22090

Skinperium Dermatology Practice

Case study Zero waste

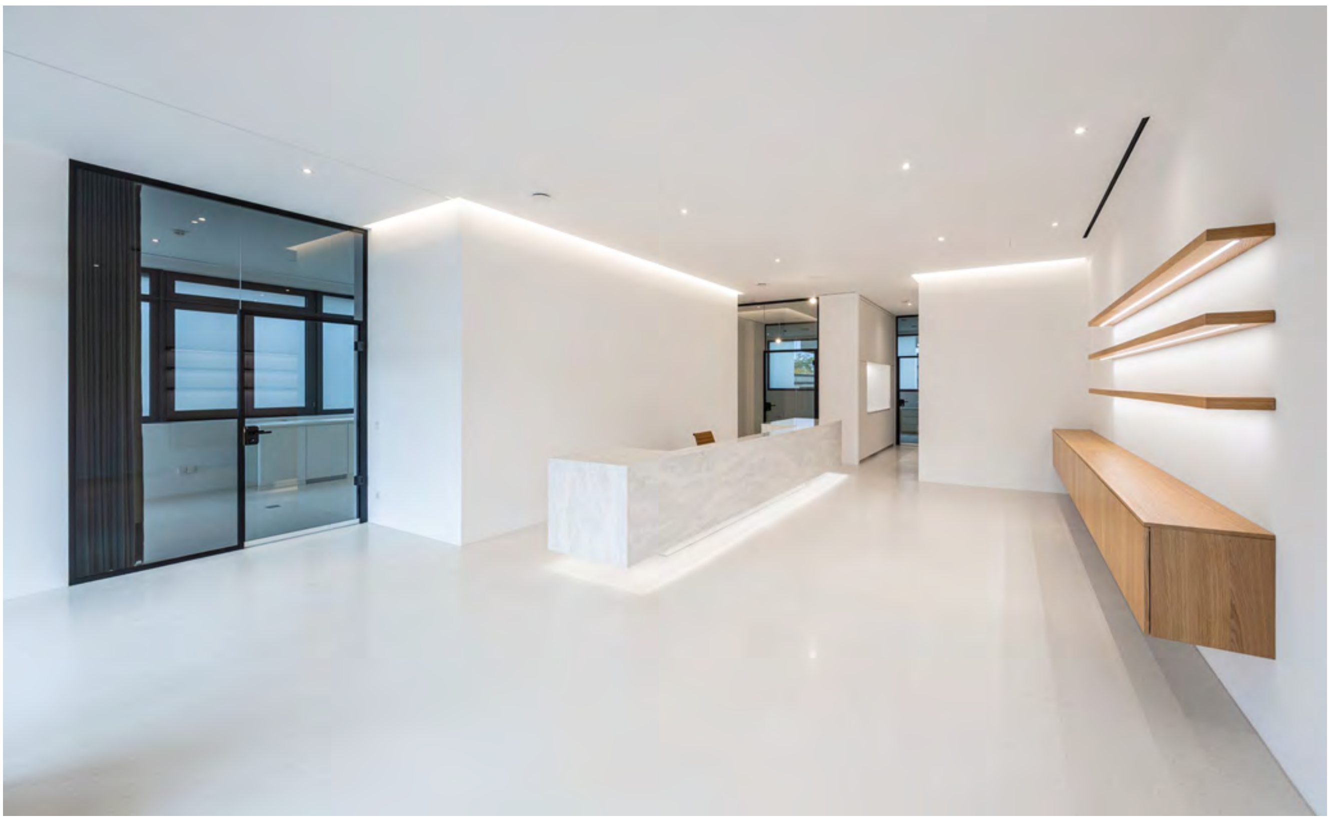
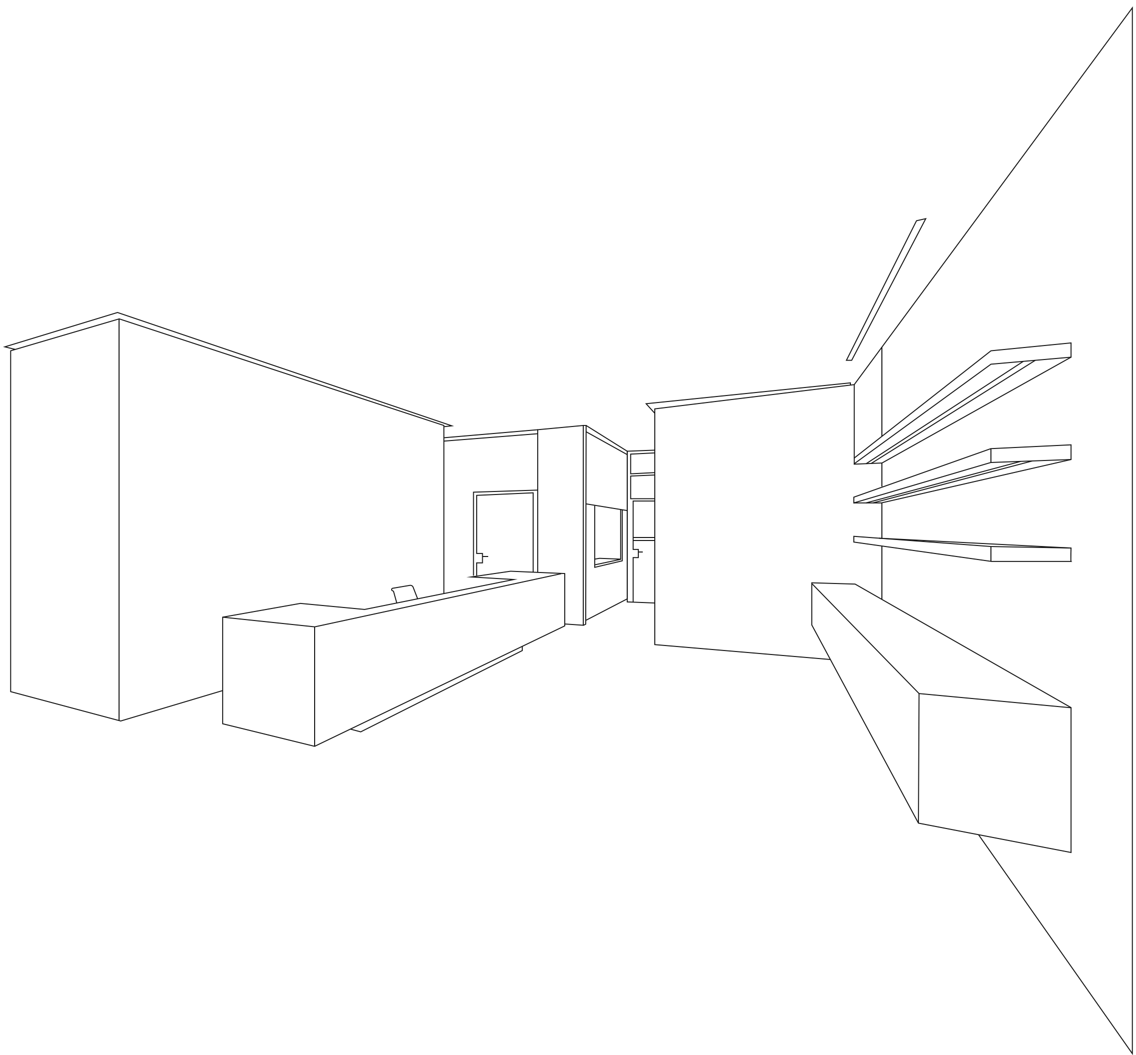


Fig. 00 The Skinperium project corresponds to applied research — entrance area SKINPERIUM © Steve Troes

Participants

Client	Dr. Chirstine Dierickx & Luc Haesaerts
Architecture	metaform architects
Project leader	GG Kirchner
Site managment	Philip Barnard
General contractor	Hubert Schmit
Sub contractor	SB Inbau
	Lindner
MEP	MKO
Painter	HöTT



01
Introduction & Motivation

01 Introduction

The Skinperium is a practice that was planned and realised according to the principles of zero waste. The guiding principle of the project is that it is not enough to simply recycle all products in order to act and build sustainably, but that a reduction in finite raw materials is urgently needed in order to save resources, waste and energy.

The joint goal of Dr. Christine Dierickx and metaform architects was to design the practice premises in a resource-saving and sustainable way. Particular attention was paid to the concept of zero waste. On a typical building site, construction waste accounts for around 30% of the total weight of the building materials delivered.

Dr. Christine Dierickx, a renowned dermatologist, envisioned a practice that would mirror the meticulous precision of her work. The result? Bright, white rooms adorned with subtle references to the doctor's aesthetic standards.

In Bertrange, Metaform architects transformed the ground floor of an apartment block into a dermatology practice that deliberately disconnects from the outside world. The design palette? Various shades of white.

Dr. Dierickx, well-known beyond Luxembourg's borders, is an outspoken perfectionist. Her vision for the new practice premises extended beyond aesthetics. Technical refinements, essential for her high-precision field, were seamlessly integrated. Traditional materials met modern sensibilities as the architects meticulously crafted the 180-square-meter space. Notably, they eschewed bold graphics and colors.

Sustainability was paramount. Dr. Dierickx emphasized resource-conscious choices. Timeless materials were employed, and a zero-waste ethos prevailed during construction. While exact figures on construction waste vary, Skinperium achieved an impressive reduction — only 3% waste, a testament to their commitment to both excellence and the environment.

The resource-intensive construction sector produces more than half of the waste that could be recycled. Innovations and certifications are key to implementing waste management throughout the entire building life cycle.

"The best waste is waste that is not produced in the first place."

01.1 Motivation

Our actions today determine our future - which is why climate-friendly construction, sustainable behaviour and the principle of the circular economy are more important now than ever before.

I (GG Kirchner) have been working intensively on the topic of sustainable construction since 2008 and have realised several pioneering projects over the years. These experiences have not only developed me professionally, but have also deepened my passion for environmentally friendly building practices.

Each of these projects was a milestone on our journey towards a holistic sustainable approach. The challenges and successes of these projects have inspired me to devote more time to the concept of zero waste.

For me, zero waste not only means reducing waste, but also a shift in thinking towards a circular economy model. My commitment to zero waste is based on the realisation that we as builders and planners can play a significant role in minimising the environmental footprint of our projects.

The current project, SKINPERIUM, is an exciting step in this direction. It combines the principles of sustainable construction with the ambitious goal of reducing waste to an absolute minimum. Through innovative material selection, intelligent planning and a consistent implementation of the zero-waste approach, we are striving to set a new standard for sustainable construction.

I am firmly convinced that our commitment to zero waste will not only bring environmental benefits, but also economic and social benefits in the future. It is my vision that zero waste will not just remain a concept, but will become a matter of course in the construction industry.

02
Construction Waste

02
Construction Waste

The waste generated during product manufacture (phases A1-A3) is not categorised as construction waste in Germany, but as industrial waste. In Germany, the liquid and solid waste generated during product manufacture is subject to a range of legal regulations aimed at preventing environmentally harmful and/or biotoxic substances from being released into the environment. This has led to adjustments in production, waste minimisation and largely regulated waste disposal. In terms of the technical aspects of sustainable construction, there appears to be little potential for optimisation.

The waste generated during the construction of a building can be divided into waste generated during product manufacture (phases A1 - A3 according to EN 15804), transport of the products to the construction site (phase A4 according to EN 15804) and waste generated during construction on the construction site (phase A5 according to EN 15804).

Gaseous waste, particularly climate-damaging gaseous waste, which is produced during the extraction and processing of building materials or components, is subject to virtually no quantity restrictions worldwide. They are also not recycled in any form. There is considerable potential for optimisation potential in this area, for which the material and component manufacturers bear responsibility.

The waste generated during construction on the construction site (phase A5) is divided into construction site waste and construction waste. In 2016, (mineral) construction site waste in Germany totalled 14.3 million tonnes, which corresponds to 6.7% of all mineral construction waste. As construction waste is also generated during the conversion and demolition phases (and is not quantified in detail during the construction, conversion and demolition phases), it is sometimes difficult to quantify the amount of construction waste generated during the construction phase.

Soil and stone as well as road demolition waste make up the largest proportion of construction waste in terms of volume. The liquid and solid waste generated on site during the construction of buildings is of minor importance in terms of volume. In Germany, they are largely disposed of in an organised manner. Gaseous waste, in particular climate-damaging gaseous waste, which is produced during the construction process itself, is of minor importance in terms of quantity.

The resources we use in our buildings are too valuable, too scarce and too energy- and CO2-intensive to be carelessly wasted or even thrown away. By applying the concepts of “zero waste” and “circular construction”, we can contribute to solving current and future material-related supply, environmental and health problems. Essential to this is the consistent implementation of circularly orientated basic ideas and requirements, design concepts and execution details.

“The visible waste is managed – the invisible impact not.”

Construction Waste Lifecycle (EN 15804)

	A1-A3: Production	A4: Transport	A5: Construction
Solid waste	> production scraps > offcuts, rejects > packaging residues		[material] > soil & stone > demolition debris > excess materials > road demolition waste [process] > packaging > small material leftovers
Liquid waste	> wastewater from processing > chemical by-products		[process] > small amounts of site wastewater
Gaseous waste	> CO_2 emissions >pollutants from material processing	> CO_2 from trucks, logistics > fuel emissions	> machinery emissions > dust, small scale CO_2
waste level	●●●	●○○	●●○

03
Case Study

03
Case Study

A responsive construction methodology. — The project investigates how material efficiency can be achieved through an evolving process, where planning and execution remain closely intertwined.

03.1
The Idea

The idea of realising the design of the Skinperium practice rooms without waste came relatively late in the course of the project. Although attention was already paid to resource-saving design at the design stage, the idea of zero waste was only decided on shortly before implementation. This meant that hardly any procedures could be established in advance.

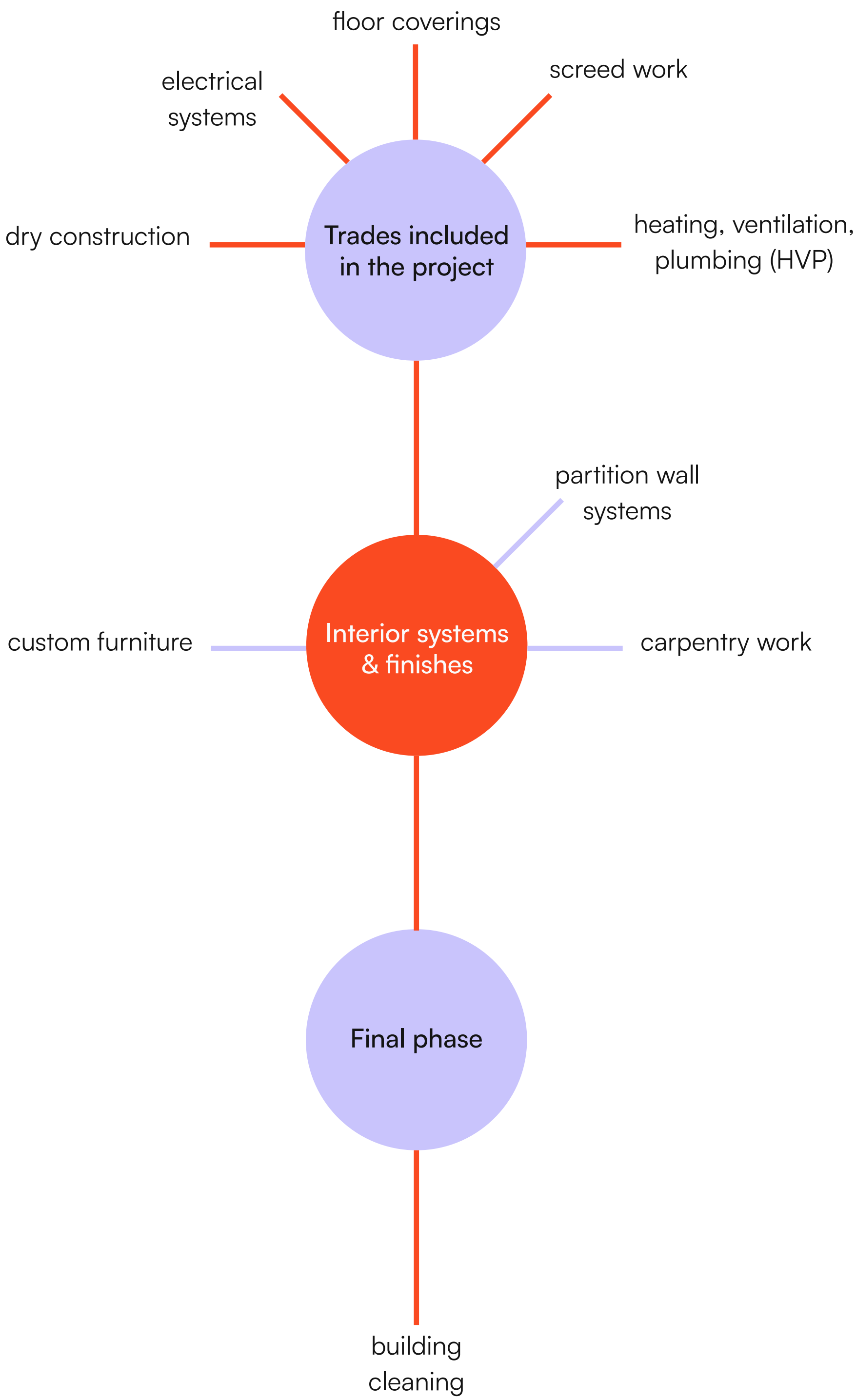
The reduction of waste was essentially regulated by the local construction management. Procedures were derived and established during the course of the project.

03.2
The Initial Situation

The building (Rue Pletzer 2 A 8080- Bertrange, Luxembourg), in which the new practice rooms were to be built, already existed as a closed shell. This meant that the shell, including the windows and façade, had already been completed.

From the installation of electrical and sanitary facilities to the design of waiting areas and treatment rooms, there were numerous options for optimising the premises in line with the needs and requirements of the future usage concept. The building shell, façade and windows were not included in this case study project.

The following trades are covered by the case study:



03.3
Electrical Work

When using copper cables in particular, it is important to use resources efficiently and minimize waste. Copper is an extremely valuable metal that is widely used in the manufacture of electrical cables due to its excellent conductivity and resistance to corrosion. However, as copper is a limited resource and the mining and processing of this metal has an environmental impact, it is crucial to reduce the amount of copper waste generated during the cable laying process.

Although the amounts of waste may seem small compared to other industries, cable sections and offcuts add up over time. It is therefore important that every stage of the electrical cable laying process is carefully considered to ensure the efficient use of copper and other resources.

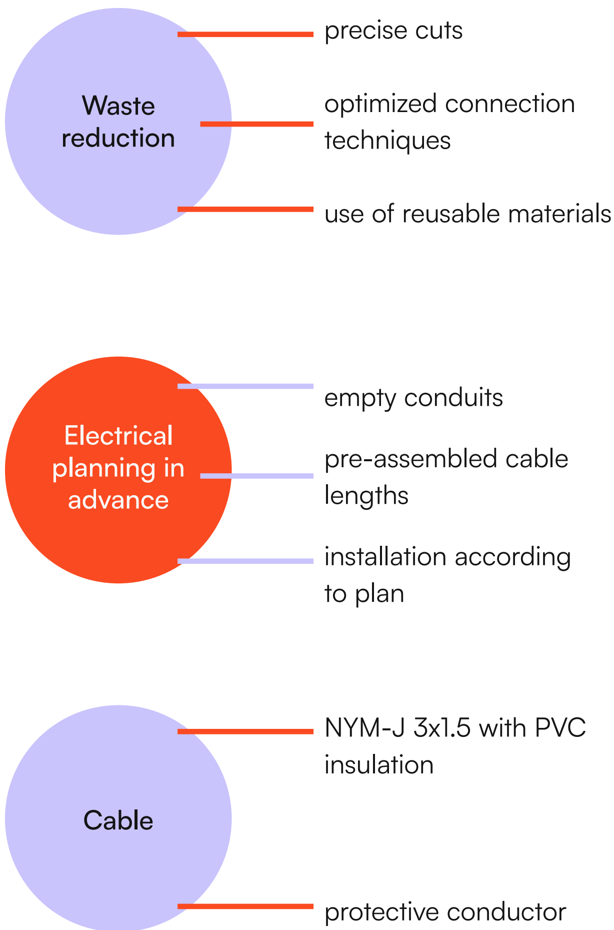
One way to optimize resource use is to plan carefully and calculate the exact amount of cable needed to avoid excess inventory. In addition, the use of recycled materials and the integration of recycling programs can help reduce the need for new copper and minimize the environmental impact of cable production.

It is also important to pay attention to waste and unnecessary scrap during the installation process. Precise cuts, optimised connection techniques and the use of reusable materials can minimise waste and maximise the efficiency of the process.

The electrical planning was precisely planned in advance. Empty conduit and cable lengths were pre-assembled and installed exactly according to plan.

Empty conduit lengths installed

The NYM-J 3x1.5 cable — standard cable has PVC core insulation and a protective conductor.



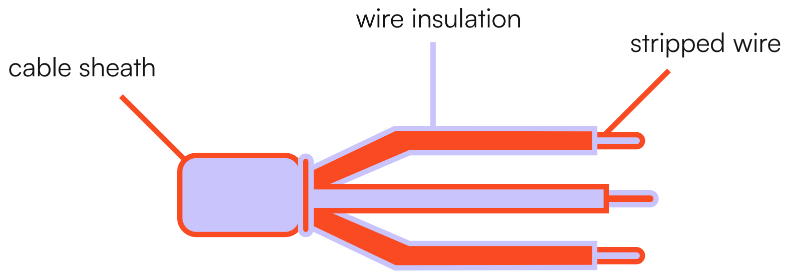


Fig. 01 Illustration of standard cable. Pre-assembly means cable waste can be almost entirely avoided.

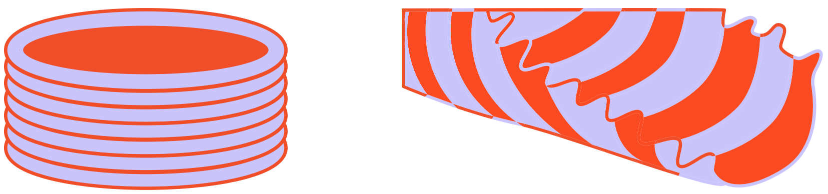


Fig. 02 PE/PP (polyethylene/polypropylene) Corrugated pipes are very easy to pre-assemble. There is hardly any waste.

Fig. 03 Electrical installation Pre-assembly of cable lengths enables precise work on the construction site

03.4
Drywall Construction | Metal Studs

The lengths of the CW profiles were chosen to minimise waste. The clear height of the shell was 3.86 m, which meant that the vertically installed profiles produced 14 cm long offcuts. These pieces could not be used elsewhere.

Total used: 372 linear meters (260 kg)

Total waste: 11 meters, corresponding to 7,7 kg

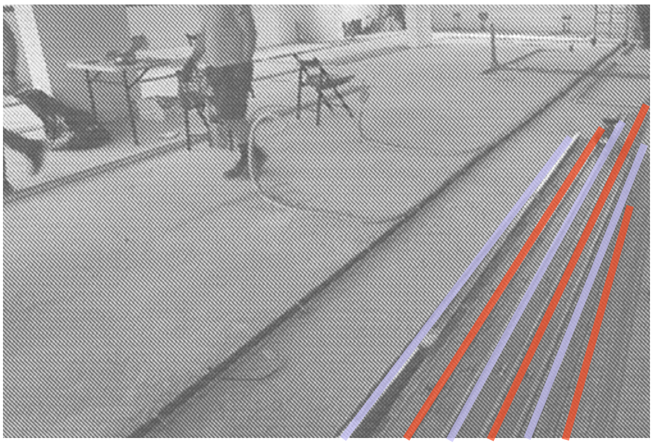


Fig. 04 Preparing for resource-saving drywall construction requires a little more lead time.

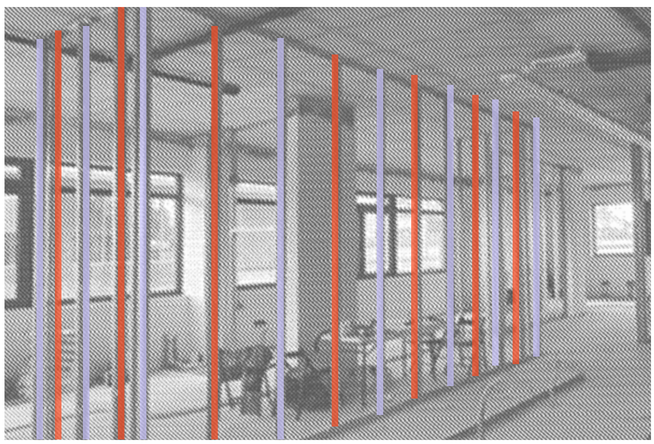
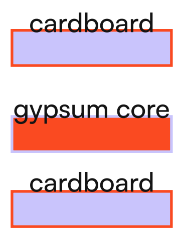


Fig. 05 When planning, consideration must already be given to avoiding waste.

03.5
Drywall Construction | Plaster Board

Plasterboard has become increasingly important in interior construction over the past four decades due to its ease of processing and cost-effectiveness.

Commonly used plasterboard panels have a sandwich structure: the core typically consists of flue gas desulphurisation (FGD) gypsum, while the two outer layers are made of cardboard. These cardboard layers absorb tensile stresses that may occur during use. In Germany alone, approximately 237 million m^2 of plasterboard are produced each year.



FGD gypsum, a by-product of flue gas desulphurisation, has long been an inexpensive raw material for the gypsum industry. However, its availability will decline significantly as coal- and lignite-fired power plants are shut down in accordance with the Paris Climate Agreement. This shortage may be offset by reopening temporarily closed gypsum mines, developing new gypsum deposits, and/or intensifying gypsum recycling efforts.

During the recycling process, the cardboard facing layers are separated from the gypsum core. The resulting material is referred to as recycled gypsum (RC gypsum).

According to Article 4 of the EC Waste Framework Directive (§ 6 KrWG), plasterboard should primarily be reused. The volume of gypsum waste generated is substantial: the gypsum content in German construction waste is currently estimated at approximately 3-4 million tonnes per year. Nevertheless, only small quantities of waste generated during production cutting or on construction sites are recycled in Germany. Instead, much of this material is removed from the recycling cycle, either through low-cost landfilling or through its use in the remediation of uranium sludge [85]. Sludge from MAPE is transported to Mydlovary in Czechia.

Production
↓
Use
↓
Waste
↓
Recycling
↓
Reuse

Total mass: 700 m^2 = 5.950 kg

Plasterboard waste: 35 kg

Savings: 1.283 kg

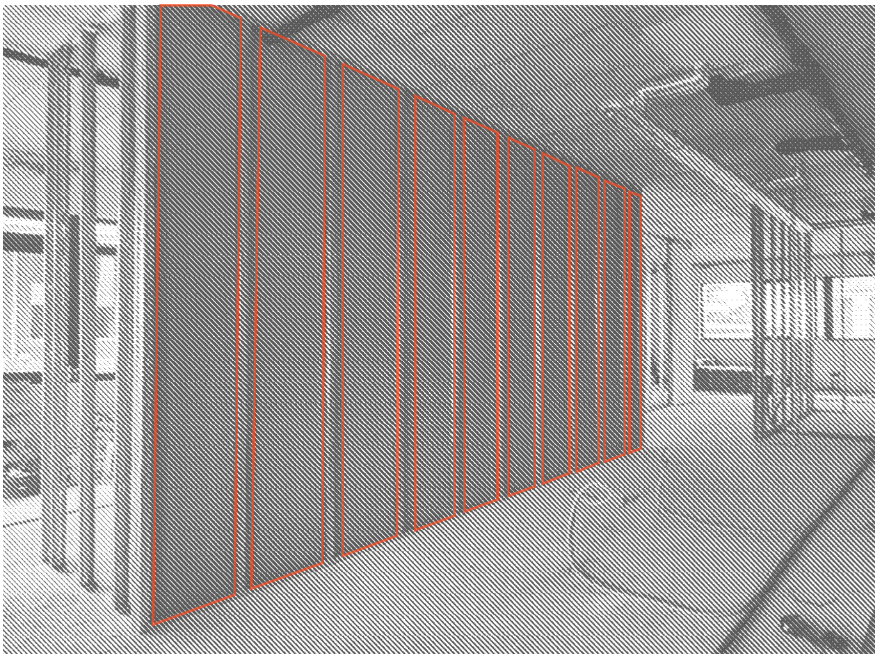


Fig. 06 Over a tonne of waste was saved in the drywall construction trade.

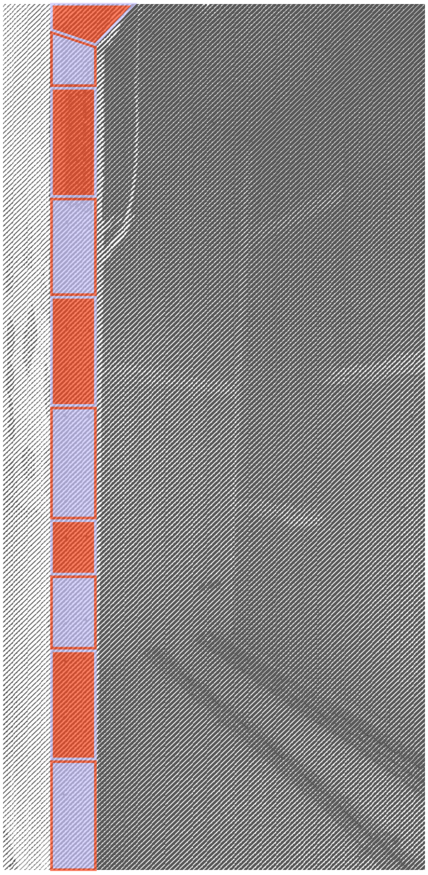


Fig. 08 Cut-to-size parts were installed in the door reveals.

Fig. 07 Small parts were not thrown away, but collected and used wherever possible, for example on the facing bricks of the walls and in the ceiling to create ventilation slots.

03.6 Insulation

An important aspect that makes Unifit 034-180 insulation a sustainable material is its manufacturing process. By using recycled glass as the main component, the need for natural resources is reduced and waste materials are reused in a meaningful way. This helps to minimise the environmental impact of insulation production and reduce the ecological footprint of the construction project.

In addition, it is important to use the insulation sparingly in order to maximise the efficiency of the material and minimise waste. Here, too, precise planning and calculation of the required amount of insulation is the key to success. The use of efficient installation methods and careful handling of the material during installation also help to minimise waste and maximise the efficiency of the insulation.

UNIFIT 034-180

UNIFIT 034 M 180X1200X02700MM 24 ROL

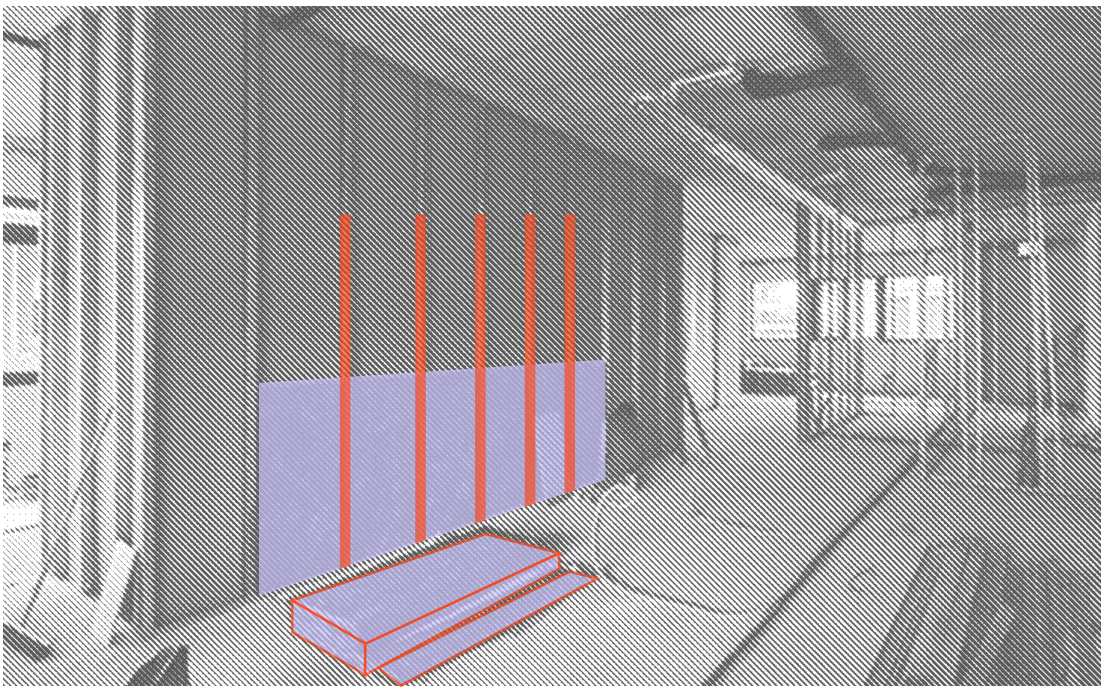


Fig. 09 Small leftover pieces are used for narrow areas.

03.7
Underfloor Heating

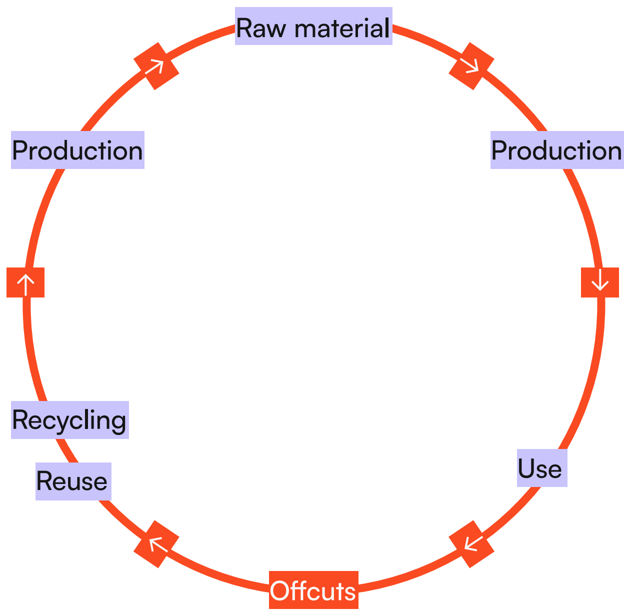
Polyurethane panels are a versatile and widely used material option in various applications, from construction to furniture manufacturing. However, in addition to their outstanding properties such as durability, lightness and weather resistance, it is particularly important to emphasise the sustainability of this material.

A crucial aspect of sustainability in the processing of polyurethane sheets lies in the efficient use of resources. The manufacture of this material requires careful selection and combination of various chemical components, and any waste during the production process can result in a significant loss of resources. It is therefore of utmost importance to optimise all steps of production in order to minimise the use of raw materials and reduce waste.

Particular attention should be paid to the use of even the smallest offcuts. When processing polyurethane sheets, waste and offcuts are inevitably produced, which are often considered unavoidable. However, every piece of these offcuts should be considered a valuable resource. Through innovative approaches such as recycling, reuse and upcycling, these leftovers can be transformed into new products or materials instead of simply being disposed of.

The reuse of scrap pieces can take various forms, from integration into other products to the manufacture of decorative elements or small items. In addition, recycling polyurethane panels can help reduce the demand for new raw materials and minimise the environmental impact of material production.

Overall, it is crucial that companies and manu-facturers who use polyurethane sheets take their responsibility for the sustainable use of this material seriously. By implementing efficient production processes, utilising innovative technologies and promoting a culture of resource conservation, they can make a positive contribution to environmental protection while also achieving economic benefits.



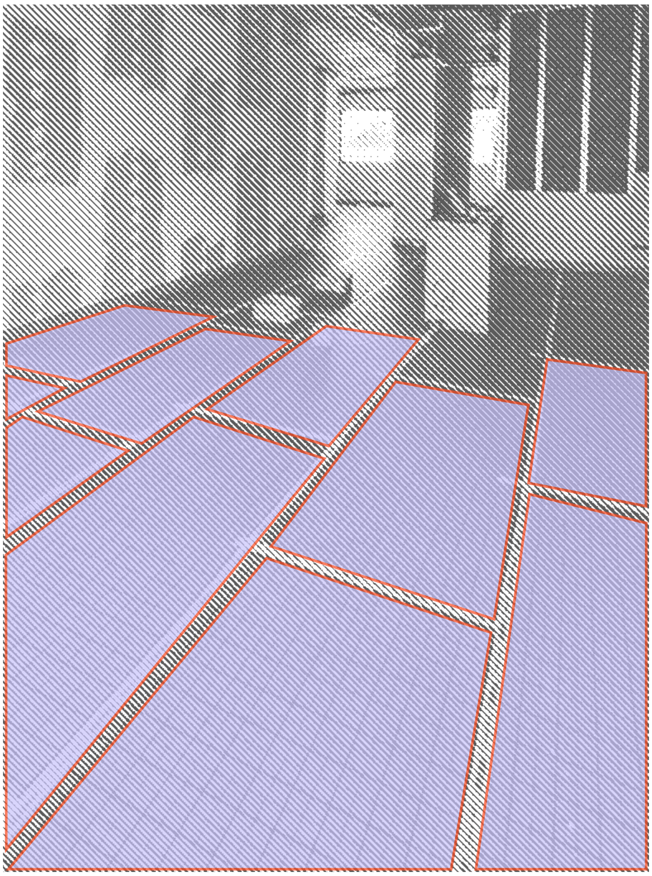


Fig. 10, 11, 12 The remains of the polyurethane panels were also largely processed in the adjoining rooms.

Fig. 11

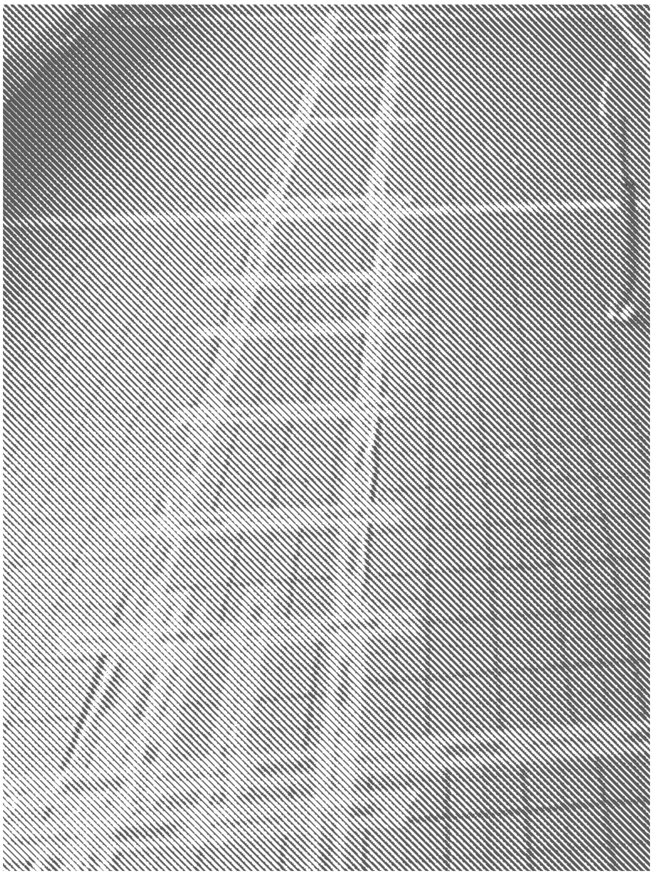
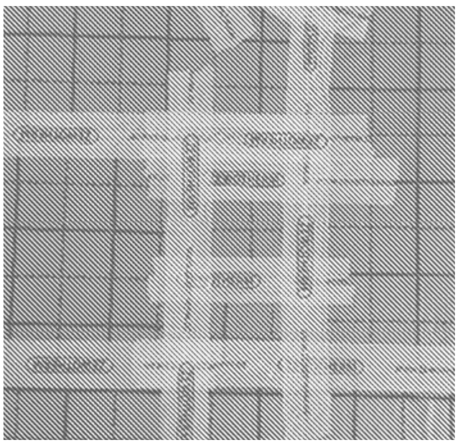


Fig. 12



Underfloor Heating | Heating pipes

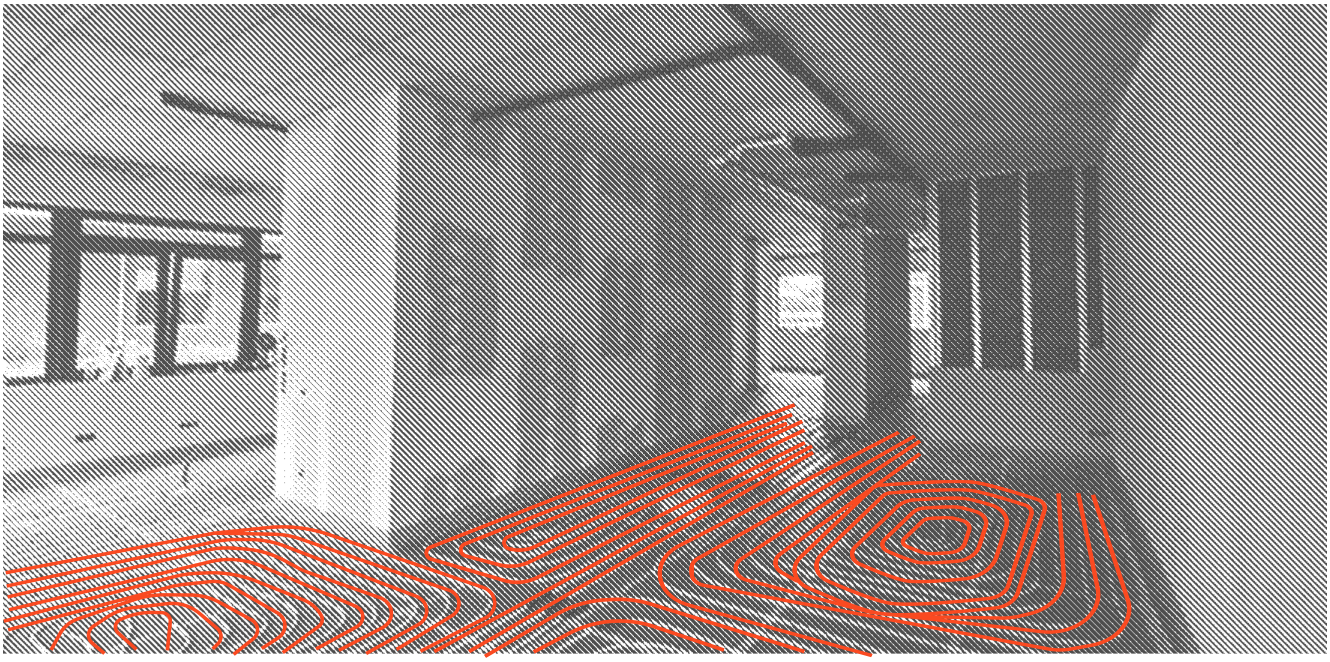


Fig. 13 The PE-RT pipe is made of thermally resistant polyethylene and is designed for use in underfloor heating systems.

03.8 Screed

During the installation process, it is important not only to achieve high-quality results, but also to promote sustainable practices that minimise waste and support the careful use of valuable resources such as sand.

Precise planning and calculation of the required amount of screed is crucial in order to minimise the amount of waste. In fact, only as much material as was needed was delivered.

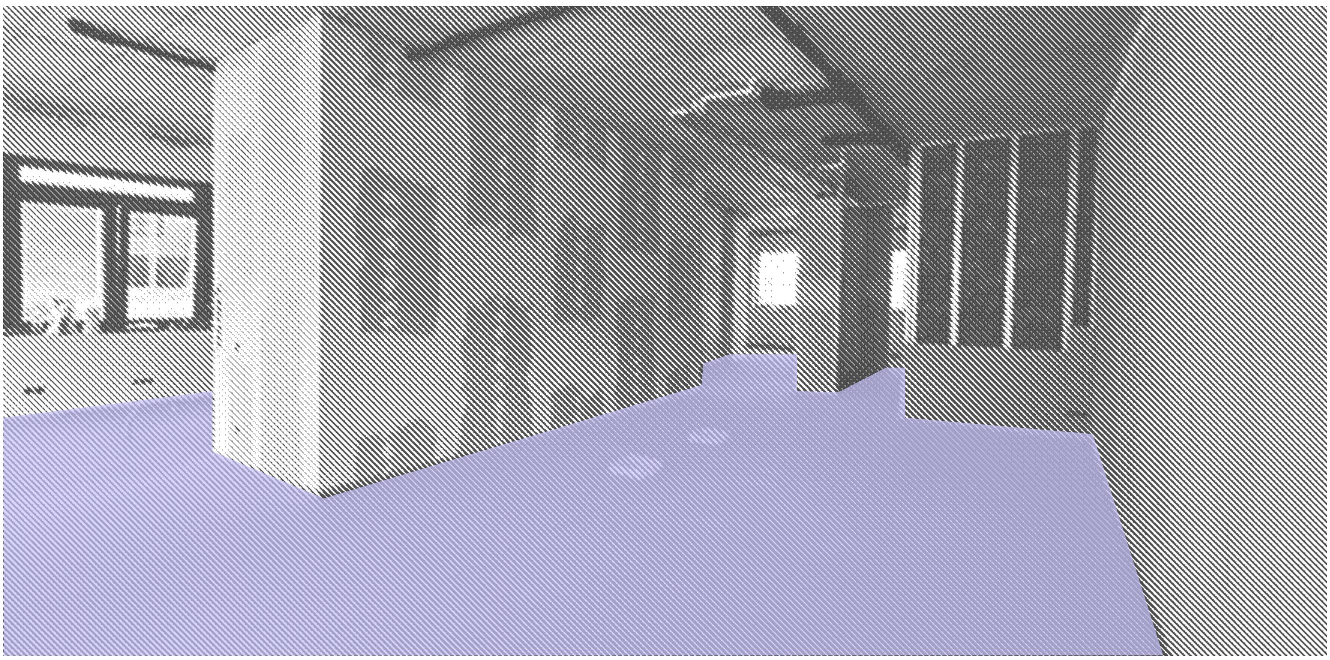


Fig. 14 Only the amount of components actually required was delivered for the screed.

Screed | Packaging

Packaging waste has become a serious environmental problem, as it often consists of materials such as paper and film that are difficult to break down and can pollute the environment. Paper packaging is often coated with a thin film to protect it from moisture and other influences. This combination of paper and film can make recycling difficult, as the two materials must be separated in order to be recycled efficiently.

Fortunately, however, progress is being made in the separation and recycling of packaging materials. Innovative recycling technologies and improved sorting systems allow paper and foil to be separated and returned to the recycling cycle. This makes it possible to make better use of resources and reduce the environmental impact of packaging waste. The separation of materials has been applied at Skinperium.

Fig. 15 All waste was documented and sorted by type.

03.9
Carpenter

Hubert Schmitt | Sustainable production

Their facility for furniture, doors and other carpentry work focuses on minimising waste and using renewable energy sources. Precise work preparation and optimised manufacturing processes ensure that only a minimum of waste is produced. This approach not only helps to reduce waste on the construction site, but also has a positive environmental impact.

Fig. 16 Delivery of prefabricated individual parts that only need to assembled on site.

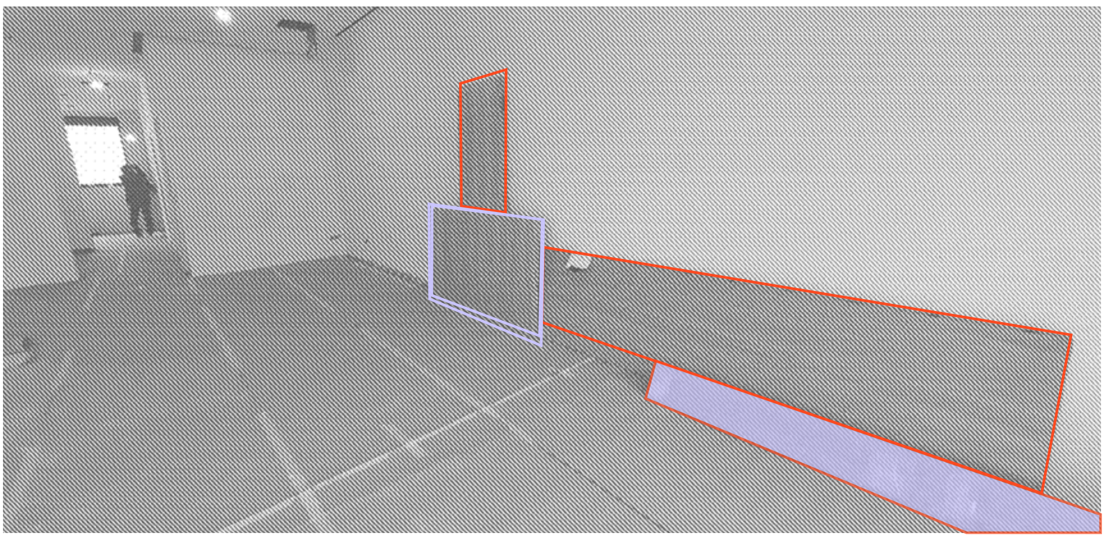


Fig. 17 Elements prefabricated in the workshop are protected for transport using reusable covers.

During the work preparation phase, all components to be produced are carefully designed and optimised in order to minimise material waste. This enables an efficient use of materials and helps reduce the environmental footprint of the production process. Throughout the entire manufacturing process, from machining to assembly, attention is given to ensuring that all wood chips and residual materials are used efficiently. This includes various processes such as cutting, milling, and drilling, during which the resulting waste is systematically collected and reused for energy production.

This holistic approach to furniture production demonstrates that it is possible to manufacture high-quality products without harming the environment. By combining precise planning, efficient resource use, and intelligent waste management, a sustainable production process is achieved that offers both ecological and economic benefits.

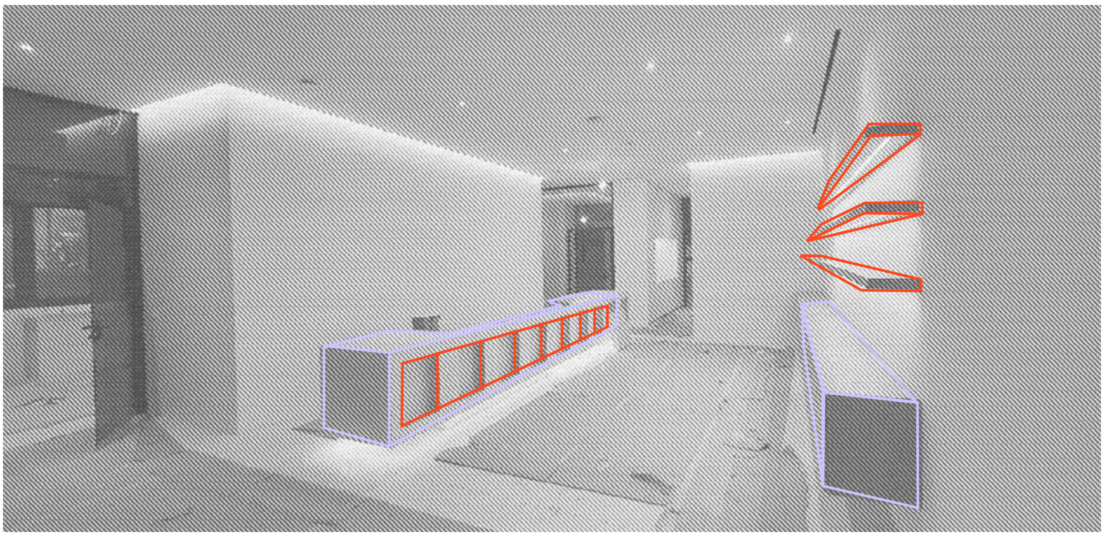
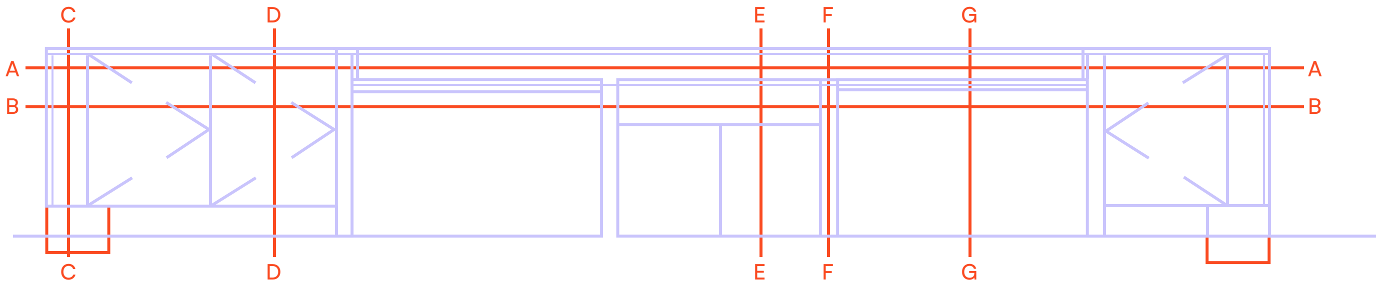
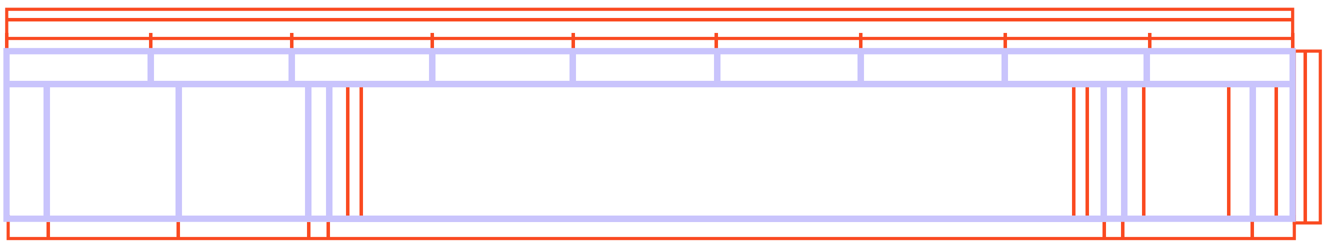


Fig. 18 Detailed and precise pre-planning and prefabrication enable fast and clean work on the construction site.

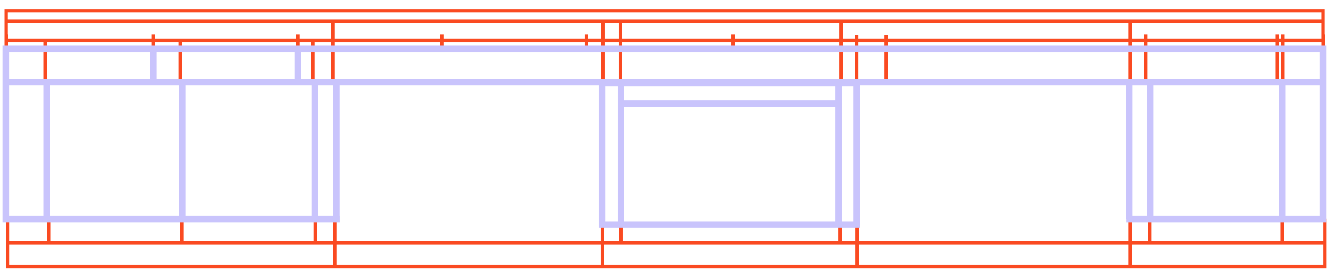
View



Section A-A



Section B-B



Section C-C

Section D-D

Section E-E

Section F-F

Section G-G

Fig. 19 Optimised production and approval processes prevent faulty production and unnecessary waste.

03.10
Quartz Panels

Quartz stone, an artificially produced material made from quartz sand and binding agents, has proven to be a popular choice in the construction industry due to its versatility, durability and aesthetics. In addition to these properties, however, quartz stone also offers a number of sustainability benefits that make it an efficient material that contributes to resource conservation and waste minimisation.

A key factor that makes quartz stone a sustainable material is the way it is manufactured. Unlike natural stone materials such as marble or granite, which often require extensive mining activities and have an environmental impact, quartz stone is produced in a controlled manufacturing process. This allows for precise dosing of raw materials and minimises the need for natural resources such as quarries and water, which contributes to resource conservation.

Another important aspect is that no waste is produced during the manufacture of quartz stone. During the production process, the quartz sand is mixed with the binding agents and poured into moulds to produce the desired slabs. Due to the precise dosing and controlled process, there is minimal waste or scrap, which can be recycled or reused. This not only reduces material waste, but also saves energy and resources that would normally be required for disposal.

Furthermore, quartz stone is an extremely durable and timeless material. Due to its hardness and resistance to stains, scratches and heat, it is ideal for use in kitchens, bathrooms and other high-traffic areas. The long service life of quartz stone minimises the need for repairs and replacements, which in turn helps to conserve resources and reduce waste.

Overall, a look at the properties of quartz stone highlights the versatility and sustainability of this material in terms of resource use and waste minimisation. As a durable, aesthetically pleasing and environmentally friendly material, quartz stone offers an attractive option for architects, designers and builders who value sustainability and efficiency. The main component used in the manufacture of quartz stone is natural, screened and purified quartz, i.e. silicon crystals ($SiO2$), which is mixed with dyes and additives to improve its technical properties.

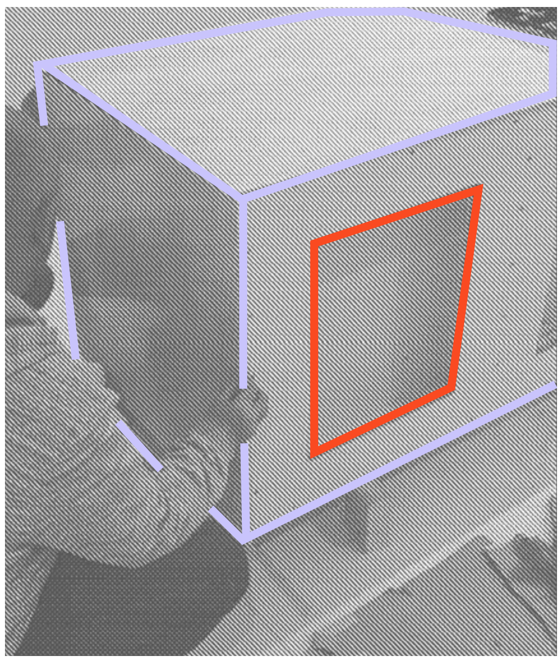


Fig. 20 Quartz panels are produced in a size of 2 x 5m and are subsequently custom-cut to size. As a result, no waste is generated on the construction site. The individual panels are assembled on site like a puzzle.

03.11 Painting

Avoiding waste when painting requires careful planning, efficient working methods, and proper handling of materials.

Before starting the painting work, accurate material planning should be carried out. This includes calculating the amount of paint required based on the area to be painted and selecting the right paint quality and type for the project. Accurate estimation reduces excess inventory and minimizes waste.

Paints and varnishes should be stored and handled properly to avoid waste. Properly closing paint cans, avoiding spills, and refilling paint rollers and brushes are important steps in minimizing material loss.

Leftover paint and materials may be reused for future projects. By carefully storing leftover paint in airtight containers, it can be used for minor repairs or touch-ups. In addition, empty paint cans can be cleaned and recycled to reduce waste.

The use of environmentally friendly paints and varnishes can help minimize waste and reduce environmental impact. These products are often more durable and have a lower toxicological impact, resulting in less waste.

By using efficient working methods such as spray guns or high-capacity paint rollers, paint consumption can be optimized and waste minimized. In addition, painters should take care to apply paint evenly and precisely to avoid touch-ups and overpainting.

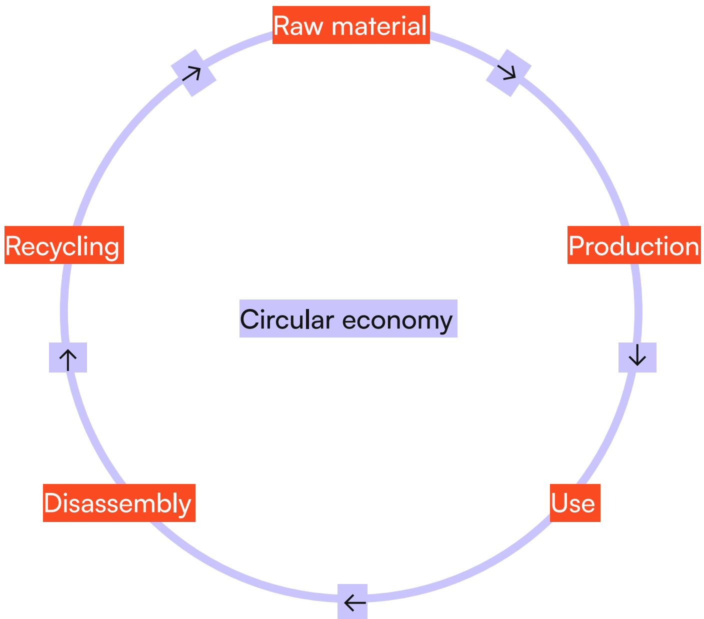
Simply spraying the paint on instead of painting the wall has several advantages.

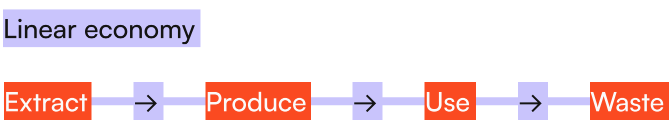
Economical paint consumption: Modern spray systems and equipment use less paint than conventional painting methods.

03.12
System Partition

Lindner products are developed and manufactured for the longest possible technical service life with optimized use of resources. In line with the Cradle to Cradle Certified® principle, Lindner increasingly considers the entire product cycle of components and system products.

The aim is to avoid the creation of waste right from the start of the life cycle. Products should be designed in such a way that at the end of their useful life they can serve as raw materials for the next generation of this product, a closed technical recycling economy. What sounds relatively simple poses a major challenge for system construction products, which are composed of many different components made of different materials.





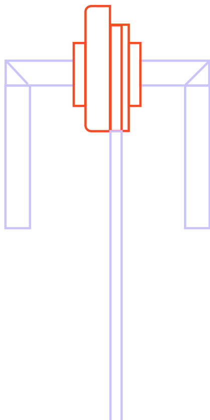


Fig. 21 The goal is to prevent waste from being generated at the very beginning of the life cycle. Products should be designed in such a way that, at the end of their useful life, they can serve as raw materials for the next generation of that product.

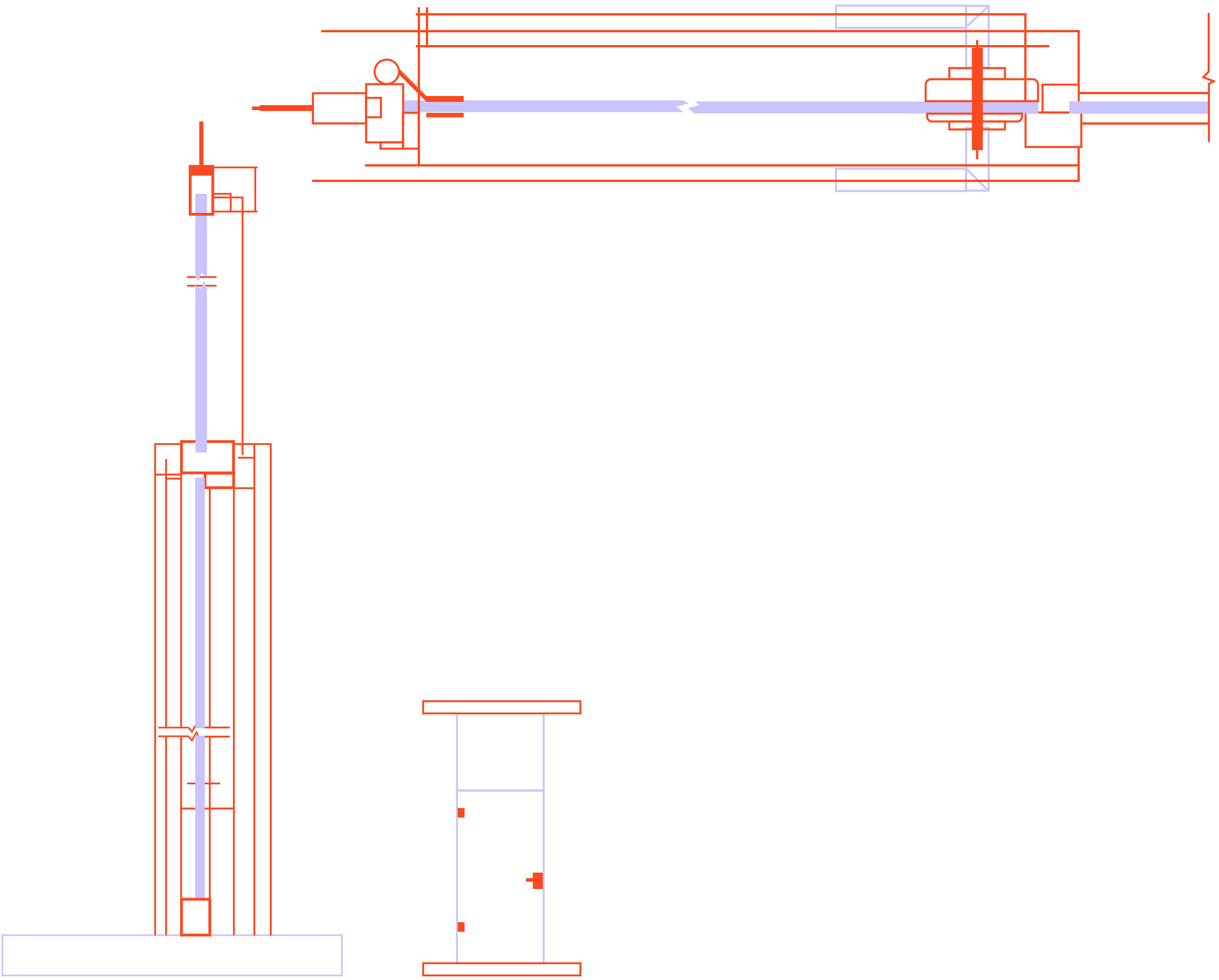


Fig. 22 Transport cradle is reused. Packaging consists exclusively of PE film.

Fig. 21 Installation of glass partitions — precise planning and an exact plan approval process gurantee waste avoidance.

04
Monitoring

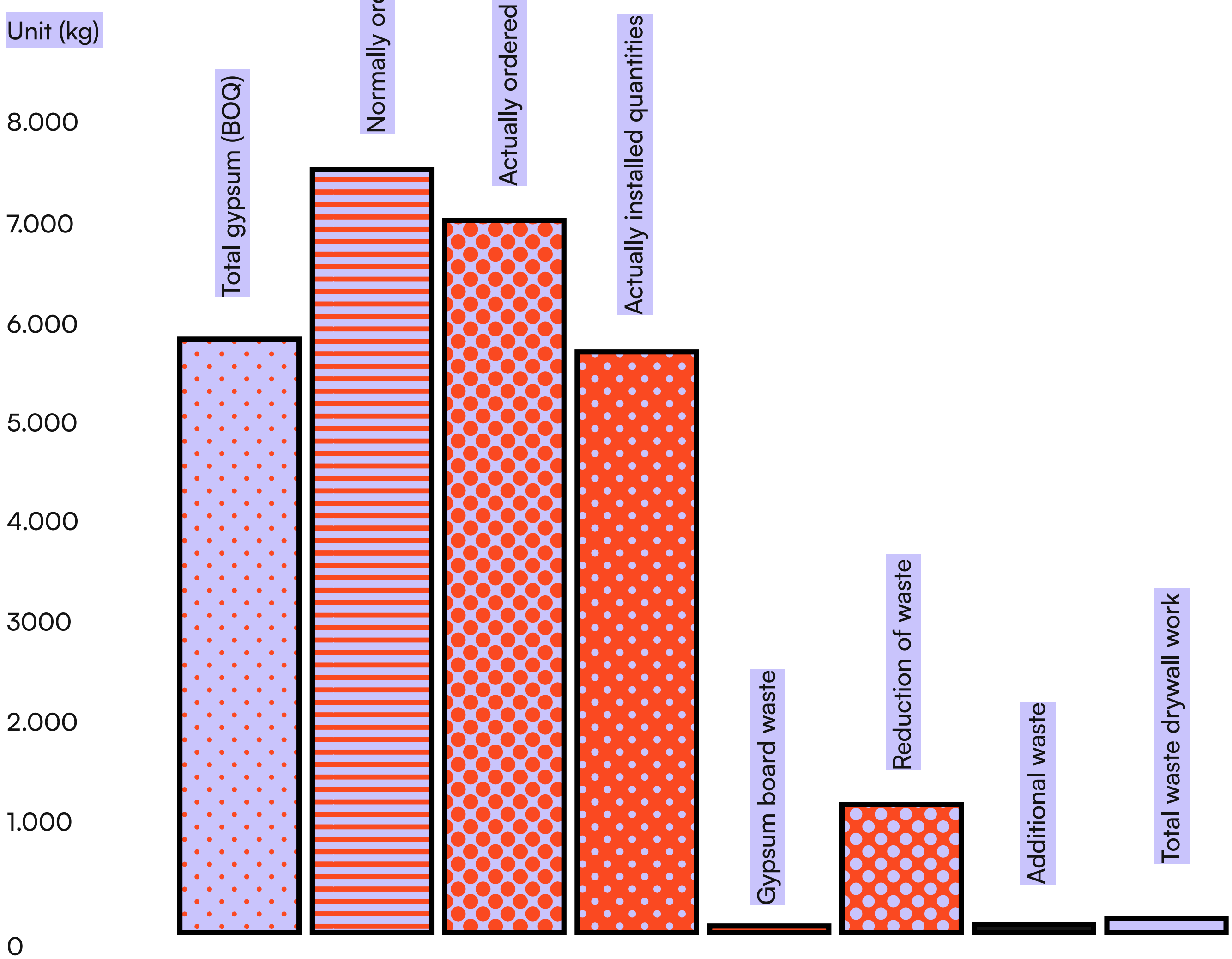
04
Monitoring | Skinperium Zero Waste

Drywall construction / plasterboard			
Walls	520 m^2		
Ceiling	180 m^2		
Total gypsum board quantity BOQ (Bill of Quantities)	700 m^2	8,5 kg/m^2	5950 kg
Quantity the contractor would normally have ordered			7650 kg
Actually ordered quantities *	840 m^2	8,5 kg	7140 kg
Actually installed quantities	685 m^2	8,5 kg	5821,13 kg
Gypsum board waste			35 kg
Reduction of waste			1283,87 kg
Additional waste: metal profiles, packaging			65 kg
Total waste drywall work			100 kg
Waste reduction in the drywall trade			1283 kg

Instead of 20-30% waste of the total gypsum board mass, less than 1% waste was generated: 0,60126%

* SB Inbau ordered less gypsum board than usual due to the Zero Waste specification

Drywall construction / plasterboard

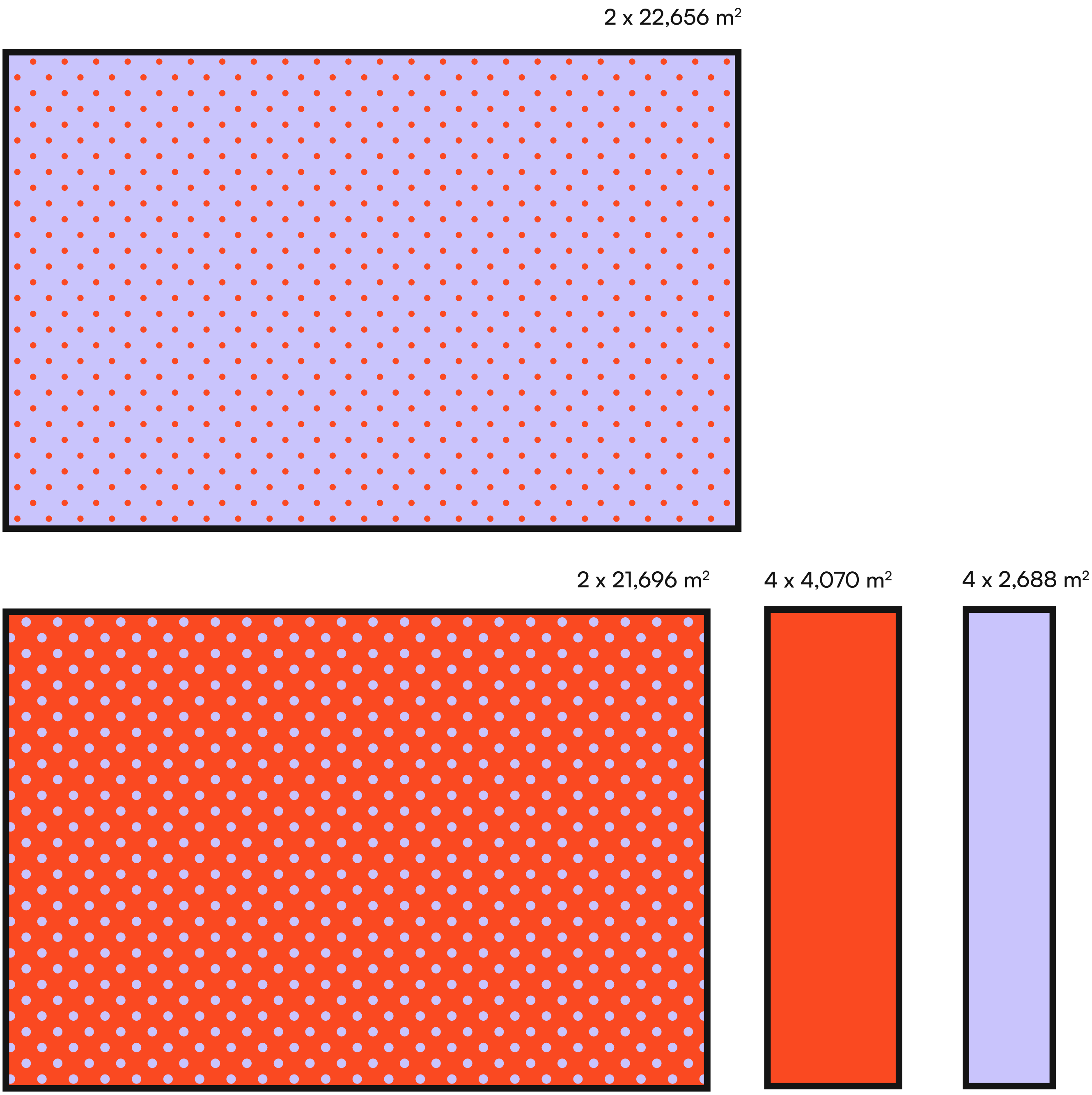


04
Monitoring | Skinperium Zero Waste

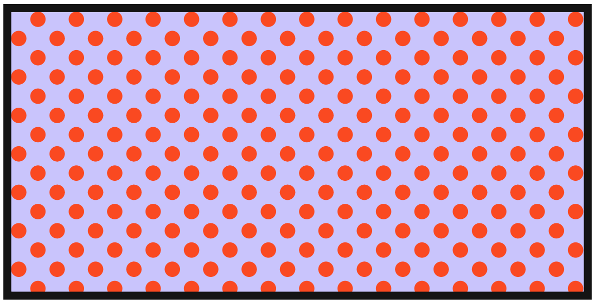
Drywall construction / plasterboard

Length (m)	Height (m)	Area (m^2)	Qty.	Total Area (m^2)
5,9	3,84	22, 656	2	45,312
5,65	3,84	21,696	2	43,392
1,9	3,84	7,296	2	14,592
1,785	3,84	6,8544	2	13,7088
1,9	3,84	7,296	2	14,592
1,785	3,84	6,8544	2	13,7088
1,06	3,84	4,0704	2	8,1408
1,06	3,84	4,0704	2	8,1408
0,7	3,84	2,688	2	5,376
0,7	3,84	2,688	2	5,376
3,19	3,84	12,2496	2	24,4992
0,725	3,84	2,784	2	5,568
0,6	3,84	2,304	2	4,608
0,725	3,84	2,784	2	5,568
0,6	3,84	2,304	2	4,608
3,95	3,84	15,168	2	30,336
3,7	3,84	14,208	2	28,416
2,1	3,84	8,064	2	16,128
2,1	3,84	8,064	2	16,128
2,1	3,84	8,064	2	16,128
2,1	3,84	8,064	2	16,128
2,1	3,84	8,064	2	16,128
2,1	3,84	8,064	2	16,128
8,58	3,84	32,9472	2	65,8944
8,58	3,84	32,9472	2	65,8944
Gypsum board walls		252,2496		504,4992
Gypsum board ceiling				180,34

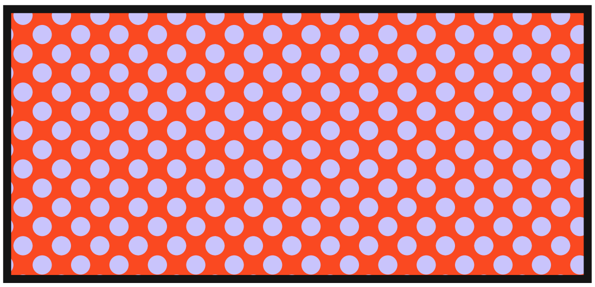
Drywall construction / plasterboard



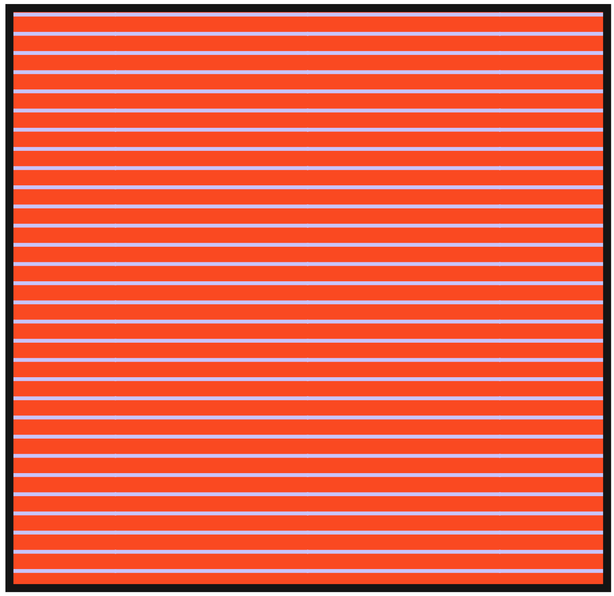
4 x 7,296 m^2



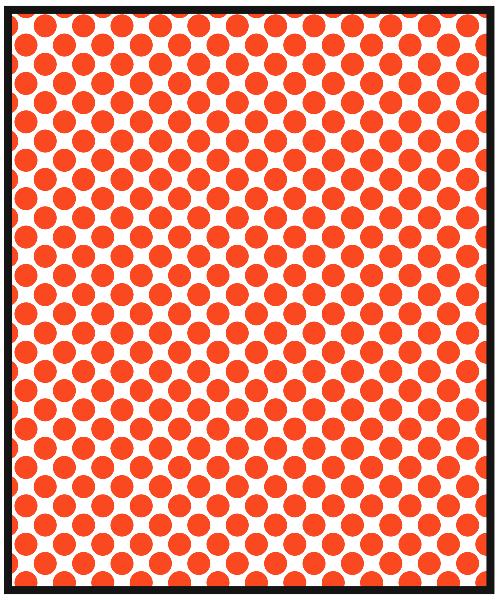
4 x 6,854 m^2



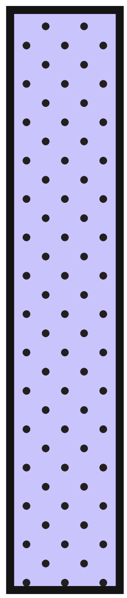
2 x 15,168 m^2



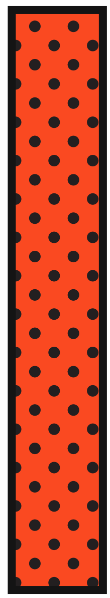
2 x 12,250 m^2



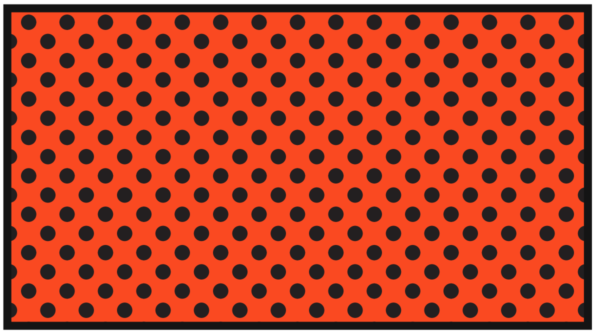
4 x 2,784 m^2



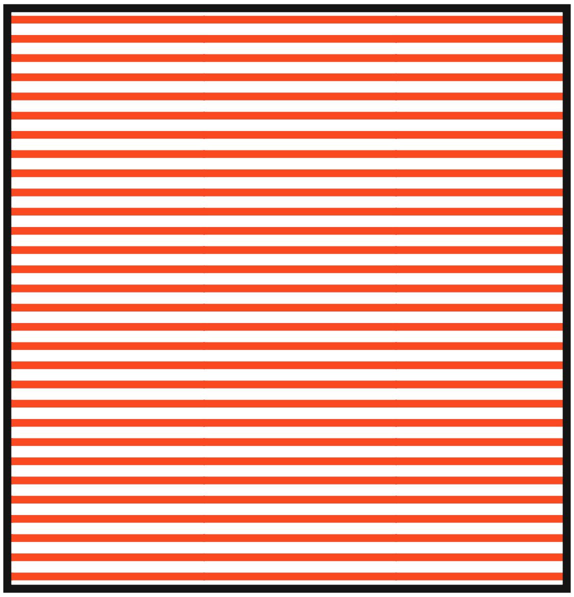
4 x 2,304 m^2



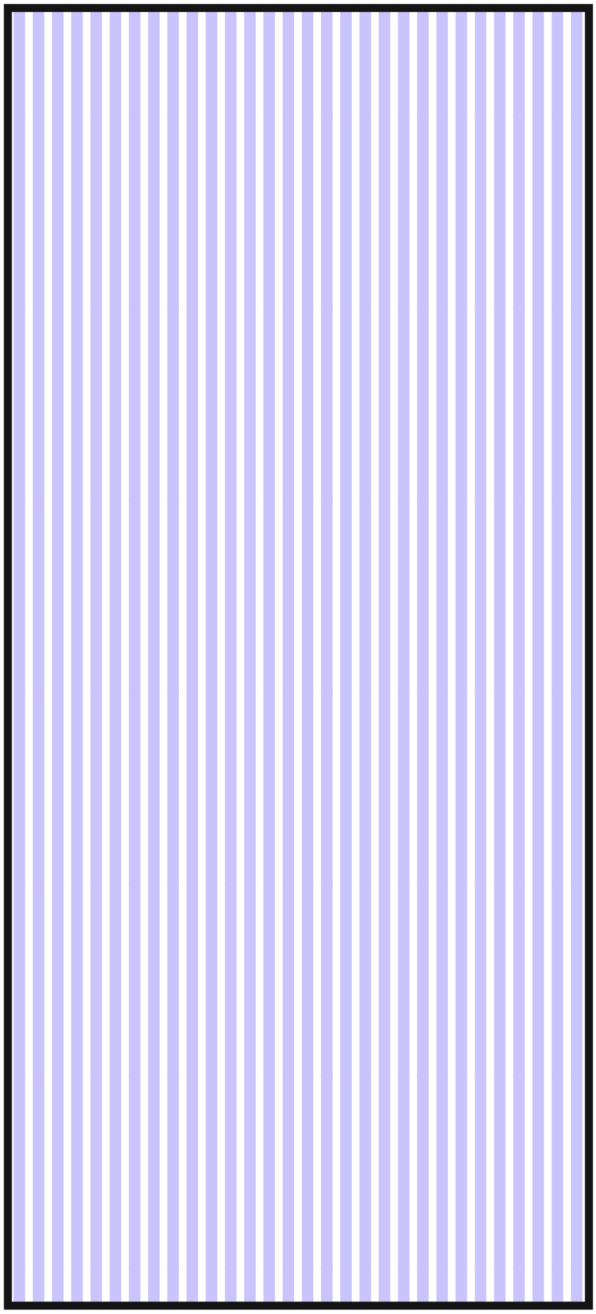
2 x 14,208 m²



12 x 8,064 m²



4 x 32,947 m²



scale 1:50

Gypsum board walls	504,4992 m²
Gypsum board ceiling	180,34 m²
Total gypsum board area	684,8392 m²

04
Monitoring | Skinperium Zero Waste

Sanitary fixtures

Item	Unit weight (kg)	Quantity	Total weight (kg)
WC	15,9	2	31,8
Washbasin	28,8	1	28,8
Sanbloc	17,0	2	34,0
Fittings (tapeware)	1,3	1	1,3
Washbasin (treatment room)	23,0	3	69,0
Total sanitary fixtures			**164,9**

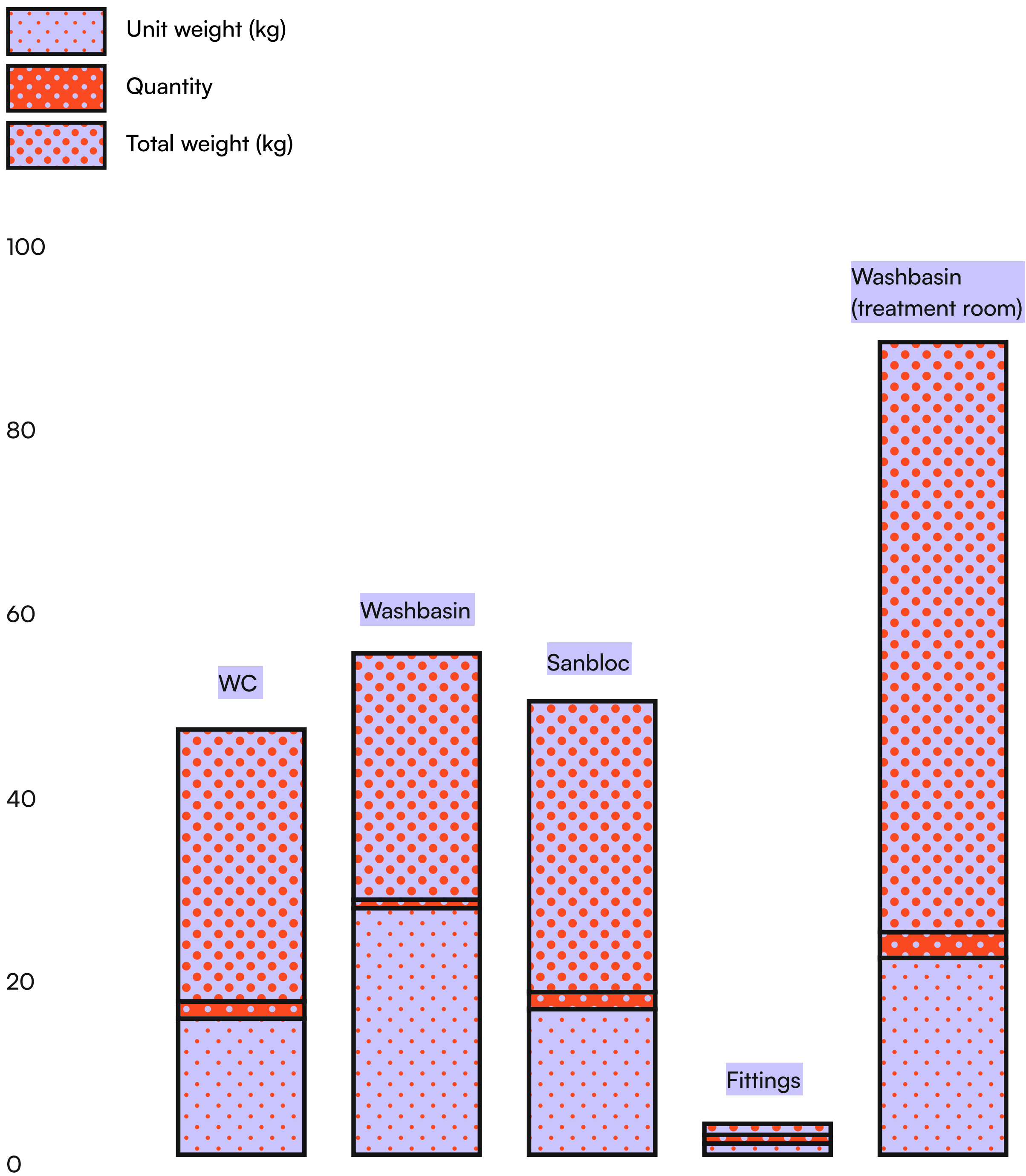
Underfloor heating

Material	Area	Thickness	Volume
Polyurethane insulation (30mm)	180m²	0,03m	5,4m³
	Volume	Density	
	5,4m³	35kg/m³	
Total mass			**189kg**

Packaging waste

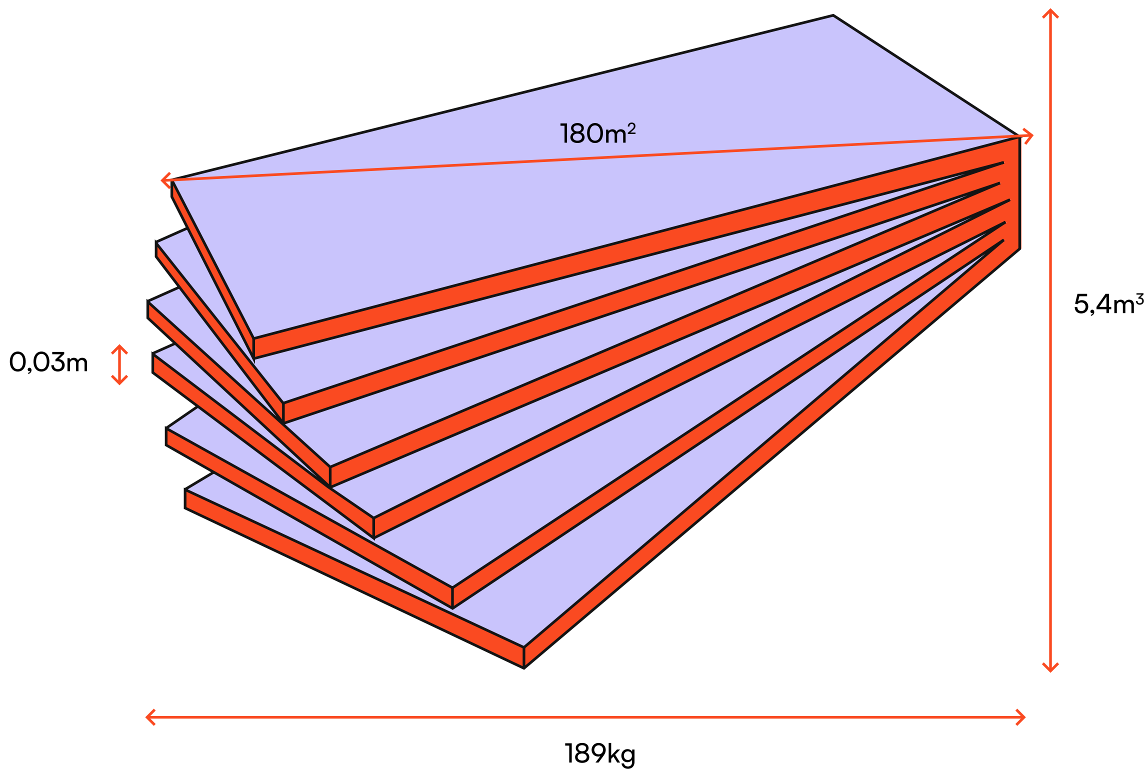
Waste type	Unit weight (g)	Quantity	Total weight (g)
Cardboard packaging	490	8	3.920
Plastic film			862
Polyethylene (PE) transport protection			326
Total waste			**5,108 kg**

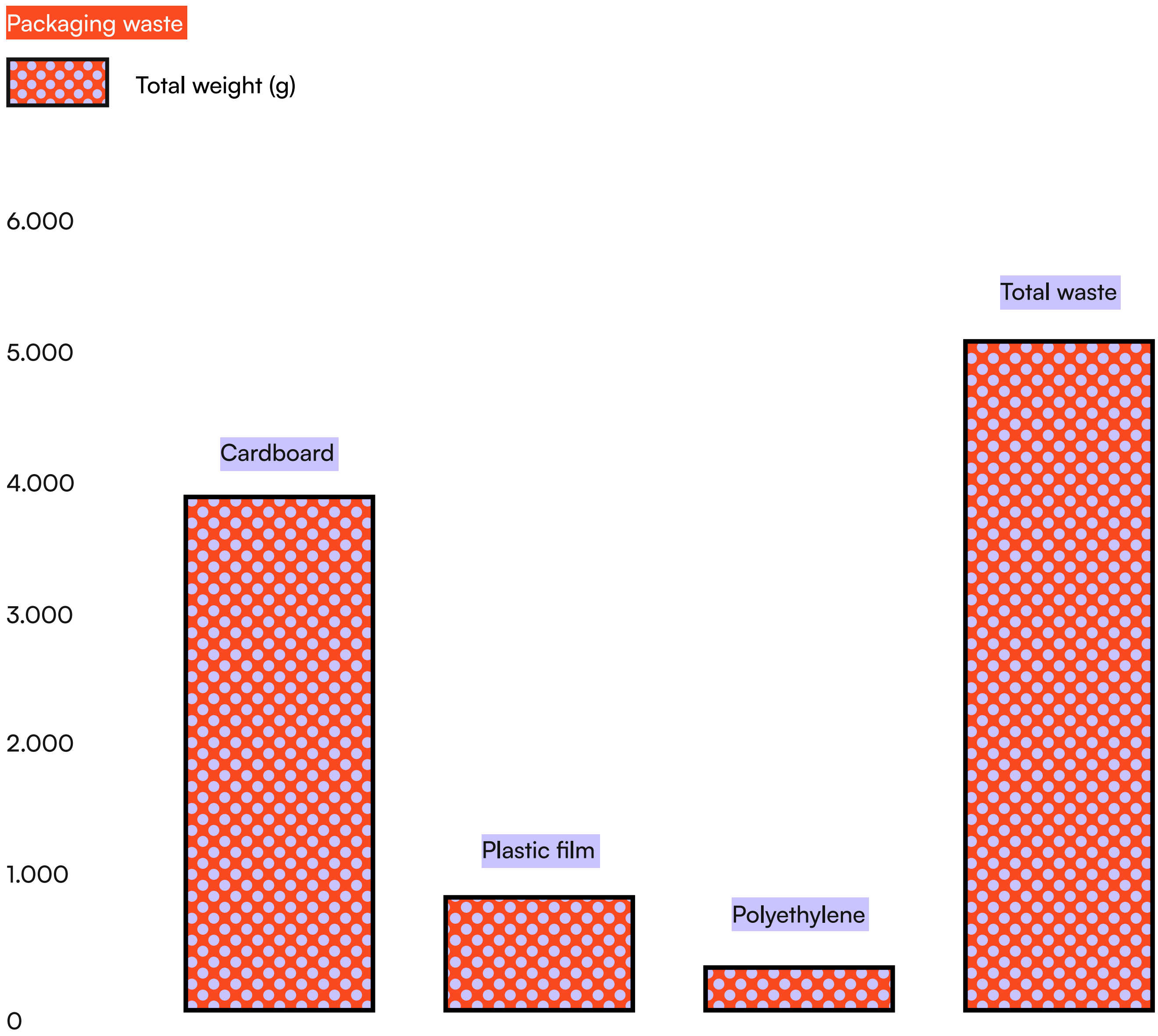
Sanitary fixtures



Underfloor heating

Polyurethane insulation (30mm)




Packaging waste
Total weight (g)
6.000
5.000
4.000
3.000
2.000
1.000
0
Cardboard
Plastic film
Polyethylene
Total waste

04
Monitoring | Skinperium Zero Waste

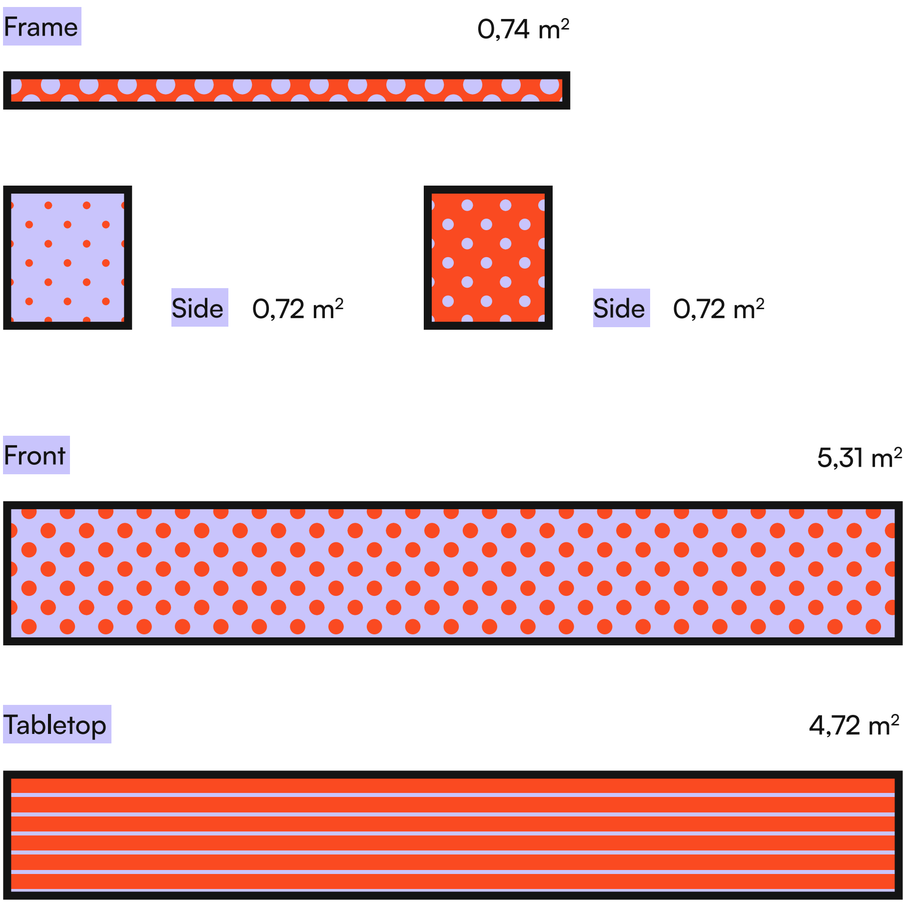
Quartz panels

Component	Length (m)	Width (m)	Area (m^2)
Tabletop	0,8	5,9	4,72
Front	0,9	5,9	5,31
Side	0,9	0,8	0,72
Side	0,9	0,8	0,72
Frame	0,2	3,7	0,74
Total area			12,21

Material weight

Area	Thickness	Density
12,21m^2	20mm	60kg/m^2
Total weight		732,6 kg
Waste		0 kg

Quartz panels



scale 1:50

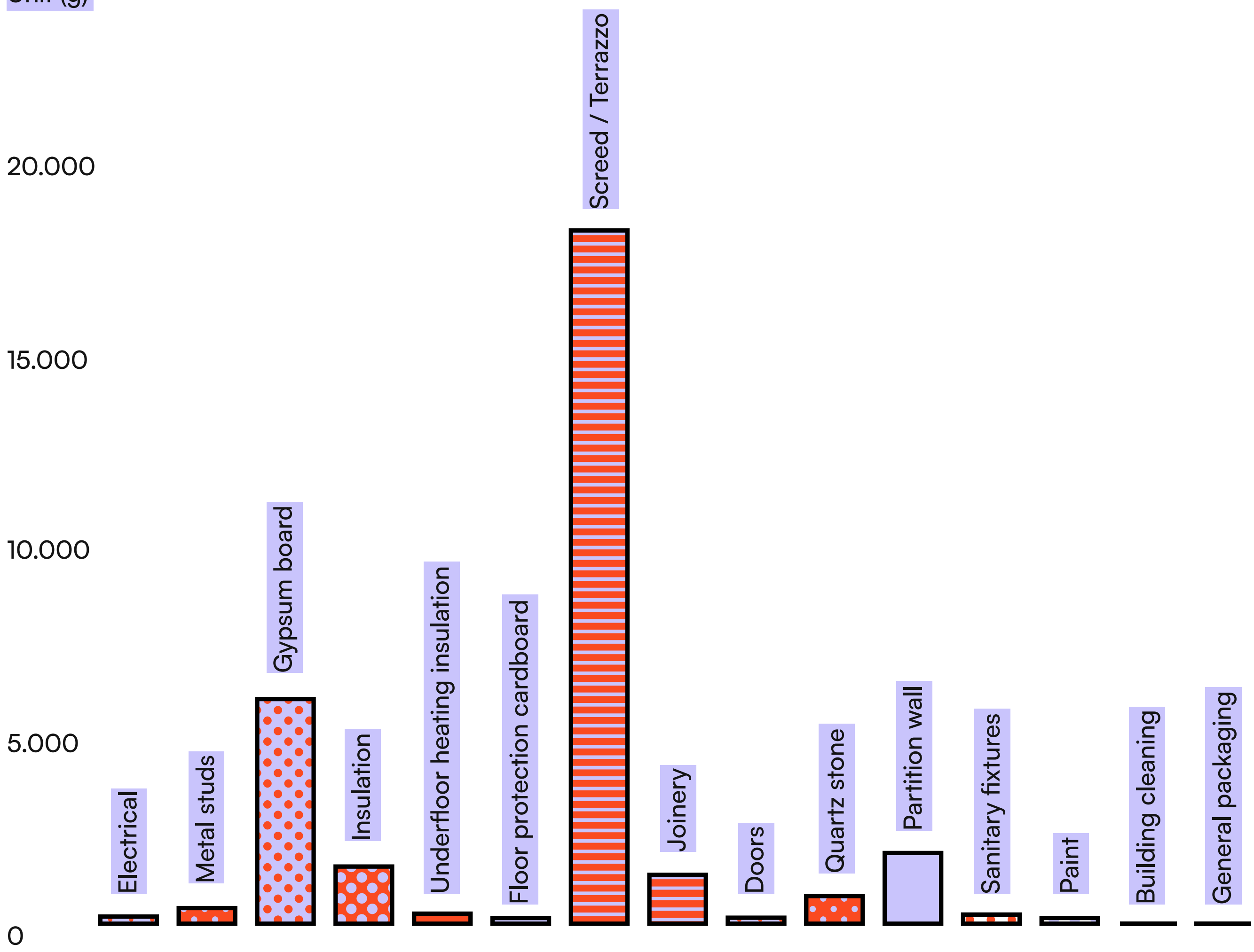
04
Monitoring | Skinperium Zero Waste

Material installation and waste

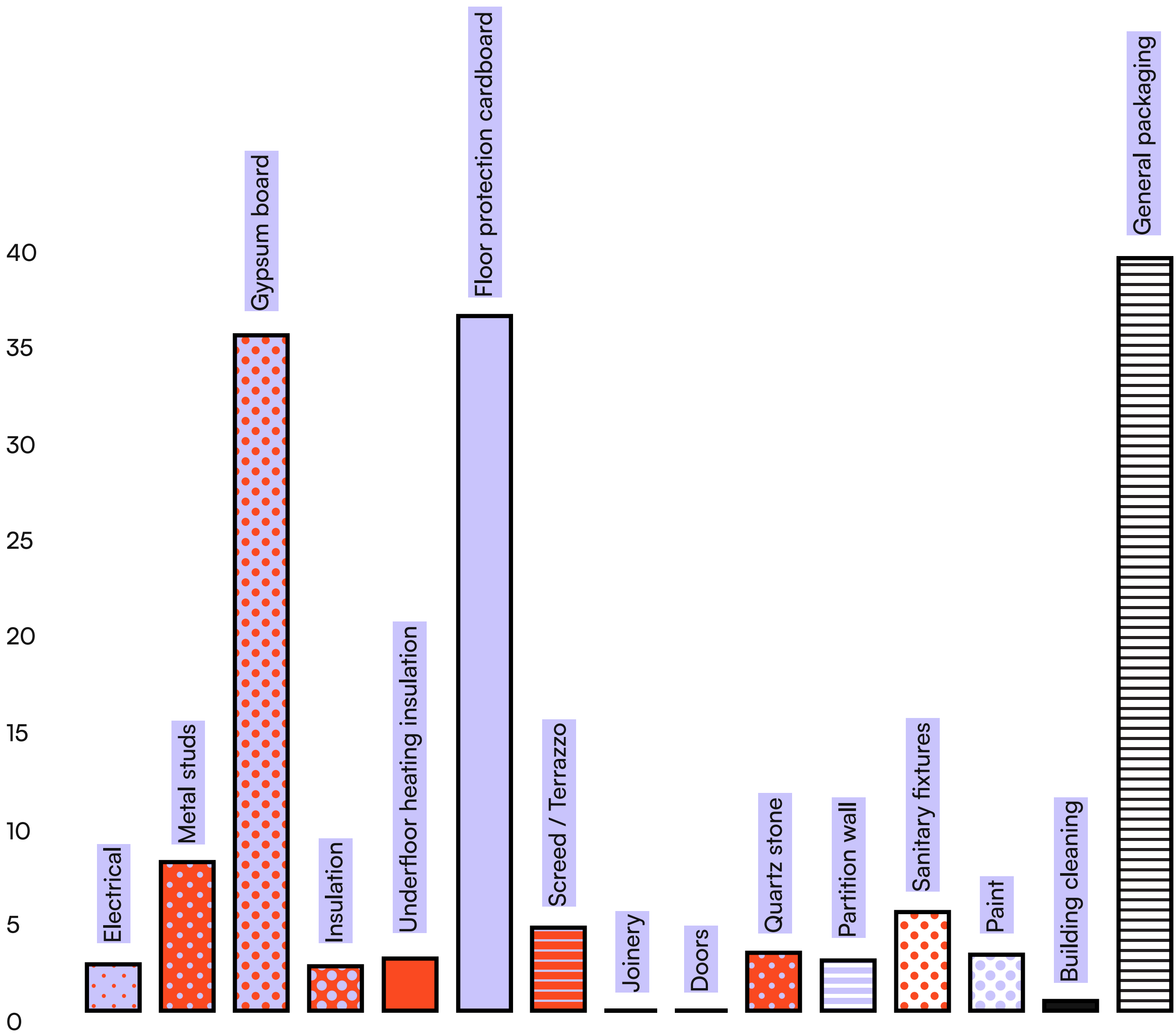
Item	Installed weight (kg)	Waste (kg)
Electrical installation	89	2,4
Metal studs	260	7,7
Gypsum board	5.950	35
Insulation	1.513,8	2,3
Underfloor heating insulation	189	2,7
Floor protection cardboard	36	36
Screed/Terrazzo	18.360	4,3
Joinery	1.295	0
Doors	120	0
Quartz stone	732,6	3
Partition wall	1.872	2,6
Sanitary fixtures	164,9	5,11
Paint	75	2,9
Building cleaning	0	0,5
	30.568,3	102,11
General packaging	0	39
Total waste	30.568,3	141,11

Material installation weight

Unit (g)



Material waste



05
Summary & Procedures

05 Summary

Resource scarcity, the energy crisis, and the climate emergency are currently placing particular strain on urban construction. At the same time, cities around the world are growing and require a massive expansion of residential development in densely populated urban areas. Against this backdrop, the development of concepts that enable energy- and resource-efficient construction and living represents one of the central challenges for urban planning and design in the coming years. The implementation of the Skinperium has demonstrated that much can already be done to make construction more sustainable.

The amount of waste has been significantly reduced. Mathematically, the amount of waste is less than 1%, so we consider the zero waste goal to have been achieved.

A significant part of this is drywall construction, which we placed particular emphasis on implementing.

Waste reduced to < 1%
→ effectively achiving zero-waste goal

Timing

We lost some time due to the increased workload of the local construction management. However, it is not possible to quantify this precisely. We estimate that it was a maximum of one week.

Costs

No cost savings could be generated, even though significant resources were saved.

05
Procedures

Similar to DGNB certification, the Zero Waste concept must also be incorporated into the project work from the outset. Important decisions can already be made during the design phase.

Analysis of current waste generation

Before planning for waste prevention begins, it is important to conduct a thorough analysis of current waste generation. This includes examining the types of waste, the quantity and frequency of its occurrence, and identifying the main sources and causes of waste.

Setting goals and priorities

Based on the results of the waste analysis, clear goals and priorities for waste prevention should be set. These goals should be specific, measurable, achievable, relevant and time-bound to ensure effective implementation.

achievable
time-based
measureable

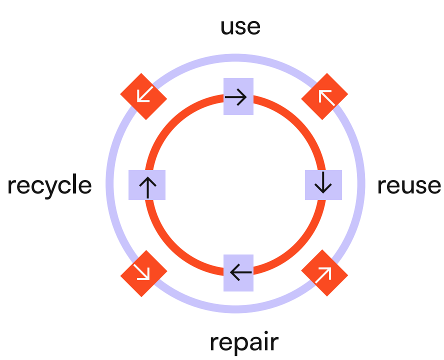
Introduction of waste prevention strategies

Develop and implement waste prevention strategies aimed at reducing the amount and volume of waste. This may include optimising production processes, using environmentally friendly materials, promoting recycling and reuse practices, and training employees and stakeholders in waste prevention.

Raw process → Optimised process

Integration of circular economy principles

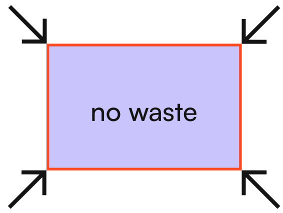
The introduction of circular economy principles into planning, which aim to use, reuse, repair and recycle products and materials throughout their life cycle, rather than disposing of them after a single use. This may include developing product designs with less waste, promoting product life extension and creating take-back systems for products and packaging.



Procedures

Tendering

Every tender and request for quotation must state that no waste may be generated on the construction site. Any waste material must be incorporated on site as far as possible.



Construction management, monitoring and evaluation

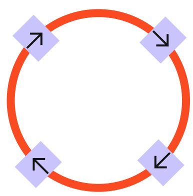
Construction management plays a particularly important role in zero waste implementation.

Implementation of a monitoring and evaluation system to track, measure and evaluate progress in waste prevention. This includes regular monitoring of waste streams, analysis of performance indicators and conducting audits to identify opportunities for improvement.

Inputs → Evaluation → Adjustment

Continuous improvement and adjustment

Continuously review and adjust waste prevention strategies based on the data and experience gathered. This makes it possible to maximise the effectiveness of the measures, identify weaknesses and recognise new opportunities for waste prevention.



06
Source references

06
Source references

Sobek, W. (n.d.). Non nobis — Über das Bauen in der Zukunft (Vol. 1, Ausgehen muss man von dem, was ist).

Deutsche Gesellschaft für Nachhaltiges Bauen. (n.d.). Zirkuläres Bauen.
https://www.dgnb.de/de/nachhaltiges-bauen/zirkulaeres-bauen

Gebäudeforum klimaneutral. (n.d.). Zero Waste.
https://www.gebaeudeforum.de/wissen/nachhaltiges-bauen-und-sanieren/zirkulaeres-bauen/zero-waste

“This case study is a metaform DAR project. DAR is a design-driven research department of metaform, which is essentially concerned with the topics of building in the future. We were founded in 2022 by metaform architects.”