

WESTMINSTER

RAE 2008, RA2 - H 30

**COLLETTI, Marjan +
CRUZ, Marcos**

**Identifier: 0610830057150
0610830058940**

Output 1 (Design / Artefact)

NURBSTERS

Colletti, Marjan + Cruz, Marcos (2003-07), Nurbsters

General Description:

NURBSTERs I-IX is a series of models and 1:1 prototypes, conceived for exhibitions and installations. The design and manufacturing processes are completely computerised. NURBSTER I resembles a 3D dividing wall designed especially for the Unit 20 Bartfest 2004. NURBSTER II is an installation/exhibition desk designed especially for the Venice Biennale 2004. NURBSTERs III are a series of exhibition islands designed especially for the Bartlett/British Council exhibitions in Prague, Bratislava and Kosice in 2004 and 2005. NURBSTER IV is a dividing media wall/seat designed during a workshop at the Feng Chia University in Taiwan in 2005. NURBSTER V is an urban furniture proposal designed especially for the 75th Lisbon Book Fair 2005. NURBSTER VI is a hanging structure designed especially for the 'Orientierung' solo exhibition in Hamburg 2005. NURBSTER VII is a model for an experimental house in Portugal designed especially for the Experimenta-Design exhibition in Lisbon 2005. NURBSTER VIII is a proposal for a public wintergarden designed especially for the Meta.morfosis exhibition at Meiac in Spain 2006. NURBSTER IX is an installation/exhibition desk and modular seats designed especially for the Unit 20 Bartfest 2007.

Research Questions:

How to develop a poetic digital avant-garde through 2D/3D software, computer numerically controlled (CNC), computer-aided design and computer-aided manufacturing (CAD/CAM) and rapid prototyping (RP) technologies that go beyond software-related aesthetics and parametric constraints. In order to push the boundaries of experimental applied research in the rapidly changing discipline of architecture, the NURBSTERs challenge the dichotomy of style/structure within the digital discourse, and communicate systematically gained practical experience and knowledge through manufacturing.

Aims/Objectives:

(1) To develop a file-to-factory design methodology bridging the gap between digital architectural theory and the built environment.

The file-to-factory design approach of the NURBSTERs makes use of innovative CNC, RP, and CAD/CAM technologies to link the design-computer to the manufacturing-computer. The series is completely developed using 2D and 3D CAD software, in which it is possible to fully comprehend, test and simulate complex 3D geometries that in an analog approach would lack experimentation and rigour. The design is then finalised in consideration of the material's (thickness, elasticity, size), the process's (2D cutting / 3D milling, printing and thermoforming), and the machine's constraints (precision, bed size). A computer file is then sent to the manufacturer without the need for further drawings and printouts, saving time and resources. This process allows optimised and unique geometric and formal multiplicity at standard or even lower costs.

(2) To develop various typologies of interior and urban furniture designs that could be enlarged to private dwelling and public spaces.

The size and scale of the NURBSTERs locates them into the domain of interior and urban furniture design, which considers modularity and mass-production, as well as structural stability and tectonic presence. The NURBSTERs utilise state-of-the-art 3D CAD software packages to design precise ergonomic pieces to fit contextual, mechanical and bodily attributes. Furthermore, NURBSTERs VII and VIII apply the research to the development of a smaller private housing unit and an open public structures. Again, the projects are intended to synthesise style and structure, ornament and engineering.

(3) To create efficient and sustainable designs that maximise CAD/CAM cutting processes to attain positive and negative cut-outs for use as 3D objects and 2D screens.

In general a file-to-factory design process allows designer and manufacturer to directly share data without print-outs, consequently saving resources (paper, ink, electricity). Without time delay or language barriers, the data can be sent to local or remote manufacturer depending on project location and production costs. The NURBSTERs series reacts to sustainable issues by optimising the layout of the positive cut-outs on the boards and by re-utilising the negative cut-outs as ornamental dividing screens.

Context:

CAD/CAM technologies are long established in the shipbuilding industry and strongly expanding due to availability and affordability. So far however, these technologies have not drastically changed the way architecture is theorised, designed or produced. If at all, such expertise has been used for the mass-manufacturing of product design, and - rarely - for larger scale structural, engineered parametric interventions such as sheds, roofs and high-rise buildings. The NURBSTERs employ a file-to-factory design methodology to develop experimental timber and steel structures, façades, skins, and ergonomic internal secondary structures, division walls, and furniture pieces from innovative materials such as LG HI MACS®.

Research Methods:

On a 1:1 scale, the design of the NURBSTERs is developed through intense CAD 2D and 3D modelling techniques. The manufacturing is performed through CAD/CAM technologies, especially laser cutting, water jetting and thermoforming. All components are cut by CAD-operated machines out of standard-sized MDF, plywood, or metal boards. A series of layered and notched sections create a complex volume of NURBS (non-uniform rational B-splines). They build up a complex object, fitting programmatic, structural, ergonomic requisites expressed through curvilinear and arabesque geometries, and reinterpret the traditional Chinese wooden cut-joint fitting technique ideal for quick assembly and disassembly. The NURBSTERs' ornamental character expresses deliberate eccentricities within the precision and material efficiency of the CAD-operated process.

Dissemination:

Exhibitions:

The NURBSTERS prototypes and installations have been exhibited in numerous places. NURBSTER I was exhibited at the 'Bartfest' in London and at 'Mladá britská architektura' in Prague Czech Republic (2004). NURBSTER II at the 'Metaflux' exhibitions at the Venice Biennale Italy as well as in Lisbon and Aveiro Portugal and in São Paulo Brazil (2004). NURBSTER III was exhibited in Prague, Bratislava and Kosice Slovakia (2004-05). NURBSTER IV was exhibited in Taichung Taiwan (2005). NURBSTER VII was exhibited in Lisbon Portugal (2005), and in Badajoz, Mérida and Cáceres in Spain (2006). NURBSTER VIII was exhibited in Badajoz and at the ARCO in Spain (2006). NURBSTERS I-VIII at the 'marcosandmarjan – Interfaces/Intrafaces' solo exhibition in Braunschweig and Hamburg, Germany (2005). NURBSTER IX was exhibited at the 'Bartfest' at the Bartlett School of Architecture, UCL, in London (2007).

Authored Articles:

NURBSTERS have appeared in various authored articles, such as:

- Colletti, Marjan; and Cruz, Marcos. *marcosandmarjan: Interfaces/Intrafaces*. Vienna/ New York: Springer, 2005, pp. 12-25.
- Colletti, Marjan; and Cruz, Marcos. 'E-vernadero. E-greenhouse (El Coral)'. In Cerveira-Pinto, António (ed.). *META.morfosis: el museo y el arte en la era digital*. Badajoz: MEIAC, 2006, pp. 136-40.
- Colletti, Marjan; and Cruz, Marcos. 'marcosandmarjan'. In *Demonstrating Digital Architecture, 5th FEIDAD Far Eastern International Digital Architectural Design Award*. Basel/ Boston/Berlin: Birkhäuser, 2005, pp. 100-5.
- Colletti, Marjan; and Cruz, Marcos. 'marcosandmarjan architects'. In Gadanho, Pedro; and Pereira, Luis (eds.), *Metaflux. Catalogue of the Portuguese Official Representation at the 9th Architecture Biennial Venice*. Lisbon: Civilização Editora and Instituto das Artes, 2004, pp. 123-31, 211-2.

Other articles:

- Sousa, José Pedro. 'Arquitectura digital portuguesa' in *Arquitectura e Vida* #71, May 2006, pp. 56-61.
- Kopernická, Andrea. 'The Bartlett School of Architecture – the most progressive expression of today's architecture', *British Council Slovakia News* (Slovakia), Autumn 2005, pp. 1-5.
- Shui Liu. 'Space and Emotion (second part)', *Interior Design + Construction* #129 (China), May 2005, pp. 102-4.
- Albuquerque, Joao. 'Da Forma ao Componente na Era Digital_NURBSTERS', *Arquitectura e Vida* #84 (Lisbon) July 2007.
- Chen, Shang-Yuan; and Cheng, Ming-jen. 'Building an Adaptive Evaluation System: A Design Education Application', *Computer-Aided Design & Applications*, vol. 3 nos. 1-4, 2006, pp. 49-58.
- Shu, Simon. 'Avant-garde Architecture Exhibition from British Archigram School', *FCU News* #1, June 2005, p. 6.
- Chen, Huei-ling. 'Splinelwall', *Central Daily News* (Taiwan), 12 March 2005, Taichung City Events Section, p. 7.
- Ye, Chih-Yun. 'Inhabitable Wall', *China Times* (Taiwan), 12 March 2005, Taichung City Events Section, p. C2.
- Yuh, Wen-Wen. 'Digital Architecture', *United Daily News* (Taiwan), 12 March 2005, Taichung City Events Section, p. C2.
- Lau, Yu. 'The Future of Digital Architecture', *Taiwan Architecture* #11, 2005, pp. 62-7.

Press release/general notes:

The NURBSTER III has been mentioned in many Czech and Slovak newspapers and magazines, such as:

- *Slovak Spectator*, 17 October and 24-30 October 2005.
- *Korzár*, 30 January 2006.
- *Staromestské listy*, No.1).
- *Új Szó*, 18 January and 26 January 2006.
- *SME*, 6-7 October and 19-21 October 2005.
- *TASR*, 04-05 October 2005.
- *Šport*, 4 October 2005.
- *Hospodářské Noviny* (and online at www.ihned.cz), 2004.
- *Architekt*, 2004.
- *British Council Slovakia News*, Autumn 2005.
- *A&B Architektura & Biznes* #12 (Poland), 2005.

Interviews:

Radio and television interviews on NURBSTER III with Marjan Colletti for Rádio Expres, Markíza, SME – Kultúra, Arch, ABS and others (2005).

Esteem Indicators:

The theoretical and practical techniques of manufacturing the NURBSTERs have been reviewed in:

- Albuquerque, Joao. 'Da Forma ao Componente na Era Digital_NURBSTERs', *Arquitetura e Vida* #84 (Lisbon), July 2007.
- Chen, Shang-Yuan; and Cheng, Ming-jen. 'Building an Adaptive Evaluation System: A Design Education Application', *Computer-Aided Design & Applications*, vol. 3 nos. 1-4, 2006, pp. 49-58
- Lau, Yu. 'The Future of Digital Architecture', *Taiwan Architecture* #11, 2005, pp. 62-7.
- Chen, Shang-Yuan. 'Multimedia Functions with Digital Design', *Taiwan Architecture* #11, 2005, pp. 80-3.

The NURBSTERs have been manufactured with grants and sponsoring (approx. £38,000 to date) from academic and commercial institutions, such as: Great Britain Sasakawa Foundation grant, £3,600 (2004); British Council Czech Republic and the British Embassy (2004); British Council Slovakia (2005); Lasindustria Lisbon €2,000 (2005); Chun-Sheng Industry Limited Company Taichung (2005); Feng Chia University (2005); iCP Institute for Cultural Policy, Hamburg €16,000 (2005); Bartlett ARF £3,000 (2006); Westcut Waterjet Melksham and Roskopf und Partner Germany €4,550 (2007).

Model prototypes of the NURBSTER I-III are part of the iCP Institute for Cultural Policy collection in Hamburg, Germany.

The early NURBSTER resulted in an invitation to hold a workshop and seminars about the making of the NURBSTERs, at the FCU & Bartlett Digital Architecture Workshop, at Feng Chia University, Taiwan (2005).

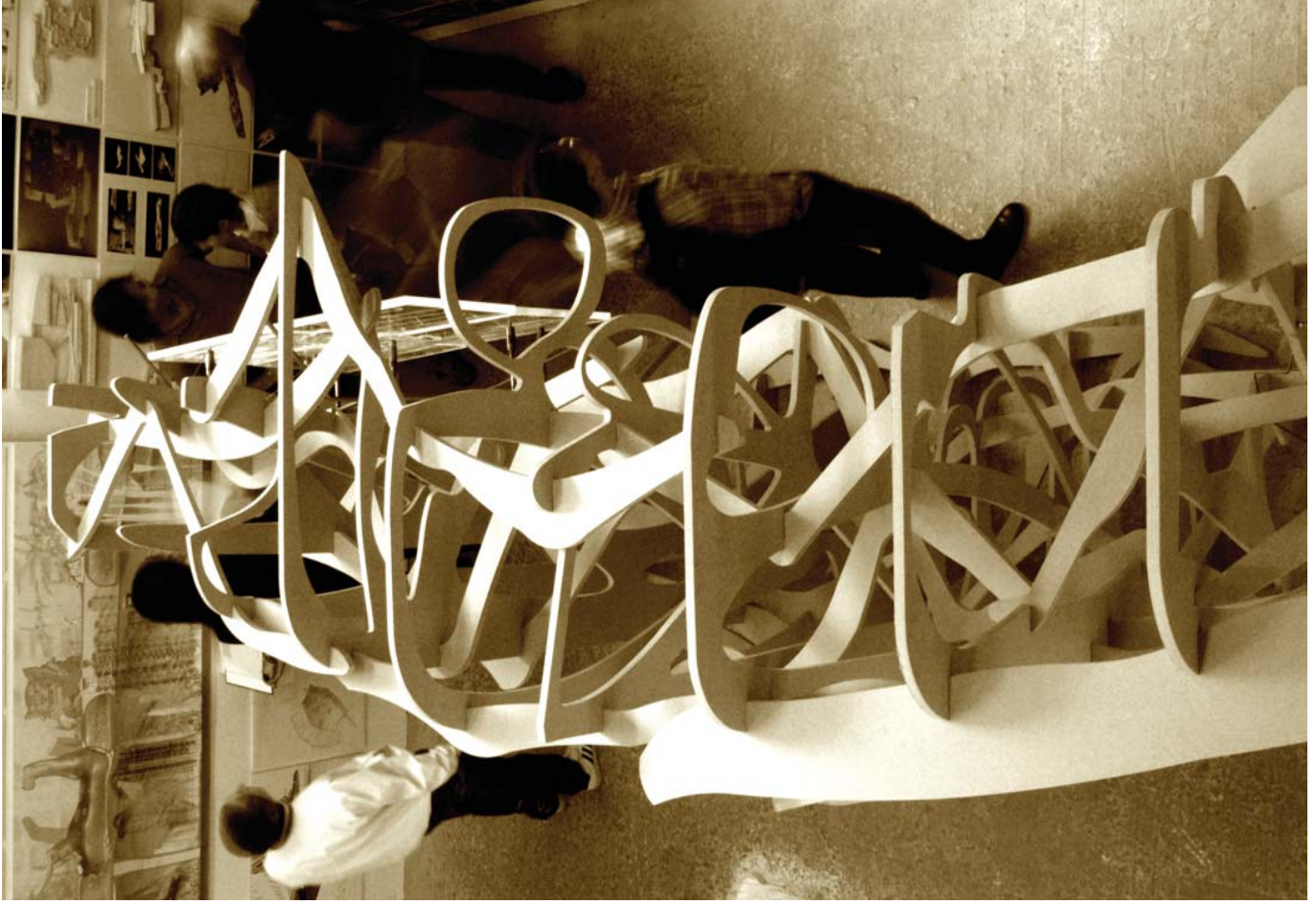


Image 1: 1:1 prototype assembled, NURBSTER I,
Slade School of Art, London (2004)

Image 2: 1:1 prototype assembled, NURBSTER II,
The Venice Biennale, Venice (2004)

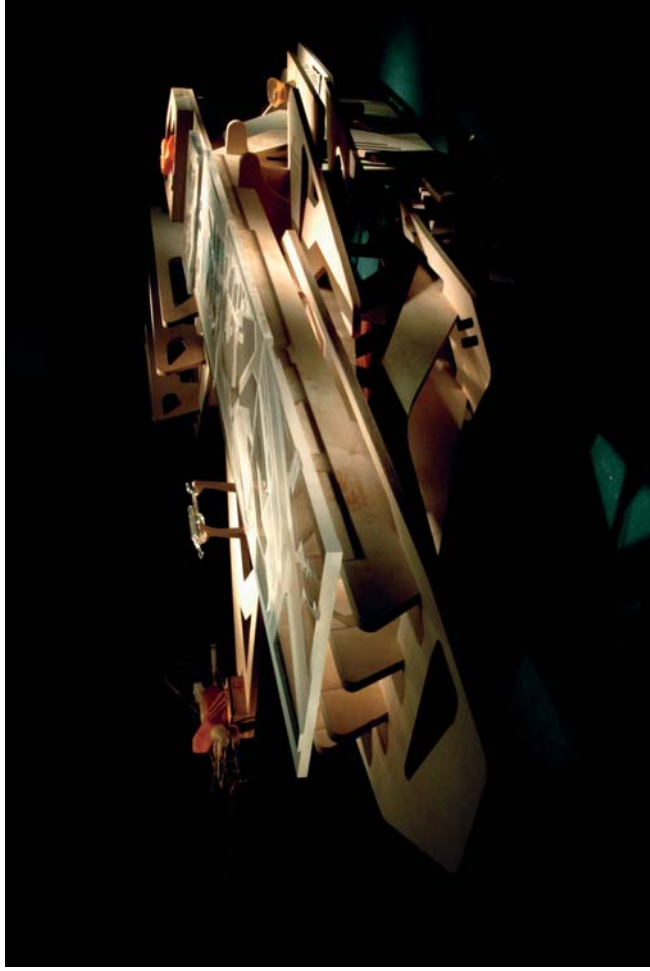


Image 3: 1:1 prototype assembled, NURBSTER III,
Fragner Gallery, Prague (2004-5)

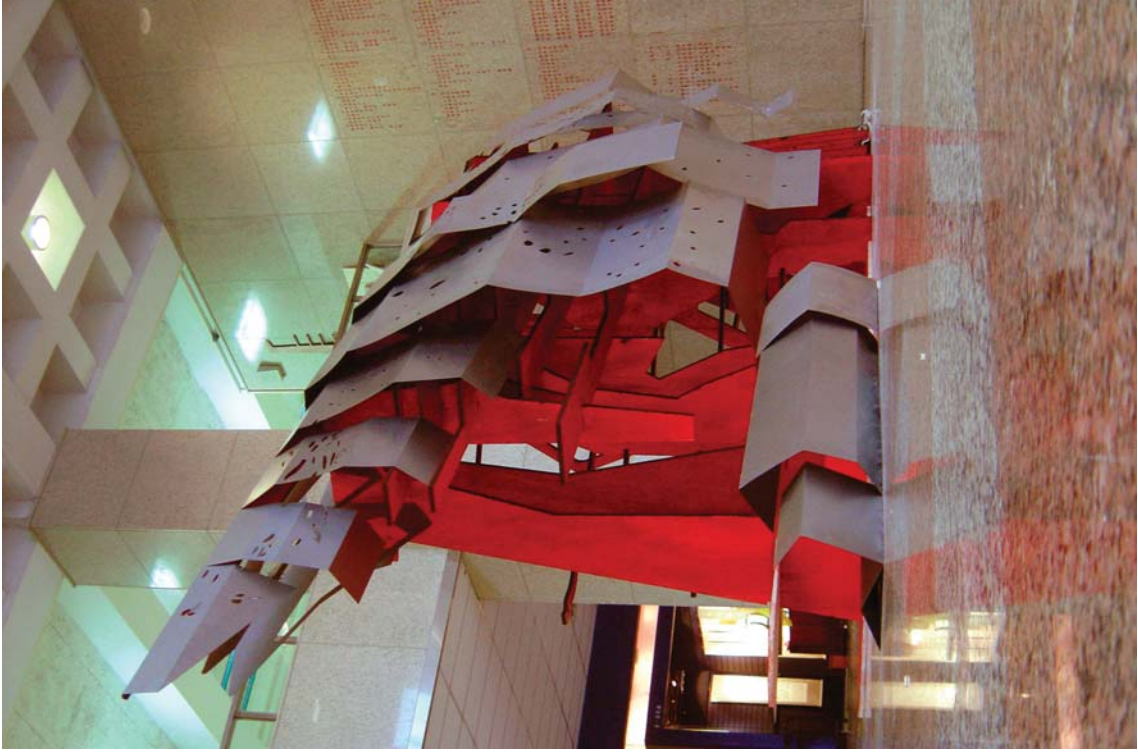


Image 4: 1:1 prototype assembled, NURBSTER IV,
The Ren Yen Building Feng Chia University,
Taichung, Taiwan (2005)



Image 5: 1:3 model assembled, NURBSTER V,
Architekturpavilion, TU Braunschweig,
Germany (2005)

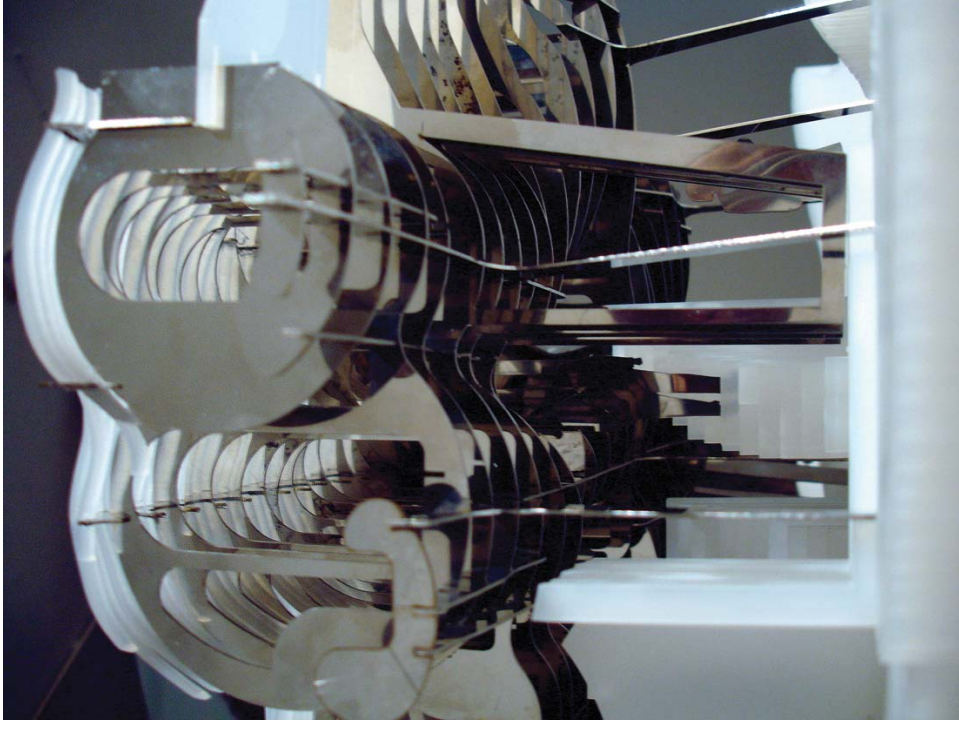


Image 7: 1:20 model assembled, NURBSTER VII,
ExperimentaDesign, Lisbon (2005)

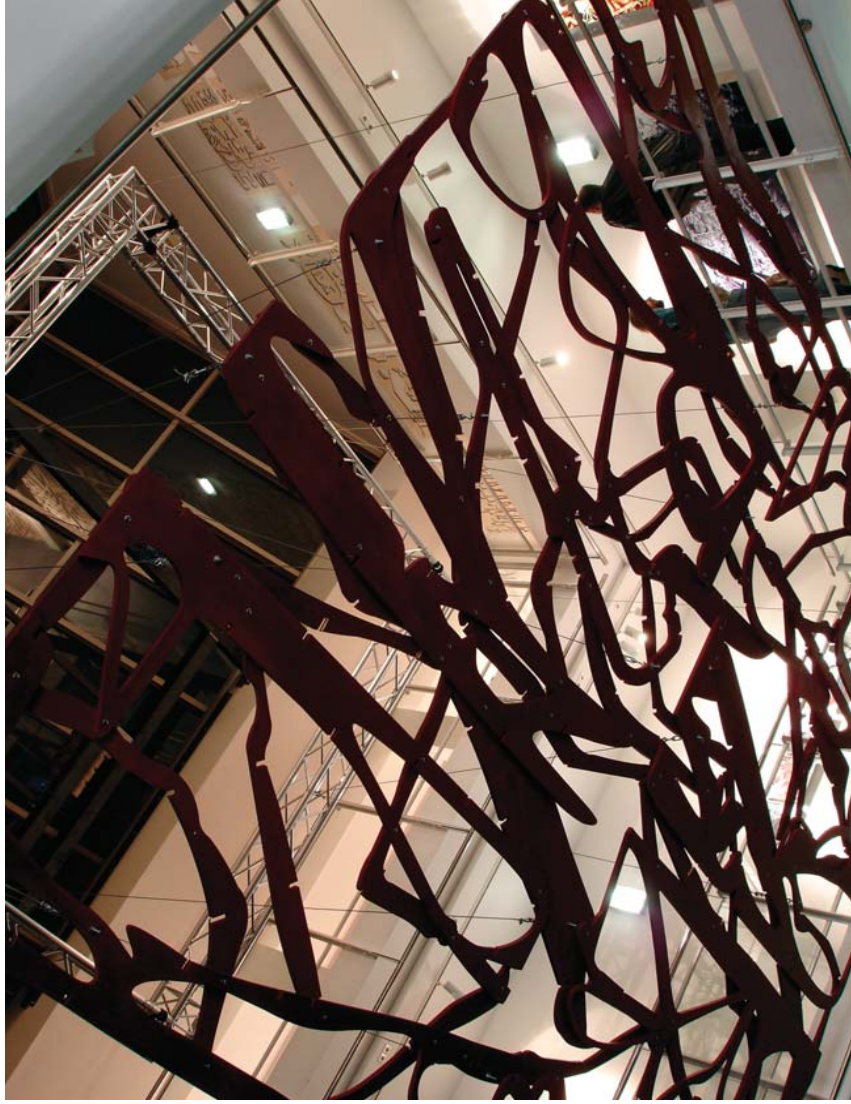


Image 6: 1:1 prototype assembled, NURBSTER VI,
Institute for Cultural Policy, Hamburg (2005)

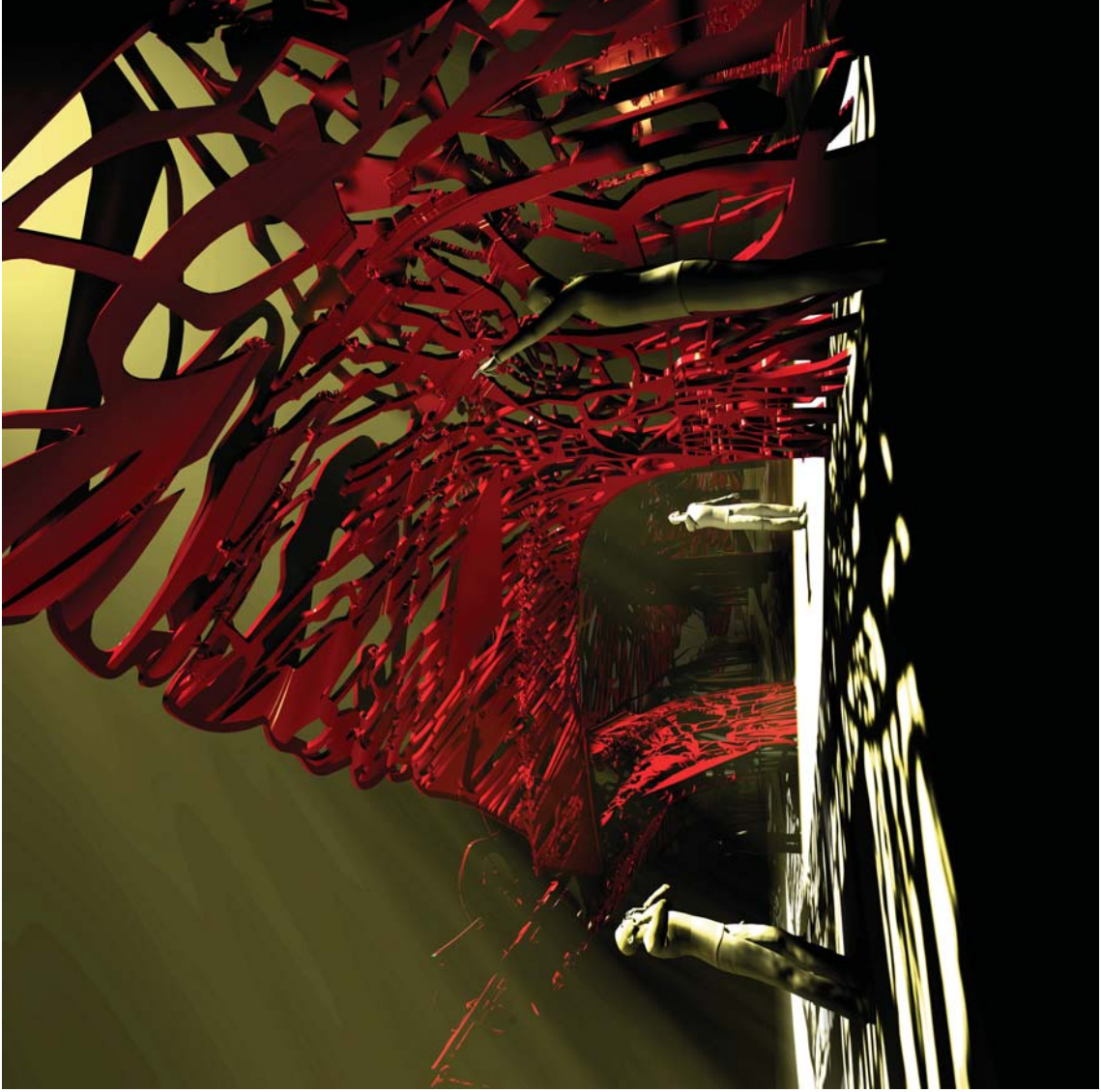


Image 8: Rendering, NURBSTER VIII (2006)

Image 9: 1:1 prototype assembled, NURBSTER IX, Slade School of Art, London (2007)



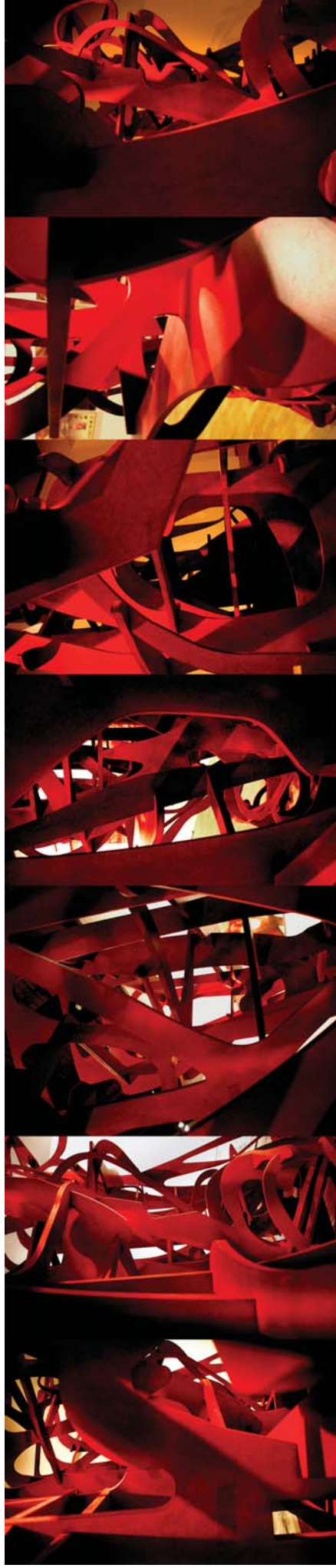
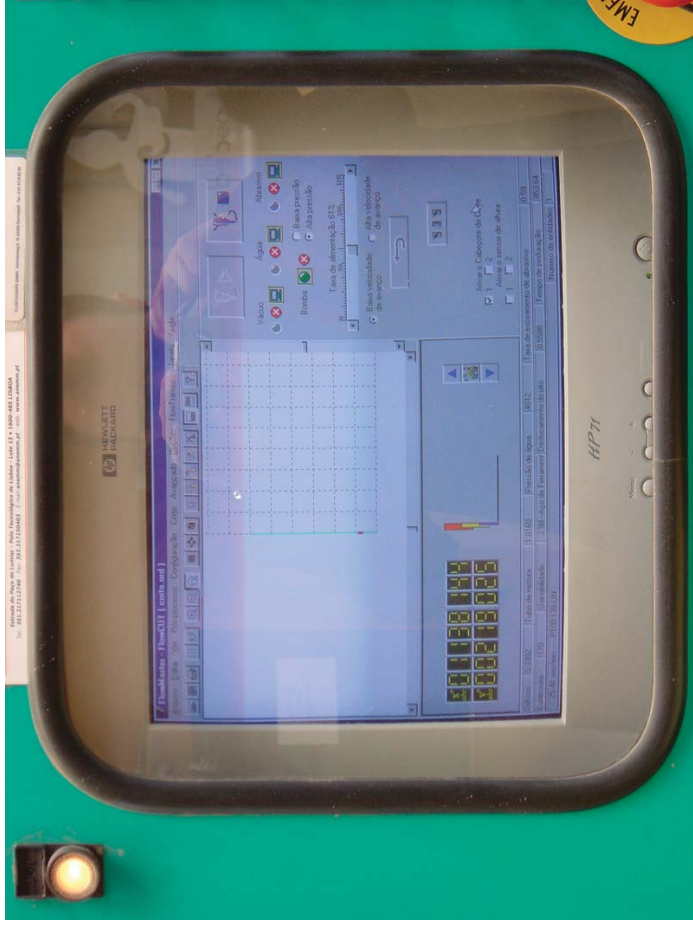
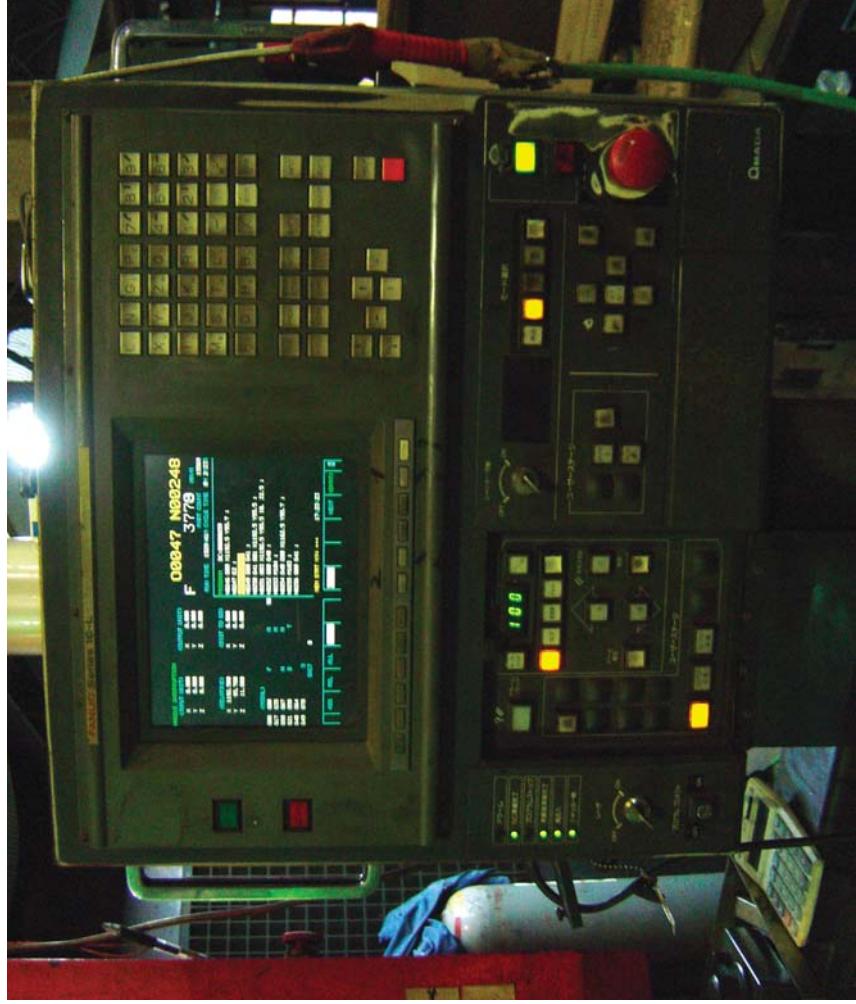


Image 10: Details showing internal spaces created by synthesis of structural and stylistic components, NURBSTER I, Medium Gallery, Prague (2004)



Images 11-12: Screens of laser-cutting and water-jetting machinery, Taiwan and Portugal (2005)

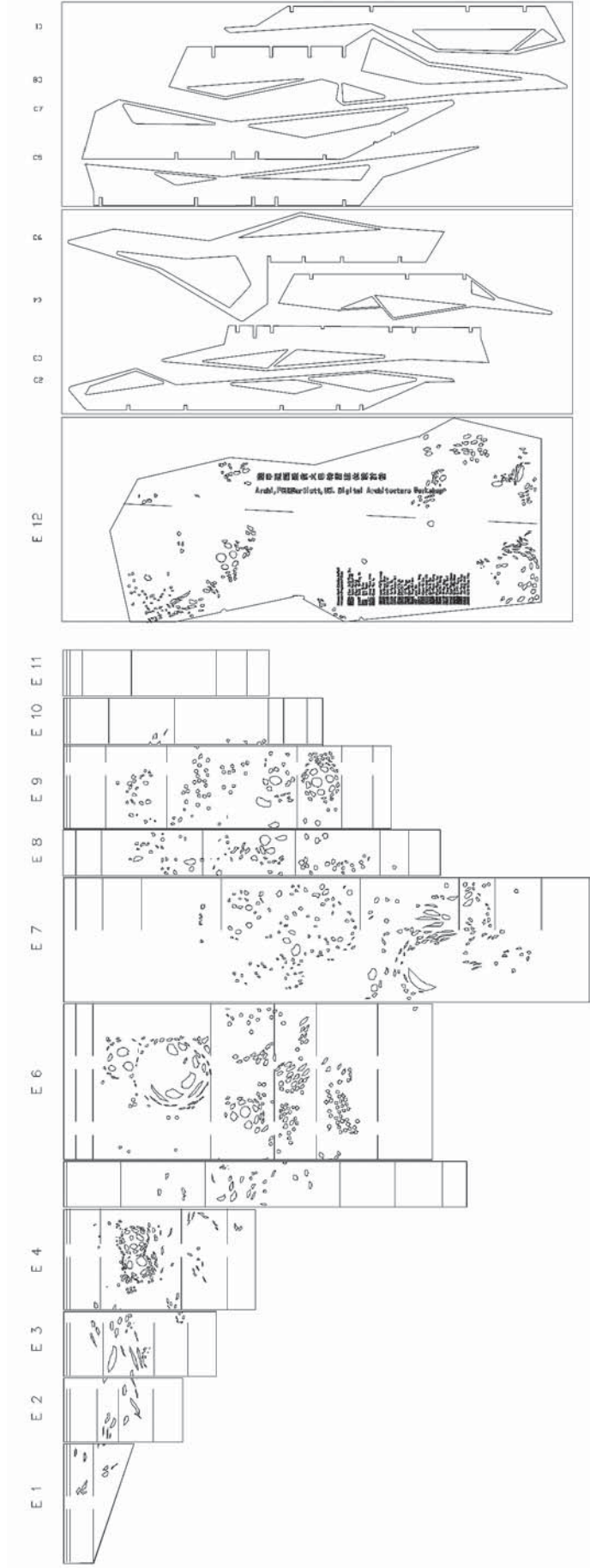
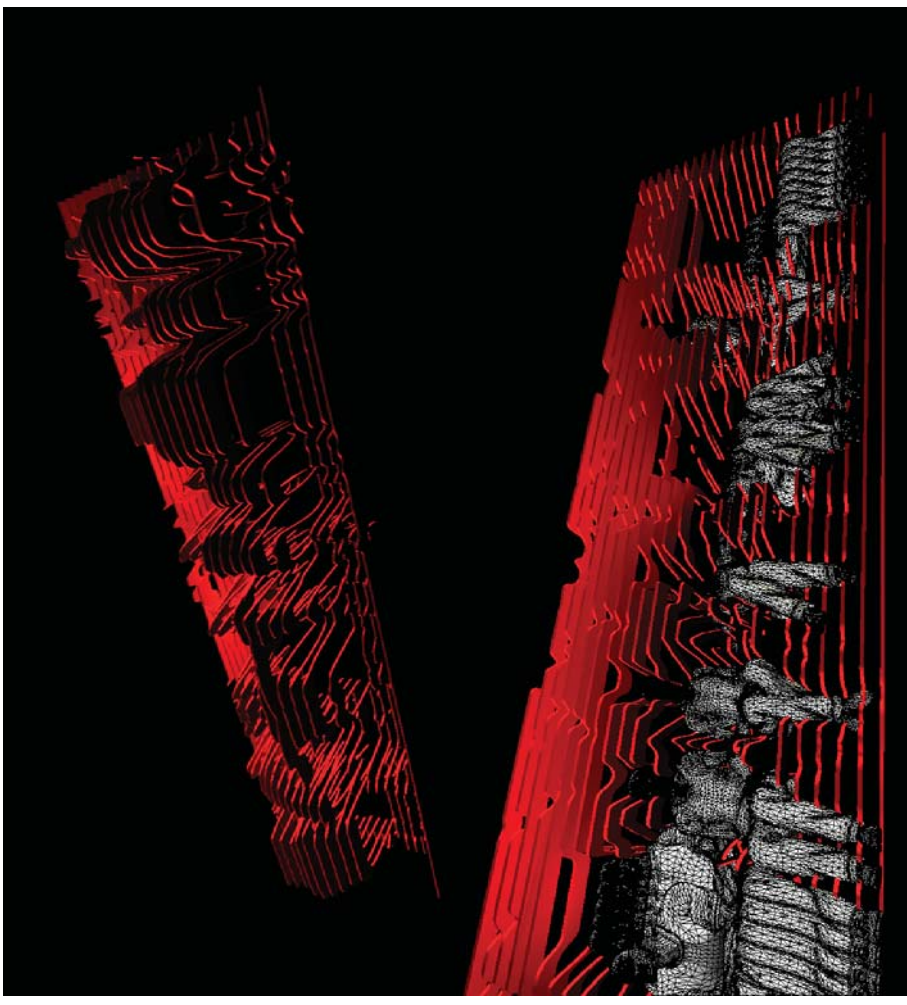


Image 13: CAD file of aluminium sheets prepared for laser-cutting, with patterns and folding lines, NURBSTER IV (2005)



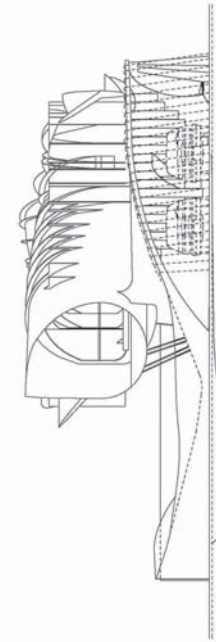
Images 14-15: Renderings of ergonomic features developed with aid of 3D human forms, NURBSTERS IV and V (2005).

== +6.50 m
 — +3.40 m
 — +3.00 m
 — +2.50 m
 — +1.70 m
 — +0.40 m
 — +0.00 m



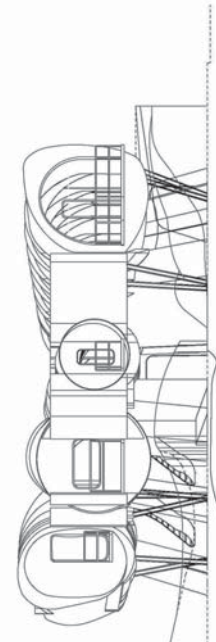
North elevation

== +6.50 m
 — +3.40 m
 — +3.00 m
 — +2.50 m
 — +1.70 m
 — +0.40 m
 — +0.00 m



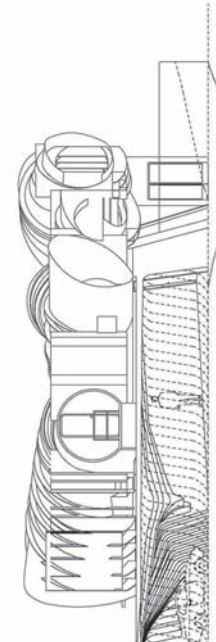
South elevation

== +6.50 m
 — +3.40 m
 — +3.00 m
 — +2.50 m
 — +1.70 m
 — +0.40 m
 — +0.00 m

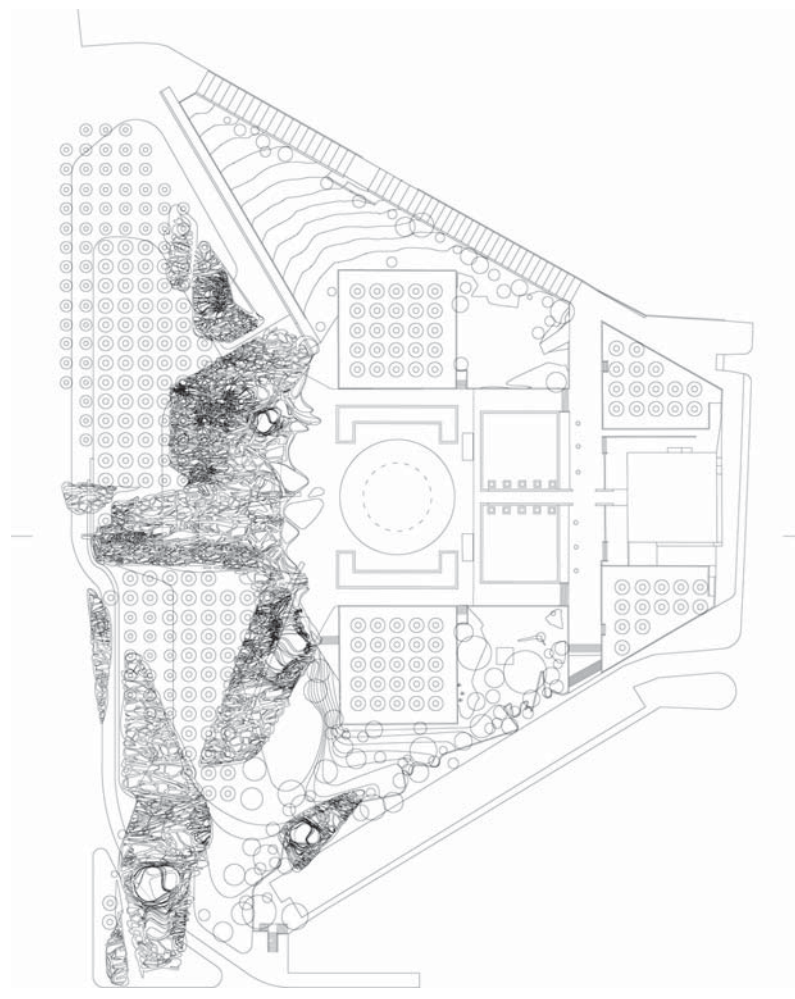


West elevation

== +6.50 m
 — +3.40 m
 — +3.00 m
 — +2.50 m
 — +1.70 m
 — +0.40 m
 — +0.00 m



East elevation



Images 16-17: Drawings showing how typologically, and tectonically, the use, inhabitation, ornament and structures are integrated - 'Elevations' NURBSTER VII (2005) / 'Roof Plan' NURBSTER VIII (2006)

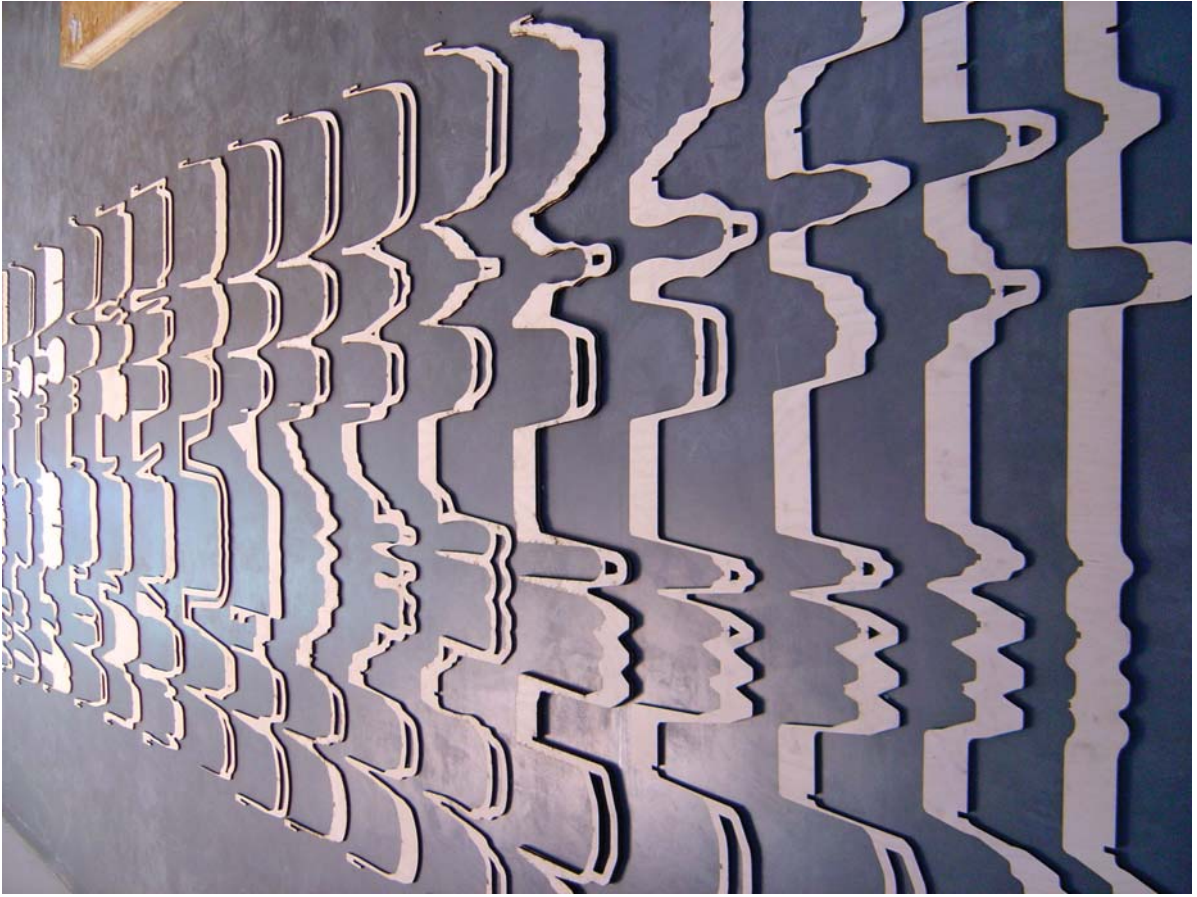


Image 18: Positive cut-outs, before assemblage, NURBSTER V (2005)



Image 19: Negative cut-outs, used as ornamental screens, NURBSTER VI (2005)



Image 20: Thermoformed HI MACS® elements,
NURBSTER IX (2007)



Image 21: Easy assembly and disassembly of the notched components,
Fragner Gallery, Prague, NURBSTER III (2004)

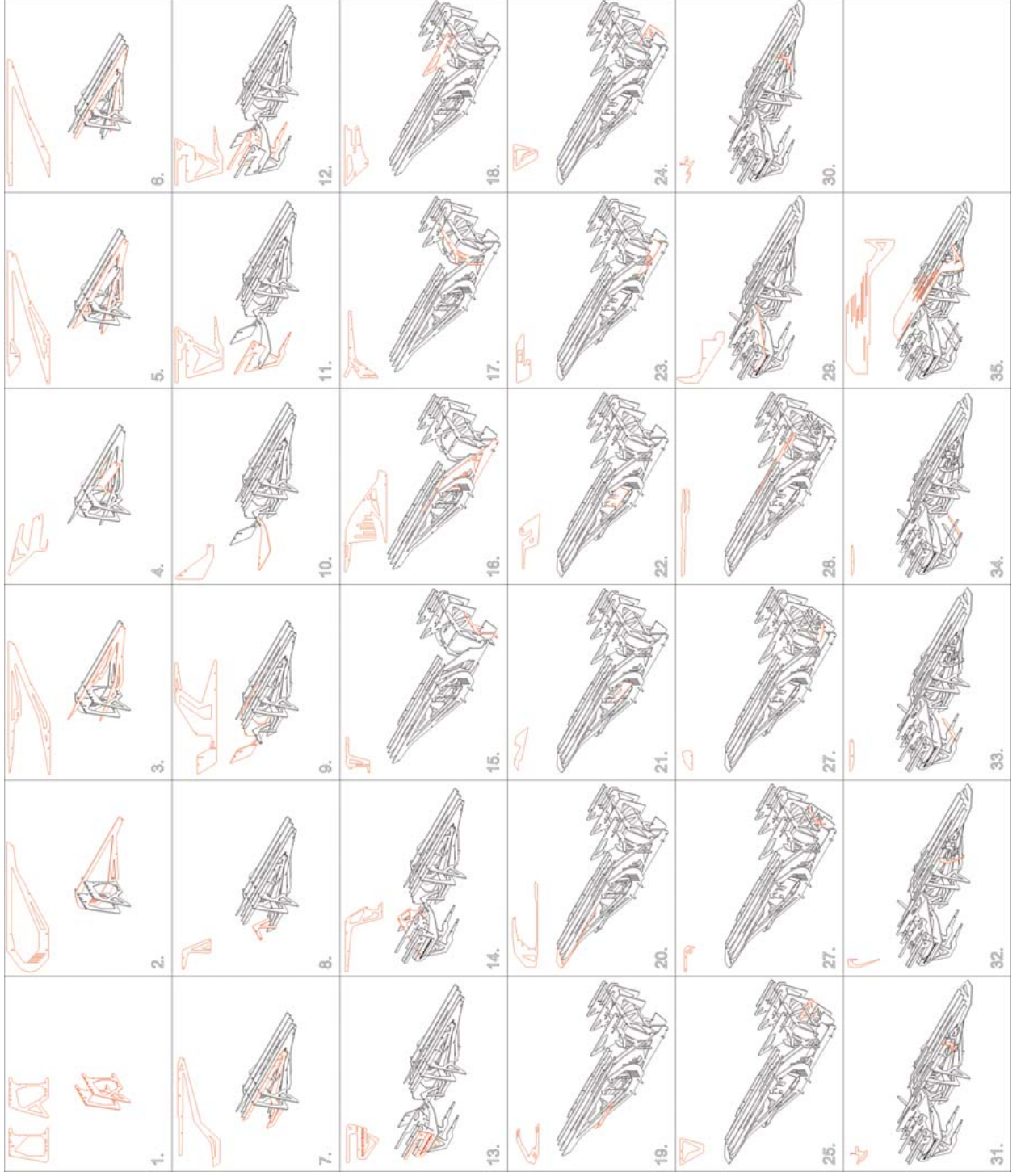
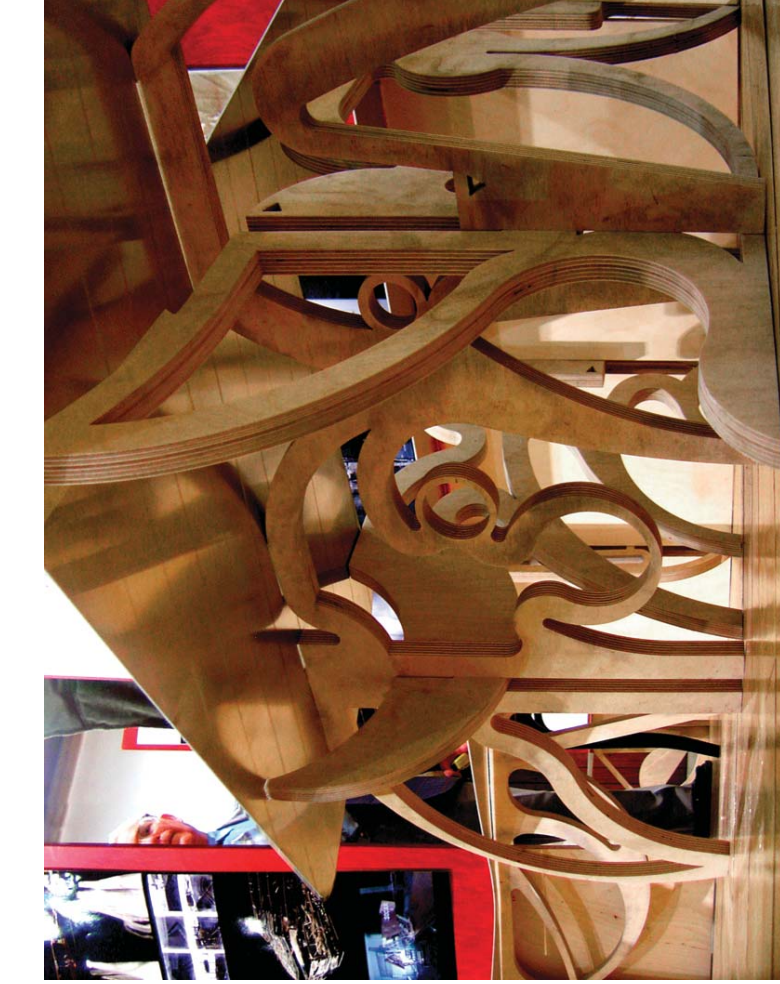
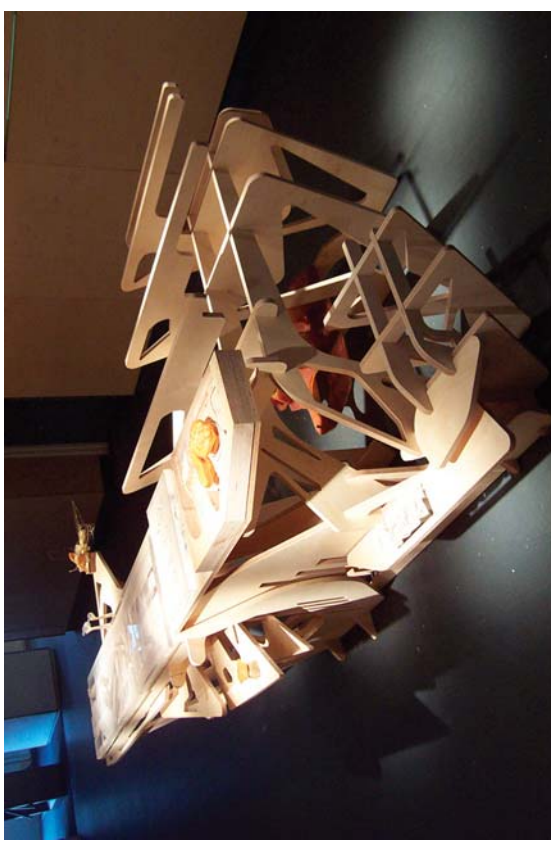


Image 22: Assemblage drawings,
 NURBSTER II (2004)



Images 23-25: Details showing the structural and geometric complexity that can only be controlled in CAD, NURBSTER II, III, VII (2004-5)





Images 26-27: Exhibitions at the Institute for Cultural Policy, Hamburg and Architekturpavilion Braunschweig (2005).

Image 28: 'NURBSTER II', exhibit in 2004 Venice Biennale Italy

