



Berlage Institute

Architect

Bouwen met Staal

Samenwerkende Nederlandse Staalbouw

STEEL MASTER CLASS 2005 RESEARCH PRACTICE DESIGN

GROUP HOLGER HOFFMANN CHRISTIAN VEDDELER WOLF MANGELSDORF

FOLDING, WEAVING & BUNDLING



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Assignment

Contemporary computational processes (CAD, 3D/4D-advanced design tools) and manufacturing methods, such as CAM/CNC, allow a bigger degree of differentiation and variation within mass production processes. In order to respond to an increasing call for differentiation also in often standardized steel buildings, we used the challenge to explore and develop innovative "steel strategies" within the discipline of architectural design. Our focus was on the attempt to push the boundaries of traditional steel construction towards a higher degree of conceptual and structural consistency, spatial excitement and formal intricacy.

For the 2005 Steel Masterclass we were exploring the engendering potential of well established but commonly generic techniques that are used for common treatment of steel: folding, weaving and bundling.

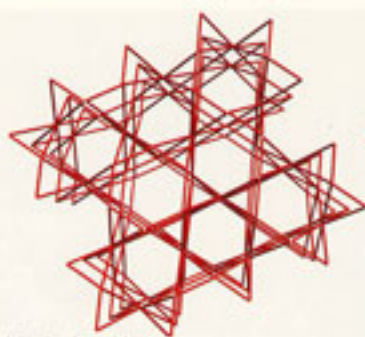
These three themes defined a conscious constraint which split our studio topic into tasks for three different teams: three interdisciplinary groups of several architects and at least one engineer challenged the geometrical and, after all, structural convertibility of complex steel-constructions to transform in degree and kind.

It was our aim to allow a broad development of conceptual designs and construction approaches, which go beyond conventional restraints preoccupied stylistic expression. Channelled by the use of precise design-methods and the necessity of methodological accuracy an integrated approach of fusing strategy, program, structure and form into one entity needed to be to be ensured.

Using the described techniques, the scope of the studio was:

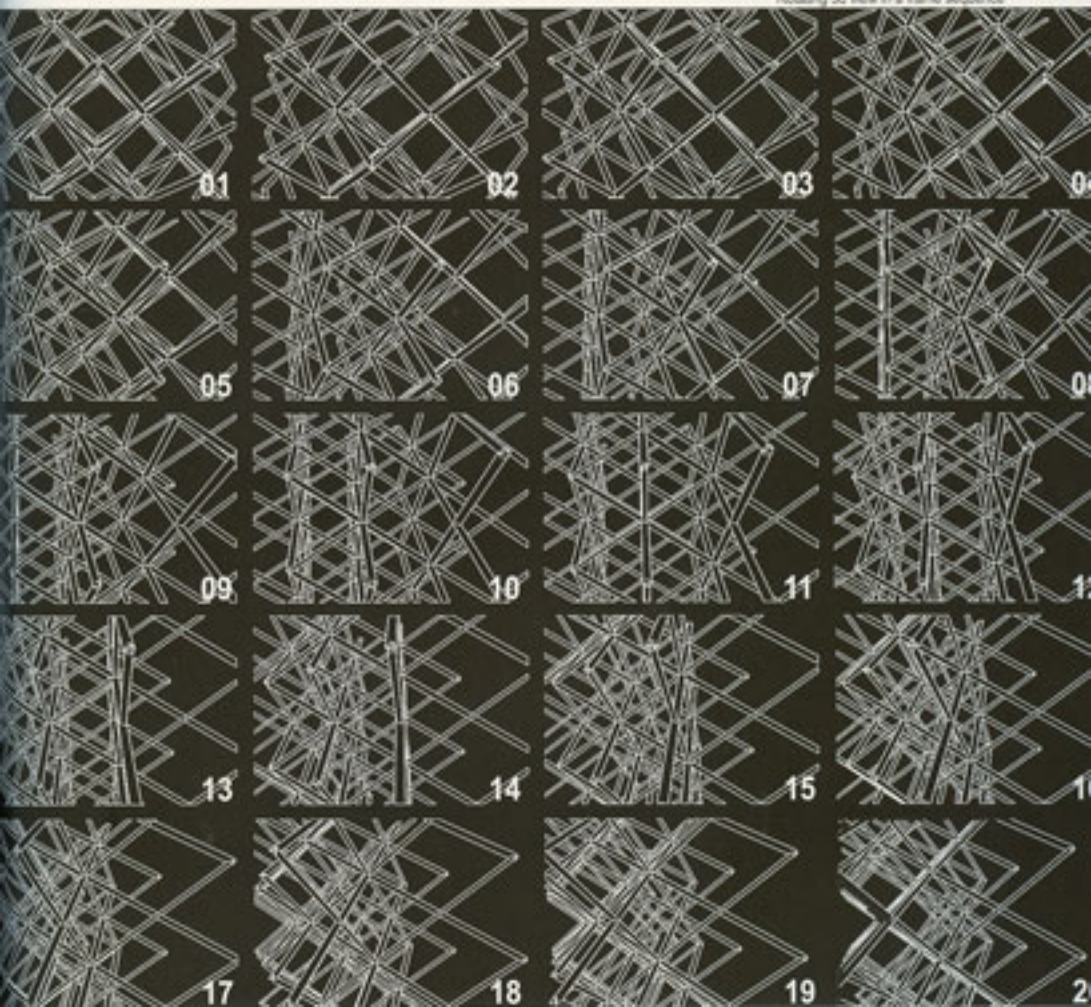
- A) To produce "generic prototypes", which contain the ability to process and evaluate all necessary information to provoke different variations, in sets of test-series or matrixes.
- B) To articulate them as "impacts", or "follies" as one could call them, at specific places and scales with specific needs. Thus a net of "impacts" throughout Rotterdam should mark certain points of crossing information - infrastructure, program, atmospheres, etc. and establish nodes of complementary conditions. (Openness and enclosure, connectivity and seclusion, rigor and looseness, skin and structure, etc. ...) These "impacts" are part of an overall strategy of possible densification of place and program. They are one family but differ in application and intensity of certain parameters.





The increase of complexity by rotating the view point

Rotating 3d view in a frame sequence



WEAVING TRIANGLES

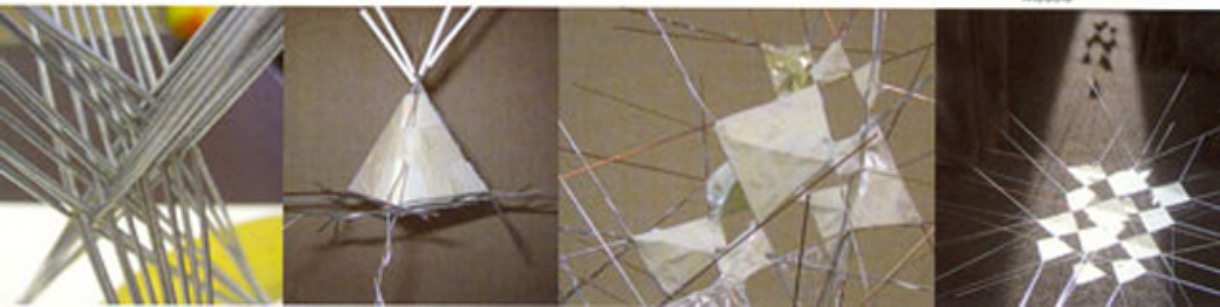
LUMING WANG MENNO KOOISTRA MIHA NOVAK MISJA VAN VEEN THIJIS HUIJSMANS

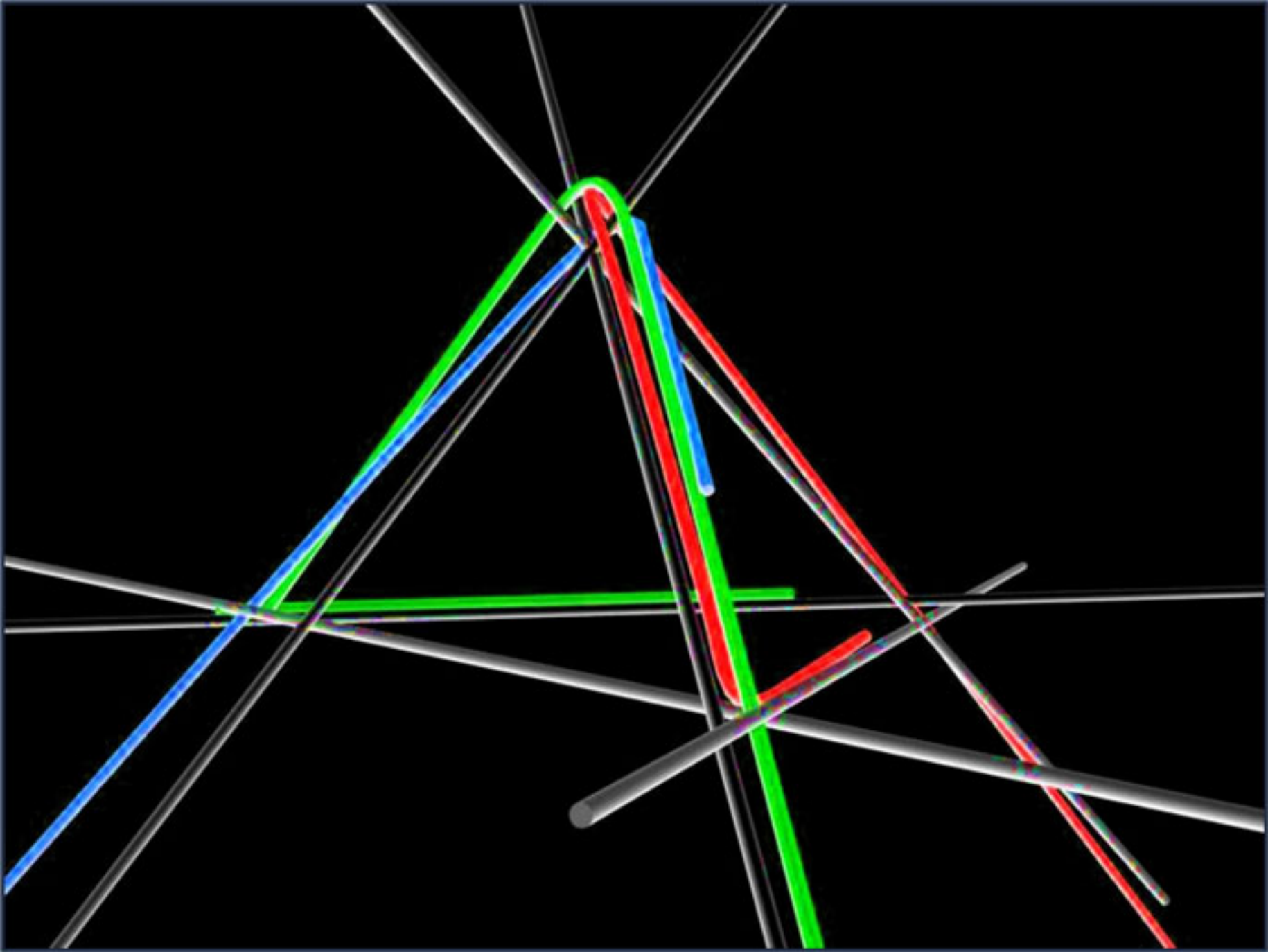
During the workshop the "weaving-team" explored the potential of interwoven steel-structures and their abilities to span, expand and tighten and to create surfaces, spaces and volumes with just one structural system applied.

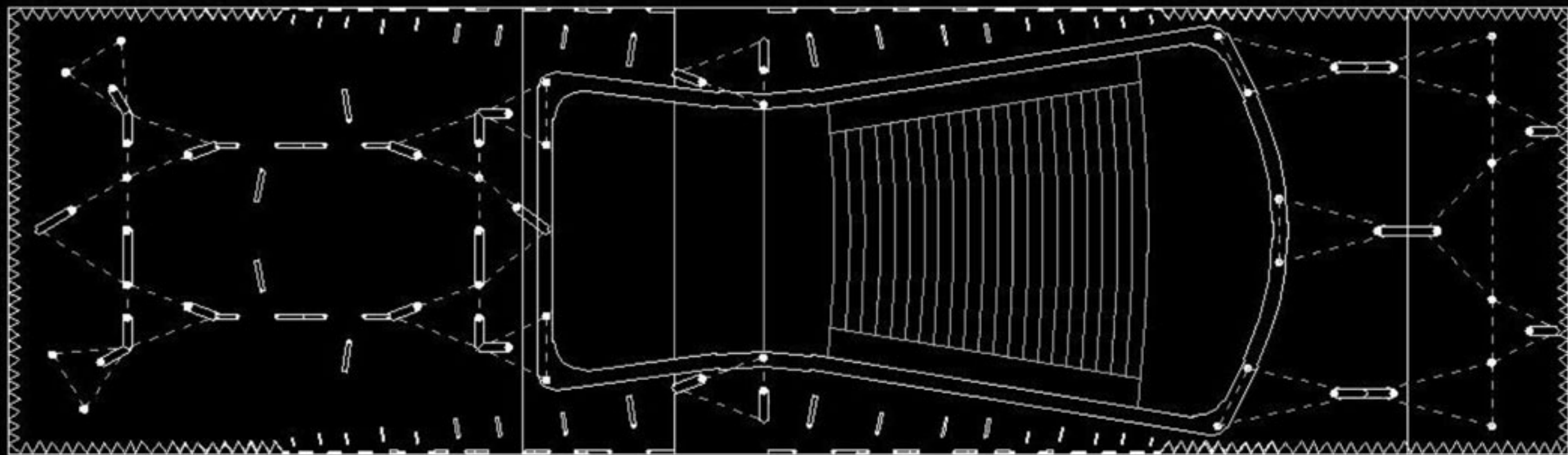
Weaving steel rods or beams as a design technique was playfully tested in model-scale: differently interwoven copper-wires and plastic strands resulted in a variety of conceptual sketch-models that already showed one big common potential or demand – diversity in difference and degree. Such a structure showed the potential to offer solutions on all possible architectural and structural scales and for different or even contradicting purposes. Controlled transformability was a key demand for a successful weaving-technique. The team based its concept on a geometrically rigid and precise overlay of interwoven chains of relations: From 1D (rotated rods that perform as stiff bundles) through 2D (a stable mesh created out of woven triangles and hexagons) to 3D (four distinct 2D meshes interwoven into one continuous spatial structure). All these levels were tested in a series of different research directions whereby some proved to be more successful than others. In general rigid geometry has been necessary to keep the weaving idea consistent at all levels from detailing through to the overall appearance of the design. The result was a regular 3D woven structure that can be adapted by scaling triangles and the bifurcation/bundling of rods. Through these adaptive strategies the prototype's woven triangles can create transitions between open/close, structure/skin and tension/compression elements. By differentiating the scale of the woven triangles the structure can be as big as multiple rooms, but also so dense that all the rods are bifurcated and interwoven to create surface to walk upon or separate space. Through bundling and bifurcating rods certain spaces can be left open and forces can gently be distributed through the system. In this sense woven triangles could be called a scaleable space frame without separate nodes. This resulted in a strong, consistent, self-similar system that could be applied at numerous levels related not only to construction but also architectural, spatial and atmospherical aspects. To explore its potentials the system was then applied to a design with precise demands on program, access and scale. This showed the immense adaptability of the prototype that had to endure several steps of transformation and testing again. The design proposal was a very large habitable canopy structure in front of Rotterdam Central Station. Like a large steel cloud the structure now hovers above a big bus deck while carrying distinct programs enclosed by a space frame of varying density.

This demonstrated that with the prototype developed during the workshop structural, programmatic and architectural design aspects could be addressed through the intelligent application and adaptation of one simple but sophisticated module.

Models







Generic Prototypes

Each team explored the potential of one given topic: folding, bundling and weaving through tests based on physical and digital models and displayed them in test-series to depict their potentials and weaknesses.

A "generic prototype" in the context was defined as a prototype that has the basic potential to unfold and develop its generic code by the means of folding, weaving and bundling, respectively. This creates a variety of possible, promising and increasingly complex specific solutions, different situations or conditions. Here information could be visibility translated into a process of first evaluation and then evolution to respond to specific architectural phenomena. The prototype's virtual potential to create a variety of actual manifestations oscillating between different degrees of sameness and difference of one strong technique is the driving force.

Assuming that formal techniques such as folding, bundling and weaving demand a controlling device, to work towards what we call "engendering geometries", the use of strong principles, such as grids, patterns, clouds, spirals, etc., will trigger unexpected and , more importantly, no longer descriptive but active development and will implement the necessary formal precision.

Impacts

Your body deserves 10min of pure pleasure and total indulgence.

Based on the elaborated generic prototypes each group had to produce a number of "follies" during the second part of the workshop. To confront the prototypes with specific programmatic and site specific information, the impacts were to be placed at different locations throughout Rotterdam to establish nodes of complementary conditions of an overall strategy of possible densification of place and program. The follies were to be a member of one strategic family but should differ in terms of program and appearance according to their differing locations and conditions. Two complementary programs had to be fused within each folly. One program was related to the folly's function as an infrastructural hub, as tram-, bus- or boat stop, park and ride-terminal, etc. The other had to respond to the wish of filling a certain waiting time with activity, such as a short-film-cinema, a prayer room or a health centre etc. The adaptability of climatic change, the transition of space, the variation of program within the system and the transition between structure and skin had to be taken into account.

The complementary programmatic demands asked for different degrees of openness and enclosure, connectivity and seclusion, rigor and looseness, etc. to cope with all necessary extremes and their gradual derivatives.

