

# VACUUMATICS

vacuumatically\_prestressed\_adaptable\_3D\_formwork\_systems



PhD\_researcher

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Eindhoven\_University\_of\_Technology (NL)  
Architecture\_Building\_and\_Planning  
Structural\_Design

financed\_by

ABT\_Consulting\_Engineers (NL)

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traditional\_construction

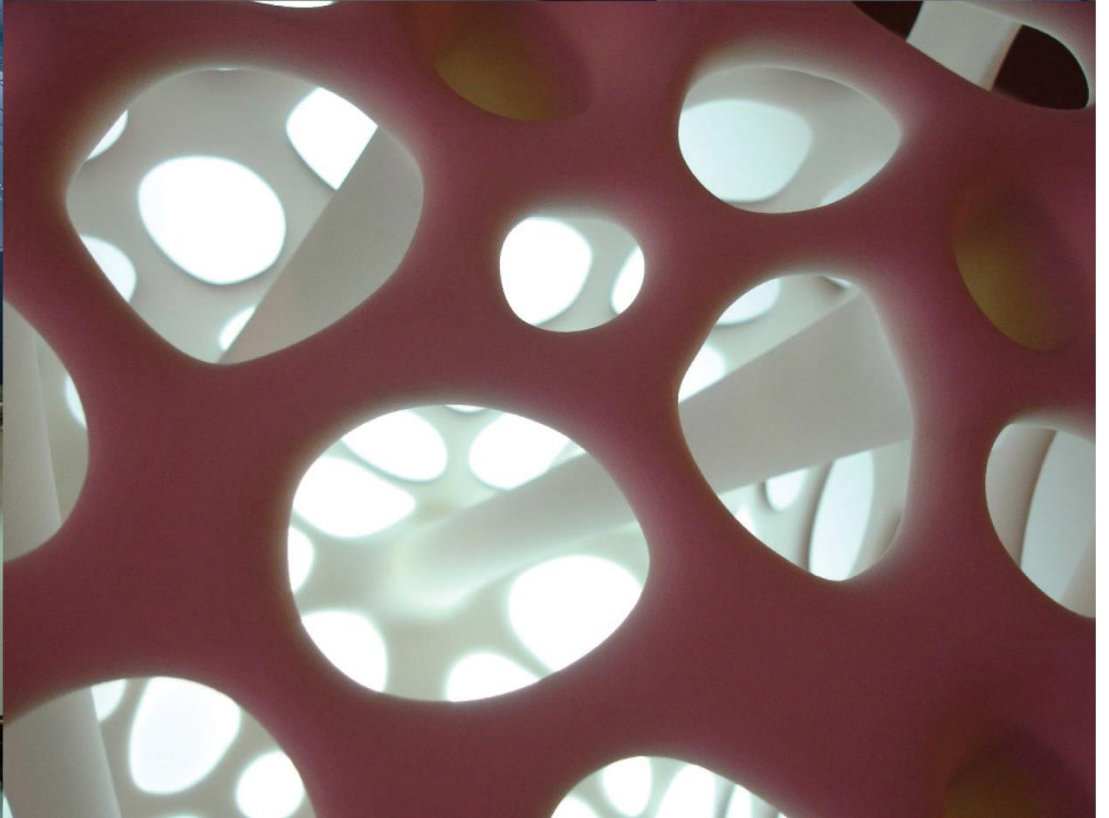
rectilinear\_orientated



INTRODUCTION



free-form



# INTRODUCTION



randomness



# INTRODUCTION





concrete\_architecture

limiting\_factor = formwork

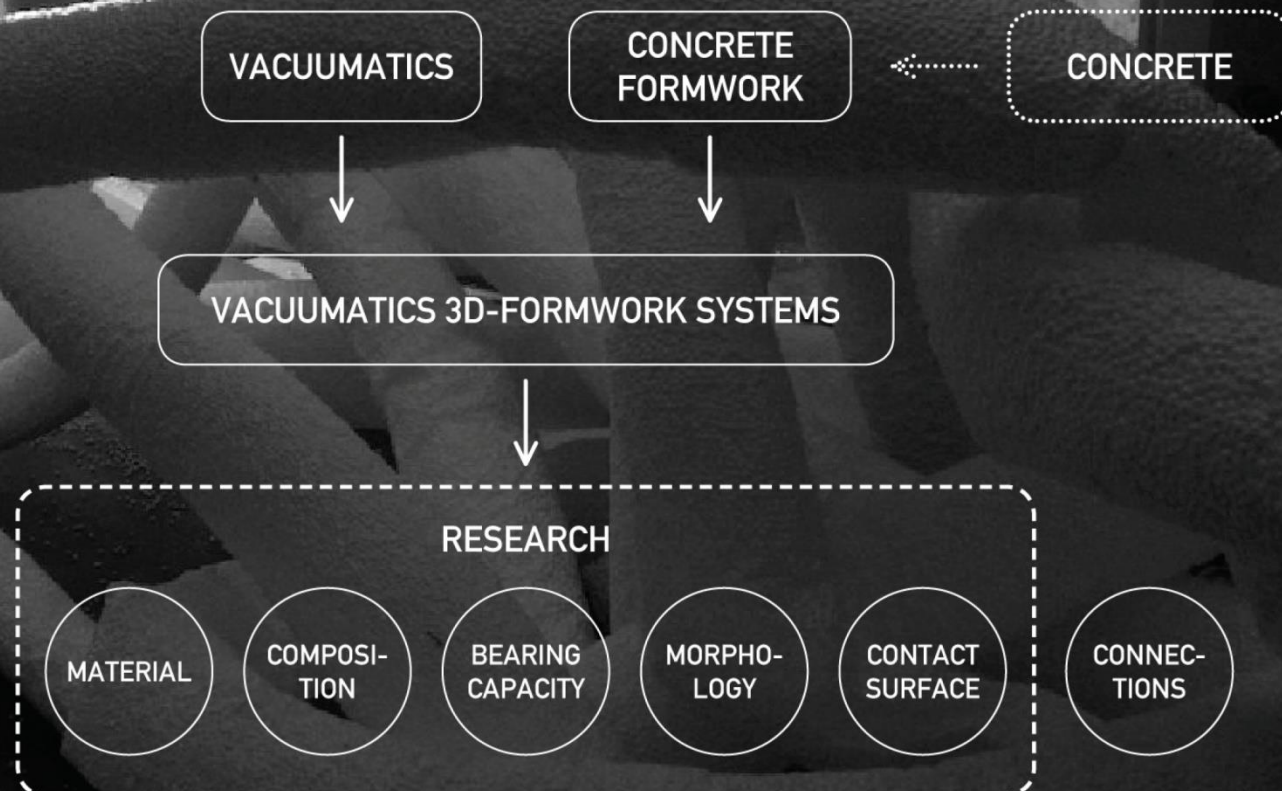
# INTRODUCTION





# VACUUMATICS

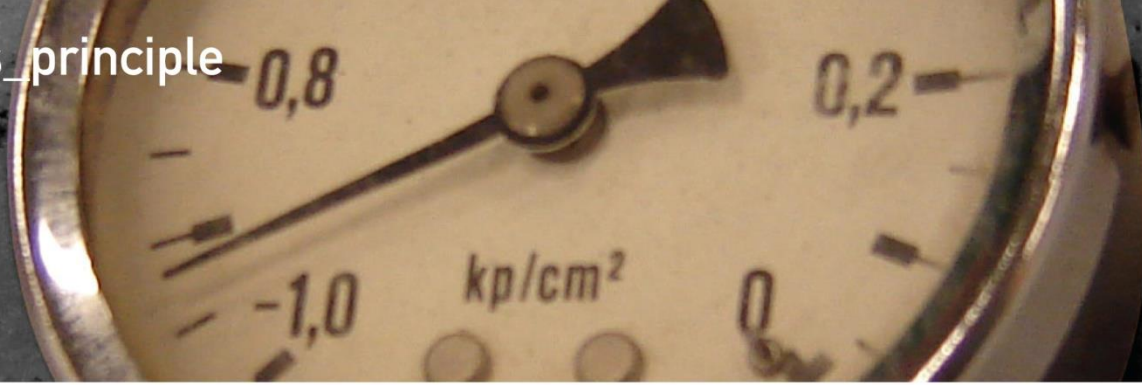
vacuumatically\_prestressed\_adaptable\_3D\_formwork\_systems



PhD\_RESEARCH\_TU/e



vacuumatics\_principle



structural\_engineering



architectural\_design



vacuumatics\_formwork





# AIR\_PRESSURE

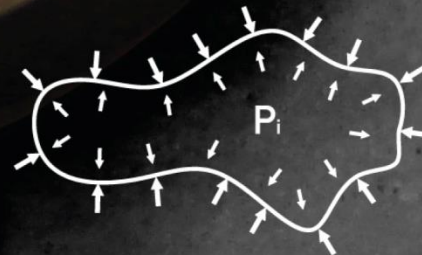
general\_introduction\_of\_the\_vacuumatics\_principle



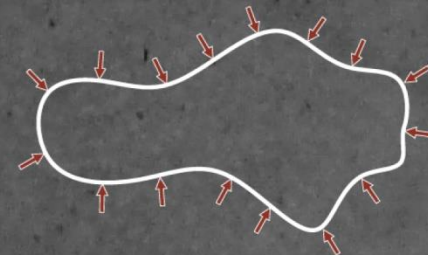
atmospheric  
pressure

= 1 bar  
= 0,1 MPa  
= 100 kN/m<sup>2</sup>

$P_a$



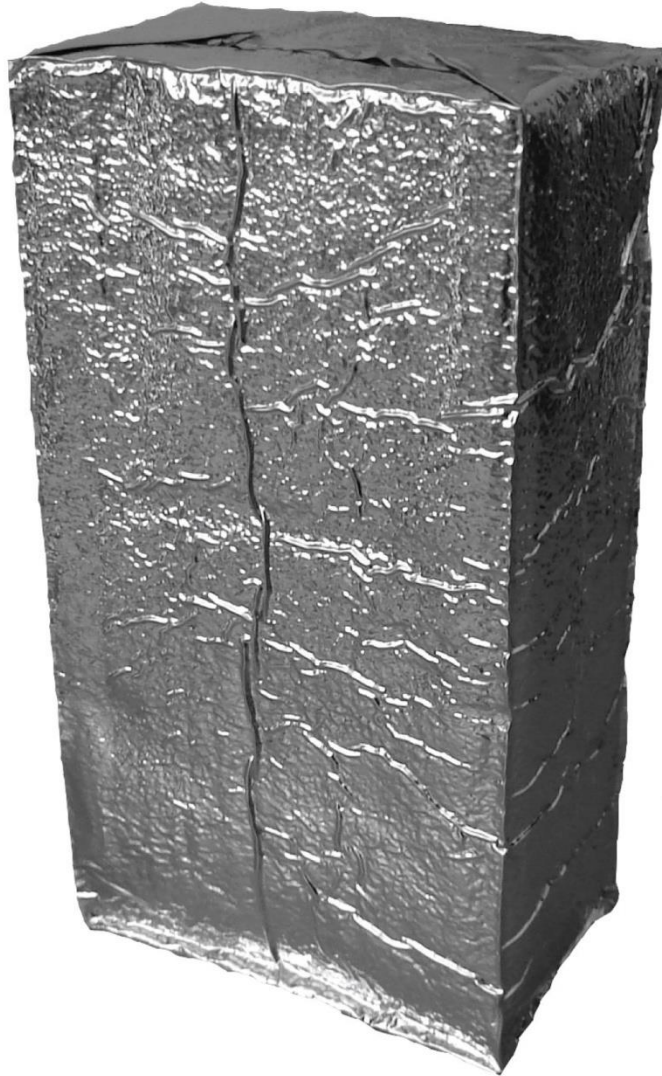
$P_v$



VACUUMATICS\_PRINCIPLE



vacuum\_packed\_coffee



VACUUMATICS\_PRINCIPLE



# MEMO\_bean\_bag

Ron\_Arad



VACUUMATICS\_PRINCIPLE



vacuumatics\_research\_1970

Queen's\_University\_Belfast (IE)



VACUUMATICS\_PRINCIPLE



deflateables\_bridge\_2007

Delft\_University\_of\_Technology (NL)

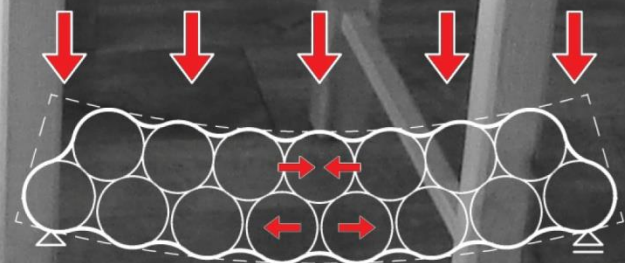
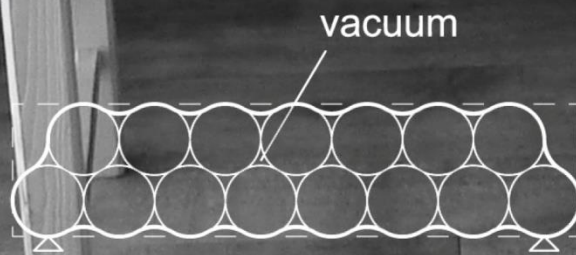


VACUUMATICS\_PRINCIPLE



# PRE-STRESS

structural\_analysis\_of\_vacuum\_pre-stressing

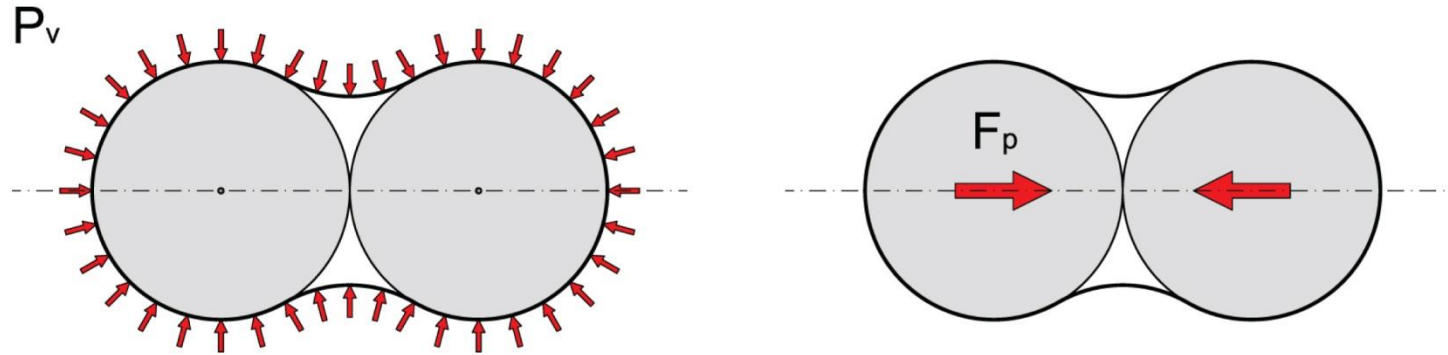


STRUCTURAL\_ENGINEERING

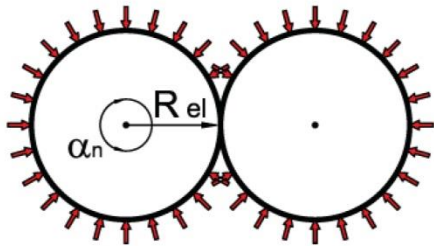


vacuumatic\_prestressing

multi-directional\_pressure

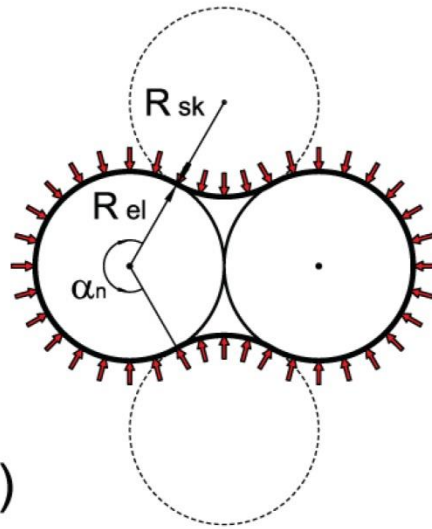


$R_{sk} = "0"$



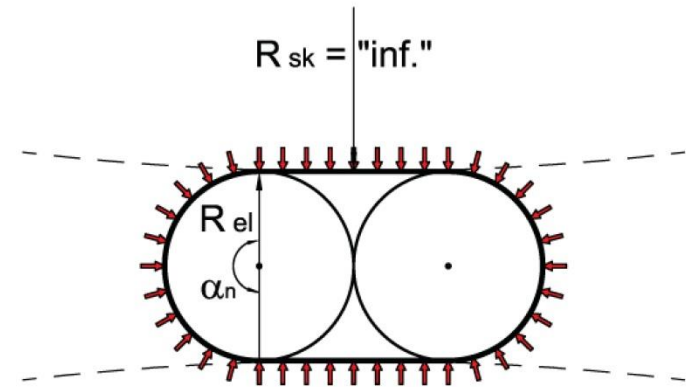
(a)

$R_{sk}$



(b)

$R_{sk} = "inf."$

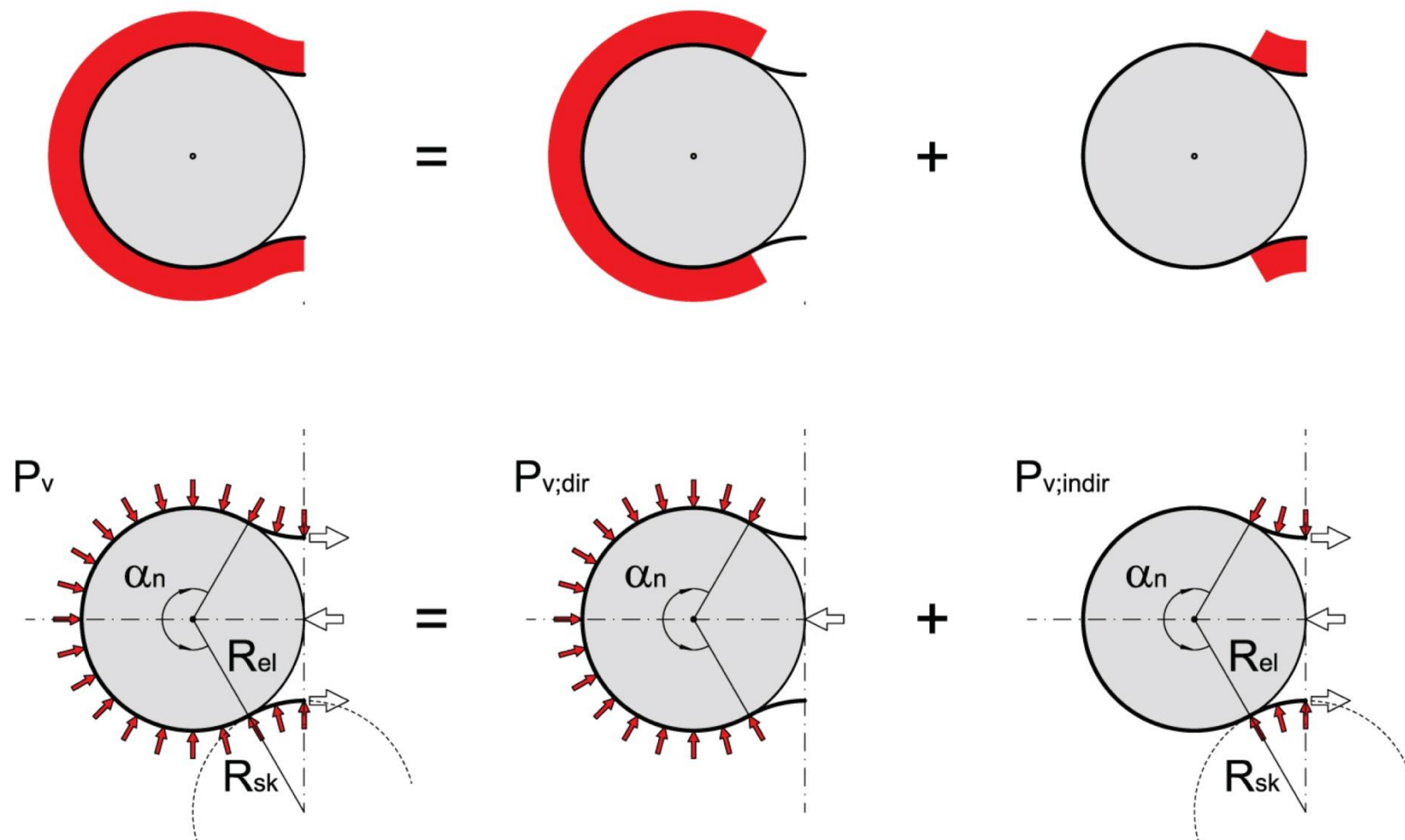


(c)



## prestressing\_components

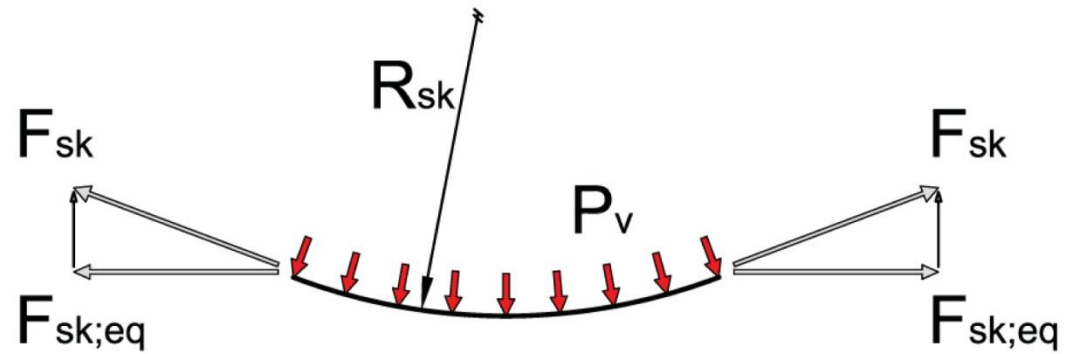
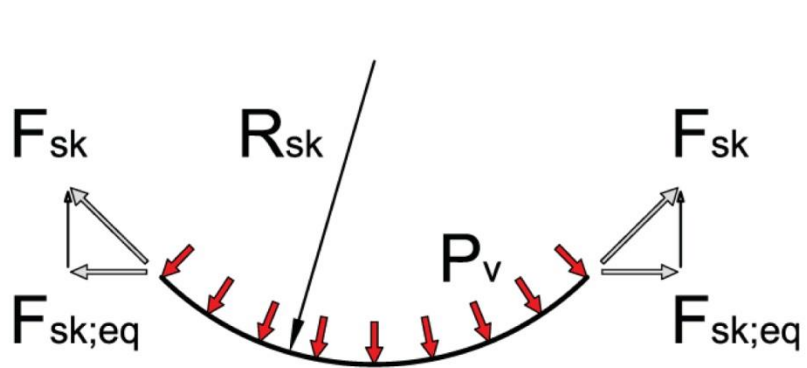
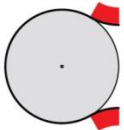
direct\_&\_indirect





surface\_stresses\_skin

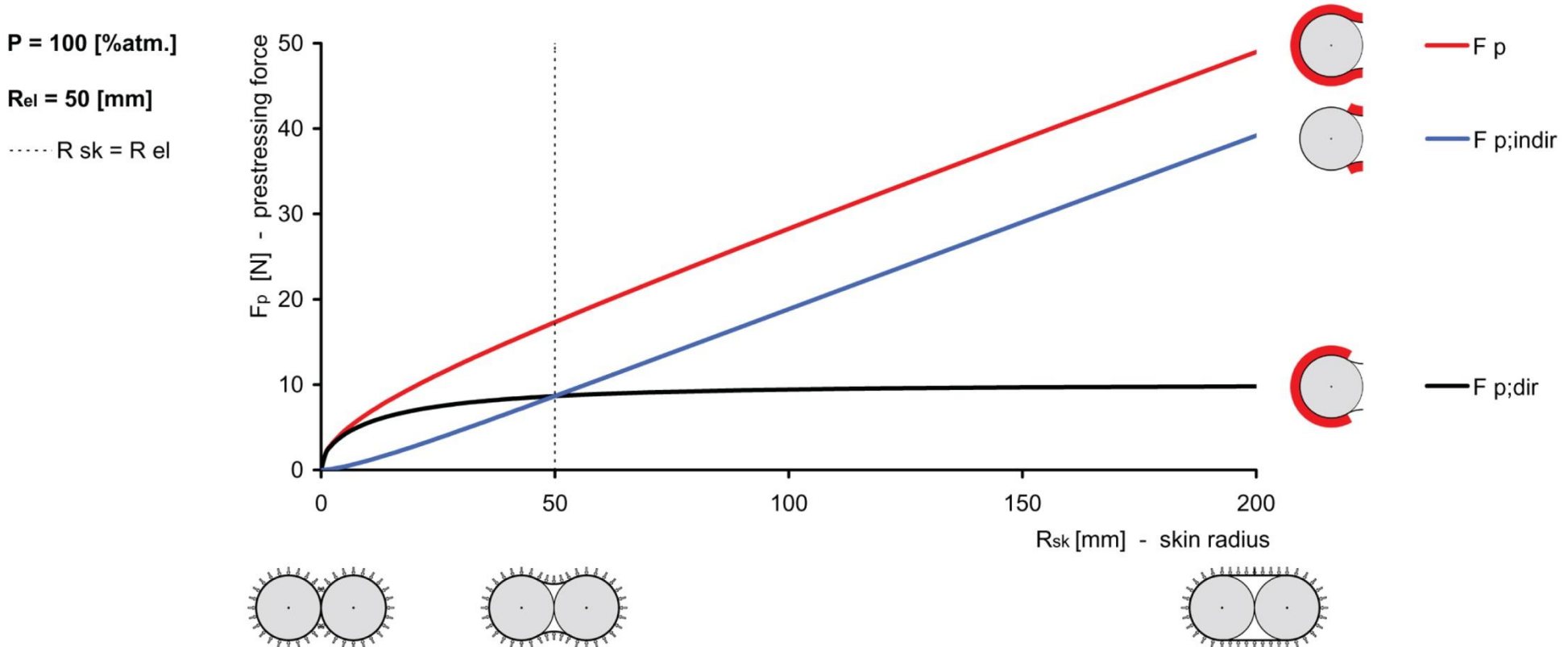
skin\_radius





prestress\_development

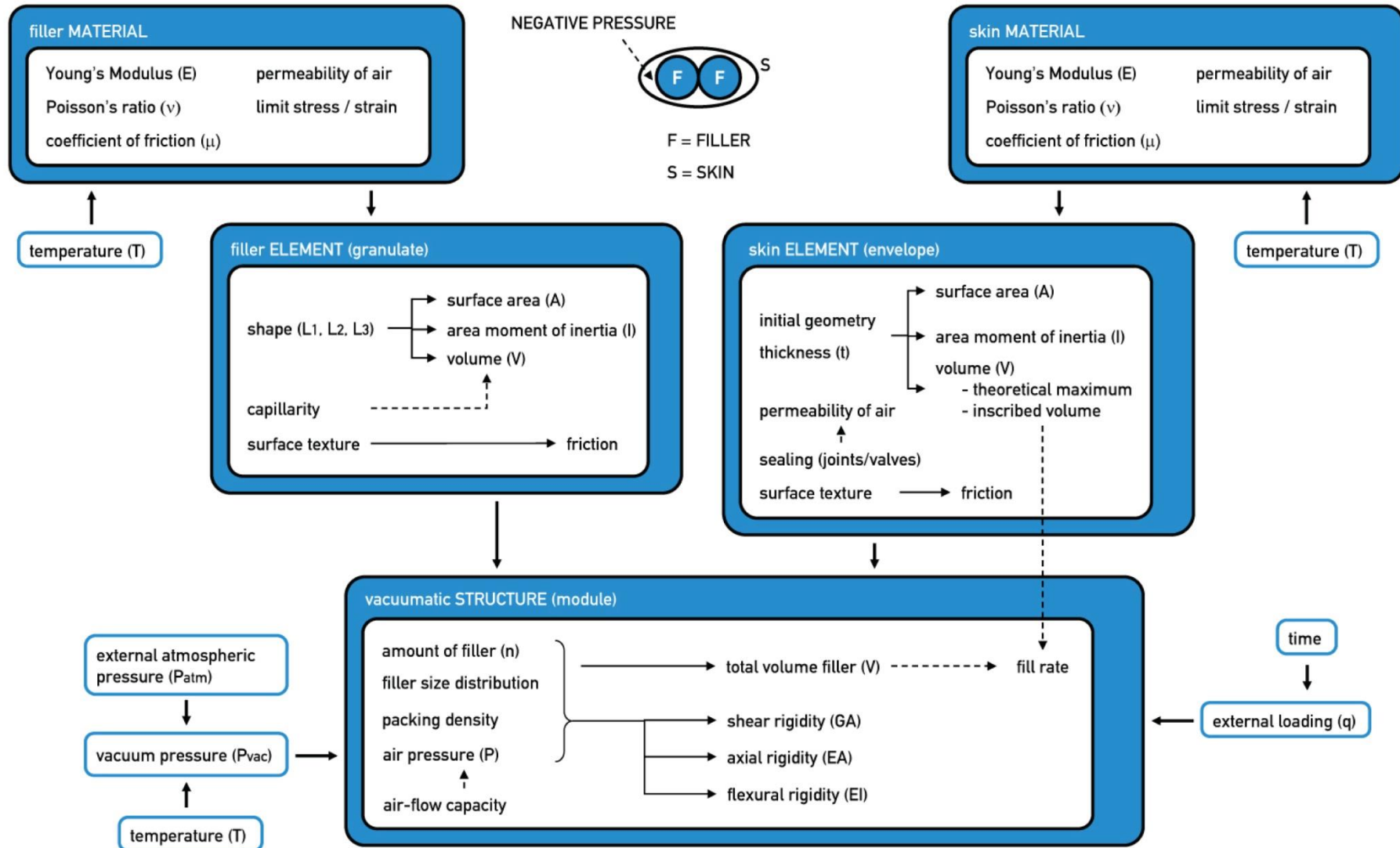
influence\_of\_skin\_elasticity





# skin\_&\_filling

## parameters\_of\_influence





# STRUCTURAL\_ENGINEERING

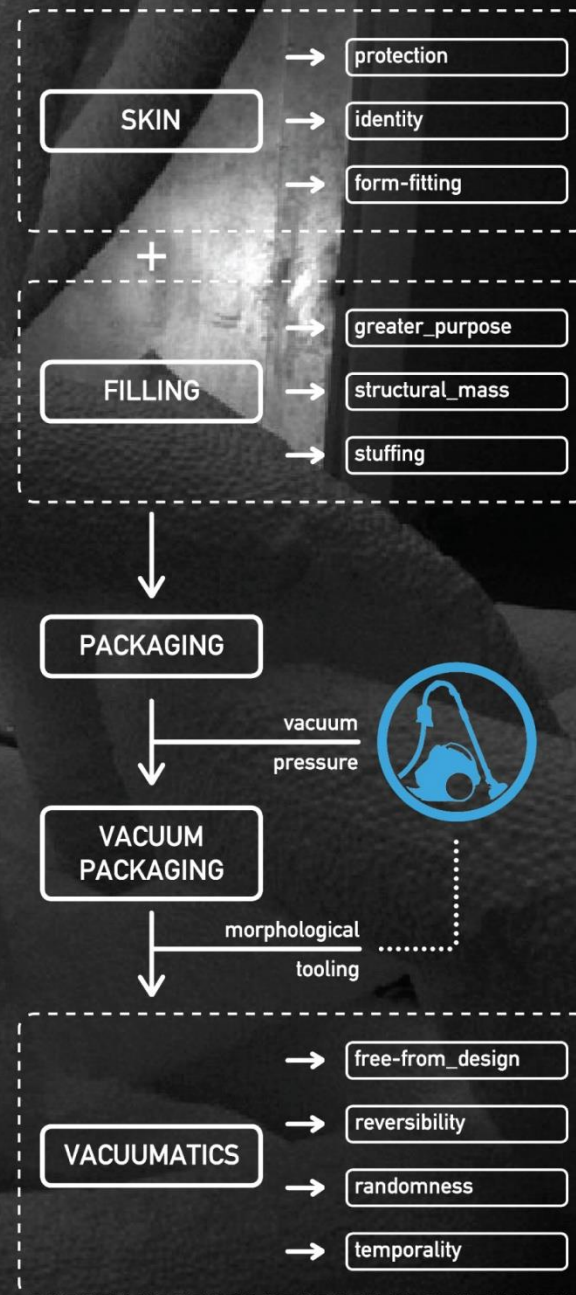
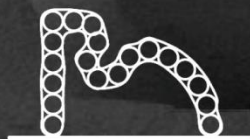
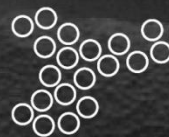
filler\_configuration

packing\_density





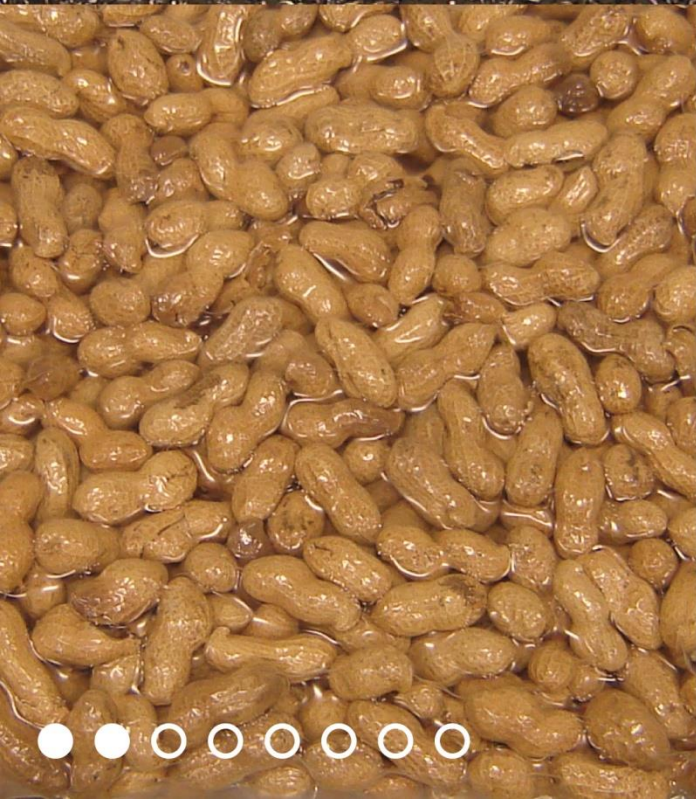
analysis\_of\_architectural\_qualities





filler\_material

aggregates



ARCHITECTURAL\_DESIGN





skin\_material

plastic\_film

# ARCHITECTURAL\_DESIGN





sensorial\_experience

recognition\_&\_association



ARCHITECTURAL\_DESIGN



free-form\_design

straw\_structure

# ARCHITECTURAL\_DESIGN





free-form\_design

EPS\_tubular\_structure

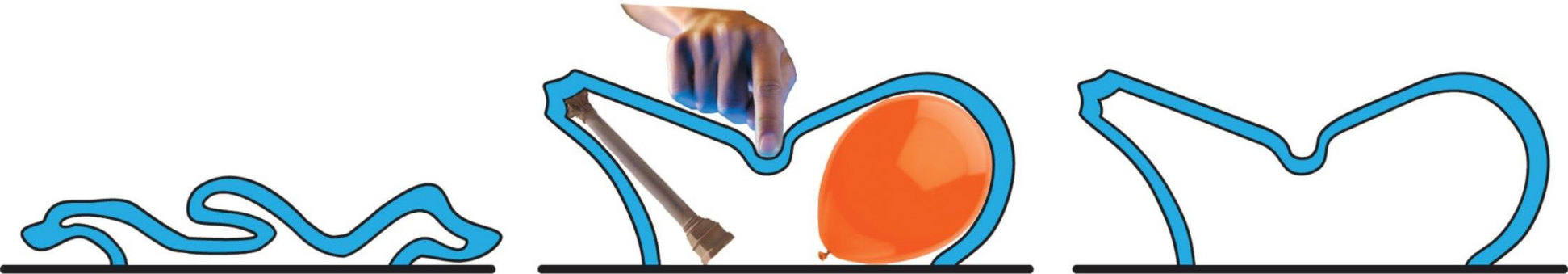
# ARCHITECTURAL\_DESIGN





morphological\_tooling

flexibility\_control



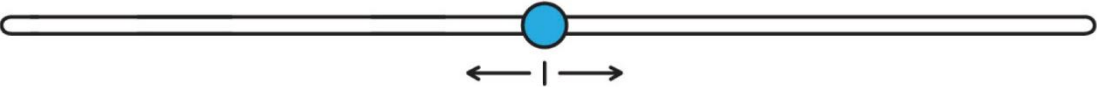
[ flexible ]

[ plastic ]

[ rigid ]

VACUUM  
PRESSURE

0 %



100 %

ARCHITECTURAL\_DESIGN



form\_adaptability

reversibility



ARCHITECTURAL\_DESIGN





# 3D-FORMWORK

reconfigurable\_mould\_for\_complex\_geometries\_in\_concrete



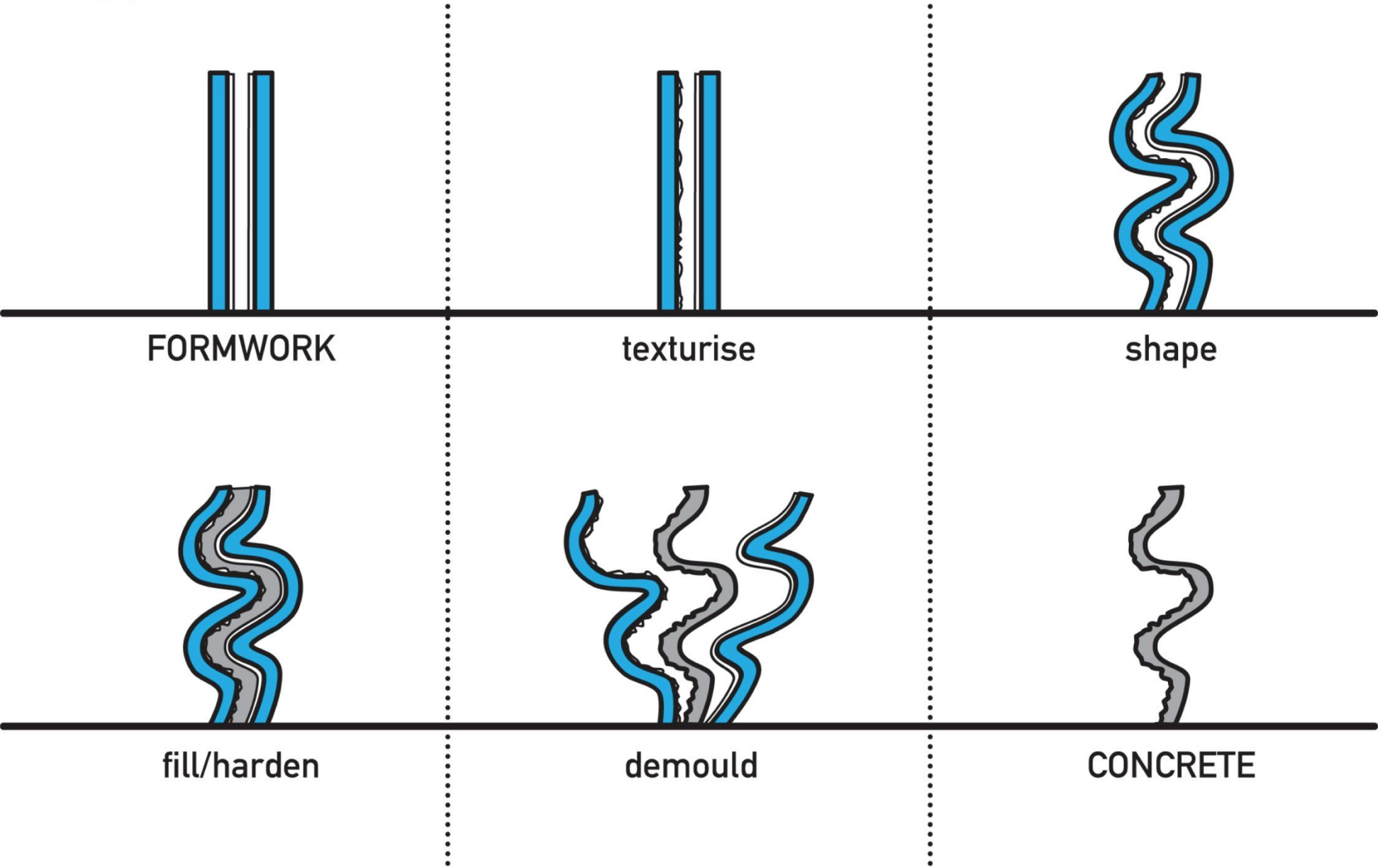
VACUMATICS\_FORMWORK





free\_forms\_in\_concrete

moulding\_process



VACUUMATICS\_FORMWORK



customised\_surface\_texture

micro\_geometry

VACUUMATICS\_FORMWORK





'new'\_shapes\_in\_concrete

developments\_in\_concrete\_technology



VACUUMATICS\_FORMWORK





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