# Design of structural detail - trends in architectural teaching

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ABSTRACT: The aesthetic meaning of detail is growing. It is being enhanced in the background by the increasing quality and diversity of modern materials. This opens new challenges and options to architects for variability in their production. Architecture is perceived in the first place through expression, form and context within its surroundings. In the second place, details have been evaluated. However, this does not mean that detail is secondary; in fact, structural detail creates delicacy in architecture. This article deals with problems of methodology in the creation of structural details in education, analysis of theoretical, technical, material and surroundings attributes. The aim is to determine a methodology for defining a suitable materialisation of detail and also defining negative influences in construction details. The conclusions focus on the evaluation of a suitable procedure for the teaching of detail design through so-called problem education.

## INTRODUCTION

Architecture without quality detail is imperfect. This axiomatic statement has its frames of objectivity. The quality of architecture is also dependent on the level of detail regardless of both the distance from which the given object is perceived, and the size of an object. The larger the distance an observer is from an object, it could seem that the above mentioned statement is not true. With closer contact with architecture, however, a detail moves into the *focus* of the percipient of an object. From the view of perception of an architectonic detail, the term graininess can be used. Here, there is some parallel with the term *graininess in urbanism*, which is connected with the intensity of function integration in an area and its availability [1].

A detail creates *fine graininess* of an architectonic structure, which requires preciseness in suggestion and consistency in creation. This fact should become a certainty in architectonic suggesting, it is equally essential during education and it must be transformed into the methodology of teaching. Regardless of the possible polarisation of opinions on the importance of detail in the study of architecture, it is an important relationship from the point of conception, which always closes the process of suggestion, and it is a part of a unit. Mutual connection of architectonic and structural aspects of a detail is inseparable for this reason.

## DISCUSSION

A detail can be a jewel of architecture but it does not have to add beauty to it. A quality detail, structurally and aesthetically, is not only a privilege of civil character or buildings which are frequently visited in town centres and dwellings. A good detail is a privilege of a good architect. Or a good architecture without a detail does not exist, as stated by Slovak architect A. Alexy [2]. This is the reason why in teaching subjects Building Structures and Design Studios in the School of Architecture at the Faculty of Architecture of Slovak University of Technology in Bratislava, Slovakia, they stress it from the view of aesthetics, but also of its anatomy.

A detail must be in unity with an overall solution of architecture, a detail is also perceived through development of technique and technological solutions. E.R. Ford claims: …*Detailing is only appropriate or inappropriate, not good or bad, or it is good or bad only in the way the building is. Detailing is no more deterministic than design. It is simply a design process informed by technology* [3].

In the same way as at the architectonical concept stage, there is also a necessity for a great amount of architectonical feeling at the design of a structural detail. Even though there is a concentration of different scientific areas for a small area at creation (one means of a detail), the scope of a subjective attitude in the process of design remains. Naming of groups of details as articulated and abstract can be found in theoretical works. It can be said that a clearly divided,

noticeable detail is articulated and shows the relatively strong factors that form it: material, composition, dismantling eventually. On the contrary, an abstract detail works with the factors presented so that the result is almost their invisibility. This fact is easily defined by connection: abstract - absence [4][5]. In a similar way, R. Koolhas, a top and awarded architect of expressive and also clear lines, has stated that …*an exceptional detail should merge and should not dominate in architecture*. This opinion can be completed: detail should complete the concept and a thought of an architect through a hard (relatively difficult) work with factors (Figure 1). Interesting definition is that detail is the type of diagram, where there are correlation between particular phase of designing and technical limits [6].

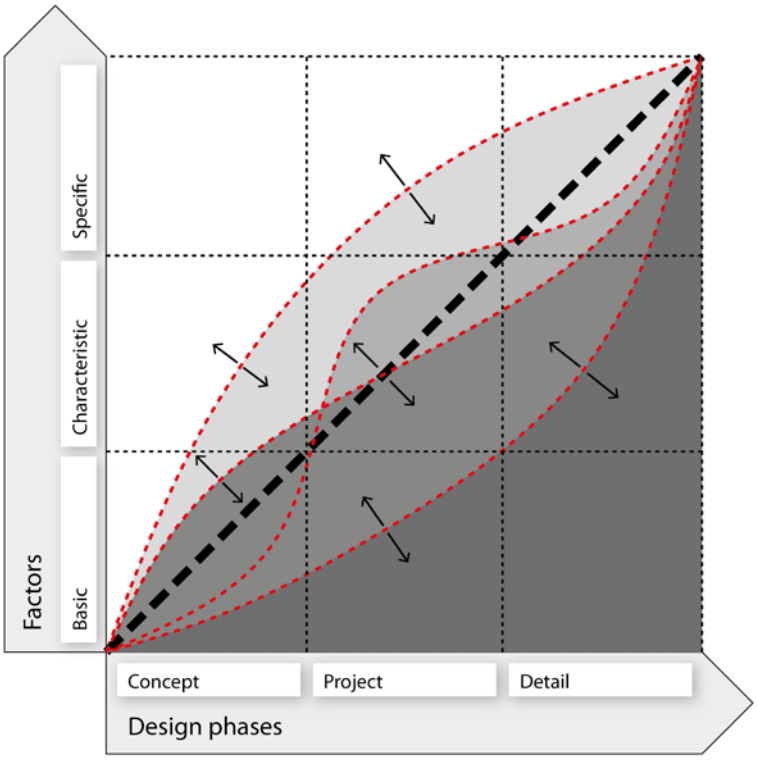


Figure 1: Growth of factors from basic to specific in various phases of design in architecture and detail; trend line changed according to the number and importance of factors ------- average trend line – – – –.

A DETAIL AND A UNITY - A UNITY AND A DETAIL (POLARITIES OF A DETAIL IN AN ARCHITECTONIC PIECE)

The problem of a mutual relationship and concept of an architectonic piece goes through the whole history of architecture. It is a relationship that many people damn and others admire. It is a philosophical problem, which is connected with a total development of opinions on architecture and its communication with the environment. The design process is determined by various factors that can be divided into the task (aim) influence of architect and the environment [7]. Also, the biggest personalities of world architecture create original details at the realisation of their concepts. World companies, which are interested in the development of design, support the development of details, particularly, in important buildings; such an attitude helps to widen the scale of details.

Many buildings often influence by their realisation, an origin of experimental details which, then, go to the catalogue of a company and they are at disposal also to other clients. For example, in the Jansen company catalogue one can find profiles designed by N. Foster's studio. R. Rogers and R. Piano advanced development of hanging and steel structures. Piano advances details of ceramic circuit panels on more constructions. Foster's tall and ecological constructions verify details of windy façades. The architect M. Botta also advanced ceramic circuit bricks. R. Meier has been credited with development of enamelled façades. J. Nouvel and R. Koolhass have experimented in the area of media façades. A new minimalistic wave (P. Zumthor, A. Siza, Herzog, de Meuron, and others) uses originality of a detail based on non-traditional combinations of materials for getting an expressive result. In these cases, detail is the basis for individuality in the expression of architecture, which is becoming a *signature* of an architect [8]. That is why the role of detail is a priority in current architectonical trends.

To express a unity of a detail with a concept level of presentation is important. From this point a detail, which is *open* or *hidden* (visible or invisible), exterior or interior, a detail with majority of construction - physical essence or the accent is put only on expression. In issues regarding a detail presentation, there is a question of a supposed trend of a creation of construction detail. In the area of a present *industrial digitalisation*, there is a trend that contractor companies are becoming routine creators of details, which they offer to architectonic offices. Their details are technologically advanced, but they miss the author *essence*, copyright of the author. Until the 1990s, architects created the detail,

nowadays, they mainly do the finishing touches. This tendency is going to go in a direction of overlapping architectonic-construction creation of a detail into the sphere of research of material, surface finishing and construction-physical characteristics of material. Companies dealing with development of construction materials determine the options and restrictions of detail creation and, so directly the level of reality according to the requirements of an architect. On the other hand, the architect is required to have the knowledge of qualities of material, so that its requirements are kept on a real level. The proof of this trend is e.g. development of nanomaterials which, in comparison with traditional materials, have different physical and strength characteristics and their construction plan causes a revolution in architecture. This development required a preparation of architects, designers, who have to know the rules of creation, but also the options and influences of modern materials on their creation.

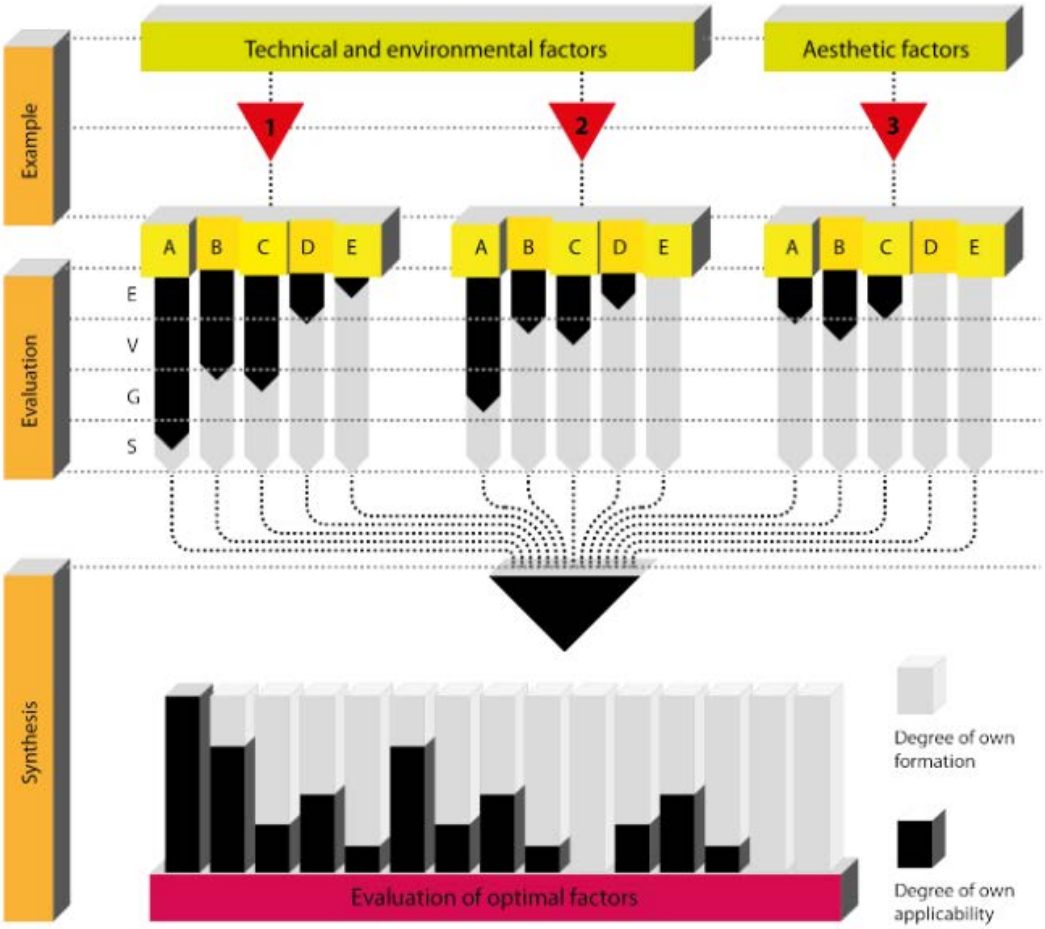


Figure 2: Methodics of analysis and factors evaluation in teaching the details in architecture; E - excellent, V - very good, G - good, S - satisfactory.

In connection with detail creation, it is necessary to profile methods of detail design, which have also changed from traditional to digital ones. Digital methods are important in the creation of a detail, because they comprise not only the detail but also technically prove and simulate what was not possible in traditional methods. Software methods enable reaching the same extremes of a maximal range of evaluation of different parameters of these details qualities [9].

## DETAILS IN TEACHING ARCHITECTURE - METHODOLOGICAL ASPECTS

To ensure quality of details in architectonic practice, one also has to create conditions and aims for it in education. It is necessary to search constantly in an area of teaching methodology also, if it is a relatively constant part of a standard creative process of architecture. An architectonic - structure detail is taught in the Faculty of Architecture of this University in different subjects during the study, but a creative dimension in creation of a detail logically starts at the higher levels of the study of architecture. The detail creates an *extra construction* in the basic content of study. Difficulty of the teaching process is in its exceptionality, which is determined by perceiving of a detail as *delicate granularity of an architectonic structure*. This fact, from the above mentioned reason, requires searching specific procedures. In teaching, mainly at the second level of study, basic methods of scientific and creative inquiry (empiric and logic) are applied as a starting point for creation of a construction detail on the one hand and, on the other hand, the gained knowledge is reasonably synthesised for particular problems [10].

In the 21st Century with its technological innovations, economic and cultural direction have essentially changed the basics of traditional education models. The most significant changes are in applying models with active participation of

students and using case studies. These cases enable students to experience the problem directly, and solve it, while the student learns and remembers 80% of the problems. [11]. It is extremely important in the education of architects, because teaching, which applies case studies reminds students of the project itself, demonstrating what awaits for them in their future life.

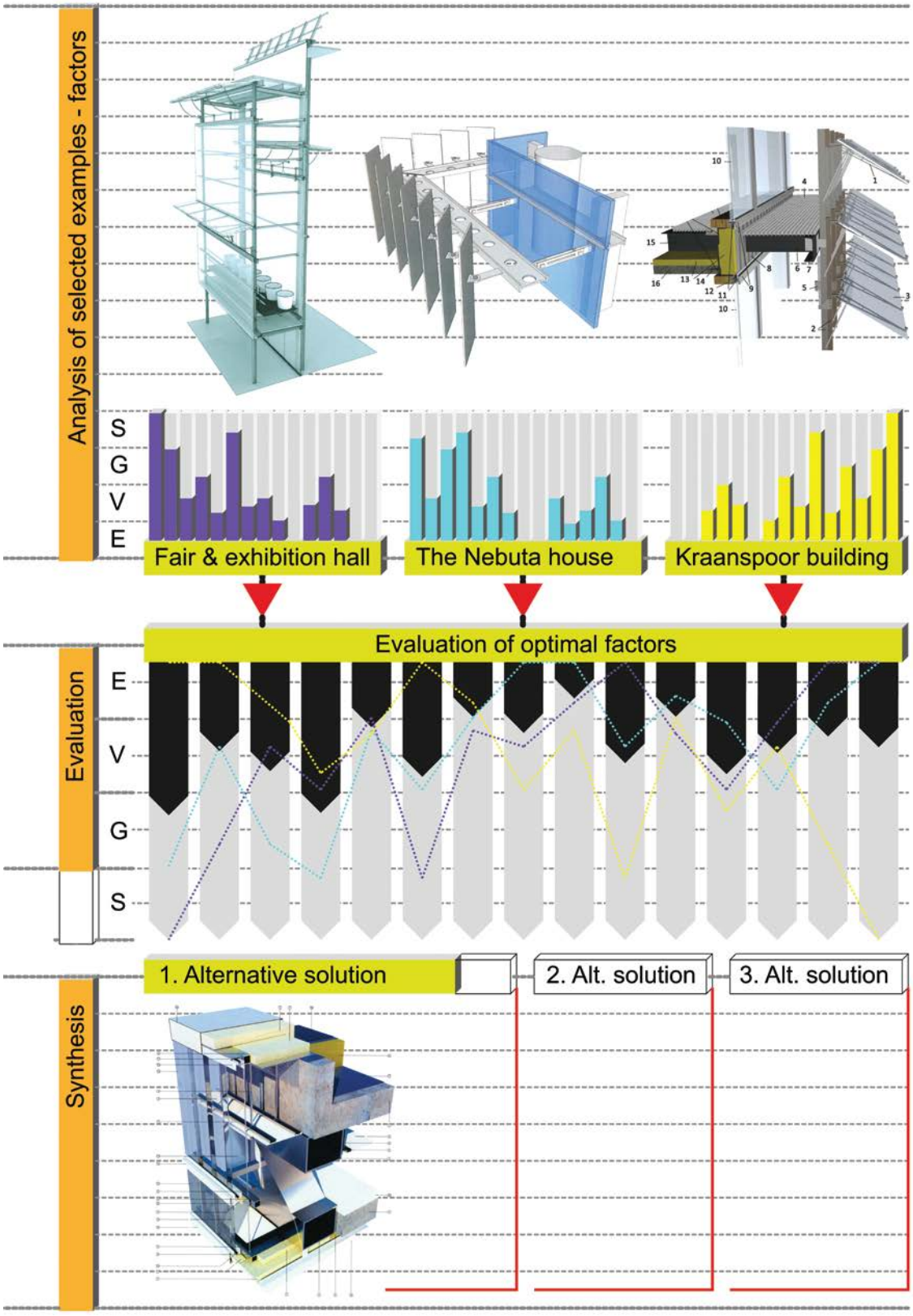


Figure 3: Application of methodics (shown in Figure 2) - analysis, evaluation of factors in existing details, following up synthesis in design of new and alternative detail; E - excellent, V - very good, G - good, S - satisfactory.

The essence of the new methodology is in analysing, evaluating and applying the gained knowledge. Graphic representation in Figure 2 is about defining technical - environmental and aesthetical factors, about evaluation of the selected details for interior and exterior in order to generalise knowledge.

Defining of an input (influential) factor as materialism, construction - physical characteristics, resistance in connection with extremes of the environment, durability in connection with using, recycling, storing, keeping, belong to technical - environmental. An important aspect in detail solution is aesthetics and its factors: originality, texture, structure, colours, and the quality of performance. Evaluation of detail qualities (different case studies) according to presented factors led to the development of a *model* of a suitable representative whose qualities students will integrate and modify for their own suggested detail, which was their task to solve. What is the sense? It is to search, analyse, study, have one's own opinion, discuss, not to solve what has already been solved, inspire in a detail design, synthesise. In the methodology, as presented in Figure 3, the teaching process is divided into three units (phases):

*In the first phase* - it is about individual study of the chosen details with stress on the anatomy of factors, qualities and function of materials. The process of education is oriented to the responsibilities from the side of a student: studying a number of examples... searching, observing aesthetics, material and functional side, selection of knowledge and evaluation.

*In the second phase* - there is a choice of a suitable representative for other elaboration of a problem itself (a detail) - in a line: solidifying and transforming gained knowledge and understanding, forming of conditions of one's *own case studies* and applying procedures from general to particular, relationship studying of a problem in connections, excursion in terrain, confrontation of theory and practice.

*The third phase* - design of a detail itself as a result of synergy of the gained knowledge and skills. Presentation of a proposal and argumentation of an individual solution in connection with a pre-set task as part of teaching methodology. Attention is given also to a possibility of using it in practice. It is the main aim, because sensible teaching is a training for practice. Real problems and conditions are a methodological accelerator for students to produce quality outputs.

## CONCLUSIONS

Concepts of detail creation are based on complexity and their mutual sign is a vision (idea) of connection of creativity and limits, which structure puts in the way of creators. Analysis and synthesis - two inseparable poles of scientific and creative work are a natural part of the methodology of teaching details. In teaching about details, one can rely on the methods presented, but it is always necessary to accommodate them to the problem set by combining traditional procedures and to *oxidise* it with traditional methods.

Traditional analysis of structure and expression of a detail *on paper* and following a model verification of construction principle of famous objects are methods significant for the Bachelor's degree; creation of one's own designs is more typical at the engineering level. This gradation of content and methodology brings effect, which can be called *teaching (knowledgeable) and pedagogical profit* and, also, a hope that a creation of architectonic - structure detail will be attractive for students and in accordance with the responsibility in architectonic creation that equates *quality detail* with *quality architecture*.

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