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GESTURE AND PRINCIPLE IN URBAN TECTONICS – AN EDUCATIONAL CASE STUDY

MARIE FRIER HVEJSEL, LEA HOLST LAURSEN AND
POUL HENNING KIRKEGAARD

Abstract

Grasping the spatial relation between urban design and architecture is a recurring challenge in the education of urban designers and architects alike. In the hectic and economically challenged context of construction practice the built environment suffers increasingly from a split between the two disciplines, leaving us with disconnected volumes and surfaces rather than inviting spaces that address the human scale.

In its capacity as a spatial theory of construction the notion of tectonics holds a potential to bridge the two disciplines. This paper explores that potential through a re-reading of the tectonic theories of Eduard F. Sekler. Given Sekler's background in the emergence of urban design as an architectural discipline at Harvard in the 1950s and '60s this re-reading enables a critical linking of architecture and urban design, volume and surface, by means of the human scale. This re-reading has led to the development of an analysis and design method that we apply in our urban design program at Aalborg University. Part of this program is the Urban Tectonics workshop, which links the analysis and envisioning of spatial *gestures* with the analysis and creation of construction *principles* in the students' projects.

Using this workshop as a case study the paper explores the potential of applying tectonic theory as an educational method of grasping the spatial relation between urban design and architecture in urban design education. The paper concludes that the workshop has awakened the students' eyes to the spatial and structural relations between building interior and urban space. Moreover, it has strengthened the students' critical approach to their future professional practice.

Keywords:
tectonics, urban design, architecture, scale, education

1 Introduction

Cities are evolving at an increasing pace that makes it ever more difficult to grasp the subtle spatial and constructive relation between urban design and architecture that is crucial to our experience and development of the built environment. In the hectic and economically challenged context of construction practice the built environment suffers from a split between the two disciplines of architecture and urban design, leaving us with disconnected raw structural volumes and commuter surfaces rather than inviting spaces that address the human scale. In his *S, M, L, XL* Rem Koolhaas characterizes the conditions of the global tabula rasa as a kind of battle between architecture and urbanism, which he addresses head on through his pragmatic “bigness” approach (Koolhaas and Mau, 1995, p.515).

This battle shines light on the need to bridge large-scale urban mobility strategies and structural *principles* with a detailed architectural understanding of the subtle spatial *gestures* needed to invite urban dwelling and interaction on the human scale. The notion of principle refers to a technical understanding of construction on behalf of the architect/urban designer and the notion of gesture to an aesthetic understanding of space. This refers to the question of our roles and responsibilities as architects and urban designers. This question was already evident in Le Corbusier’s vast theories on the *City of Tomorrow and Its Planning*, which contained an often overlooked call for sensibility rooted in an in-depth understanding of architecture as a space (Corbusier, 1924, p.39).

Repositioning this call for sensibility and addressing of the human scale by transmitting a sense of interiority to its inhabitants is, from our point of view, the finest potential of the built environment. It is a common challenge for architects and urban designers alike, a challenge that starts when they are students. However, we lack theories and methods that enable us to join forces in this matter and methods that allow us to study simultaneously volume and surface, space and construction, movement and motionlessness. By referring to the methodological implications of the task of the *tekton* of unifying aesthetics and technique in the creation of architecture in general, this paper argues that tectonic theory offers a unique potential in this matter.

Within the field of architecture tectonic theory has been applied as a means of architectural analysis and criticism since its emergence in German architectural theory around 1850, continuing through its reintroduction in, especially, Kenneth Frampton’s seminal work in the 1990s (Bötticher, 1852; Semper, 1851; 1861; Frampton, 1990; 1995). Recently, the notion has also become associated specifically with the development of digital fabrication and certain experimental material technologies and fractal geometries in architecture (Leach, Turnbull and Williams, 2004; Reiser and Umemoto, 2006; Hensel, 2013). In the field of urban

design, however, no explicit development of tectonic theory and method has emerged. As argued by Torben Dam, who has studied tectonic theory as a possible provider of meaning and quality in urban design and landscape architecture, “enhancing constructional thinking forces the landscape designer and partners to design with a deep understanding of ‘constructions’ including terrain, sustainability and plant dynamics” that he states to be needed but still unarticulated (Dam, 2007, p.5).

Continuing this line of thought, we have observed that the work of architect and architectural historian Eduard F. Sekler has the potential to pursue such articulation. Sekler’s etymological distinction between structure, construction, and tectonics, in particular, outlines a direction for associating the spatial language of architecture and urban design with that of human body language. This association provided a methodological and theoretical grip that he applied successfully in his work as an architectural historian and professor of architecture and urban design (Sekler, 1964). This paper investigates the contemporary educational potential of Sekler’s tectonic work through a case study on urban design education. Consequently, the research question is to investigate whether tectonic theory can be applied as a methodological means of grasping the spatial relation between urban design and architecture in urban design education.

2 Method

We conduct a re-reading of Sekler’s tectonic theories and his work on urban design education related to the current challenges of urban design practice. Given Sekler’s background in the emergence of urban design as an architectural discipline at Harvard Graduate School of Design in the 1950s and onwards, this re-reading enables a juxtaposition of architecture and urban design, volume and surface, by means of the human scale.

This linking of architecture and urban design was applied in the development of an analysis and design method that we applied in our urban design program at Aalborg University through a workshop entitled “Urban Tectonics”. This workshop allowed the students to articulate and link the analysis and envisioning of spatial *gestures* (describing what the space does) with the analysis and creation of construction *principles* (describing how it does it) in their urban design projects.

The first part of the paper presents the development of this analysis and design method at a theoretical level, while the second part uses the described practical workshop as empirical material in investigating the research question. The paper presents this workshop as a case study discussing the potential of applying tectonic theory as a methodological means of grasping the spatial relation between urban design and architecture in urban design education.

2.1 Emergence of urban design as a discipline

In works such as Jørn Utzon's *Sydney Opera House* or the *Piazza Del Campo* in Siena, large-scale urban mobility strategies and construction principles need to be bridged with a detailed architectural understanding of the subtle spatial gestures. Such a bridging aims at providing inviting urban interaction and such spatial gestures seem to be readily visible in these cases. In the first case an urban platform and the shimmering shells of the roof structure create a gathering point without precedent, and in the second, a gentle inclination gathers the focus of an entire city by directly addressing the human scale.

In such gestures, stemming from an active shaping of structural elements, we are reassured of the finest potential of the built environment: to move its inhabitants by transmitting a sense of interiority without the built environment being reduced to a structural framework. However, the articulation and the revealing of this quality within the multifarious and economically driven construction practice is a recurring challenge that involves both architects and urban designers.

The work of Eduard F. Sekler deals explicitly with this need and is to be understood within the historical and geographical context of Harvard Graduate School of Design (GSD) from the 1950s and onwards. Josep Lluís Sert, appointed dean in 1953, inaugurated the seminal series of Urban Design Conferences that led to the establishment of the urban design program at the GSD, often described as the emergence of Urban Design as a discipline (Krieger and Saunders, 2009). As exemplified in the title of Eric Mumford and Hashim Sarkis' account for this development – *The Architect of Urban Design* – the environment at Harvard was dominated by European architects such as Sigfried Giedion, and many of them had formerly been involved in CIAM (Congrès Internationaux d'Architecture Moderne) which Sert had chaired from 1947 to 1956 (Mumford and Sarkis, 2008; see also Mumford, 2002).

In this way the teaching and research at Harvard was influenced by these architects' reaction towards the advancing inconsistency of the urban development especially visible in the booming American cities at the time. This marked a continuation, so to speak, of CIAM's effort to articulate the nature of architecture within modern society by addressing the opportunities and challenges related to industrialization from an architectural point of view. As argued by Alexander Cuthbert, there are perspectives, other than this distinctly architectural one, that are significant and decisive to the development and definition of the discipline of Urban Design (Cuthbert, 2010, p.444; Krieger and Saunders, 2009). Cuthbert mentions that urban design also emerged as a social, economical and political discipline, visible, for example, in the Civic Design program that was established in 1908 at Liverpool University.

A critical analysis of this matter lies outside the scope of this paper. Rather, we deliberately focus on the relation between architecture and urbanism education. The development at Harvard and the work of Sekler mark a direction that is likewise evident within our specific Danish context. Here the long-time work of architect and urban consultant Jan Gehl relates to the urban design tradition at Harvard, as he is a strong advocate for focusing on the human scale when developing the urban environment (Gehl, 1971). Gehl has analyzed extensively urban spaces and thereby developed *principles* for how they can address the human scale. Gehl is strongly inspired by the work of Jane Jacobs and her ply in the book *The Death and Life of Great American Cities* (1961) for planning at eye level. In our work we build upon both Gehl's and Jacobs's analytical positioning of the human scale in the urban environment.

Gordon Cullen, who used the human perspective to record *The Concise Townscape*, has also worked in order to position the human scale urban design (Cullen, 1961). Likewise, Aldo Rossi and Robert Venturi, who account for the significance of the architectural artefact to the experience of the city as a whole across time, define the foundation for our work here (Rossi, 1966; Venturi, 1966). We try to build upon this continuous spatial understanding of architecture and urban design by relating it to the technical question of making implied in tectonic theory. However, we intend to zoom in a bit further – on the physical relation between building and urban space – and to pursue the development of a design method rooted in a spatial moulding of urban space and architecture related to the human scale. This is connected to our conception of urban design practice at Aalborg University where we consider the focus of urban design as the shaping and designing of urban spaces and discuss how to develop the urban environment in the future from a design point of view (Laursen, 2009). This “is related to a place-specific starting point, meaning that the physical place in many different scales is the main area of interest” (Laursen, 2009, p.29). Thus, the intention of the workshop is to strengthen the ability of our students to:

- analyze, describe, and design experienced spatial quality as an aesthetic relation between the architectural volume and the urban surface
- analyze, describe, and design the structural build up of this experienced spatial quality as a technical merging of the architectural volume and the urban surface

In terms of this spatial relation between architecture and urban design, we hypothesize that Sekler's theories mark a key potential to what we state above.

2.2 Sekler's Harvard – seminars as an example

Given their architectural background, Sert, Giedion and Sekler, in particular, chose to address the challenges of the hasty urban developments by means of an explicit critical focus on the resulting spatial experience

on the human scale. Resulting from this critical stance Giedion and Sekler developed a seminar series entitled *The Human Scale – Advanced Seminar for the Master’s Class*. They made the human scale the central learning component aimed at evoking among the students an individual sense of the spatial relation between urban design and architecture:

Each one of you should know how to handle proportion in his own work. Our discussions should rouse this demand within you, but your own energy must carry on from there. In this seminar we can only expose the principles in their framework (Giedion and Sekler, 1959, fall term p.1-2).

The seminar participants studied an explicitly spatial understanding of the relation between architecture and urbanism as a continuous shaping of spaces for human dwelling and interaction by undertaking spatial analyses intended to identify the key *principles* of the example. This learning approach implies a critical utilization of architectural history exemplifying the etymological meaning of urban design described by Mumford and Sarkis as “the systematic study of methods that permit adaption of the urban habitat to the needs of the people; the ensemble of techniques for the application of these methods”¹ (Webster’s dictionary from 1910; cited in Mumford and Sarkis, 2008, p.16). Consequently, Sekler held the seminar *The Shaping of Urban Space* in 1960 and 1961, which demonstrated a methodological approach of such analyses by means of scale models using the human scale as the breeding ground of architecture, both aesthetically and technically.

1 “Étude systématique des méthodes permettant d’adapter l’habitat urbain aux besoins des hommes; ensemble des techniques d’application de ces méthodes”.

In his article of the same name published in the Harvard Student Magazine *Connection* in 1965, Sekler describes how “urban design needs to be studied on many interacting levels which reach from the most comprehensive to the minute” (Sekler, 1965, p.29). Sekler goes on to explain how this entity can be analysed.

[This entity can be analysed] under such headings as interrelationship of space and volume, sight lines, proportions, dimensions and subjective scale, texture and color, movement and rhythm [...], concluding that treatment of urban spaces in these terms alone, however, would remain superficial unless it were tied at all times to an awareness of the social, cultural and economic conditions that led to the forms and spaces which are finally experienced. Every urban space makes visible and tangible such conditions. They give it vitality and urbanity, and to understand them is as important for the urban designer as to understand the formal and spatial qualities, and the way in which we perceive them (Sekler, 1965, p.29).

In order to grasp the complexity of urban design, Sekler asked the students to make similarly sized scale models of selected urban spaces

mixing historical and contemporary examples for comparative analysis. Sekler's teaching represents a pedagogical linking of the critical analysis of existing renowned works of architecture with design classes, defining an active role of architectural history and theory in relation to future experimentation and design work (Sekler, 1957; Sekler, 1967). By linking the re-modelling of existing works with studies of the conditions under which each case was realized Sekler allowed the students to study the spatial gestures of these examples side by side with the principles employed in realizing them.

Referring back to Giedion's articulation of the intention to evoke the students' "own energy", these analyses represent a critical exploitation of architectural theory and history calling forth a positioning on behalf of the individual student within the field of urban design at a methodological level (Giedion and Sekler, 1959, fall term, p.1-2). This notion of "own energy" seems to refer to the fact that architecture and urban design is always contextual and therefore depends upon the individual architect's or urban designer's ability to read and position herself or himself within this context. This pedagogical approach entails an elaborate discussion of the methodological implications of the urban designer's act and responsibility in unifying aesthetics and technique at a general level. This is also visible in Sekler's account of tectonic theory in architecture.

3 Towards urban space tectonics

In architectural education more generally, a key focus is the evocation of the individual critical aesthetic sense and the ability to envision spatial gestures that address the human body and mind. In addition, the technical skills and ability to experiment with and develop the material and structural knowledge forming the principles needed to realize them within the multifarious context of construction practice are important. Today the increasingly hectic and economically challenged context of construction practice is readily visible in the built environment, which can be read as a split between the two disciplines of architecture and urban design. However, there is also a general lack of the necessary connection between such gestures and principles, leaving us with disconnected raw structural volumes and commuter surfaces rather than inviting spaces for residing that address the human scale.

This lack of understanding of the spatial relation between urban design and architecture is a recurring challenge in architecture and urban design education. Returning to the *tekton's* task of uniting aesthetics and technique in the creation of inviting dwelling spaces, we observed that we need to explore the development of tectonic theory and method at the urban scale – the formulation of an *Urban Tectonics*. To help with this Sekler's 1964 publication of the essay "Structure, construction, tectonics" is used to methodologically link architecture and urban design

spatially by means of tectonic theory (Sekler, 1964). This work outlines a direction for methodologically associating the language of architecture – also at the urban scale – with that of body language, enabling an explicit comparative study of the gestures and principles that signify the experienced quality of the built environment. We look at that in the following section.

3.1 Sekler's tectonic statement

In “Structure, construction, tectonics” Sekler starts out by defining structure “as the more general and abstract concept that refers to a system or principle of arrangement destined to cope with forces at work in a building, such as post-and-lintel, arch, vault, dome and folded plate” (Sekler, 1964, p.89). With this definition of structure as principles, Sekler immediately forms a series of technical components to be applied in the realization of architecture in general. Sekler continues by defining construction as

[...] the concrete realization of a principle or system – a realization which may be carried out in a number of materials and ways. For example, the structural system which we call post-and-lintel may occur in wood, stone and metal and its elements may be fastened together by a number of methods (Sekler, 1964, p.89).

When finally moving into his account for tectonics, Sekler takes his point of departure in the question of our role and actions as architects in the construction process. Consequently, he defines tectonics as the language of the architect. In his opinion, tectonics describes the way we implement specific structural principles to transmit a specific architectural statement, stating that “through tectonics the architect may make visible, in a strong statement, that intensified kind of experience of reality which is the artist’s domain – in our case the experiences of forces related to forms in a building” (Sekler, 1964, p.92). This statement is not to be misunderstood as conveying a formal conception of architecture as an artistic object form. According to Sekler, what matters “is the tectonic statement: the noble gesture which makes visible a play of forces, of load and support in column and entablature, calling forth our empathetic participation in the experience”, and he stresses the spatial linkage between the architects’ idea and the inhabitants eventual experience (Sekler, 1964, p.92). In this way, the notion entails a methodological discourse and positioning on behalf of the individual architect as to the architect specifically envisions a tectonic unification of a spatial gesture and a structural principle when adopting Sekler’s terminology.

Because of the critical linkage of the experienced aesthetic quality and technical realization of architecture that they imply, we hypothesize that these notions of gesture and principle hold a particular potential in spurring a contemporary repositioning of tectonic theory as an analysis

and design method. Until now, we have explored this potential at the architectural scale in both research and education (Hvejsel, 2011). With this paper, we are further investigating and exploring the application of this knowledge into urban design education.

Sekler's essay was dedicated to the task of clarifying the delicate relation between "action, thought and language" in architecture in general, using the development of an in-depth understanding of the human scale and perception as the point of departure (Sekler, 1964). Whereas Sekler's theories did not explicitly address urban design, there exist a potential to extend these notions from the architectural scale and out into the urban one as argued above. This is especially evident when reading Sekler's tectonic theories in relation to the urban design-teaching program developed at Harvard, especially in the conduct of the *Human Scale* seminars. In the following, we pursue this potential further in order to outline a link between tectonic theory and urban design education.

In his use of the notions of gesture and principle in describing tectonic practice, Sekler could be considered a predecessor of Marco Frascari. In his essay "Tell the tale detail", Frascari conceived of the tectonic as a methodological concept that becomes a school of thought as well as a way of expressing oneself as an architect (Frascari, 1984). Frascari exemplified such a mind-set by analyzing the work of Carlo Scarpa and argued that the immense quality of Scarpa's work and architectural quality in general are seen in the details.

Based on his analysis of Scarpa's work, Frascari concluded that such details simultaneously form a constructive junction. Stating that the significance of such joining may be understood independently, whether at the scale of the detail of a tenon in a furniture joint or at the joining of a piece of architecture in its urban context, Frascari introduced the idea of pursuing a linkage of Sekler's gestures and principles emerging at the architectural scale with the discipline of urban design.

The explicit utilization and significance attributed to the notion of joining links directly to the structural and constructive perspective of the engineer. This allows us to begin to understand the notion of "urban space tectonics" as unification of architectural and urban space with construction engineering or as "the relationship between interior structure, load-bearing structure and infrastructure" (Deplazes, 2005, p.295). The architect and engineer Andrea Deplazes has used this phrase to characterize the construction technical task defined by the built environment as a whole. This juxtaposition refers to both the envisioning of spatial experiences created in the meeting between architectural volumes and urban surfaces, their concrete constructive realization and our experience of them; it is simultaneously word and action. In continuing this line of thought, we are able to read, for example, Scarpa's architecture

as a particular way of joining if adopting this vocabulary of gesture and principle.

In its immediate reference to the dimensions and emotional subtlety of the human body and mind, the notion of gesture allows us to juxtapose architecture, urban design and engineering through a repositioning of the human scale. When studied from the point of view of the human scale, the theorem of statics and the properties of structural members such as columns, beams, plates, and shear walls can be tested and evaluated in direct relation to the spatial gesture that they are intended to reveal. Likewise, the spatial contrasts resulting from different structural system such as post and lintel become tangible as principles that we are responsible for shaping during the design process.

From a merging of the architects', urban designers', and engineers' perspectives on tectonic theory we can begin to understand:

- **Gesture** as describing the experienced spatial quality existing in the spatial relation between the architectural volume and the urban surface explaining what the space does
- **Principle** as describing the structural build-up of the spatial relation between the architectural volume and the urban surface explaining how it works

By demanding a critical positioning of existing works of architecture as a point of departure for design work through his teaching at Harvard, Sekler forced his students to take position on the kind of gesture they intended for their designs as well as the principles used to realize it. Likewise our inspiration from Sekler's work and our attempt to develop it further as a theory and method applicable in urban design (and architectural) education is motivated in a wish to foster such critical awareness and positioning among our students. As argued above, the vocabulary of gesture and principle allows us to extract knowledge from the study and analysis of existing works within architectural history at a critical methodological, rather than a formal, level.

We can begin to decipher how the experienced quality of Jørn Utzon's *Sydney Opera House* and *Piazza Del Campo* in Sienna manifests itself as ideas on behalf of both architect and inhabitant. Likewise, we can articulate how this experienced quality emanates in the envisioning of a spatial gesture that addresses the human scale. Rather than from a purely formal idea, it stems from the application of deliberate structural principles that merge architectural volume and urban surface by means of a shaping of structural elements (Hvejsel, 2011). Hence, we discover how the notions of gesture and principle allow for an explicit linkage of creation and end experience and of analysis and design in its capacity as a juxtaposition of word and action. For example, we discover that the unique sense of framed movement and strive *gesturing* us in the merging of architectural volume and urban surface results from a deliberate

application of a plateau and shell *principle* on behalf of Utzon transforming the entire identity of Sydney (Weston, 2008).

In the same way we may discover how the gathering gesture that is felt so strongly upon entering the Piazza Del Campo in Siena results from a subtle but powerful merging of plan and section in a gentle tilting principle that at once addresses the human scale offering a seat and simultaneously technically and functionally orchestrates the infrastructure, ceremonies and draining of water in Siena at an urban scale. Opening our eyes to the subtlety of the principles applied in order to achieve the magnificent resulting gestures is most certainly methodologically exemplary if we are to successfully address the question of repositioning the human scale in urban design education and future practice. Our first attempt to apply these notions of gesture and principle as a tectonic theory and method in urban design education is the workshop entitled *Urban Tectonics*. This workshop is presented and discussed as a case study in the following sections.

3.2 Educational case study: The Urban Tectonics workshop

Teaching at Aalborg University is based on the problem-based learning (PBL) method, which means that we value and stress the ability of our students to position themselves within their field while taking part in professional cooperation in practice. At the Department of Architecture, Design & Media Technology the method of PBL is reflected in an articulate focus on integrated design developed to exemplify the multidisciplinary context of architectural and urban design practice directly within the pedagogical strategy. Consequently, our teaching program for each semester is organized around a main project that the students develop in groups. This main project is supplemented by course modules that are intended to contribute to the development of the students' general knowledge and methodological foundation and in the learning of particular skills such as drawing.

The *Urban Tectonics* workshop is a short 4-day workshop held for our sixth semester Bachelor students of urban design. The workshop is intended to aid the students to grasp and position themselves critically in the spatial relation between urban design and architecture. The students' main project deals with the task of designing large-scale, mixed-program urban architecture. The goal of the workshop, which we ran for the first time in 2011, is to stress the significance of a positioning of the human scale in the built environment as well as to strengthen the students' technical understanding of their projects by:

- analyzing, describing, and designing experienced spatial quality as an aesthetic relation between the architectural volume and the urban surface, forming a "gesture" that addresses the human scale
- analyzing, describing, and designing the structural build-up of this experienced spatial quality as a technical merging of the architectural volume and the urban surface forming a "principle" that addresses the human scale

When developing the workshop we were inspired by *The Human Scale* seminars conducted by Giedion and Sekler at Harvard in the late 1950s. *The Human Scale* seminars served both as an example of how to exploit architectural and urban design theory and history critically rather than as merely passive knowledge to be memorized and as an example of how to pursue a linkage of analysis and design in architectural and urban design education. Relating these early urban design seminars with Sekler's tectonic architectural theory allowed us to connect the aesthetic experience of the built environment as a gesturing of the human scale with a technical awareness of principles of realization in the design of the *Urban Tectonics* workshop.

The workshop opens with two lectures that introduces the task of the workshop and the notion of urban tectonics as a tension field that critically relates architecture, urban design, and construction engineering by means of the human scale. The first lecture focuses on the task of repositioning the human scale in urban design through an outline of a merging of existing urban design theories with tectonic architectural theory, as exemplified in Sekler's introduction of the notion of gesture. The second lecture outlines the constructive reality of the field of urban design (and architecture), stressing the laws of statics and outlining a series of structural systems of construction that enable the students to decipher the "principles" that gives life to these gestures.

Inspired by Giedion and Sekler's utilization of the scale model to establish their intended focus on the human scale in urban design education, we intended to develop a similar physical object to form the cornerstone of the workshop. However, instead of full models we let the section be the focal point of attention and venue of experiment. We do this in order to allow for an explicitly spatial study that juxtaposes architecture, urban design and engineering and allows the students to study volume and surface, space and construction, movement and stay, inside and outside mutually. The students' task is to select their favourite large-scale architecture / urban design project from a series of recognized examples and model a three-meter wide section relief of it. Working in a section model, as one could call the reliefs, forces our urban design students, who otherwise work mainly in vast-scale plans at a more diagrammatical level, to understand the architectural interior and the urban exterior as a continuous spatial entity mediated by its construct. The workshop task addresses both analysis and design outlining a critical relation between the two that will be elaborated upon below.

3.3 Project analysis

In analyzing their chosen project, which can be historical or contemporary (the only requirement being that it exemplifies a tectonic relation between architectural volume and urban space), the students have to choose and construct a section slice of the project as described above.

Through the analysis process, the students discovered that whereas the eventual relief section itself is a reduced presentation of the project studied, they were unable to construct it unless they had acquired an in-depth understanding of the work in its entirety – not only of its spatial and structural build up but also of its history, idea, and critical motivation. For example, in the case of the study of *Solomon R. Guggenheim Museum* the students discovered that the sculptural horizontal language of Wright’s museum, which contrasts the verticality of its surrounding urban fabric, states a sense of relation to the American prairie landscape from which its vast scale metropolises have grown. This spatial gesture comes to life as a result of Wright’s structural skills and insight, allowing him to give form to the structural elements of the museum as a cantilevering spiral. The museum also gestures the park on the other side of the road in its structural principle as an organic living pause that addresses the human scale by means of its intriguing spiral movement that evokes an urge of exploration by allowing only glimpses of its interior.

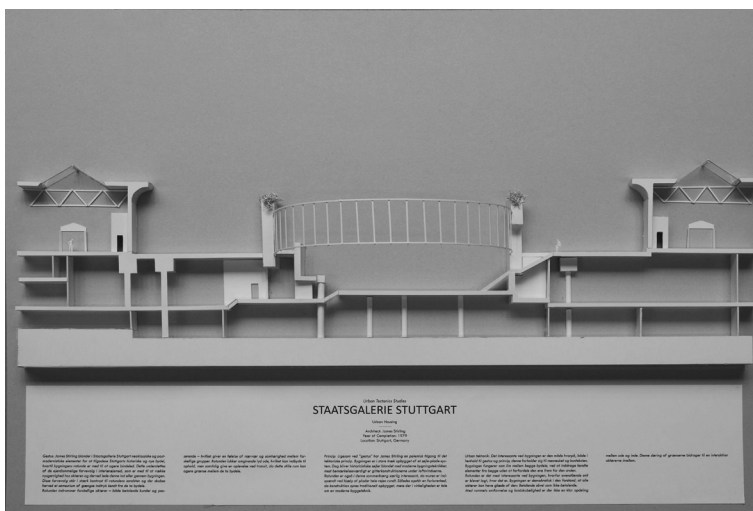
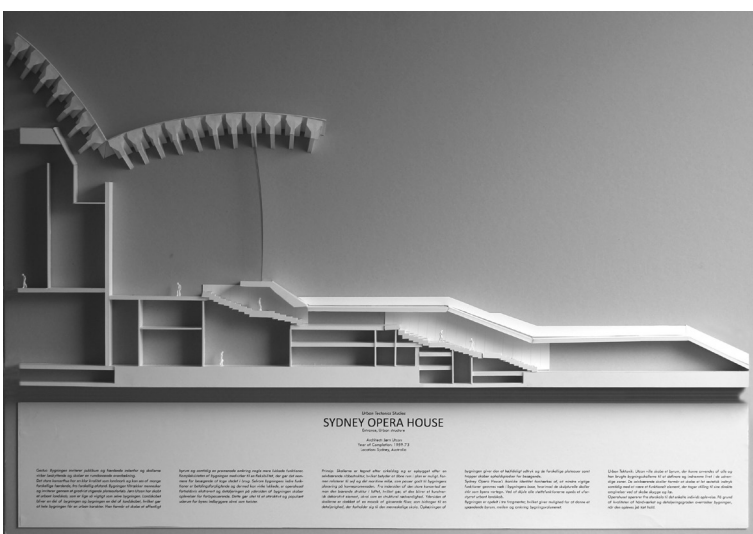
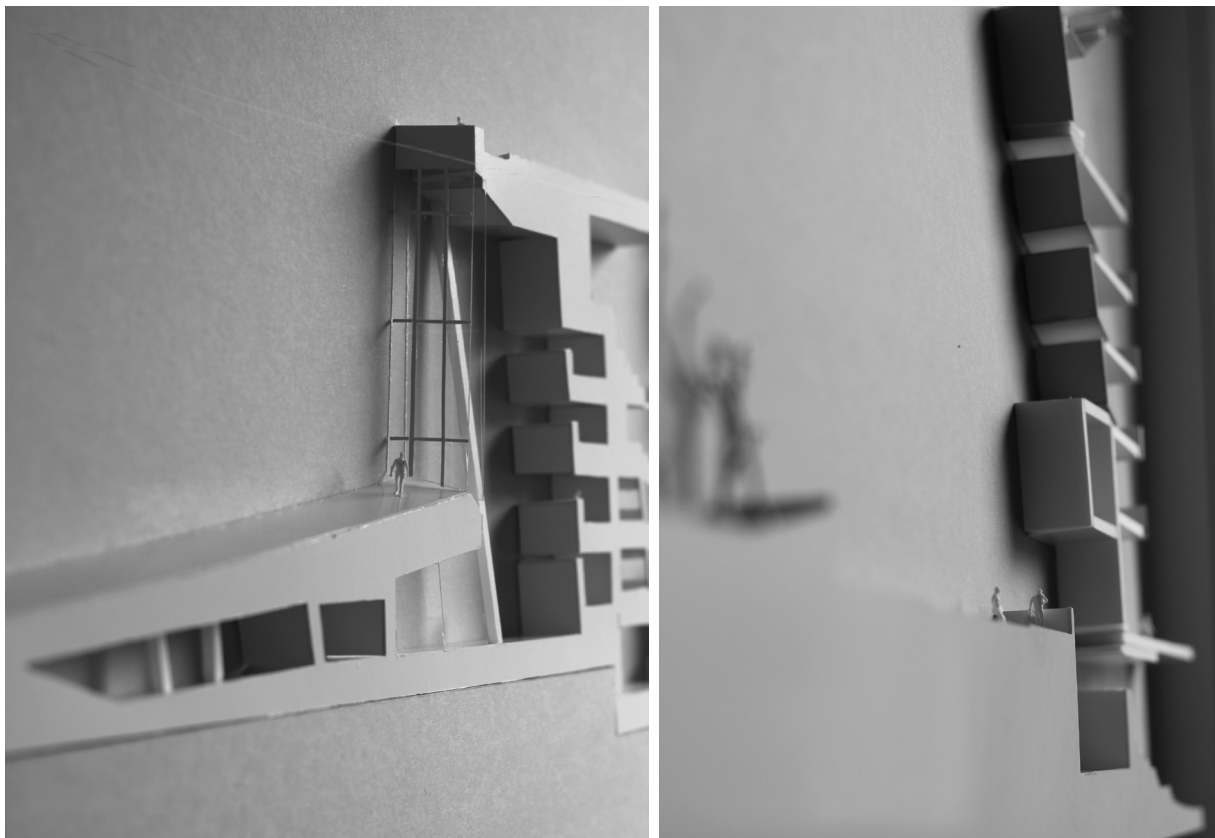


Figure 2
1:100 relief sections of *Neue Staatsgalerie* in Stuttgart by James Stirling and the *Sydney Opera House* by Jørn Utzon, respectively, examining the gestures and principles that describe the relation between the architecture of the museum and the urban space surrounding it. Work by sixth semester Bachelor students from the Department of Architecture, Design & Media Technology 2011–2015.



It is also clear in the examples of the relief sections of the *Neue Staatsgalerie* building in Stuttgart by James Stirling and the *Sydney Opera House* by Jørn Utzon (see Figure 2) how the relief sections allow the students to study volume and surface, space and construction, movement and stay mutually, and how the critical relation between architecture, urban design and construction engineering is stressed. Through the perspective of urban tectonics, the students uncover the meaning of Stirling's postmodernist statement as they discover how the *Neue Staatsgalerie* is both a traditional museum building that one can enter to discover its interior exhibitions and a public urban space that connects the historical and the modern part of Stuttgart. The structural and material technical mixture of new and old applied as a principle by Stirling is echoed in the spatial gesture. This results from a deliberate merging of architectural volume, urban space and construction engineering. In Stirling's postmodern linkage of history and presence, we are intrigued by glimpses of fellow visitors, offering an opportunity of encounter that is otherwise seldom found in the contemporary city.

Figure 3
Detail of 1:100 relief section of the *Oslo Opera House* by Snøhetta and the *Solomon R. Guggenheim Museum* by Frank Lloyd Wright, respectively, examining the gestures and principles that describe the relation between the architecture of the museum and the urban space surrounding it. Work by sixth semester Bachelor students from the Department of Architecture, Design & Media Technology 2011–2015.



Working as detailed as in scale 1:100 forces the students to zoom in and to position their work in relation to the human body as seen in Figure 3. In the relief section, the building interior and urban exterior can suddenly be understood as a spatial continuum that stresses the complexity of conditions, parties, and means involved in the creation of this continuum. By using the vocabulary of “gesture” and “principle”, the students are constantly forced to reflect upon the quality of this space, in analysis as well as in their own design work, which we discuss in the following section.

3.4 Design discussion

On the last day of the workshop, the students have to present not only the relief sections stemming from their analyses but also their own project design ideas. We ask them to apply the vocabulary of gesture and principle in the development of their own project. We require them to think critically about their project as a detailed interrelation of architectural volume and urban surface, thereby motivating an increased precision in their presentations and mutual group discussions during the design process. Consequently, the students are forced to ask themselves and each other: Which gesture do we intend for the project? Which structural principles are we exploiting in order to reveal this gesture? What is the tectonic relation between the gesture and principle of our project and how is this relation reflected in the detailing and joining of structural elements experienced at the human scale?

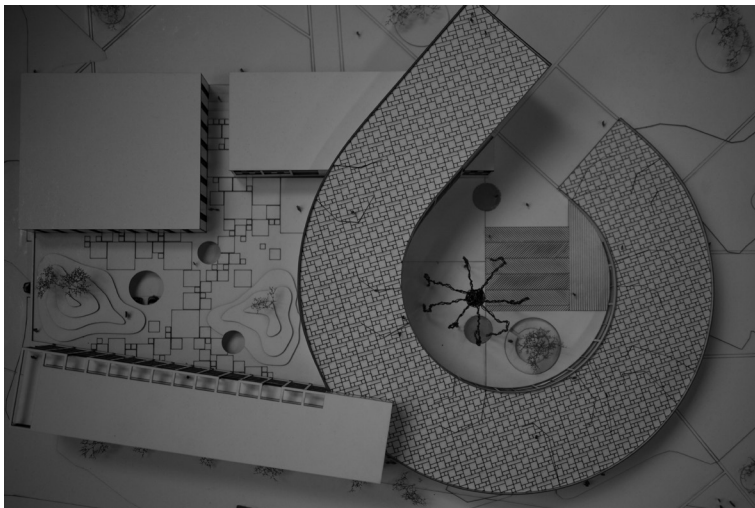
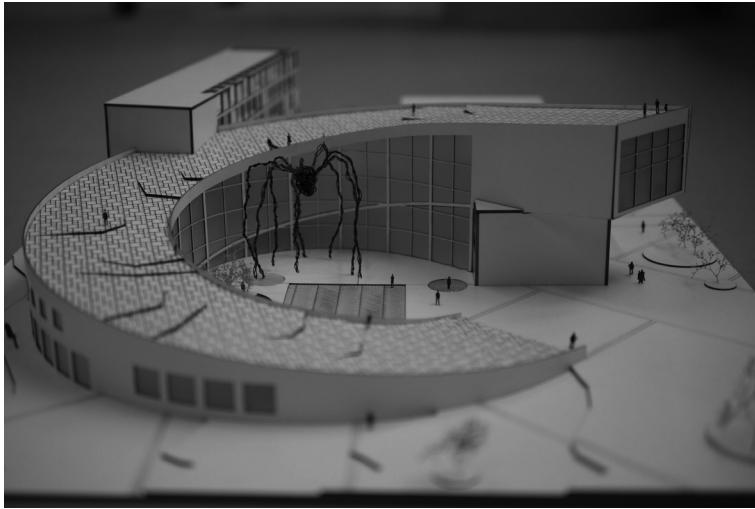
At a general level, the notion of gesticulation and Gestures can be approached as a language for communication. The language of gesticulation is a nuanced and universal language used to describe everything from uttermost surprise and joy to indifference and disgust through subtle nuances in our body language (Hvejsel, 2011, pp.52–73). One could say that this language is spatial because we use our bodies to form it. If applied to the description of the tectonic relation between architectural volume and urban surface, a means to reposition the human scale is suggested that has proved of value to the students. By focusing their attention on the necessity of such spatial aesthetic gestures both when analysing existing examples and in their own design processes an explicit study and development of the technical principles that enable us to reveal these gestures in construction practice is simultaneously stressed.

The effect of this was visible in the student’s main projects, where they are met with the task of designing large-scale, mixed-program urban architecture. With the application of the vocabulary of gesture and principle as described above, the goal of the workshop is to equip the students with an analysis method applicable not only in grasping the need to stress the significance of the human scale, but also to equip them with a design method that fosters architectural and spatial designs that address the cross-field between architecture and the public space. This

likewise entails a critical understanding of the means of construction. By analysing the student projects, it becomes evident that they have acquired an increased focus on the transition between inside and outside and between building and space.

The students indicate that it is difficult and challenging to create meaningful relations between the inside and outside of the building, and this recognition is a valuable learning experience. This deliberate work with building and public space as a continuum softens the conventional idea of large-scale architecture, in which an architectural object is often considered alien from its surrounding city, by conceiving of it as an integrated part of the urban setting. For example, one of the project groups deliberately pursued a blurring of the boundaries between the building and urban fabric with a project entitled *The Culture-Node*. This blurring was achieved both spatially and in terms of structure and construction, as they designed a space that contains public workshops, a gallery and a mixed-use auditorium as well as daily functions such as shopping, a convenience store and dwellings (see Figure 4). The building draws together locals, tourists and visitors alike in a node of levels and volumes that weave together and open up the existing block structure. The project engages dialogue with the surrounding historical centre and the largest church there called *Budolfi*. The pivotal circular node building rises up to provide a gathering gesture that is likewise evident in the structural principles and material detailing of the project as the circle is broken and twisted to welcome visitors into, onto, and under the node.

In conclusion, the project is underlined by subtle changes of materials and patterns that mark an increased awareness of the significance of such details to the experienced quality of urban space on behalf of the students. They also acquire an increased spatial and structural understanding of the physical constraints and potentials of their node-idea that is visible in the section model that they prepared for their exam (see Figures 5 and 6).

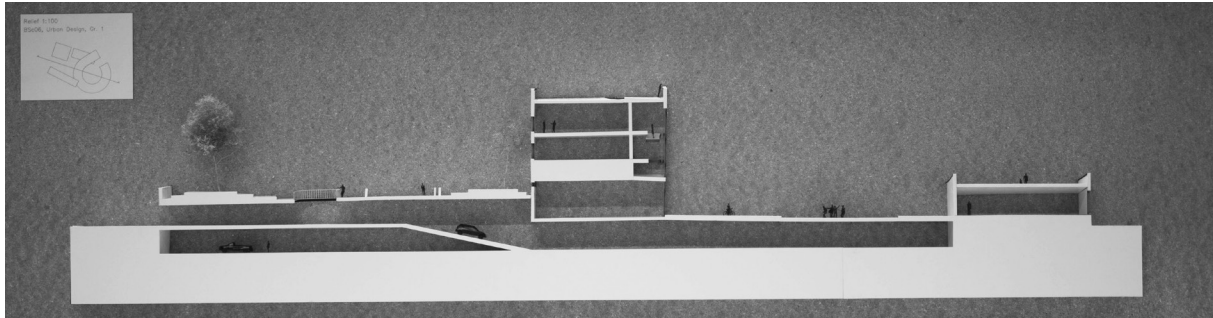


When compared with earlier sixth semester urban design Bachelor projects prior to the introduction of the *Urban Tectonics* workshop it is evident that the workshop has motivated the development of a better understanding of the spatial relation between architectural volume and urban surface. It is especially clear how working in sections has opened the eyes of our urban design students to the relation between building interior and urban space and that they are approaching a more detailed understanding of the respective quality of the two.

As opposed to the otherwise primarily formal approach to this relation, we observe that this specific spatial focus, of which the human experience and scale is the focal point, will be of decisive significance to the students' ability to take part in the multifarious project constellations that characterize construction practice. The relief sections have motivated the development of a particular eye amongst the students for the decisive role of structure and construction in the creation of these spaces. We believe that this preconditions their ability to take on a leading

Figures 4 & 5
The Culture-Node model showing the inviting gesture that appears as the block is opened towards the historical *Bufoldi* church as well as the weaving principle that realizes it. Project credits: Line Guldhammer, Kristian Kristensen, Thor Nielsen, Katrine Munck, & Laura Lyhne.

responsibility in the practice of their field. In this way, the workshop has contributed to an increased interest in the structural aspects of architecture and urban design that are otherwise not a primary interest of the students.



4 Discussion

The intention behind the workshops was to strengthen our students' abilities to grasp the tectonic relation between aesthetic spatial gestures and their technical principles of realization. In terms of their ability to analyze, describe and design the spatial qualities of urban spaces the students have learned to create architectural and urban details that focus on the transition between building and urban space, emphasizing the gestures of the urban environment on a human scale. Hence, with regards to analyzing, describing, and designing experienced spatial quality as an aesthetic relation between the architectural volume and the urban surface forming a gesture that addresses the human scale, the students have obtained:

- An eye for the spatial relation between building interior and urban space and are approaching a more detailed understanding of the respective quality of the two

With regards to analyzing, describing, and designing the structural build-up of this experienced spatial quality as a technical merging of the architectural volume and the urban surface forming a principle that addresses the human scale, the students have obtained:

- An eye for the decisive role of structure and construction in the creation of these spaces

It should be stressed that when reviewing the student projects there are, of course, still challenges to be met. While it may be clear that they have opened their eyes to the spatial and structural relation between architectural volume and urban space, the true difficulty of practically realizing the tectonic potential of this relation as a unification of volume and surface as a continuous landscape is also evident. In Figures 4 and 5, it is clear how the urban space and the building interior are still realized as two almost different projects. At a general level, this may serve as a

Figure 6
The Culture-Node relief section in scale 1:100, investigating the urban space tectonics of the project, including the physical potentials as well as constraints of the node-idea. Project credits: Line Guldhammer, Kristian Kristensen, Thor Nielsen, Katrine Munck, & Laura Lyhne.

reminder of the fact that the whole concept of theory and method related to architecture and urban design, where the relation between theory and practice is never exact, is a delicate matter that poses a continuous challenge to our discipline.

This weakness can be addressed by referring to Linda Pollak's writings in which she argues that we have to inhabit the boundary between architecture and landscape urbanism "constructing as a space by oscillating back and forth across it" (Pollak, 2005, p.138). She goes on to say that

[...] a site exists in an unlimited number of scales. If a project can be understood to reproduce its site, the potential of a project to operate at different scales relies upon a designers investment in representing the elements and forces that exists or have existed at those scales, as a precondition for designing ways to foster interdependencies between them (Pollak, 2005, p.130).

With the proposed application of the notions of gesture and principle, we are trying to equip the students with a professional vocabulary that enables them to grasp the complexity of the design task described in sociological and analytical terms by Jacobs and Gehl and as a designed artefact by Rossi and Venturi (Jacobs, 1961; Gehl, 1971; Rossi, 1966; Venturi, 1966). We have found that the linking of tectonic architectural theory and urban design has opened the students' eyes to the delicate relation between them, which a promising potential for further research and pedagogical development.

5 Conclusion

In this paper, we have discussed the development of urban tectonics as a theory and method that enable a repositioning of the human scale in urban design education. Our main conclusion is that urban tectonics provides an educational means to critically address the current state and practice of the built environment, which suffers increasingly from a split between architecture and urban design. This split often leaves us with disconnected volumes and surfaces rather than inviting spaces. The method we used incorporated a re-reading and application of Eduard F. Sekler's tectonic theories related to the current challenges of the urban design practice. We were especially inspired by Sekler's ability to juxtapose architecture and urban design by means of a particular tectonic focus at the human scale and his ability as an educator to critically link theory and practice, analysis and design, by evoking the students' "own energy".

The result of this work is the development of an analysis and design method that we apply in our Urban Tectonics workshop at Aalborg University. Through this case study, we have discussed the potential of

applying tectonic theory as a methodological means of grasping the spatial relation between urban design and architecture in urban design education. We have found that the application of the notions of gesture and principle as a tectonic method of analysis and design has awakened the students' eyes to the spatial and structural relation between building interior and urban space.

We conclude that this has strengthened the students' own energy and critical approach to their future careers, aspects essential to taking on responsibility for repositioning the human scale in urban design practice. While the 4-day workshop represents only a small-scale pedagogical experiment in this respect, a future iteration could be a joint course that brings together students from the urban design and architectural design programs. It would also be worth forming cross-disciplinary practice-oriented research projects focused at the spatial end of the structural relation between building interior and urban space. We also found that the notion of urban tectonics holds promise as a research area in its own right, research that we look forward to pursuing further in the realm of practice as well as the classroom.

Inspired by Sekler's work we would like to see a joining of forces: urban designers, architects and engineers coining the notion of *Urban Tectonics*. The goal of this endeavour is to develop theories and methods applicable in urban design- (and architectural) education that allow us to study volume and surface, space and construction, movement and stay by means of the critical notions of gesture and principle.

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