



# ***SELECTED WORKS***

CONFIDENTIAL PORTFOLIO

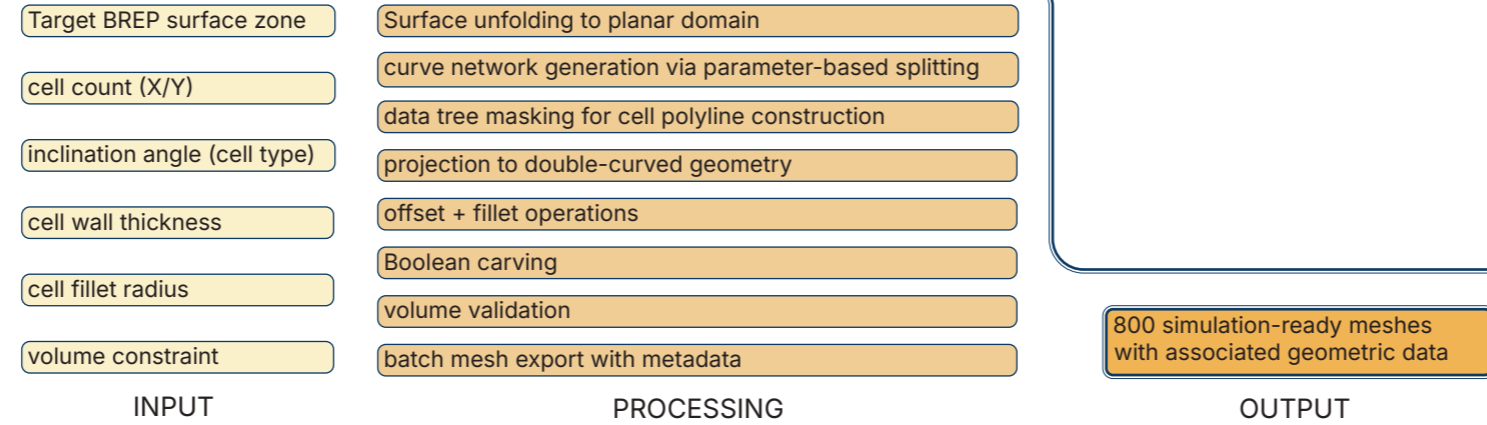
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# PROJECT PLG: PARAMETRIC LATTICE GENERATOR

Interactive real-time lattice generator implemented using JavaScript/WebGL is available at: [www.dimiale.com](http://www.dimiale.com)

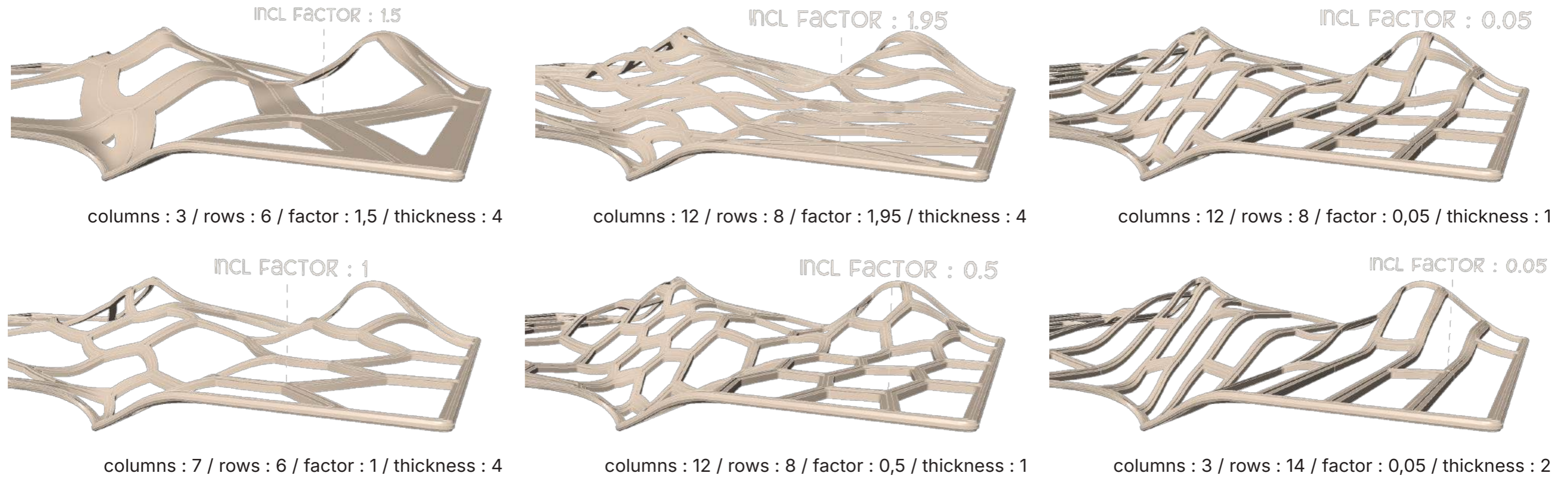
## Problem

Performance footwear development requires systematic exploration of lightweight lattice structures (hexagonal, quad, rhombus, triangular cells) for FEA simulation, limiting design exploration to 5–10 configurations per day considering manufacturing constraints (volume limits, symmetry requirements).



## Solution KPIs (120h development)

- Time reduction :** 40–80 minutes → 2–3 minutes per variant
- Design exploration :** 5–10 manual variants → 800 systematic variations
- Material efficiency :** 20–40% weight reduction while meeting strength requirements



## Transferability

Applicable to aerospace wing structures, automotive crash absorption components, medical implant lattices, architectural facade systems, protective packaging optimization—any domain requiring lightweight structural performance.

## Technical Implementation

Pattern generation on complex double-curved surfaces with enforced bilateral symmetry. Integrated Grasshopper Hops for accelerated batch processing. Python handles fillets operations (it stabilizes) and mesh export with embedded simulation parameters. Gradient-based manual optimization enabled through rapid regeneration after FEA analysis.

# PROJECT OSM: ORGANIC SURFACE MODELING

## Problem

High-quality pattern-based surfaces require manual surface construction with attention to blend transitions, surface curvature continuity and manufacturing constraints, such as for all types of advanced manufacturing.

- base sub-surface
- wave source point
- wave frequency
- wave amplitude
- blend zone width

INPUT

- translation of UV domain into point grid
- circular boundary trimming or domain remapping to disc
- mathematical function evaluation per vertex
- vertex move along Z by computed displacement values

PROCESSING

infinite geometric configurations  
of production-ready solids

OUTPUT

## Solution KPIs (8h development)

- Time reduction :**  
30min per organic surface variant → instant regeneration
- Pattern exploration :**  
5 manual variants → 100+ validated pattern options
- Blend quality :**  
Achieved G1 continuity across organic-to-rigid transitions



## Transferability

Applicable to medical/dental device surface modeling, ergonomic product housings, organic form blending for consumer electronics, injection-molded decorative components

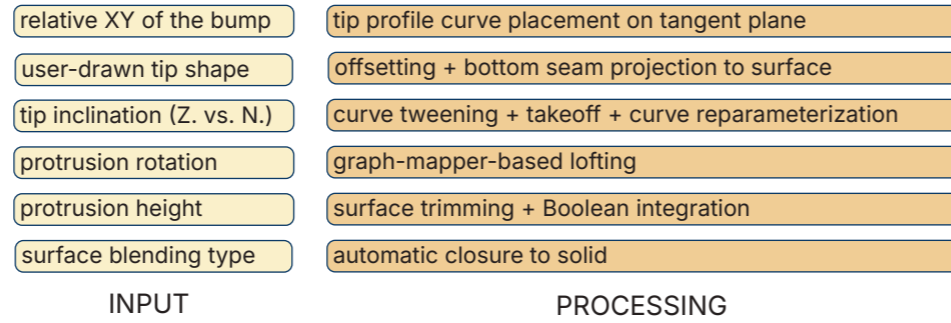
## Technical Implementation

Wave propagation algorithm on double-curved NURBS with G1/G2 blend surface construction between organic and rigid zones. Automated curvature validation and manufacturing constraint checks (overhang limits, wall thickness for FDM).

# PROJECT SFP: SURFACE FEATURE PLACEMENT SYSTEM

## Problem

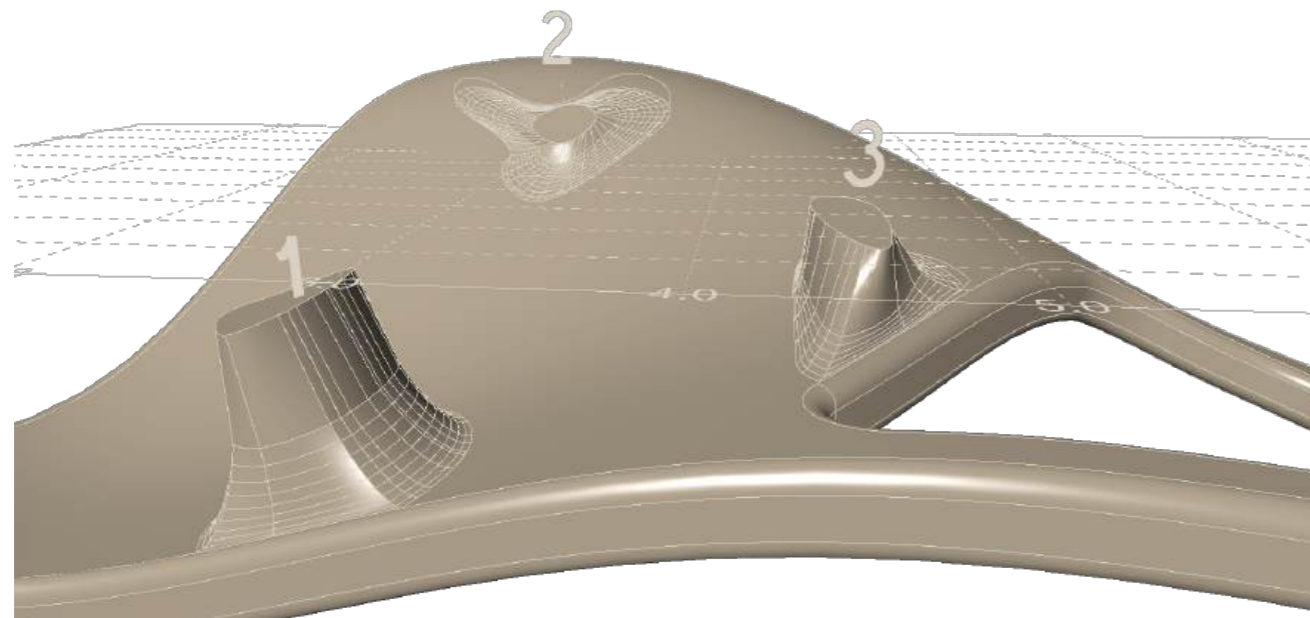
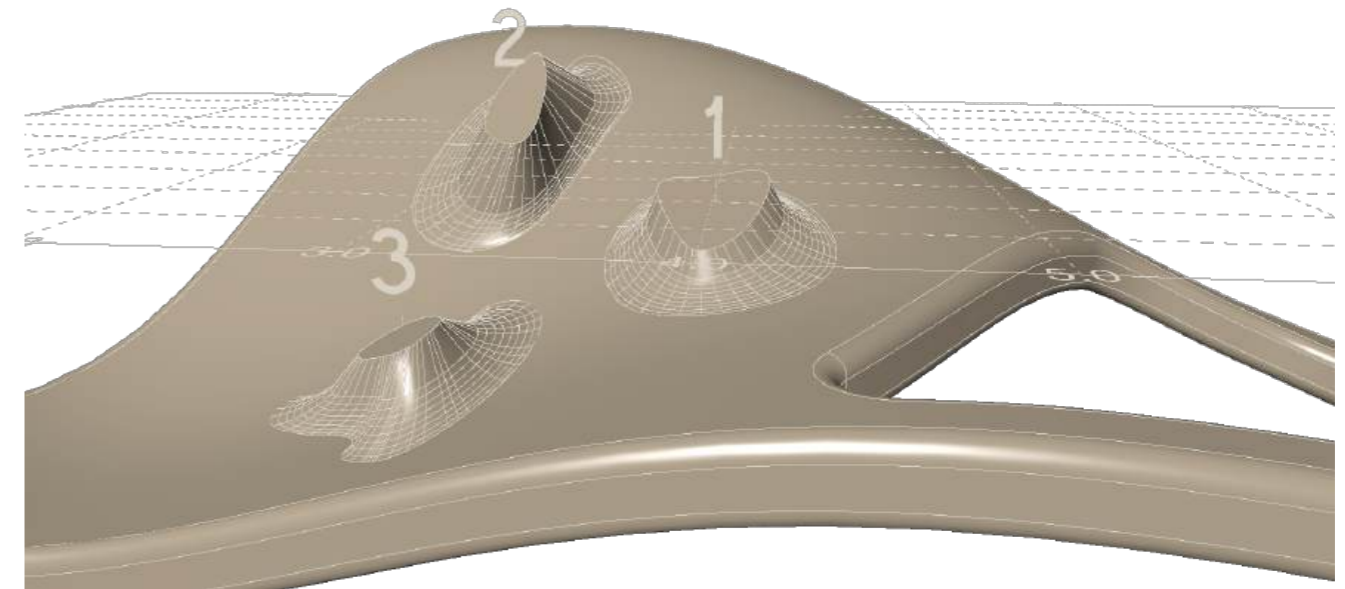
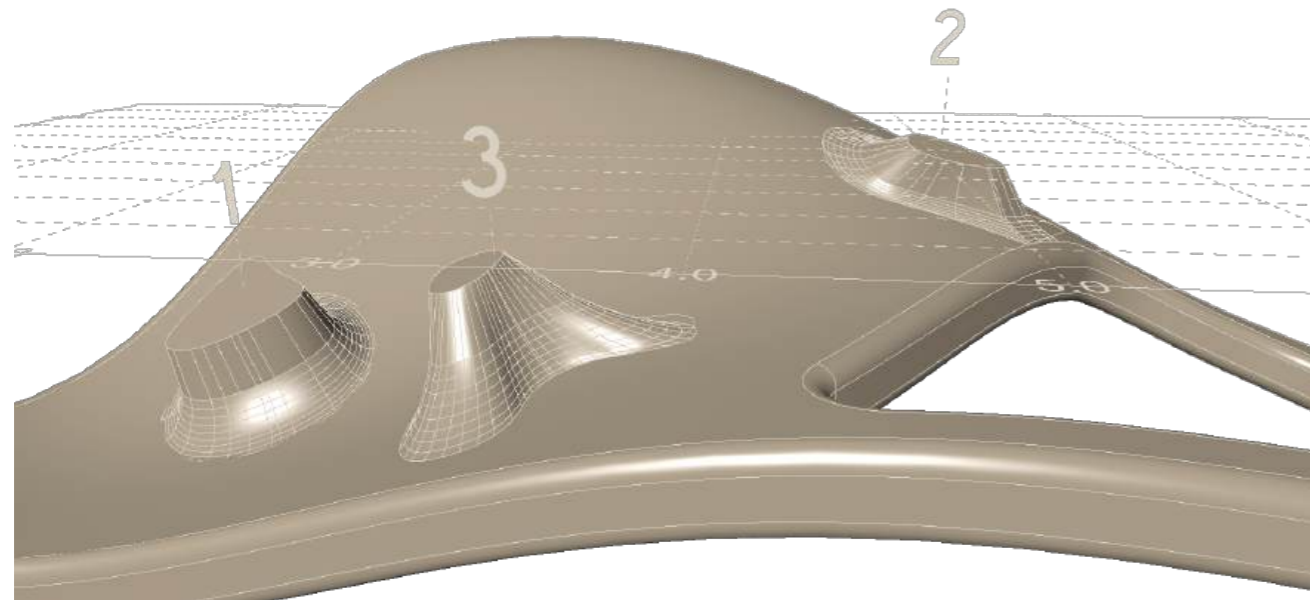
Functional surface protrusions requires manual modeling for each geometric variation—adjusting position, height, rotation, tip shape, and blending for every design iteration. Manual workflow prevents systematic exploration of grip patterns and makes design iteration impractical for projects requiring dozens of variants.



infinite geometric configurations of production-ready solids

## Solution KPIs (180h development)

- Time reduction :** 2-3h per configuration → instant regeneration
- Iteration capacity :** 3-5 concepts per day → 50+ variants per day
- Performance quantification :** Automated geometry estimation + sorting for traction analysis



## Transferability

Core placement logic applies to: ergonomic grip surfaces (power tools, medical devices), thermal management (heat sink fin placement), mold cavity design for functional patterns, anti-slip industrial safety equipment.

## Automated Analytics

System generates performance statistics per feature: wall surface area, directional surface area (Y-axis projection for traction analysis), geometric validity checks. Canvas-based spatial sorting of protrusions organizes component positioning for structured data export.

## Technical Implementation

Generative design system for parametric placement and blending of functional surface protrusions. Handles complex double-curved base geometry with automatic edge-case resolution (features extend beyond base surface).

# PROJECT QC: GEOMETRIC QUANTITY & COST EXTRACTION SYSTEM

## Problem

Office fit-out projects required manual extraction of geometric data from CAD plans (areas, workspace counts, spatial categories), followed by cost calculation from market pricing spreadsheets and layout (re-)preparation for client presentations.

- Automated office plan geometry (from space generation tools)
- Excel cost database per unit (Standard/Premium/High)
- regulatory formulas + descriptions + disclaimers
- layout sheet dimensions

INPUT

- automated extraction of areas and workspace typologies from CAD generated floorplan
- categorization of geometry by construction phase (owner/tenant fit-out, furnishings, technical systems)
- cross-referencing with pricing database
- generation of formatted layout with auto-positioned tables and proportional wheel chart visualization

PROCESSING

- client-ready PDF with cost breakdown across 3 pricing tiers

OUTPUT

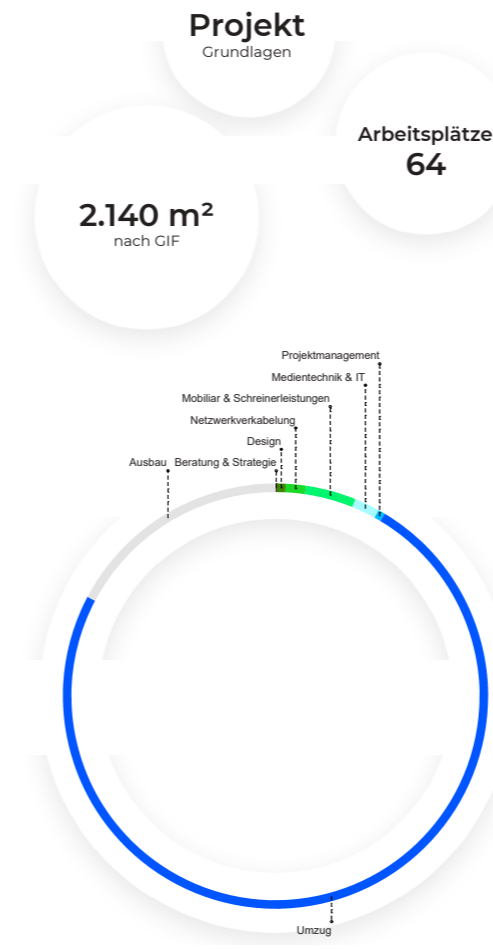
## Solution KPIs (80h development)

- Update speed :** 2-hour recalculation after plan changes → 30 seconds
- Error reduction :** 15–20% manual calculation errors → <2% automated
- Client presentation preparation :** 2 days for multiple comparison variants → 10 minutes

## Einfacher Kostenrahmen

Durchschnittliche Kosten Ausbau Eigentümer		1100 €/m <sup>2</sup>	1500 €/m <sup>2</sup>	2000 €/m <sup>2</sup>
		Standard	Gehobener Standard	Premium
<b>Kosten Eigentümer</b>		1.694.921 - 2.448.219 €	2.448.219 - 3.201.518 €	3.201.518 - 4.331.465 €
<b>Ausbau</b>	Kostengruppe 300-700	1.694.921 - 2.448.219 €	2.448.219 - 3.201.518 €	3.201.518 - 4.331.465 €
<b>Kosten Mieter</b>		8.123.547 - 9.684.693 €	8.585.526 - 10.203.170 €	9.104.002 - 10.731.646 €
<b>Beratung &amp; Strategie</b>	Kostengruppe 700 Baunebenkosten	10.000 - 20.000 €	20.000 - 30.000 €	30.000 - 50.000 €
<b>Design</b>	Kostengruppe 700 Baunebenkosten	65.914 - 84.746 €	103.579 - 122.411 €	141.243 - 160.076 €
<b>Netzwerkverkabelung</b>	Kostengruppe 400 Technische Anlagen	150.660 - 188.325 €	188.325 - 282.487 €	282.487 - 376.649 €
<b>Möbiliar &amp; Schreinerleistungen</b>	Kostengruppe 600 Ausstattung und Kunstwerke	376.649 - 564.974 €	564.974 - 753.298 €	753.298 - 941.623 €
<b>Medientechnik &amp; IT</b>	Kostengruppe 600 Ausstattung und Kunstwerke	188.325 - 376.649 €	376.649 - 564.974 €	564.974 - 753.298 €
<b>Projektmanagement</b>	Kostengruppe 700 Baunebenkosten	52.000 - 130.000 €	52.000 - 130.000 €	52.000 - 130.000 €
<b>Umzug</b>	Kostengruppe 700 Baunebenkosten	7.280.000 - 8.320.000 €	7.280.000 - 8.320.000 €	7.280.000 - 8.320.000 €

SpaceCost bietet einen ersten, transparenten Überblick über alle relevanten Kostenarten, die im Rahmen einer Büroflächenplanung auf Nutzerseite und Eigentümerseite entstehen können – noch bevor konkrete Projektinformationen vorliegen. Der einfache Kostenrahmen hilft dabei, frühzeitig ein Gefühl für die Größenordnung und Struktur möglicher Aufwände zu bekommen. Im weiteren Projektverlauf wird diese Übersicht zur detaillierten Kostenschätzung weiterentwickelt.



## Transferability

Applicable to residential construction cost estimation, retail space planning budgets, warehouse layout optimization, facility management cost modeling—any context requiring geometric data extraction from CAD for downstream business processes.

Core value is automated geometric data extraction from complex CAD plans—area calculations, spatial category identification, component quantification

## Technical Implementation

Python ensures stable Excel parsing. Grasshopper Pancake plugin enables complex conditional logic for cost categorization. Elefront manages Rhino blocks and smart automated baking for layout generation. System integrates with upstream plan generation tools for end-to-end workflow. Multilingual layout switching (German/English) via Excel configuration.

## PROJECT EFS: EDGE FILLETING SYSTEM

### Problem

Applying fillets to complex CAD models with hundreds of edges requires manual edge identification by its indicies—a process prone to selection errors and geometry failures later on if done simultaneously with standard Grasshopper components. 50+ models required 2–4 hours of manual work with ~15-20% error rate in edge selection.

BREP geometry

dihedral angle threshold

edge length filter

INPUT

Geometric analysis algorithm calculates face normal angles at edge midpoints

filters edges by sharpness and length criteria

sequential (not simultaneous) filleting with spatial re-indexing (edges tracked by 3D location, not index)

automated BREP validation

PROCESSING

production-ready  
filleted closed solids

OUTPUT

### Solution KPIs (35h development)

#### Time reduction :

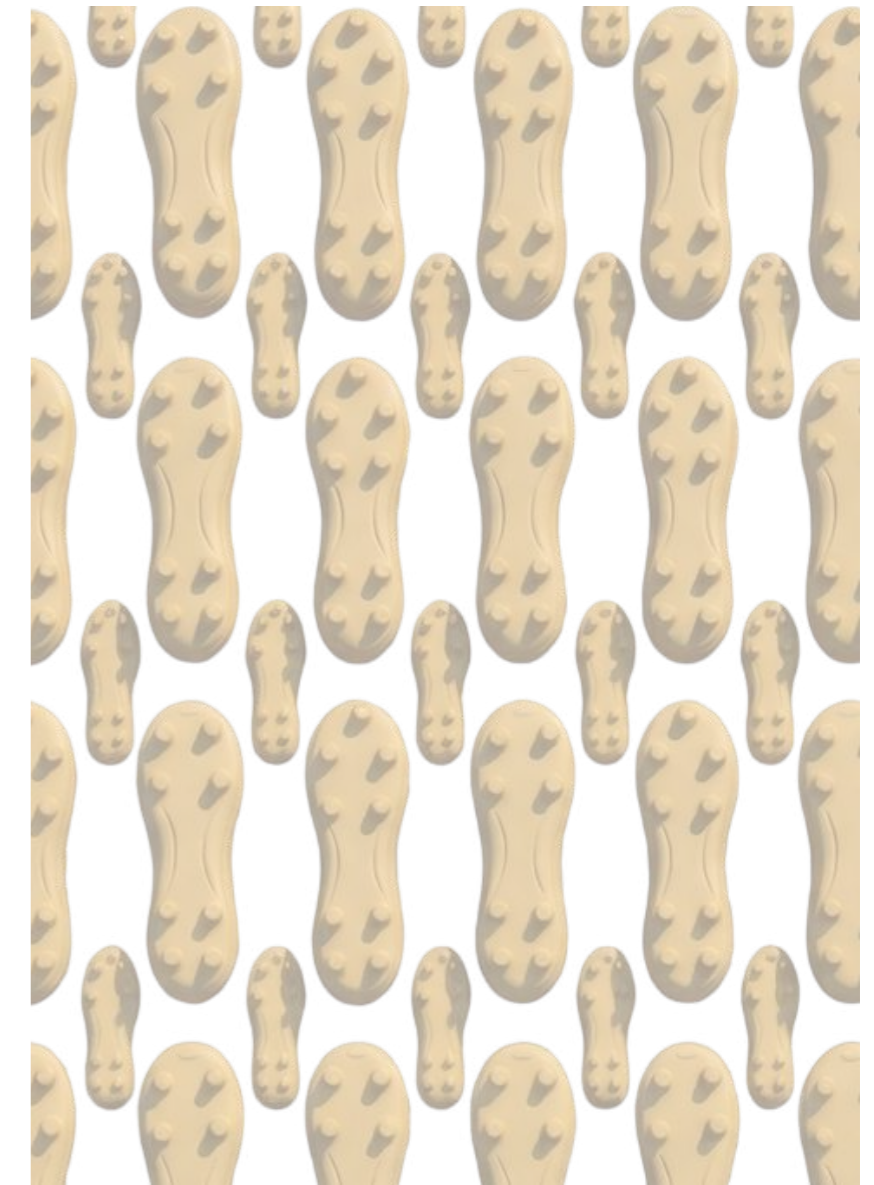
2–4 hours → 3–5 minutes per 50+ models

#### Error elimination :

15-20% selection error rate → 0% with automated detection

#### Material optimization :

5–15% material reduction through consistent fillet application



### Transferability

Core logic applies to any industry requiring edge treatment on complex CAD solids: automotive interior components, medical device ergonomics, consumer electronics housing, aerospace structural fairings.

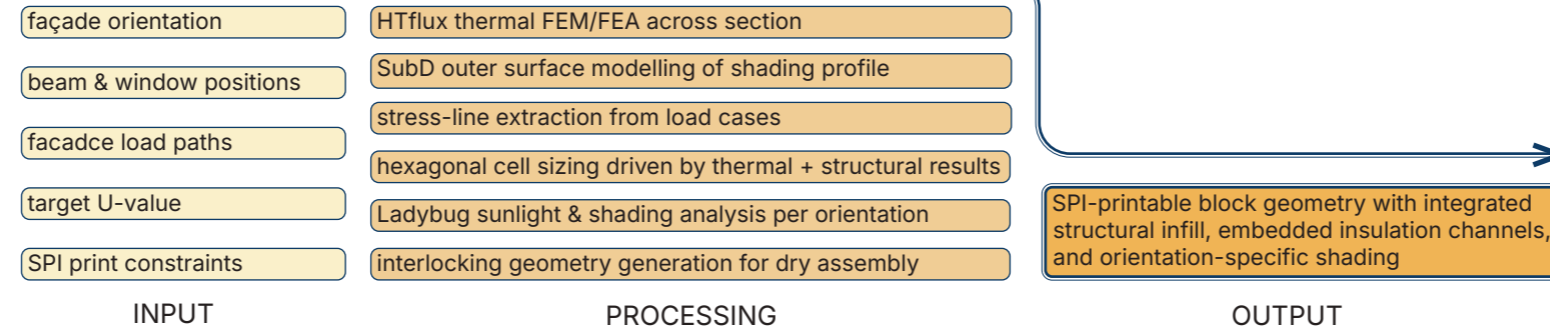
### Technical Implementation

Custom algorithm solves topology instability by storing edge curves before modification, then spatially relocating them after each fillet operation. Enables batch processing of complex models that break conventional filleting tools.

## PROJECT LFB: LIGHTWEIGHT FACADE BLOCK

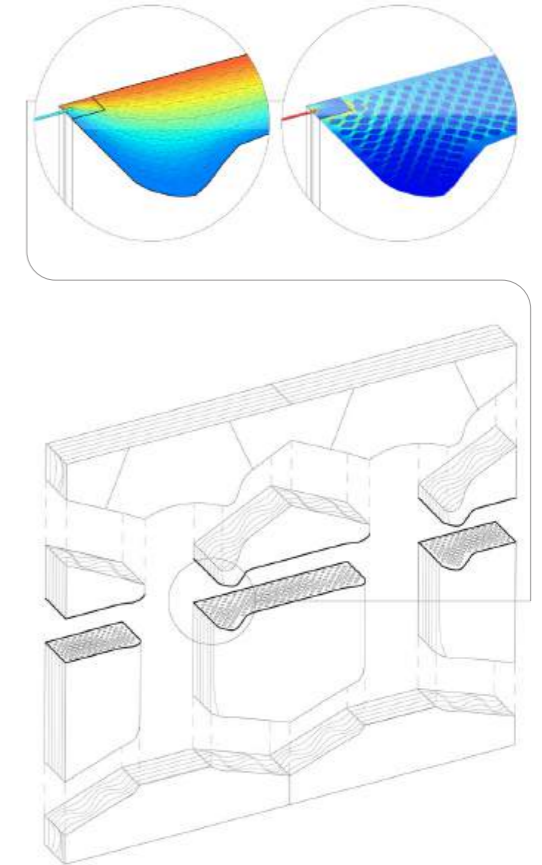
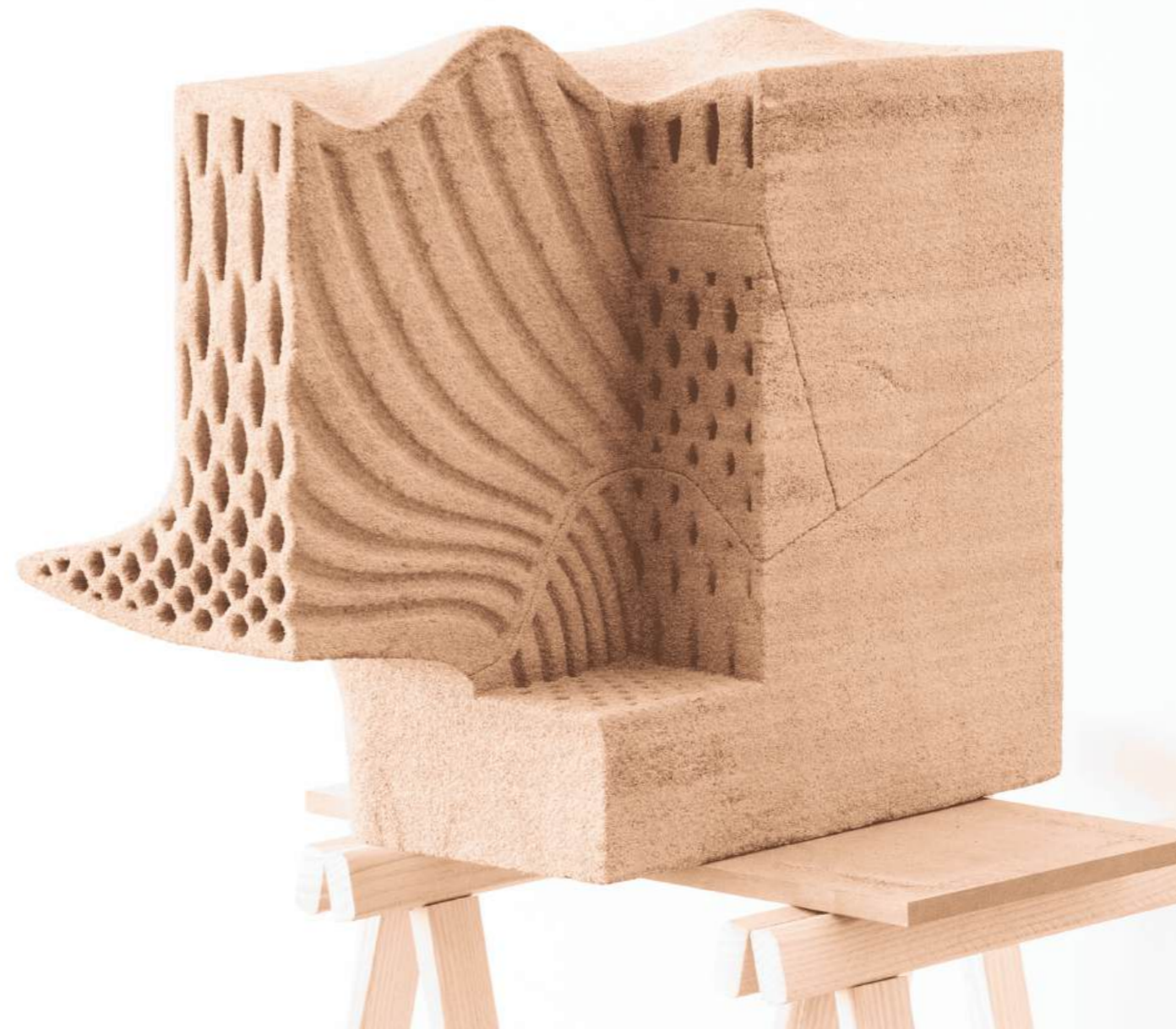
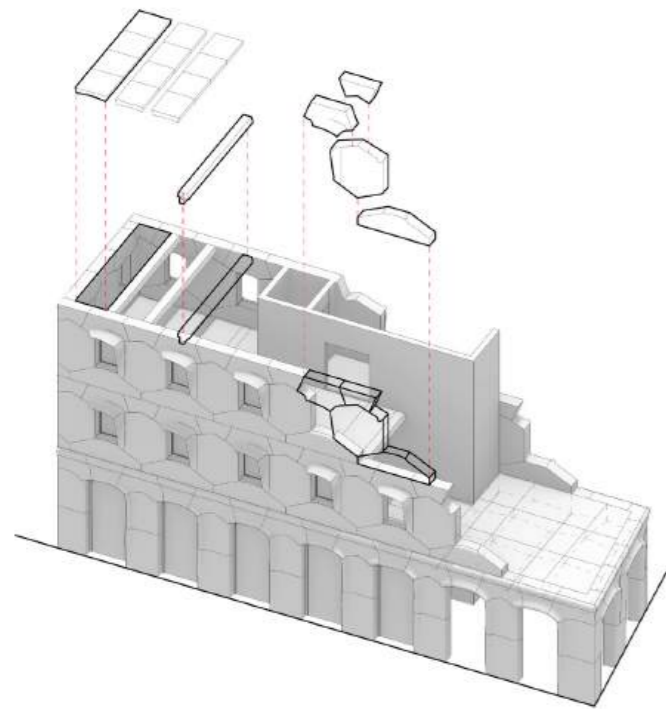
### Problem

Conventional façades separate structure, insulation, shading, and cladding into distinct layers, trades, and material streams. Each added layer increases weight, labour, and waste. Integrating all functions into a single fabricable element demands a workflow where structural, thermal, and solar logic are resolved together rather than sequentially.



### Solution KPIs (60h development)

- Function integration :** structure, insulation, shading, assembly → one block
- Assembly logic :** mortar-based wet trades → dry interlocking, mortarless stacking
- Design coupling :** sequential structural / thermal / solar review → single simulation-driven geometry



### Transferability

Applicable wherever structural, thermal, and shading performance must be resolved in a single fabricated element: heritage-sensitive façades, climate-adaptive envelopes, prefabricated dry-assembly systems, and — beyond architecture — aerospace panels and automotive components requiring functionally graded infill.

### Technical Implementation

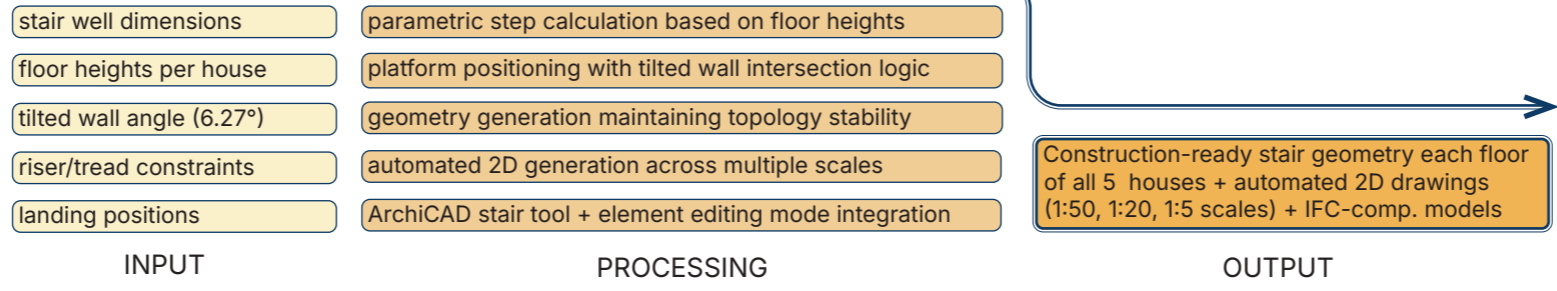
Rhinoceros 8 as the main platform, with Grasshopper coordinating Ladybug (solar), HTflux (thermal FEM/FEA), and Lunchbox (cell structure). Hexagonal infill is generated directly from simulation output rather than drawn and checked afterwards: bound concrete with recycled glass granulate forms the load-bearing skeleton, while unbound granulate remaining

inside the printed cells acts as insulation. Cell walls thicken along stress lines traced from beam and window positions, and thin where loads are light. Shading profiles are cut into the outer surface per façade orientation. All geometry respects the 1.5 cm minimum wall thickness of the SPI process. Prototype printed by Additive Tectonics (FIT AG GmbH).

# PROJECT PSA: PARAMETRIC STAIR APPROACH

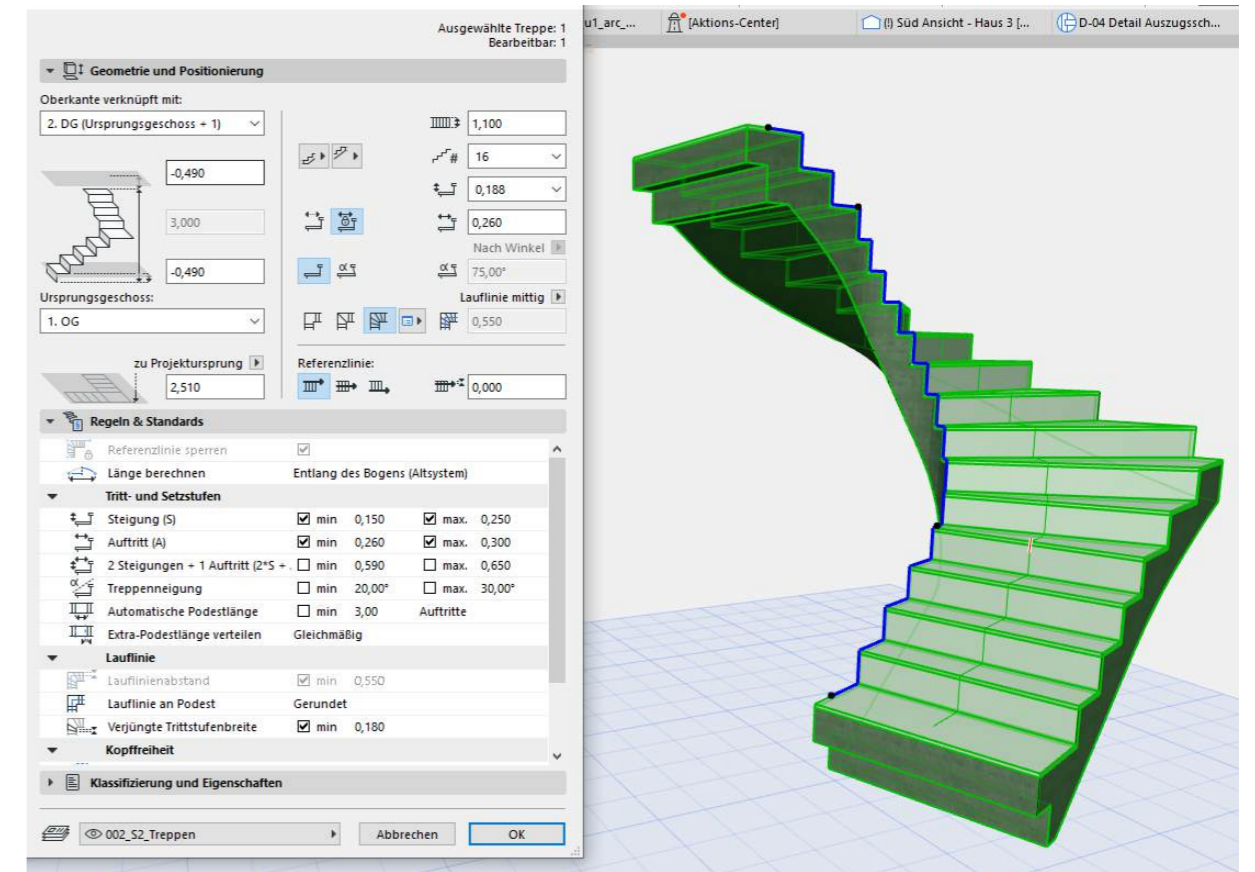
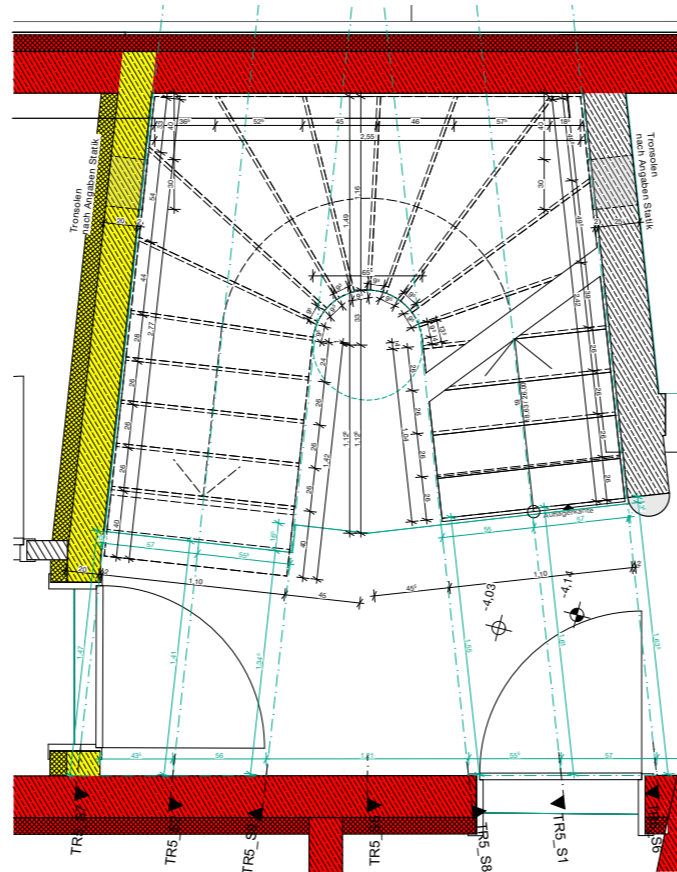
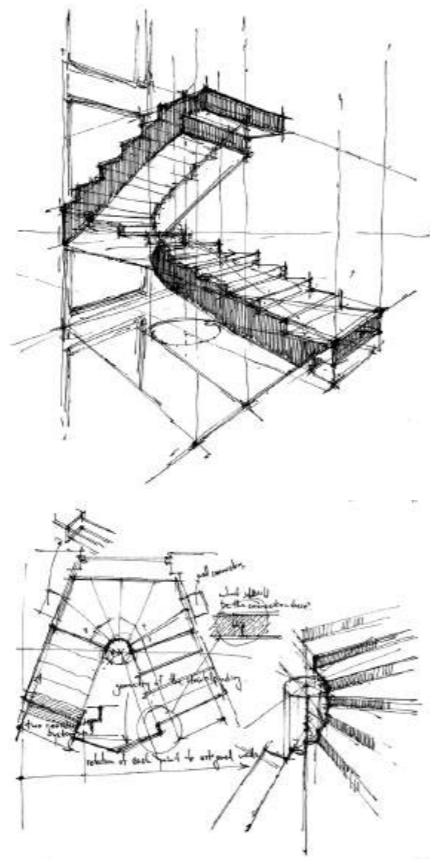
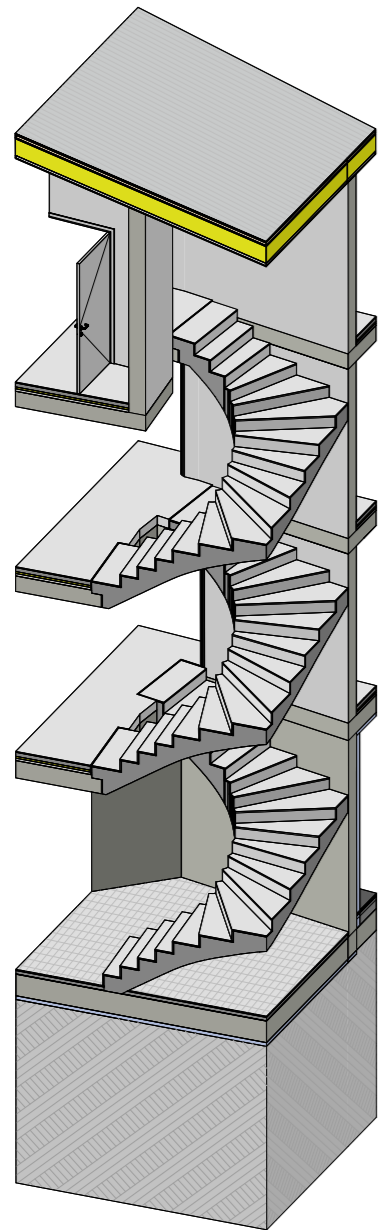
## Problem

Custom staircases across 5 houses required unique geometry for 6.27° tilted walls and varying floor heights. Manual design with topology changes during sequential operations caused geometry failures requiring extensive rework for multi-scale construction documentation.



## Solution KPIs (75h development)

- Error elimination :** Topology-stable and construction-ready surface generation and filleting across all variants
- Time reduction :** 2-4 hours per stair variant → 5-10 minutes per variant
- Iteration capacity :** 20+ validated stair variations generated with consistent documentation



## Transferability

Applicable to AEC projects requiring complex geometry with unconventional constraints (tilted walls, curved plans, split-level configurations), industrial design requiring ergonomic stair systems with variable geometries, footwear design utilizing complex curved last geometries requiring sequential surface operations and topology-stable filleting.

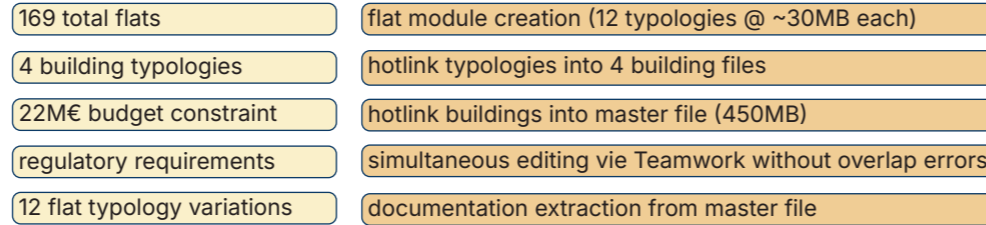
## Technical Implementation

ArchiCAD 22 stair tool maximized through combined stair editing and whole-element editing modes. Parametric geometry maintains topology stability through sequential operations. Automated 2D generation produces 1:50, 1:20, 1:5 documentation directly from 3D model with IFC exchange for external collaboration.

# PROJECT HFF: HOTLINK FLAT FRAMEWORK

## Problem

169-flat development across buildings required execution documentation within 22M€ budget. Conventional single-file BIM creates unmanageable file sizes (>1GB), prevents simultaneous work, and risks corruption. Individual planning of 169 flats would exceed timeline and budget.



INPUT

PROCESSING

Coordinated BIM model across all buildings + execution-ready documents for 169 flats + local permission documentation

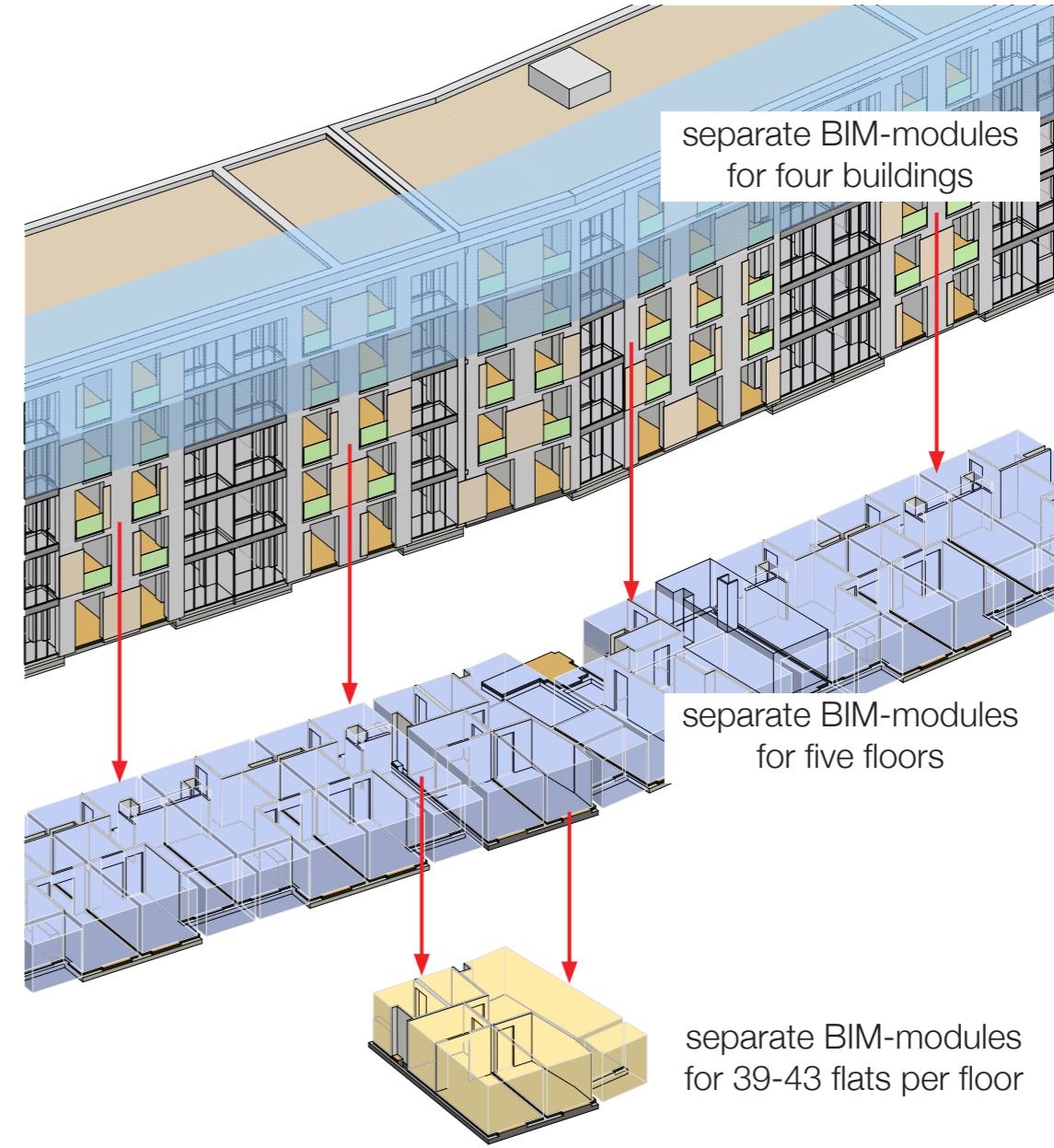
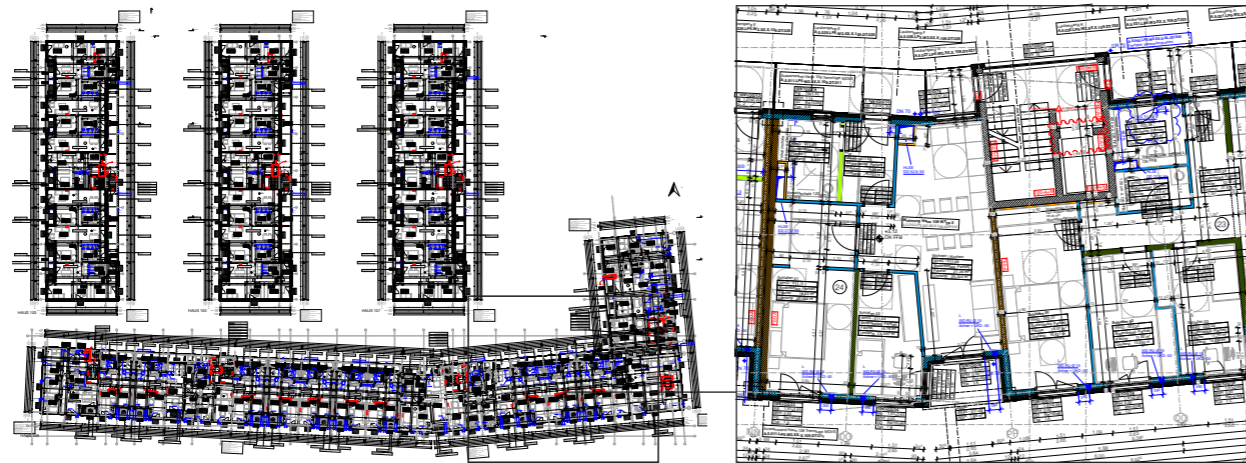
OUTPUT

## Solution KPIs (45h development)

- Project duration :** 2.5 years (conventional single-file workflow) → 1.5 years (modular hotlink system)
- Team efficiency :** 2 people working simultaneously on different modules without file conflicts
- File management :** 450MB master file maintained through distributed 30MB typology modules preventing misinteraction and corruption



construction site drone photo / source : www.dawonia.de



## Transferability

Applicable to large-scale residential developments with repeated unit types, mixed-use projects requiring systematic typology variation, institutional buildings (hospitals, universities, hotels) with standardized room modules, modular construction workflows requiring factory-to-site coordination, any BIM project where file size and team collaboration create bottlenecks in conventional single-file approaches.

## Technical Implementation

Three-tier ArchiCAD Teamwork hotlink hierarchy: 12 flat typology modules (~30MB each) → 4 building files → 1 master file (450MB). Bottom-up change propagation enables typology edits to auto-update through buildings into master. Distributed structure prevents corruption and enables simultaneous editing without conflicts.