



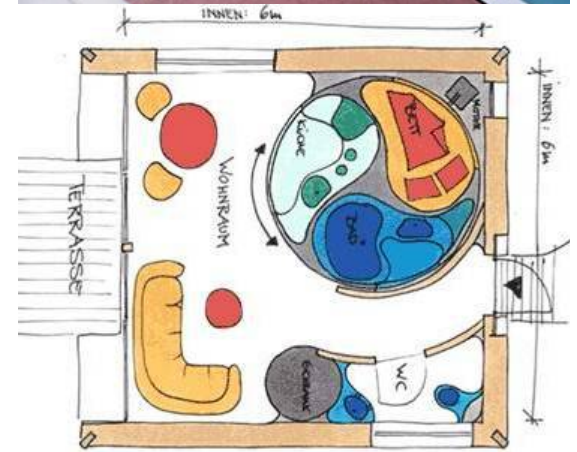
Smart materials & Architectuur toepassingen

Charlotte Lelieveld, Promovenda, Bouwtechnologie, Architectural Engineering

Adaptive architecture

- Componenten kunnen zich aanpassen aan de gebruiker of omgevings eigenschappen.
- Mechanische oplossing voor aanpasbare omgeving

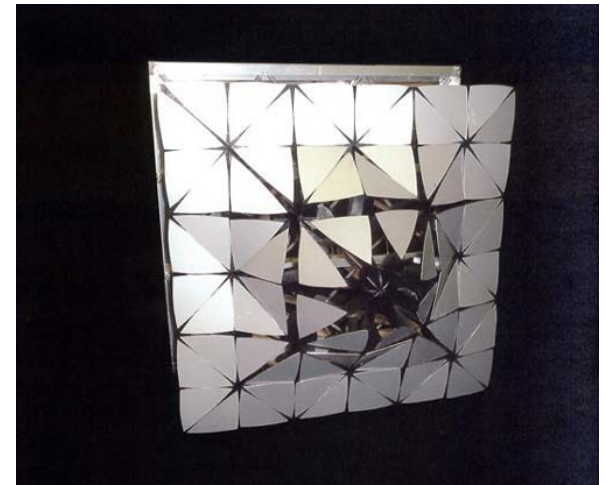
Luigi Colani, Rotorhouse, 2000



Adaptive architecture

- Samenwerking tussen wiskundigen, ontwerpers en werktuigbouwkundigen

Aegis Hyposurface, 2001, by dECOi



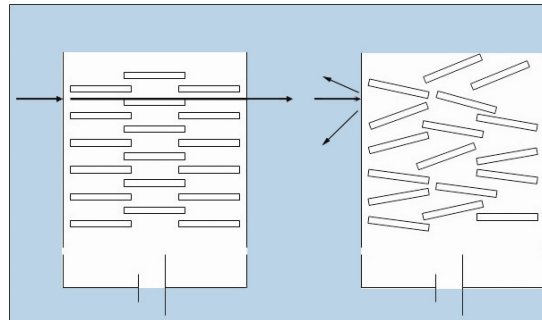
Smart materials & systems

- Sensorische en actuator eigenschappen
- Input stimulus veranderd - materiaal reageert hierop met actie/ reactie
- Intrinsieke materiaal eigenschappen zorgen voor fysieke veranderingen van het materiaal
- Mechanische oplossing voor aanpasbare bouwcomponenten nadelen:
 - grote constructieve elementen
 - geluid
 - onderhoudgevoelig

Smart material systems

Klimaat en daglicht systemen

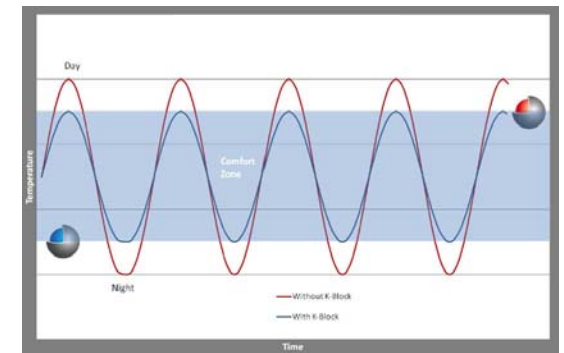
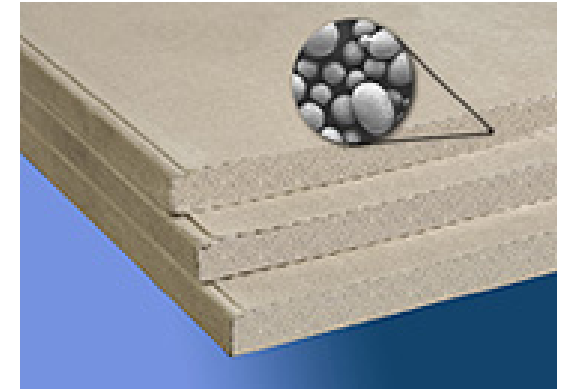
- Actieve en passieve geïntegreerde systemen
- Kleur/ transparantie verandering door middel van externe stimuli; temperatuur, pH, licht, electriciteit etc.
- Electro/ thermo/ foto/ gasochromic
- Electro/ thermotropic
- Suspended Particles



Smart material systems

Binnenklimaat- Phase change materials

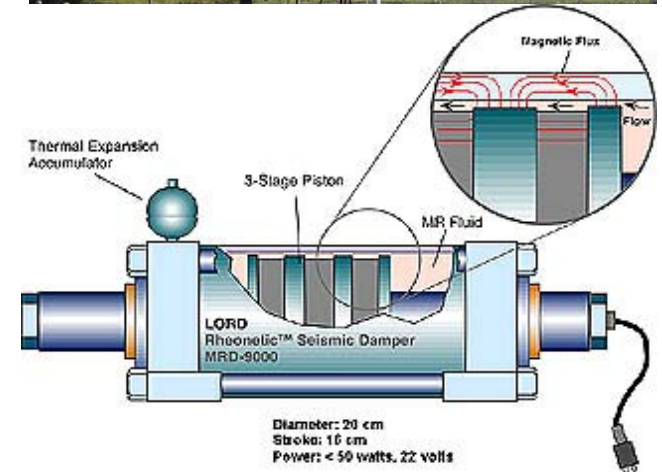
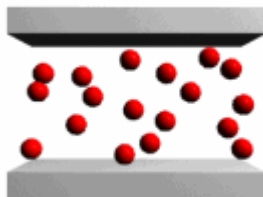
- Fase overgang bij wisselende T
- Tegen gaan van extreme temperaturen
- Warmte accumulatie



Smart material systems

Constructief- aardbevingsproef

- Rheological fluid
- Viscositeit verandering door middel van elektrische input/ magnetisme
- Miraikan gebouw, Japan
- Dong Ting Lake bridge, China

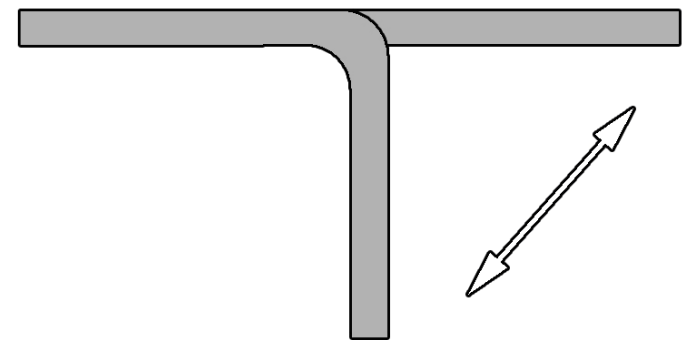


Smart composiet

Prototype

Vorm veranderbare component

- Vervormen en terugvormen
- Twee dimensionale vervorming
- Vervorming fixeren zonder continue energie input
- Lage activatie energie
- Commercieel verkrijgbaar
- Structurele eigenschappen

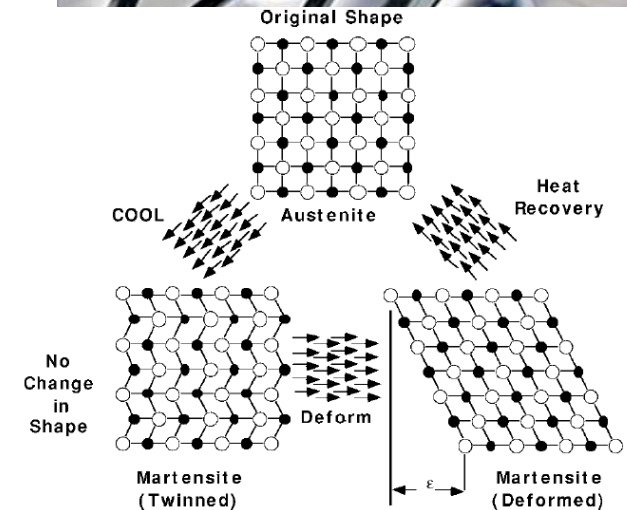
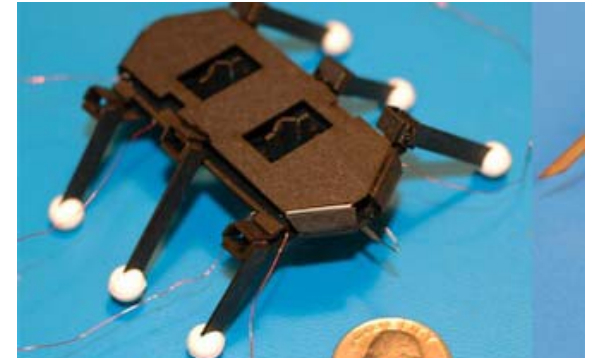


Smart composiet

Prototype

Shape Memory Alloy- Geheugen legering

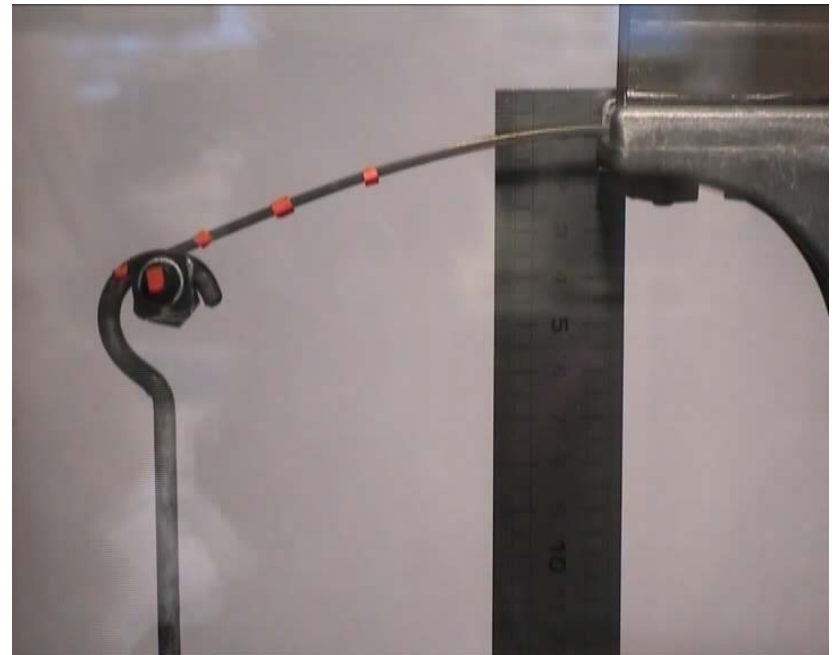
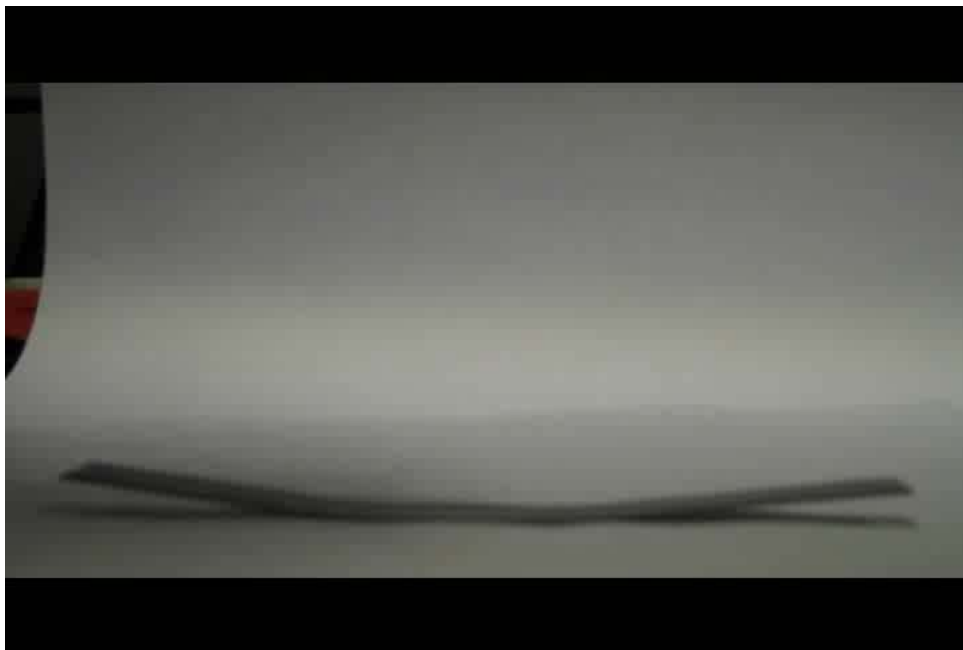
- Actuator gebaseerd op fase verandering
- Lage temperatuur- martensite
- Hoge temperatuur- austenite
- Oorspronkelijke vorm uitgloeien
- Grote vervorming en actuator krachten
- Toepassingsgebied: Medisch, industrie & robotica
- Temperatuur geactiveerd



Smart composiet

Prototype

Geheugen legering

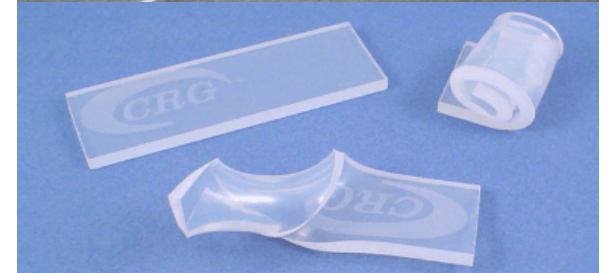
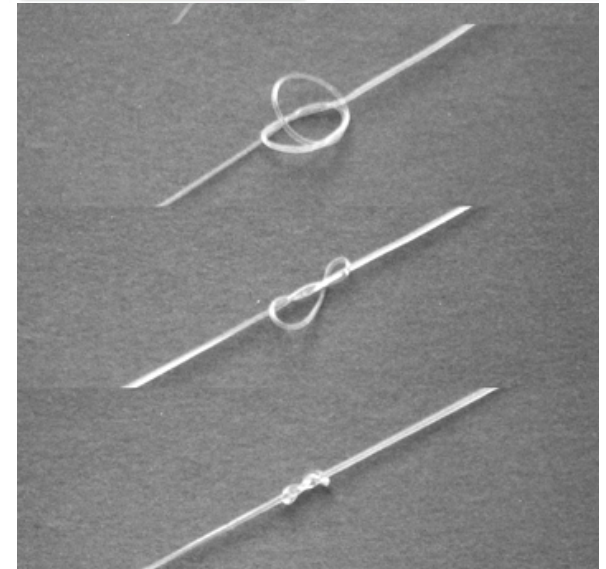
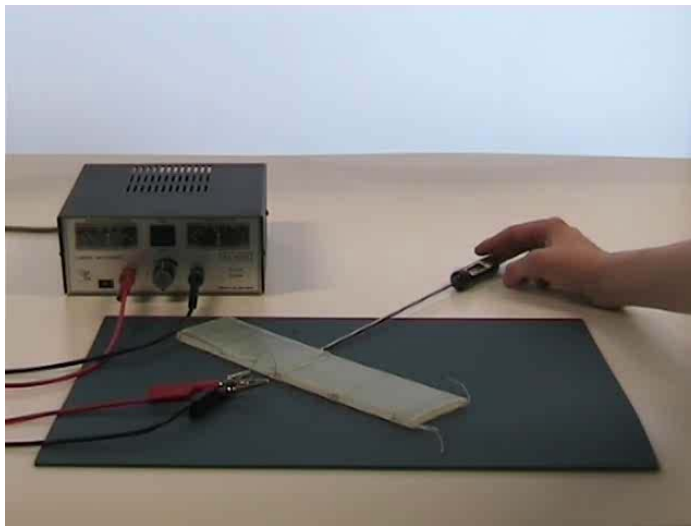


Smart composite

Prototype

Shape Memory Polymer- Geheugen polymeer

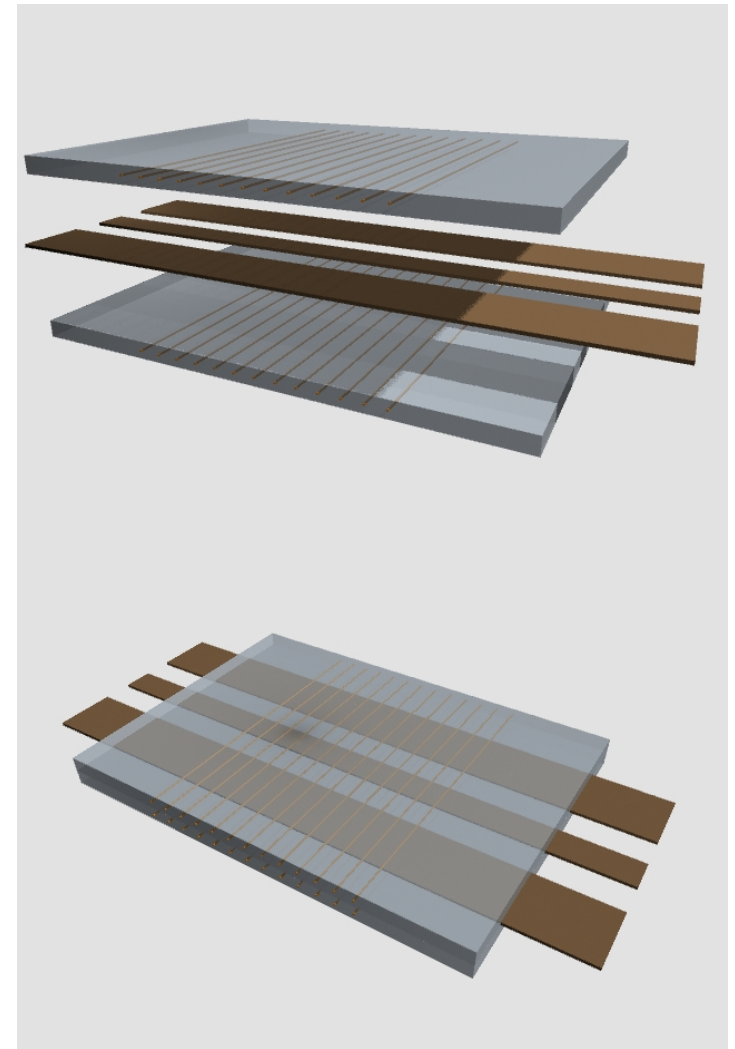
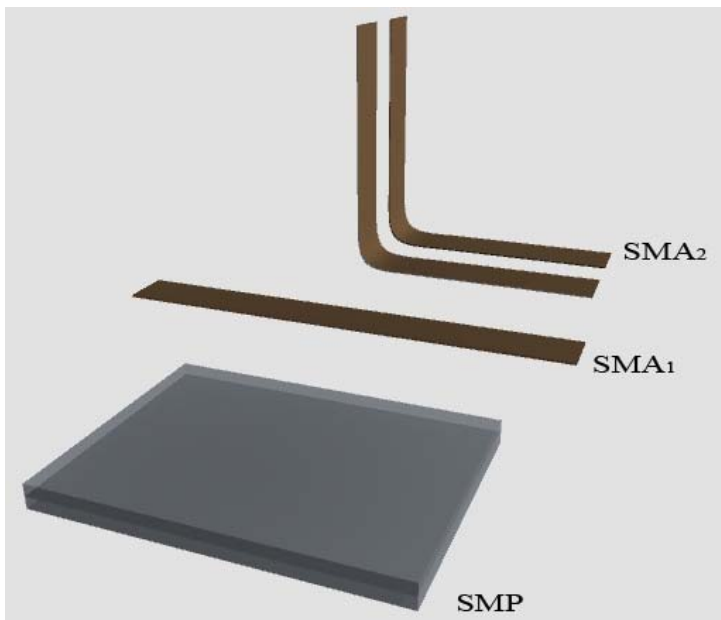
- Oppervlakte materiaal
- Thermisch responsief
- Toepassingsgebied: mallen, medisch, textiel & ruimtevaart



Smart composiet

Prototype

- Assemblage van SMA SMP
- SMA₂ is onder vervorming toegepast
- Weerstandsverwarming

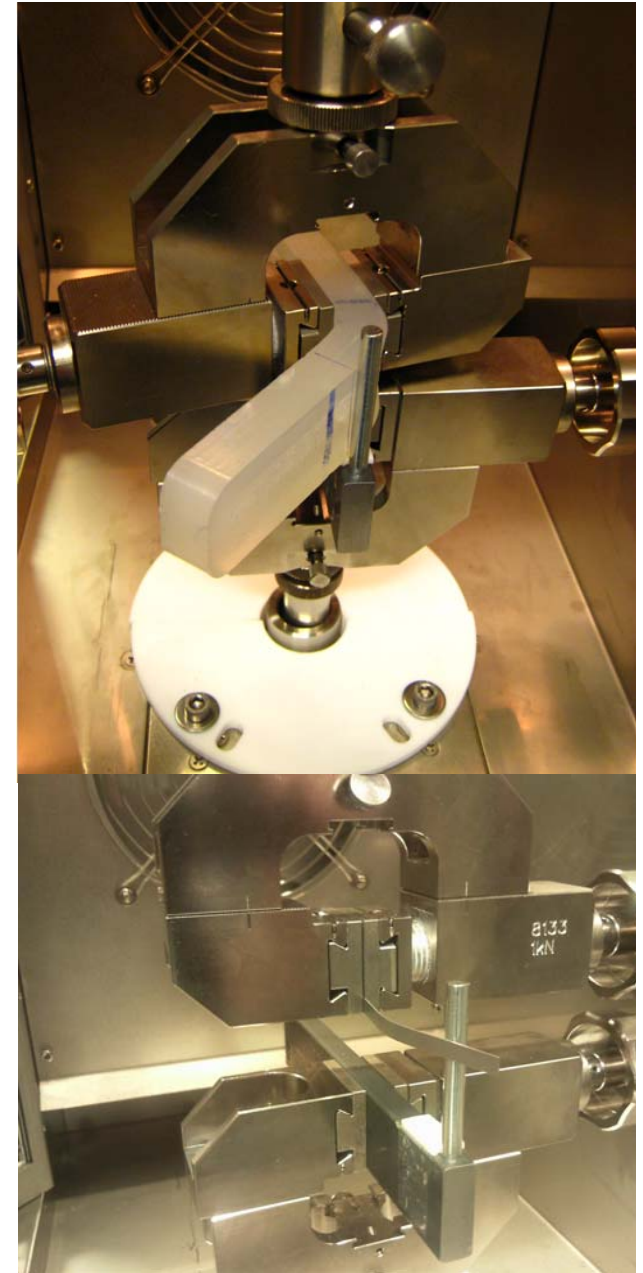


Smart composite

Prototype

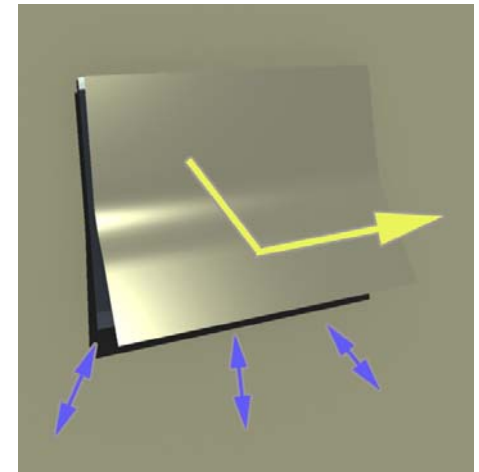
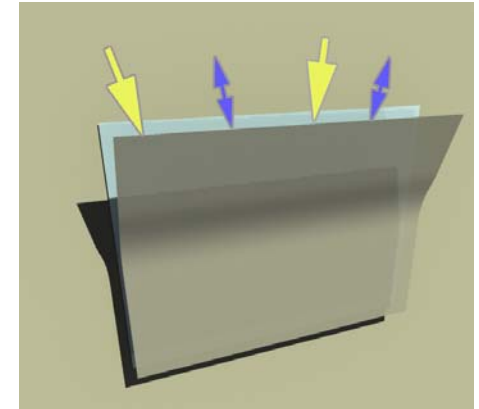
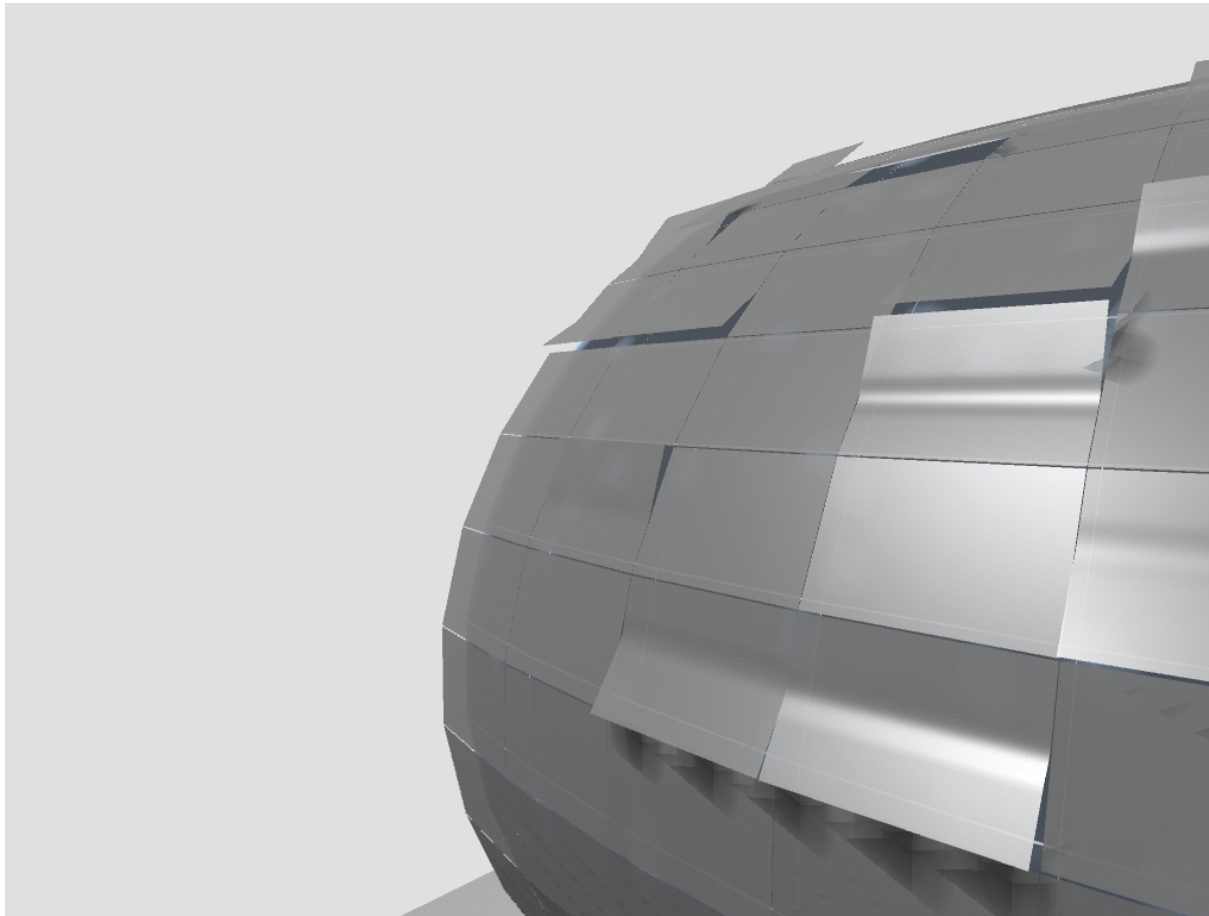
Torsie testen voor het vaststellen van:

- Actuatie kracht SMA bij hoge T
- Deformatie kracht SMA bij lage T
- Deformatie kracht SMP boven transitie T



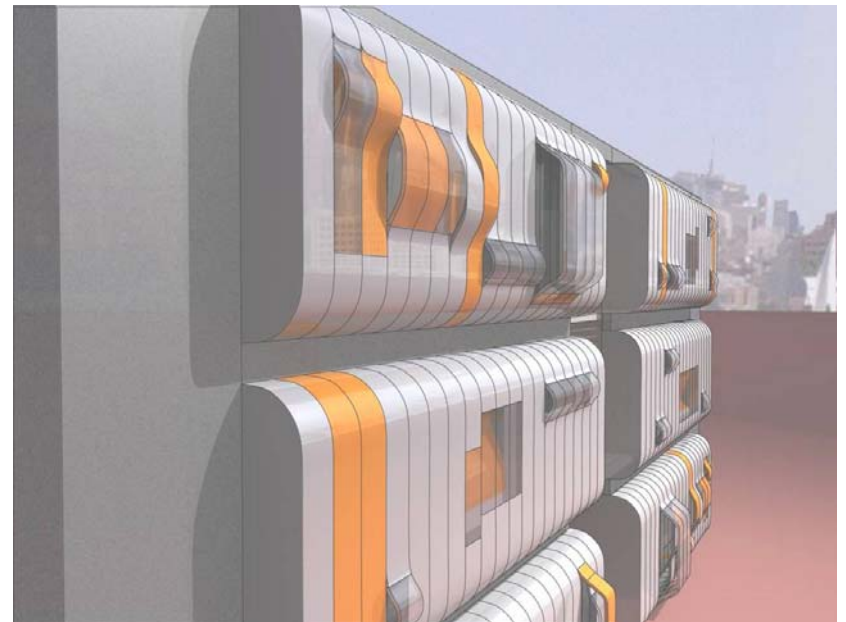
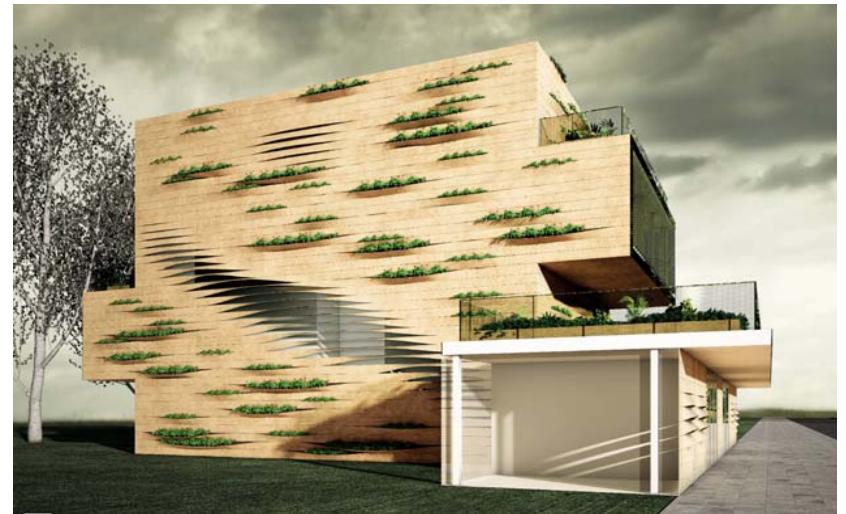
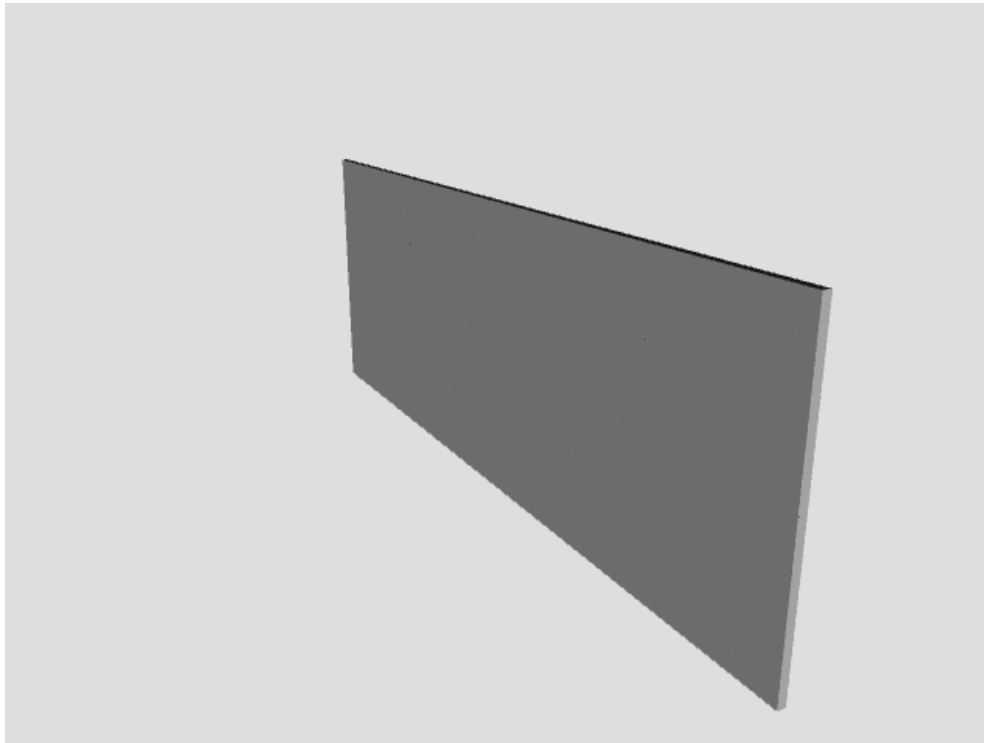
Smart composiet

Ontwerp



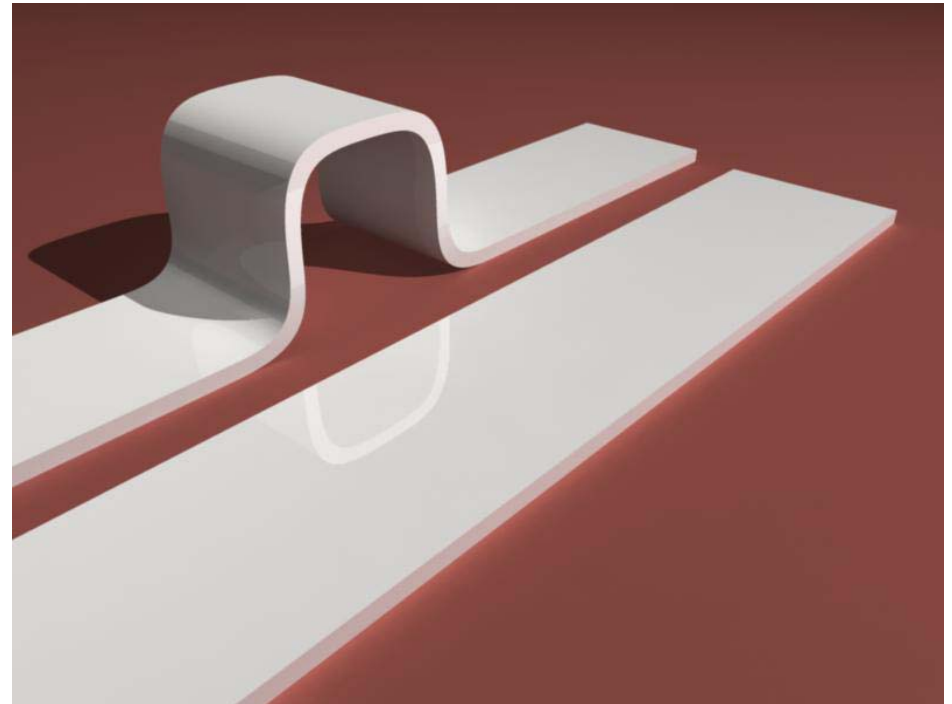
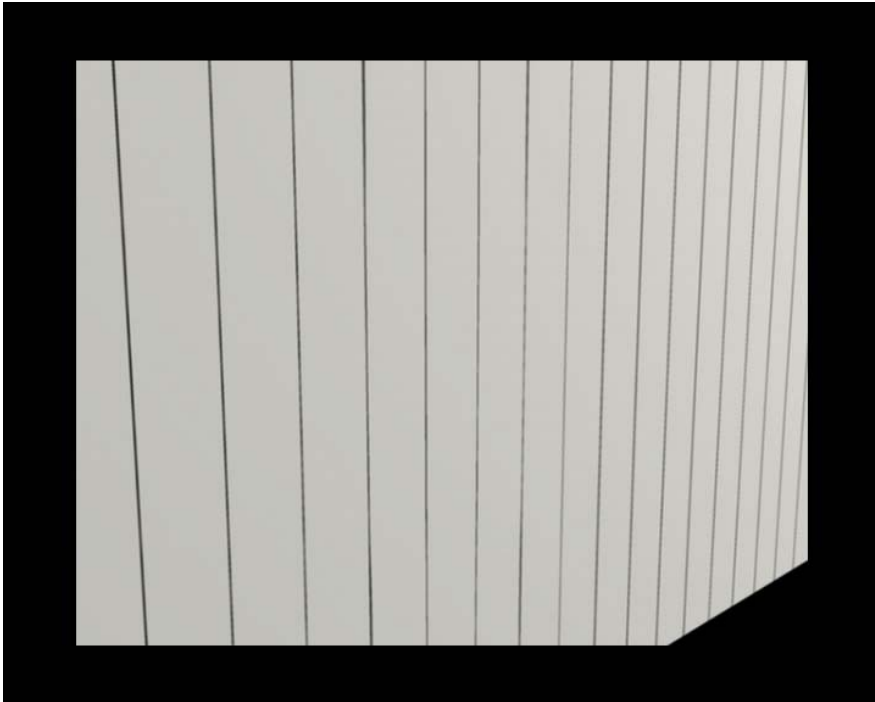
Smart composiet

Ontwerp



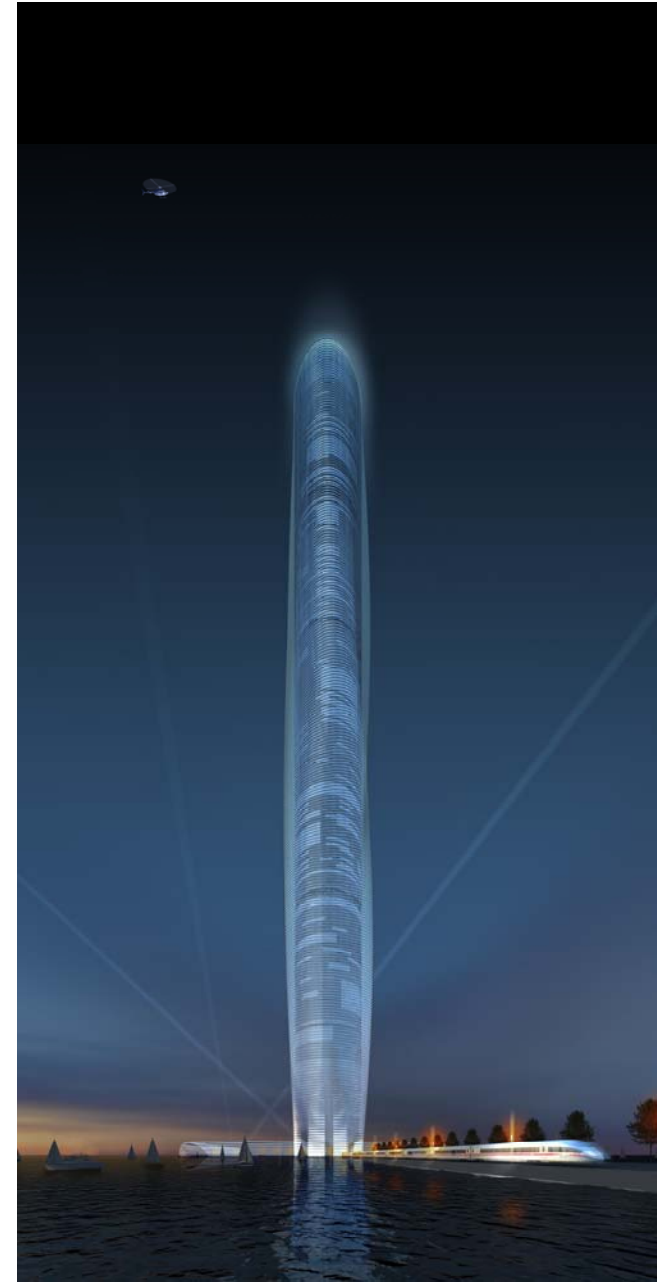
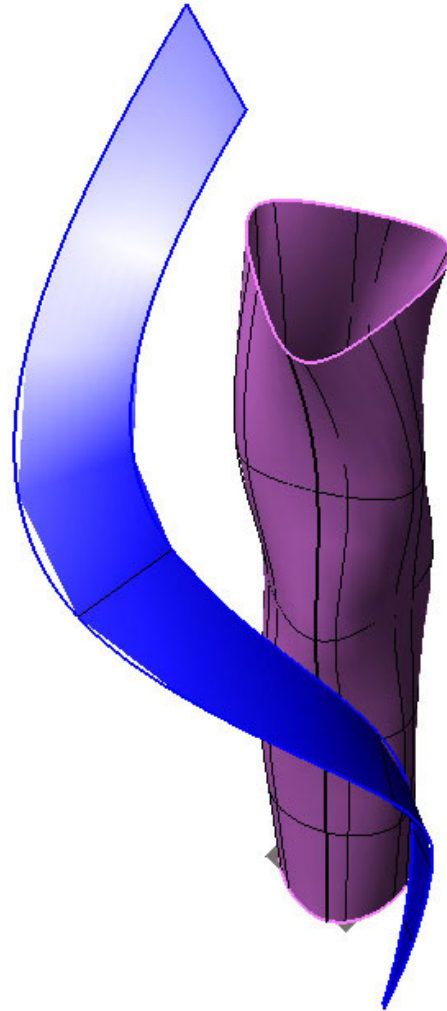
Smart composiet

Ontwerp



Smart composiet

Ontwerp



Dank u

