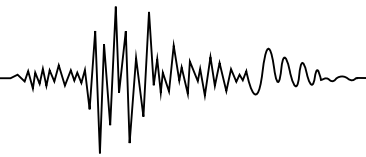
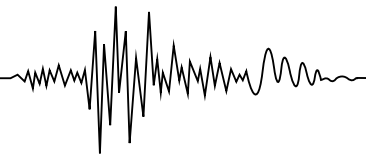
Solutions for the Province of Groningen

Seismic retrofit of historic Amsterdam School houses

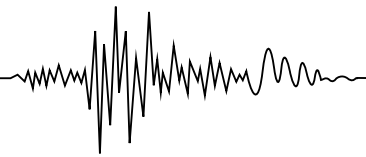
P5 presentation Pasquale A. van Dijk



- Introduction
- Problem statement
- Boundary conditions
- Designs
- Conclusions



Introduction



7.8 on the Richter scale

3.6 on the Richter scale

Introduction

EMS-98 Intensity	Felt	Impact	Magnitude (Approxi-mat Value)	Building Damage (Masonry)
I	Not felt	Not felt		
II-III	Weak	Felt indoors by a few people. People at rest feel a swaying or light trembling.	2 – 3	
IV	Light	Felt indoors by many people, outdoors by very few. A few people are awakened. Windows, doors and dishes rattle.		
V	Moderate	Felt indoors by most, outdoors by few. Many sleeping people wake up. A few are frightened. Buildings tremble throughout. Hanging objects swing considerably. Small objects are shifted. Doors and windows swing open or shut.	4	
VI	Strong	Many people are frightened and run outdoors. Some objects fall. Many houses suffer slight non-structural damage like hair-line cracks and falling of small pieces of plaster.		
VII	Very strong	Most people are frightened and run outdoors. Furniture is shifted and objects fall from shelves in large numbers. Many well-built ordinary buildings suffer moderate damage: small cracks in walls, fall of plaster, parts of chimneys fall down; older buildings may show large cracks in walls and failure of in-fill walls.	5	
VIII	Severe	Many people find it difficult to stand. Many houses have large cracks in walls. A few well built ordinary buildings show serious failure of walls, while weak older structures may collapse.		
IX	Violent	General panic. Many weak constructions collapse. Even well built ordinary buildings show very heavy damage: serious failure of walls and partial structural failure.	6	
X+	Extreme	Most ordinary well built buildings collapse, even some with good earthquake resistant design are destroyed.	7	

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← Kathmandu

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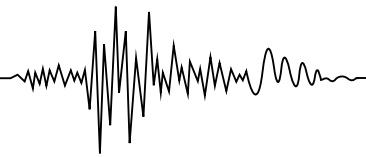
← Loppersum

← Kathmandu

Problem statement



35,000 - >100,000

Demolition?

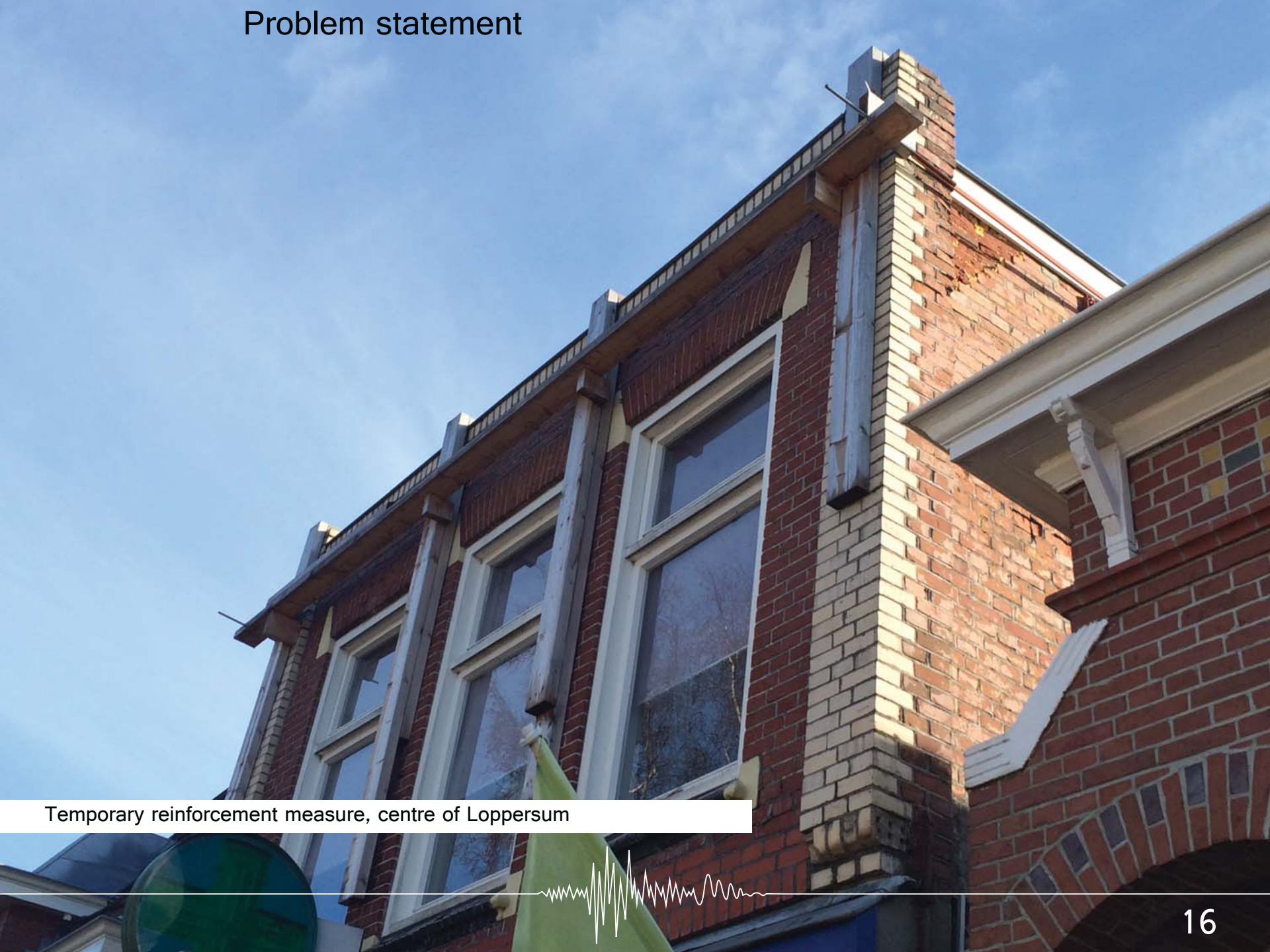
Problem statement

Amsterdam School style buildings in the Province of Groningen

Problem statement

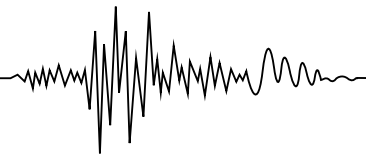
Reinforcement measures to protect the building against earthquakes, United States

Problem statement



Temporary reinforcement measure, centre of Loppersum

Boundary conditions



Level 1

Restraint of possible falling hazards

Boundary conditions

Broken chimney after an earthquake, United States

Braced chimney, United States

Boundary conditions

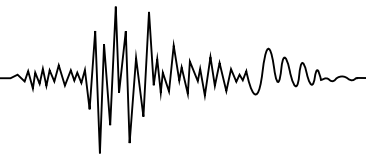
Lightweight chimney, Loppersum

Boundary conditions

Lightweight chimney

Level 2

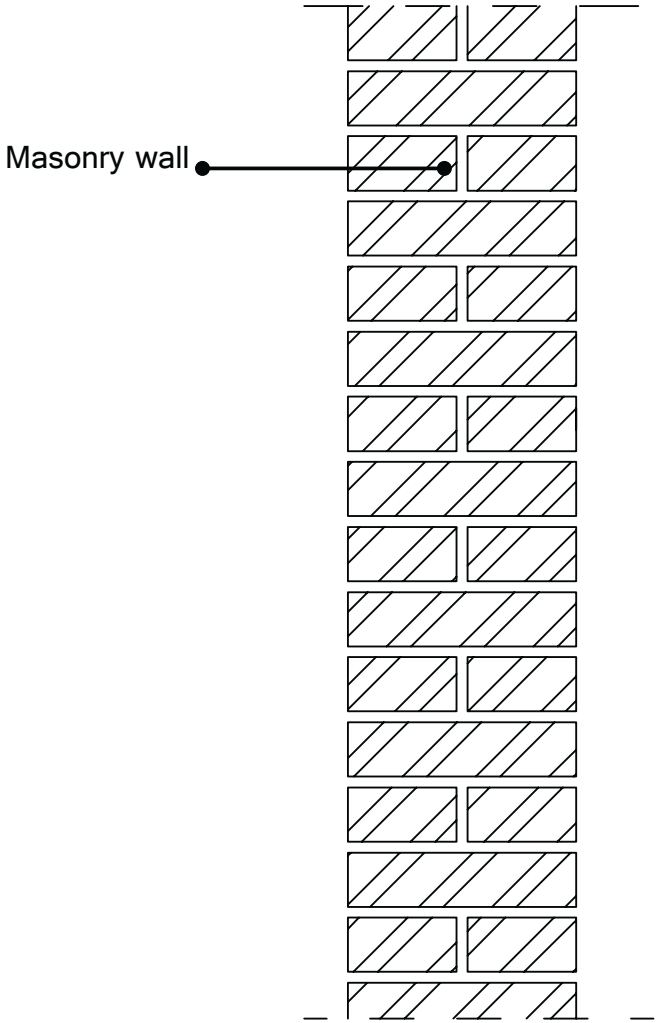
Tying of floors and walls



Boundary conditions

Pattress plate

Boundary conditions



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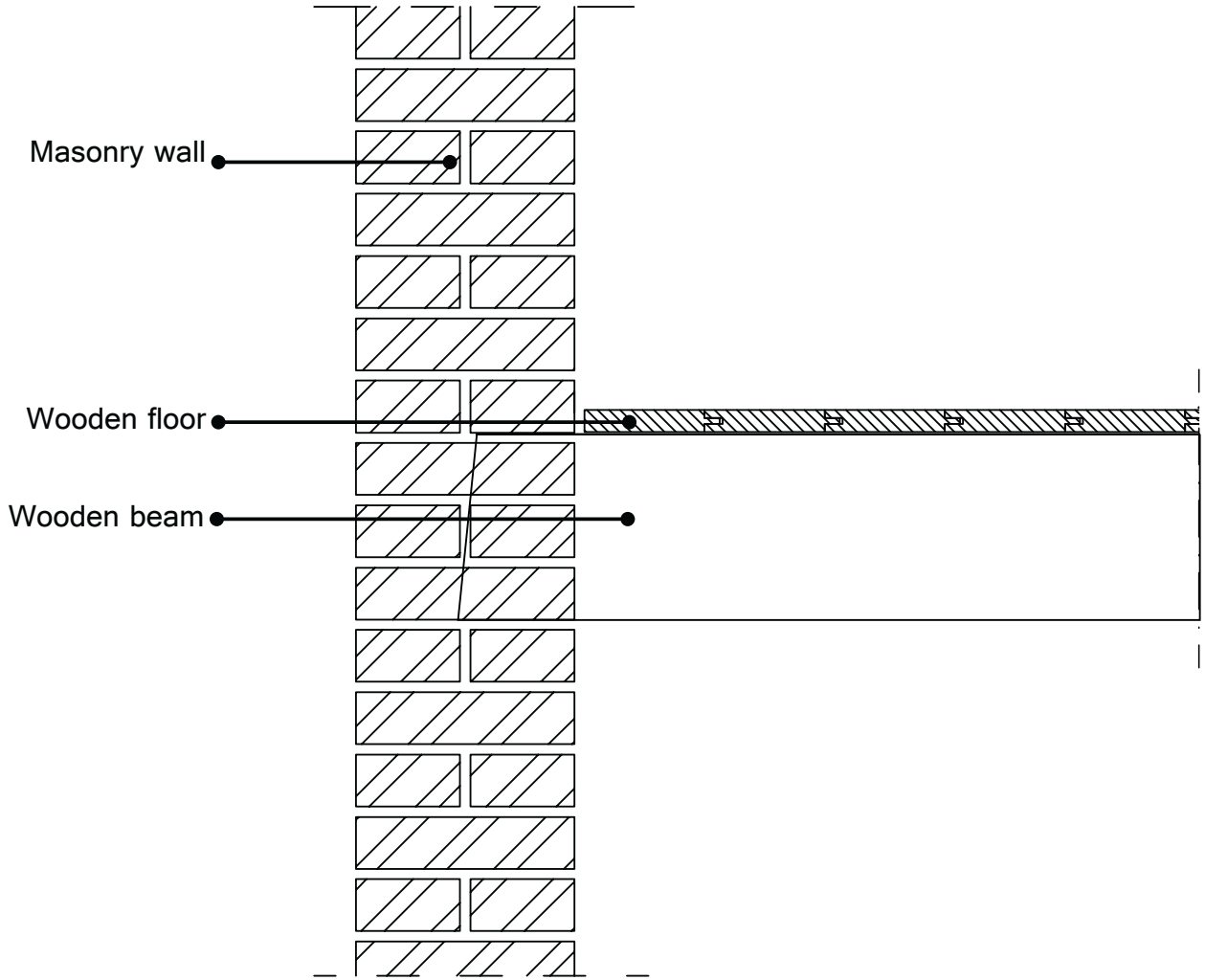

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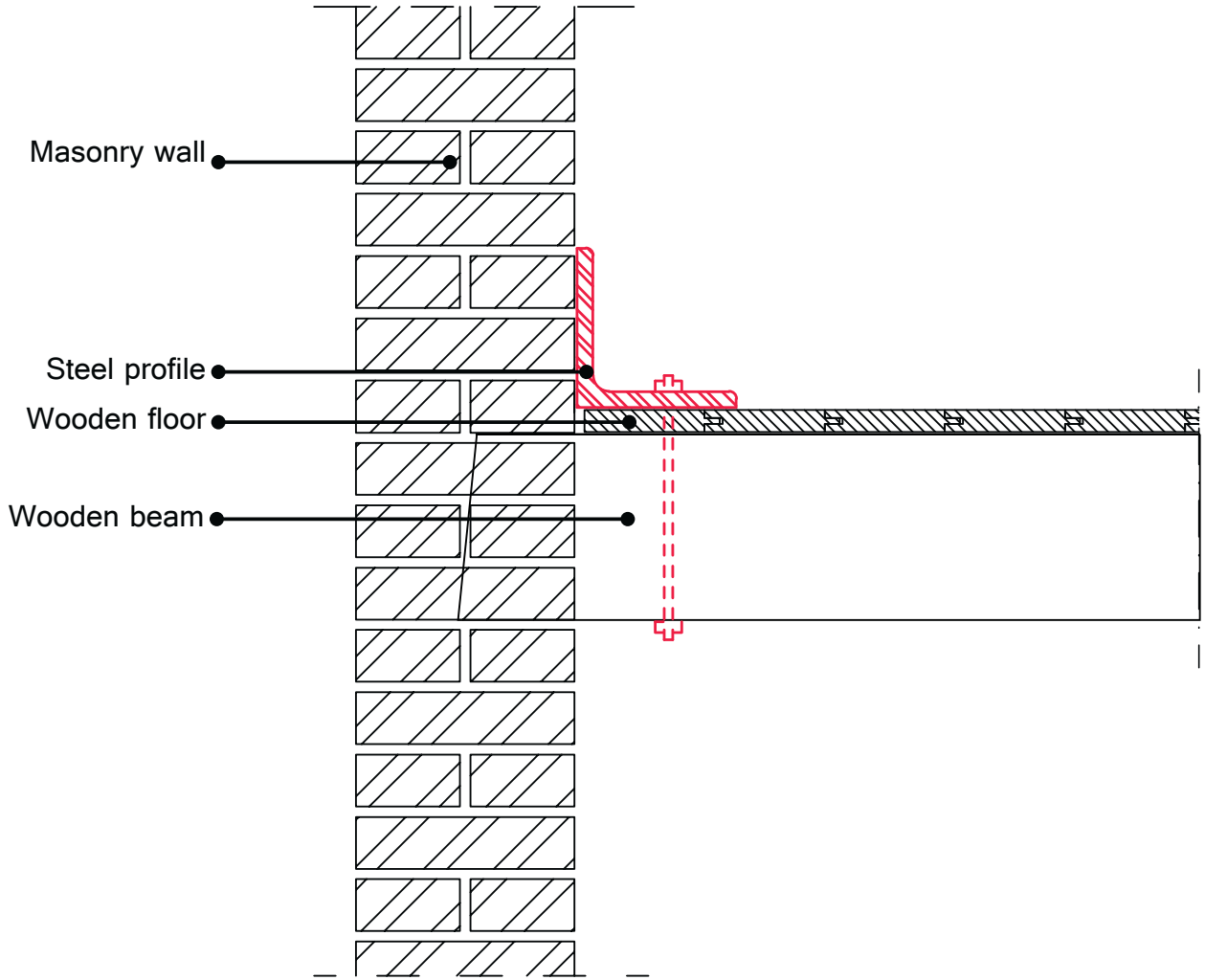

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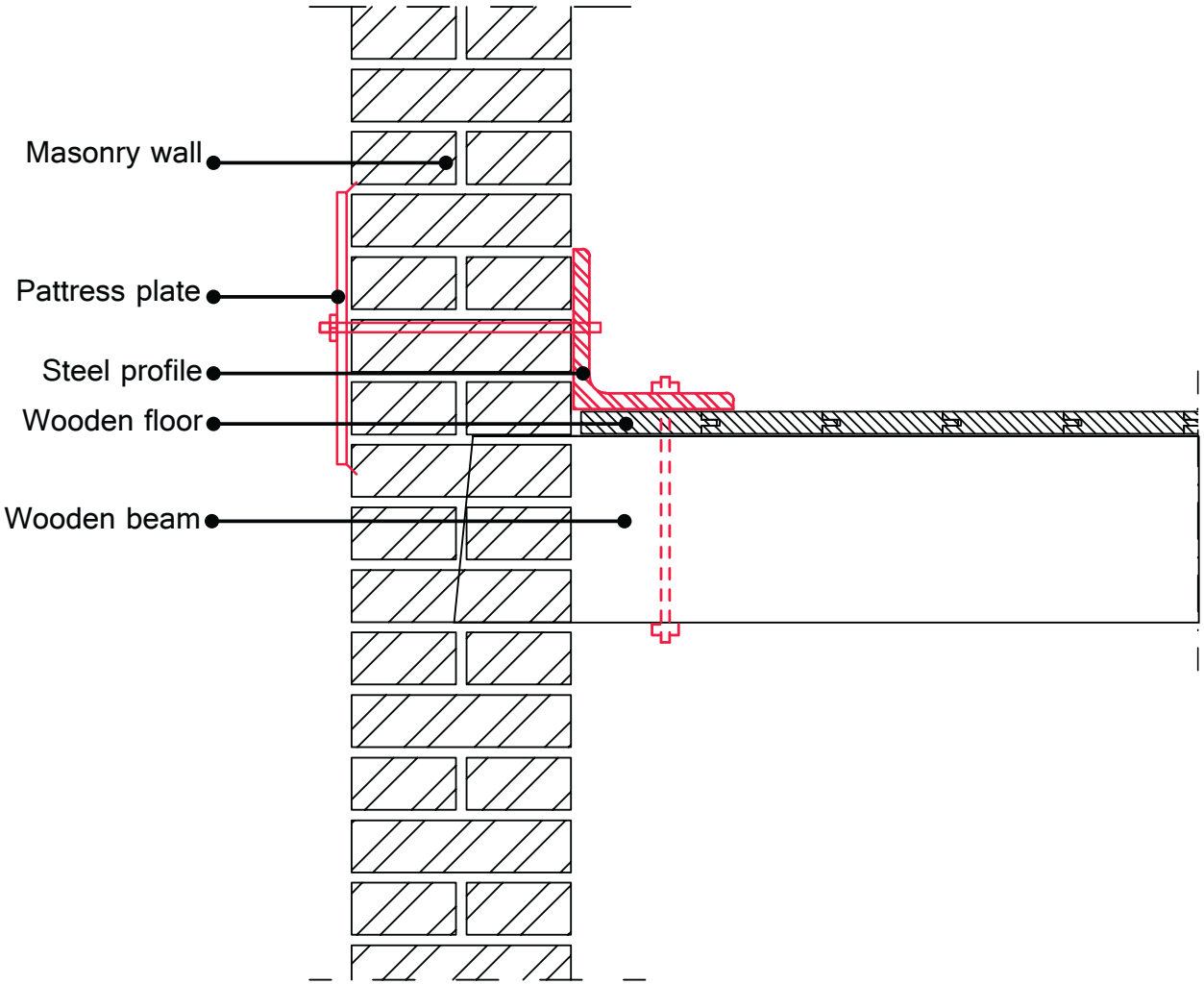
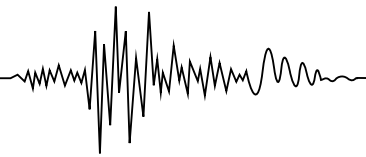


Level 3

Stiffening of flexible diaphragms



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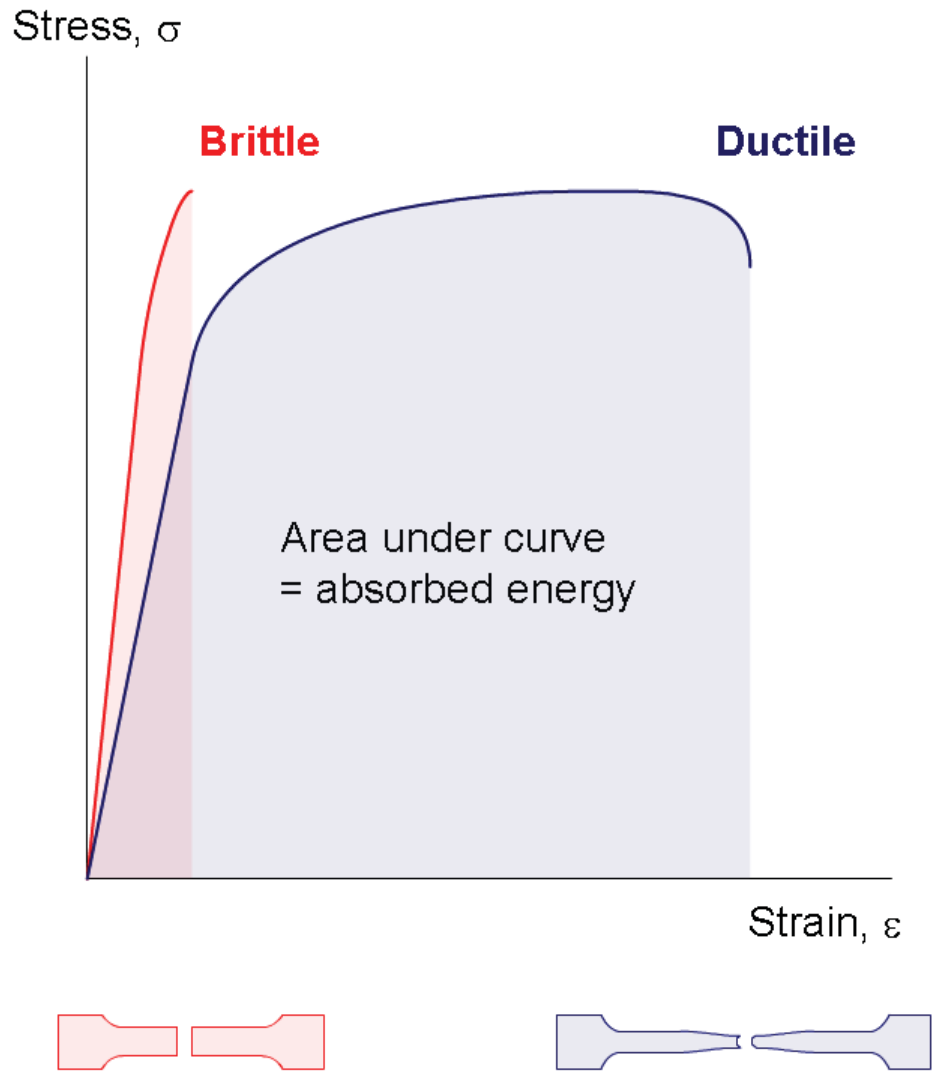
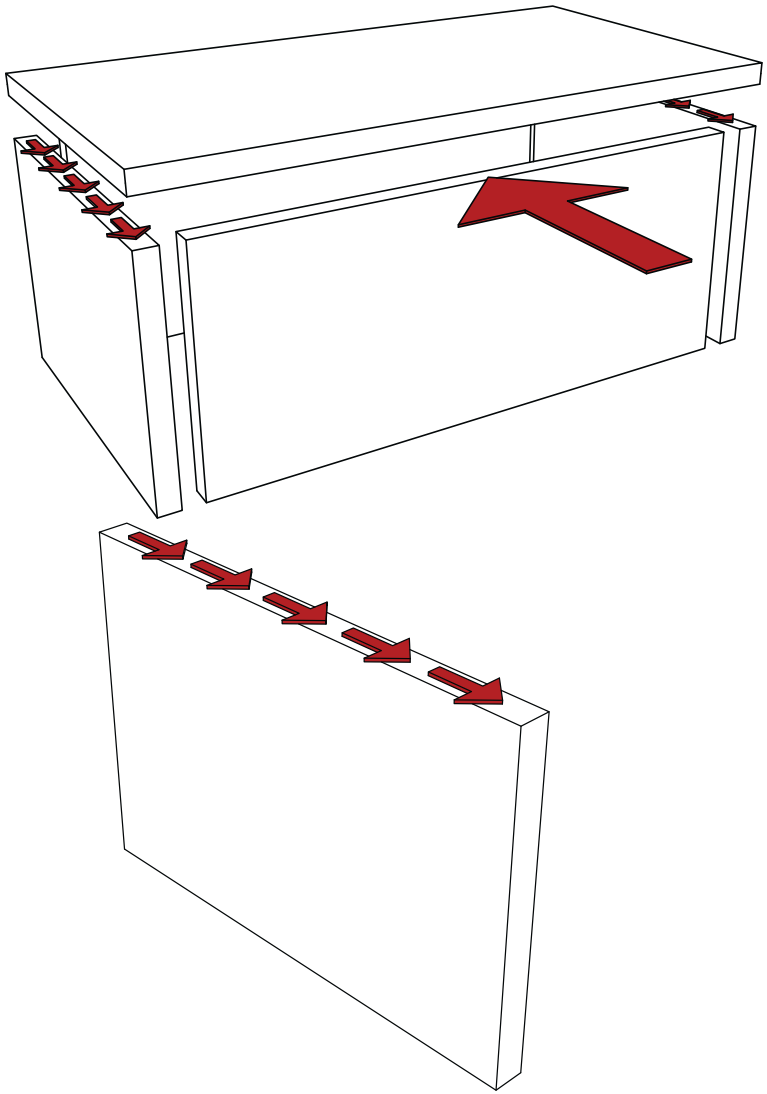
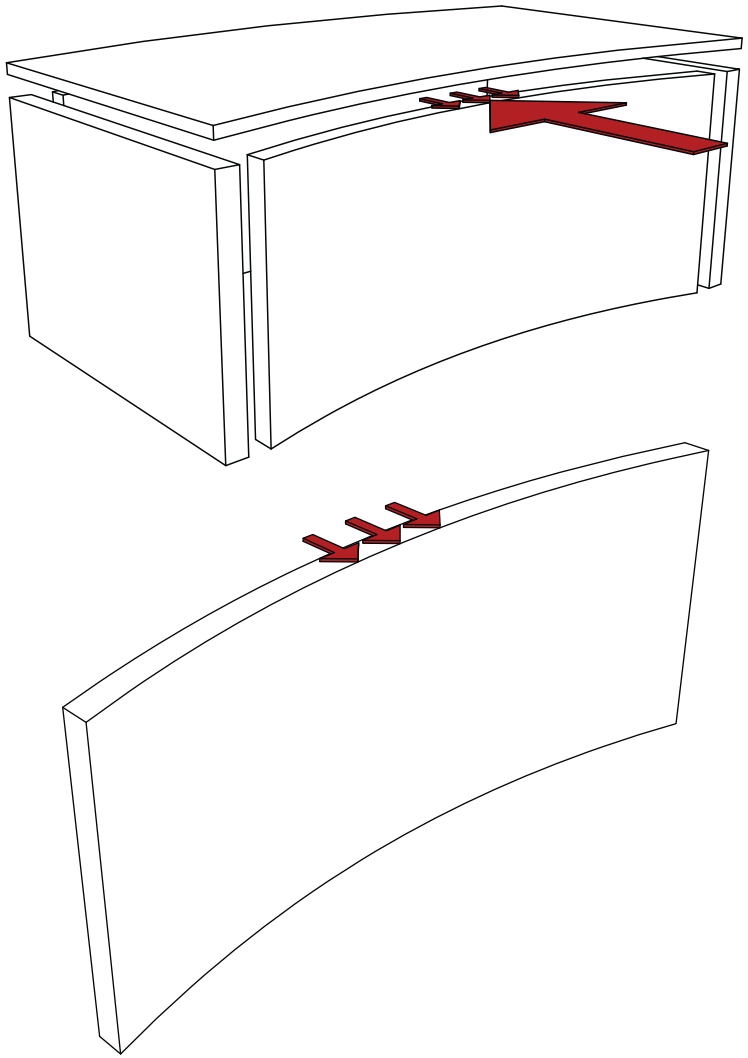


Stress-strain diagram

Boundary conditions

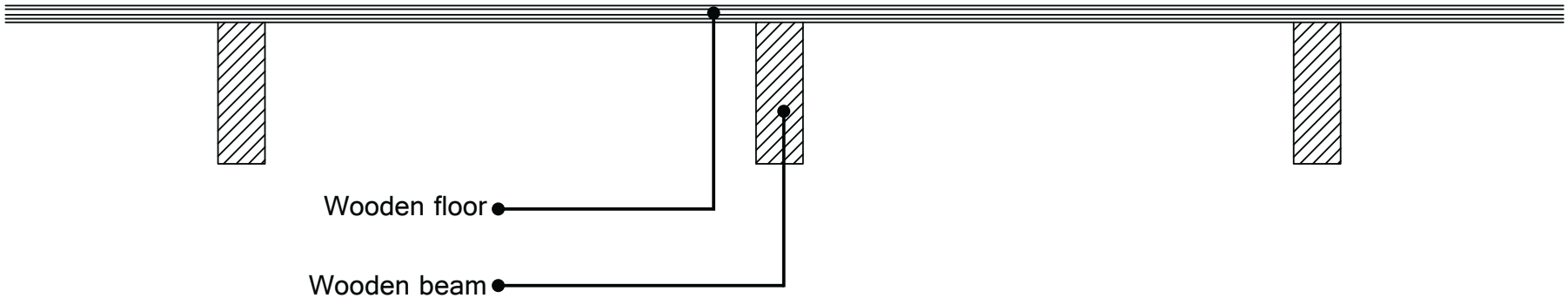


Distribution of forces stiff floor



Distribution of forces flexible floor

Boundary conditions



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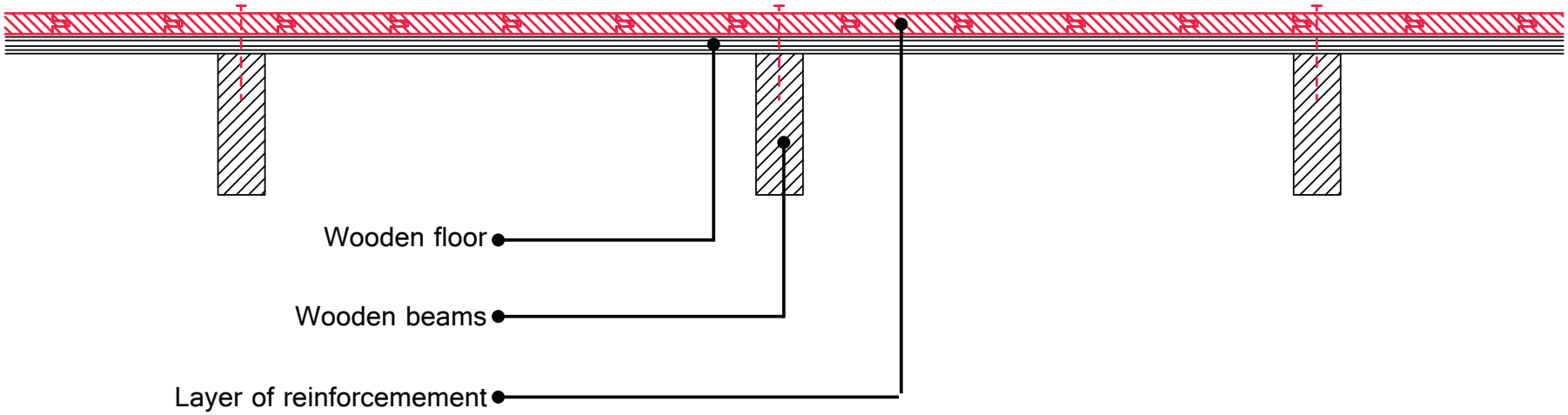

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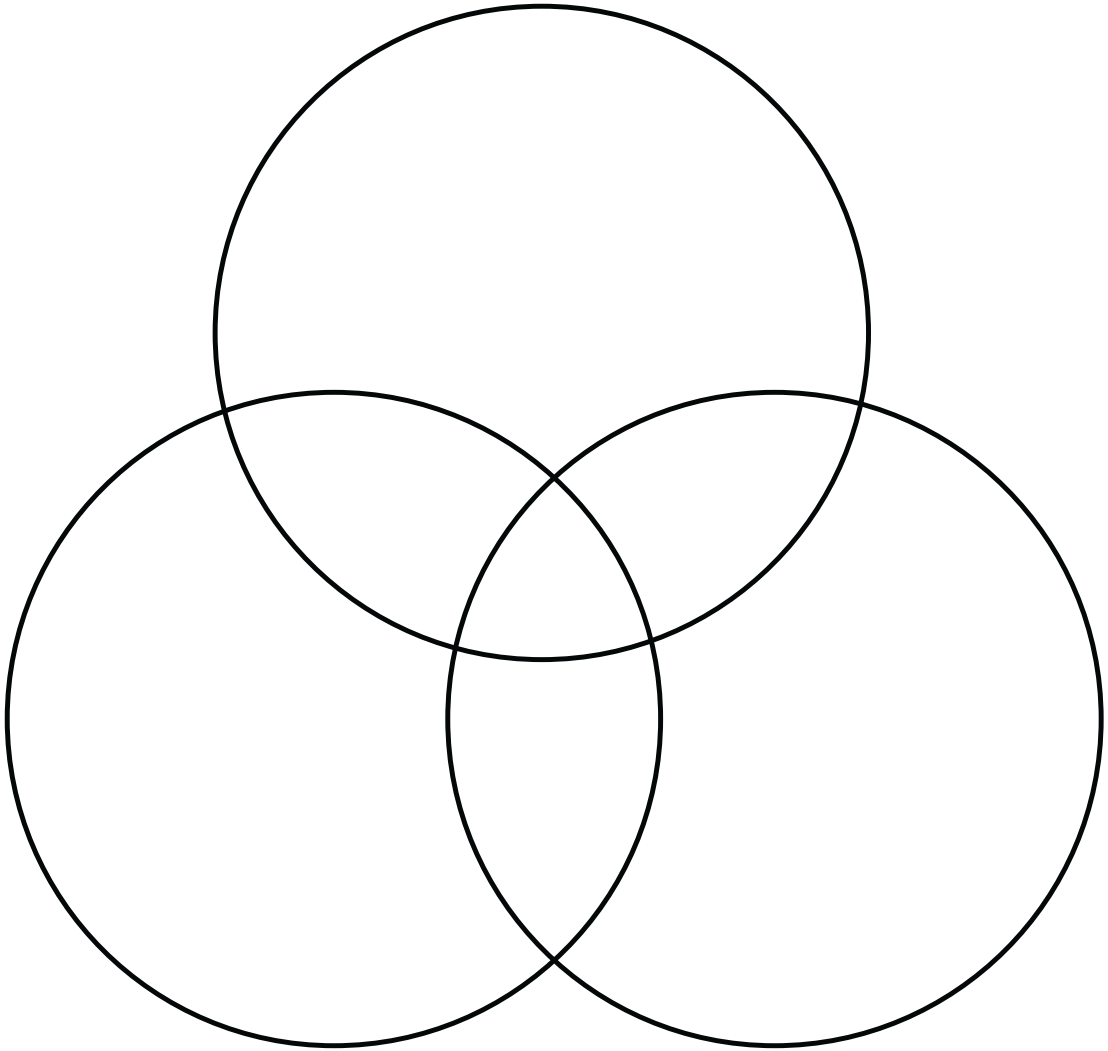

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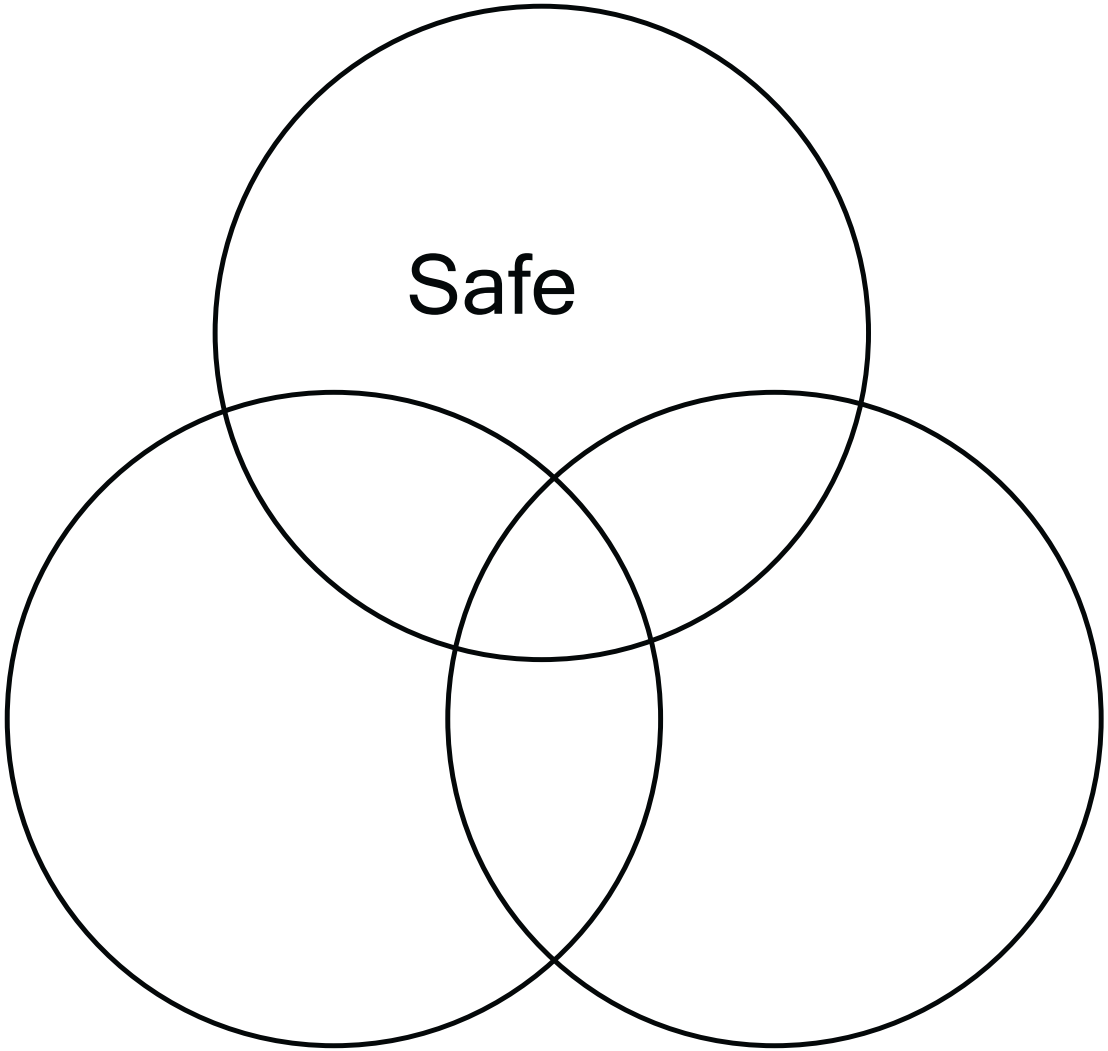

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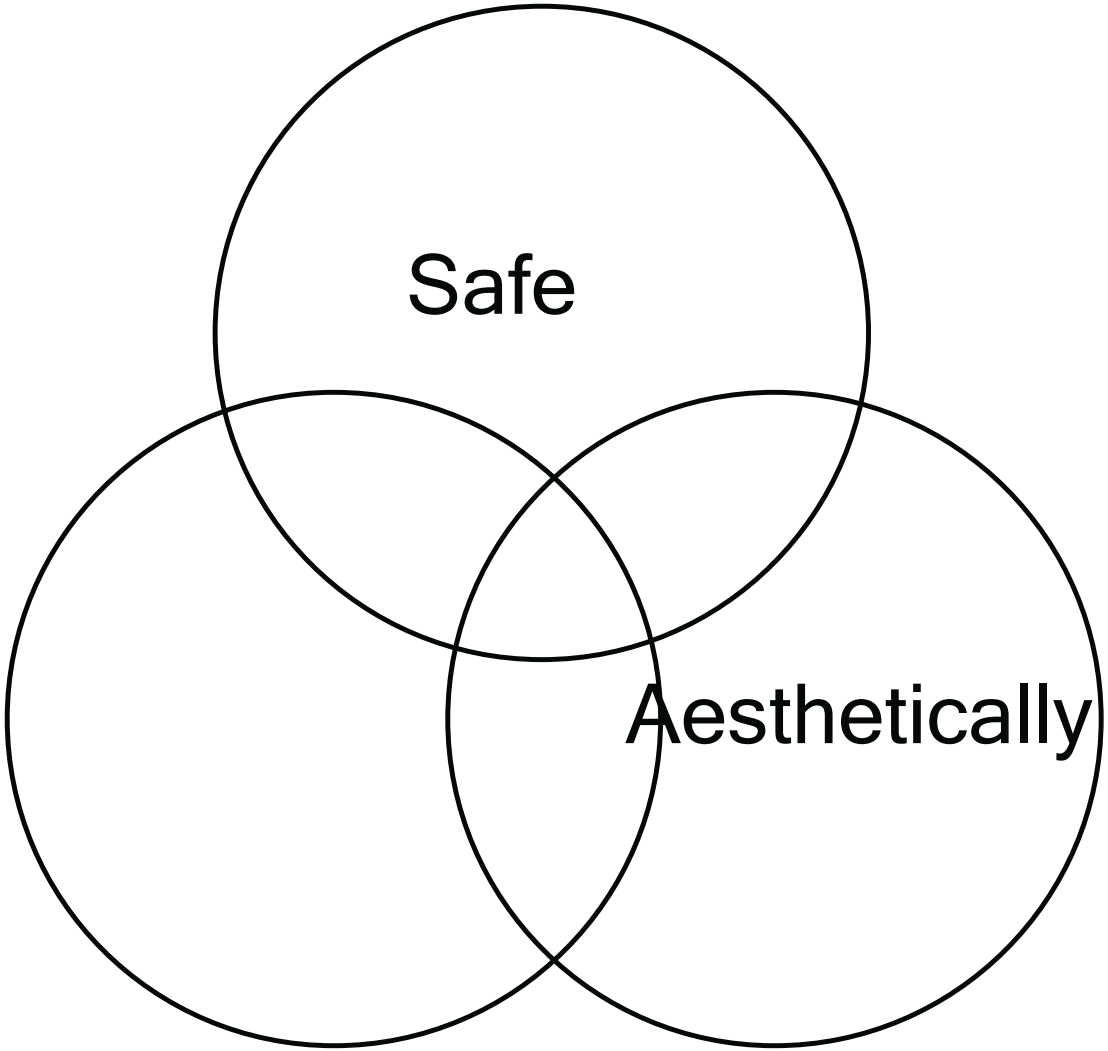

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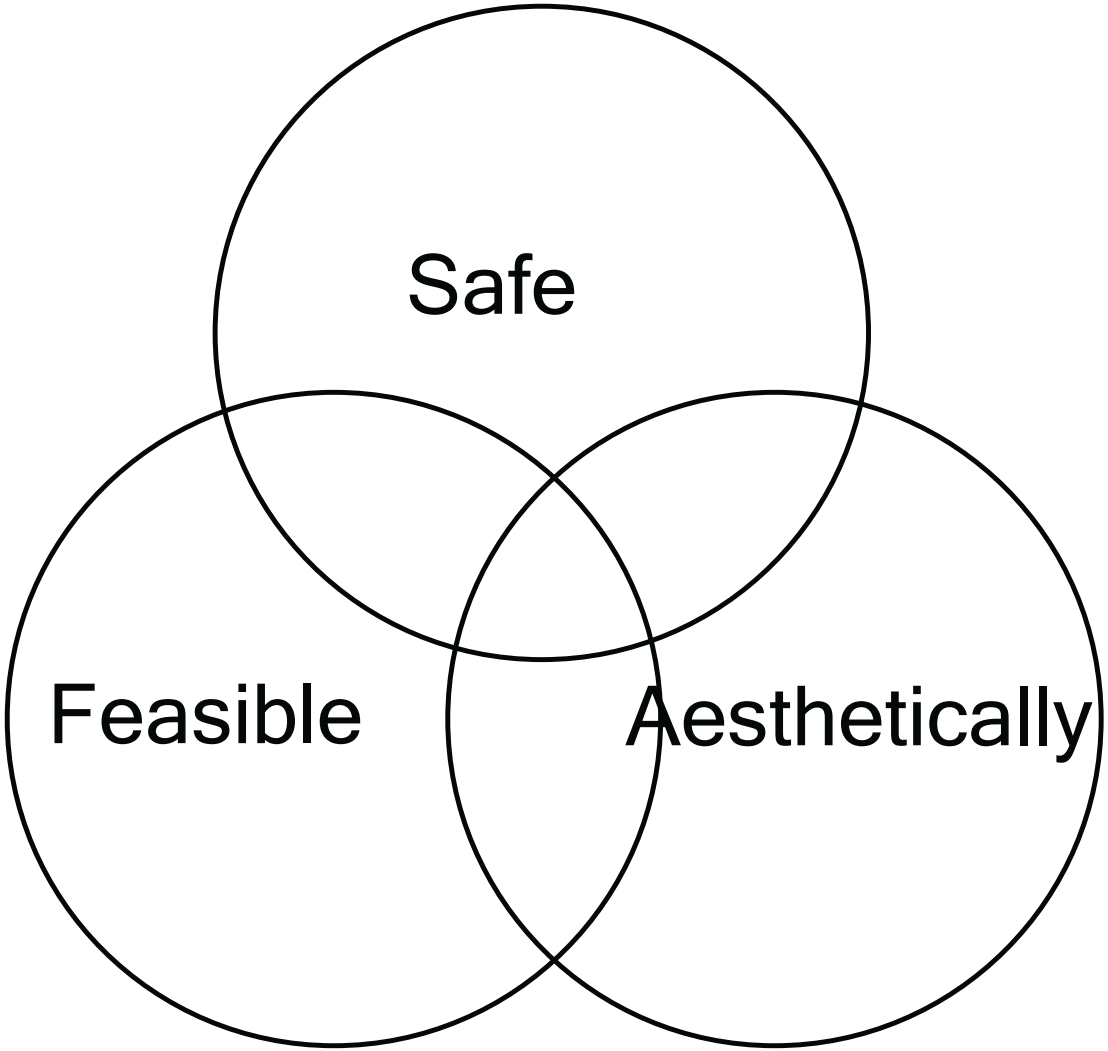

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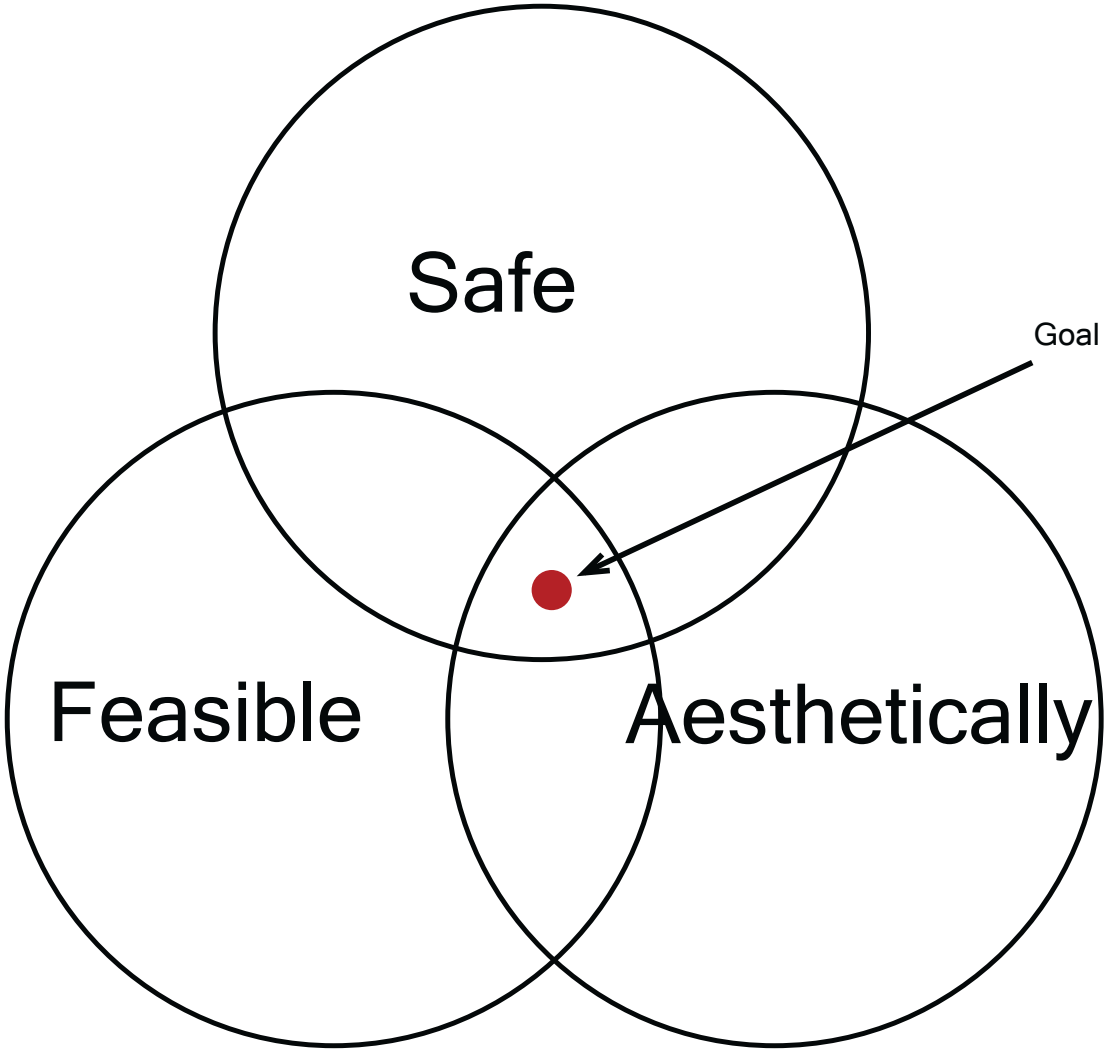
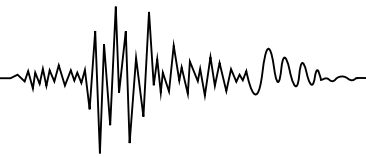


Designs



Case study 1

Zeerijperweg 12, Loppersum

Case study 2

Wijmerspad 1, Loppersum

Case study 3

Wirdumerweg 27, Loppersum

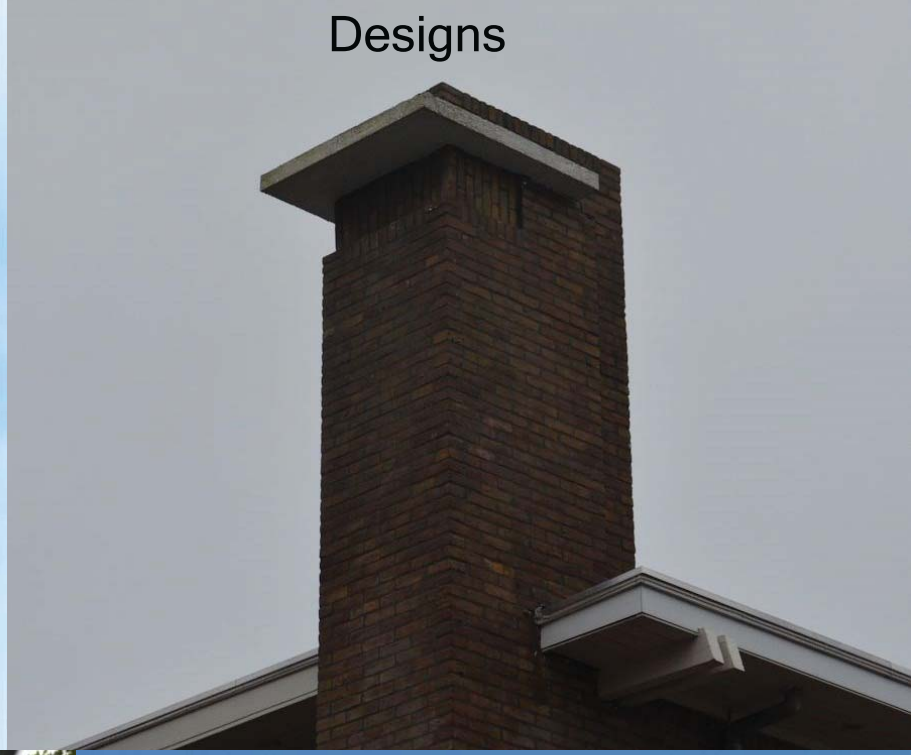
Case study 4

Stationslaan 7, Loppersum

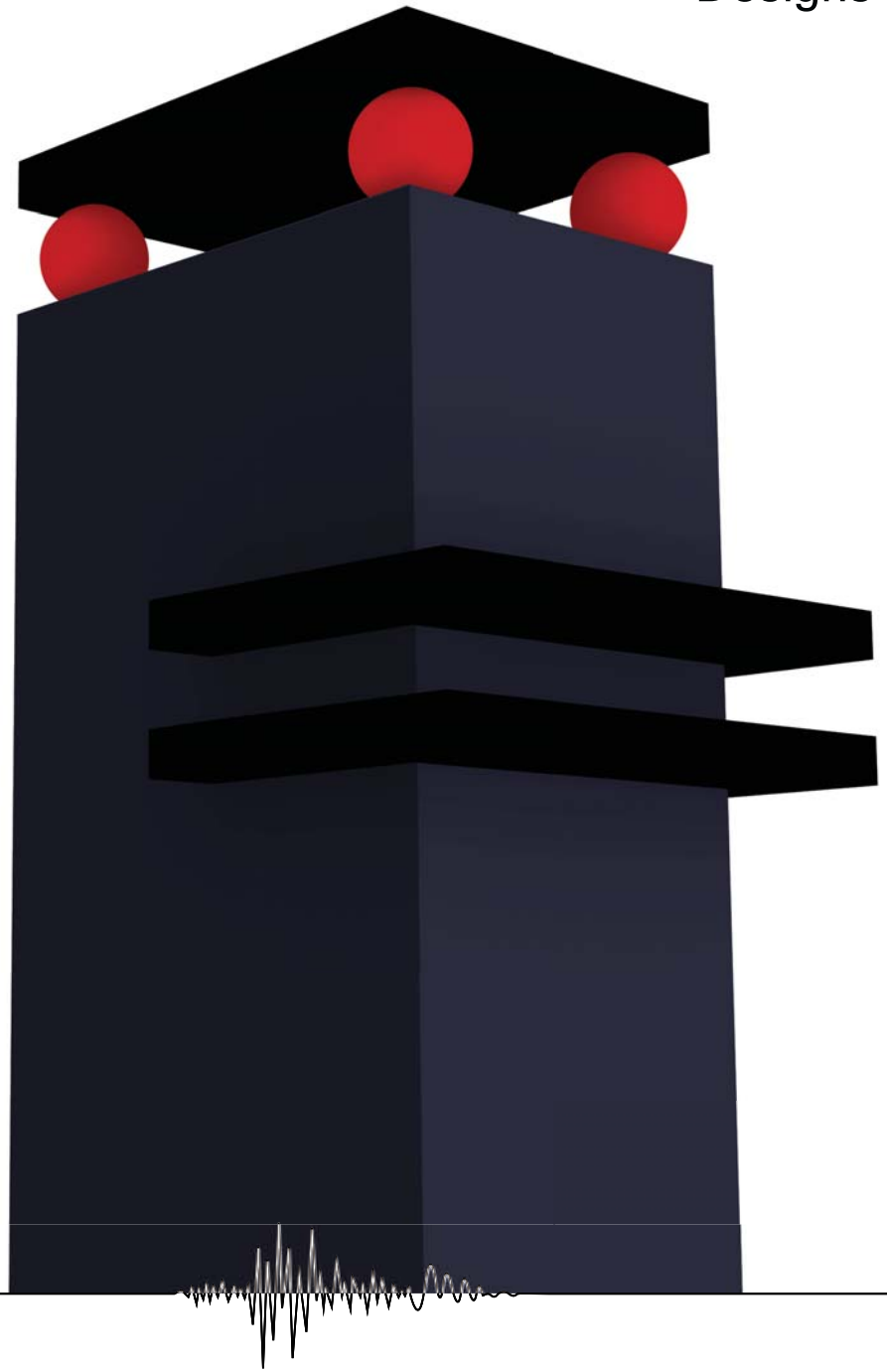
Design 1

Before retrofit

After retrofit




ZUNNEHÖRN

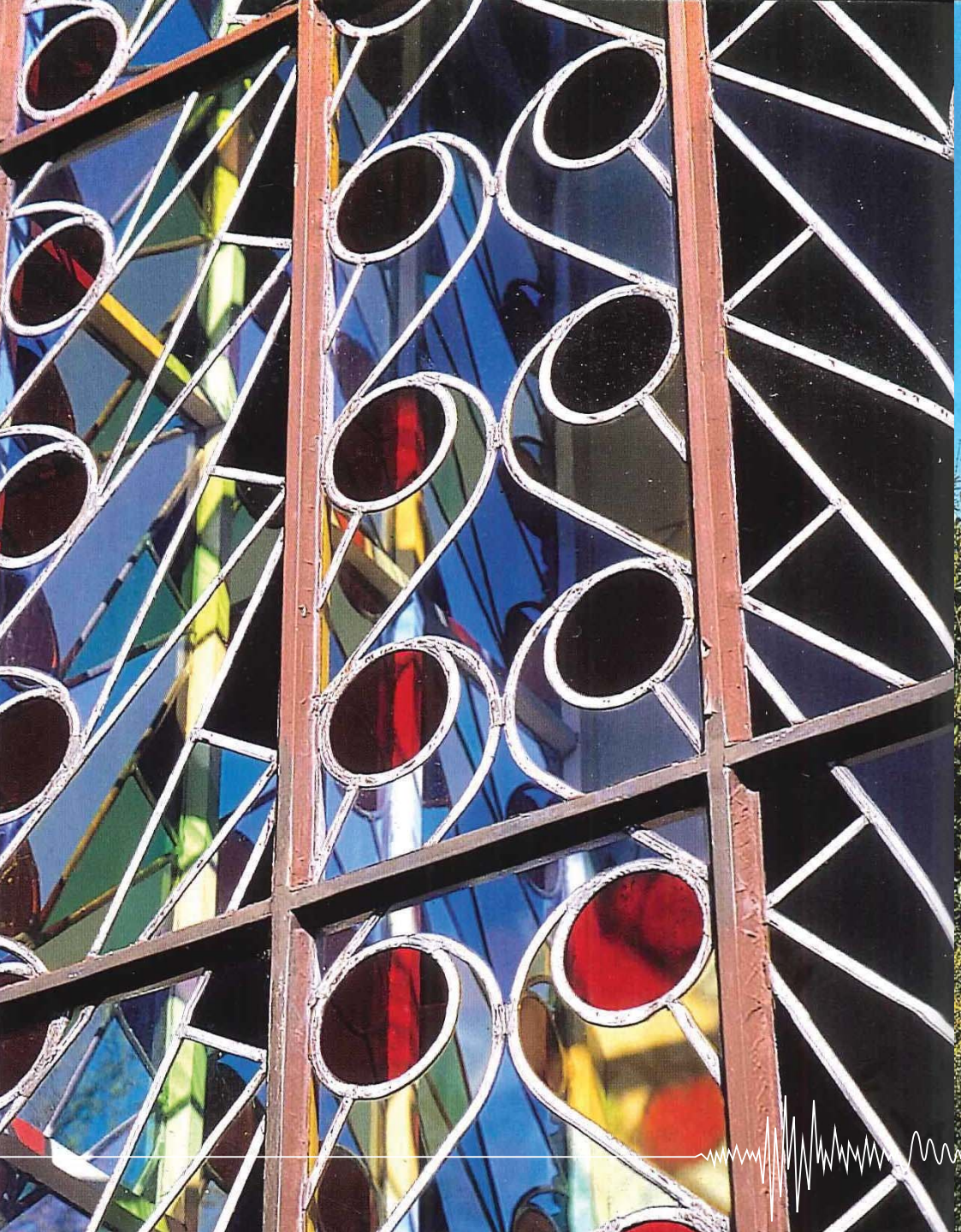


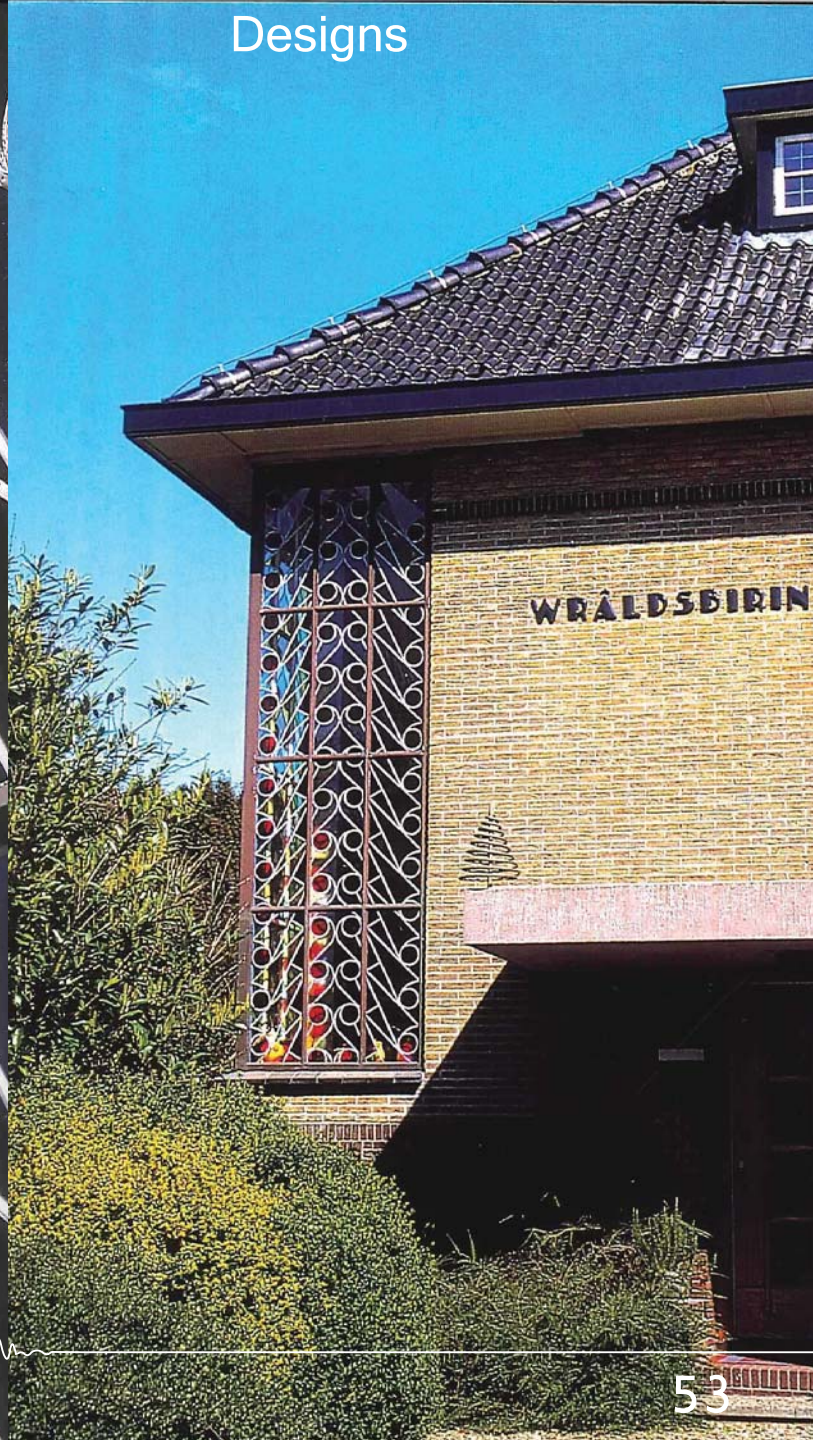

WRÁLDSBIRIN

Design 2

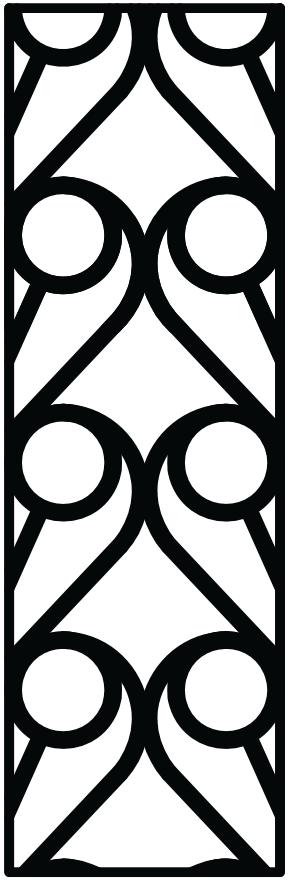
Before retrofit

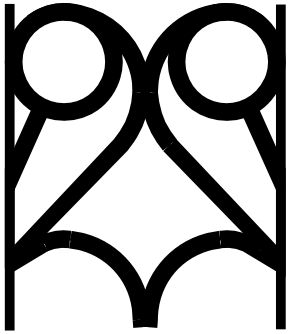
After retrofit

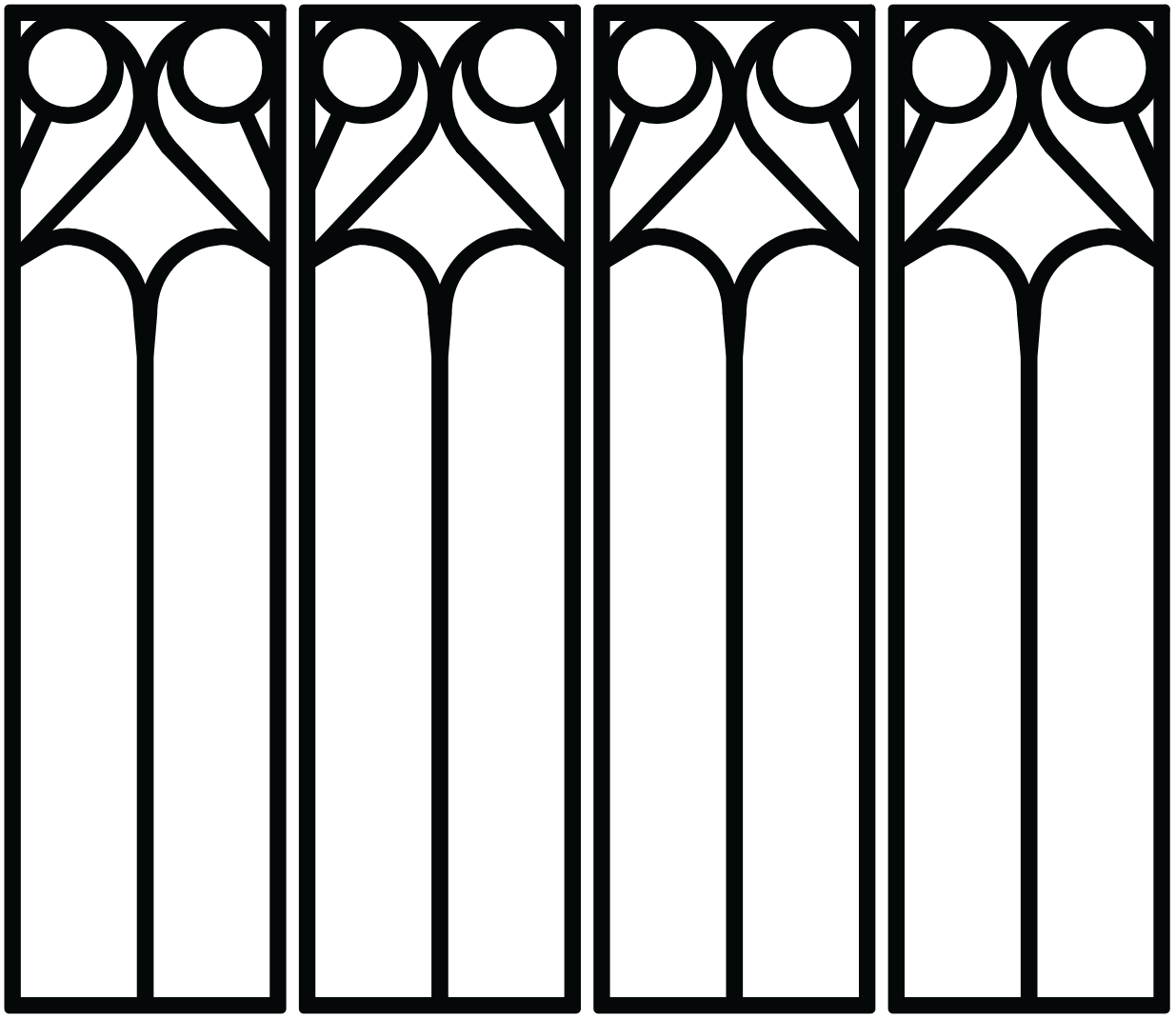


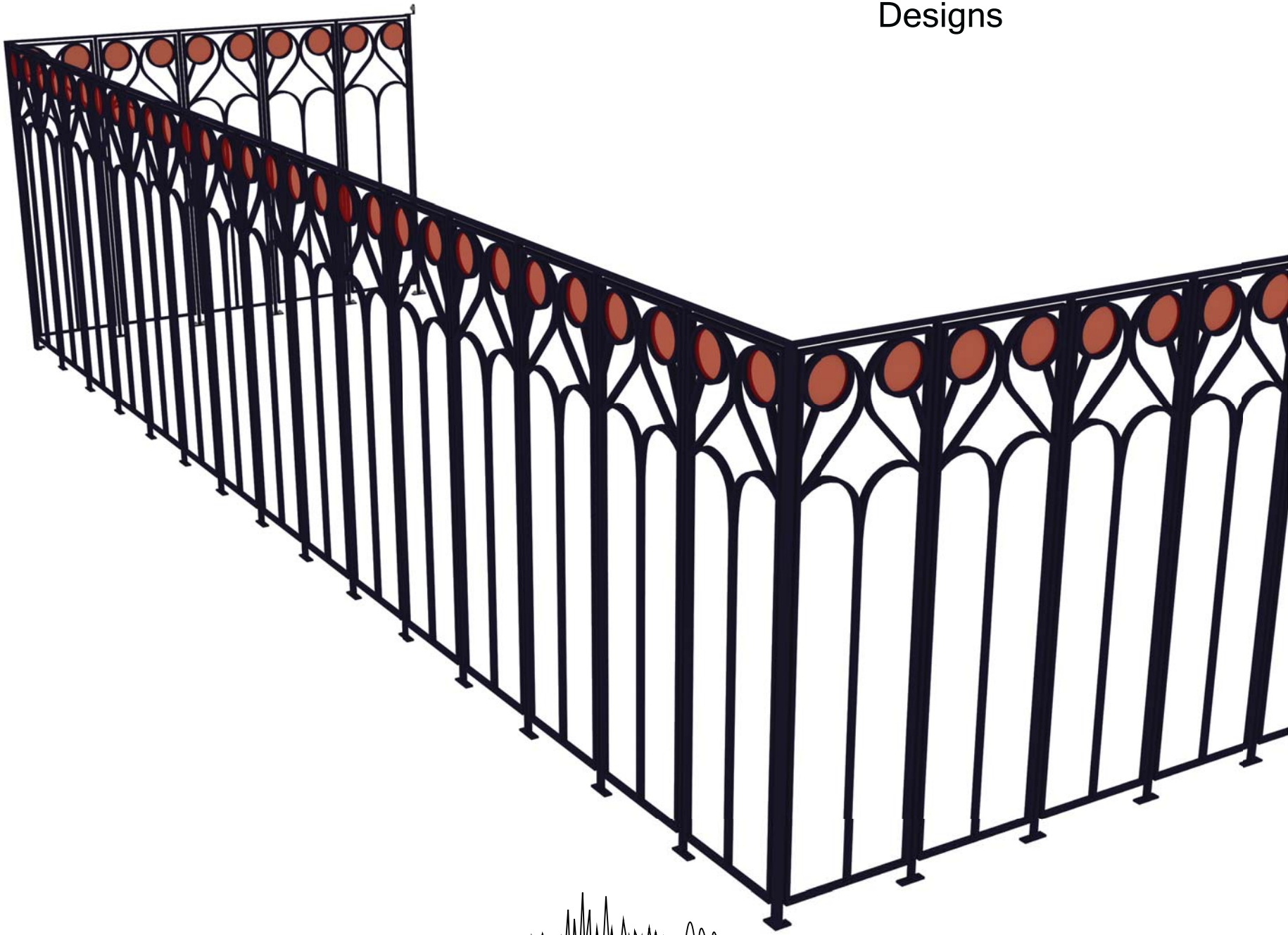

WRÅLDSBIRIN

Designs





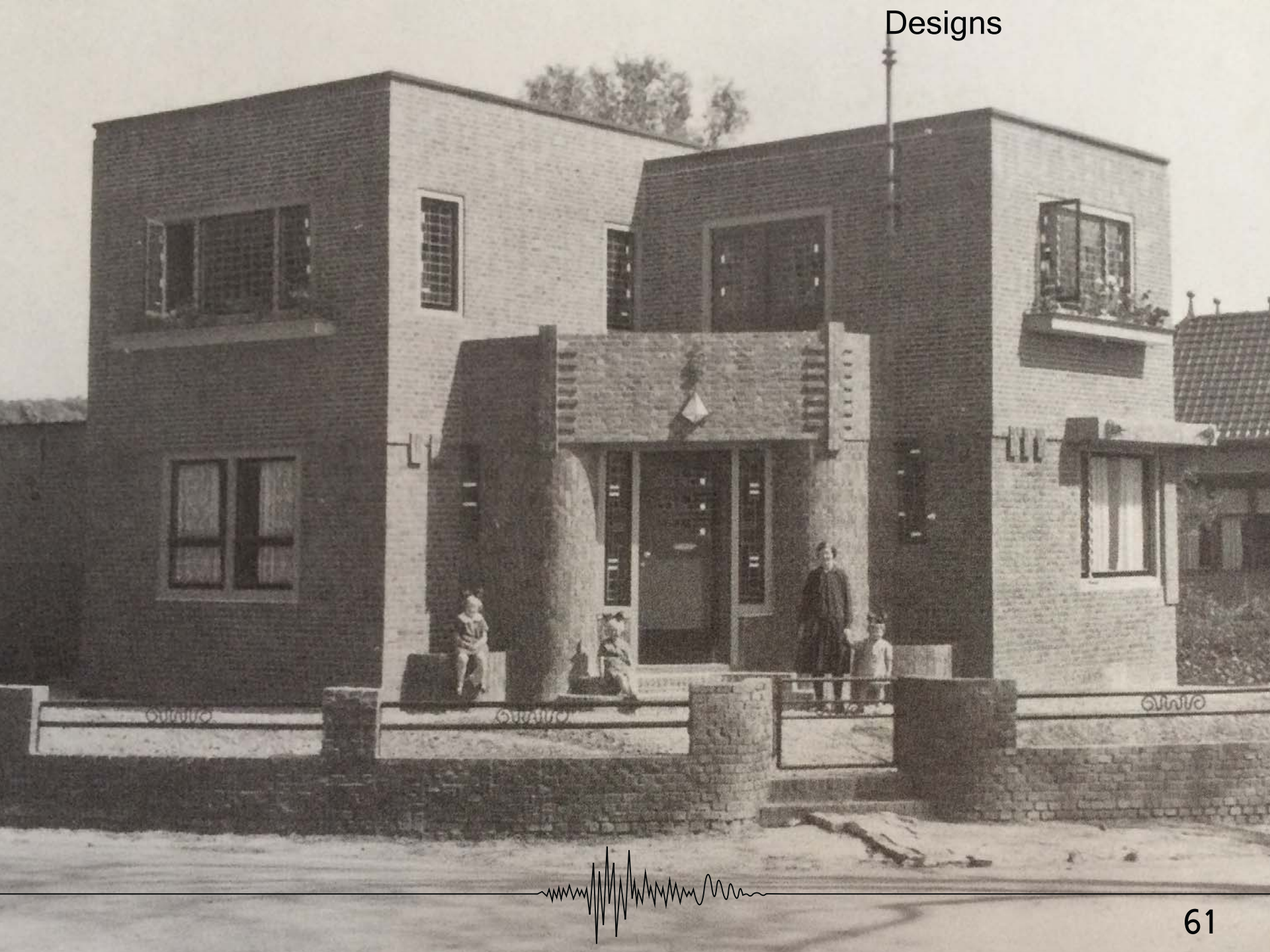


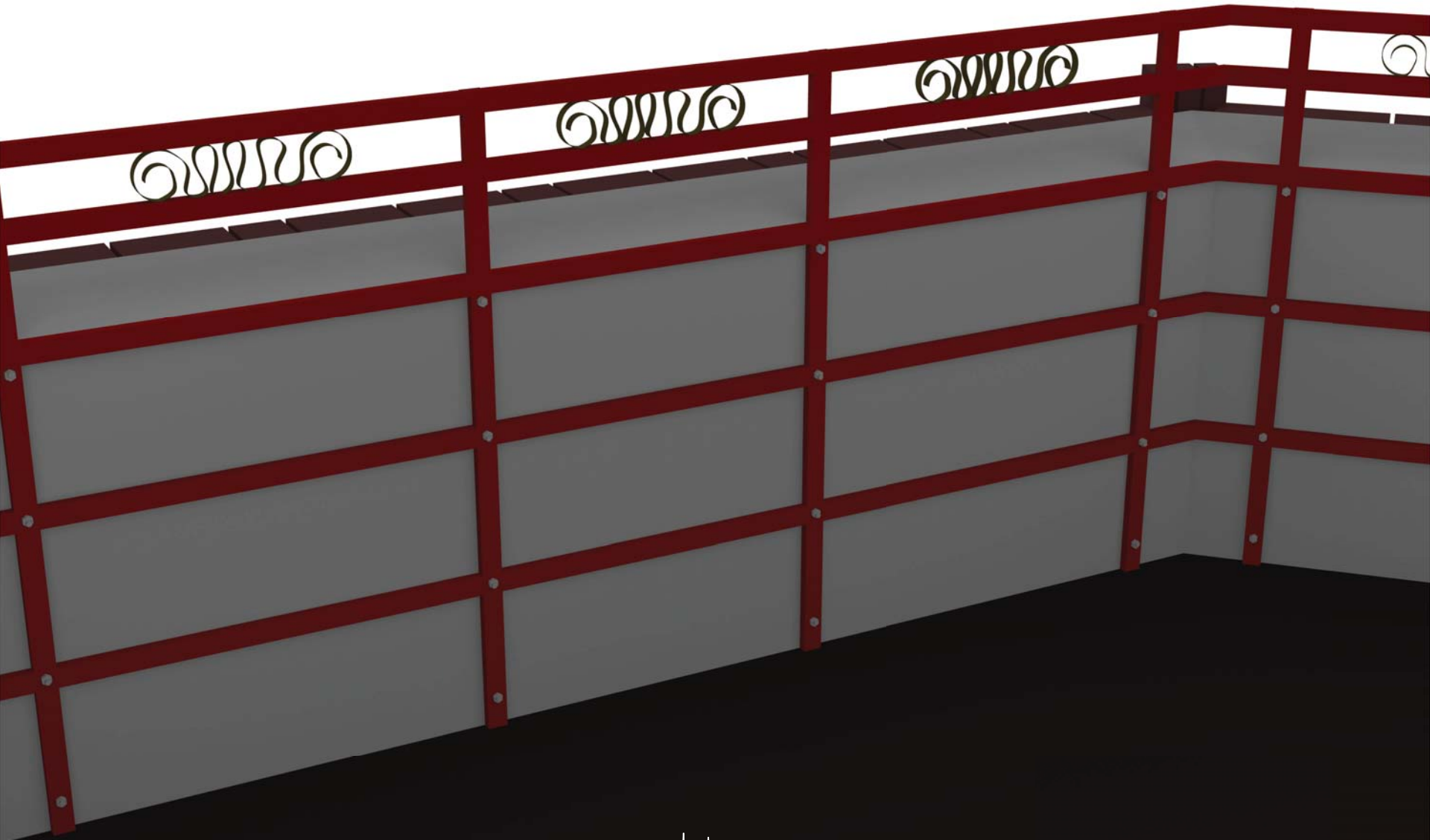


Design 3

Before retrofit

After retrofit





Design 4

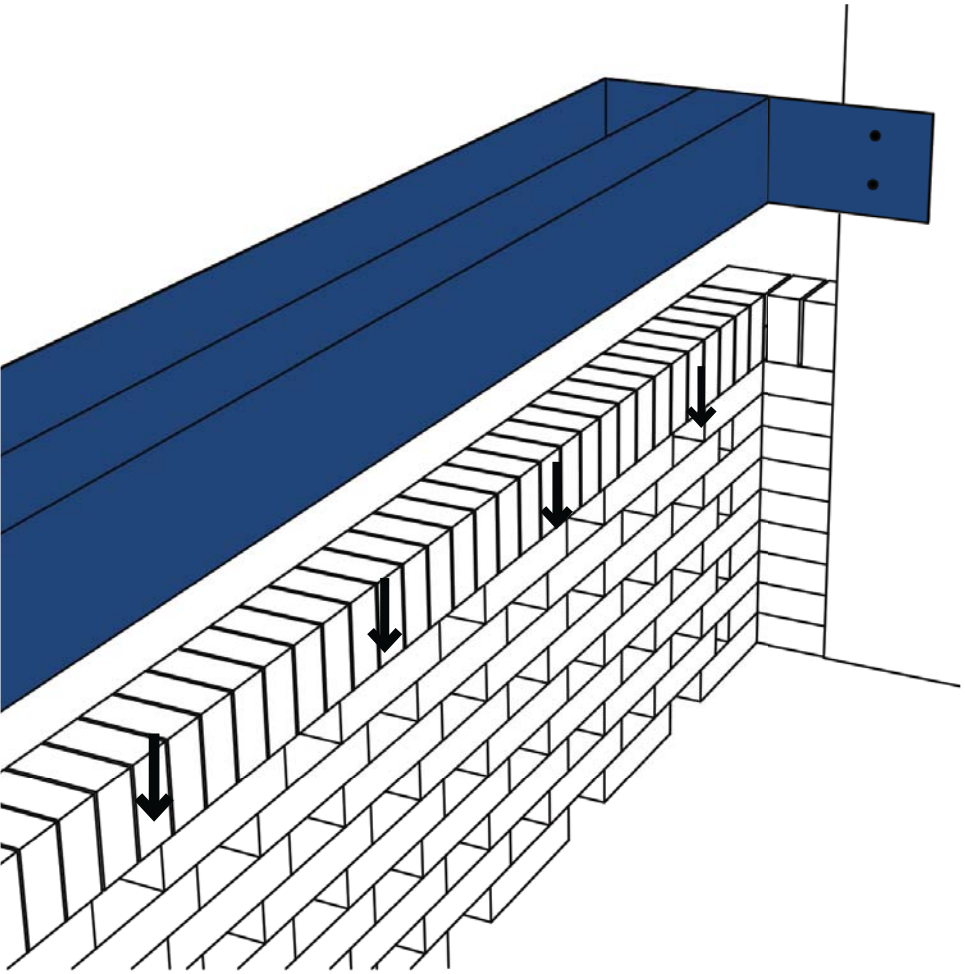
Before retrofit

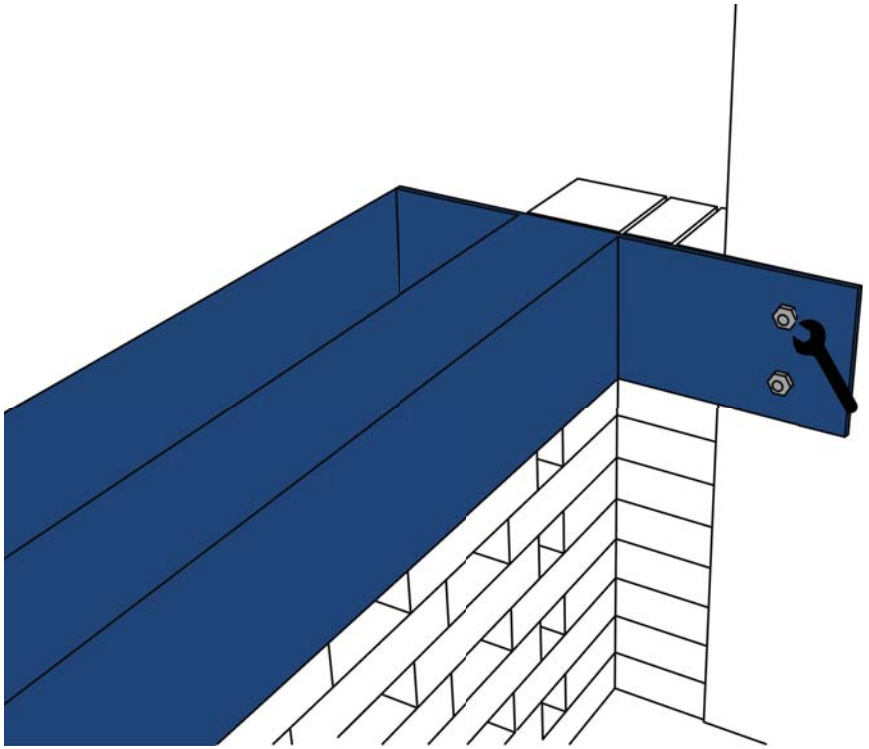
After retrofit

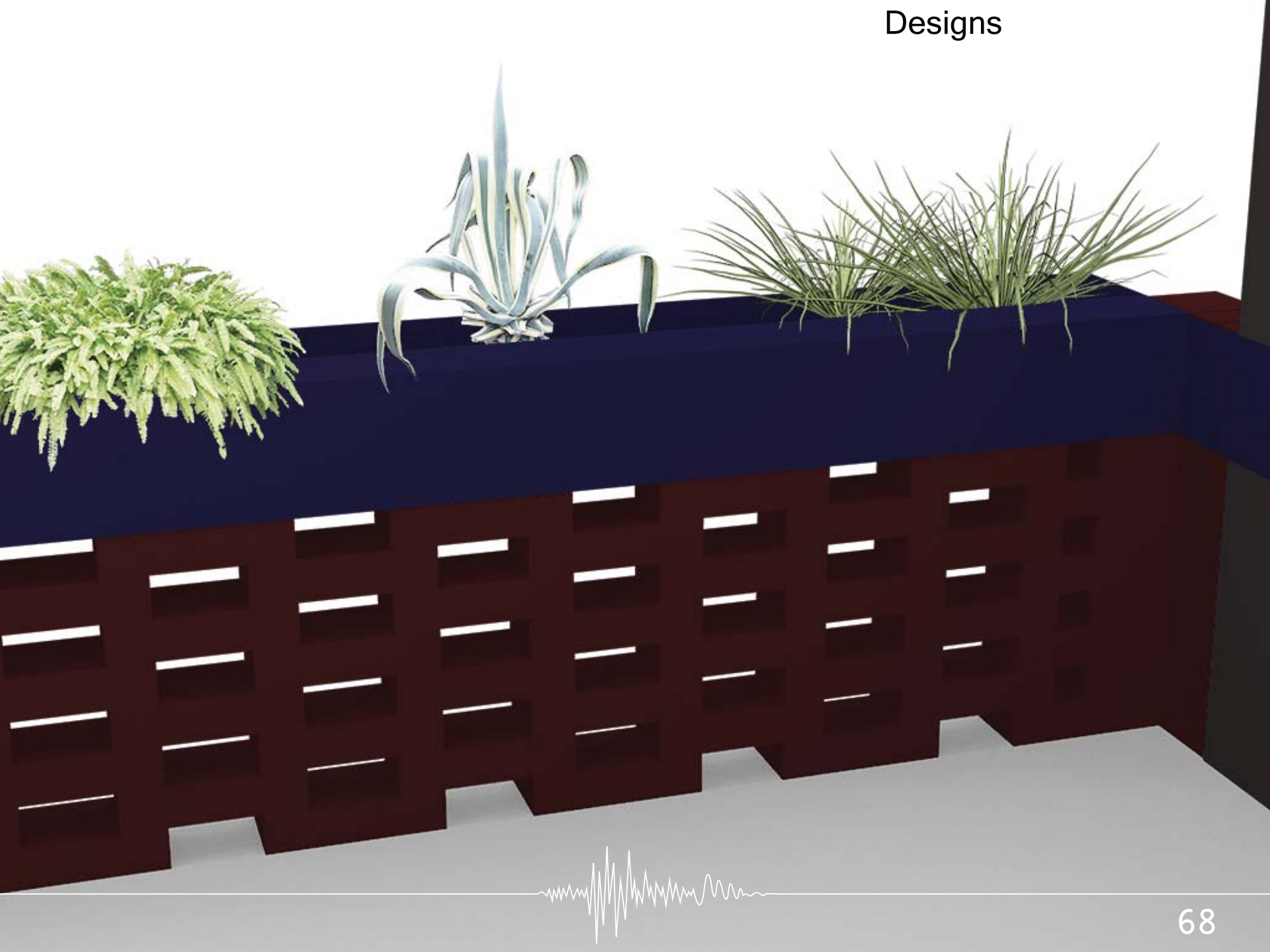
Before retrofit

After retrofit

Designs







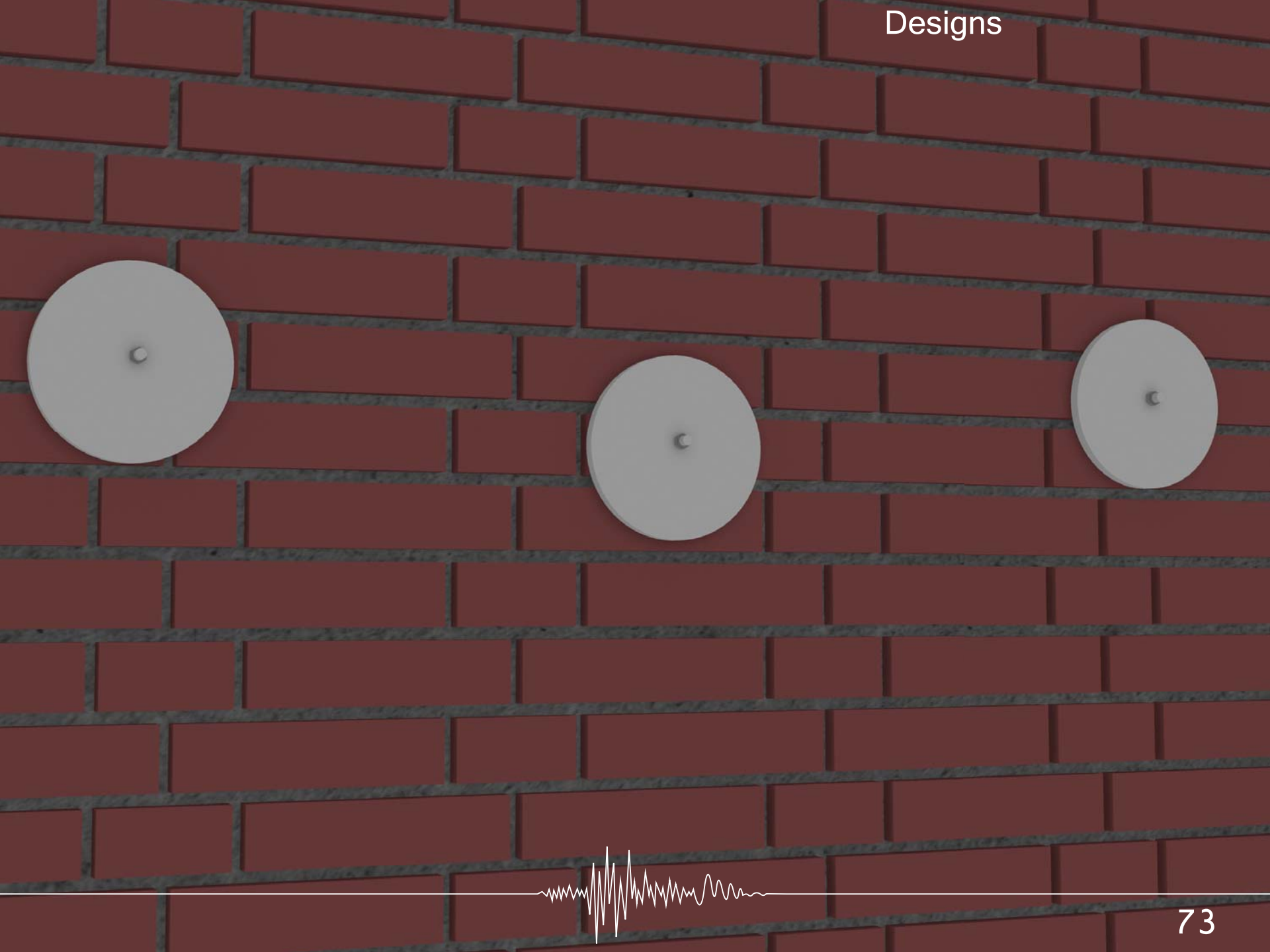
Design 5

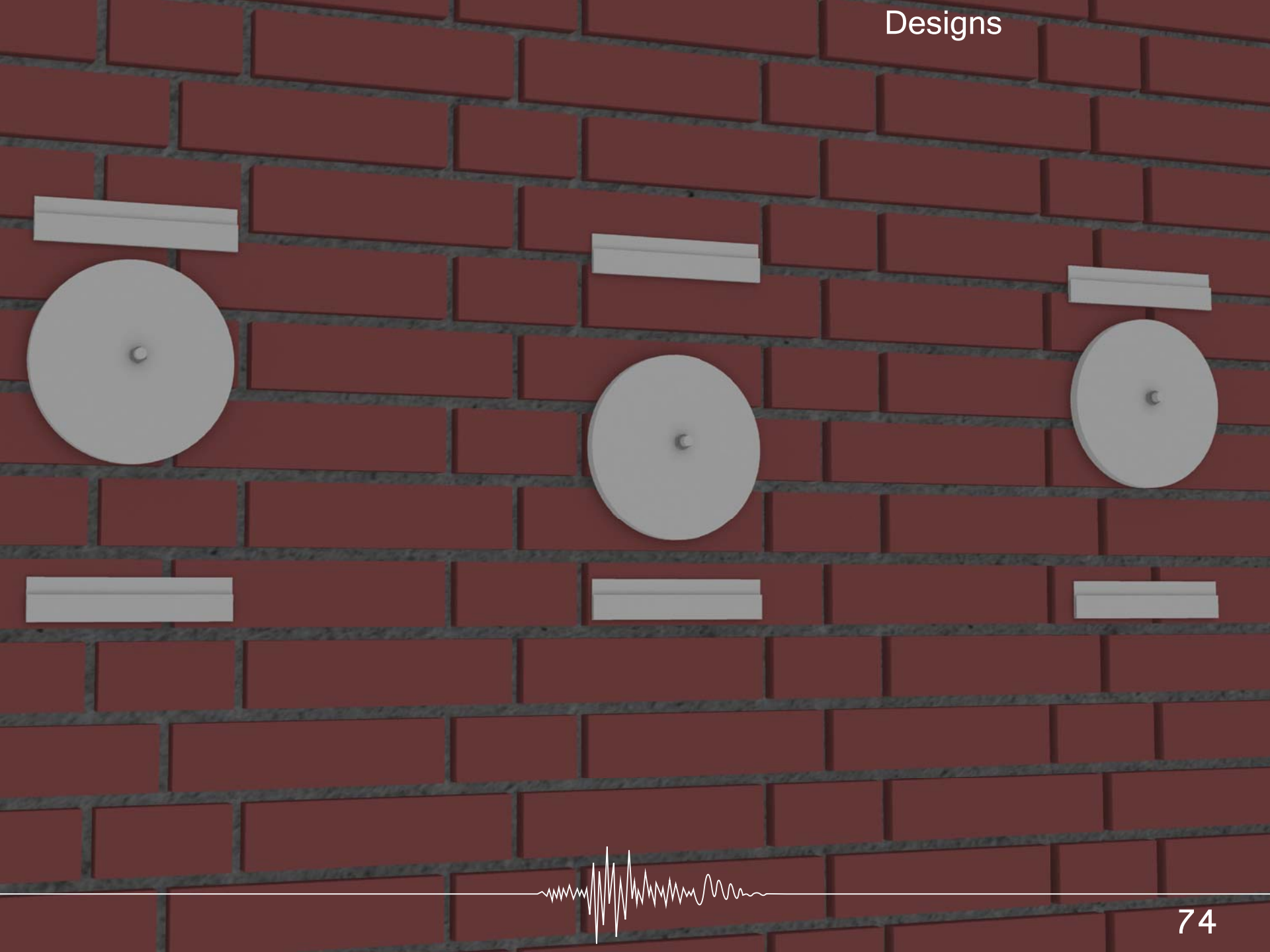
Before retrofit

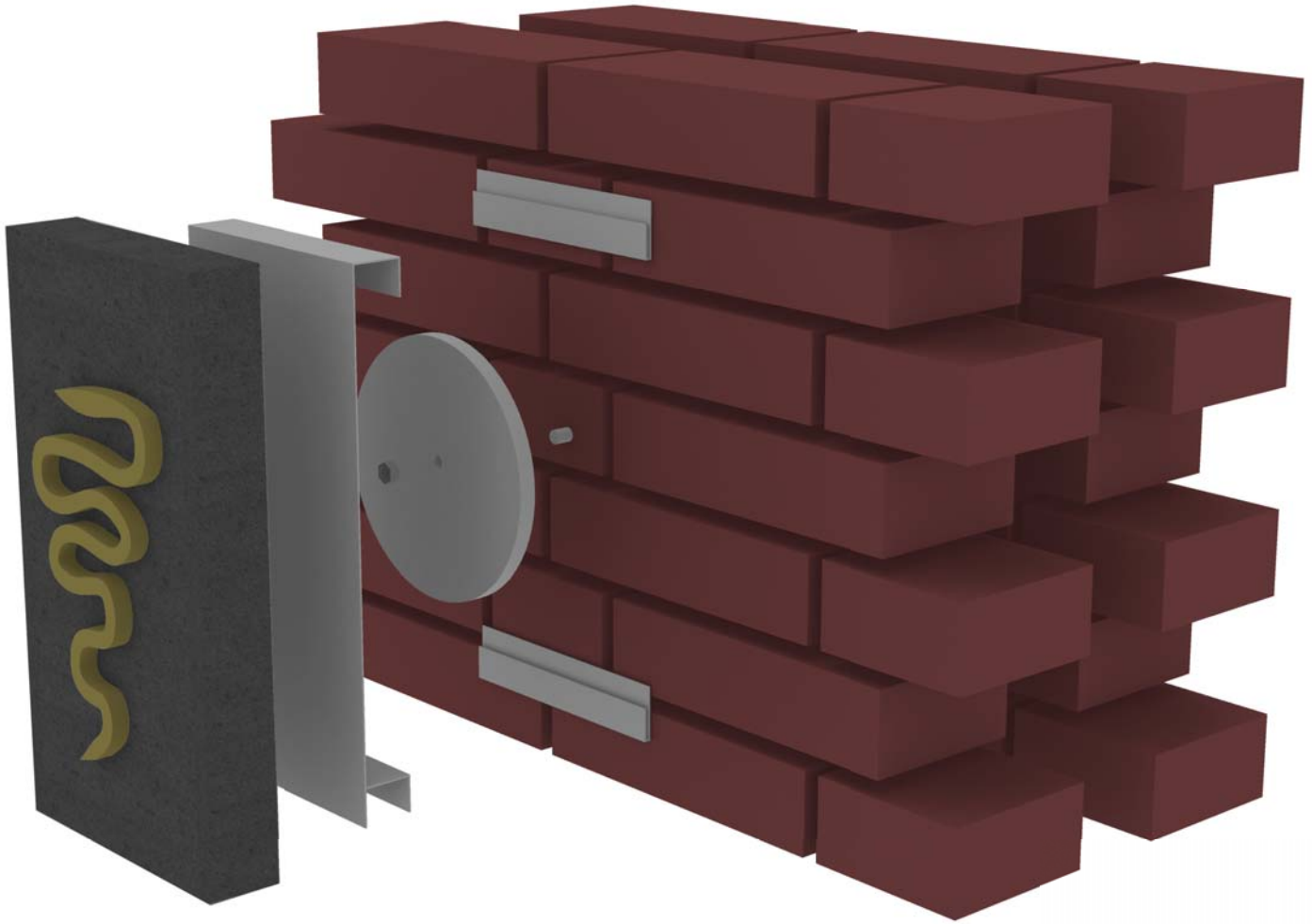
After retrofit

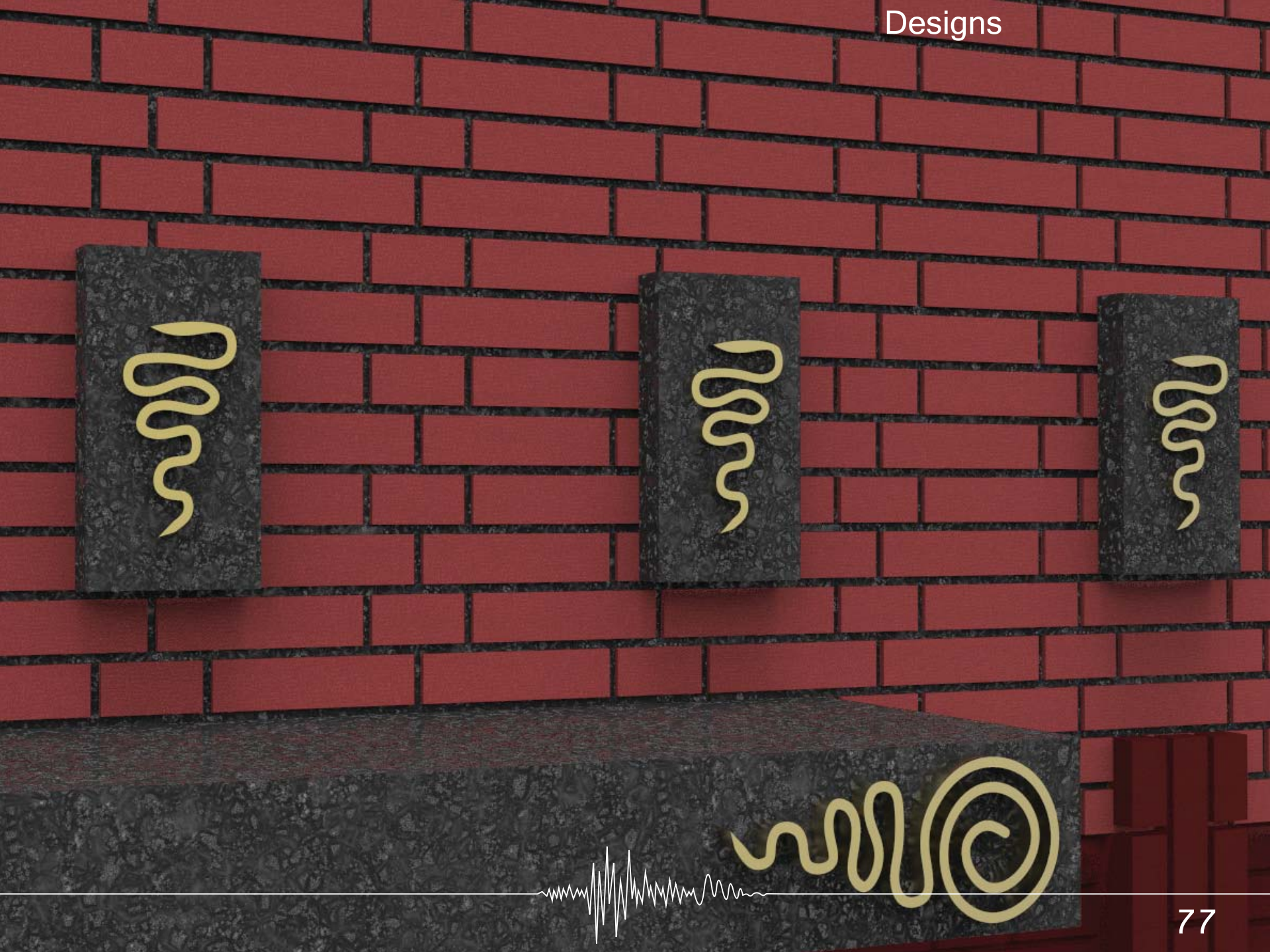

27


27





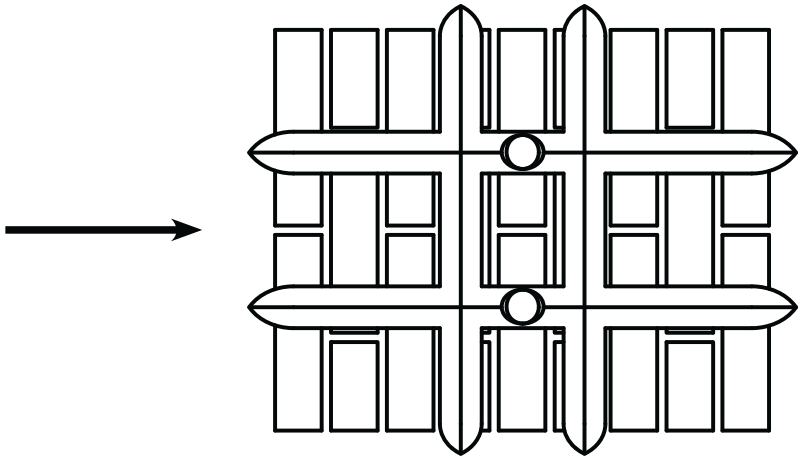


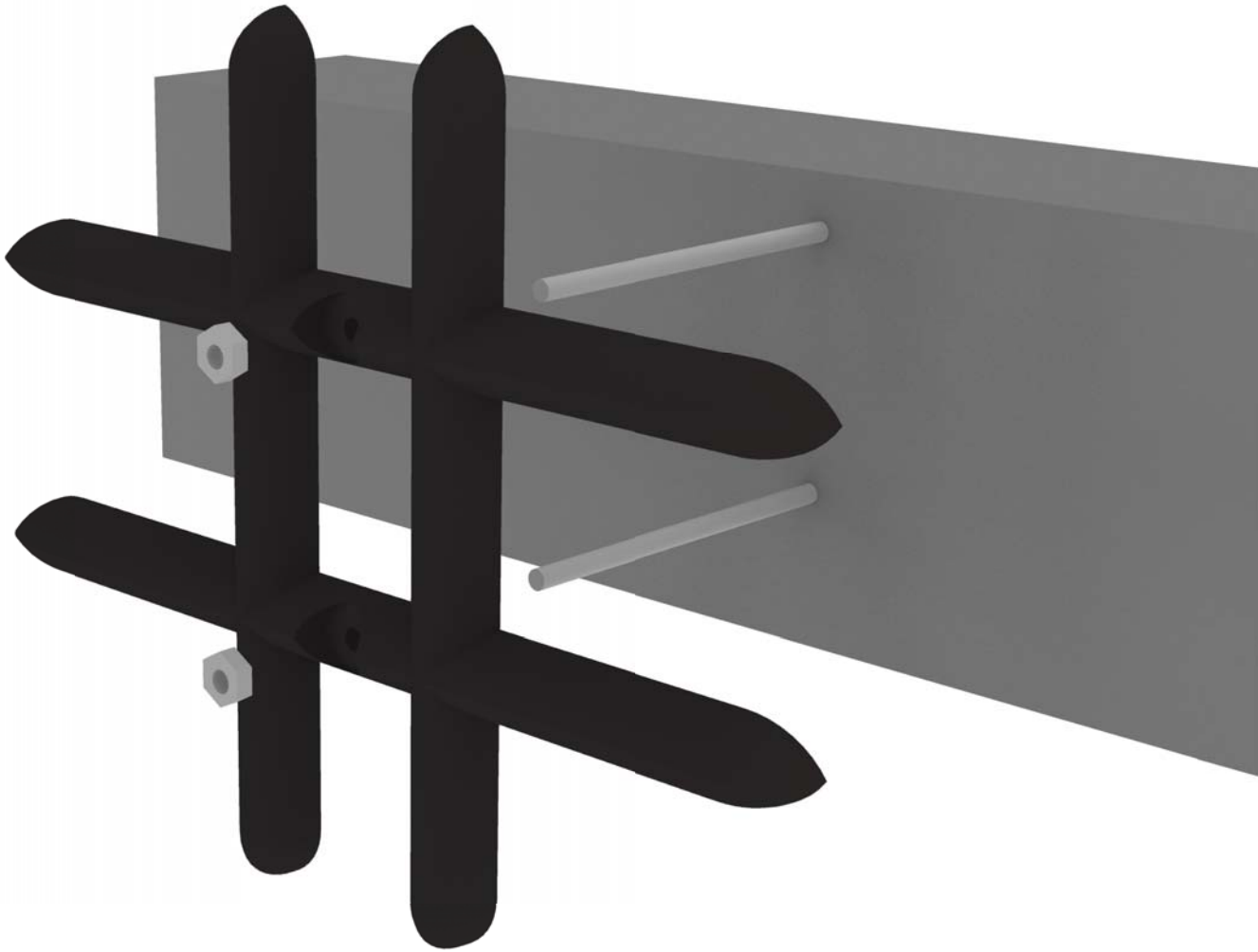


Design 6


Before retrofit
After retrofit


POELMAN GOSLINGA

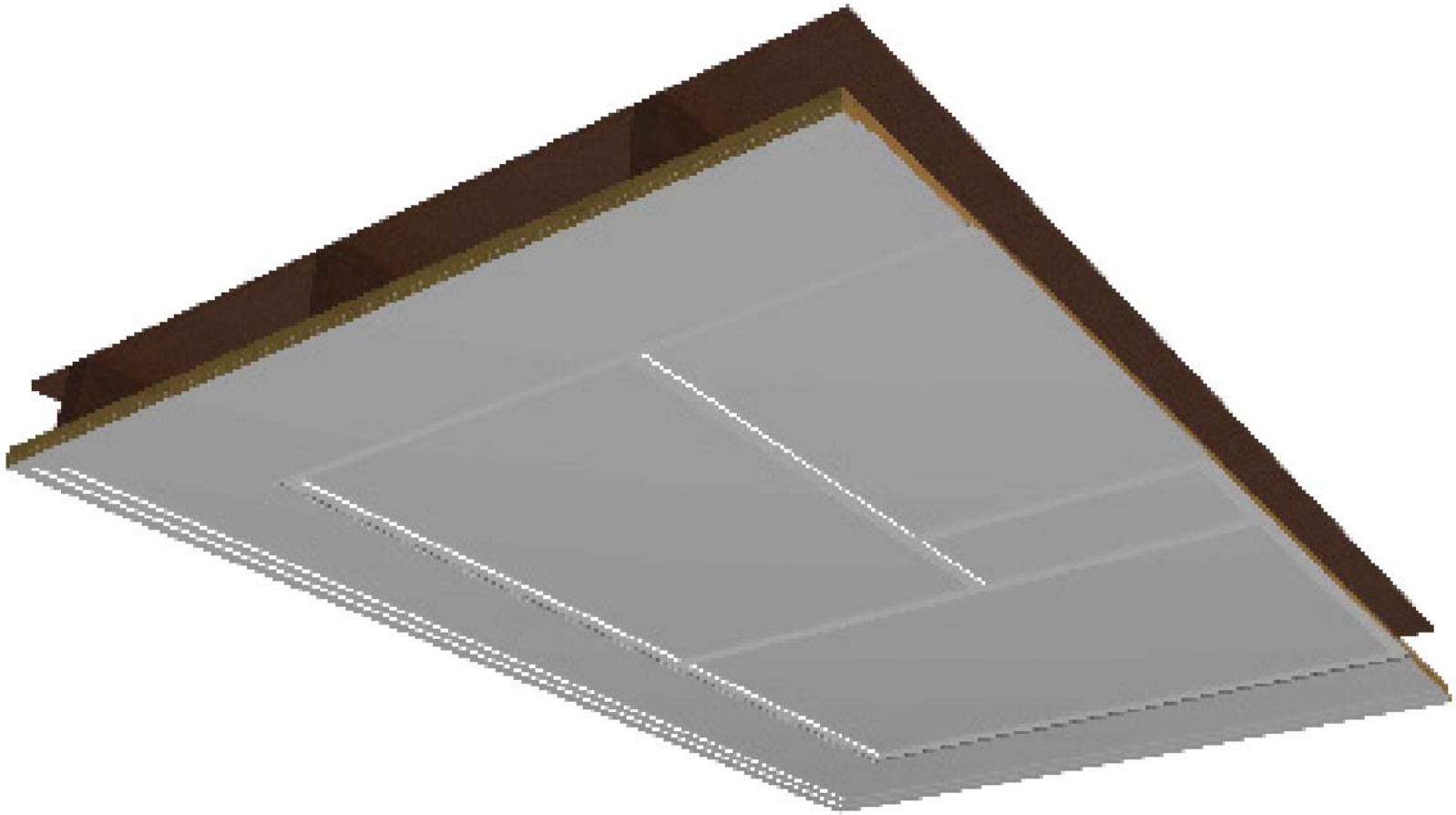


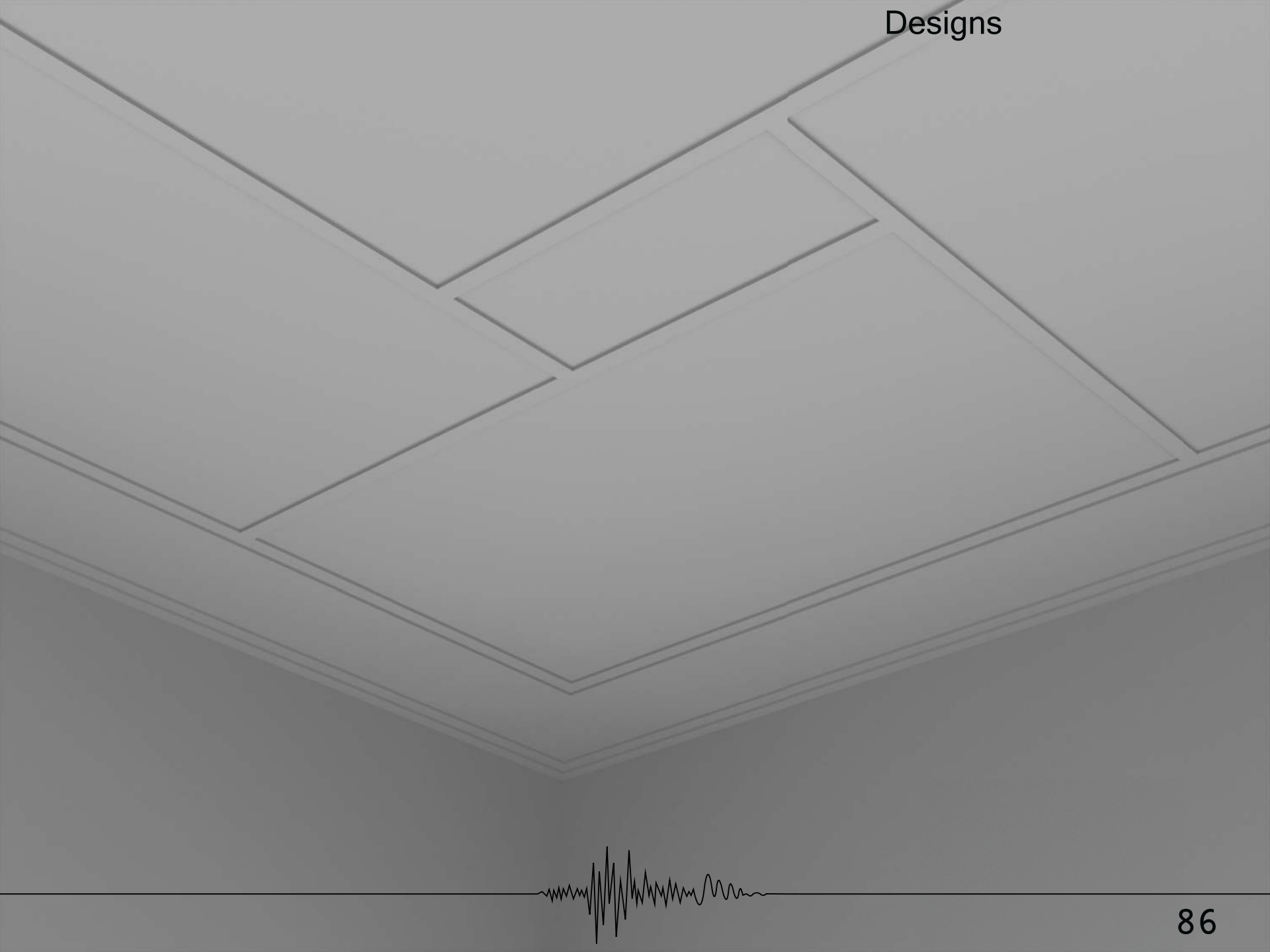


Design 7

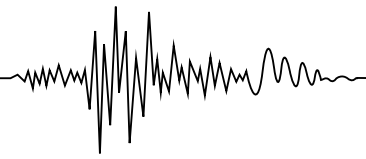
Before retrofit

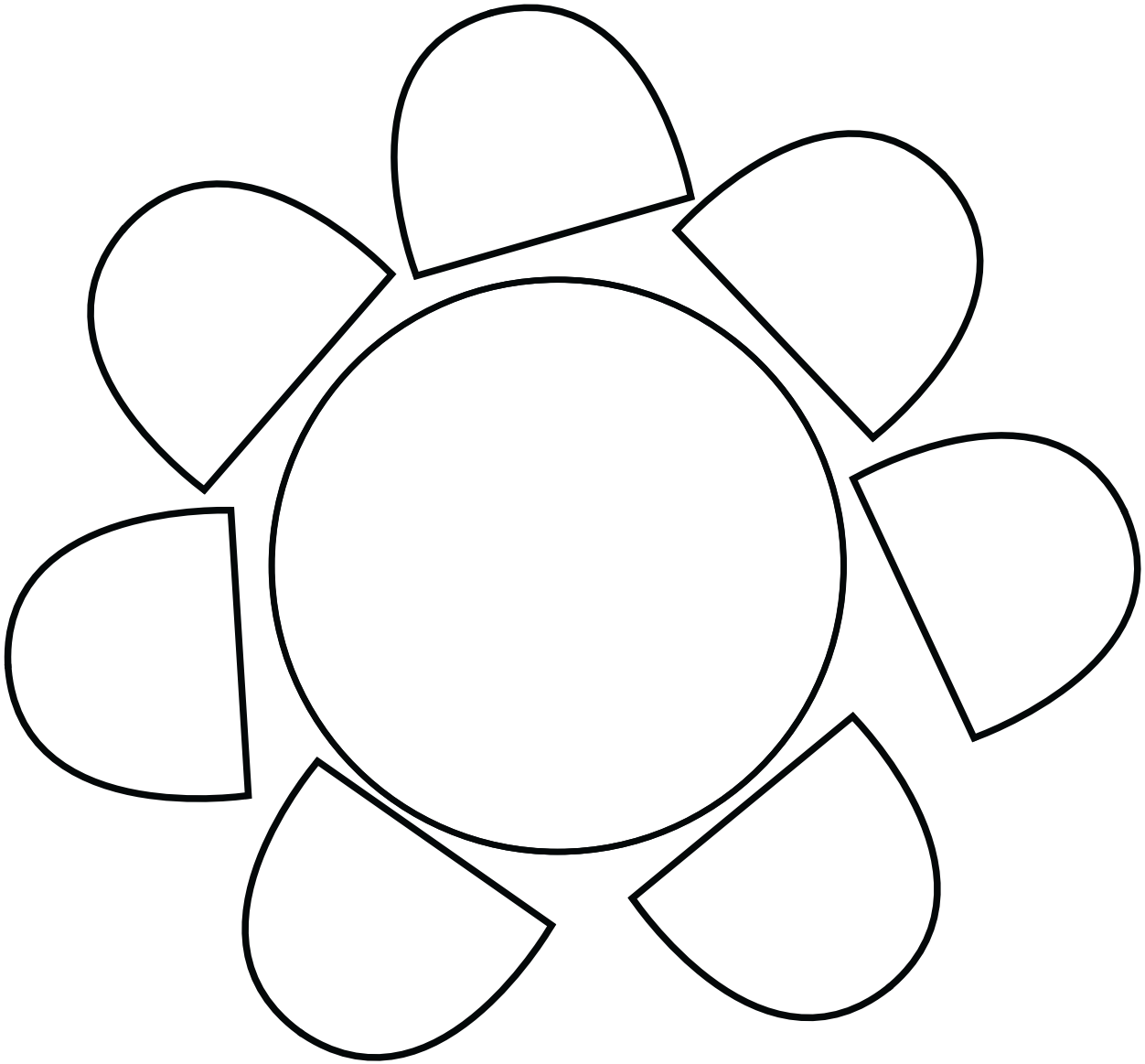
After retrofit

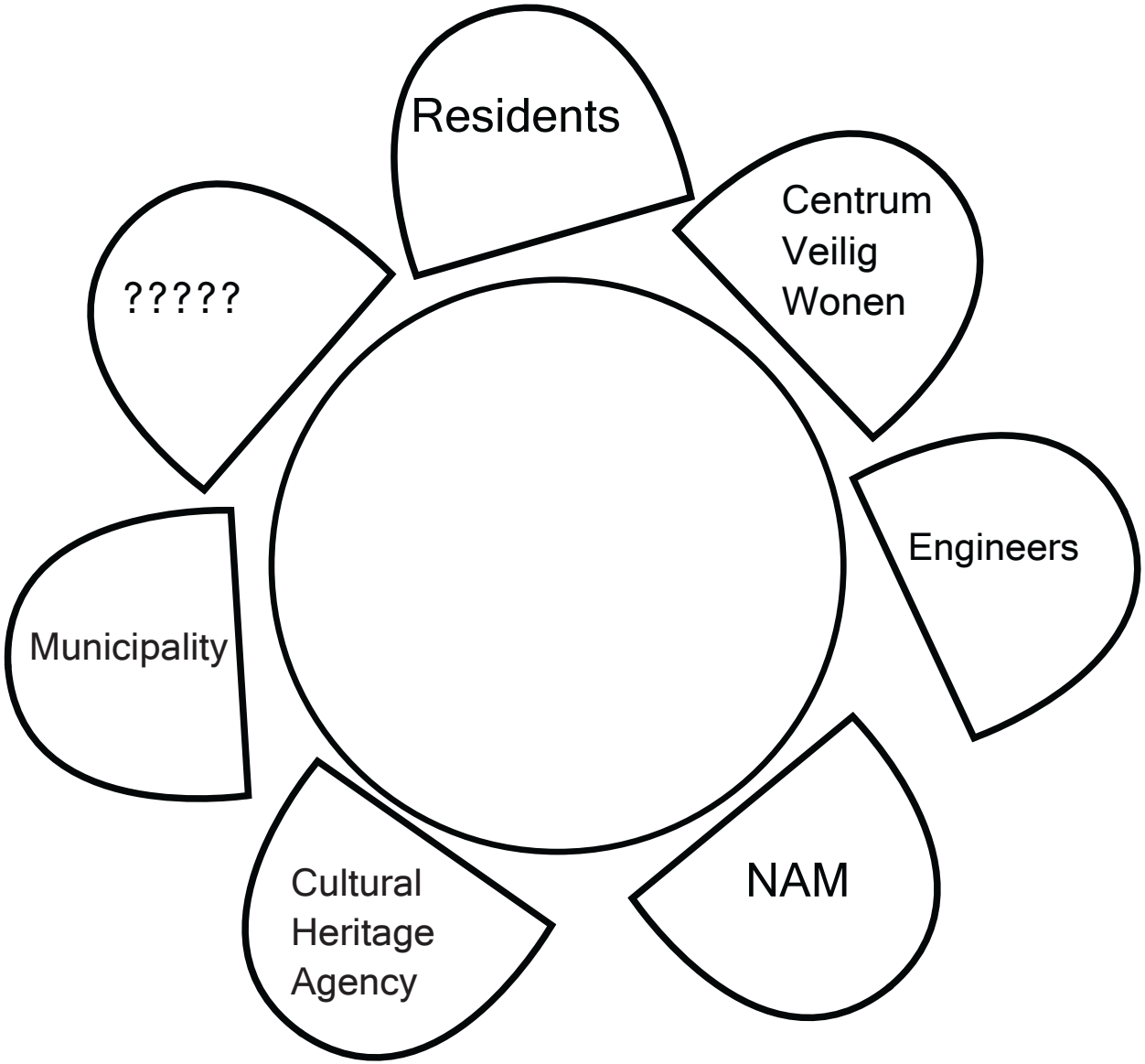


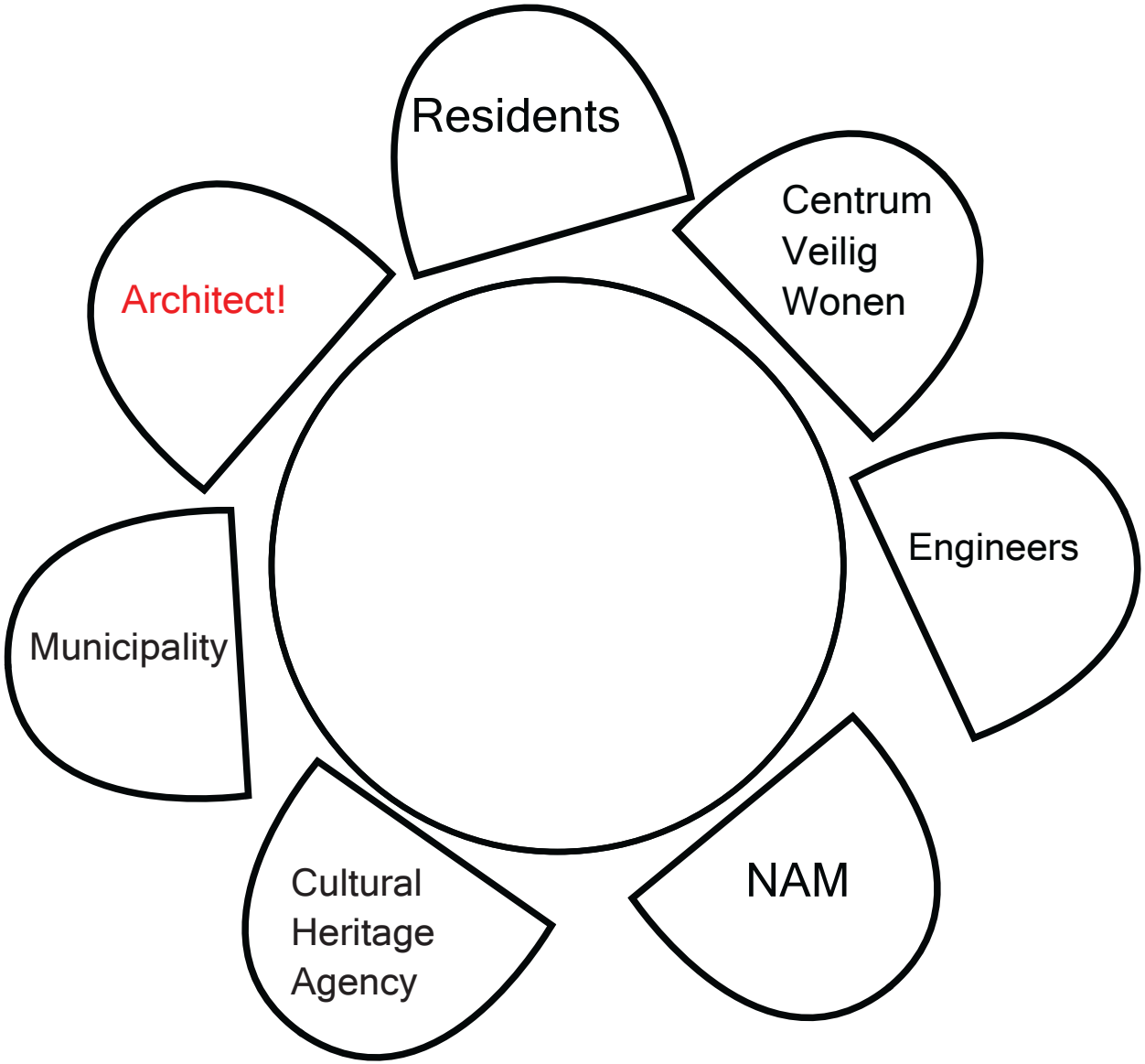


Conclusions






Residents
Centrum
Veilig
Wonen
Engineers
NAM
Cultural
Heritage
Agency
Municipality
?????


Residents
Centrum
Veilig
Wonen
Engineers
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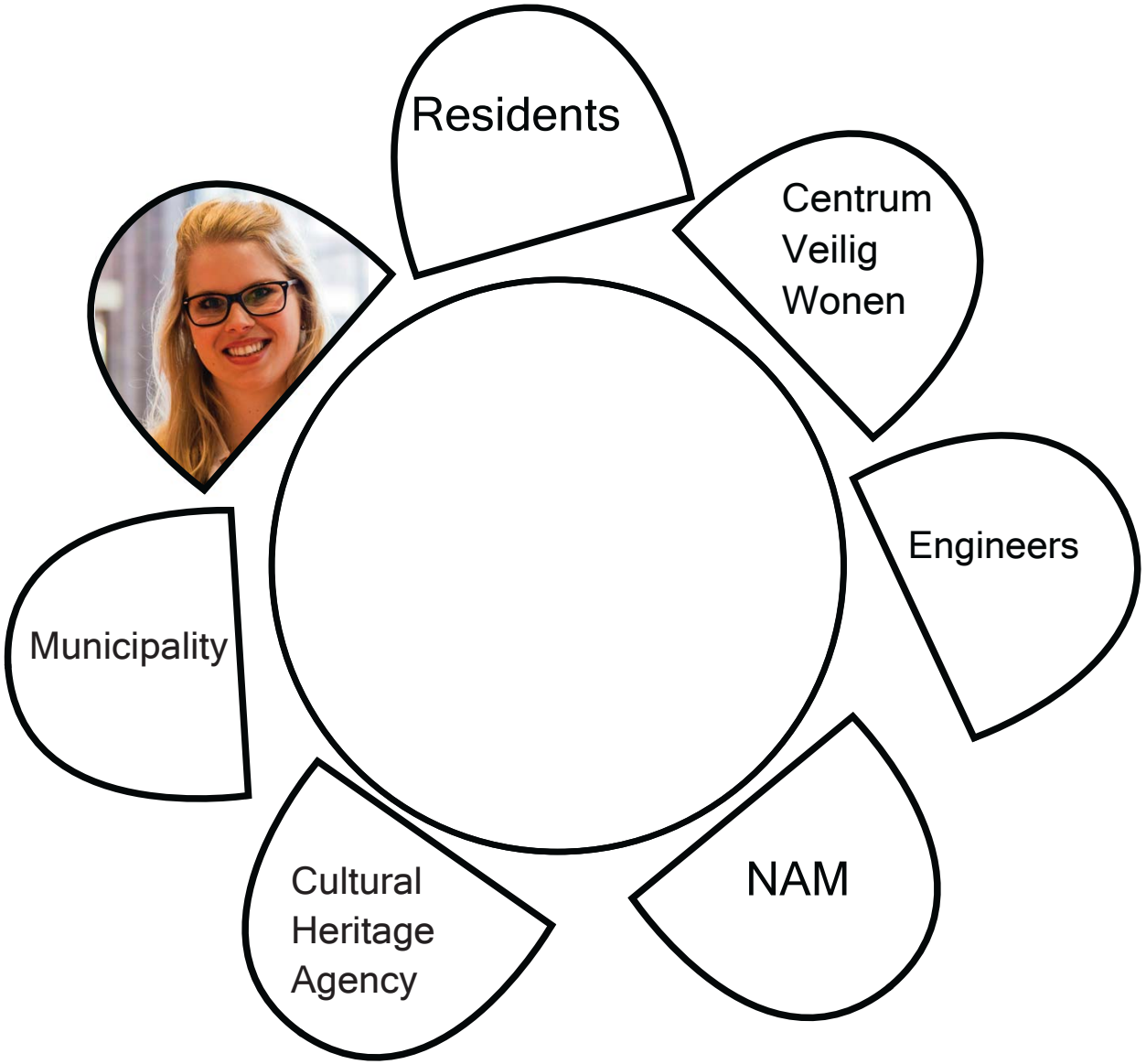
Municipality
Architect!


Residents
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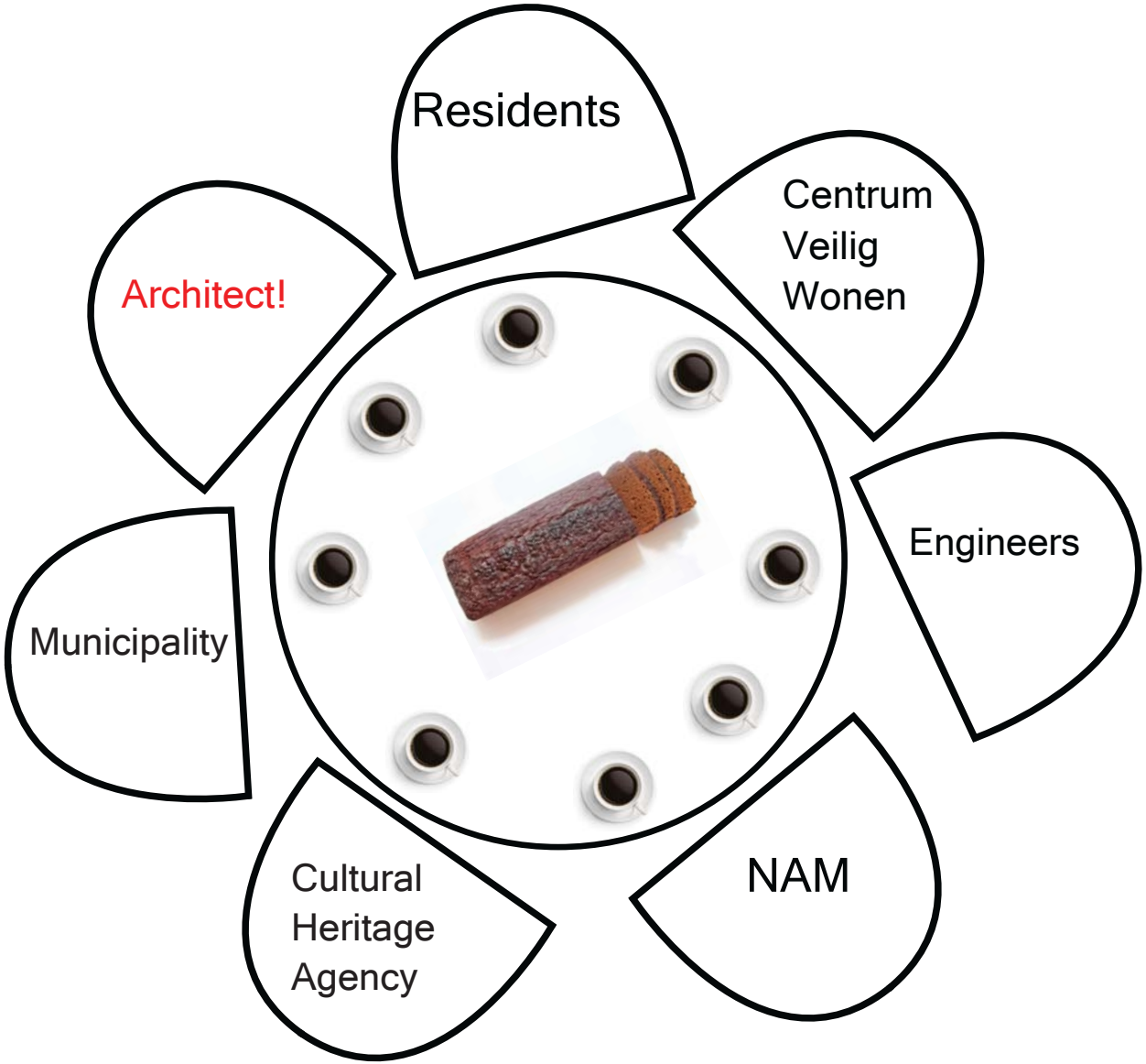
Municipality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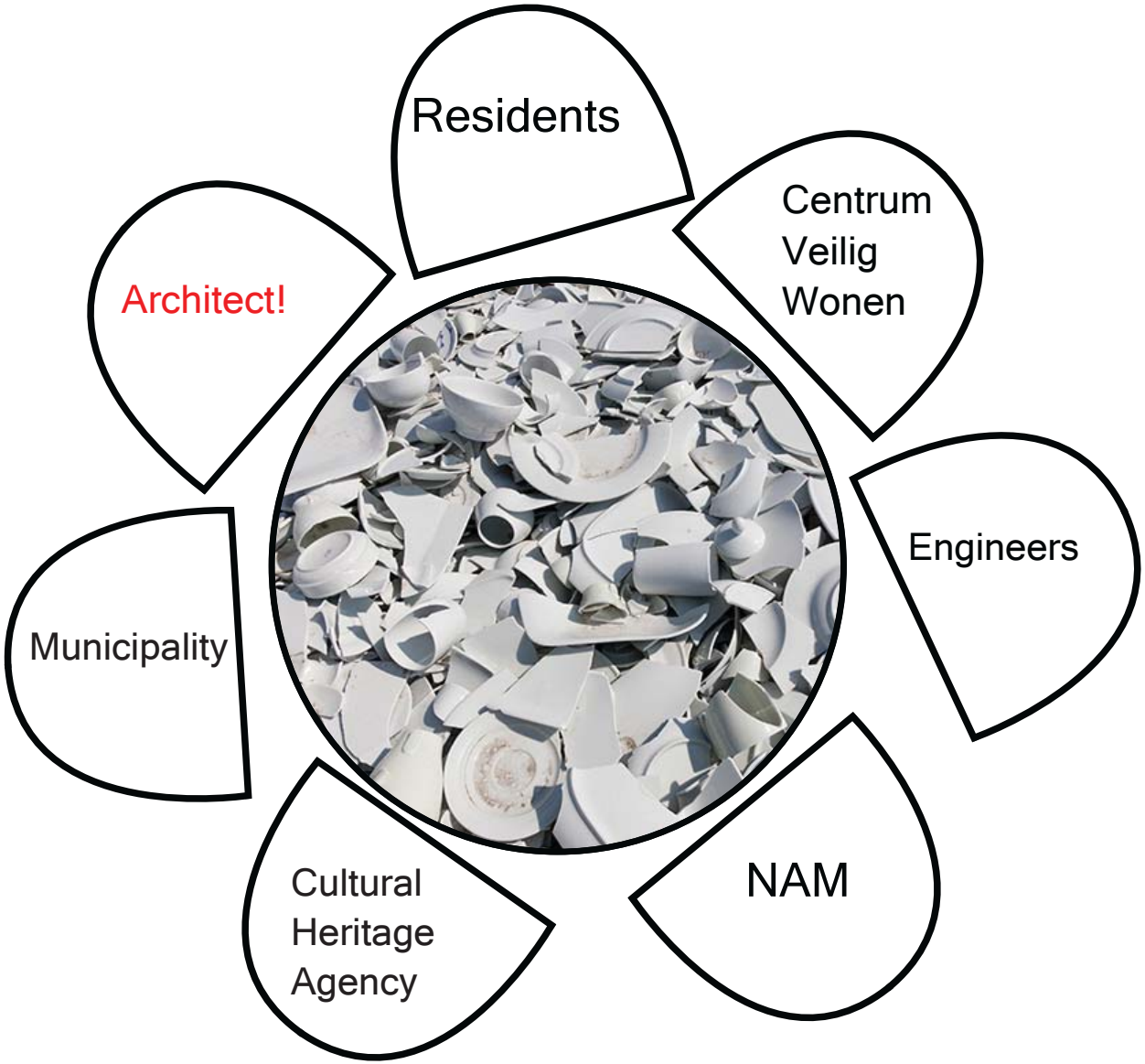
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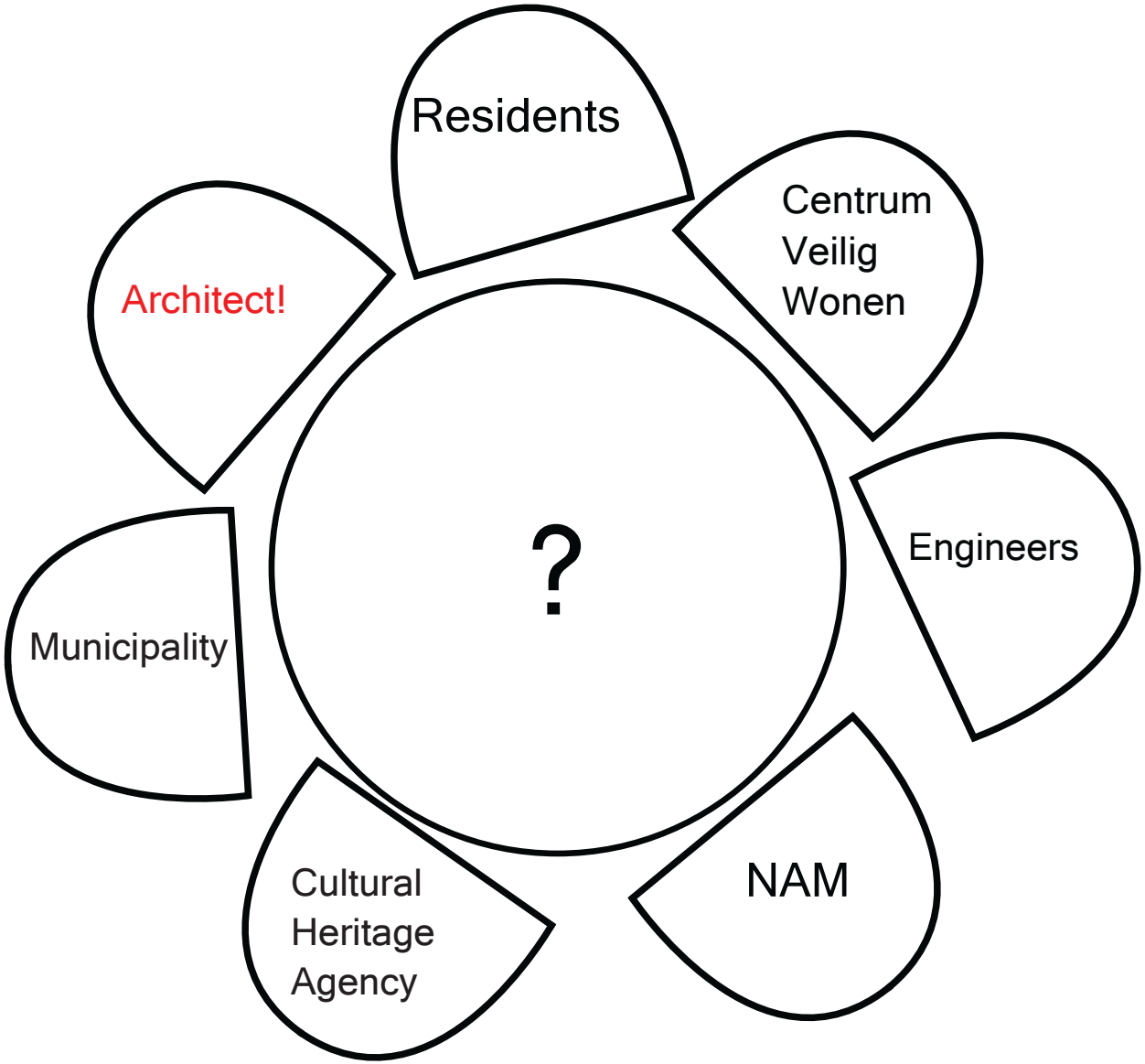
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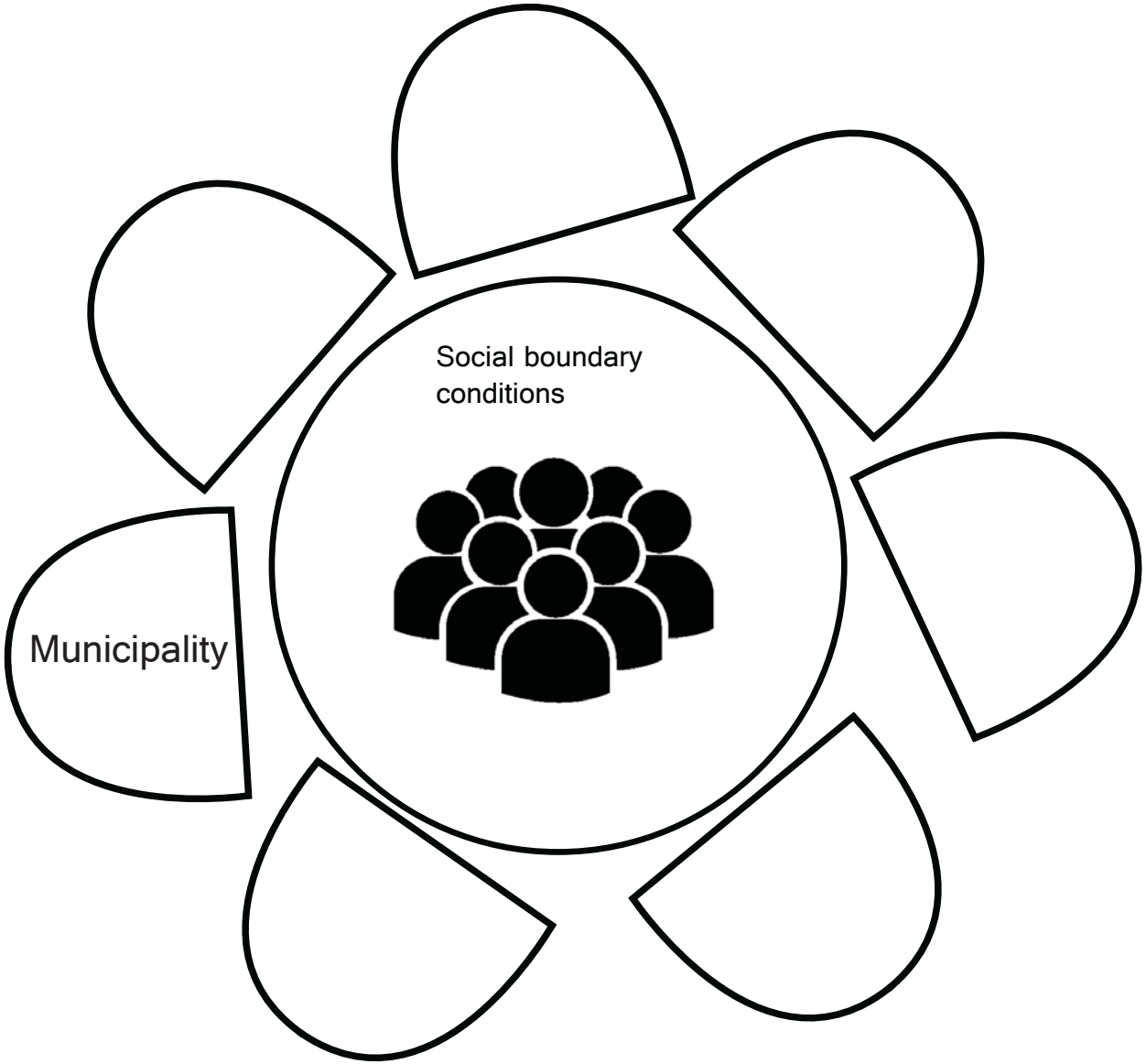
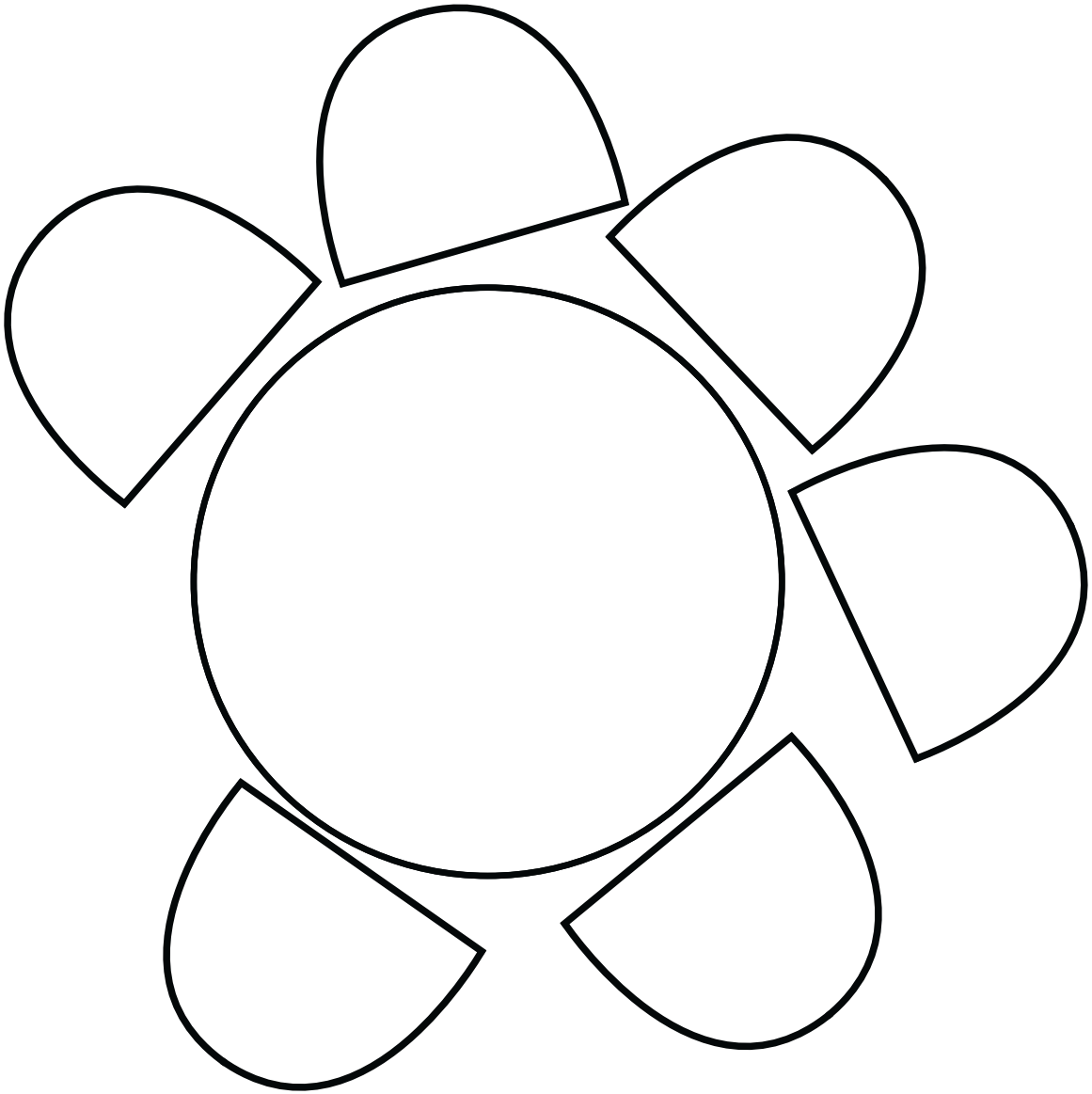
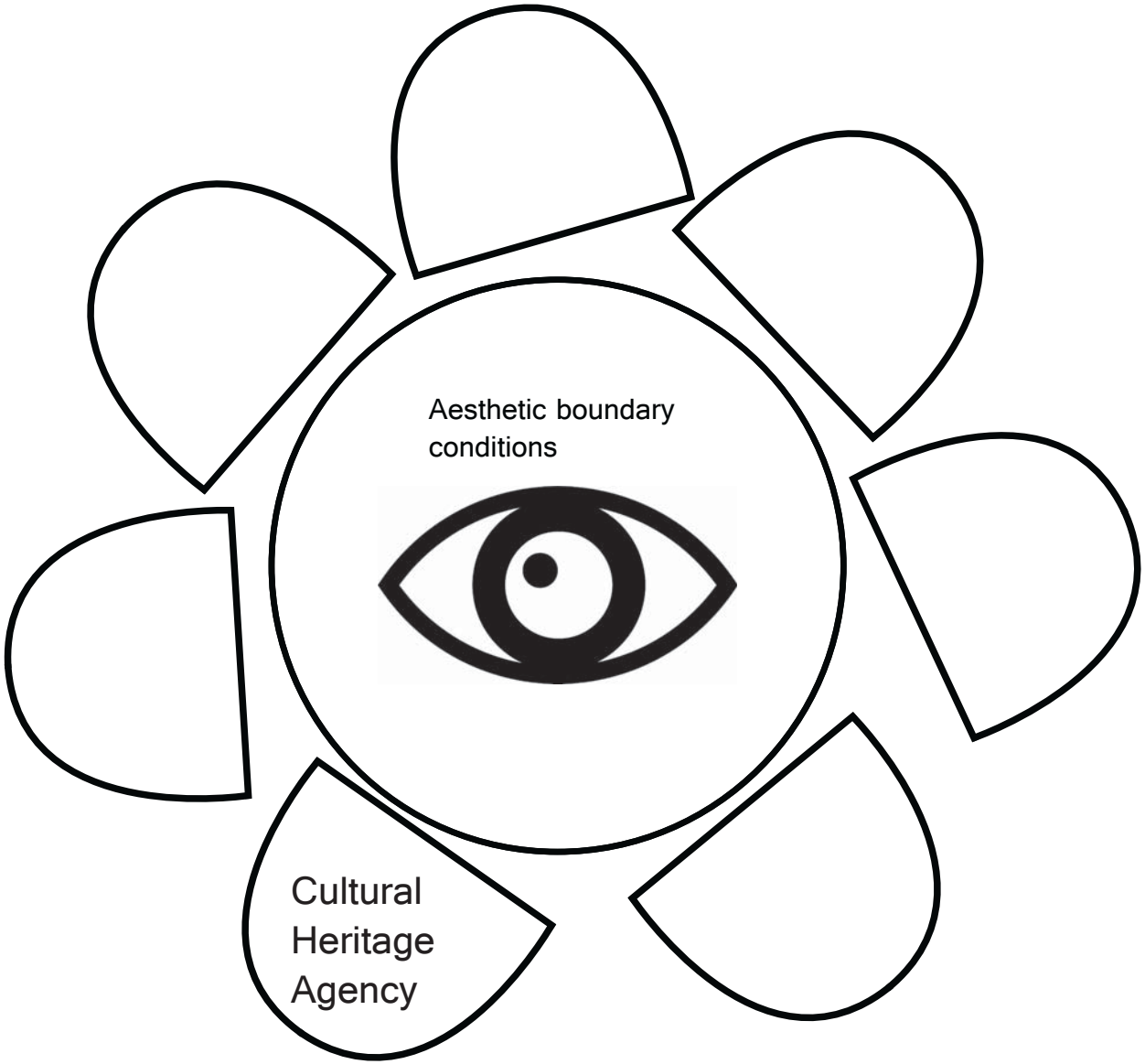
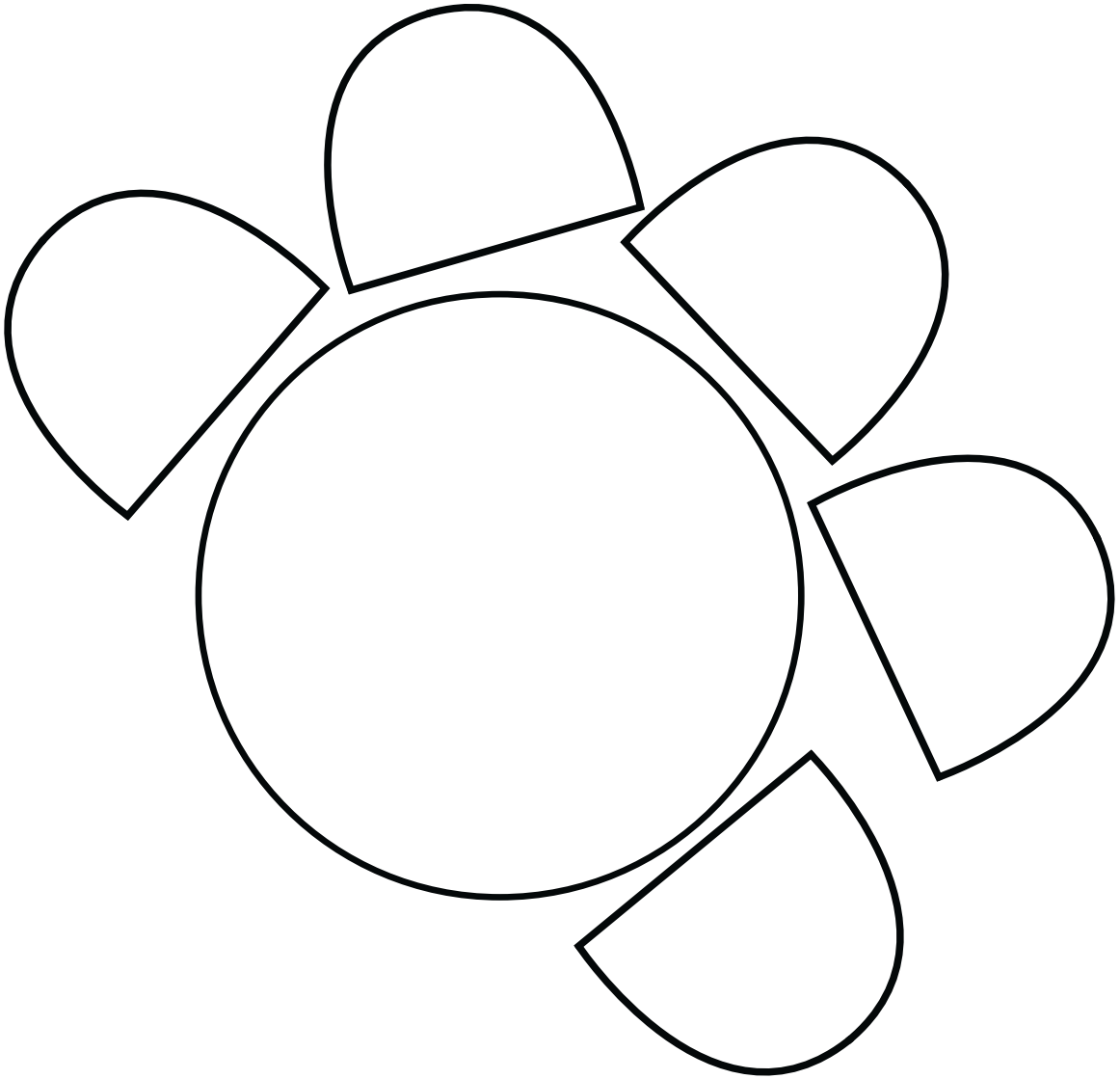
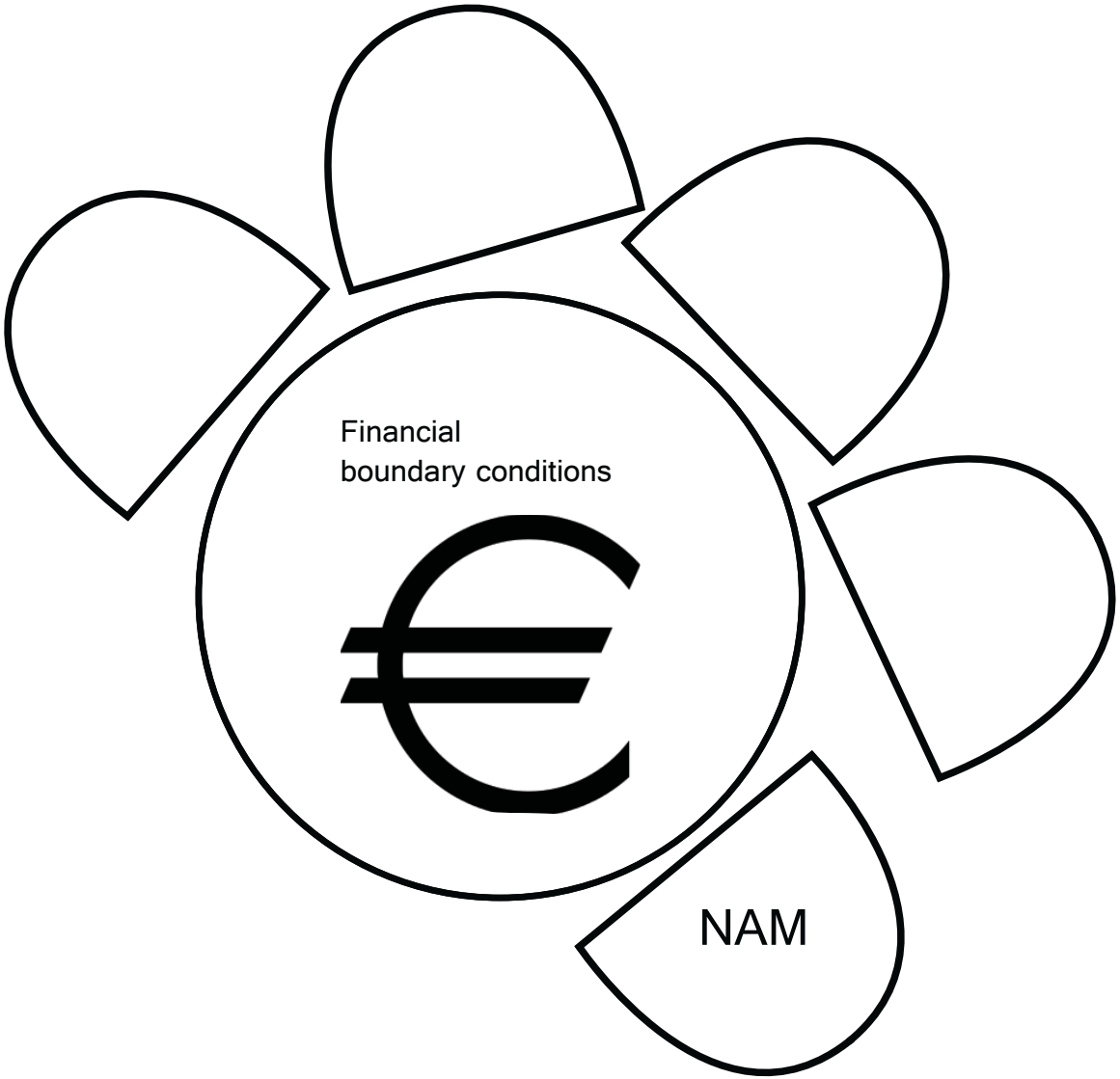
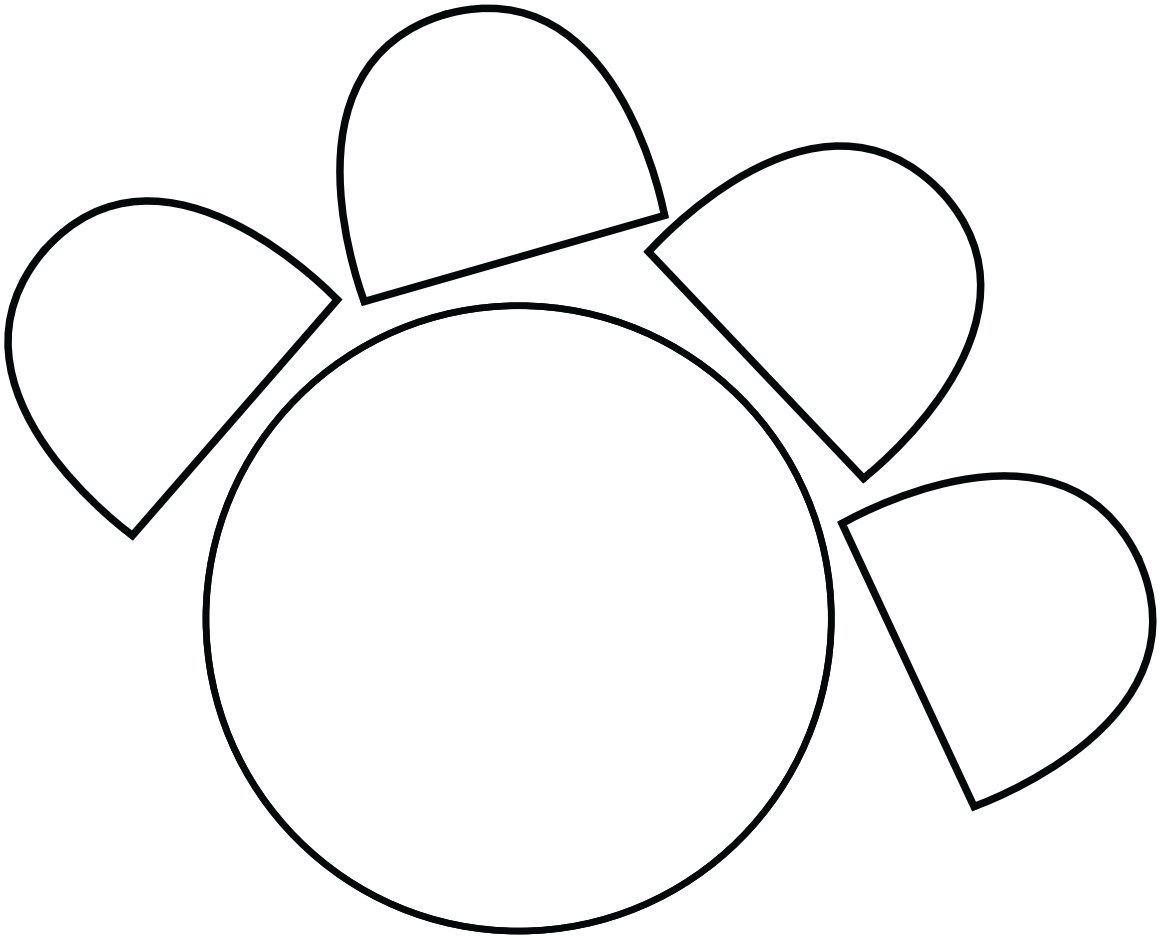

Social boundary conditions
Municipality

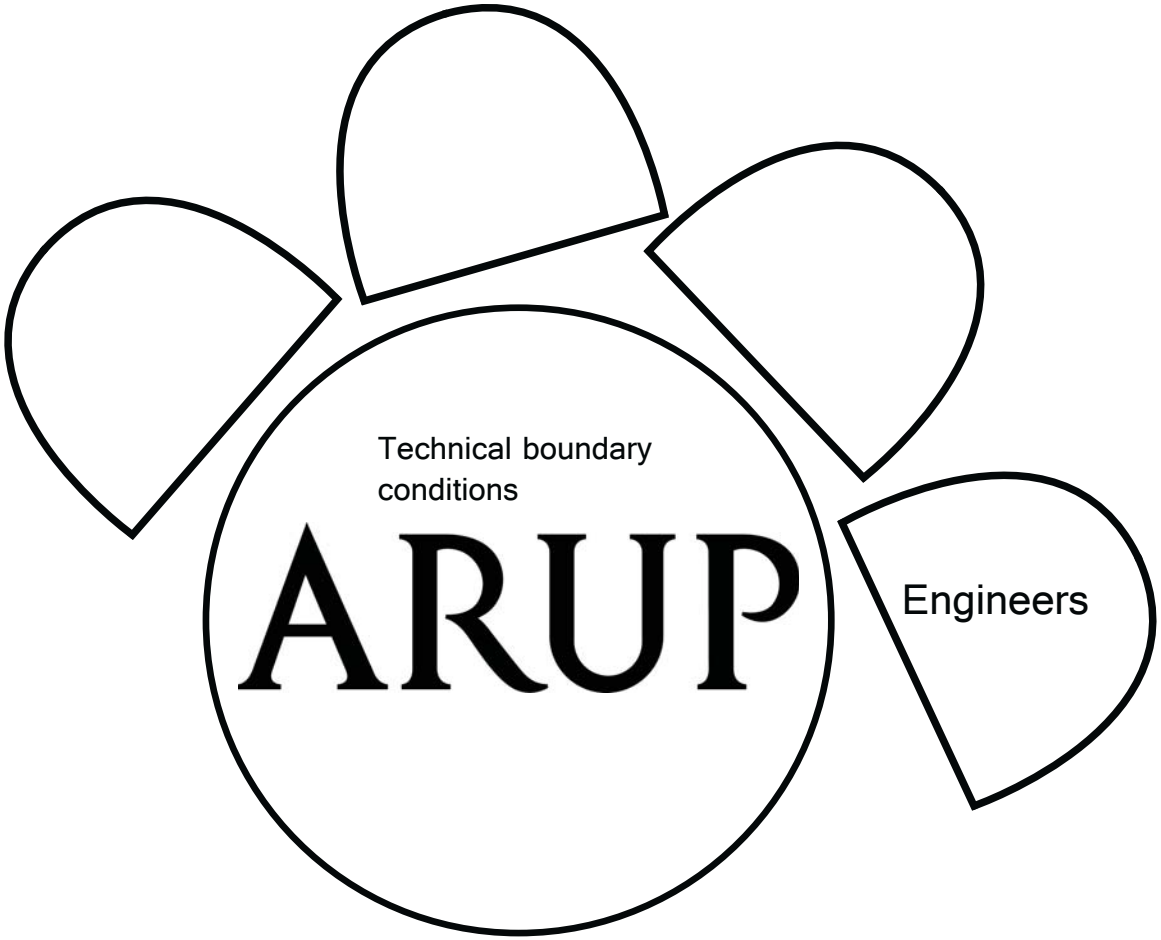


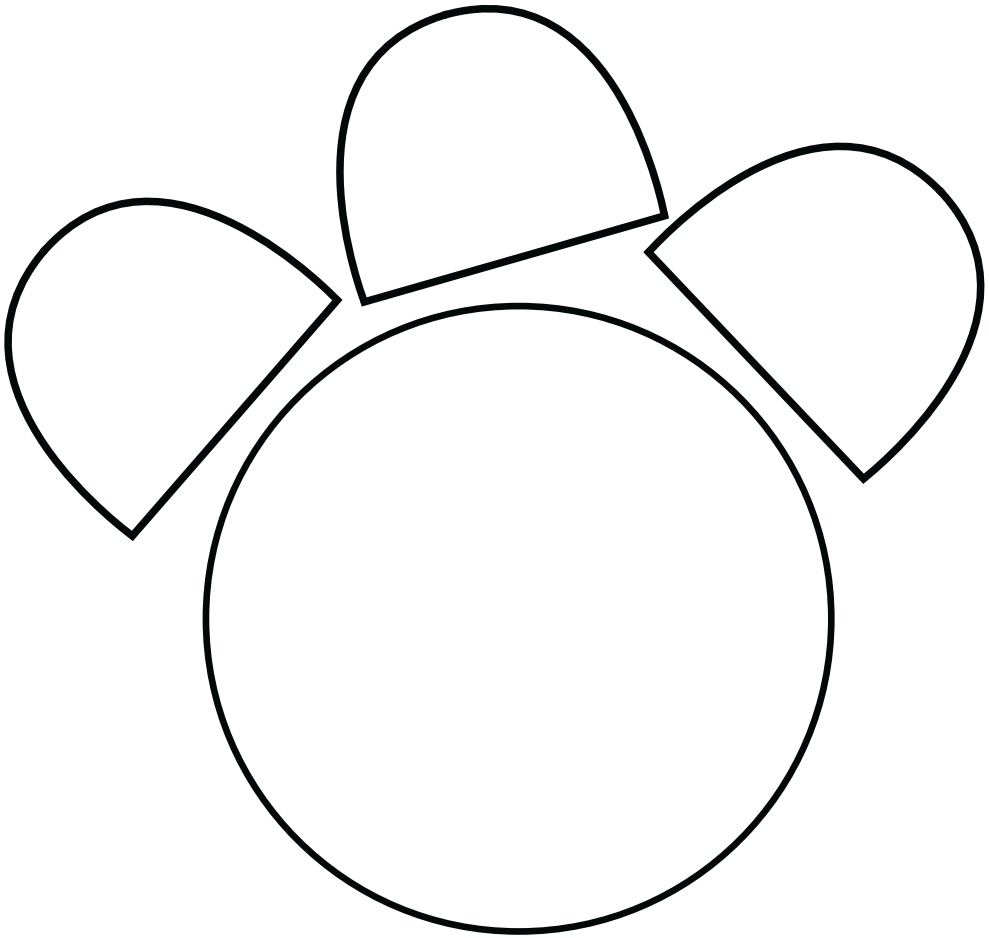

Aesthetic boundary conditions
Cultural Heritage Agency

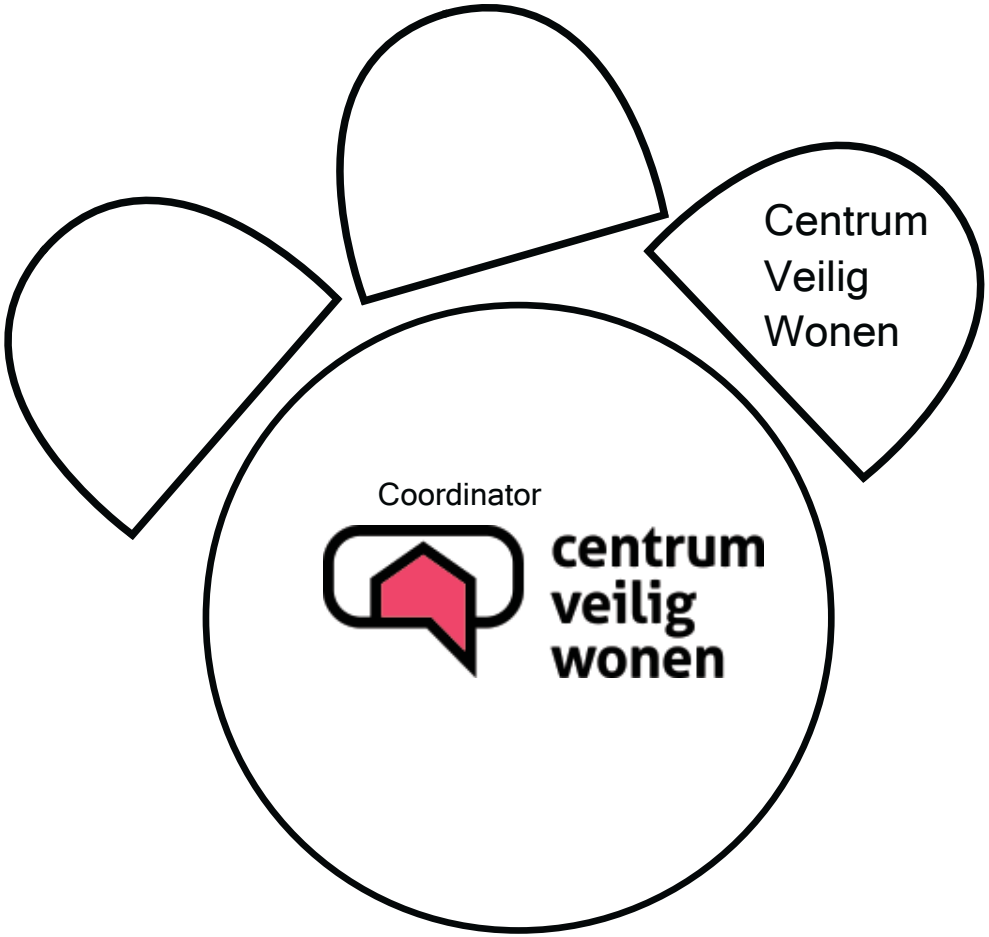



Financial
boundary conditions
NAM




Technical boundary
conditions
ARUP
Engineers




Centrum
Veilig
Wonen
Coordinator
centrum
veilig
wonen

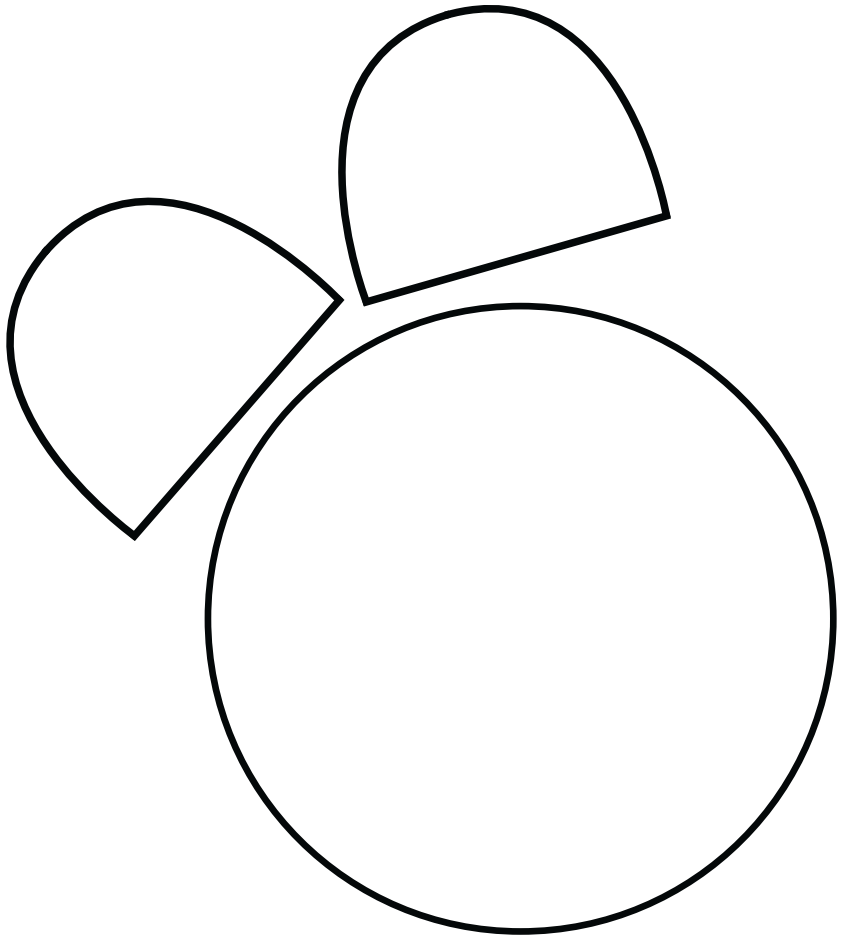
Front page website CVW

Centrum Veilig Wonen is een zelfstandige organisatie met de NAM als opdrachtgever en die ook rapporteert aan het door de minister van Economische Zaken ingestelde toezichtsorgaan.

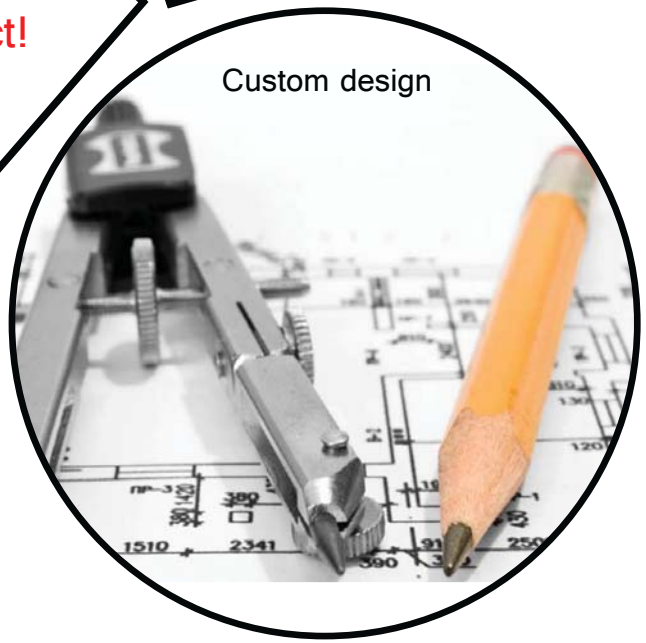
We hebben de afspraak gemaakt om in 2015 te komen tot bouwkundige versterking van 3000 woningen en andere panden. Een deel daarvan volgt direct uit de inspecties. Een ander deel

Het is gemakkelijk om met Centrum Veilig Wonen in contact te komen. Alle gebruikelijke kanalen zoals telefoon, e-mail en sociale media zijn daarvoor te gebruiken en natuurlijk kan wie dat wil ook 'gewoon' langskomen in ons pand in Appingedam. Het hart van onze organisatie wordt gevormd door het bewonerscontactcentrum. Bij het aannemen van schades

Businessplan CVW 2015



Architect!




Residents
Architect!
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