

Hani Buri, scientist, architect epfl fas
Folded plate geometries for timber constructions

Chapel for the deaconesses of St Loup

IBOIS laboratory for timber constructions



Direction

Prof. Yves Weinand, ISA architect, EPFL civil engineer,

Associated Professor

Administration

Hildegard Bachmann, secretary

Staff

Hani Buri, EPFL architect, scientific collaborator

Johannes Natterer, EPFL SIA civil engineer, PhD assistant

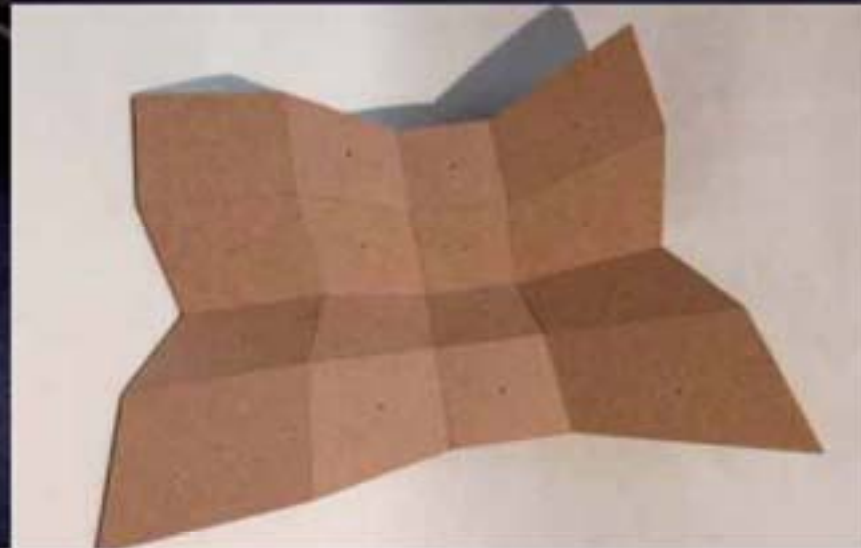
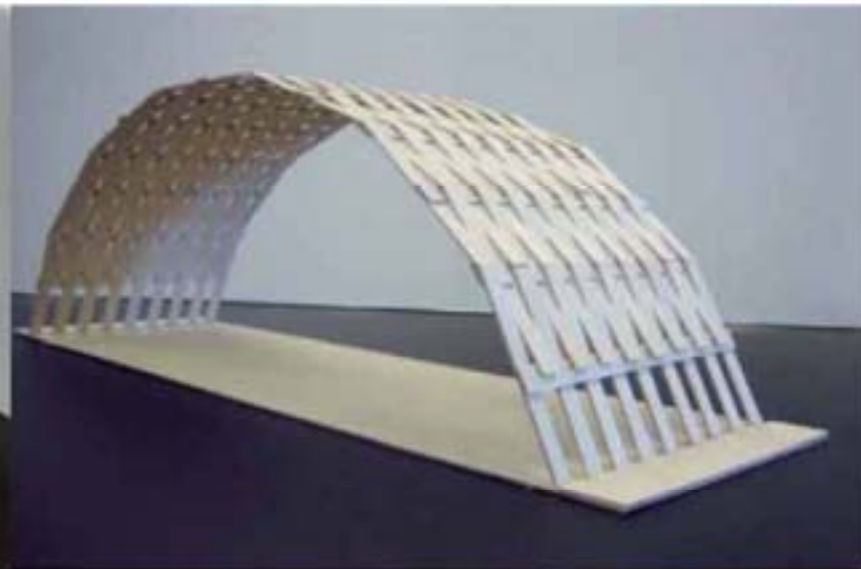
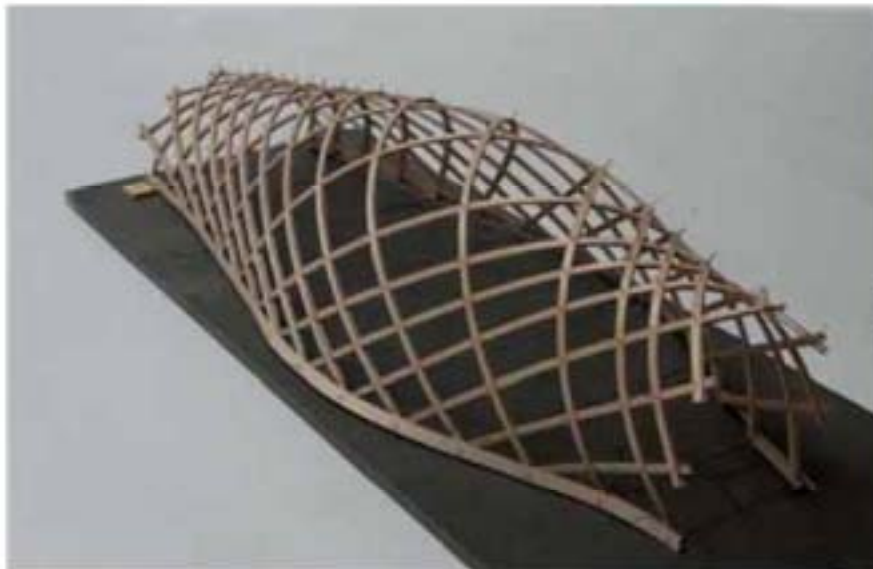
Ivo Stotz, EPFL architect, PhD assistant

Gilles Gouaty, DEA EDIIS Lyon (F) computer scientist, PhD assistant

Markus Hudert, Städelschule Frankfurt (D) architect, PhD assistant

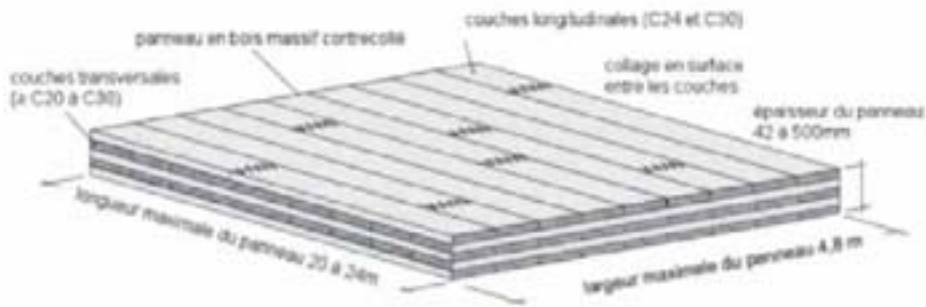
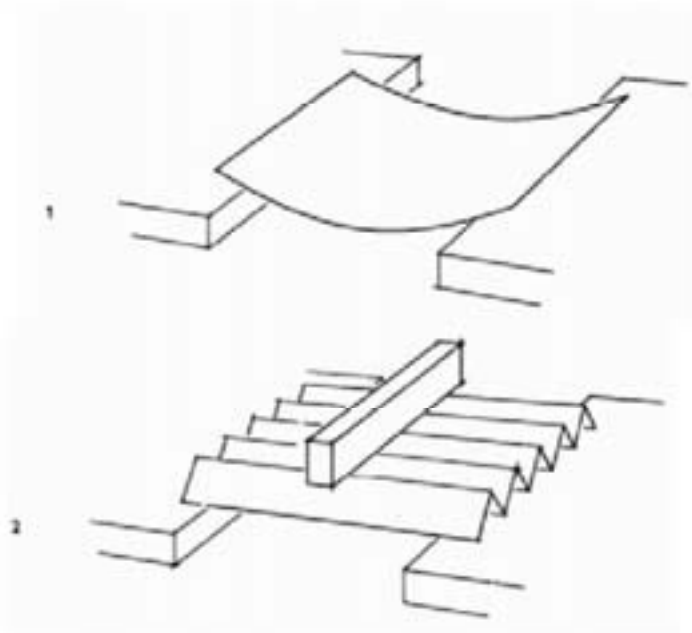
François Demoures, EPFL mathematician, PhD assistant



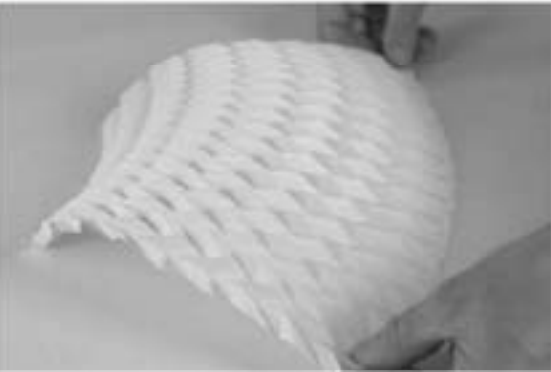


Origami – Folded Plate structures

An interdisciplinary research between architects, engineers and mathematicians



Paper folding

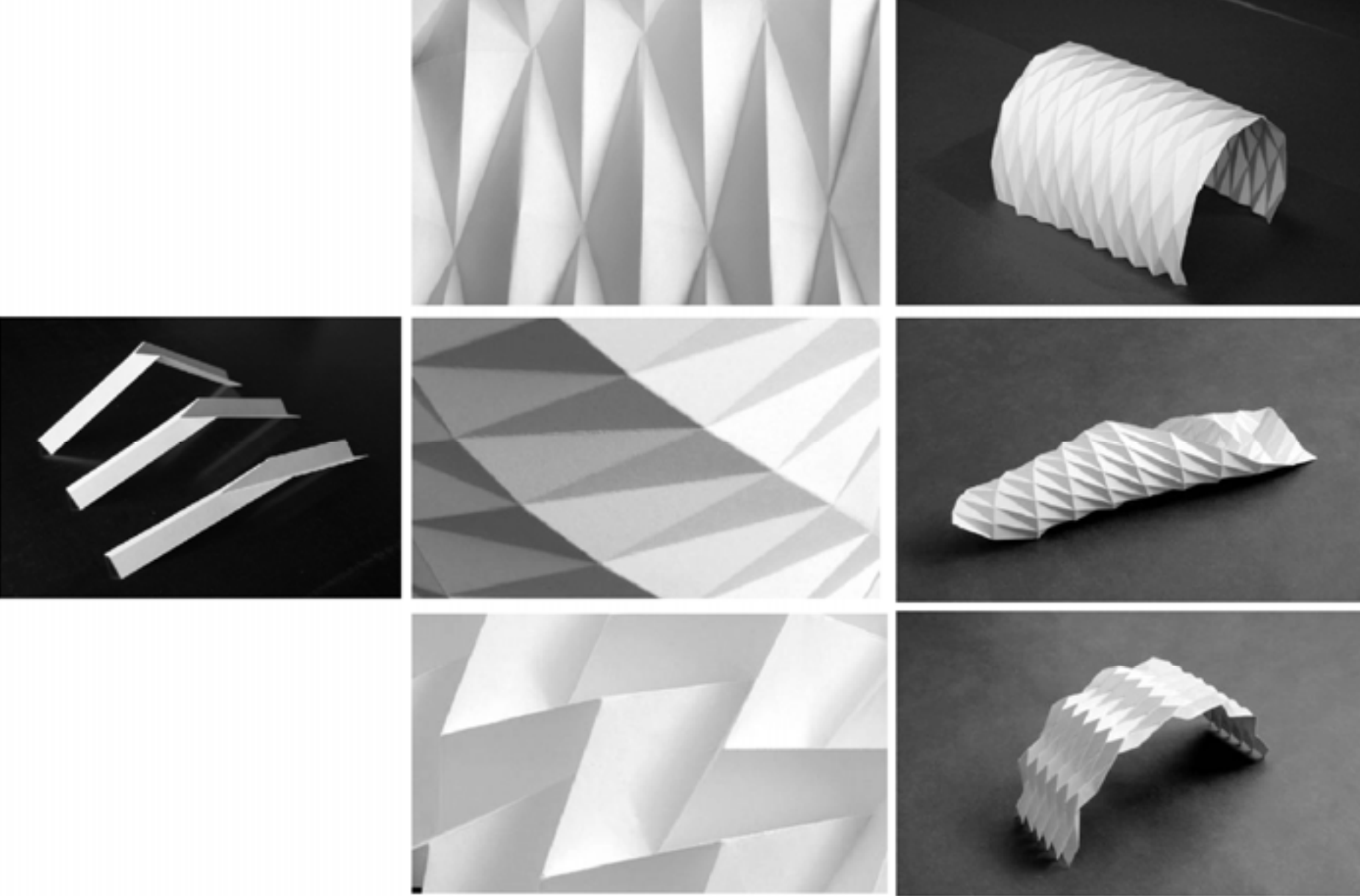


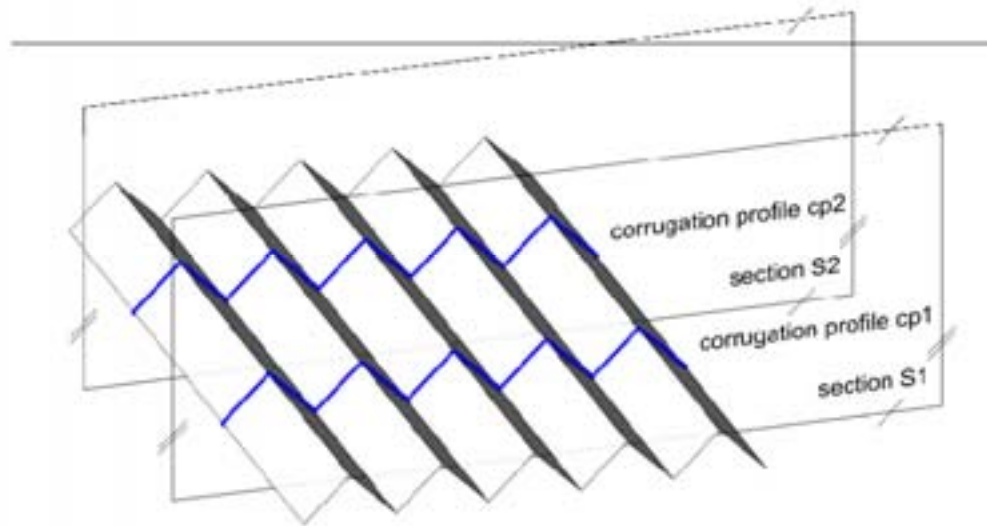
Geometric analysis



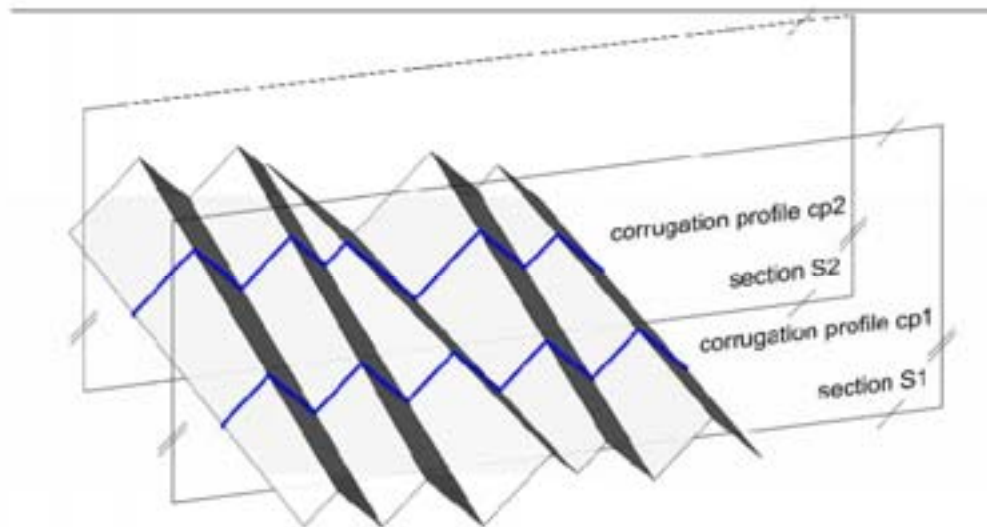
Prototypes



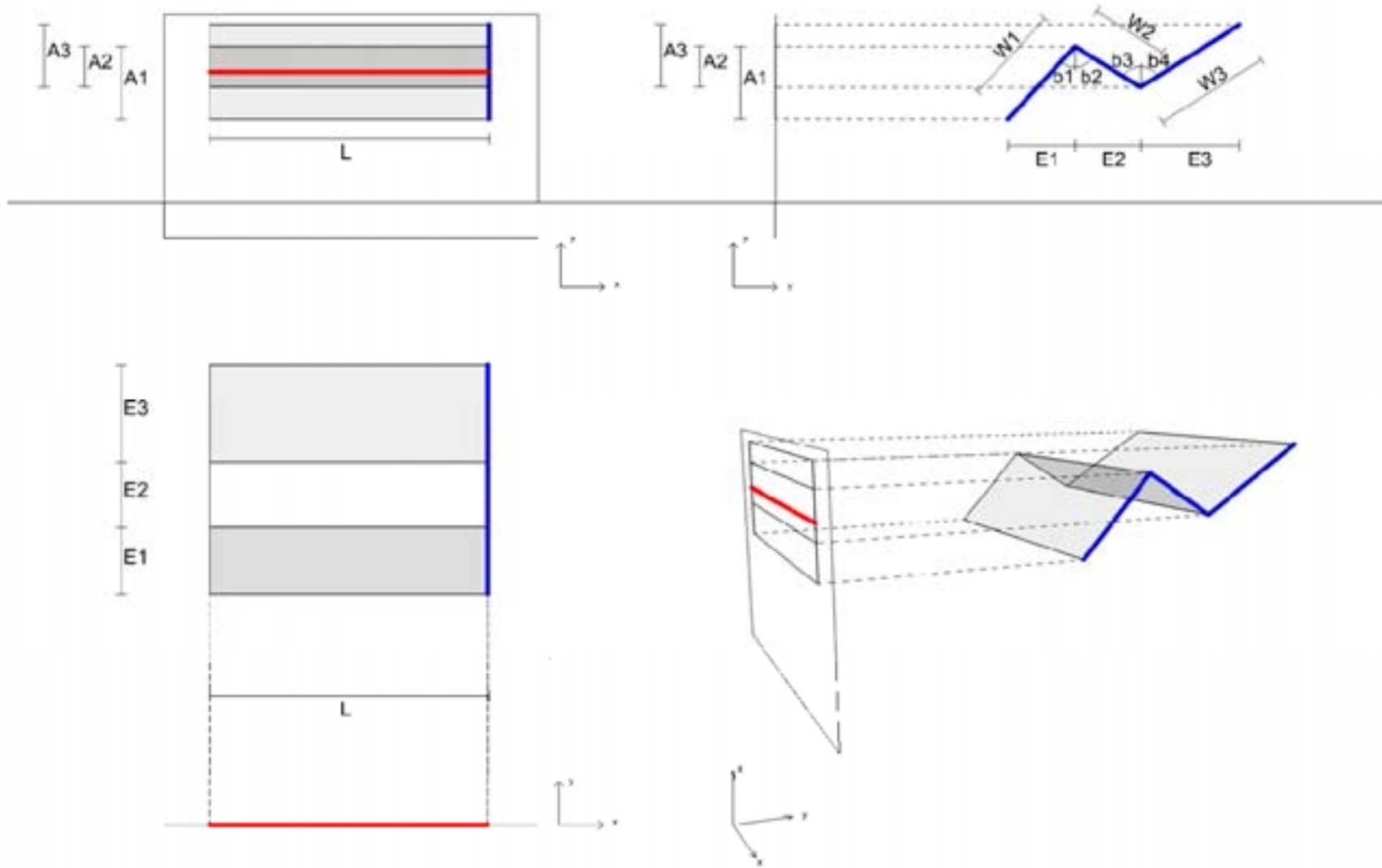


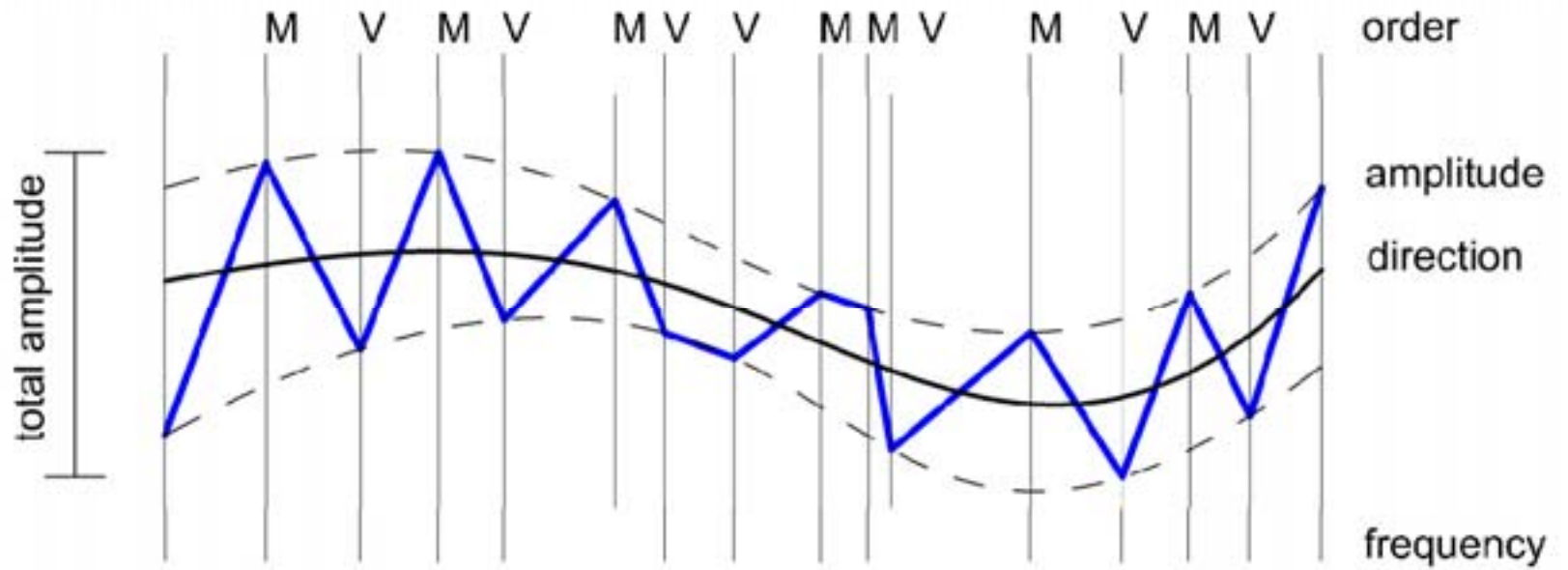


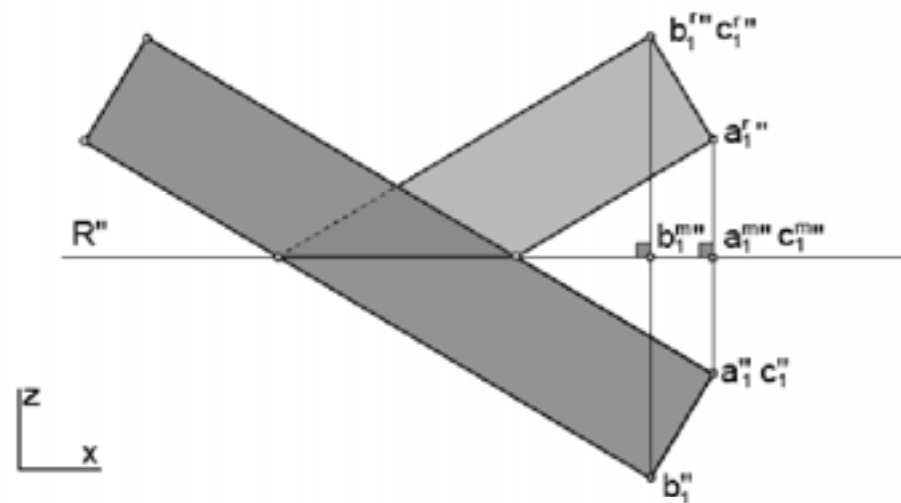
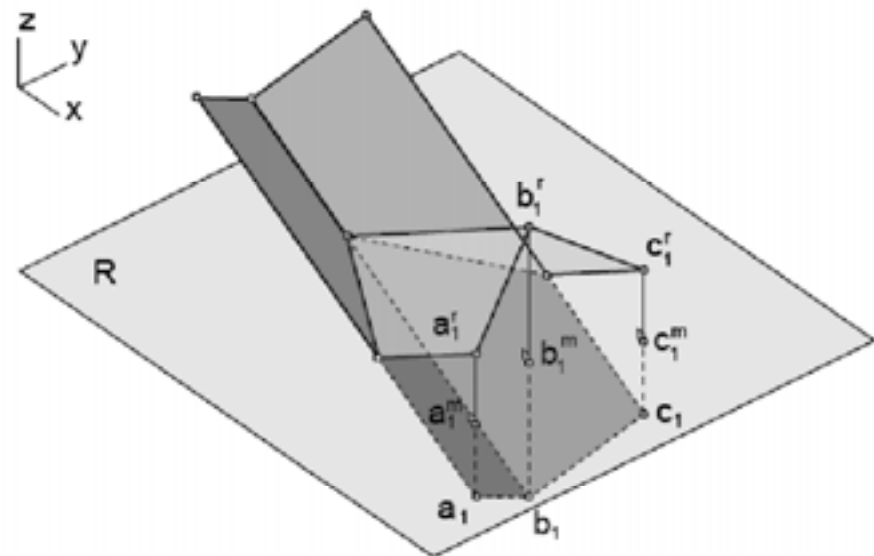
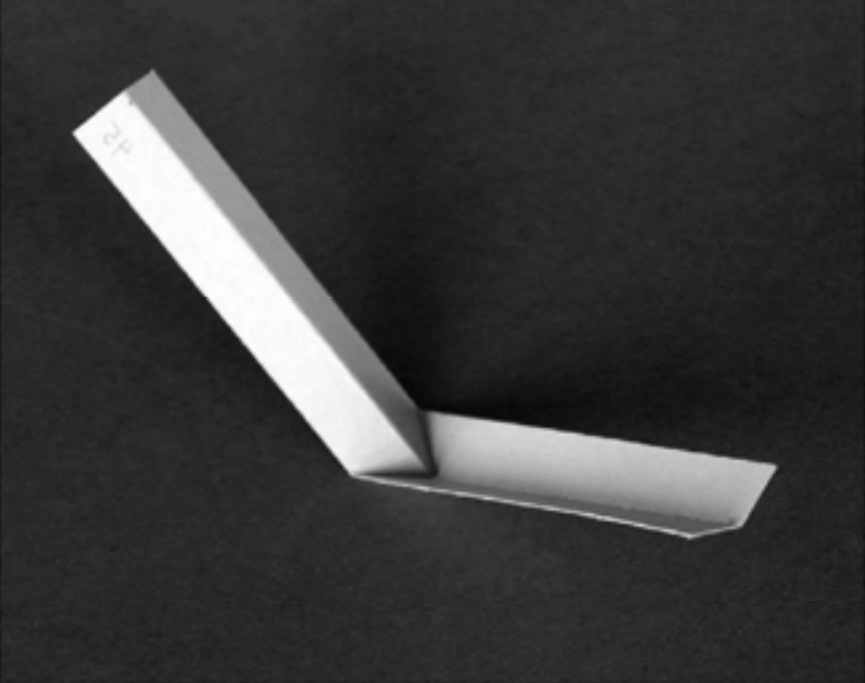
Parallel folds

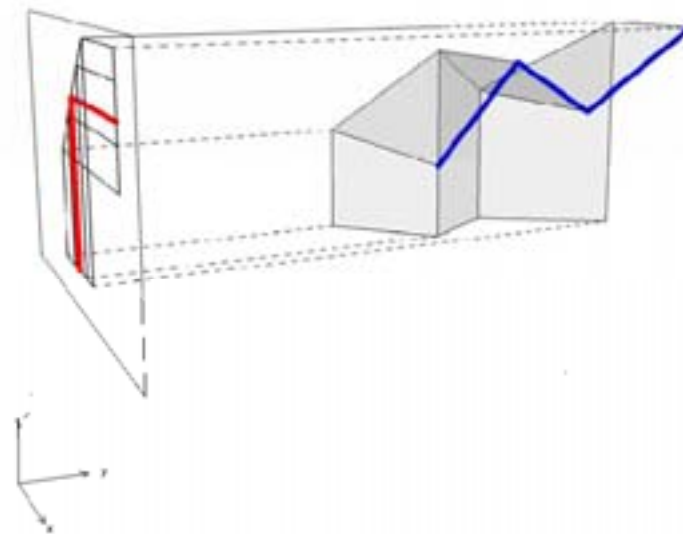
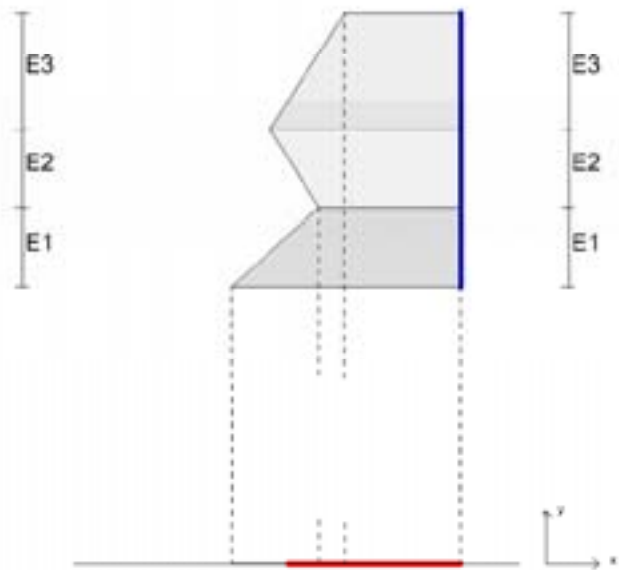
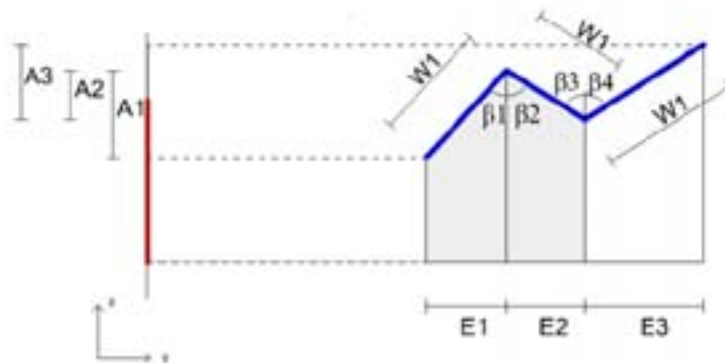
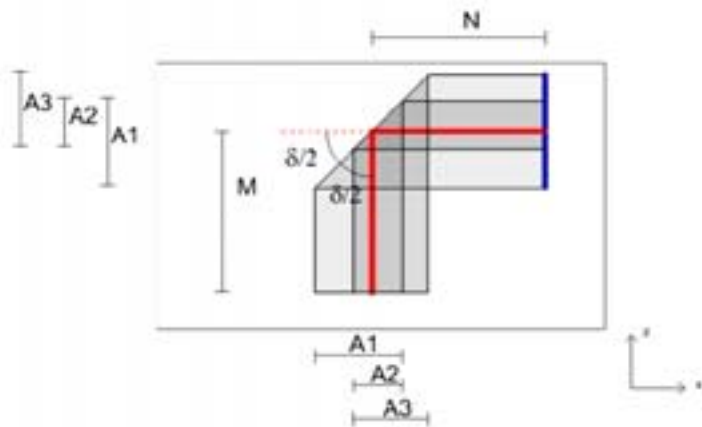


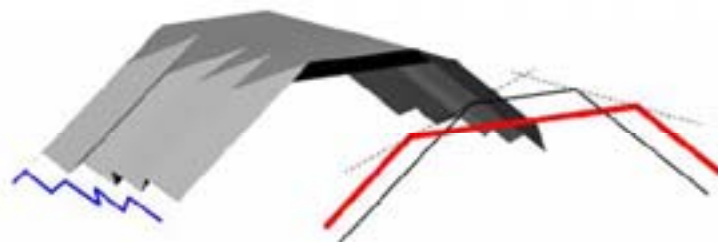
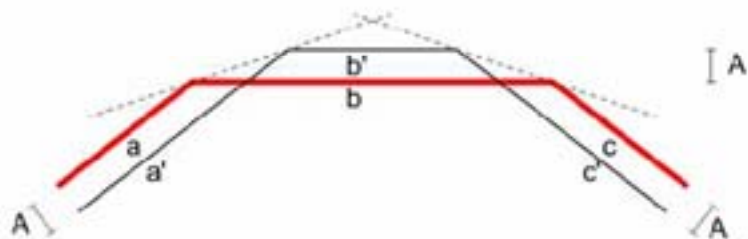
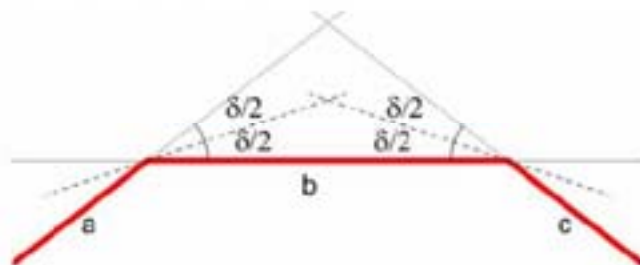
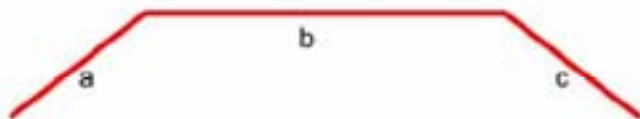
Non Parallel folds

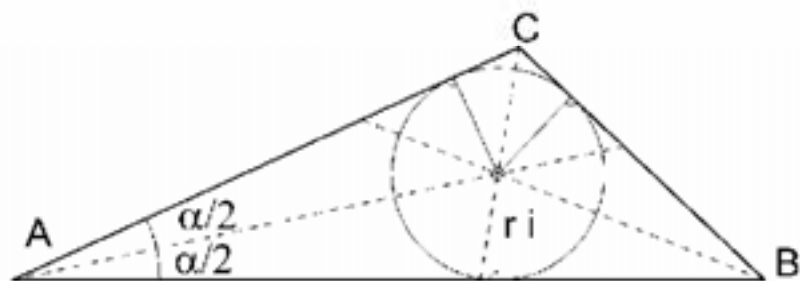
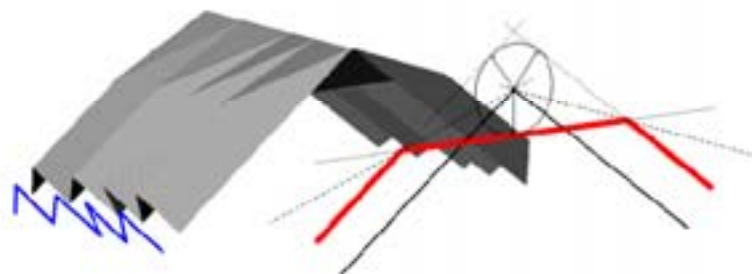
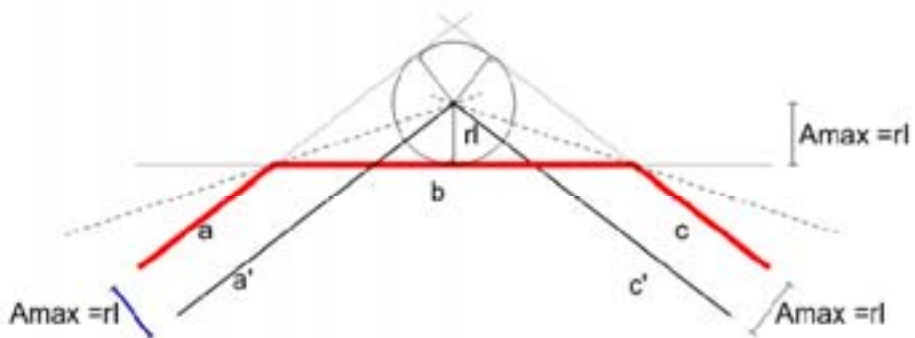
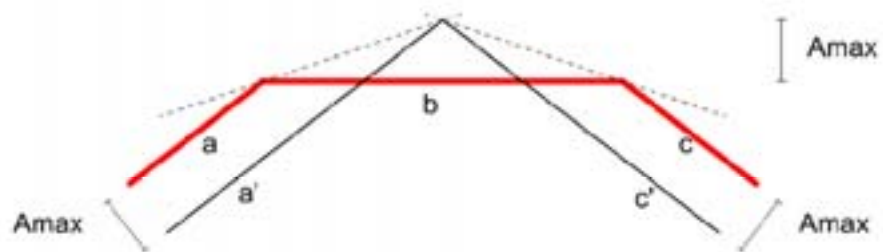


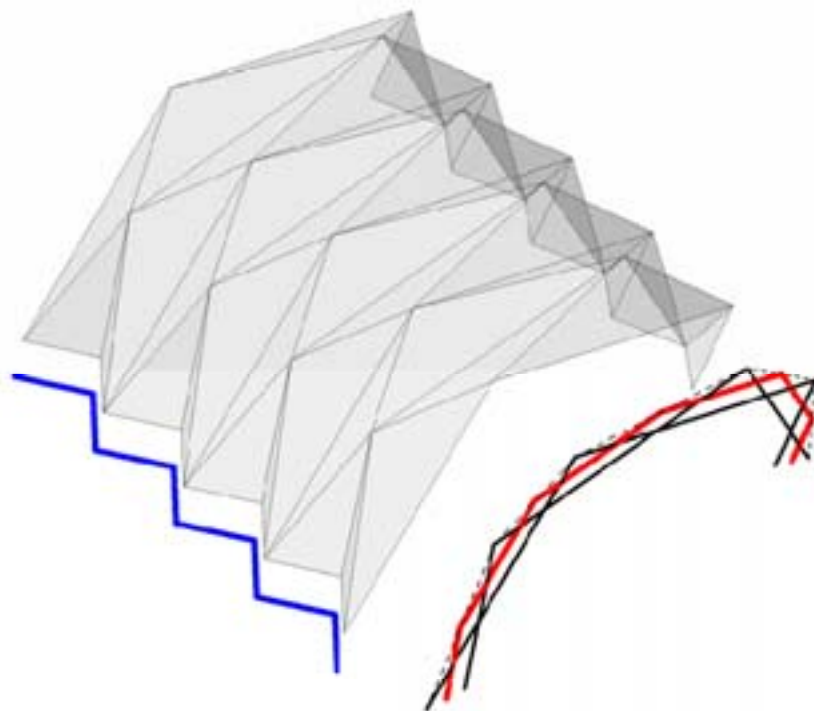
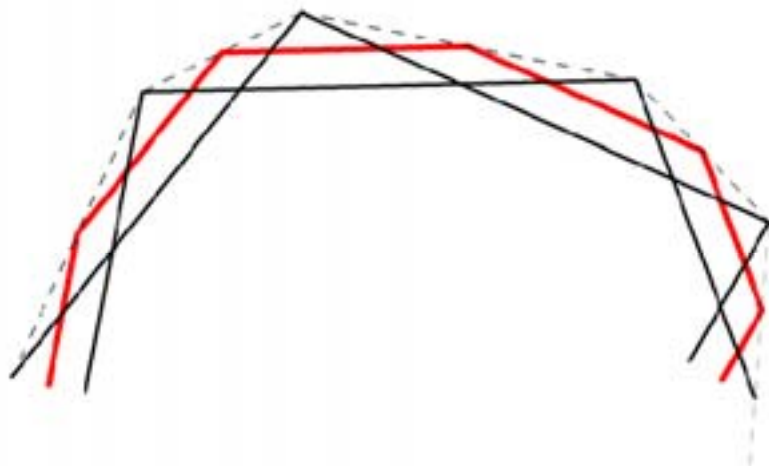
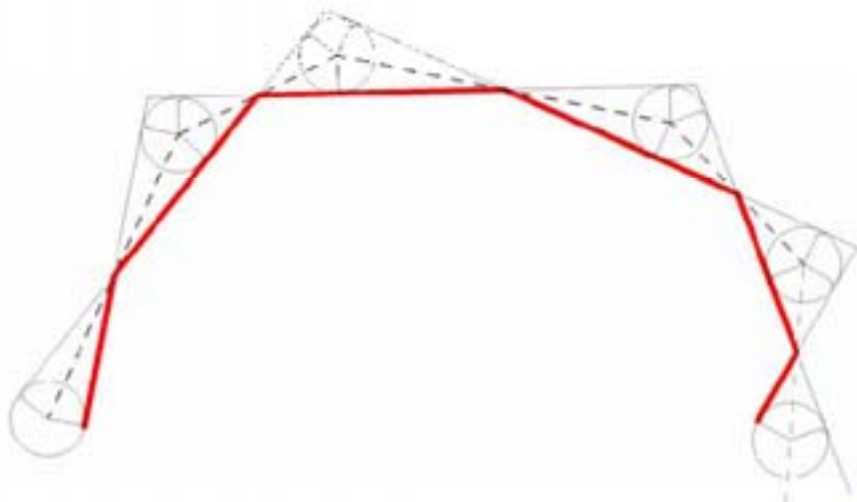


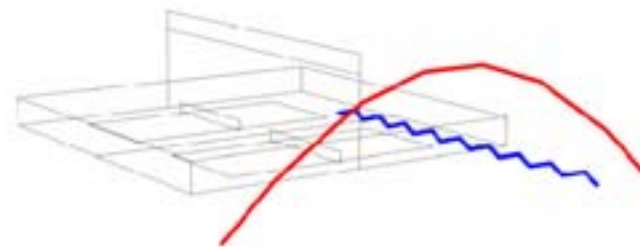
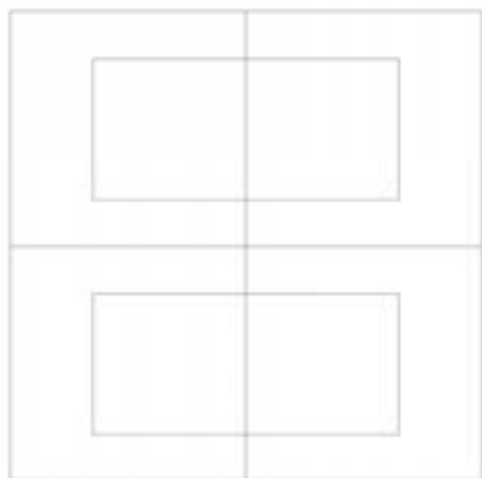


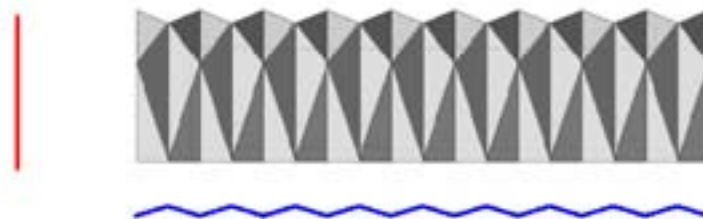
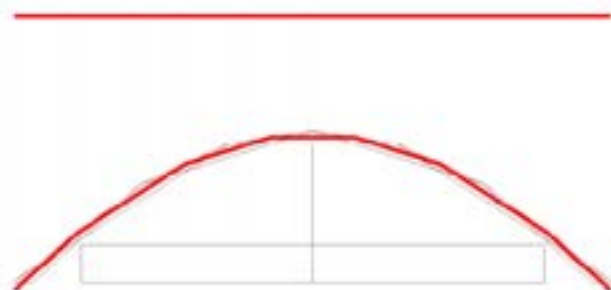
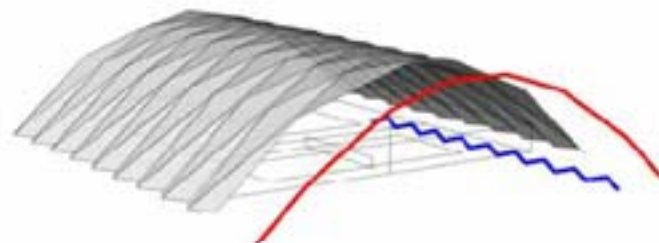
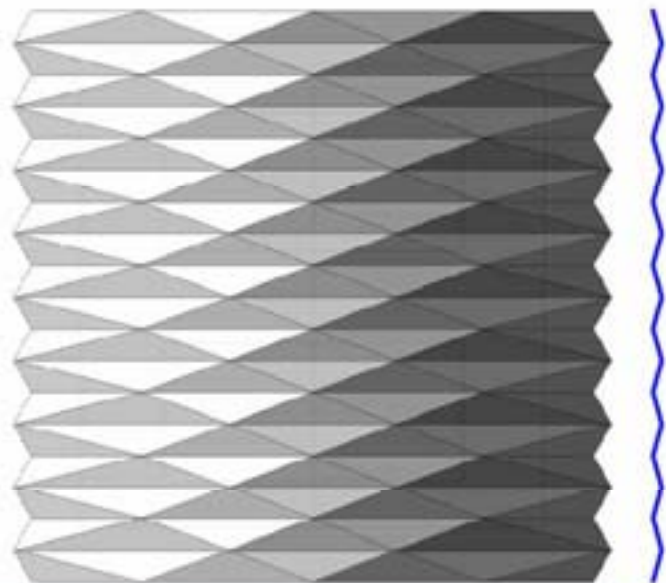


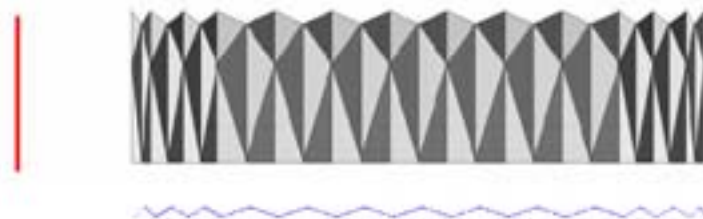
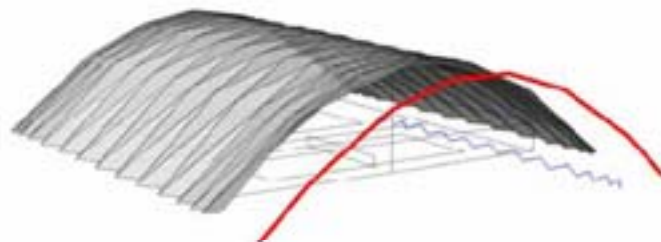
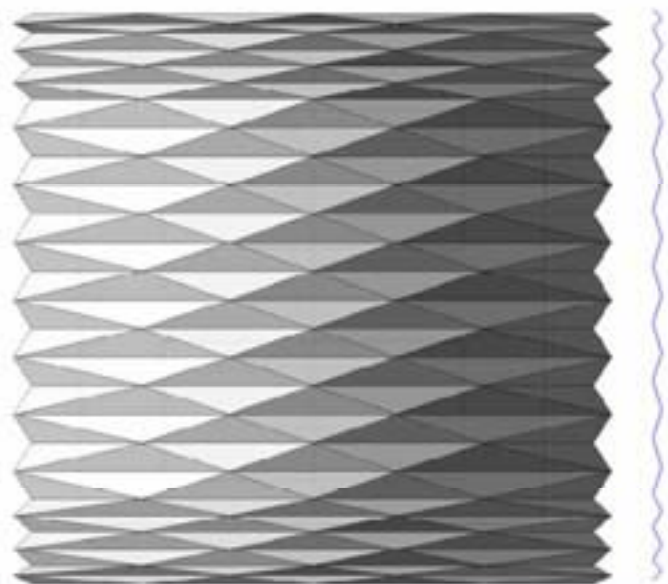


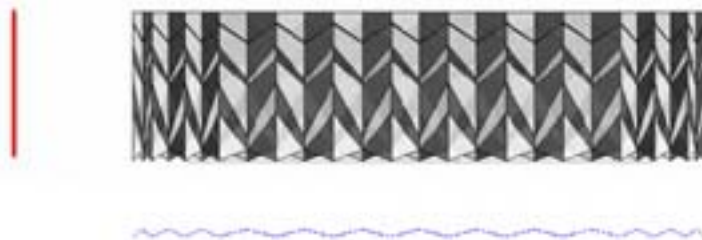
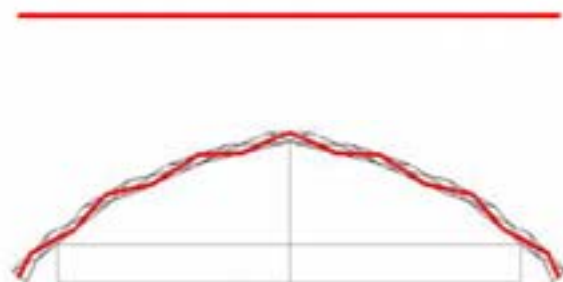
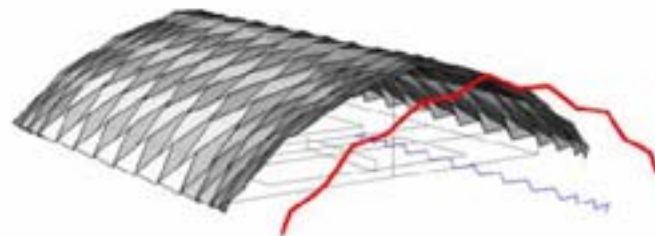
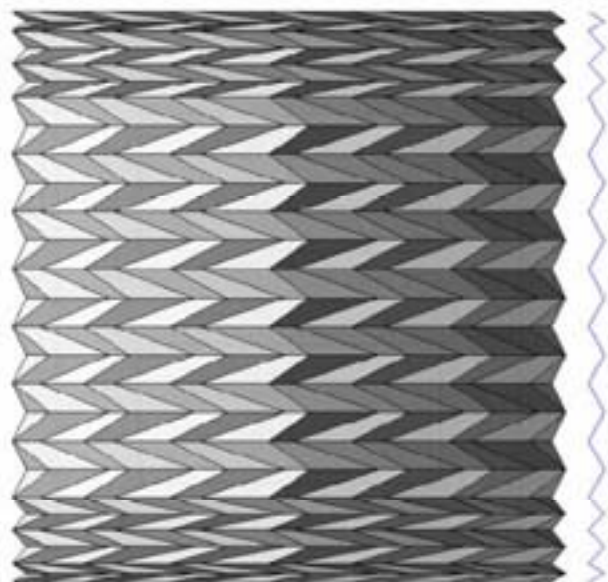






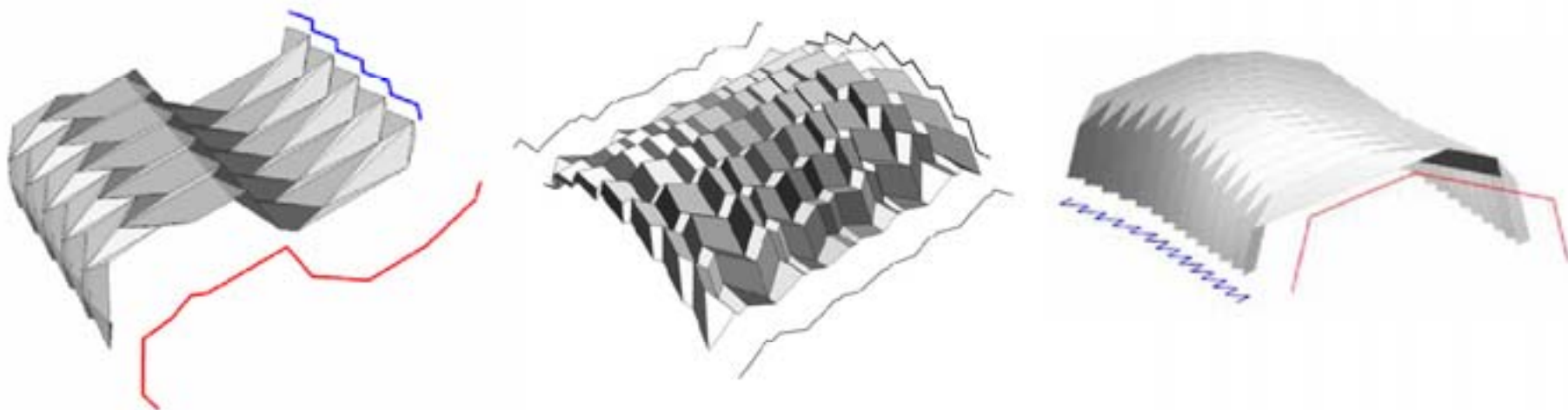






Digital modeling

single patch geometries



multi patch geometries



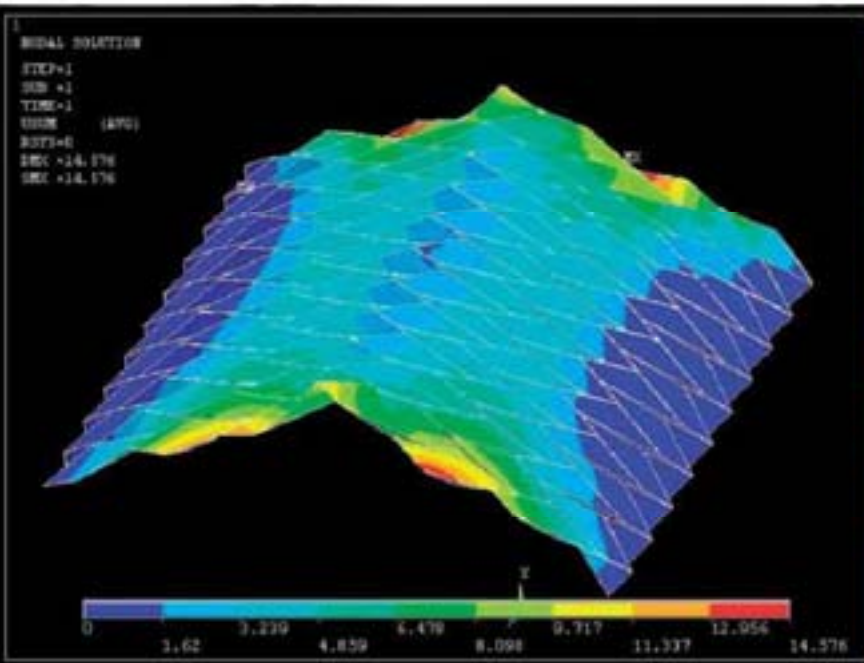
Prototype



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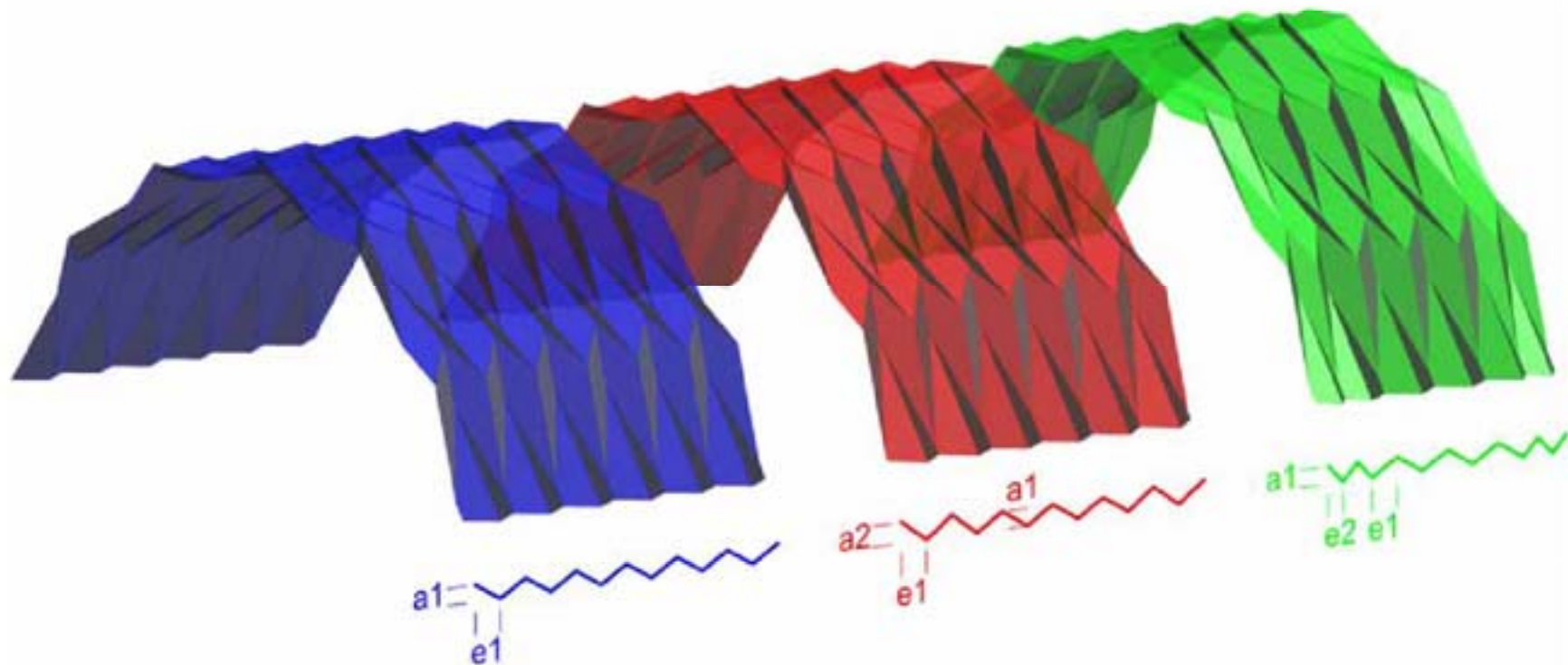
engineering

Both numerical simulation and laboratory testing contribute important information



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Variations of amplitude and extension of a folded plate structure:



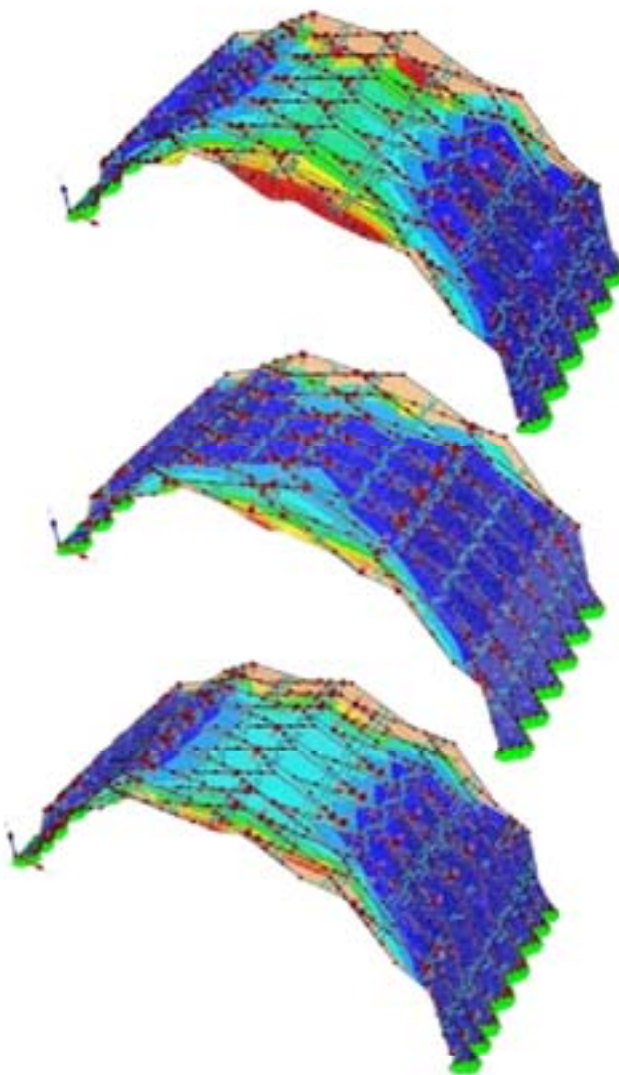
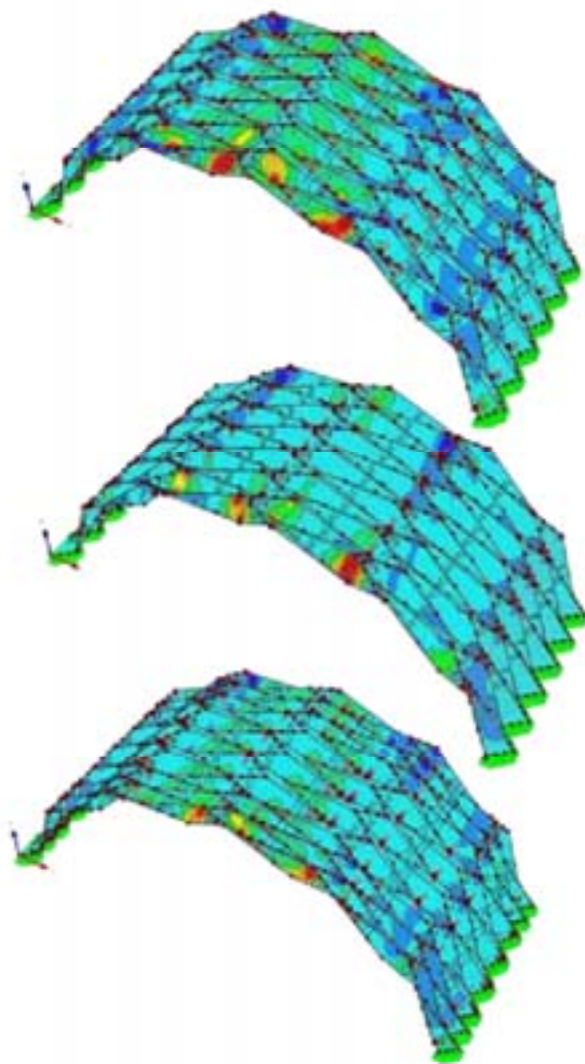
1. amplitude a_1 constant
extension e_1 constant

2. amplitude $a_2 > a_1$
extension e_1 constant

3. amplitude a_1 constant
extension $e_2 < e_1$

Internal forces

Deformations



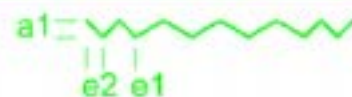
1. Max vectorial displacement 3.3 mm



2. Max vectorial displacement 2.2 mm



3. Max vectorial displacement 1.9 mm



A temporary chapel for the deaconesses of St.Loup

CLIENT

Institution des Diaconesses de St.Loup

PROJECT AUTHORS

Groupement d'architectes

Localarchitecture

Bureau d'architecture Danilo Mondada

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a IBOIS EPFL start up

GOVERNMENT GRANT

Federal Office for the Environment FOEN



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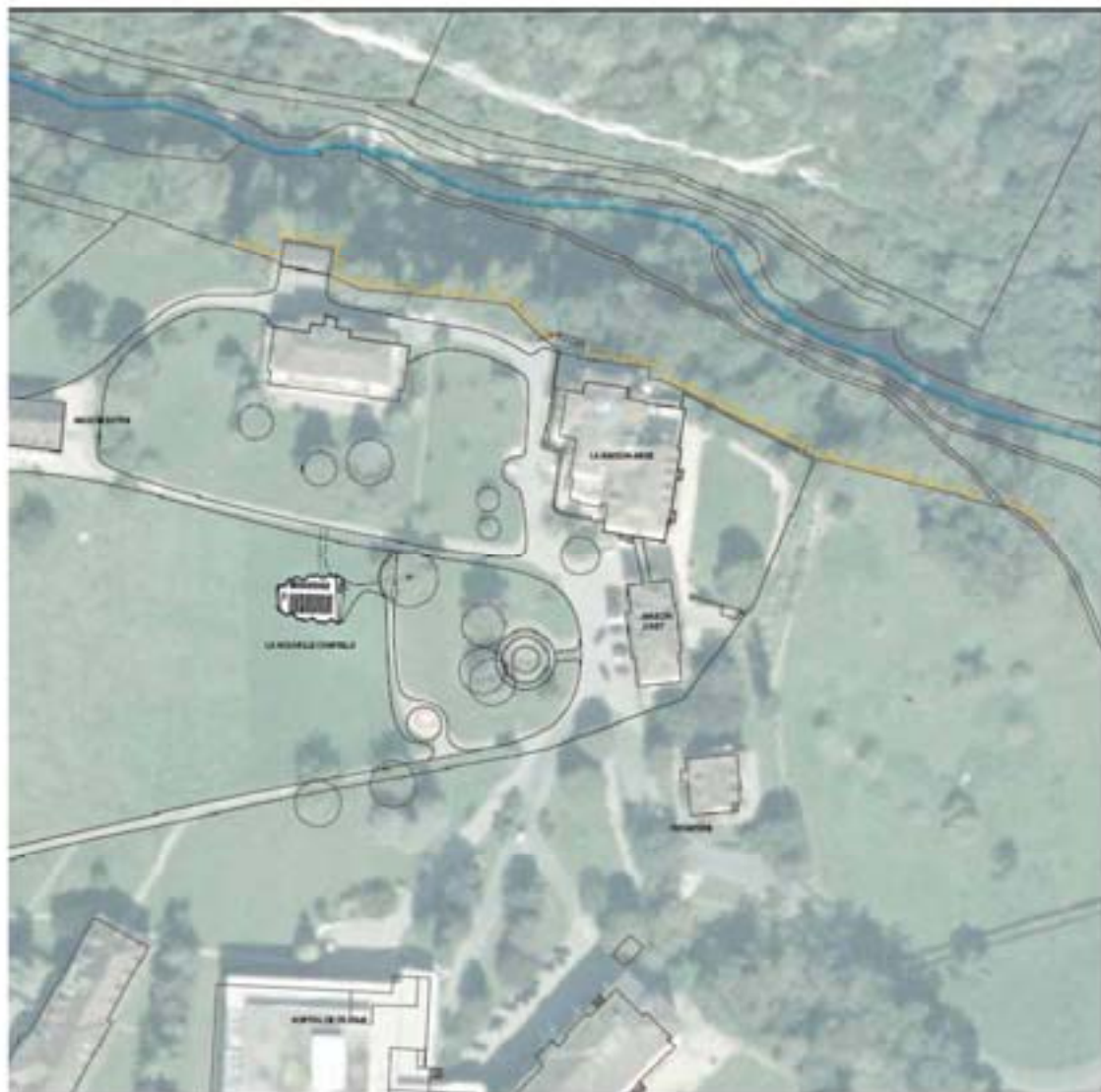
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Tallin, november 2006



Situation



1

2

3

1 Kapelle Betlis, Amden (<http://www.amden.ch/de/navpage-HikeHL-gwanderungenAW-80991.html>)

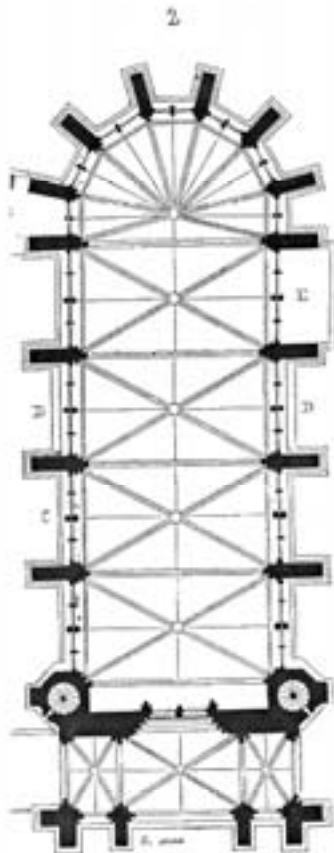
2 Nepomuk-Kapelle, Holzem (<http://www.villip.de>)

3 Kapelle Sogn Benedetg, Architekt PZumthor, Aussenansicht (<http://www.flickr.com/photos/306/2088363809/>)

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1



2



3

1 Sainte chapelle, Paris, Plan chapelle haute (dictionnaire raisonné d'architecture E.Viollet-le-Duc)

2 Sainte chapelle, Paris, Innenansicht (<http://www.flickr.com/photos/22646437@N04/2557968416/>)

3 Kapelle Sogn Benedetg, architecte PZumthor, Innenansicht(<http://www.flickr.com/photos/p2cl/354240964/>)

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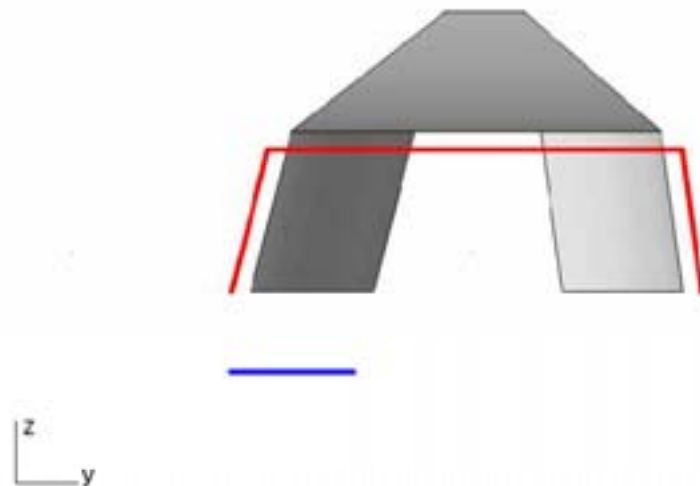
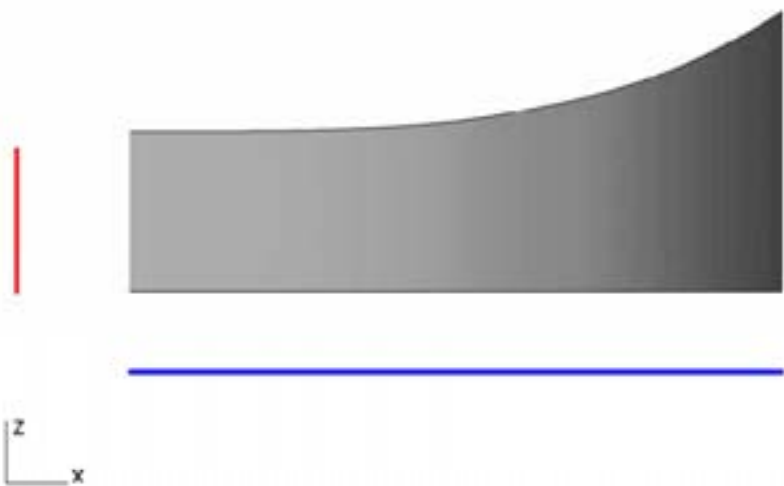
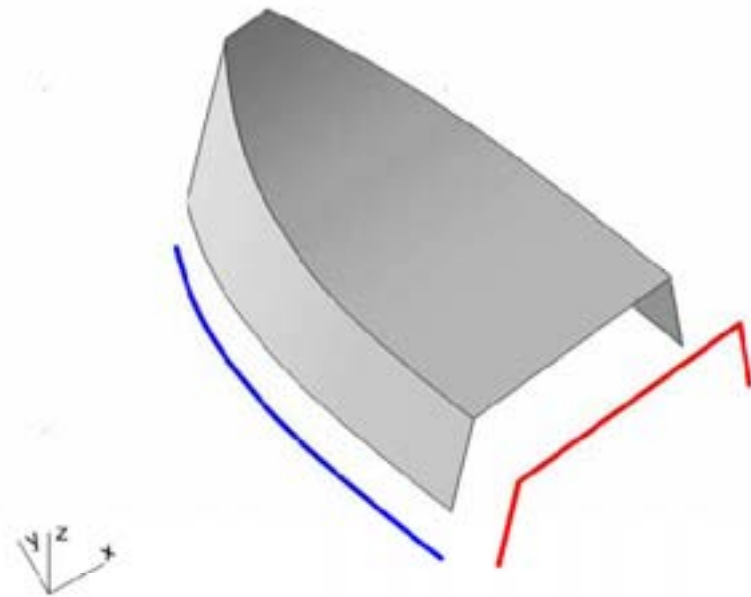
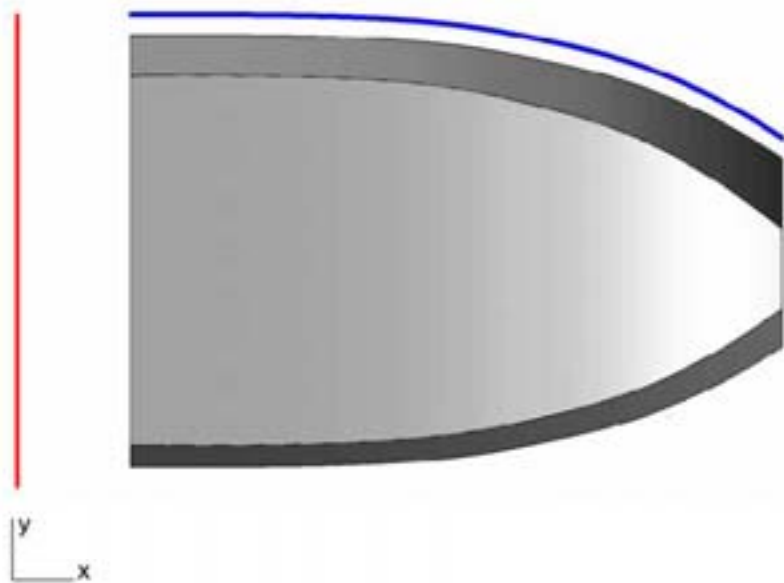
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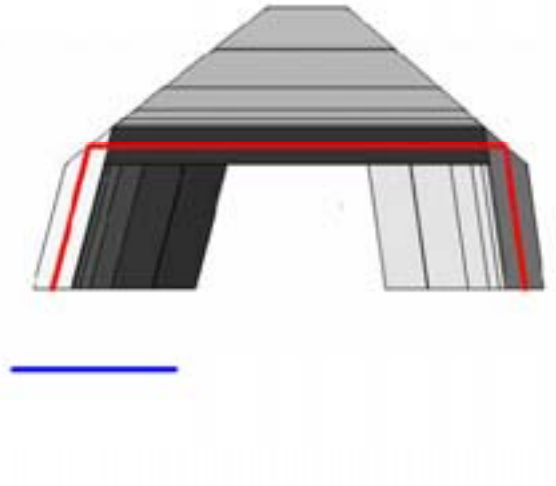
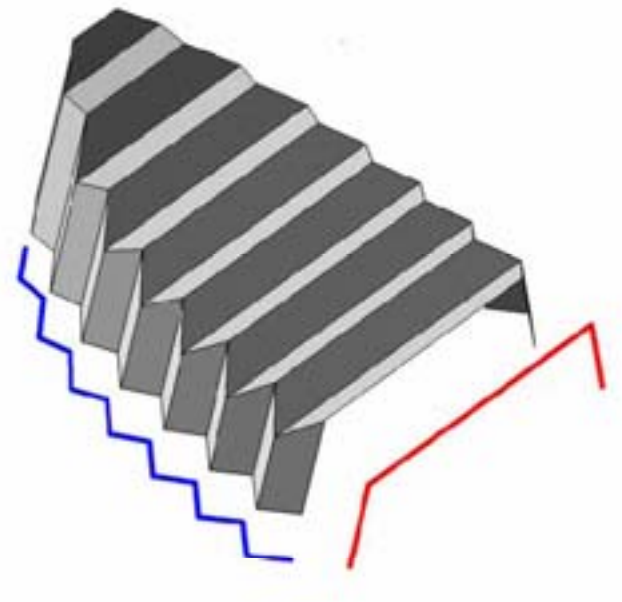
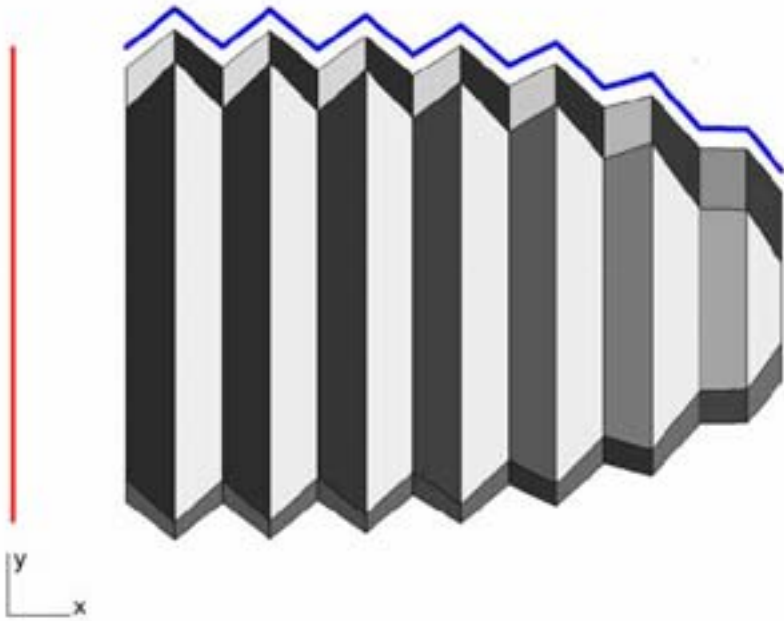
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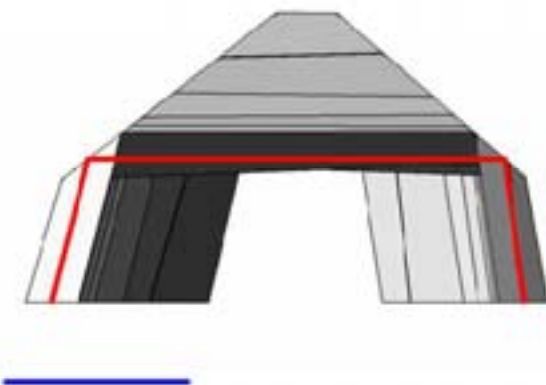
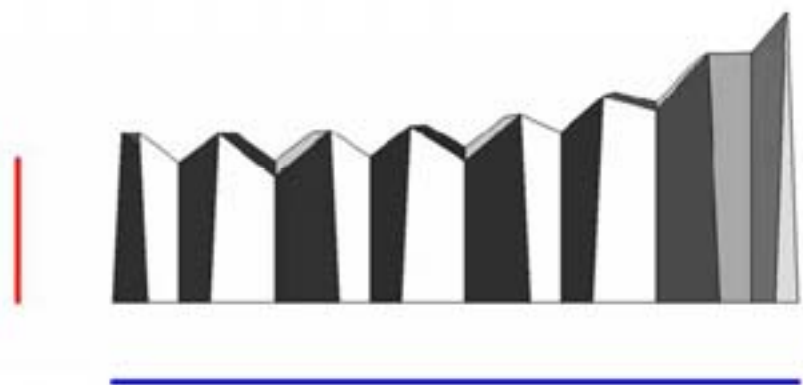
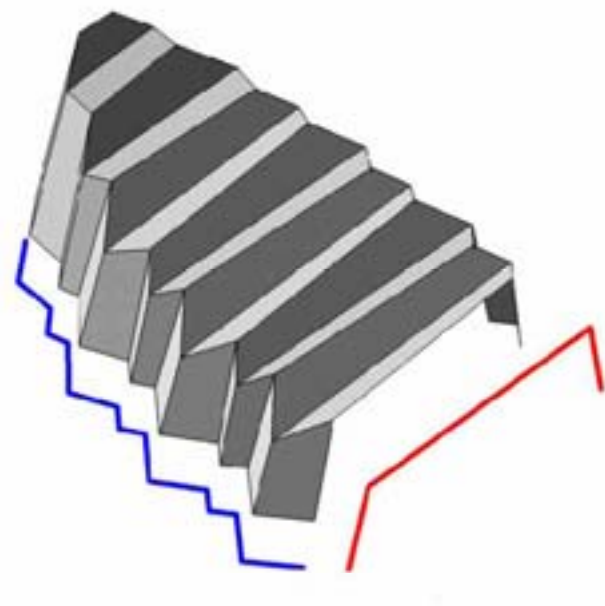
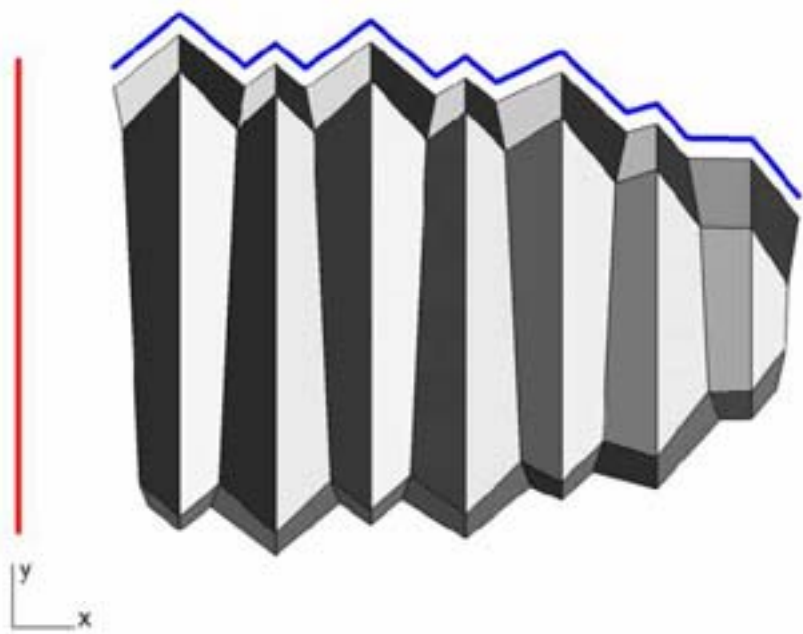
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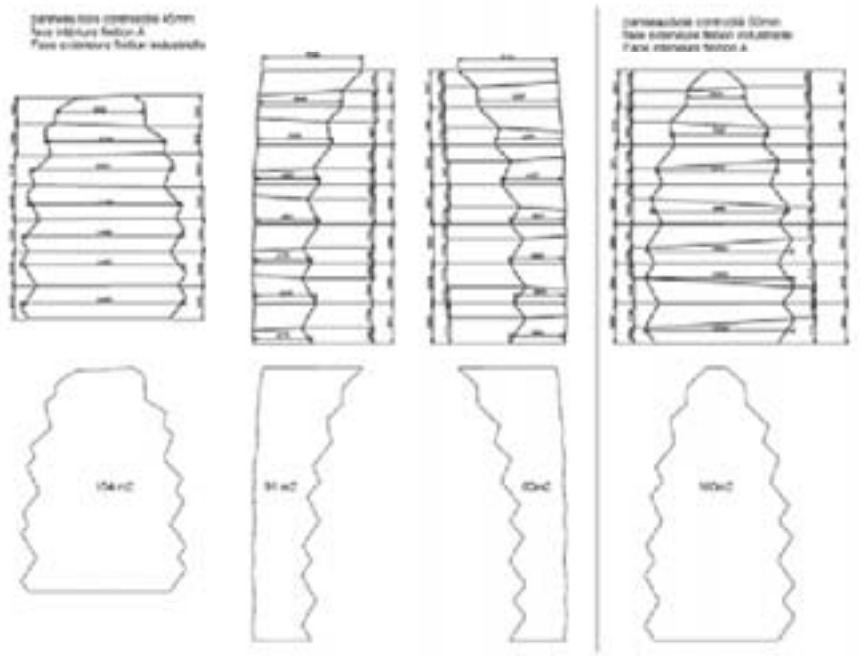
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x

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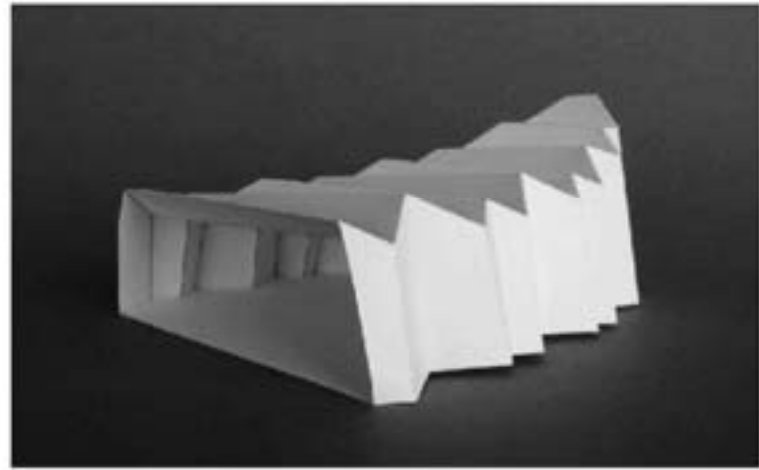
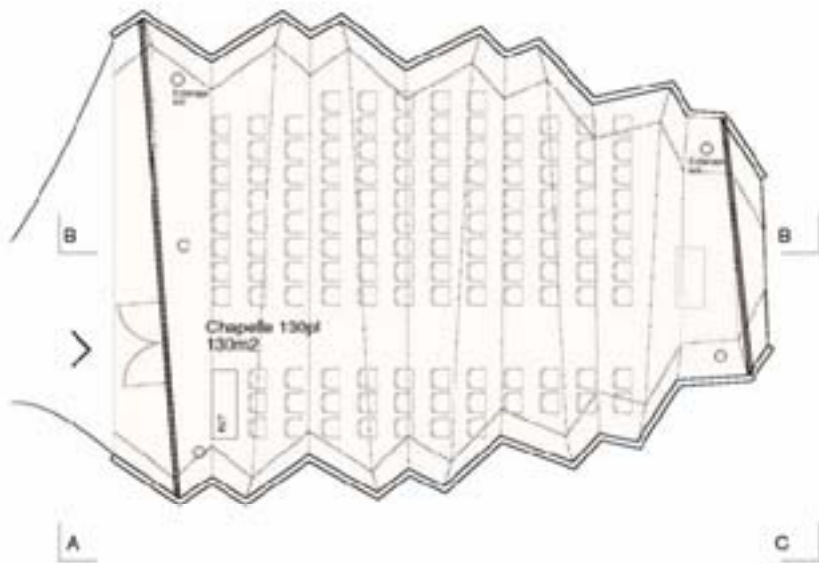
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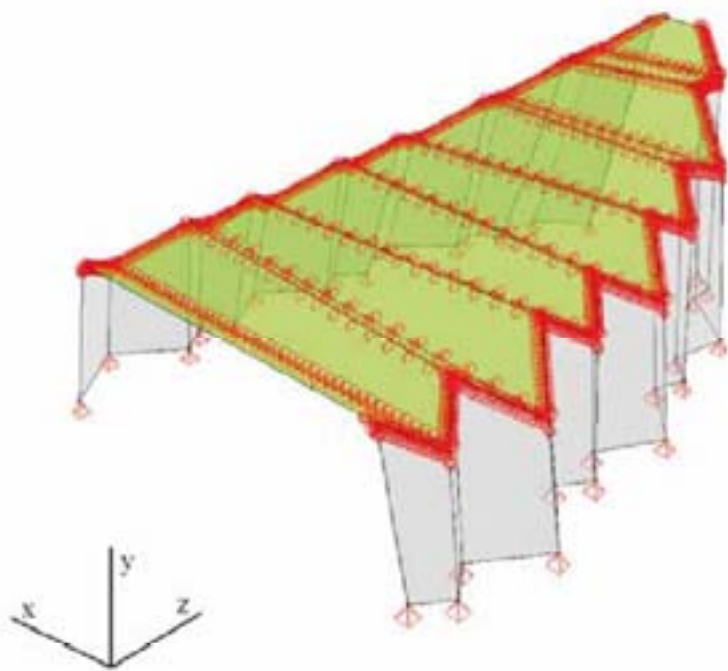


Plan und Schnitt (LOCALARCHITECTURE), Papiermodell (SHEL)

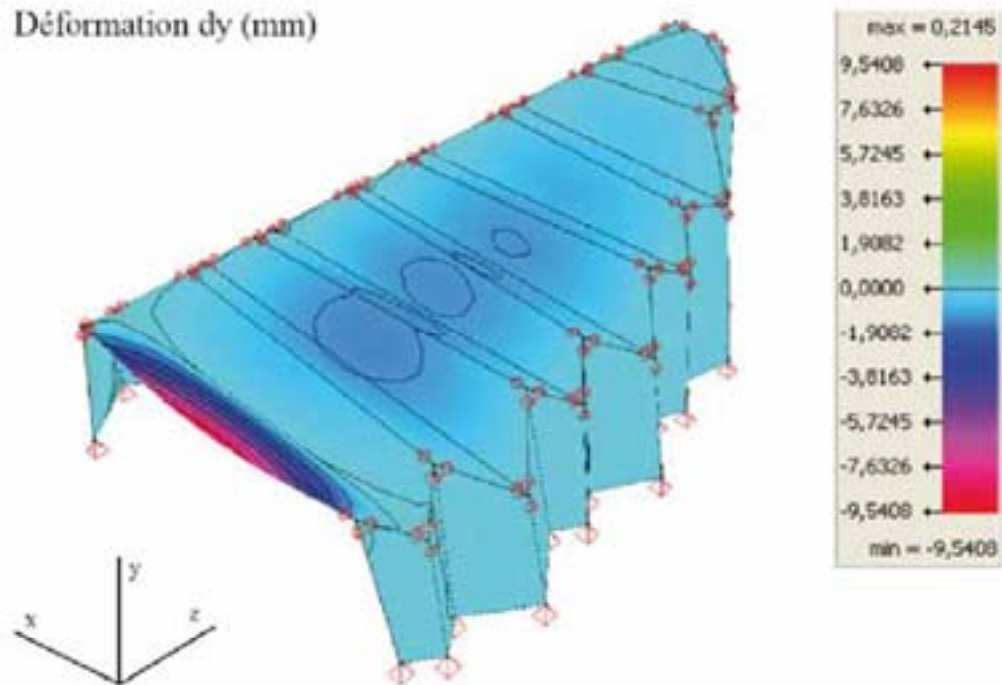
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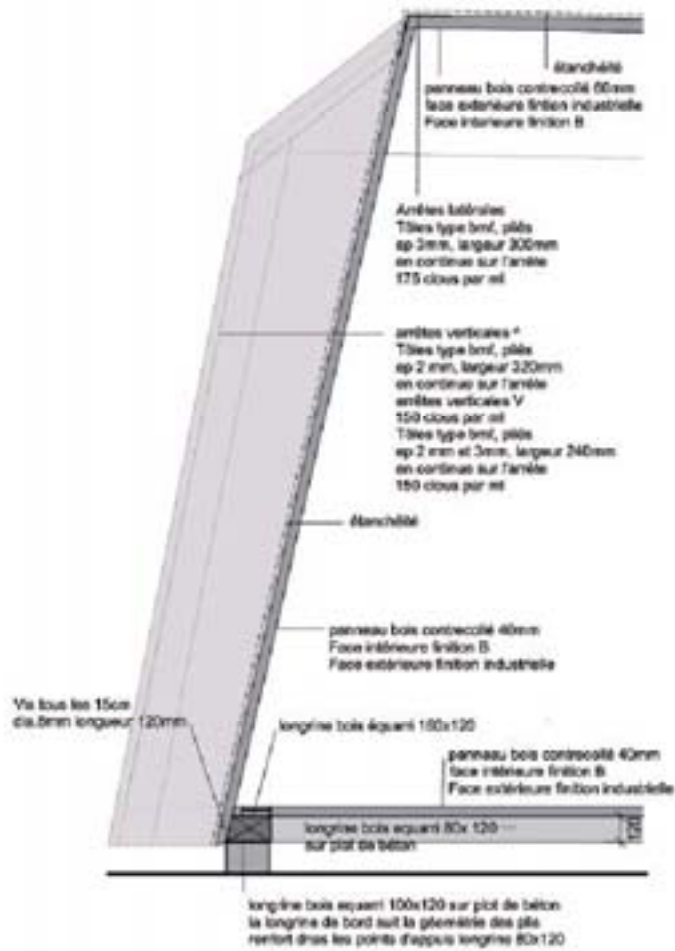
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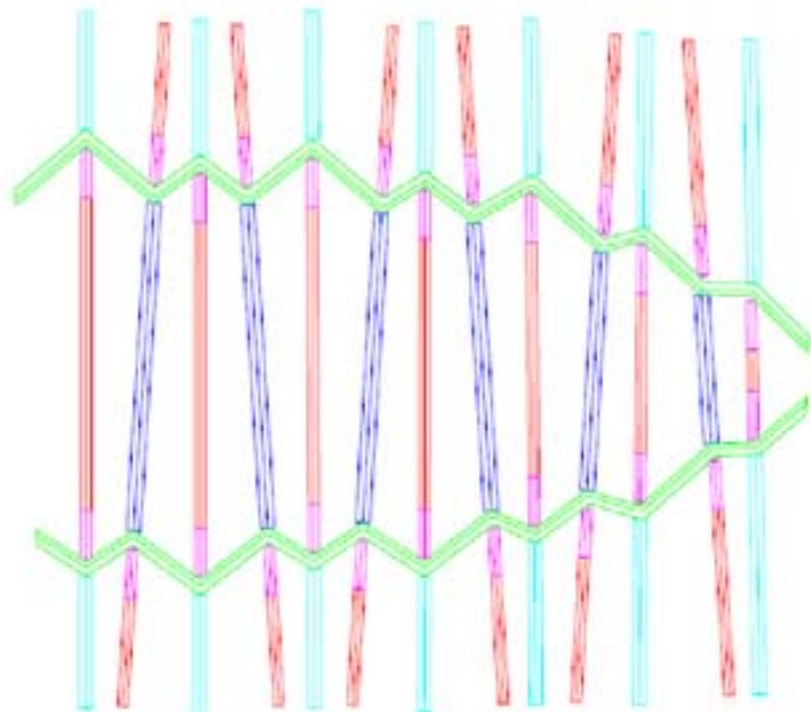
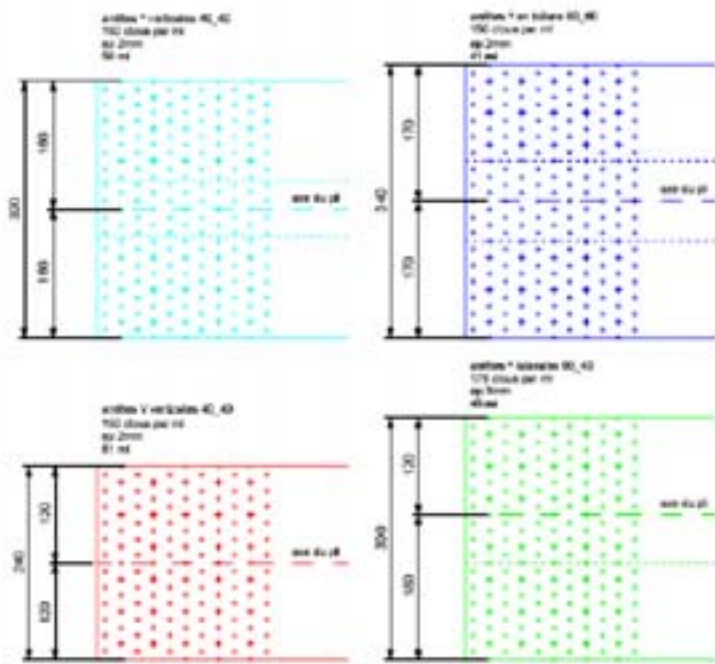
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Déformation dy (mm)



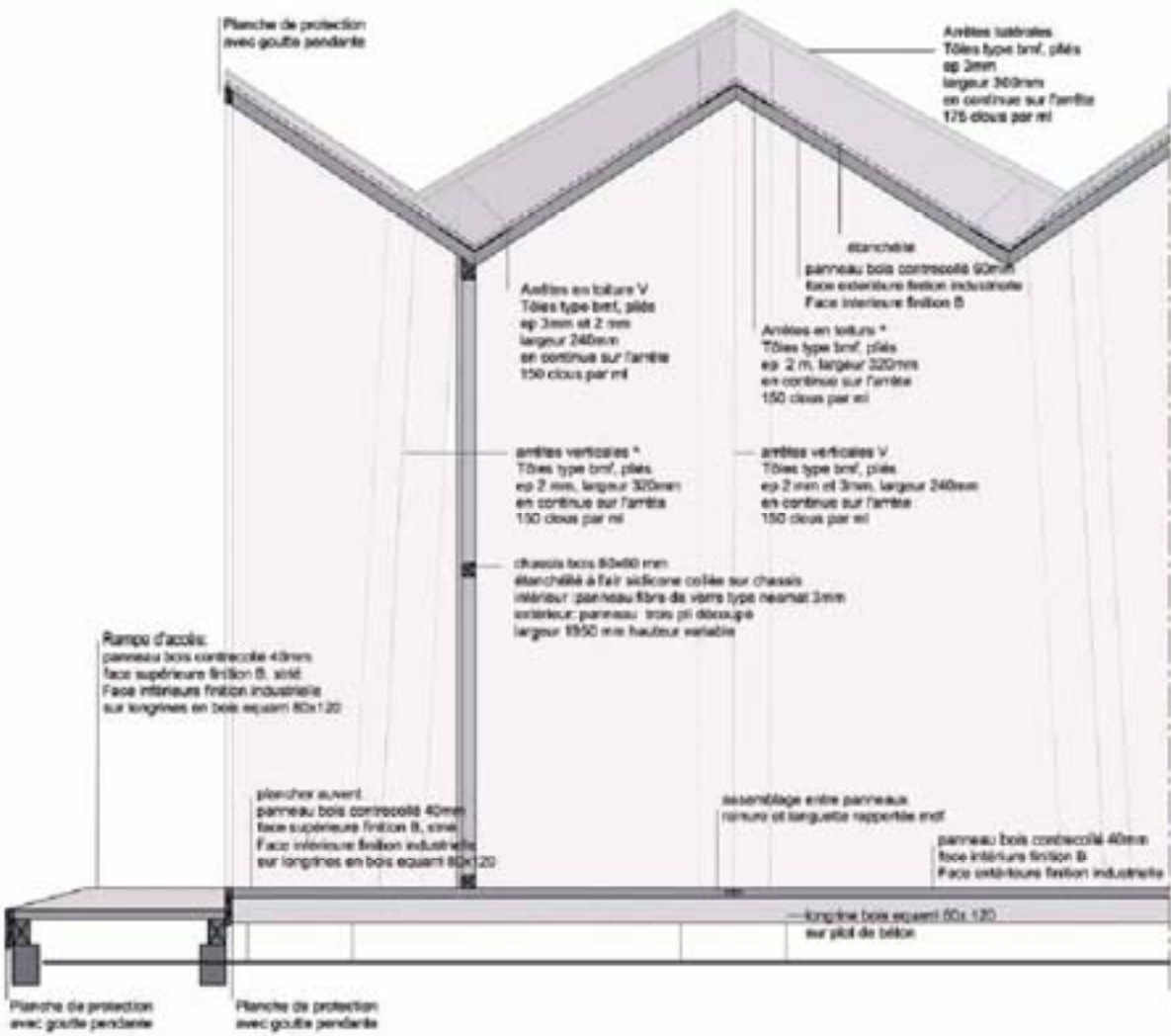




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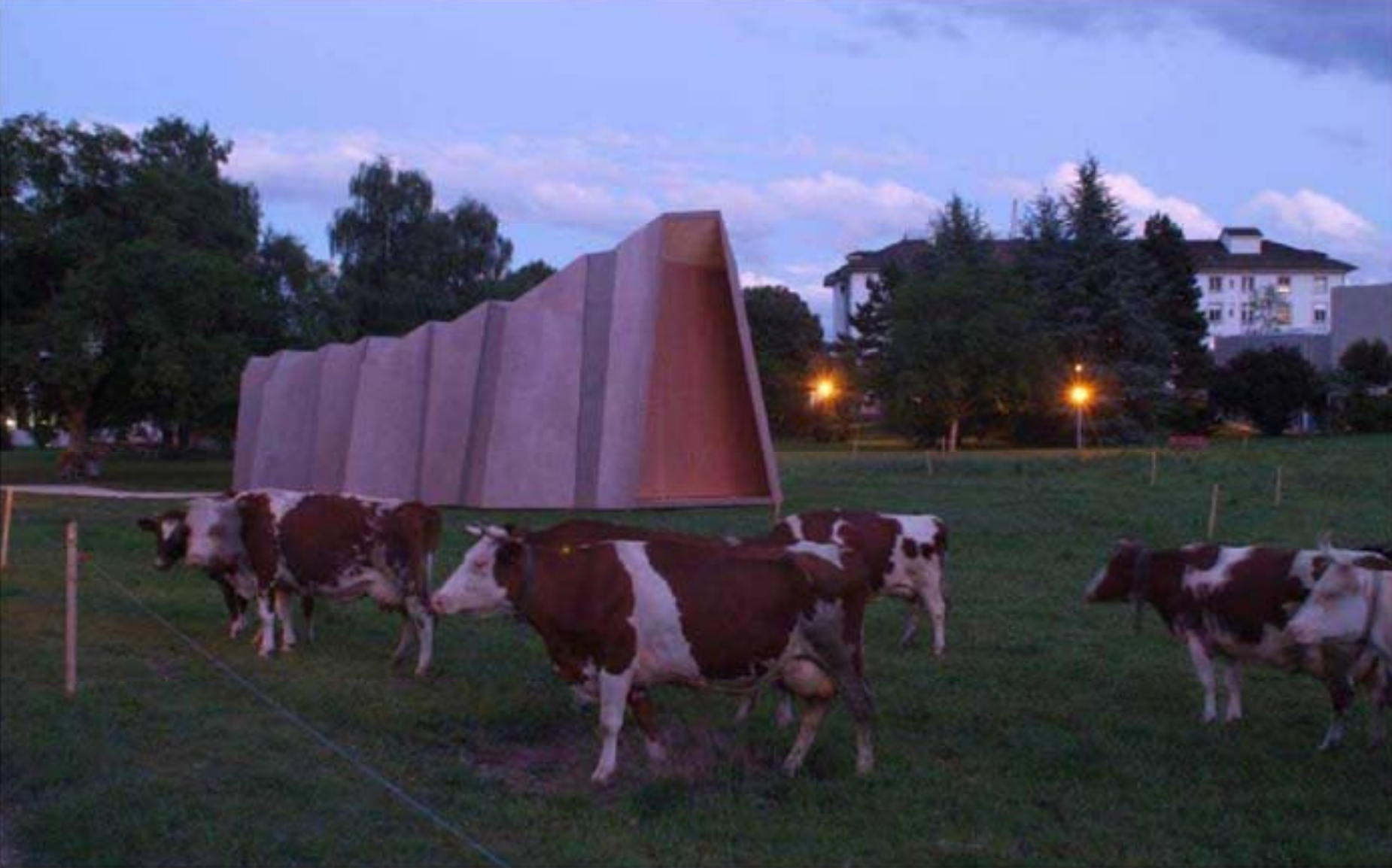


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