

SYMMETRY IN BUILDING TECHNOLOGY

"PAPER"

PETER SCHMID

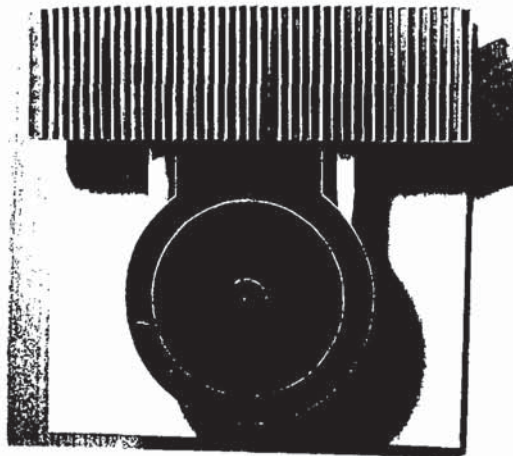
0. INTRODUCTION

We understand Symmetry within Building Technology as a fundamental and morphological phenomenon. We understand Symmetry moreover as a basic 'form-shaping' principle in order to 'arrange' material in accordance to the construction and function of buildings, which - naturally or artefactually - has to be fulfilled.

Taking this 'statement' into consideration we will firstly look to the material parts of Architecture and Building as a first item of study, which generally excludes the spaces or rooms which just and mostly - at least in Building - are literally embraced by the material parts in this field.

After this an excurs will be made towards assymmetrical formations in Building Technology in order to see their possibilities and limits.

Finally we will try to conclude with a view on the whole of the discussed subject towards some guidelines for research, design and development within Building Technology in relation to as/symmetric(al) structures.



1. SYMMETRY IN BUILDING

In the material part of Architecture, Engineering and Building Technology we distinguish besides the Building Principles, like masonry or modelling Building Systems, Building Parts or Elements, from which a System is composed, and Joints, Knots or Details, which connect or help to connect the Parts in order to be able to realize a whole System. Those Details of course can be and are mostly supported by various types of Means.

Looking to those, mainly, three categories of objects which together makes a whole, in Architecture and Building Technology, we find a clear dominance of symmetrical objects:

Although a whole building system might be not symmetric, observing the composition, there are even in majority, nearly always, symmetrical shaped fragments of a whole asymmetric system. The Building System Types of representative, monumental, public buildings - small or big - of the past and the present illustrate convincing this short analysis.

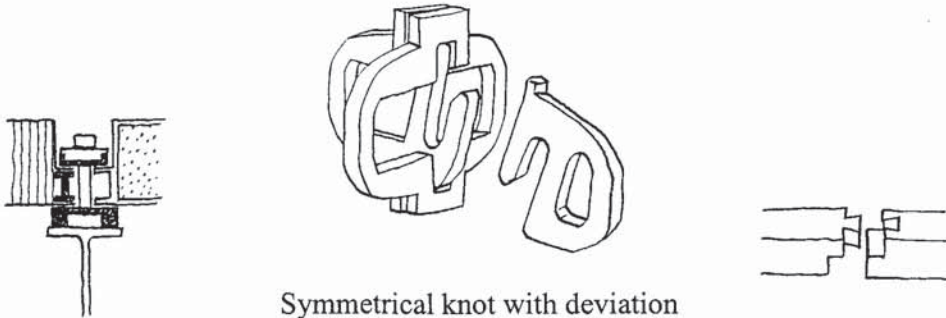
The Building Parts, Elements and/or Components of a Building/System again show quite more symmetrical than asymmetrical shaped objects. In spite of e.g. several 'one-sided' orientated movements of building part, like doors with their consequences in the (one sided) position of locks most of those components have their symmetry axis: windows and doors, wall and floor elements, roof girders, nearly all of the various tiles

Finally we look to the smallest 'part(icle)s' in the 'story' of Building Technology - the Joints, Knots, Connections, Details and the various Means, which help to connect the components more or less durable or even sustainable. And again we can find mainly symmetrical objects. Symmetrical on base of one or even more axis or levels.

Joints, rabbets, seams, nails, screws, spikes, dowels, pegs, plugs They all have dominating symmetrical shapes. The material, which the various means for connection displace, the eventual whole, prepared to be filled with such a mean for connection - of course - is symmetrical as well.

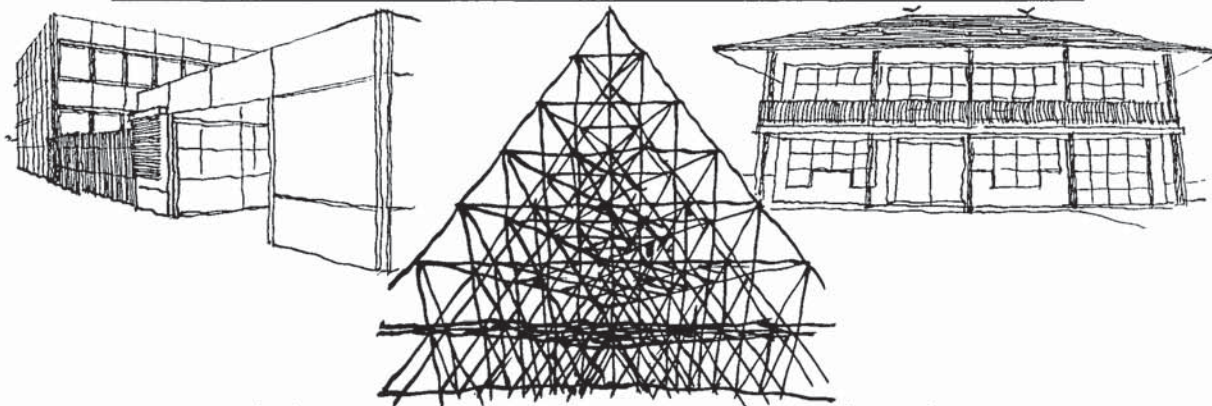
Having briefly analysed the dominating symmetric configurations of the various categories of Building Technology, the question arises, whether there is perhaps (already) a methodical approach or method for designing Building Knots - Components and Systems developed and available, a method in or with which the use of the knowledge about the symmetry of the parts could help systematically to reach (better) results. It seems there is no method for this purpose.

AS-SYMMETRY IN BUILDING TECHNOLOGY ILLUSTRATIONS



Symmetrical joint in curtain wall

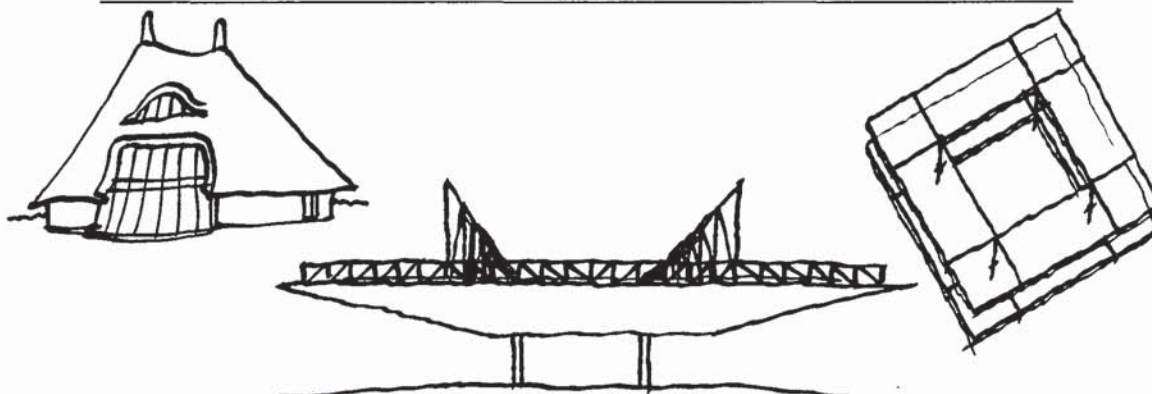
Wellknown dovetail connection



Assymetrical arrangement

Architectonic symmetry

Symmetrical space frame structure



Symmetry with deviation

Fully symmetrical building

Cantilabering building system

Some Examples of As-Symmetry in Building Technology
Knot, Joints, Parts, Elements, Systems, Structures

2. ASSYMMETRY IN BUILDING

Since within the polarity of principles Assymmetry seems to be the counterpart of Symmetry, it could be worthwhile to investigate the place and meaning of assymmetrical building structures and parts as well.

From the viewpoint of geometry and morphology it is imaginable to design and to make not only assymmetric buildings, rooms and building systems, but also elements and joints, which all could fit to each other in the sense of a harmoniously structured whole.

Actually there is always a strong and conditional relationship with the constructive and functional aspects and demands, to be fulfilled by Building Technology and its Parts. Those demands have to make with the use of buildings on the one side and with the structural-constructive necessities on the other side. Taking this additional aspects into consideration, we can explain the reasons for assymmetrical shapes in e.i. the need of cantilevering, (partially) enclosing, embracing,

However, most of the assymmetrical shaped objects still show a symmetrical profile or cross section of the basic 'element' which possibly is assymmetric shaped in its 'bigger' form.

It seems, that the smaller building elements are, the more they will and have to be symmetrical. The larger the building elements are, the easier it is, and may be, the more necessary it could be, to design assymmetrical objects for special purposes.

Zooming in on those circumstances we possibly could paraphrase that one 'point' necessarily is symmetrical, while an additive system or system put together from smaller systems or objects, gets the chance to be assymmetric.

An important remark should be made about the consequence or exactness of symmetry, certainly - if allowed - when we take living systems and Architecture into consideration. So, a cell, roughly can defined as symmetrical, while the 'nucleus' of the cell has a slightly assymmetrical position within the cell. The Symmetry in architectural objects - the decorations mainly in a previous time, functional rooms nowadays show again slightly different propositions while they, roughly spoken and generally, are symmetric.

It might be that those Deviations ('Abweichungen') have an essential value, likewise the little 'deviation' from the exact, geometric Symmetry in the human body in the most of the objects of nature, as Bionics teaches us.

3. SYMMETRY AS DESIGN AID

We would like to make a “try-out” for a “symmetrical-design-aid” a SDA for Architecture, Building and Planning, mainly focusing on Building Technology. As an effect of the causes, as described in the former chapters, Symmetry and Architectural Symmetry is - however - a dominating and basic principle of forming and shaping in Nature as well as in Building Technique.

The method of SDA - SDAM contains the following rules and can be described as follows:

- A building system has to be symmetrical structured, while a number of such systems could be composed in an asymmetrical position (to each other).
- A building part, element, component has to be shaped symmetrical, while the arrangement of such parts might be asymmetric.
- A building joint has to get a mainly symmetric form, while the disposition of those joints might be asymmetric. The connecting (sub)parts of a joint might be asymmetric, but brought together into the state in which they finally fulfil their task, again they show a symmetrical ‘gestalt’.

We did not describe the rules so far, that the various ‘degrees of symmetry’ were discussed. Of course we see the possibilities of certain orders of symmetry along one or more axis and even ‘all a round’. An interesting game could be played with the application of the various degrees of Symmetry on the Building Systems, Parts and Joints. We leave this, to be worked out more detailed, to another paper or chapter of the ongoing research. The use of computer eventually could bring us quicker towards richer visualisations and realisation in this field, but the principles have to be explored by the creativity of the mind.

The disbenefit of an overvaluation of Symmetry could be a certain limitation in design. The benefit - beside and based on the natural ‘Gestalt’ principle can be found in the relatively clear order and constructive functionality of the arrangement of matter(s) in a kind of guaranteed equilibrium, and in connection with this, the chances for a calm and harmonious appearance.

Accordingly ancient (Hatha) Yoga guidelines from India - Asanas, special exercises, have to make us symmetrical in order to keep balance and health in life generally and - as a remark of the author - the built environment should support this.

4. CONCLUSION

We briefly discussed in this paper the place and meaning as well as the strong and weak aspects of the application of As/Symmetry in Building Technology.

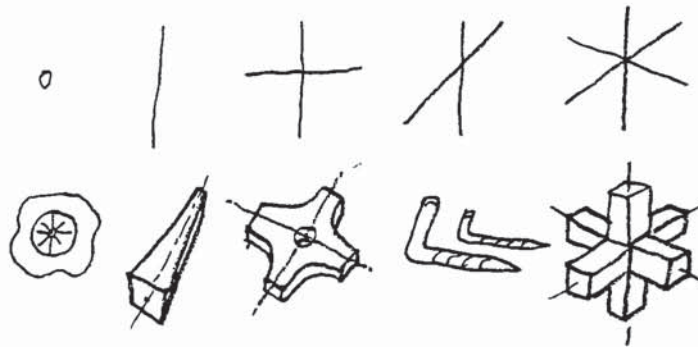
The phenomenon of As-Symmetry itself - doubtless - is of enormous importance not only visually but also functionally and constructive.

The arrangement of (building) materials in a symmetrical way is simply 'natural'. With the exception of a certain 'deviation' it became obvious, that Building Systems, Building Parts and Building Joints have mostly and mainly a certain symmetrical form or shape.

This analysis invited us to formulate some rules for a SDAM, a Symmetrical Design Aid Method, which could help to get even new solutions in the field of Building Technology, Architectural Engineering and Architecture, but possibly also in the dimensions of city/town and regional/physical planning.

This, by the way, meets also with some typical rules, applied within Indian Sthapatya Veda of Chinese Feng Shui traditions.

Beside the so-called practical aspects - a "symmetrical approach" could help to support the forces, directed on a calm and harmonious appearance, which will work towards an equilibrium and which effects the users as well as the environment positively.



SELECTIVE BIBLIOGRAPHY AND REFERENCES

The Consultation and Discussion group around the Chair of the author **Architectural Completion (Milieu-Integration)** - of course within the university - worked on some of the items - **Symmetry in relationship to Architecture and Building** incidentally during the last 25 years.

The Working group '**Harmonical Ellips**' a section of the Society Integral Biological Architecture (**VIBA-Vereniging Integral Bio-Logical Architecture**) in The Netherlands deals with concerned aspects for nearly 20 years.

The author paid attention to **Symmetry** in some of his publications like:

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