preciousplastic.com/>



Mycro Tree by Hebel + Block. Source: <https://block.arch.ethz.ch/brg/project/mycotree-seoul-architecture-biennale-2017>

Structure

PHASES

The course will be developed in three phases:

Phase 1. Overview + Contextualization. In this first phase two parallel investigations will be carried out. On the one hand, different Playground cases will be studied from the different specialties (types of uses they house, types of materials used and how they are built/manufactured). On the other hand, the current situation in Aarhus should be studied, also from the three specialties (what uses does the city need, what kind of materials are available and what processes can be used to recycle them, and how building components can be manufactured from the new materials).

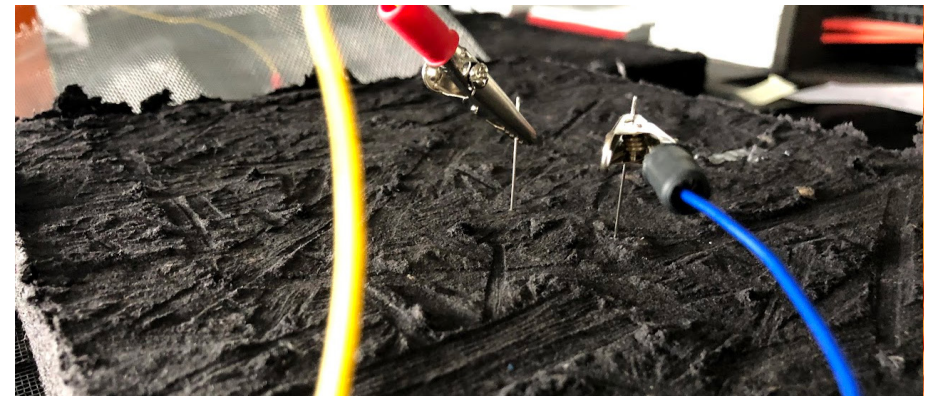
Phase 2. Focus. The second phase will cross-reference the knowledge produced by the two investigations carried out in the first phase. The objective of this phase will be to decide which program will host the design, which materials will be used and which manufacturing and assembly models will be explored.

Phase 3. In this third phase, the project will be developed in an integral way, attending at all times to the aspects that concern the three specialties mentioned above.

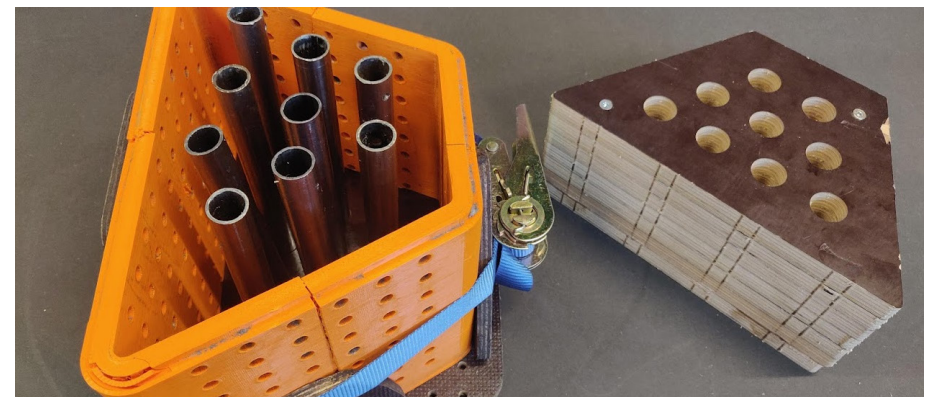
During the seminar a total of 6 submission will be required. Besides that there will be weekly supervisions.



1/10 Model of the CrushUp pavilion. Photo by Ignacio Borrego.



Monitorization of Early material prototypes from the CrushUp research. Photo by Karolina Rysava



Formwork for fabricating an early prototype from the CrushUp research. Photo by Thomas Pearce

Structure

PHASE 1: SEARCH

PHASE 2: DETECT PHASE 3: SOLVE

PHASE 4: DELIVER

Submission 1.
OVERVIEW + CONTEXTUALIZATE
01.11.22

Submission 2.
FOCUS.
15.11.2022

Submission 3.
DEVELOP I
06.12.22

Submission 4.
DEVELOP II
10.01.23

Submission 5.
DEVELOP III
31.01.2023

Submission 6.
FINAL PRESENTATION
21.02.2023

		Submission 1. OVERVIEW + CONTEXTUALIZATE 01.11.22	Submission 2. FOCUS. 15.11.2022	Submission 3. DEVELOP I 06.12.22	Submission 4. DEVELOP II 10.01.23	Submission 5. DEVELOP III 31.01.2023	Submission 6. FINAL PRESENTATION 21.02.2023		
ROLE	A. Urban Design	<p>Design Questions</p> <p>What kind of uses can a playground have?</p>	<p>What kind of uses does Aarhus need? Where in the city?</p>	<p>Which kind of uses will the design hold?</p>	<p>What is the design of the playground? 1/100 aproach</p>	<p>What is the design of the playground? 1/50 aproach</p>	<p>What is the design of the playground? 1/50 aproach</p>	<p>Summary of all the previous questions</p>	
		<p><i>Formats</i></p>	<p><i>Case study. Catalog of uses.</i></p>	<p><i>Informed map of Aarhus + Plan of the Area + Diagrams</i></p>	<p><i>Diagram of uses Schematic Floorplan, Elevation, Sections and Axonometric</i></p>	<p><i>Floorplan 1/100 Elevation 1/100 Sections 1/100 Axonometric</i></p>	<p><i>Floorplan 1/50 Elevation 1/50 Sections 1/50 Axonometric</i></p>	<p><i>Floorplan 1/50 Elevation 1/50 Sections 1/50 Axonometric</i></p>	<p><i>Situation map 1/500 Floorplan 1/50 Elevation 1/50 Sections 1/50 Axonometric Renderings Model</i></p>
	B. Material Science	<p>Design Questions</p> <p>What kind of materials are used in playgrounds? Which kind of properties do they have? Which materials are used for what purpose?</p>	<p>What kind of materials are available in Aarhus?</p>	<p>Which kind of source matter will we use? How to transform it?</p>	<p>How does the new matter behave?</p>	<p>How does the new matter behave?</p>	<p>How does the new matter behave?</p>	<p>Summary of all the previous questions</p>	
	<p><i>Formats</i></p>	<p><i>Case study. Catalog of materials and its properties</i></p>	<p><i>Catalog of available materials: Properties of the materials before and after its recycling + their life cycle</i></p>	<p><i>Source matter samples A prototype set. Transformations of source samples</i></p>	<p><i>Material tests on previous Prototype set. New prototype set</i></p>	<p><i>Material tests on previous Prototype set. New prototype set</i></p>	<p><i>Material tests on previous Prototype set. New prototype set</i></p>	<p><i>Informed catalog of matter prototypes: Production diagram Relevant physical Properties Life cycle diagram</i></p>	
C. Fabrication	<p>Design Questions</p> <p>How are playgrounds built?</p>	<p>How we can transform the available materials?</p>	<p>How to fabricate components?</p>	<p>How to assemble the components?</p>	<p>How to assemble the components?</p>	<p>How to assemble the components?</p>	<p>Summary of all the previous questions</p>		
	<p><i>Formats</i></p>	<p><i>Case study. Catalog of assemblies and construction</i></p>	<p><i>Diagram + Catalog of ways of processing the available materials</i></p>	<p><i>Diagram of the fabrication process</i></p>	<p><i>Exploded Axonometric Component + Assembly prototype</i></p>	<p><i>Exploded Axonometric Component + Assembly prototype</i></p>	<p><i>Exploded Axonometric Component + Assembly prototype</i></p>	<p><i>Fabrication process (Diagram) Catalog of components Catalog of joints Assembly instructions 1/1 Joint of 2 component</i></p>	

Calendar

WS 22-23

	DATE	INFO
	Tuesday 12:00 -14:00	
KW 42	18.10.22	First meeting / short introduction / organization of the groups
KW 43	25.10.22	Lecture by Andreas Woyke + Supervision
KW 44	01.11.22	Submission 1: OVERVIEW + CONTEXTUALIZATION Lecture by Maxie Schneider
KW 45	08.11.22	Supervision
KW 46	15.11.22	Submission 2: FOCUS Lecture by Marta Fernández Guardado
KW 47	22.11.22	Supervision
KW 48	29.11.22	Supervision
KW 49	06.12.22	Submission 3: DEVELOP I
KW 50	13.12.22	Supervision

	DATE	INFO
	Tuesday 12:00 -14:00	
KW 02	10.01.23	Submission 4: DEVELOP II
KW 03	17.01.23	Supervision
KW 04	24.01.23	Supervision
KW 05	31.01.23	Submission 5: DEVELOP III
KW 06	07.02.23	Supervision
KW 07	14.02.23	Supervision
KW 08	21.02.23	FINAL PRESENTATION

The sessions **will be presential** and will take place in room **A 204B**.

Exceptionally, they can be held online in the CoLab Zoom Room.

***CoLab Zoom-Room**

Link:<https://tu-berlin.zoom.us/j/92884189565?pwd=cFB4UFljRlJBbmRpc3JwNytWZmt-kZz09>

ID: 92884189565

Password: 20202020



Course information

REGISTRATION

Registration for the CrushUp 4 Course is organized through the MTS Platform.

1. Log in with your TUB username and password on <https://moseskonto.tu-berlin.de/soles/modultransfersystem/index.html>
2. In the left panel click on “Modulprüfungen” > “An-/Abmelden”
3. Click on “Neue Prüfungsanmeldung erstellen” button.
4. Follow the instructions of the portal.

The course name for BA Students is: #61363 Architekturdarstellung und digitale Fertigung II (BA)

and for MA Students: #61375 Architekturdarstellung und digitale Fertigung II (MA)

Registration and deregistration are possible from the 17th of October until the 13th of December.

COLLABORATION

For a smooth sharing of material, references, and general collaboration, we will be using a Miro Board, which you can access with the following link:

Miro board link: <https://miro.com/app/board/uXjVPMqzhoE=/>

Password: Colab2022

Recommended Bibliography

Baker-Brown, Duncan. *The Re-Use Atlas: A Designer's Guide Towards the Circular Economy*. Routledge, 2019.

Braungart, Michael, and William McDonough. *Cradle to Cradle*. Random House, 2009.

Gorgolewski, Mark. *Resource Salvation: The Architecture of Reuse*. John Wiley & Sons, 2017.

Hebel, Dirk E, Marta H Wisniewska, and Felix Heisel. *Building from Waste: Recovered Materials in Architecture and Construction*. Birkhäuser, 2014.

Lendager, Anders and Esben Pedersen. *Solution: Circular Buildings*. Danish Architectural Press, 2020





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