

TECTONIC EXPRESSION OF CONCRETE AS
AN ARCHITECTURAL MATERIAL

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

ASLIHAN ŞİMŞEK

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF ARCHITECTURE
IN
ARCHITECTURE

SEPTEMBER 2011

Approval of the thesis:

**TECTONIC EXPRESSION OF CONCRETE AS
AN ARCHITECTURAL MATERIAL**

submitted by **ASLIHAN ŞİMŞEK** in partial fulfillment of the requirements for
the degree of **Master of Architecture in Architecture Department, Middle
East Technical University** by,

Prof. Dr. Canan Özgen _____
Dean, Graduate School of **Natural and Applied Sciences**

Assoc. Prof. Dr. Güven Arif Sargin _____
Head of Department, **Architecture**

Prof. Dr. Ali Cengizkan _____
Supervisor, **Architecture Dept., METU**

Examining Committee Members:

Assoc. Prof. Dr. C. Abdi Güzer _____
Architecture Dept., METU

Prof. Dr. Ali Cengizkan _____
Architecture Dept., METU

Assoc. Prof. Dr. Ayşen Savaş _____
Architecture Dept., METU

Prof. Dr. Ali İhsan Ünay _____
Architecture Dept., Gazi University

Inst. Dr. Haluk Zelef _____
Architecture Dept., METU

Date: 16.09.2011

I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name, Last Name : Aslıhan Şimşek

Signature :

ABSTRACT

TECTONIC EXPRESSION OF CONCRETE AS AN ARCHITECTURAL MATERIAL

Şimşek, Aslıhan

M. Arch., Department of Architecture

Supervisor: Prof. Dr. Ali Cengizkan

September 2011, 116 pages

This thesis is an inquiry into the position of concrete as an architectural material in architectural production and expression. With increasing use of concrete in architecture not only technical properties but also aesthetical ones of the material came to foreground. Reconsidering concrete as a building material, the thesis aims to find out tectonic possibilities of concrete as an architectural expression tool. The purpose to search for concrete's tectonic potentials is to rescue it from its bad connotations and reveal it as an architectural tool instead of being mere constructional mean for an end.

In order to explore aesthetic qualities of concrete as a part of architectural production, the scrutiny of tectonic theories provide a conceptual framework for a contemporary interpretation of concrete usage in architecture. Kenneth Frampton, Karl Bötticher, Gottfried

Semper and Martin Heidegger are the key references to understand the tectonic potentials of concrete material in architecture. Within the framework of Semper's abstract procedures, manipulation of concrete material is analyzed through the specific examples. Structure and symbol, material and method, clear structure and joint are the consulted binary keywords related to the evaluation of tectonic aspects of concrete in architecture.

By the technological developments, concrete material -both as a science and art- has been freed from the constraints of traditional production techniques and generated a field for the imaginative creations of the architect. When considered as a part of architectural design, concrete constitutes not only the "core-form", but with its innate qualities revealed by the designer it transposes the building into an "art-form". Constituting the structure, surface, or detail of building, concrete material has the ability to express architectural meanings behind design concept. This study attempts to identify concrete material as a value indicating to tectonic, craft, "poiesis", technology connotations and emphasizes its architectural expression power.

Keywords: concrete, tectonics, "poiesis", technology, "practical aesthetics".

ÖZ

MİMARİ MALZEME OLARAK BETONUN TEKTONİK İFADESİ

Şimşek, Aslıhan

Yüksek Lisans, Mimarlık Bölümü

Tez Yöneticisi: Prof. Dr. Ali Cengizkan

Eylül 2011, 116 sayfa

Bu tez mimari malzeme olarak betonun mimari üretim ve ifadede yerini araştırmaya yöneliktir. Betonun mimaride kullanımının artmasıyla sadece teknik özellikleri değil, aynı zamanda estetik özellikleri de ön plana çıkmıştır. Betonu bir yapı malzemesi olarak göz önünde bulundurarak, tezin amacı mimari ifade aracı olarak betonun olanaklarını açığa çıkarmaktır. Betonun tektonik potansiyellerini araştırmanın amacı onu kötü çağrışımlarından kurtarmak ve sadece konstrüksiyonun değil mimari ifadenin de bir aracı olduğunu açığa çıkarmaktır.

Mimari üretimin bir parçası olarak betonun estetik özelliklerini araştırmak için tektonik teorilerin incelenmesi, betonun mimaride kullanımının çağdaş yorumuna kavramsal bir çerçeve oluşturmaktadır. Kenneth Frampton, Karl Bötticher, Gottfried Semper and Martin

Heidegger, beton malzemenin mimaride tektonik potansiyellerini anlamak için ana referanslardır. Semper'in soyut işlemleri çerçevesinde, betonun işlenmesi belirli örnekler aracılığıyla analiz edilmiştir. Strüktür ve sembol, malzeme ve yöntem, saf strüktür ve birleşim, mimaride betonun tektonik yönlerinin değerlendirilmesiyle ilgili başvurulan anahtar sözcük çiftleridir.

Teknolojik gelişmelerle, beton malzeme -hem bilim hem sanat olarak-geleneksel üretim tekniklerinin sınırlamalarından kurtarılmış ve yaratıcı mimarın eserleri için bir alan oluşturmuştur. Mimari tasarımın bir parçası olarak düşünüldüğünde, beton sadece "çekirdek-yapı"yı oluşturmaz, fakat tasarımcı tarafından açığa çıkarılan doğal özellikleriyle binayı "sanatsal-yapı"ya dönüştürür. Binanın strüktür, yüzey, ya da detayını oluşturan beton malzeme tasarım kurgusunun arkasındaki mimari anlamları ifade etme yetisine sahiptir. Bu çalışma tektonik, zanaat, "yapma", teknoloji çağrışımlarına işaret ederek betonu bir değer olarak tanımlamayı hedefler ve onun mimari ifade gücünü vurgular.

Anahtar Kelimeler: beton, tektonik, "yapma", teknoloji, "pratik estetiği".

To My Dear Father Emrullah Kocaman

ACKNOWLEDGEMENTS

First and foremost I would like to express my deepest gratitude to my supervisor Prof. Dr. Ali Cengizkan for his guidance, criticism and inventive supervision through the research. It was a pleasure to me to study with him whom I have learned a lot.

I also wish to express my thanks to jury members Assoc. Prof. Dr. C. Abdi Gzer, Prof. Dr. Ali İhsan nay, Assoc. Prof. Dr. Ayşen Savaş and Inst. Dr. Haluk Zelef for their valuable critics and inspiring comments. Their contributions are very valuable in the finalization of this thesis. I am also thankful to Affan Yatman and Nesrin Yatman for their significant assistance, criticism, encouragement, tolerance and for experiences they added to me.

I am forever indebted to my family; my dear father Emrullah Kocaman, my dear mother Tlay Kocaman and my dear brother Birkan Kocaman for their endless love, trust, and self-sacrifice through my life. My gratitude for their support, patience and understanding can never be enough. This thesis is dedicated to my precious father who has been and will always be in my hearth with his warm-hearted existence. I would not be who I am without his confidence and belief in me.

I would like to express my deep-felt appreciation to my love, my husband Necdet Şimşek, who has been supporting me since the beginning of my whole study with his patience, care and love. He motivated me with his critical guidance and inspirations throughout my studies. I also want to express my endless love for our sweetest baby

who has not been between us yet: your glow has reflected on this study.

I have always been fortunate with the existence of my valuable friends not only during this long endeavor but also through my life. I would like to express my special thanks to Ayşegül K k Pınarevli, Cenk  zkan, Ercan  rek, Esra  renbaş, Mehmet Pınarevli, Nihan Kocaođlu, Seda Uludađ and Uđur  zt rk for their presence and support during my architectural education and through this research.

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CHAPTER 1

INTRODUCTION

“Each material has its specific characteristics in which we must understand it if we want to use it. In other words, no design is possible until the materials with which you design are completely understood.”

Mies van der Rohe

Architecture comes to life through materials, they are intrinsically intertwined. Materials with their substance are the medium that architects work with. Materials bring design to reality, give form to ideas; but without knowing their qualities, ways of expression, their performance cannot be predicted. The sensorial effect is achieved by the understanding of technical components. Foreseeing materials' optical, tactile, and acoustical effects in various forms and their transformation into architectural language are at the very center of architectural discourse.

The conscious use of material allows a much more complex and rich architecture. Real artisan is the one who properly responds to latent potentials of form and shape in material giving justice to it. Only then the internal prosperity of material is presented in human settlement. In the book “Material Precedent: The Typology of Modern Tectonics,” G.P. Borden states that:

"The making of architecture is guided by a material's manufacturing process and construction techniques. These systems establish specific boundaries with the freedom to operate within their systems. Design is not simply ingenuity of form but rather a collaboration of poetry and rational systems. It is the balance of these two that produces architecture. Material has tactility and an intrinsic nature. Its visual and emotional characteristics carry an interpretation. Its use, whether honest and integral, or applied, establishes an aura and a narrative. The aura comes from an emotive and experiential association, whereas the narrative tells the story of its history, fabrication, and application. Putting materials to their best use involves an appreciation of their innate sensory qualities as well as their technical potential. This must be at the root of architectural design."¹

Material applications and inventions have constituted the architecture history. New material applications and reinterpretation of existing ones have been closely related with architectural evolution. Before the Industrial Revolution, material was locally limited because of transportation difficulties and also due to the tradition of making mastered from cultural generation. The Industrial Revolution brought great changes along. The emergence of new materials, such as steel and concrete, broadened the palette of the architects.

Before, relationship between architecture and materials were merely constructional and they were shaping designs according to those challenges. Material has long been subservient to form, structure, and geometry; it was, just handled in technical terms, not at the core of architectural discourse. Later with the developments of technology, the situation has changed; today the material is embodied with the meaning

¹ Gail Peter Borden, "Material Precedent: The Typology of Modern Tectonics", USA: John Wiley & Sons, 2010, p.8.

ascribed by the designer and it becomes a tool bestowing aesthetic meanings. The expression of design comes through the application, expression, and detailing of materiality. Architect is no longer limited with tradition or form, but his role is expanded with material variety and its interrelation with all other architectural issues. Material, as Borden says, is “a physical expression of context and culture.”² Innate qualities and constraints of material, its technical properties determine form and design approaches.

Katie Lloyd Thomas touches upon privileging of form over material in architecture in her publication “Material Matters: Architecture and Material Practice.” According to her, secondary status of material leads to a kind of invisibility. She conceives materials “discussed in guides to construction rather than in theoretical works, where formal concerns are dominant, or in historical works, where, as Andrew Benjamin discusses, an idealist approach tends to prevail.”³ Referring to Aristotle’s “hylomorphism theory” where matter (hyle) is given shape by form (morphe), she explains that matter is understood as inert and undifferentiated, instead of determining it serves form. Actually by characterizing matter as inert, architect is exalted as a form giver. Thomas implies here that “materials are themselves active; it is a transaction, rather than a one-way operation, that occurs in the shaping of stuff.”⁴ She proposes that architecture should explore materials for the understanding of their productive effects and potentials, as experiential and political.

² Ibid., p.9.

³ Katie Lloyd Thomas, “Material Matters: Architecture and Material Practice”, USA: Routledge, 2007, p.3.

⁴ Ibid., p.4.

Peter Zumthor is one of the contemporary architects quite interested in material expression in architecture. Benefiting from basic knowledge about man's use of materials and also exposing the essence which is beyond culturally conveyed meaning are the ways he exploits material. He claims that only if architect can generate a meaningful situation for materials, they can bear a poetic quality in architectural context. The sense of materials in Zumthor's buildings is beyond composition rules, beyond tangibility, smell or acoustic qualities of materials. He declares that "sense emerges when I succeed in bringing out the specific meanings of certain materials in my buildings, meanings that can only be perceived in just this way in this one building."⁵

The aim of this thesis could be defined as searching for the importance of an architectural material -the concrete- in architectural expression. For a deeper understanding and interpretation of the contemporary applications of concrete as an architectural material, the inquiry re-introduces seminal studies of Karl Botticher (1806-1889), Gottfried Semper (1803-1879), Kenneth Frampton (1930-) and Martin Heidegger (1889-1976) as key references.

It is the object of the study to find out how to retrieve concrete -the dull, cold material- from its bad connotations. A close reading of Frampton will provide a conceptual framework for the evaluation of tectonic aspects of concrete usage in architectural production. The study also suggests that concrete is not just a "material" but also a "process" which can be handled with reference to Semper's "practical aesthetics" notion.

⁵ Peter Zumthor, "Thinking in Architecture", Berlin: Birkhäuser, 1999, p.10.

1.1 The Scope of the Thesis

Based on tectonic theories of Frampton, Bötticher and Semper, the thesis focuses on concrete material as a design tool in contemporary architecture. Concrete is the second most widely consumed substance on earth after water⁶, and also a favored material of many architects and engineers with its unlimited potential as a medium for imaginative forms and surfaces. Being a part of architect's pallet of expression, concrete is more than just the constructive component. The exhibition "Liquid Stone: New Architecture in Concrete", presented at the National Building Museum in Washington between 2004 and 2006 was one of the projects revealing the many aspects of concrete as an architectural material. It constitutes an exemplary case to further the understanding of concrete as a versatile building material offering opportunities for architectural innovations.

The scope of the study is the concrete material used for architectural expression as a design parameter. Rediscovered in the context of the Industrial Revolution, concrete has been the key element in the formation of the modern architecture. By the developments in the scientific and technological fields, concrete has been pushed to extremes by architects. Concrete was not thought to be related merely to science, but also closely related to art with the potentials it has revealed. The forms of expression that have emerged alongside the technological developments resulted in renewed interest in the issue of tectonics. Architects not only used concrete as the major construction

⁶ The information taken from the web site:
http://www.nationalbuildingmuseum.net/liquid_stone/home.html (Last accessed August 2, 2011).

material for their buildings, but also regarded it as synonymous with experimental architecture.

Widely pronounced dead, dull and repetitive, concrete has been animated by many architects, it has been resuscitated as a part of design with its tactility, plasticity and other implicit performances unconcealed by designers. Many concrete design competitions and workshops has been done in order to explore possibilities of concrete as a design tool. The International Concrete Design Competition for Students funded by a consortium of European cement and concrete associations is one of them, which aims at promoting innovative design attitudes related to the use of concrete as a material and a technology. Each competition cycle is framed by a theme designating a specific property of concrete, such as "robustness", "plastic-Opacity", "implicit performance", and "monolithic". These competitions do not aim formal solutions for designs, but research of concrete as a material and as a process and understanding its possibilities resulting in innovative design approaches for each unique design.

By the new technical developments, concrete material has been subject to great transformations. It has been closely related to technology. Colored concrete, light-transmitting concrete, photoengraved concrete, lightweight concrete, ductal concrete have been some of the developments in concrete industry. However, the object of this thesis is not to list the technical possibilities of concrete, but to explore how concrete is employed as a tool for architectural expression, with its tectonic possibilities.

1.2 The Method of the Thesis

Understanding of concrete use in architectural expression is conducted by the use of tectonic theories and conceiving essence of technology. Within the framework of tectonic approaches of Kenneth Frampton, Karl Bötticher and Gottfried Semper, concrete material and its production techniques has been explored as an architectural tool.

In the light of "essence of technology" in Heideggerian sense, understanding "techne" and "poiesis" will bring forth opportunities for a new understanding of concrete use in architecture. Heidegger does not see materials to be consumed up for an art-work but handle it as the art-work itself. It is bringing forth from concealment to unconcealment, it is something poietic. Instead of merely becoming a tool for construction, concrete and its production techniques are revealed as the artistic creation.

Tectonic, defined by many architects and theoreticians, is the key concept in this thesis for the analysis of concrete use in architecture. Defined by Frampton as the "poetics of construction", tectonic signifies the expressive potentials of building elements. Artistic expression is the revelation of technical practice. Frampton focuses on architecture as a constructional craft. Primarily as a response to Robert Venturi's concept of the "decorated shed" -the idea that architecture is just a wrapping independent of the internal construction-, Frampton's tectonic theory reveals the constructive elements, joints, details and materials as the architectural expression tools.

An earlier tectonic theorist Karl Bötticher defines the "core-form" and "art-form" relation as the expression of architecture's "essential form." For Bötticher, the ontological status of the structure and the representational role of the ornament are dependent to each other. The ontology indicates the representation, the spatial quality of the architecture is determined by the material and structural system. The representation indicates the ontology, serves as a purpose in the sense that it explains and enhances the structural system.

Influenced by the studies of Bötticher, Gottfried Semper's main interest was the integration of material and production techniques. According to Semper artistic expression of materials will come out of the technical skill, by this way a given material can be used to the full extent of its expressive scope. Practical aesthetics -the material properties, applied technical process, and the function of the object- is the main frame for Semper to achieve tectonic expression. According to Semper "knot" is the earliest architectural artifact, and while binding, weaving and joining image maker role of the man is revealed as well. Complete mastery of the material with its production technique is the only way to achieve ideal-real synthesis.

Concrete architecture closely related to technology, is both a science and an art. Following the developments in this field, designers transform the technical possibilities of the material into an art form. The thesis will study "tectonic" as the conceptual framework in order to be able to understand concrete use as an architectural tool in the following selected architectural products. Exhibiting different applications of concrete as part of designs, the examples -Church of Light, The MUMUTH, 11 11 Lincoln Road Parking Garage, and De Blas House- are selected according to the methods and techniques of concrete

constructions transposing the studied buildings into another level of criticism.

1.3 Concrete as an "Architectural Material"

Material is the tangible beginning of architecture that exposes the intangible. Materials and associated technologies of construction used for millennia determined the history of architecture. Such is the case for concrete, both as an old (a major component of Roman buildings) and new (object of unexpected and surprising invention) material, which is world's most widely used structural material. Concrete is liquid, can be cast into any form and is isotropic, supports loads in all directions. A new material does not emerge spontaneously with the knowledge of efficient and purposeful use of it. Wood beams and columns were transferred to massive stone post-and-lintel construction by the Greeks, which seem to be an anachronism. Merits of concrete have been explored through a long period as well.

By the Industrial Revolution, concrete has been rediscovered and it has been transfigured by scientific theories and technological advancements. With its constituent elements, such as cement and iron, and building types it has produced, concrete became an object of mass production. It is rather comprehended as dull and repetitive although many modernists tried to "animate" this latent material. Jean-Louis Cohen and G. Martin Moeller explained this as "a sort of frightening metonymy of the industrial age"⁷ as described in "Liquid Stone: New

⁷ Jean-Louis Cohen & G. Martin Moeller, "Introduction", Liquid Stone: New Architecture in Concrete, Berlin: Birkhäuser, 2006, p.6.

Architecture in Concrete.” According to them the paradoxes of concrete lies in the fact that “a material initially considered ethically superior – ideally suited to modernism’s aspiration, to structural “honesty” and to the movement’s social optimism– has become liability.”⁸ Concrete started to dominate the building construction. Architects used concrete, the “new” material, not only as construction material but also regarded it as equivalent to experimental architecture. With its constructional possibilities, they put it to extremes. It is also opted for its visual impacts, its expressive or decorative possibilities. Revival of the subject “tectonics” among many architects and architectural theories resulted in a more complex view of structure and envelope relation, especially in concrete buildings. Tectonic debates lead designers to rediscover the virtues of craft and aesthetic, instead of merely fastening upon “high-tech” style or superficial application of industrial-looking finishes.

The use of concrete as a building material is closely related with the relation between architecture and technology. It has been since the eighteenth century that technology appeared as autonomy in construction scene, the Enlightenment being a turning point for this. Concrete’s capacity to produce impressive objects and systems, its dynamism and potential helped many designers to challenge the autonomy of technology. However, the split between engineering and architecture yielded technology to compel architecture redefine its objectives and methods. “Was architecture only an artistic superstructure in a world ruled by technology and capitalism, as Tafuri suggested in 1973 in *Architecture and Utopia*, or could it regain its power to affect spatial and social change?”⁹ In fact, technology is an integral part of concrete. The intimate understanding of materials, their

⁸ Ibid.

⁹ Antoine Picon, “Architecture and Technology: Two Centuries of Creative Tension”, Liquid Stone: New Architecture in Concrete, Berlin: Birkhäuser, 2006, p.9.

properties, extends the realm of design. Following the technological developments, in order to liberate design from traditional constructional constraints, architects had been looking for a new material. Although iron construction offered a partial solution, it lacked the plastic nature of traditional materials, which is inherent in concrete.

Throughout the modernist era critics, historians, and architects conceptualized the material concrete drawing it either toward art or toward science. The American critic Francis S. Onderdonk emphasized the aesthetic qualities of concrete in his book “The Ferro-Concrete Style” in 1928. He essentially underlines the new possibilities of concrete, especially highlighting the surface treatment and sculpture potentials of the material. The “textile blocks” of concrete used by Frank Lloyd Wright on the walls of his houses achieved the tectonic effects that dissipated the dull impression of concrete. This seems to associate with Gottfried Semper’s analogy between buildings and textile, which will be discussed in the frame of this inquiry as well. As Jean-Louis Cohen put it forward, “[t]wo new problems arose as soon as the illusion of imitating stone structures was abandoned; the first had to do with the exterior expression of the interior structure, and the second dealt directly with the surface of the building.”¹⁰ This helped to explore and understand the tectonic potentials of concrete which has been ignored till then.

¹⁰ Jean-Louis Cohen, “Modern Architecture and the Saga of Concrete”, Liquid Stone: New Architecture in Concrete, Berlin: Birkhäuser, 2006, p.27.



Figure 1. Frank Lloyd Wright textile blocks, Ennis House, Los Angeles
 Source: <http://takesunset.com/2010/02/frank-lloyd-wright-ennis-house-2607-glendower/> [Last accessed August 21, 2011]

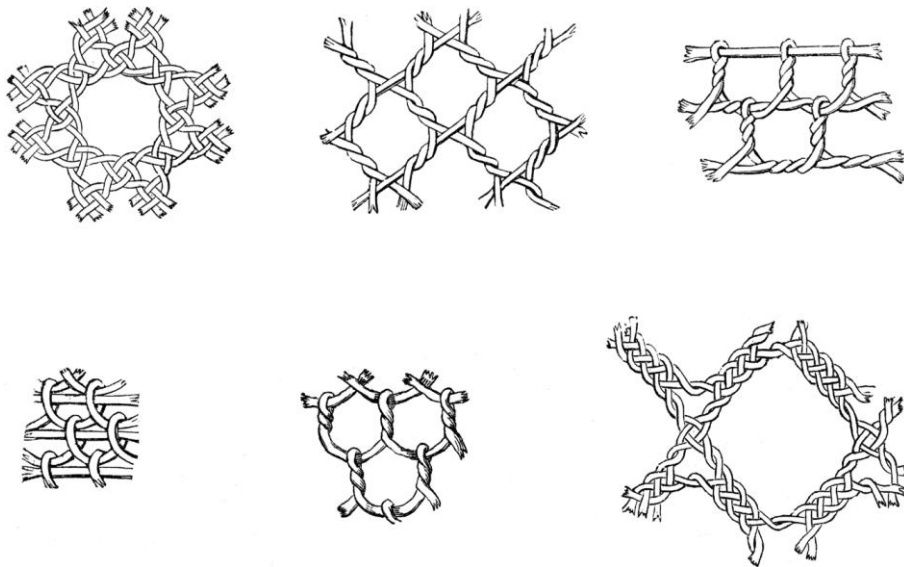


Figure 2. Semper's textile patterns
 Source: Gottfried Semper, "Style in the Technical and Tectonic Arts or Practical Aesthetics", The Four Elements of Architecture and Other Writings, New York: Cambridge University Press, 1989, p.223.

Little discovered concrete world was opening up new horizons to engineers and architects at the turn of the eighteenth century, and Robert Maillart was one of them who made concrete his domain. While some engineers were only practicing concrete in the standard way that François Hennebique had evolved, Maillart realized the monolithic character of the reinforced concrete as an evolutionary tool for each unique design. As he remarks, “[i]t was laid as if it were steel or wood, girders spanned from wall to wall and from column to column....The slab was considered as a structural element only by the machine engineer in the construction of boilers; the structural engineer had done nothing about it.”¹¹ He further indicates that reinforced concrete does not grow like wood, or rolled like steel, or have joints like masonry; its essential character is its ability to give fluid continuity to structure. By freeing himself from the dictated rules of traditional materials, designer should use the material to its ultimate.

Concrete pioneered the creation of new building systems, for the mass production of industrial, commercial, and residential structures in the twentieth century, systems ranging from cast-concrete to textile blocks. But it has not been a tool neither only for an expressionist heroism nor for monotonous mass production, concrete became a part of a notable pragmatism. Cohen evaluates “the social construction of concrete –as a technology, as a design ethos, and as a material shaping the surface of everyday architecture”¹² as a complex process, however open to various creative explications.

¹¹ From Cranston Jones, “Robert Maillart: The Vault Through Space”, Architecture Today and Tomorrow, New York: McGraw-Hill Book Company, 1961, p.205 as cited in Max Bill, *Robert Maillart*, Zurich: Girsberger, 1955, p.165.

¹² Cohen op.cit., p.32.

The ideal or real formal expression of concrete has been tackled throughout the history of concrete. Structural rationalism propounds that each material should find its own proper form and should not claim itself to the forms of another one, and new materials could generate new building styles. However, concrete appeared to be without a language of its own; as Frampton voices Frank Lloyd Wright's word that "aesthetically concrete has neither song nor story."¹³ Although the plasticity of concrete excited many architects and engineers, some considered it unnatural and morally questionable due to the fact that it had no intrinsic form. John Ruskin, a nineteenth century critic, argued for "truth" in materials; they should be used according to their physical properties and their character should be revealed in the finished structure. Concrete can borrow from the forms of every other material, it has no inherent shape and its physical characteristics varied according to the skills and whims of the workers. Moeller refers to Francis S. Onderdonk stating that "[t]he more a material can be affected by mechanical and chemical influences while being formed, the more possibilities it contains and hence the more perfect it is."¹⁴ Actually it is not that concrete has no aesthetic, but rather it has too many. That's why there is not a consensus about the "correct" use of concrete. While for the French architect Auguste Perret concrete architecture must consist of articulated trabeated structures with infilling precast blocks; for his pupil, Le Corbusier, it was the cantilevered slab of the Domino system. It was not merely the intrinsic properties of the material but also the extrinsic forces within the architectural culture that shaped the form

¹³ Kenneth Frampton, "Frank Lloyd Wright and The Textile Tectonic", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England, The MIT Press, 1995, p.106.

¹⁴ G. Martin Moeller, Jr., "Reinforced Concrete and the Morality of Forms", Liquid Stone: New Architecture in Concrete, Berlin: Birkhäuser, 2006, p.156.

of concrete structures. In short, “concrete –like all other materials- is not a technical given but an architectural construct.”¹⁵

Apart from the focus on concrete as a structure, the aesthetics of exposed concrete, how to treat its external appearance has been the main concern in the modernist era. Varied and inventive essence of concrete has been explored within the cast-in place vs. prefabricated, handmade vs. machine made, smooth vs. rough dichotomies. Frank Lloyd Wright and Louis I. Kahn were among the first architects who understood how to work with all these factors. At first, concrete had been regarded as suitable only for structure covered with more elegant finishings, like stone, metal, tile. Later the possibilities of concrete were appreciated not only as a finish material but also as a decorative one. Exposing the impressions of wooden board formwork and aggregates, Wright enhanced the natural aspects of concrete. Kahn was more interested in purifying the expression of formwork, so he created concrete surfaces that expressed the plywood form panels and their joints. In his works, instead of a simple component material, the order, the modulation, the careful labor, a highly controlled process is evident. Rather than using an applied skin, concrete is worked in its corporeal form. Le Corbusier’s Chapel of Notre Dame du Haut at Ronchamp, France (1955) exemplifies the creative forms achievable in massive, monolithic concrete construction. Many other architects, such as Oscar Niemeyer, Félix Candela, and Eero Saarinen exploited the tectonics of concrete. Saarinen, in his TWA Terminal Building at Idlewild (now John F. Kennedy International) Airport in Queens (1962), used concrete not only as a technical mean but also conveying a certain architectural spirit. He has combined beauty, expressiveness, and technological

¹⁵ Réjean Legault, “The Semantics of Exposed Concrete”, Liquid Stone: New Architecture in Concrete, Berlin: Birkhäuser, 2006, p.46.

sophistication. Art of building is closely related to constructional craft which has been dealt for centuries.



Figure 3. Le Corbusier, Chapel of Notre Dame du Haut, France

Source: <http://aedesign.wordpress.com/2010/03/12/notre-dame-du-haut-haute-saone-france/ronchamp-chapel/> [Last accessed August 21, 2011]



Figure 4. Eero Saarinen, TWA Terminal Building, Idlewild

Source: <http://autologue.typepad.com/autologue/brand/> [Last accessed August 21, 2011]

Pier Luigi Nervi, an engineer and architect, is best known with his innovative use of reinforced concrete. He evaluates concrete as the finest construction material man has found, and employs it as his medium of expression. The organic beauty that Nervi created was result of his engineering. For him the aesthetic perfection comes from technical perfection, beauty comes from structural coherence, not from crude decoration. The execution of reinforced concrete, for Nervi, was as important as the design itself, fine finish and economy was part of the construction.



Figure 5. Pier Luigi Nervi, Small Sports Palace, Rome, structural detail

Source: <http://jtnicol.files.wordpress.com/2011/01/nervi01.jpg>

[Last accessed August 22, 2011]

Designation of concrete as a material is a common but mistaken notion. Adrian Forty asserts in his essay that instead of being a material “it is a process”¹⁶. Human labor produces concrete with sand, gravel, cement, and water. Forty continues as “even naturally occurring materials such

¹⁶ Adrian Forty, “The Material without a History”, Liquid Stone: New Architecture in Concrete, Berlin: Birkhäuser, 2006, p.35.

as stone, timber, and clay have to be processed before they become buildings; the difference between concrete and these other, so-called natural, materials is only a matter of degree. With concrete, the human labor element is more visible and more immediately apparent in the finished result, but the same element is present in all other materials.”¹⁷ Martin Heidegger claims that a work of architecture is the “bringing forth” of immanent properties of materials, which is difficult to apply to concrete for Forty, because it is the human skill and invention that is brought forth. That’s why early pioneers of concrete patented their techniques of “process”, such as François Hennebique.

Discussions about concrete over the last centuries have always underlined its newness. It was new in the eighteenth century, and it is still today. Repeatedly, people talk about this “new” material’s potential and possibilities. This rises the question whether concrete is a historical or an ahistorical material. As Forty put it forward, a material without a history should have interested the modernists. However, after many years since the invention of reinforced concrete, it is strange to think the material without a past. Auguste Perret enounces that “construction in concrete is amongst the oldest of all building methods, and at the same time it is one of the most modern.”¹⁸ The important thing is to reconcile concrete’s history with its supposed existence in the future.

Concrete, with its availability and mass consumption, can liberate mankind’s creativity and improve social progress. The utopian vision of the material was embodied in the modernist buildings disseminating concrete’s potentials as cultural expression. In the course of time, the focus of twentieth-century materials science research, cement-based

¹⁷ Ibid., p.37.

¹⁸ From Ibid., p.39 as cited in Karla Britton, Auguste Perret, London: Phaidon, 2001, p.244.

materials advancement and industrialization of concrete products became the imperatives of mass production. Concrete engineering has become standardizing codified concrete products, ready to be employed structural members with diverse selections. This standardization process created the capital for the final industrialization of concrete, which deprived concrete of its latent qualities.

The aim of this thesis is to emphasize the tectonic qualities of concrete as an architectural expression material which seems to have lost its “poetic” meaning as a result of production techniques developing with technology. Architecture, closely dependent on technology, is degraded to visual and surface impression. Tectonic as a construction art and science, needs to be reconsidered and should retrieve to its poetry. Scrutinizing tectonic in architecture with poetic meanings will result in the enrichment of intellectual and sensual perception of the building. It is within the framework of the inquiry to understand the relationship between technology and tectonic, which will help to express the aesthetic qualities of concrete in architecture.

There is a phrase; “concrete conglomerate.” However if you don’t construct a qualitative timber building, it also becomes a “timber conglomerate,” or “metal conglomerate,” or “stone conglomerate.” Misfortune with concrete is that, it displays its faults distinctly. Concrete has its own tectonic; apart from being a structural material, it conveys aesthetic meaning. Without aesthetic conditions being resolved, it is only “speechless” architecture just serving objective purposes, but do not interest in the intellectual needs. The architect must go beyond the initial requirements and the building must exceed the constructional needs. Concrete and reinforced concrete are not limited to calculations,

or transferring loads. It does not need to be covered, or concealed as a shame. Indeed, its repetitive and moldable properties make it favorable.

As a result of technological developments, concrete material usage in architectural production has been exposed to great transformation. Improvements in concrete industry increased the availability of different applications and techniques of concrete use in architecture. "Lightweight concrete" with low-density as a result of air bubbles and light aggregates, has a strong strength and insulation. "Concrete-agilia" eliminates vibration by its fluidity, provides high-quality surface, and wraps and protects reinforcements against corrosion. "Concrete-ductal" is a 6-8 times stronger concrete with organic fibers instead of steel reinforcement, is aerodynamic, light, smooth, and less-porous. Moreover, Light Transmitting Concrete (Concrete-LiTraCon), discovered by Hungarian architect Aran Losonczi in 2001, is a translucent concrete constituted of optical glass fibers instead of aggregates. All these technological developments result in various new concrete construction options. All these improvements do not see concrete as a standing reserve and use it up for architectural production. Indeed, the "essence" of technology is to bring forth the artistic expression.



Figure 6. Light Transmitting Concrete by Aran Losonczi

Source: <http://coolboom.net/materials/litracon-light-transmitting-concrete/>

[Last accessed August 22, 2011]

CHAPTER 2

TECTONIC THEORIES IN ARCHITECTURAL PRODUCTION

2.1 Essence of Technology and "Poiesis" in Architecture

In an age of high technology, the definition of technology still remains crucial to be examined. Martin Heidegger, while questioning technology in his seminal book "The Question Concerning Technology and Other Essays," points to the "essence" of technology that should be considered first and foremost which is not anything technological. According to Heidegger, the definition of technology as an instrument, as a means to an end is so much accepted that the "nontechnological" essence has already been obscured. However this instrumental definition of technology by the modern conception blinds us to the comprehensive "essence" of technology, that is both the modern view of technology and the ancient conceptions of technology including the *techne*. R. L. Rutsky evaluates Heidegger's aim as to broaden the understanding of the "essence of technology" from modern view as an instrument, tool, or machine into a "more general concept of making or producing, including artistic production."¹⁹

The notion of technology in the classical treatises on architecture was different than today. It was due to the fact that the word "techne"

¹⁹ R. L. Rutsky, "Introduction: The Question Concerning High Tech", High Techne: Art and Technology from the Machine Aesthetic to the Posthuman, USA: University of Minnesota Press, 1999, p.6.

represented an ontological bond between science and art. Gevork Hartoonian indicates that the notion of *techne* in the early discourses, such as of Vitruvius or Palladio, signifies "the *logos* of making: a concept of fabrication in which technique is congenial with the image of the final object itself."²⁰ In the late seventeenth century *techne* gave place to the "technique," meaning use of technical elements for an art or craft by the artist. Later with the advent of the mechanization, however, "the ontological relationship between art and science disappeared."²¹ Through the early twentieth century, the fundamental issue became that artifacts, architecture as well, must be advanced in conformity with technological developments. Industry and machinery stimulated architects. As Hartoonian refers to Walter Gropius' declaration: "art and technology: a new unity."²² Absorbing technical facts, architecture transforms them into architectural figures.

Martin Heidegger indicates that technology is both a means to an end and a human activity. He inquires "technology as a means" in relation to four types of causality: (1) the *causa materialis*, the material, the matter out of which the thing is made (for example, a silver chalice), (2) the *causa formalis*, the form or the shape that the material takes (for example, the chalice form), (3) the *causa finalis*, the end, the purpose of the thing that it would be put into (for example, a sacrificial rite), and (4) the *causa efficiens*, which brings about the finished thing (in this instance the silversmith). A silversmith (the *causa efficiens*) makes a chalice (the *causa formalis*) out of silver (the *causa materialis*) for a sacrificial rite (the *causa finalis*). According to Heidegger, "causality" is linked to "instrumentality", and "instrumentality" as "a means to an end"

²⁰ Gevork Hartoonian, "Poetics of Technology and the New Objectivity", Journal of Architectural Education, vol.40, no.1, 1986, p.15.

²¹ Ibid.

²² Ibid.

is the standard perception of technology. "The four ways of being responsible," as Heidegger says, "bring something into appearance."²³ He asserts that,

"Bringing-forth brings hither out of concealment forth into unconcealment. Bringing-forth comes to pass only insofar as something concealed comes into unconcealment. This coming rests and moves freely within what we call revealing (*das Entbergen*). The Greeks have the word *alethia* for revealing. The Romans translate this with *veritas*. We say "truth" and usually understand it as the correctness of an idea."²⁴

The essence of technology is directly related with revealing, -with *alethia*. Heidegger remarks that technology is not just means but a way of revealing, and the essence of technology is the realm of revealing, of "truth".

The word "technology" stems from the Greek "*technikon*" which belong to *techne*. As Heidegger explains, *techne* is the name both for the activities and skills of the craftsman, and for the arts of the mind and the fine arts. It belongs to bringing-forth, to *poiesis* as he denotes, it is something poetic. Heidegger terms *techne* both "poetic and revealing", it not only designates tools and fabrication, but also signifies its place in the world of values, that is "knowing." While technology draws only from its own resources (physics and mechanics), *techne* precedes practical knowledge and resides in poetics. For Heidegger, the act of craftsman and artists are poetic insofar as these acts bring something forth: "whatever passes beyond the nonpresent and goes forward into

²³ Martin Heidegger, "The Question Concerning Technology", The Question Concerning Technology and Other Essays, New York: Harper&Row, 1977, p.9.

²⁴ Ibid. , pp.11-12.

presencing..." Also, *techne* is "revealing"; it makes thing palpable according to knowledge that has precedent. So as Hartoonian puts it forward building a roof refers not to the act of building, but to the roof itself. He indicates that "*techne* characterizes the ontological relationship between object-type and its logos of making, i.e., architectural knowledge."²⁵

The Greeks, who gave an extreme interest to their art works, used the word "*techne*" both for art and craft. *Techne* refers to a kind of knowledge. Demetri Porphyrios clarifies *techne* in his article "From *Techne* to Tectonics" as "[i]t implies method and consistency and it represents man's reasoned intelligence put into practice."²⁶ It is an "ordered application of knowledge" that Greeks referred while producing a specific product demanding special skill. They used the term "*techne*" equally to carpentry, pottery, agriculture, medicine, painting, sculpture, architecture, music, and poetry. As Porphyrios clarifies the old German word "*kunst*", which is used today for art, implies this reasoned intelligence and practiced knowledge like the word *techne*. Derived from the word *kennen* or *können*, it originally meant knowledge and skill, the sense of a know-how.

With his etymological survey, Porphyrios indicates the close relation between building and construction, and come close to the notion of *techne*. As he analyses, the Greek word *oekodomeo* for "to build" comprises two roots: *oekos* meaning house or dwelling and *demo* meaning to tie and put together, to construct. Here "the sense of house as a constructed entity" is emphasized. Much related with the *techne* of building, Porphyrios explores the origins of the Latin word *aedificare*

²⁵ Hartoonian, op.cit., p.18.

²⁶ Demetri Porphyrios, "From *Techne* to Tectonics", Andrew Ballantyne ed., What is Architecture?, London: Routledge, 2002, p.130.

also meaning "to build." The roots *aedes* means house or temple, and *facere* to make. However, this "making" indicates a specific manner of making, a kind of fashioning and molding by hand. Further, the French word for "to build", *bâtir*, derived from the Old High German word *bestan* meaning "to bind." Porphyrios points to the root of *bestan* coming from the *bass*, which refers to the inner bark of trees used for plaiting wickerwork. As he declares, to build by the word *bâtir* also specifies a specific mode of building that is binding by plaiting. By the help of these analysis, Porphyrios displays the "essential meaning of building as constructing" and highlights the importance of *techne* as the "body of knowledge, which was formerly required for building."²⁷

First there was builder in timber, the carpenter, and later there appeared builder in stone and mason. The *tecton*, Greek word for builder, was first an artisan in wood, a carpenter and only later the word included the artisan working in metal, stone, clay, paint, etc. Porphyrios explains that the *techne* (organized body of knowledge) of the *tecton* is superseded by *tectonike*, the knowledge of carpentry, from which "tectonics" derives. Most important thing according to Porphyrios' analysis is "the realization that tectonics invoke a potential order which is defined by the form-giving capacity of the material used."²⁸ For him tectonics is concerned with three important issues:

"First, the finite nature and formal properties of constructional materials, be those timber, brick, stone, steel, etc. Second, the procedures of jointing, which is the way that elements of construction are put together. Third, the visual statics of form, that

²⁷ Ibid., p.134.

²⁸ Ibid., p.135.

is the way by which the eye is satisfied about stability, unity and balance and their variations or opposites."²⁹

Porphyrios here emphasizes revealing the ontological experience of construction instead of particular exigencies of it. With this view, he finds some aesthetic theories misleading when they evaluate tectonics only as signifying gestures applied to the construction practices. Tectonic design produces critical and sensitive resolution of technical considerations for the aesthetic expression. Porphyrios claims that tectonic experience constitutes both necessary and freedom.

The simultaneous existence of both art and craft within the meaning of *techne* supports the idea that through the reasoning and logical development of a project from the *techne* perspective, art is inherent. *Techne* implies the knowing in the sense of ontological revealing latent within a work. That is what artist attempts to convey in the creation of his art work. Art is inseparable from the design process of tectonics.

The understanding of *techne* in the Heideggerian sense can be defined as inclusive of both "tectonic" and "type." Construction is simply a response to gravity; architectural elements are put together with the help of mathematics and mechanics. On the other hand, tectonic meaning is beyond construction. Hartoonian claims that tectonic "denotes the making, by figurative objectification, of architectonic elements such as wall, column, beam and roof."³⁰ Thus, the architectural elements surpass their structural rationality and reveal meaning. Tectonic responds to gravity by analogy rather than efficiency or adequacy. Here ornament is not a crime, but a necessity. Detail exhibits the connection between aesthetic and practical judgment. In

²⁹ Ibid., p.136.

³⁰ Hartoonian, loc.cit.

this sense, classical architecture is unique. Through the interplay of revealing and concealing, detail integrates ornament with construction rules. Tectonic resides between structural elements and their analogical representation. That molds architectural knowledge, the logos of making. With the formation of new concepts and themes in architectural discourse and with developments in techniques of construction, it changes and evolves continuously by use and production.

Esra Akcan, in her essay, “Art in an Age of its Own Oblivion: An Interpretation on Heidegger” claims that the problem of the era is that the relationship between the words *techne* and *poiesis* –i.e. revealing, giving birth, exposing, emerging of the truth- is forgotten, the meaning of *techne* is just degraded to mere means production. As she puts forward, according to Heidegger, art has the possibility of bringing out the shine in the conception of technology. Understanding the words “*techne*” and “*poiesis*” within essence of technology, rethinking the meaning of “truth” that had been forgotten, will bring forth opportunities for a new understanding of art.

While Heidegger responds to the question “what is (should be) an art-work”, he points out the difference between work and tool. Tool and art-work, though both are produced by technology, are human productions. However for Heidegger, tool is a standing-reserve ordered for being useful and reliable. Being used for an end, it exists as long as it assures the result. Tool is consumed as long as it is used, and when it is used up till the end, it is finished. Using a matter as a tool is consuming it. As Esra Akcan asserts, for Heidegger art-work is neither a tool nor it uses things standing by as a tool. She explains it as that clay for artists is not a tool used for sculpture, but the sculpture itself; words are not just

communication tools for poets but the poetry itself. So art-work calls for us not to look at the world behind the means-end relationship.

According to Heidegger, Esra Akcan writes, art is occurrence of “truth”. Truth reveals itself in art-work. For him, truth is not the correctness. It has the meaning of *alethia*, unconcealment. Art is revealing of the truth as *alethia* meaning. Art is not producing standing-reserves, familiar things for an end. The truth in a work is unconcealment that as it never has been and will be presence. On her Heidegger comment, Esra Akcan further says:

"An artist does not consume paint as a tool; he/she lets the color sparkle in the work. Land is not an earth piece given to architects to turn maximum meter square to maximum profit, it is the place settled, enlivened world that is revealed. If a bridge is constructed as an art-work, a place occurs, a world is set; that bridge makes us notice the possibility of that place bringing the two shores together, among the many spots on the world only that one becomes a place by means of that bridge, it becomes a world...In an art-work the occurrence of the truth is not and should not be the “representation” of an “object” in a “correct” manner. Art as a presentation, not as a representation, is the one that can stand out of the “enframing” phenomenon of the era. In art work objects that are faced by subjects are not represented, things are presented."³¹

In relation to *techne*, Heidegger claims that:

"Whoever builds a house or a ship or forges a sacrificial chalice reveals what is to be brought forth, according to the perspectives of the four modes of occasioning. This revealing gathers together

³¹ Esra Akcan, “Geçmişte Kaldığı Çağda Sanat Yapıtı: Bir Heidegger Yorumu”, (Art in an Age of its Own Oblivion: An Interpretation on Heidegger), DeFTER, 25, 1995, p. 82.

in advance the aspect and the matter of ship or house, with a view to the finished thing envisioned as completed, and from this gathering determines the manner of its construction. Thus what is decisive in *techne* does not lie at all in making and manipulating nor in the using of means, but rather in the aforementioned revealing. It is as revealing, not as manufacturing, that *techne* is a bringing-forth."³²

Furthermore, Heidegger advocates human experience apart from technical and economic statistics justifying construction actions. Relevant to Heidegger's view, Adam Sharr explains in his book "Heidegger for Architects" that inhabiting their surroundings people first make sense and response to them emotionally, and then "quantify their attitudes and actions through science and technology."³³ While for construction industry data is the important trade, for architects it is the human experience. However, rise of technology had blurred this notion.

³² Heidegger, op.cit., p.13.

³³ Adam Sharr, "Introduction", Heidegger for Architects, New York: Routledge, 2007, p.2.

2.2 Tectonics as the Poetics of Construction

One of the fundamental debates of the nineteenth century architecture was related to the interaction between artistic symbolism and new materials, construction techniques of industrial culture. Within the interplay of these extremes, corporeality of building and inner consciousness of art were tried to be associated. These efforts resulted on the discourse about “tectonics” which is defined by the architectural historian Mitchell Schwarzer as “an arena of argumentation in which architecture was described on a continuum between the powers of the senses to create, and the imagination to enhance, the physicality of industrial culture.”³⁴ This fusion of constructional materiality and art possessed, as Schwarzer quotes Nikolaus Pevsner, “both a faith in science and technology and a romantic aesthetic of the machine.”³⁵ Merging art and utility was important for the parameters of modern individuality and society. Tectonics was not only concerned with ontological issues of structure and materials, but also it signified the modern subjectivity and artistic freedom, a new design aesthetic. Tectonics was not a victory, as Schwarzer opposes, of “a realistic observation of nature over subjective ideals.”³⁶ As he states, it yielded “the idealized power of the senses”³⁷, integration of empiricism with rationalism.

The term tectonic has been used in architectural theory by many architects and theoreticians. It has two main meanings in architecture: the theory of the inner structure of a work of art, and the shaping and

³⁴ Mitchell Schwarzer, “Freedom and Tectonics”, German Architectural Theory and the Search for Modern Identity, USA: Cambridge University Press, 1995, p.167.

³⁵ From *ibid.* as cited in Pevsner, Pioneers of Modern Design, p.210.

³⁶ *Ibid.*, p.175.

³⁷ *Ibid.*

joining of form elements to a unity. Several theorists, such as Karl Bötticher, Gottfried Semper, Eduard Sekler, and Kenneth Frampton, have discussed the term. Bötticher divides architecture into “Kernform” (core form) and “Kunstform” (art form), the structural and the representational and tectonic is the system that ties all the elements of a building into a whole. He indicates the importance of expressing structure and new materials visually within artistic forms. Semper also makes a division as technical and symbolic, and also focuses on the coherency between material and production techniques. He brings forward the integration of artistic and utilitarian in which evolving structural systems and new materials are covered with artistic ornament. Frampton foresees tectonic as a tool revealing essence of building. Carles Vallhonrat says in his essay that tectonics depends upon a very few fundamental aspects of the physical world. One is gravity and physics affecting what we build, another is structure of materials and also the way we put them together. “How and why we do it affects the way they appear as the surfaces that bound space.”³⁸

Kenneth Frampton employs the term tectonic in his book “Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture,” defining it as “poetics of construction.” For him, the term tectonic focuses on architecture as a kind of constructional craft. However by this, Frampton does not mean just the revelation of constructional technique, but rather he points to its expressive potential. He declares that in so far as the tectonic signifies a poetic of construction it is art, and it is not figurative or abstract art. Building is first an act of construction, a tectonic activity, not a scenographic one. Unlike fine art, Frampton sees building as an

³⁸ Carles Vallhonrat, “Tectonics Considered Between the Presence and the Absence of Artifice”, *Perspecta*, Vol.24, 1988, p.123.

everyday experience; it is a thing rather than a sign. He evaluates architecture by a different set of criteria, emphasizing its tectonic and tactile dimension. According to Frampton, “built invariably comes into existence out of the constantly evolving interplay of three converging vectors, the *topos*, the *typos*, and the *tectonic*. And while the tectonic does not necessarily favor any particular style, it does, in conjunction with site and type, serve to counter the present tendency for architecture to derive its legitimacy from some other discourses.”³⁹

Harry Francis Mallgrave indicates Frampton’s axiomatic definition of architecture, “poetics of construction,” and appreciates the tectonic and tactile dimensions of architecture reminded by him. However, Mallgrave questions Frampton’s undermining “architecture’s capacity for representational values,” although his interpretation of tectonic is totally different from “cruder efforts at artistic materialism.”⁴⁰ In order to solve this dilemma, Mallgrave figures out Frampton’s historical examples. According to Karl Friedrich Schinkel, for example, an edifice should convey cultural meaning on many levels; not only in tectonic form depicting its constructional logic but also in iconographic and didactic efficacy. As in his Bauakademie, while the exposed brick piers and castellated cornice refer to tectonic system, the terra-cotta tapestry, depicting its mythological and constructional history, surrounds the doors and principal windows. Schinkel reconciles the ideal and the real. In this regard Frampton refers to Schinkel’s theoretical statements, “The Principle of Art in Architecture”:

³⁹ Kenneth Frampton, “Introduction”, Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England, The MIT Pres, 1995, p.2

⁴⁰ Harry Francis Mallgrave, “Foreword”, Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England, The MIT Pres, 1995, p.ix.

- "1. To build (bauen) is to join different materials into a whole, corresponding to a definite purpose.
2. This definition, encompassing a building in both its spiritual and material aspects, clearly demonstrates that purposiveness is the fundamental principle of all building.
3. The material edifice, which now presumes a spiritual aspect, is here the subject of my consideration.
4. The purposiveness of every building can be considered under three aspects: these are:
 - a) Purposiveness of spatial distribution or of the plan,
 - b) Purposiveness of construction or of the joining together of materials appropriate to plan.
 - c) Purposiveness of ornament or of the decoration."⁴¹



Figure 7. Bauakademie, structurally expressed

Source:http://commons.wikimedia.org/wiki/File:M_Bauakademie_Berlin_1888.jpg#file [Last accessed August 22, 2011]

⁴¹ From *ibid.* p.79 as cited in Harry Mallgrave, "Aus Schinkel's Nachlass", Book II, Section 208.



Figure 8. Bauakademie, terra-cotta tapestry

Source:http://www.spreeinsel.de/html/3_stadtentwicklung/liste/bauakademie.html [Last accessed August 22, 2011]

Mallgrave posits that this graphic impulse was elevated to another theoretical level with the distinction of Karl Bötticher's core form and symbolic art form. It was defined by Friedrich Theodor Vischer and Robert Vischer as "the mostly unconscious projection of human emotion, of our mental-sensory self, into sensuous form"⁴², the notion of empathy. As Mallgrave further explains, "[t]his notion of empathy for Robert Vischer (and later, in 1886, for Heinrich Wölfflin) was in no way a merely figurative reading of form. It presumed both our psychological and emotional engagement with the world and therefore was corporeal and emotive rather than conceptual and intellectual."⁴³ Through his analysis, Mallgrave acknowledges that Frampton's tectonic is totally

⁴² Mallgrave, *op.cit.*, p.x.

⁴³ *Ibid.*

apart from vulgar materialism, the empathetic sensitivity to form and its material expression reveals the representational side of his tectonic thesis. He argues that “[t]he author does not wish to deprive architecture of other levels of iconic expression but rather to reinvest a design with a now largely understated layer of meaning, one perhaps more primitive or primordial in its sensory apprehension.”⁴⁴ While investigating certain architects’ tectonic works, all of uses and definitions of the term throughout his seminal book imply an artistic expression out of a technical resolution. An intended expression is revealed by making, *poesis* denotes an artistic expression. Tectonics is the cooperation of technical practice and aesthetic expression realizing an integrated design.

In his inquiry, Frampton explores the Italian architect and theorist Vittorio Gregotti with respect to detailing in architecture. Gregotti’s stance in detailing is that it should not be an afterthought in architecture and should not be an insignificant technical means lost in the design process. According to Gregotti architecture resides in the details, and he claims that it has been overlooked by the contemporary architects. Clarifying Gregotti’s point, Kate Nesbitt states that “detailing demonstrates the attributes of materials through application of the laws of construction.”⁴⁵ For example, textures that are created by formwork while concrete is formed become a part of the final design. Even the voids, once ties are removed, are means to express the final appearance of the building. The experience that users will have, are determined through these details which are even not shown up in drawings. Double articulation of the poetic and cognitive aspects of a

⁴⁴ Ibid.

⁴⁵ Kate Nesbitt, “Introduction: The Exercise of Detailing”, *Theorizing A New Agenda For Architecture: An Anthology of Architectural Theory 1965-1995*, New York: Princeton Architectural Press, 1996, p.494.

building results in the tectonic success. As Frampton states that “the tectonic stands in opposition to the current tendency to deprecate detailing in favor of the overall image.”⁴⁶ The role of the detail in architectural production is praised in the modern era by many architects, especially with Mies van der Rohe’s famous maxim “God is in the detail.” The Italian architect Marco Frascari interprets the dictum as “detail as a minimal unit in the process of signification (that is, the manipulation of meaning), it is useful to restate that architecture is an art as well as a profession.”⁴⁷ Architecture as an art is not only interested in creating a shelter, but also in gathering spaces and materials in a meaningful manner. Poetic expression can be realized collaboratively with functional, economic, technologically concise order; artistic expression is inherent in technical process. As long as technology and technical knowledge is integrated with form and art, a well-conceived tectonic design is achieved. “In the last analysis, everything turns as much on exactly *how* something is realized as on an overt manifestation of its form. This does not deny spatial ingenuity but rather to heighten its character through its precise realization.”⁴⁸

For a better understanding of Greek architecture in the early nineteenth century, tectonics was one of the deeply discussed concepts around neoclassicism. Around the mid-nineteenth century, two German architects and theorists, Karl Bötticher and Gottfried Semper, treated the word “tectonic” in their titles deeply. For them tectonic was the key word in order to understand the relationship between final and

⁴⁶ Frampton, op.cit., p.26.

⁴⁷ Marco Frascari, “The Tell-the-Tale Detail”, Theorizing A New Agenda For Architecture: An Anthology of Architectural Theory 1965-1995, Kate Nesbitt ed., New York: Princeton Architectural Press, 1996, p.511.

⁴⁸ Frampton, loc.cit.

expressive architectural forms and prototypes born from technological, constructional necessity.⁴⁹

Frampton uses the word tectonic in several contexts. Referring to Karl Bötticher's influential book *Die Tektonik der Hellenen* (The Tectonic of the Hellenes), while Bötticher distinguishes between the Kernform – timber rafters in Greek temple- and the Kunstform –artistic representations of the same elements-, he interprets the term tectonic as “signifying a complete system binding all the parts of the Greek temple into a single whole, including the framed presence of relief sculpture in all its multifarious forms.”⁵⁰ On the other hand, Frampton mentions Gottfried Semper's taxonomy of four elements –the earthwork, the hearth, the framework, and the lightweight enclosing membrane- and classifies the building crafts into two as “the tectonics of the frame” and “the stereotomics of the earthwork.” This “light and heavy” distinction creates a more general differentiation of material production. According to Semper's *Stoffwechseltheorie*, “the history of culture manifests occasional transpositions in which the architectonic attributes of one mode are expressed in another for the sake of retaining traditional symbolic value,”⁵¹ as stone is cut and laid in the Greek temple to reinterpret the timber frame.

Frampton also mentions the "*representational*" and "*ontological*" aspects of tectonic form, as Semper's distinction between the *symbolic* and *technical* aspects of construction: the skin representing the construction and the core of a building. For Frampton, the dichotomy between the ontological nature of the earthwork, frame, and roof and

⁴⁹ Eduard F. Sekler, “Structure, Construction, Tectonics”, Structure In Art and In Science, G. Kepes ed., New York: George Braziller, 1965, p.90.

⁵⁰ Frampton, op.cit., p.4.

⁵¹ Ibid., pp.5-6.

the more representational, symbolic nature of the hearth and the infill wall must be rearticulated in the creation of architectural form, since each building type, technique, topography, and temporal circumstance brings about a different cultural condition.⁵² Referring to Harry Francis Mallgrave's analysis, Frampton indicates the uncertainty of Semper between "the relative expressivity of construction as a thing itself – rationally modulated from both a technical and an aesthetic standpoint– and a symbolic elaboration of the cladding irrespective of its underlying structure."⁵³ For this dichotomy Mallgrave posits a reconciliation of the representational and the ontological.

Eduard Sekler, in his 1973 essay entitled "Structure, Construction, and Tectonics," points to the differences and relationship between these terms. As he explains, structure is a system or a principle of arrangement to cope with forces in a building, like post-and-lintel structure, arch structure, or folded plate structure; on the other hand construction is the realization of these systems in a number of ways an materials, like wood construction of post-and-lintel, stone construction of arch. Further he clarifies the term tectonic as;

"When a structural concept has found its implementation through construction, the visual result will affect us through certain expressive qualities which clearly have something to do with the play of forces and corresponding arrangement of parts in the building, yet cannot be described in terms of construction and structure alone. For these qualities, which are expressive of a relation of form to force, the term tectonic should be reserved."⁵⁴

⁵² Ibid., p.16.

⁵³ Ibid.

⁵⁴ Sekler, op..cit., p.89.

It is the architect's domain to make experience of reality visible, the experience of forces related to forms, through tectonics. The visual expression is given through tectonics by the realization of construction. Among the three concepts that Sekler discussed, tectonics is the "most autonomously architectural" one. The structural or constructional conditions may not be completely in his control, but he is the "undisputed master of tectonic expression."⁵⁵

Frampton further mentions the arbitrary and positive beauty distinction of Claude Perrault, and here he indicates the evidence of tectonic. In Perrault's assertion style is related to arbitrary beauty while material richness and precision of execution belong to positive beauty. For that reason, style may be regarded as atectonic because of its representational emphasis, whereas positive beauty is accepted as tectonic inasmuch as it is based on material substance and geometrical order. Later, Schinkel's concern for craft precision and material richness as well derives from Perrault's positive beauty. Schinkel stresses the importance of using the most appropriate material and also revealing the quality of both materials and craftsmanship. Like Perrault, Augustus Charles Pugin advocated the decorative elaboration of tectonic features instead of applied ornament. He asserted that "tectonic form should be largely determined by the nature of the material."⁵⁶ However, unlike Eugene Emmanuel Viollet-le-Duc, he was not interested in an evolving style. Although he used iron as a new material in his details, he was not concerned with the integration of new methods and materials. As Viollet-le-Duc's masterpiece *Entretiens* proves it, for him architecture was an art of construction based on logic, climate, economy and craft

⁵⁵ Ibid., p.95.

⁵⁶ Kenneth Frampton, "Greco-Gothic and Neo-Gothic: The Anglo-French Origins of Tectonic Form", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England, The MIT Press, 1995, p.37.

production, he refused the scenographic eclecticism. Although both Pugin and Viollet-le-Duc adduce some principles from French twelfth-century Gothic, unlike Pugin, Viollet-le-Duc insists on using these principles to generate new structural forms. His method was “syntactic, open, an additive, rather than semantic and closed.”⁵⁷ As Frampton indicates, in his magnum opus *Entretiens*, Viollet-le-Duc encourages the assembly of different materials, techniques, and resources for an effective and engaged mode of building for the given moment. “By such an assembly, however, he did not intend a simpleminded transposition of different technologies, as in, say, the inarticulate substitution of cast-iron columns for stone supports, without reconsidering the interactive and contingent character of the entire assembly.”⁵⁸

⁵⁷ Ibid., p.50.

⁵⁸ Ibid.

2.3 Core-form and Art-form Relation

Between 1843 and 1852, the seminal book *Die Tektonik der Hellenen* (The Tectonic of the Hellenes) was published in three volumes by Karl Bötticher, which gave a new direction to architectural theory. Bötticher investigated to resolve the dichotomy between the materiality of the structural rationalism and the symbolism of Greek form. He sought a synthesis “between the ontological status of the structure and the representational role of the ornament.”⁵⁹ Influenced both from Johann Gottfried von Herder’s tactile structural aesthetic and Karl Friedrich Schinkel’s articulated method, Bötticher claimed that interaction of support and load could express architecture’s essential form. He persisted on the corporeality of architecture; constructional form is fundamental and it should never be concealed by the symbolic revetment. Mitchell Schwarzer affirms, in his article “Ontology and Representation in Karl Bötticher’s Theory of Tectonics,” that “philosophical aesthetics was leading architecture into purposeless immateriality and a dependence on extrinsic aims, Bötticher interpreted ornament as the communication of themes intrinsic to building.”⁶⁰

In his book Markus Breitschmid refers to the architecture-historian Richard Streiter pointing in his doctoral dissertation to Bötticher’s theory as “an aesthetic approach to architecture.”⁶¹ According to Streiter,

⁵⁹ Kenneth Frampton, “The Rise of the Tectonic: Core Form and Art Form in the German Enlightenment, 1750-1870”, Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England: The MIT Press, 1995, p.82

⁶⁰ Mitchell Schwarzer, “Ontology and Representation in Karl Bötticher’s Theory of Tectonics”, Journal of the Society of Architectural Historians, vol. 52, 1993, p.267

⁶¹ Markus Breitschmid, Can Architectural art-form be designed out of construction? Carl Boetticher, Gottfried Semper, and Heinrich Woelfflin: a sketch of various investigations on the nature of Tectonic in nineteenth-century architectural theory, USA: Virginia Polytechnic Institute and State University, 2004, p.23.

Bötticher loved architecture for its own sake; he did not see architecture as a possibility of an expression of a metaphysical world view, for him its beauty comes from within, from the meaning of the correlation of forms.⁶² Streiter states that with his architectonic and archeological knowledge “Bötticher freed the aesthetics of architecture from the religious and historical view of the philosophy... and became a part of the transition that began to prepare the grounds of the new psychological aesthetics.”⁶³ Breitschmid declares Bötticher’s tectonic as the unified understanding of the system of statics, interior and exterior design, handling of building materials, and the artistic articulation of building. It questions why certain forms look the way they do instead of a historical perspective, developing an architectural form with present-day approaches.

Bötticher distinguished, as he had defined the terms, between the *Kernform* and the *Kunstform*. Wolfgang Hermann explains the difference in his book “Gottfried Semper: In Search of Architecture” with Bötticher’s words: “The concept of each part can be thought of as being realized by two elements: the core-form and the art-form. The core-form of each part is the mechanically necessary and statically functional structure; the art-form, on the other hand, is only the characterization by which the mechanical-statical function is made apparent.”⁶⁴ They cannot be found independently in buildings. Bötticher stresses that the essence of constructional core is revealed by the shell, the *Kunstform*. For him, the difference between the constructional part and its enrichment –cladding or ornament– should be expressed. He defines the art form as “only a covering and a symbolic attribute of the part –

⁶² Ibid.

⁶³ Ibid.

⁶⁴ From Wolfgang Hermann, “Semper and the Archeologist Bötticher”, Gottfried Semper: In Search of Architecture, London: The MIT Press, 1984, p.141, as cited in Karl Bötticher, Die Tektonik der Hellenen, Potsdam, 1852, vol.1, p.xv.

decoration.”⁶⁵ This decoration is not historical or cultural, instead it leans on the core form. Breitschmid evaluates art-forms as “expressing and characterizing the invisible structural functioning of the building and, thus, the inanimate stones with which the building is built are transformed into an expressive architectural language.”⁶⁶ He claims that art-forms are the visual language of tectonic forms, and without them static forces would not be seen and the building would be dead. This decorative attribution of the core-form –the symbolic “dressing”- was conceived “with its mechanical function and thus was no willful or arbitrary appendage.”⁶⁷ Bötticher’s distinction between the structural work core-form and its artistic representation art-form appeared as a keystone for architectural tectonic theories and application of these concepts to new materials and technologies increased.

Caroline van Eck explores in her essay “Modernity and the Uses of History: Understanding Classical Architecture from Bötticher to Warburg” that art forms have an important role although they do not contribute to the material solidity of a building. As Eck claims, as a result of “their expression of the invisible structural functioning of the building the dead stones are transformed into a living work of art.”⁶⁸ For Eck the building would seem dead without art-forms, they are “the visual language of tectonic forms.” Speculating on the question how architecture may be called an art, like ballet or music in which the human spirit is liberated from all material conditions, in spite of its practical utility, Eck argues that building becomes an art “through the

⁶⁵ Ibid.

⁶⁶ Breitschmid, op.cit., p.26.

⁶⁷ From Harry Francis Mallgrave, “Refugee in Paris and London: 1849-1955”, Gottfried Semper: Architect of the Nineteenth Century, London: Yale University Press, 1996, p.219, as cited in Karl Bötticher, Die Tektonik der Hellenen, p.xv and 8.

⁶⁸ Caroline van Eck, “Modernity and the Uses of History: Understanding Classical Architecture from Bötticher to Warburg”, Mari Hvattum and Christian Hermansen ed., Tracing Modernity: Manifestations of the Modern in Architecture and the City, London: Routledge, 2004, p.59.

use of ornament that expresses the inner nature of architecture, and at the same time transcends its materiality because the use of *Kunstformen* is evidence of free aesthetic design and planning of the building as a whole.”⁶⁹ According to Eck, by his theory Bötticher reconciled the practical and the aesthetic demands –solid, functional one with beautiful, expressive of the freedom of the human spirit.

Schwarzer defines Bötticher’s tectonic in his article as the activity of forming a building. Instead of direct or analogical imitations, Bötticher’s tectonic was interested in the processes which made up building. Schwarzer indicates that “Architecture was no longer conceived of as a finite world of forms; rather, it became a dynamic and infinite universe of forces.”⁷⁰ Throughout the eighteenth century, Schwarzer says, artistic judgment was released from the restraints of imitation and rule as a result of originality, sensations, and imagination. Instead of passive apprehension of objects, active unfolding of the imagination is reflected on architecture. While Bötticher believed that functional needs and constructive forces constituted architecture’s essence, he insisted that art also must refer back to these utilities and external forces. As Schwarzer analyses “a harmony between building and human culture brought about through the mediation of artistic ornament.”⁷¹

Bötticher took up the fundamental question that how architecture, in service of need and utility, is elevated to a fine art. As Frampton states in *Studies in Tectonic Culture*, Bötticher was impressed by Schelling’s natural philosophy as Schinkel was, both believed that the mere pragmatism of architecture can be exceeded by means of symbolic significance. Only by generating analogies between tectonic and

⁶⁹ Ibid., p.61.

⁷⁰ Schwarzer, loc.cit.

⁷¹ Ibid.

organic form, the inorganic structural form could acquire symbolic meaning. However, this does not mean, of course, a direct imitation of natural forms. Although Bötticher argued that architecture only imitates itself, he never accepted an opportunistic borrowing of historical forms. Following Schinkel, he believed that constructive forms must be symbolized by ornament, elaborated with aesthetic feelings. Schwarzer states that “Bötticher strove to replace outdated paradigms of artistic rule, proportion, and symmetry which had dominated architecture since the Italian Renaissance, but which were no longer in harmony with the reconceptualization of art in philosophical aesthetics.”⁷² As Schwarzer puts it forward tectonic was a reply to aesthetic reductionism. Bötticher’s tectonic theory was to “explicate the meaning and unity of mechanical processes and natural forces through artistic symbols,”⁷³ he pursued for an integrative system of structure and art. In philosophical terms Schwarzer explains the theory “attempts to resolve architectural *Mannigfaltigkeit* (the variety and complexity of the mechanical forces of building), in an *Einheit* (unity), possible only in art.”⁷⁴

Bötticher associated structure and ornament with ontology and representation. Kunstform is the artistic representation of Kernform. This amplification, as Schwarzer indicates, yields to the integration of modern complexities of materials, statics, and everyday needs with the universal unities of beauty and truth. For Bötticher artistic signs were the representation of mechanical forces:

"All decorative characteristics of the parts of built structure are perceptible demonstrations of their functions, essence, physiognomic beginning, development, turns, conclusions, and

⁷² Ibid., p.269.

⁷³ Ibid., p.271.

⁷⁴ Ibid., p.270.

connections. In short, art is an explication of the organicism which connects the whole with its parts."⁷⁵

Schwarzer specifies Bötticher's consciousness about the disaffection of aesthetics from the material world. Like Hegel, Bötticher was questioning architecture's external forms, whether having any meaning within themselves or serving an end apart from themselves. Different than Hegel's spiritual architecture, as Schwarzer puts it forward, Bötticher comprehended "artistic symbolism in architecture dependent upon considerations of need, material, and technological innovation."⁷⁶ Aesthetic hierarchies were reversed by Bötticher's idea that "artistic representation exemplifies (not dominates) the qualities of materials and lineaments of static forces."⁷⁷ He neither accepted the subservience of materials, static relationships, and needs for artistic representation nor rejected the importance of artistic symbolism. In his theory, states Schwarzer, function, statics, and material precedes the embellishment of building by painting and sculpture. Bötticher argued that all mechanically serving parts of Greek architecture is represented through their artistic forms. Harry Francis Mallgrave affirms that this is "a very animate conception of Greek architecture, one in which all of the decorative characteristics of the structural parts not only articulate their immediate purpose (the circuitous lines of gravitational forces) but also "the organism of the whole as well as of the parts" (higher Kantian purposiveness)."⁷⁸ According to Mallgrave, Bötticher's analyzed each line metaphorically, every form comprised by an artistic

⁷⁵ Schwarzer, op.cit., p.273.

⁷⁶ Ibid.

⁷⁷ From Ibid. as cited in Karl Bötticher, *Entwicklung der Formen*, p.328.

⁷⁸ Harry Francis Mallgrave, "The Animate Brain: Schinkel, Bötticher, and Semper", *The Architects Brain: Neuroscience, Creativity, and Architecture*, USA: Blackwell Publishing, 2010, p.65.

conceptualization, he appraised all parts in an intensely animate fashion.

Schwarzer furthermore refers to Herder's 1770 "Plastik" (Sculpture) essay, in relation to Bötticher's tectonic theory. Schwarzer thinks that rejecting rational rules Herder realigns beauty through the sensibility of matter as well as imagination. Herder argued against the dominance of visual perception merely as a means for aesthetic enjoyment of sculpture. Schwarzer stresses that, comparing sight and touch, for Herder tactile perception is the key in order to understand the meanings of bodily fullness which is not accessed by vision. What Herder points is the difference between sight focused flat planes and tactile sensed three dimensional forms, sensations of hardness and softness, roughness and smoothness, weight and lightness. After the writings of Herder and Schinkel, "tactile, mechanical, and eventually, spatial forces were progressively recognized as essential to the determination of architectural beauty."⁷⁹

Closely related to Herder's point of view, the German architect Friedrich Gilly focused on the organic, integrated relationship between art and science. For him architecture was both a science and an art, it has "higher poetic values to satisfy."⁸⁰ As Schwarzer figures it out, Gilly "commented on the fundamental aesthetic attributes of architectural surface and mass as conditioned by statics and materials, and accorded philosophical pertinence to the perception of functionally-determined typological forms, and raw unmediated walls."⁸¹ This can be

⁷⁹ Schwarzer, op.cit., p.274.

⁸⁰ Harry Francis Mallgrave, "Friedrich Gilly: from Some Thoughts on the Necessity of Endeavoring to Unify the Various Departments of Architecture...(1799)", Architectural Theory: Volume 1, an Anthology from Vitruvius to 1870, USA: Blackwell Publishing, 2006, p.399.

⁸¹ Ibid.

achieved by the unification of artistic and theoretical. Influenced by Herder and Gilly, Schwarzer asserts, Bötticher emphasized the importance of body, mass, and materials in his tectonic theory. For Bötticher “to understand tectonics is to grasp how all single elements of a building are integrated into a harmonious and organic spatial whole.”⁸² Moreover, foreseeing many themes in Bötticher’s *Tektonik*, the architectural theorist Johann Heinrich Wolff consciously clarified the material and static relation in architecture. He wrote in 1834:

"No form is permitted therefore in architecture to appear as arbitrarily added ornament; rather each must be based on a sufficient motive. The symbolic meaning of building and its parts and similar motives emerges either from the demands of practicality, the means of construction, the nature of materials or the suitable joining of plant forms, and the use of ribbons for fastening."⁸³

Schwarzer associates this thinking with Bötticher’s *Kunstform-Werkform* relation. The art form never commands the core form. Bötticher affirmed that “*Kunstform* intricately mirrors the external relations, qualities, and conceptual relations of its *Werkform*,”⁸⁴ and he continues that “each *Werkform* is clothed by a characteristic covering.”⁸⁵ In this connection, Schwarzer refers to Schinkel, as an influence on Bötticher, insisting that this essential covering on constructive members should not ruin the original form. As Schinkel described in his *Lehrbuch* “decoration is the embodiment of tectonic systems, the raising of architecture to art.”⁸⁶

⁸² Ibid., p.275 as cited in Karl Bötticher, *Entwicklung der Formen*, p.316.

⁸³ Ibid., p.276 as cited in Johann Heinrich Wolff, *Beiträge zur Aesthetik der Baukunst, oder die Grundgesetze der plastischen Form nachgewiesen an den Haupttheilen der griechischen Architektur*, 1834, p.26.

⁸⁴ Ibid., p.276 as cited in Karl Bötticher, *Die Tektonik*, 1:31.

⁸⁵ Ibid. as cited in Karl Bötticher, *Die Tektonik*, 1:25.

⁸⁶ Ibid. as cited in Karl Friedrich Schinkel, *Architektonische Lehrbuch*, p.83.

According to Schwarzer, Bötticher's tectonic theory is totally against the modern architectural theorists' rejection of historical styles, aesthetics, or artistic ideals for the sake of structural and functional advancement. He states that Bötticher believed in "the conditioning of both artistic subjectivity and mechanical objectivity within the laws of historical succession."⁸⁷ Bötticher opposed the arbitrary use of historical ornaments; he insisted harmonizing materials and statics with ornaments like historical eras. In his text, "The Principles of the Hellenic and Germanic Way of Building", Bötticher posited a third style which synthesizes the Gothic and the Greek legacy. He argues that the eclecticism of the spirit, the essence behind the appearance is the only way to the true tectonic tradition. He mentioned about the "essence" of forms in his text as:

"An architect of genius today thus fulfills his appointed mission in two ways. On the one hand, by satisfying present needs through his work, he spurs others to emulate him. On the other hand, by clothing this work in a historical style and thus by seeking to elevate it to an object of history, he forces the science of art to investigate the style that, by adopting, he has clearly designated as fit for its purpose. There is no need here to preface these remarks by noting that by the science of ancient architecture we do not mean the mere knowledge of the works and art-forms that have come down to us –this we take for granted– but the knowledge of the essence and the original conception that is artistically embodied in those forms."⁸⁸

⁸⁷ Ibid., p.277.

⁸⁸ Karl Bötticher, "The Principles of the Hellenic and Germanic Way of Building with Regard to Their Application to Our Present Way of Building", In What Style Should We Build?, USA: Getty Center, 1992, p.148.

Bötticher's tectonic is the rational system of design analogous to nature's own creative ways, as it was in Greeks. In "Gottfried Semper and The Problem of Historicism," architectural historian Mari Hvattum indicates that Bötticher's external form-inner idea relation is derived from all natural phenomena. In nature, inner essence of creations is always expressed through forms. Referring to Bötticher's argument Hvattum states that "the correspondence between form and concept that characterized natural beings from their embryonic beginning to their mature state should be present also in works of art."⁸⁹ He associated the intrinsic principle of architecture with the principle of creative nature:

"The principle of Greek tectonics is . . . identical with the principle of creative nature: the concept of each work [*Gebildes*] is expressed in its form. From this principle alone springs a law of form, which stands high above the individual conditions of the particular subject matter [*des werktätigen Subjektes*]. [It rules] within boundaries that admit only the true and highest freedom, and opens an inexhaustible source for invention."⁹⁰

The modern architecture historian Kai K. Gutschow writes in his essay that "tectonics insured that every architectural detail was designed to be a true expression of its own inner structural, functional and material "essence," as well as an integral component of an overall design."⁹¹ Bötticher studied Greek architecture, inspired from its formal principles, however, he never accepted symbolic, structural, or idealist reasoned copying of those forms. As Gutschow writes referring to Bötticher "all

⁸⁹ From Mari Hvattum, "The Doctrine of Imitation", *Gottfried Semper and the Problem of Historicism*, New York: Cambridge University Press, 2004, p.58 as cited in Karl Bötticher, *Tektonik*, 2nd ed., 4.1, p.19.

⁹⁰ From *ibid.* as cited in Karl Bötticher, *Tektonik*, 1st ed., p.xiv.

⁹¹ Kai K. Gutschow, "Restructuring Architecture's History: Historicism in Karl Bötticher's Theory of Tectonics", <http://repository.cmu.edu/cgi/viewcontent.cgi?article=1036&context=architecture> (accessed March 14, 2011)

dry copying of an art style and all eclectic use of its forms is barbarism and leads straight to corruption."⁹² The mutual relationship between Kernform and Kunstform displays a dynamic interaction between the structure and ornament of architecture. Bötticher found out valuable examples of this in the classical orders, such as the articulation of base emphasizing the compression and the gravity force, concave and convex movement of the Echinus articulating the entablature resting upon it. Hvattum specifies architectural ornament as "an expression of the inner, static working of the tectonic body: nothing else than the embodied image of its concept."⁹³

In his second edition of 1874, Karl Bötticher also stresses the man's "creative urge" in the formative act of building. According to Schwarzer this shift can be explained by Gottfried Semper's influence about the insufficiency of merely imitation of the mechanical laws of nature for the treatment of architecture. Also Schinkel, following whom Bötticher invented his tectonic theory, associates material expression with spirit. Work-form and art-form relation was not enough for him for an aesthetic pleasure. It is through the active interpretation of the sensuous mind that the significance of construction of a building and representational values are linked. "It is really the deep inner connection of a work of art, which points to that which cannot be represented; because this connection itself can only become clear when it is grasped by every feeling mind through its own activity in represented forms and figures."⁹⁴ Pertinent to the discussion, Mallgrave states in his book "An Anthology from Vitruvius to 1870" that:

⁹² Ibid.

⁹³ From Hvattum, loc.cit. as cited in Karl Bötticher, *Tektonik*, 2nd ed., 4.3, p.19.

⁹⁴ From Breitschmid, op.cit., p.29 as cited in Karl Friedrich Schinkel, *Architektonisches Lehrbuch*, quoted from: Caroline van Eck, *Organicism in nineteenth-century architecture: An inquiry into its theoretical and philosophical background*, Amsterdam: Architectura & Natura Press, 1994, p.155.

"The Greek building in its design and construction shows itself in every respect to be an *ideal* organism *articulated* for the production of the *spatial need* in an *artistic way*. This space serving organism, from the whole to the smallest of its members (*membra*), is an imagined creation; it is an invention of the human mind and has no model in nature from which it could have been designed. Every *one* of its members proceeds only from the *whole*; for this reason, each part is an *imperative* and *necessary* part, an *integrating* element of the whole, which conveys and transfers its *special* function and place to the *whole*. From such a conception, the working hand of the architect [*Tektonen*] fashions each member into a bodily *scheme*, which for the cultivation of spatiality *most perfectly* fulfills each member's *unique* function and its structural *interaction* with all *other* members. As one endows a form with an appropriate material, and indeed the form of an *architectural* member, as one arranges all of these members into a self-sufficient mechanism, the material's inherent life, which in a *formless* condition is resting and *latent*, is resolved into a dynamic expression. It is compelled into a *structural function*. It now gains a higher existence and is bestowed with an *ideal* being, because it functions as a member of an *ideal* organism."⁹⁵

⁹⁵ Harry Francis Mallgrave, "Karl Bötticher; from Greek Tectonics (1843)", An Anthology from Vitruvius to 1870, USA: Blackwell Publishing, 2006, p.532.

2.4 Material and Production Techniques in Architectural Expression

Throughout his studies Gottfried Semper explored architecture's material limitation, as Mallgrave puts it forward "the origin of its formal language in the arts and crafts, textiles, ceramics, metal works, carpentry, and the oldest stone construction."⁹⁶ Caroline van Eck indicates in her article that like Bötticher architectural meaning was representational for Semper as well but much broader. In addition to tectonic forces at work, Semper considered the development of entire human crafts. At the center of his theory was the integration of material and production techniques with the human intellect and will. Rather than idealist aesthetics, he suggested man's handling of the physical world. Accordingly, Mitchell Schwarzer asserts in his book "German Architectural Theory and the Search for Modern Identity" that Semper "located the unity of culture in the ways that people satisfied both their spiritual and material drives in the act of making artistic and/or useful things."⁹⁷

Influenced by the Caribbean hut that he saw in the Crystal Palace Exhibition of 1851, Semper defined through his seminal book "The Four Elements of Architecture and Other Writings" the "four elements of architecture" as the *hearth, mound, roof, and enclosure*. As Frampton indicates, by his four elements Semper proposed a counterthesis to both Vitruvius' "utilitas, firmitas, venustas" triad and Laugier's primitive hut of 1753. Semper conceived his "elements" not as "material

⁹⁶ Harry Francis Mallgrave, "Introduction", The Four Elements of Architecture and Other Writings. New York: Cambridge University Press, 1989, p.1.

⁹⁷ Mitchell Schwarzer, "Freedom and Tectonics", German Architectural Theory and the Search for Modern Identity, USA: Cambridge University Press, 1995, p.175.

elements or forms, but as “motives” or “ideas”, as technical operations based in the applied arts.”⁹⁸ He further associated these motives with certain tectonic crafts: “textiles pertained to the art of enclosure and thus to the side walls and roof, carpentry to the basic structural frame, masonry to the earthwork, and metallurgy and ceramics to the hearth.”⁹⁹

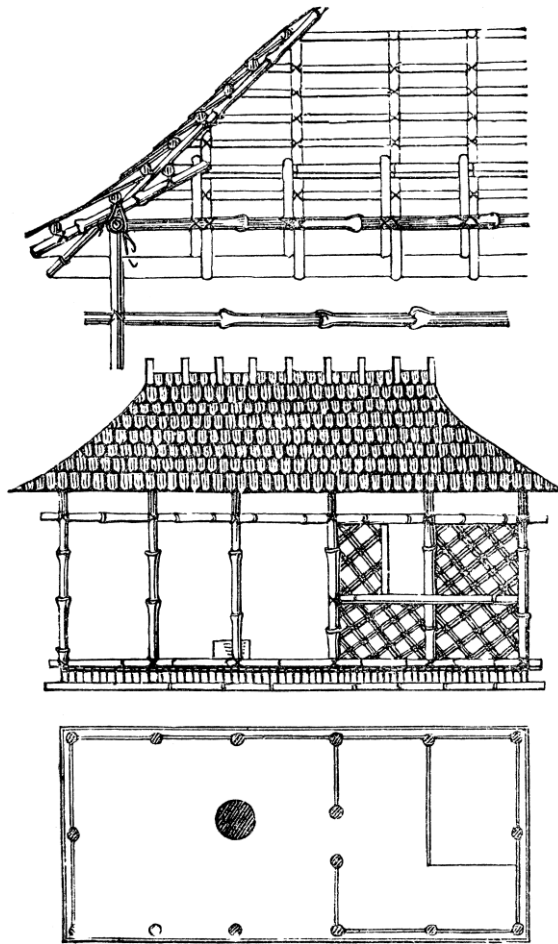


Figure 9. The Caribbean Hut, Gottfried Semper

Source: Gottfried Semper, "Introduction", The Four Elements of Architecture and Other Writings, New York: Cambridge University Press, 1989, p.29.

⁹⁸ Semper, op.cit., p.24.

⁹⁹ Kenneth Frampton, "The Rise of the Tectonic: Core Form and Art Form in the German Enlightenment, 1750-1870", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England: The MIT Press, 1995, p.87.



Figure 10. Laugier's primitive hut

Source: Mari Hvattum, "Gottfried Semper and the Problem of Historicism", New York: Cambridge University Press, 2004, p.32.

Right after Semper emphasized his enclosure element and explains its metamorphosis into the “dressing” (*Bekleidung*) idea. The necessity of warmness, resulting in more solid and durable walls evolved textile wall hangings to “dressing”. Relating to this idea Semper introduced his “material transformation” (*Stoffwechsel*) thesis as a result of industrial and scientific developments.

With respect to *Stoffwechsel* theory, like primitive words of languages, the elemental forms of architecture improve meaning in time. Although their precise meaning may change, original sense is conserved within the form. Mallgrave explains this theory as architectural forms “undergo changes of material but carry forward vestiges or residues of their earlier material styles in later forms symbolically alluding as it were to

the materials used in the past.”¹⁰⁰ This symbolic conservation is explicated by Frampton as “the mythical-cum-spiritual values attaching to certain structural elements cause them to be translated into petrified compressive forms.”¹⁰¹ In Greek architecture, as Semper exemplifies, it is obvious that certain symbolic motifs persist which might had been the result of the transposition of textile covering over a nomadic wooden framework with the polychromatic ornamental dressings of the triglyphs and metopes in the Doric order. Comparing Abbé Laugier and Semper’s views, Frampton indicates that such forms did not arise “from the petrification of timber construction, of beam ends and rafters, but rather from features used to tie down the textile fabric covering the roof.”¹⁰² Referring to the 1851 Great Exhibition, Semper argued that the cheap industrial simulation –by casting, stamping, and molding- of one material by another ignored all symbolic continuities, which are essential to the “recreation of tectonic form.”¹⁰³

In his essay *Wissenschaft, Industrie und Kunst* (Science, Industry and Art) of 1852, Semper defines three preconditions of form: the primordial motives (*Urmotiven*), the intrinsic and technical influences (material treatments, methods and processes within advancing technology), and the extrinsic influences (local, temporal, and ethnological aspects). All these factors designate the term style:

"Style means giving emphasis and artistic significance to the basic idea and to all intrinsic and extrinsic coefficients that modify the embodiment of the theme in a work of art."¹⁰⁴

¹⁰⁰ Harry Francis Mallgrave, “The Zurich Years: 1855-1869”, Gottfried Semper: Architect of the Nineteenth Century, London: Yale University Press, 1996, p.284.

¹⁰¹ Frampton, loc.cit.

¹⁰² Ibid.

¹⁰³ Ibid.

¹⁰⁴ Gottfried Semper, “Science, Industry, and Art”, The Four Elements of Architecture and Other Writings. New York: Cambridge University Press, 1989, p.136.

Frampton points out three different causes that Semper argued as the reasons of arising style crisis: “first the alienation of the arts from their original motifs, second the devaluation of material and labor, and third the loss of the ability of the art form to exercise a specific function in relation to the historical moment.”¹⁰⁵ In order to prevent this devolution, Semper propounded ethnographic origins of manufacturing in relation to their material and corresponding forms. Frampton remarks Semper’s emphasis on “task of the form and the process of fabrication over the specific nature of any given material.”¹⁰⁶ Universality of making, evolution of crafts and of industrial arts are the proof of tectonic. Regarding the 1851 Great Exhibition, Semper thought that although new technical conditions, materials and techniques of the industrial age resulted in an artistic failure and destroyed traditional art, that disintegration was not considered good or bad. As Mallgrave puts it forward “it was simply an inevitability that would eventually create a new, nonhistorical art”¹⁰⁷ and for Semper that indicated the new definition of style: “not a historical language of forms but a qualitative standard of design.”¹⁰⁸

Like his colleagues, Semper hesitated from the machine and industrialization, with the potentials of decline in artistic taste and inconsistency of various branches of arts. Traditional art practice based on "human hand" had been devaluing by industrialization with its "excess of means."¹⁰⁹ Mallgrave claims that only if those means are analyzed properly with their artistic implications, style crisis that Semper

¹⁰⁵ Frampton, loc.cit.

¹⁰⁶ Ibid.

¹⁰⁷ Harry Francis Mallgrave, “Gottfried Semper; from Science, Industry, and Art (1852)”, Architectural Theory: Volume 1, an Anthology from Vitruvius to 1870, USA: Blackwell Publishing, 2006, p.540.

¹⁰⁸ Ibid.

¹⁰⁹ Harry Francis Mallgrave, "Competing Directions at Midcentury", Modern Architectural Theory: A Historical Survey, 1673-1968, New York: Cambridge University Press, 2005, p.134.

had indicated can be overcome. Through the Great Exhibition he testified the admirable superiority of half-civilized nations in technical arts by their innate sense of color and form. This notion, which had been lost by the modern nations, says Wolfgang Herrmann, cannot be gained by “the technical, mechanical and economic means that we have invented and by which we have the advantage over the past.”¹¹⁰ In order to catch up those people artistically and achieve beauty of form and color, we must study and respect consciously “the properties of the material and the requirements of the task.”¹¹¹ Nonetheless, Semper did not ignore machines and technology and not defend a return to ancient arts as the only model like John Ruskin did. Aesthetic sensitivity would be improved by mastering new means. Only if, Herrmann quotes Semper, “the machine learned to be subordinate to the natural properties of the material, then it will have a beneficial effect on the arts.”¹¹²

While Semper regarded stone use of Greek classical architecture as sculptural rather than tectonic, he also insisted that the industrial arts and the textiles craft assure the formal elaboration of monumental architecture. Different material properties and crafts became basis for the material and technological ramifications of his four elements. For Semper, technical skill was evolved by the articulation of craft capacity closely related to materials, and in technical skill “the hand gradually increases its ability to work a given material to the full extent of its expressive scope.”¹¹³ In order to understand how earliest architectural cultures created forms Semper assessed the material nature and

¹¹⁰ From Wolfgang Herrmann, “The Great Exhibition of 1851 as Inspiration for Der Stil”, *Gottfried Semper: In Search of Architecture*, London: The MIT Press, 1984, p.85 as cited in *Stil 1*, p.193.

¹¹¹ From *ibid.* as cited in *Stil 1*, p.124.

¹¹² From *ibid.*, p.87 as cited in *Stil 1*, p.104.

¹¹³ Frampton, *op.cit.*, p.88.

production technologies as central part of his inquiries, artistic expression of materials was very important for him. He not only accepted materials tangible and artistic potentialities, but also was careful about the overvaluation of material properties. He argued that materials should not imitate the other while saying:

"Let the material speak for itself; let it step forth undisguised in the shape and proportions found most suitable by experience and science. Brick should appear as brick, wood as wood, iron as iron, each according to its own static laws. This is the true simplicity on which we can let our fondness for the harmless embroidery of decoration run free."¹¹⁴

Semper's anthropological inquiry manifested the knot was the earliest basic architectural artifact, primary tent and its textile fabric followed it. Etymologically, in German, knot is indicated by *der Knoten*, joint is by *die Nacht*, and both are connected to *die Verbindung*, binding. Frampton specifies that the knot/the joint is the basic significant tectonic element for Semper. The patterns created and the construction used in the knot, the wreath, braiding, and weaving are intertwined. The tool maker and the image maker roles of the man are not separate. As Semper indicated even the primitive tribes in their early stages incorporated their artistic instinct into their weaving, plaiting of textile coverings while they were still naked. Embracing the earliest artisans' methods, Semper conceived profoundly three factors: "the properties of the material used, the technical process applied, and the function the object was to perform,"¹¹⁵ which he called as "practical aesthetics." Practical aesthetics was helpful for Semper to understand designing a

¹¹⁴ Gottfried Semper, "Preliminary Remarks on Polychrome Architecture", The Four Elements of Architecture and Other Writings. New York: Cambridge University Press, 1989, p.48.

¹¹⁵ Herrmann, op.cit., p.86.

building with style and to reveal meanings behind artifacts with reference to earliest ones. Instead of making a research only on classical architecture, he extended his studies to primitive crafts and their metaphorical meaning, which he believed as the origin of building. Eck states that Semper found the origin of architecture in binding, joining and weaving, consequently “the meaning of architecture is not located in particular buildings or in ideas associated represented by them, but in human action in its social and cultural context.”¹¹⁶

Of the four elements, Semper thought that “enclosure”, functionally the wall, comprises the essence of architecture. Pursuant to *Stoffwechsel* theory, the idea of enclosure must remain within every wall built. The original form woven fence remains encoded within each enclosure, original structure and material is embedded symbolically as it transforms. Semper called this *Bekleidung* (dressing). Mallgrave explains this theory as “[t]his archeological and spatial theme suggests that the textile motive for the wall underwent an intricate process of formal development, as the conceptual rudiments of weaving evolved into textile wall hangings and later into solid wall dressings (paneling and paint) that emulated in style their original textile origin.”¹¹⁷ The evolutionary applied art is linked by material and spiritual demand, real and ideal are merged. Architectural decoration –the ideal side- and constructional systems –the real side- are originated in synthetic productive activity. For Semper ideal-real synthesis was most apparent in the textile art, within this productive craft he foresaw an organic achievement. According to his *Bekleidung* theory, architecture derives

¹¹⁶ Caroline van Eck, “Modernity and the Uses of History: Understanding Classical Architecture from Bötticher to Warburg”, Mari Hvattum and Christian Hermansen ed., *Tracing Modernity: Manifestations of the Modern in Architecture and the City*, London: Routledge, 2004, p.62.

¹¹⁷ Harry Francis Mallgrave, “Gottfried Semper; from The Four Elements of Architecture (1851)”, *Architectural Theory: Volume 1, an Anthology from Vitruvius to 1870*, USA: Blackwell Publishing, 2006, p.536.

from textiles that “the beginning of building coincides with the beginning of textiles.”¹¹⁸ Textile making is the first art, dominant technical skill for wall construction, its motifs and patterns derive from its pure, unmediated nature. By plaiting branches, diverse geometric patterns were created which were the origins of representational faculty. This explains the continuing urge for adornment of structure; it is an original, universal aspect of architecture. Architectural decoration was an integral part of the system, not a meaningless additive to structure. Schwarzer points out that for Semper “it is by virtue of a material system’s capacity to take possession of form based on necessary requirements that architecture reveals its realistic connection.”¹¹⁹ Beauty is not an additive to this act. Advocating absolute truth, Semper sought for the coherence of observable reality and artistic ideals. The German architect Constantin Lipsius, directly influenced by Semper’s structure-decoration integration, wrote in this view:

"The direct representation of construction as such is not the task of architecture. More important is the aesthetic embodiment of specific building ideas in both the whole of a building and its parts. We are moved therefore in each case to sharply elevate construction, to clothe it or modify it: all of our efforts can and should have only one purpose, which is to designate the purposefulness and constructional possibilities and laws of our creations, and to create, animate, and enliven a beautiful phenomenon. The disharmonies, rawness, sobriety, anxieties, and torment of actual reality are not the healthy sphere for art."¹²⁰

¹¹⁸ Gottfried Semper, “Style: The Textile Art”, The Four Elements of Architecture and Other Writings. New York: Cambridge University Press, 1989, p.254.

¹¹⁹ Schwarzer, op.cit., p.177.

¹²⁰ From Schwarzer, op.cit., p.179 as cited in Constantin Lipsius, Deutsche Bauzeitung, 1878, p.365.

By his *Bekleidung* theory, Semper aimed the dematerialization of architecture; instead of focusing on stereotomic matter, he insisted on the reticulation of surface and dematerialization. Carrying his dressing theory to the "masking of reality," Semper believed both dressing and masking are as old as human civilization. He signifies every artistic creation is inhabited with a carnival spirit. The denial of material reality is the way for meaningful symbolic forms. Though masking is meaningful only if it fits the thing behind. In order to achieve this Semper suggests the complete mastery of the material. "Only by complete technical perfection, by judicious and proper treatment of the material according to its properties, and by taking these properties into consideration while creating form can the material be forgotten, can the artistic creation be completely freed from it, and can even a simple landscape painting be raised to a high work of art."¹²¹

Eck indicates in her article "Figuration, Tectonics, and Animism in Semper's *Der Stil*" not construction but dressing (*Bekleidung*) was the origin of architecture according to Semper's theory. Eck denotes dressing and masking -*Bekleidun und Maskiren*- as representations; "no longer the space or structure they represent, but their sign, and as such have a different ontological status."¹²² The material and practical function is replaced by these representational signifiers. Eck indicates two important things about the dialectics between painting and building. One is imitation, representation, transformation and above all denial of material reality. The other is the theatricality of masking or dressing which Semper had already evaluated as the carnival spirit. Dressing is both representation of four basic crafts and transformative step for a

¹²¹ Gottfried Semper, "Style: The Textile Art", *The Four Elements of Architecture and Other Writings*. New York: Cambridge University Press, 1989, p.258.

¹²² Caroline van Eck, "Figuration, Tectonics, and Animism in Semper's *Der Stil*", *The Journal of Architecture*, 14:3, p.327.

monumental architecture. Eck remarks that by the denial of material reality dressing "paradoxically greatly enhances the presence of the work of art, be it a drama or a building. It makes the building appear and act upon the viewer, makes it alive and humanizes it."¹²³

With his 1898 entitled article "The Principle of the Dressing," Adolf Loos addressed Semper's *Bekleidung* theory inquisitively. Considering the dressing, first appearing as a spatial enclosure and then as a protective coating, Loos argued for the innate language of material in the creation of form. Mallgrave deciphers Loos' view as "the architect should never confuse the material "dressed" with the "dressing," that is, one must never paint wood the color of wood or score stucco to imitate masonry."¹²⁴ Loos evaluated dressing as expressive tool. Like Semper, he acknowledged the origin of motive laying in textile hangings, and that the structural framework developed after these ornamental dressing manufacturing. He distinguishes some architects from "the" architect. While some just create walls and then feel obliged to cover them, "the" architect, as Loos describes, "first senses the effect he intends to evoke and envisions the space he wishes to create. The effect he wishes to bring to bear on the spectator –be it fear or horror in a prison, reverence in a church, respect for the power of the state in a governmental palace, piety in a tomb, a sense of hominess in a dwelling, gaiety in a tavern – this effect evokes by the material and the form."¹²⁵ Therefore architecture awakens feelings. As a sentimental mask, dressing is the part of the created space which evokes sensation.

¹²³ Ibid., p.328.

¹²⁴ Harry Francis Mallgrave, "Introduction", The Four Elements of Architecture and Other Writings. New York: Cambridge University Press, 1989, p.42.

¹²⁵ From *ibid.* as cited in A. Loos, *Das Prinzip der Bekleidung*, in *Ins Leere Gesprochen* (Vienna, 1921; reprint by Georg Prachner, 1987), p.140.

Following Bötticher and Semper, Otto Wagner attempted to apply tectonic to the modernizing realities of the twentieth century. As an engineer and architect, Wagner had an affinity both for the real and the ideal. He claimed that every architectural form comprises the construction knowledge and experience resulting in art-forms. Although this view supported Bötticher's thesis that art-form arises from core-form, it is not related to Semper's *Bekleidung* theory. At this point, Frampton enounces Wagner's embracement of Semper's masking metaphor: "Masking does not help, however, when behind the mask the thing is false."¹²⁶ Frampton expresses by masking Semper "did not intend falsehood, but rather the creation of a tectonic veil through which and by which it would be possible to perceive the spiritual significance of the constructional form, as it lay suspended, as it were, between the pragmatic world of the fact and the symbolic world of value."¹²⁷

A thorough study of Bötticher's seminal book "Die Tektonik" influenced Semper along his inquiries. Semper accepted core-form and art-form formulation of Bötticher. However, he criticized Bötticher's comparison between a nature work and tectonic structure. Herrmann explains that for Bötticher "unlike the work of nature in which the life force causes the embryonic form to unfold, tectonics makes its forms out of dead material and is unable to express this process."¹²⁸ According to Bötticher the only way was to resemble natural unfolding and that seemed added from the outside. Admitting the non static function of decorative symbols, Semper objected to the view that they are applied, added parts. Herrmann indicates that for Bötticher only Greeks achieved "giving their architectural structures and tectonic products an

¹²⁶ Ibid., p.257.

¹²⁷ Frampton, op.cit., p.90.

¹²⁸ Wolfgang Herrmann, "Semper and The Archeologist Bötticher", Gottfried Semper: In Search of Architecture, London:The MIT Pres, 1984, p.142.

organic life so to say... Greek temples and furnishings are not constructed and skillfully joined, they have grown; they are not structures adorned by having floral and animal forms attached to them; their forms are like those that organic forces call forth when striving against mass and weight.”¹²⁹ Relating to this quotation, Greek temple was, as Semper asserted, a synthesis of the “Egyptian system of stone construction” and the “Asiatic principle of incrustation.” In Greek arts the two elements, core-form and art-form, merged into each other.

While Bötticher differentiated between the constructive and the decorative parts, nonetheless, he emphasized their dependence to each other. In Greek tectonics, to characterize the dead stone with a form analogous to its very idea was the main intention, which faded away deadness of the stone. Bötticher expressed that the art-form and the core-form were born simultaneously and in unity. In this regard, Herrmann refers to Bötticher’s phrase that “it comes to life fully finished from the moment the hand is put on the block from which it is going to be formed.”¹³⁰ They are deeply related and cannot be changed without affecting the other. This close correlation obstructs any subjective and arbitrary applied embellishment added haphazardly to structure. It is in the nature of things as Bötticher claimed. Semper also took same view with Bötticher about the constructive and decorative parts’ relation in Greek architecture. For him structural parts were expressed symbolically by decorative parts. Greek ornaments are, as he declares “emanations of the constructive forms and, in [sic] the same time, they are symbols of the dynamical functions of the parts to which they belong.”¹³¹

¹²⁹ From *ibid.* as cited in MS 156, fol. 5.

¹³⁰ From *ibid.*, p.143 as cited in *Tektonik*, Excursus 2, p.34.

¹³¹ From *ibid.*, p.144 as cited in MS 129, fol. 14.

Even while further justifying his Bekleidung theory, Semper stepped closer to Bötticher's view. As Herrmann mentions Greeks preferred structure instead of covering while delineating their monuments. For Herrmann this situation never contradicts Semper's theory about the negation of matter that "in order to forget matter it is necessary at the form-giving stage to take all its properties into fullest account."¹³² This statement brings to mind Bötticher's suggestion about the potential creativity of a nation depending on "how thoroughly it had apprehended matter for tectonic purposes and had mastered it."¹³³

Although both Semper and Bötticher shared common views about tectonics, they differed in some respects with opposing positions as in the "significance of the material as a formative factor."¹³⁴ While Semper evaluated material, its properties, and effects on form and shape as essential, for Bötticher only the functional expressivity was mattered. Still Bötticher did not consider material irrelevant. Indeed, he opposed to the idea that Greek temple was derived from primitive wooden construction, and argued stone as the original material for Greek architecture.

¹³² From *ibid.*, p.145 as cited in *Stil 1*, p.448.

¹³³ From *ibid.* as cited in *Tektonik 1*, p.17.

¹³⁴ *Ibid.* p.149.

CHAPTER 3

CONCRETE MATERIAL AS ARCHITECTURAL EXPRESSION

Discussions about tectonics in architecture has been examined within the framework of material and production techniques. By considering architecture as "poetics of construction", this thesis aims to emphasize concrete's, the most used architectural material's, aesthetic potential in architectural expression. As defined by Semper, material nature and production technologies are central part of architectural design. My intention here is to posit that concrete as an architectural material is not just a constructional mean for an end which will be covered as a shame, but it is also a tool of the architect for an architectural art form. In this part of the thesis, previously discussed theories will be scrutinized through different applications of concrete in architectural productions in order to reveal concrete's aesthetic potentials.

3.1 Church of Light (Tadao Ando) (Osaka/Japan)

The Japanese architect Tadao Ando who works primarily in exposed cast-in-place concrete, can be described as the "concrete poet". For him architecture is about understanding and expressing the tectonics of material. Expressive possibilities of concrete have become part of almost all of his designs. Ando's concrete walls are constructed on a

block-like grid, each block having exposed holes, the result of the moulding-board screws used during construction. In his buildings, smooth poured concrete walls are enlivened with the interplay of light and water creating various textures and spaces which are the essential part of his architecture. The way Ando employs concrete lacks sculptural solidity and weight of the material. He uses the homogenous surfaces of concrete to produce light, treating concrete as a cool, inorganic material with a concealed background of strength. He does not only intend to express the nature of concrete, but to employ it to reinforce the intent of the designed space.

"Concrete is not a material that one can simply use as one pleases. People generally think that concrete is always the same, but it isn't. Even though the material is the same, its strength, durability, texture, and appearance can vary greatly depending on the circumstances, including the sensibilities of the people who create it. Le Corbusier had his own concrete, while Louis Kahn had his."¹³⁵

Church of Light is one of Ando's valuable buildings, especially with his use of concrete as a part of architectural expression. It was built in 1989 in Ibaraki, Osaka. The budget of the project was relatively low, and Ando handled this issue by using his usual pallet of inexpensive materials such as reinforced concrete and wood. Concrete walls primarily define the space and wood is used for the elements such as tables, pews, and floor. Consisting of the main chapel and Sunday school (later added in 1999), these simple concrete rectangular cube blocks located in a quiet residential neighborhood on a corner site. The church is penetrated by a wall at a fifteen degree angle and it controls

¹³⁵ The Grand Tour with Tadao Ando, http://www.andotadao.org/grand_paris3.htm (Accessed, June 16, 2011).

the circulation into the space. This simple building is a testament of the phrase "less is more". The Sunday school addition serves as a support space consisting of a kitchen, gathering space, office and storage. Like the church, Sunday school is punctuated by a freestanding wall creating a strong tension between the two buildings.



Figure 11. Church of Light

Source: Philip Jodidio, "Ando: Complete Works", Taschen, p.129.



Figure 12. Church of Light

Source: Philip Jodidio, "Ando: Complete Works", Taschen, p.130.

Ando uses concrete walls and light in such a way that the outside world is forgotten and natural, spiritual worlds are emphasized in an abstract manner. Except from the extruded cross from the east facade, concrete shell composes the whole church. Adding to the darkness of the church, massive concrete walls create more humble, meditative place of worship. Inside the concrete shell light enters through the only opening, the cross form, and creates dramatic effects of shade and shadows over the pure concrete surfaces. The way the concrete is poured and formed gives it a luminous character when exposed to natural light. The cross void placed on the east facade allows for the early morning and day light pour into the space. The dark volume is transformed into an illuminated spiritual box with the dematerialization of the interior

concrete surfaces. Ando's use of concrete surfaces and light as a part of his design in the Church of Light and also in his other projects as well "has a surreal effect that perceptually changes material into immaterial, dark into light, light into space".¹³⁶ Purely crafted concrete walls, lacquered with a protective coating, have an ethereal delicacy contradicting their robustness. The effect created on the smooth surfaces of the concrete walls by the light, strengthens the spiritual aura of the church. The concrete walls transcends their corporeal existence, gains its essential artistic meaning with its dematerialization and become a part of this spiritual place as a pure form.



Figure 13. Church of Light

Source: Philip Jodidio, "Ando: Complete Works", Taschen, p.126.

¹³⁶ Andrew Kroll, "AD Classics: Church of the Light/Tadao Ando", Arch Daily, <http://www.archdaily.com/101260/ad-classics-church-of-the-light-tadao-ando/> (Accessed, June 16, 2011).

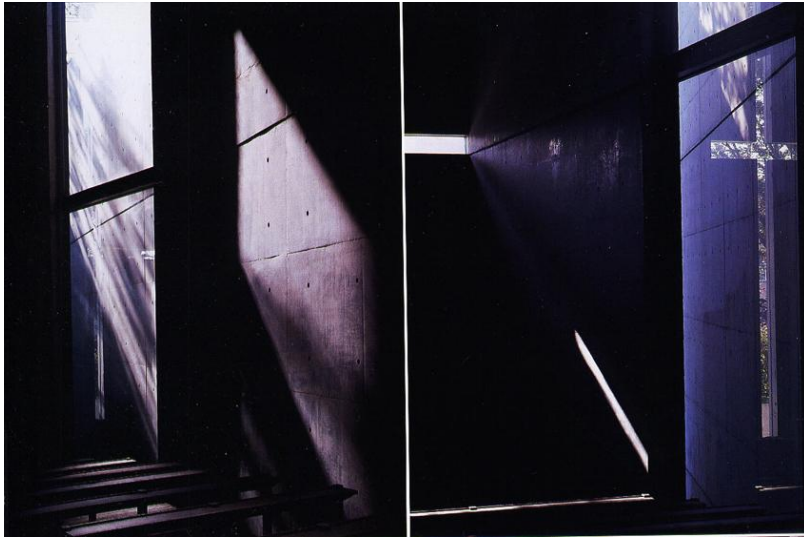


Figure 14. Church of Light

Source: Philip Jodidio, "Ando: Complete Works", Taschen, p.131.

Church of Light with its modern, minimalist structure, exposes an architectural purity found in details. Any and all ornament in this reinforced concrete volume is part of the construction process. The seams and joints of the concrete handled in the design process, becoming a part of the final product. Joints are aligned accurately. Cross extrusion perfectly aligns with the seams of the concrete formwork. How each concrete elements are integrated into a harmonious whole is the main concern of Ando. Because the art-form is achieved by construction process, it is the result of the core-form itself. Section drawings of the church show that how technical process applied for the construction of concrete walls is handled as a part of building's articulation. Highlighting tectonic aspects of the structure, art-form emerges from the core-form. Handling the joint-knot in Semperian view as the basic significant tectonic element, patterns created and the construction used are intertwined. The image becomes the result of the tool.

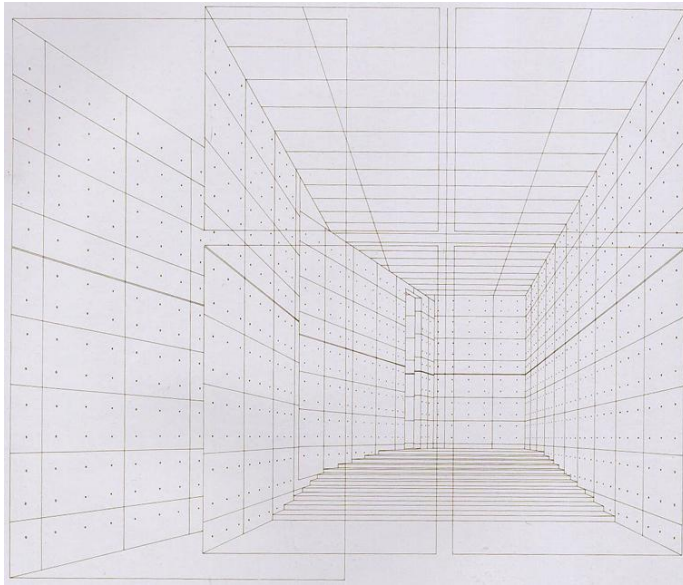


Figure 15. Church of Light, drawing detail

Source: Philip Jodidio, "Ando: Complete Works", Taschen, p.132.

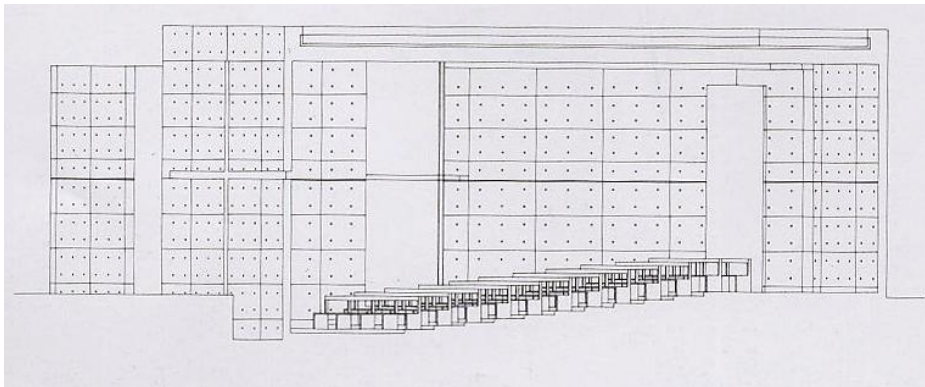


Figure 16. Church of Light, drawing detail

Source: Philip Jodidio, "Ando: Complete Works", Taschen, p.132.

Ando's handling of the concrete as a part of his design can be closely related to the Italian architect Carlo Scarpa's craftsmanship. As in the case of Scarpa's memorial cemetery Brion-Vega Cemetery constructed between 1970-1972 in San Vito d'Altivole in Italy, concrete is not used just a construction material. Manipulation of the concrete is not just the mere physical means for constructing the space, but the instruments for a sensorial, psychological and didactic achievement. Skillfully produced

various construction details show how Scarpa's architecture is composed of tectonic achievement of each elements and materials. Precisely designed formwork not only became a tool for the construction of concrete walls, but also created the "text-tile" effect resulting in purely adornment of concrete surfaces. Three dimensional ziggurat motif details of the concrete element created by Scarpa, provides a unity with those two-dimensional formwork textured surfaces. With the play of shade and shadows over these grey surfaces, this latent material is animated with these construction details. The tectonic activity carries the building away a scenographic one.



Figure 17. Brion-Vega Cemetery

Source: Ayşe H. Köksal, "Carlo Scarpa", Betonart, vol.11 (2006), p.85.



Figure 18. Brion-Vega Cemetery

Source: Ayşe H. Köksal, "Carlo Scarpa", *Betonart*, vol.11 (2006), p.88.

Like in Brion-Vega Cemetery, production details thought as a part of design from the very beginning of Church of Light building. The detailed drawings of construction and their effects on the material concrete become part of the final design. Artistic expression is achieved out of technical resolution. In both buildings, as Louis Kahn pointed out, "detail is the adoration of nature." Revealing concrete's production techniques, Scarpa -as in the case of Ando- transforms his construction into an art form.

Tadao Ando' s innovative concrete construction was influenced by early Japanese carpentry tradition. As Frampton indicates "metalinguistic forms and spatio-temporal rhythms are bound up with the act of building in Japan."¹³⁷ Building and place-making practices seem to have been closely interconnected. As in the case of traditional tatami mat

¹³⁷ Kenneth Frampton, "Introduction", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England, The MIT Pres, 1995, p.16

construction, Ando creates spaces through concrete construction's practical aesthetics. He develops a language from the constructional logic of concrete that transforms the basic elements of Japanese culture. This transformation is seen in formwork pattern cast into the concrete that is inspired by tatami mats. As mentioned in Semper's "material transformation" theory, building-place making duality is achieved by the new, modern material concrete. Traditional construction is combined with the potentials of this new material.

Concrete with its cold, grey, dull surface is handled by Ando as a part of design in order to reveal the "Shintai," the Japanese word for body. The inert concrete surfaces embodying the church come to be animated by the presence of light and by the sensuous pressure of the subject. The body consummates spaces and is being consummated by the space.

"When "I" perceive the concrete to be something cold and hard, "I" recognize the body as something warm and soft. In this way the body in its dynamic relationship with the world becomes the *shintai*. It is only the *shintai* in this sense that builds or understands architecture. The *shintai* is a sentient being that responds to the world."¹³⁸

For Ando, tactile awareness will be our survival rather than secession resulted by the power of sight. Mediatic abstraction overwhelmed our ocular senses. Like Herder, Ando realigns beauty through the sensibility of matter. Instead of merely visual perception, tactile sensed three dimensional forms, sensations of hardness and softness, roughness and smoothness, weight and lightness are the main concern for Ando's space in order to understand the meanings of bodily fullness.

¹³⁸ From *ibid.* p.11 as cited in Tadao Ando, "Shintai and Space", *Architecture and Body*, New York: Rizzoli, 1988.

3.2 The MUMUTH (The House for Music and Music Theatre) (UN Studio) (Graz/Austria)

The MUMUTH is a faculty building designed for the University of Music and Performing Arts Graz (KUG), located among historic houses in Graz. Launched as an international competition in 1999, the winning project was designed by UN Studio and realized in 2008. It is not only for teaching and practice, but for live concerts as well. The MUMUTH, standing free on the Lichtenfelsgasse street, has been said that:

"[A] glass box inside a cage of steel mesh, the metal screen bulging on all sides as if about to burst its seams. Depending on where you stand, the building looks distorted, as if conceived through a fisheye lens. None of this, however, prepares the visitor for the drama inside. For once you step in off the street into the theatre's public space, you are confronted by a coil of sculpted concrete that spirals and twist almost impossibly as it rises up and through the building"¹³⁹

¹³⁹ Music Theatre Graz,
http://www.concrete.net.au/CplusA/issue12/CCA0012_Music%20Theatre-Graz_FA.pdf (Accessed, August 28, 2011).



Figure 19. The MUMUTH, day view

Source: http://www.archicentral.com/wp-content/images/11106_1_haus1big.jpg

[Last accessed August 26, 2011]



Figure 20. The MUMUTH, night view

Source: <http://www.fubiz.net/tag/architecture/page/4/>

[Last accessed August 26, 2011]

This is a building in which music lives, and the concrete twist structure is the most direct relationship to music. Ben Van Berkel evaluates the concrete spiral as the organizing element of the theater like "Serialism" in contemporary music: without losing its continuity, the line absorbs and regulates intervals and interruptions, changes of direction and leaps of scale. A unit-based volume -the black box of the theater- and a series of flowing, movement based volumes -foyer and public circulation- are combined within one rigorous gesture; a free, fluent internal spatial arrangement of concrete structure is realized which efficiently connects spaces. The spectacular concrete spiral is the hearth of the building.

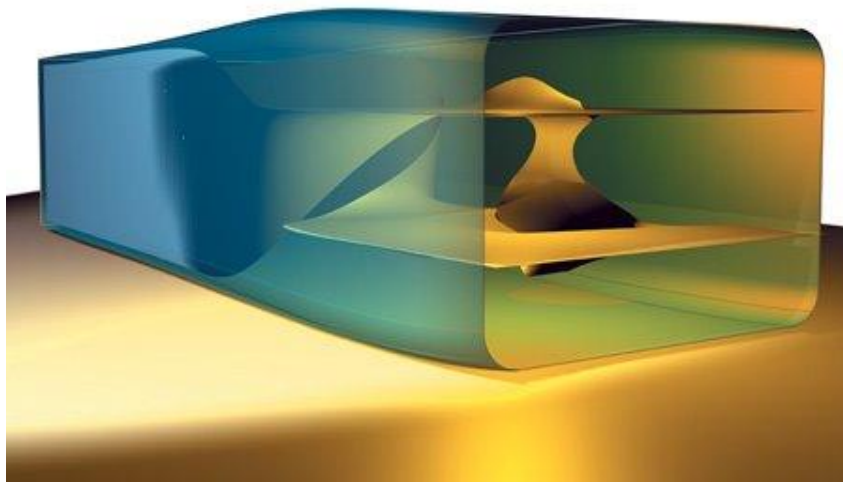


Figure 21. The concrete structure diagram of the MUMUTH

Source: http://2.bp.blogspot.com/_6M5RbpxhRR4/SaqfG4FGINI/AAAAAAAAAhs/NSMN5Yne2lw/s1600-h/8.bmp

[Last accessed August 26, 2011]

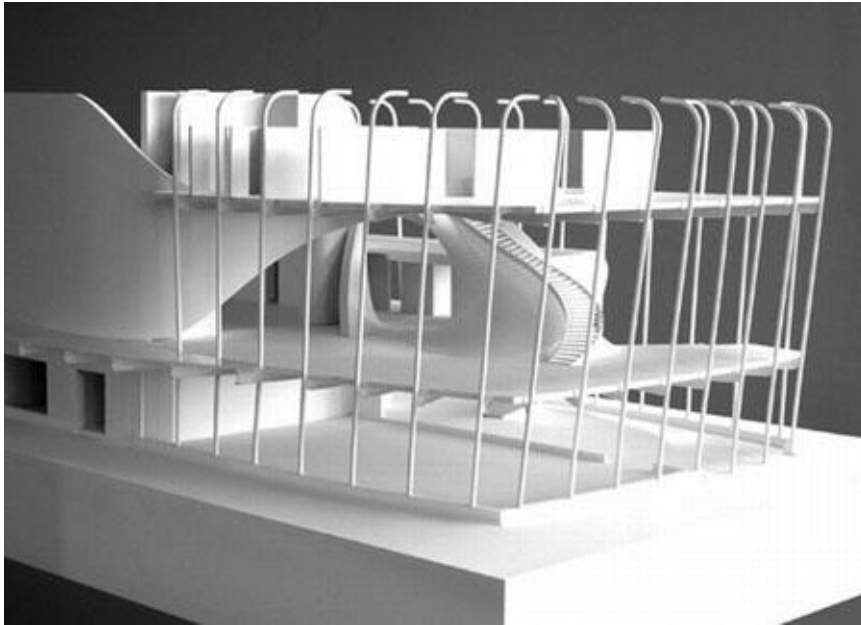


Figure 22. The structure model of the MUMUTH

Source: <http://www.tuvie.com/graz-music-theater-goes-futuristic/>

[Last accessed August 26, 2011]

The free formed concrete "twist" in the transition zone between the theater box and the foyer area is the focus point of the design. The two longitudinal walls of the theater are twisted horizontally which forms the first and third floor slabs in the foyer area. This movement is extended by the spiral like connection between both slabs, used as a support for the stairs between the different floor planes. The load-bearing "twist" cantilevers from the theater box to support the inner area of the first and third floor foyer slabs. It defines the entire building. Everything revolves around concrete twist, it forms a central feature of the public space. It carries the floor and wall plates, takes visitors into the various spaces that comprise the theater.



Figure 23. The structure model of the MUMUTH

Source: <http://www.tuvie.com/graz-music-theater-goes-futuristic/>

[Last accessed August 26, 2011]

The concrete spiral touches our tactile and visual senses, sets them in motion, prepares the audience to be moved by strong emotion. Concealed at the heart of the building behind steel mesh envelope, concrete spiral is revealed as a sculptural art-form at nights. The building becomes a theater stage at nights and the concrete form is the only actor responding to the city with its dynamic form. As a "joint" point articulated by the potentials of material, this transition zone appears as the expressive face of the design. As in the works of Carlo Scarpa, indicated by Frampton, "the joint is treated as a kind of tectonic condensation; as an intersection embodying the whole in the part, irrespective of whether the connection in question is an articulation or a bearing or even an altogether larger linking component such as a stair

or a bridge."¹⁴⁰ The concrete spiral is the tectonic expression of the concept of the design.

The monumentalized "joint" -the concrete twist- is the result of material and production technique combination. The plasticity of the material is expressed to the extent in harmony with the function of the form. As indicated by Bötticher the core-form and the art-form born simultaneously. Articulated structure of the concrete form is revealed as an artistic creation. Static calculations do not limit the form of the "joint", indeed, provide an expressive form as a result of the material possibility, only dependent to the designers imagination. Mentioned previously, concrete "is not a technical given but an architectural construct."

The concrete spiral has a hand-crafted quality. It can be said that it is not something that has just come out of the building industry. Mastering the technical means, aesthetic sensitivity is achieved. As the hearth of the design concept, the concrete spiral is handled in relation to the "ceramics", one of the abstract procedure of Semper, with its plastic character. According to the functional needs of the spaces created, the continuous line of this plastic material takes shape and result in stylistic-aesthetic treatment. Employing the concrete material to the full extent of its plastic property, a nodal point is created which attracts and gathers people, the "moral element - hearth" of the building as Semper defined it.

¹⁴⁰ Kenneth Frampton, "Carlo Scarpa and the Adoration of the Joint", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England, The MIT Pres, 1995, p.299.

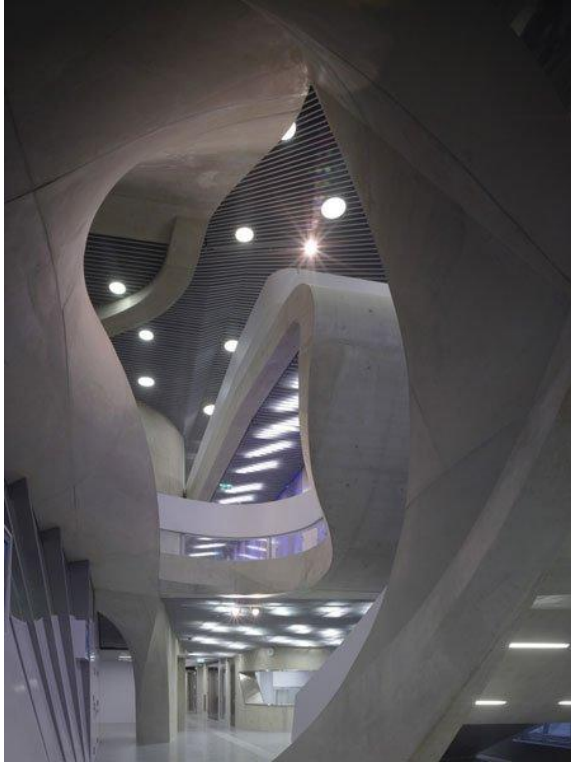


Figure 24. The view of concrete spiral

Source: http://4.bp.blogspot.com/_6M5RbpxhRR4/SaqfDO_DtVI/AAAAAAAAAhk/X7cnWA97_Xg/s1600-h/9.bmp

[Last accessed August 26, 2011]



Figure 25. The view of concrete spiral

Source: <http://www.fubiz.net/tag/architecture/page/4/>

[Last accessed August 26, 2011]



Figure 26. The view of concrete spiral

Source: <http://formness.com/architecture/articles/architecture-projects/mumuth-music-theatre-graz>

[Last accessed August 26, 2011]

The fluid use of concrete has made a series of spaces that flow into one another. Although concrete is commonly accepted as a massive, heavy material, in the design of the MUMUTH it transforms to a lightweight, mobile material with its fluidity. Connecting the all floors of the building, concrete is used like a silk curtain flowing from one level to another. With respect to Semper's material transformation theory, as a result of industrial and scientific developments the concrete use is transformed beyond its meaning. Instead of its calm, stable quality, concrete acquires an active, animated reality. Complete mastery of the concrete material is the imperative precondition for the freed artistic creation. By this way, the architects achieve to provide a link between the design and the music.

Consequently, concrete is used as an architectural expression tool of the design of the MUMUTH. Possibilities of the concrete material is

revealed as a formative factor for the concept of the design. Being as a music theater, the building is exhibited as a stage with the main actor on it: the "concrete twist". As the "knot" of the building, the concrete twist displays itself as the art-form.

3.3 11 11 Lincoln Road Parking Garage (Herzog & de Meuron) (Miami/USA)

11 11 Lincoln Road Parking Garage is a contemporary building, part of a mixed use development called 1111 Lincoln Road comprising four parcels in Miami Beach at the corner of Alton and Lincoln roads, one of the most active pedestrian areas in the city, designed by Herzog & de Meuron and constructed between 2005-2010. In addition to the existing building, the former Sun Trust bank, a mixed use structure for parking of 300 cars, a private residence and a retail was constructed. Parking garage with its remarkable structure has become a landmark in the city. Contrasting to the existing massive, closed Sun Trust bank building, the parking garage is a fully open, expressive concrete structure creating a public space. Consisting of five stories with different heights, the parking garage become much more than a typical garage. Herzog & de Meuron avoided its usual weaknesses, not over-scale, under-articulated or repetitive. As a building type, its monumentality and visibility are reinforced. The building is open to the city scope with its monumental structure, with its tectonic expression and provides a relation with the city by its eye-catching appearance. The structure is used for different social or commercial activities as well, offering amazing views as the background for the stage.



Figure 27. Parking Garage and existing Sun Trust building

Source: <http://cubeme.com/blog/2010/11/15/herzog-de-meurons-car-park-in-miamis-lincoln-road/>

[Last accessed August 24, 2011]



Figure 28. Parking Garage and existing Sun Trust building

Source: <http://cubeme.com/blog/2010/11/15/herzog-de-meurons-car-park-in-miamis-lincoln-road/>

[Last accessed August 24, 2011]

The building is constructed exclusively of concrete in accordance with vernacular garage construction. But its broad, irregularly shaped columns that support the floor decks break with the tradition. Casting different shadows, these columns give more character to the facade. The edges of the slabs are tapered to give more delicate line to the floors. The slabs are offset from each other so they do not form a monotonous line in elevation. The structure becomes the architecture itself. It is a whole unity of concrete slabs, columns and ramps. The location and form of these elements are the result of series of forces acting upon each other. The resulting art form is the success of structure. From the very beginning structural elements were thought as a part of the design in order to achieve the tectonic effect. The senior partner of Herzog & de Meuron Christine Bingswanger explains that:

"The garage is an organism made up of a family concrete slabs, deployed as floor plates, columns and ramps. The location and form of these elements result from a series of forces acting upon each other. What looks arbitrary or like an artistic impulse is in fact the complex overlapping of site, program, and building code requirements... We tried to avoid the stereotype of a parking garage, offering excessive views, clean ceilings, an open stair, and indirect lighting."¹⁴¹

¹⁴¹ Herzog & de Meuron: 1111 Lincoln Road, <http://www.designboom.com/weblog/cat/9/view/10365/herzog-de-meuron-1111-lincoln-road.html> (Accessed, August 22, 2011).

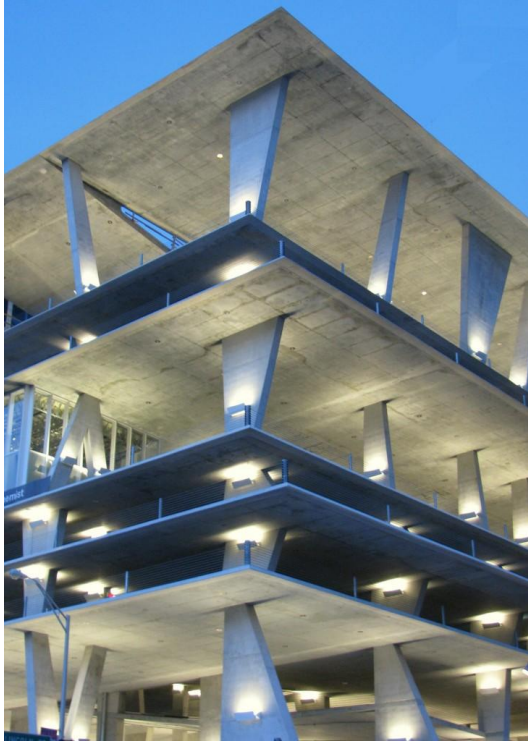


Figure 29. Parking Garage columns and slabs

Source: http://www.architizer.com/en_us/blog/dyn/1898/11-11-lincoln-road/
[Last accessed August 24, 2011]



Figure 30. Parking Garage columns and slabs

Source: http://www.architizer.com/en_us/blog/dyn/1898/11-11-lincoln-road/
[Last accessed August 24, 2011]

The architect Jacques Herzog describes 11 11 Lincoln Road Parking Garage as "all muscle without cloth." Emphasizing its tectonic dimension, a simple garage building is transformed into an art form becoming a part of the city. Though its unfinished-like construction, the parking garage reveals a kind of poetic experience with its dramatic silhouette during day and night. Different than existing closed, covered facades of the city, this open structure creates a public stage consisting of different scenes from different points by its various column designs. Inside is out, revealing the truth of the building, the truth of a parking garage as an architectural experience. Simple column and beam garage design is transformed by the architects to a monumental structure with the material, structure, and program combination. It is obvious to see how a function related to an infrastructure -a parking garage- can be transformed into a value only by a single material and a simple construction system.

The uncovered structure of the parking garage is adorned only at nights by artificial lighting in order to reveal the tectonic effect of the concrete construction during nights. The mechanical-statical function is made apparent as art form. Art-form is born out of core-form. Lighting the various shaped columns, architectonic effect is made apparent. Concrete structure results in neither figurative nor abstract art referring to Frampton's view. The unity of the form and material expression is the aim of the designer to achieve this tectonic effect. Instead of covering and concealing the structure, a standard, traditional garage design is transformed into an art-form by the revealing of concrete columns and slabs.



Figure 31. Parking Garage, lighting structure

Source: <http://www.haas-architecture.com/lincoln.htm>

[Last accessed August 24, 2011]



Figure 32. Parking Garage

Source: http://www.architizer.com/en_us/blog/dyn/1898/11-11-lincoln-road/

[Last accessed August 24, 2011]

By the possibilities of new materials and construction systems, structure and envelope have been freed from each other. Exterior expression of interior structure and surface of the building have been handled separately. This helped to explore the potentials of concrete as an architectural material revealing its architectonic possibilities. Not only "skin" is the artistic image of building anymore, but also freed structure is handled as a part of design exposing its tectonic reality. While as in the case of Semper's textile rugs, structure was for holding enclosure, for the representational side up. But later structure itself -the ontological one- also become a part of design. Ontological aspect re-presents itself as the image of building.

As Frampton has indicated Auguste Perret was strongly bound up with the articulation of reinforced concrete frame construction. He was obsessed with the expression of concrete skeleton in his buildings. Frampton points that for Perret "reinforced concrete was the perfect homogenous system with which to reconcile the two-hundred-year-old schism lying at the very heart of the Greco-Gothic ideal, that is to say, to combine the asperities of Platonic form with the tectonic expressivity of structural rationalism."¹⁴² With the possibilities of concrete construction, structure was exposed as tectonic reality of building by Perret. Structural reality becomes a tool for his architectonic expression. About this issue Frampton also refers to Peter Collins' explanation that:

"What matters is that for Perret, the visual expression of the structural material was as important as the visual expression of the constructional system. Far from "lacking a sense of detail" he becomes obsessed with the desire to achieve it in profiling and

¹⁴² Kenneth Frampton, "Auguste Perret and Classical Rationalism", Studies in Tectonic Culture: The Poetics of Construction in Nineteenth and Twentieth Century Architecture, London, England, The MIT Press, 1995, p.123

coloration. He obtained the former by modulations in the timber framework. He attained the latter by using aggregates of varying size and color."¹⁴³

Perret insists on the poetic primacy of the construction. According to him construction is the "mother tongue" of the architect, "[a]rchitect is a poet who thinks and speaks in terms of construction." For Perret concrete structure was the medium he revealed his architectural language. He didn't use concrete skeleton simply as an engineer, but for him this material and structure were including poetic meanings, and for his each design Perret tried to display these tectonic aspects. Concrete was not just to be a substitute for stone, he explored possibilities of this "new" material. As Collins put it forward:

"For him, architectural form was essentially structural form; not merely brute structure as calculated from an engineer's text-book, but structure emphasized and refined to provide all the emotional overtones which proportioning and surface modulation could create."¹⁴⁴

Herzog & de Meuron does not reveal the structure of the parking garage simply as calculated by an engineer, but they also find out the tectonic potentials of column and slab concrete construction. It is not simply the result of concrete material itself, but how this plastic material is processed by the architects. Concrete's dynamism and potential helped designers to challenge the autonomy of technology. The construction technology is not only a tool for the architects to achieve their design. In Heideggerian sense the essence of technology is

¹⁴³ From *ibid.*, p143, as cited in Peter Collins, *Perret, Auguste*, Macmillan Encyclopedia of Architects, New York: Free Press, 1982, vol.3, p.394.

¹⁴⁴ Peter Collins, "Concrete: The Vision of a New Architecture", 2nd ed., London, McGill-Queen's University Press, 2004, p.172.

revealed as artistic production. Concrete as a constructional material is not consumed up as a tool for standing the parking garage, but it becomes the garage itself. The material in the form of structure reveals itself as an art-form. Instead of concealing itself, the concrete structure is represented as the art-form.

Reminding Le Corbusier's Maison Dom-ino, the parking garage uses all the possibilities of reinforced concrete construction technique. As indicated by Le Corbusier in his Maison Dom-ino project (1914-1915) compared to traditional systems, reinforced concrete technique was a great convenience with freedom it offered. Conveying the potentials of reinforced concrete construction to their limits, Le Corbusier develops architectural tools with the possibilities of concrete construction. The wall was dependent to the structure in traditional building methods, but reinforced concrete freed the wall of any structural function consisting of simply thin columns. With its beamless slabs and free standing columns, Dom-ino freed the designer from the limitations of traditional architectural space.

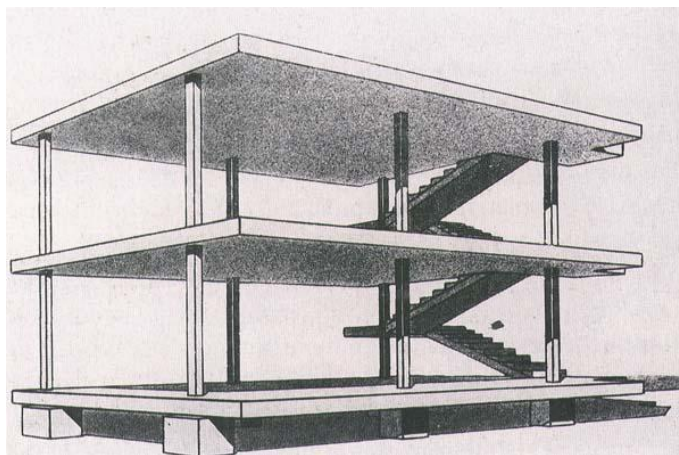


Figure 33. Maison Dom-ino

Source: <http://visionesdevanguardia.com/profiles/blogs/le-corbusier-vers-une>
[Last accessed August 24, 2011]

11 11 Lincoln Road Parking Garage is a kind of interpretation of Maison Dom-ino. The structure not only provides free spaces for the architects but also becomes a part of the design with its columns and beamless slabs. Using the plasticity of concrete as an advantage, designers took slender, rectilinear columns one step further creating dramatic effects. The simple column-slab construction is transformed into an artistic production taking the advantages of concrete material and construction. In short, the parking garage is animated as an art-form with the significance of the concrete material.

3.4 De Blas House (Alberto Campo Baeza) (Sevilla/Spain)

De Blas House is a contemporary building, designed for a literature professor in 2000, located on top of a hill in southwest of Madrid. The house stands on rugged terrain in a hostile environment. Instead of trying to tame the setting, Alberto Campo Baeza has preferred to emphasize the barren beauty of the place. What he has achieved is not a primitive shack but "more with less." A large concrete box was built as a podium in the steep site on which a transparent glass box, covered with a light and simple structure of white-painted steel, was placed. The concrete box is nestled into the hillside. It acts as a foundation, as a retaining wall for the lightweight structure above. The upper glass box is used as a living room with the panoramic view of the surrounding landscape, while the lower level concrete volume is used for the service areas and served spaces -the kitchen, dining room, and bedrooms.



Figure 34. De Blas House

Source: <http://www.housedesigntrend.com/concrete-house/concrete-house-of-de-blas-house-by-alberto-campo-baeza/>

[Last accessed August 28, 2011]

The design concept is to emphasize the contrast between the stereotomic character of the basement piece and the tectonic expression of the light structure above. The continuity of the earth is declared by the concrete podium like "a cave". Working with concrete is compared by Campo Baeza with "creating the earth." So the concrete was the best aesthetic solution for the design concept. Referring to Semper's distinction between stereotomic and tectonic, Campo Baeza displays the unity of the heavyweight architecture closely related to the ground, the earth and the lightweight one rising over the ground to the sky. This is the unity of the "cave" and the "hut". The monolithic character of the concrete material ensures the single volume appearance of the cave-like box.

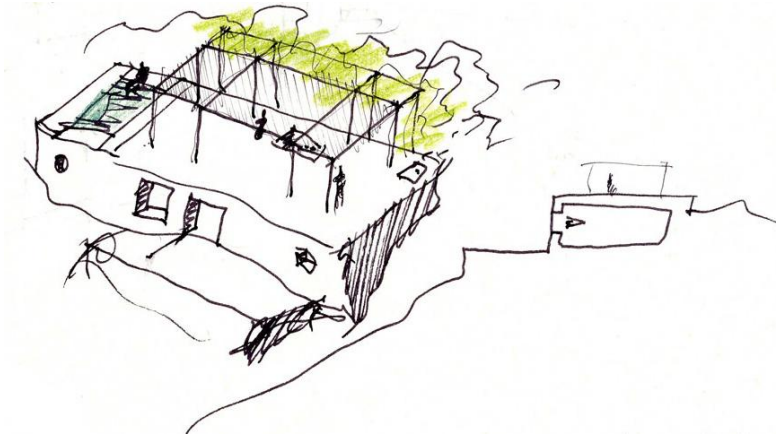


Figure 35. De Blas House conceptual drawings

Source: [http://2.bp.blogspot.com/_7oLYMTkdGVE/SjldvqvP8I/](http://2.bp.blogspot.com/_7oLYMTkdGVE/SjldvqvP8I/AAAAAAAAAck/fwUqB2DAR2g/s1600-h/b-cro-Blas-5.jpg)

[AAAAAAAAAck/fwUqB2DAR2g/s1600-h/b-cro-Blas-5.jpg](http://2.bp.blogspot.com/_7oLYMTkdGVE/SjldvqvP8I/AAAAAAAAAck/fwUqB2DAR2g/s1600-h/b-cro-Blas-5.jpg)

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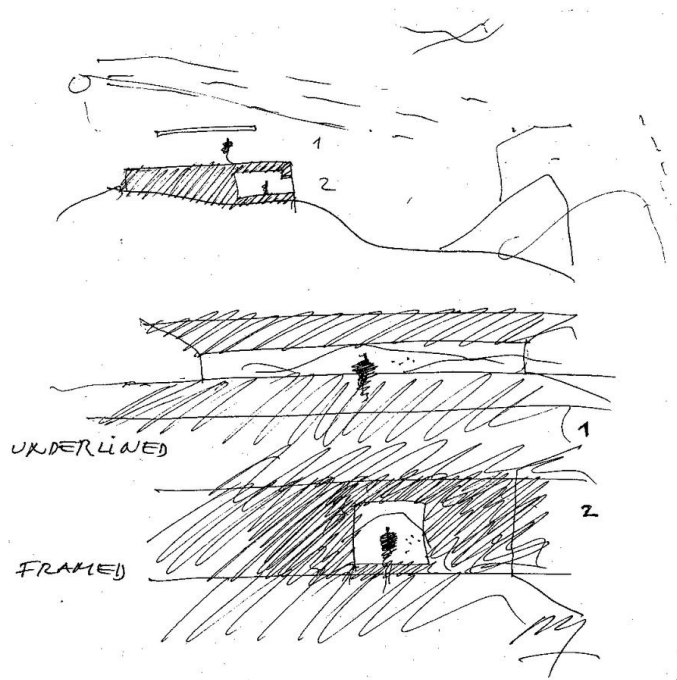


Figure 36. De Blas House conceptual drawings

Source: <http://www.dailycharrette.com/maison-de-blas/>

[Last accessed August 28, 2011]

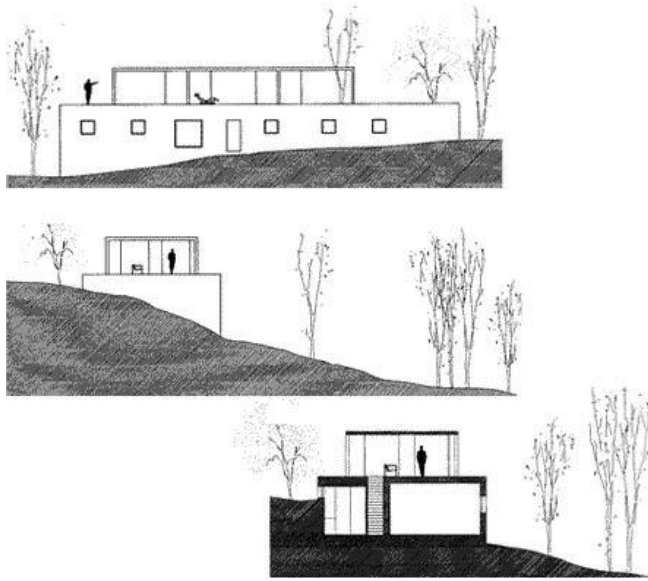


Figure 37. De Blas House elevations and sections

Source: <http://www.worldatlaspedia.com/es/europa-espana-comunidad-de-madrid-provincia-de-madrid-villanueva-de-perales/fotografias/detalleFotografia?idLocalizacion=6359397#29>

[Last accessed August 28, 2011]

Composed of simple geometric forms, the house is an abstracted transformation of the traditional building composition. Like the Caribbean hut of Semper, it is the light box over the solid static pedestal. Here the stereotomic form is not only a "mass" protecting the building from ground effects, but is a "volume" including the serving and served spaces. The heaviness, closeness of the concrete structure surrounds the spaces and isolates them from the outside world, while contrasting light frame structure above unites the space with the surrounding landscape. With the square openings of various sizes on the concrete box, framed landscape views are taken inside the isolated box. The steel-framed, cast-concrete central door links the dining room with the exterior. The concrete door maintains the unity of the concrete cave without disturbing it.



Figure 38. De Blas House massive, concrete volume

Source: http://1.bp.blogspot.com/_Wts5NqTZ67A/SOifmq1oDul/AAAAAAAAABUk/XhMWddoyHvA/s1600-h/CB-D.jpg

[Last accessed August 28, 2011]



Figure 39. De Blas House open, light structure

Source: <http://www.dailycharrette.com/maison-de-blas/>

[Last accessed August 28, 2011]

Isolated from the outside world, the inside of the concrete cave is white-washed. While the massive concrete volume surrounds the individual, with the white surfaces of walls inside spaces are transformed into an light, spacious places. On the other hand, outside image of the concrete structure is in harmony with the natural environment. Horizontal timber boarding, used as framework, provides the exterior of the box with a rich texture. The texture of the concrete box supports its cave-like view as a part of the site.



Figure 40. De Blas House inside of the concrete box

Source: <http://www.flickr.com/photos/campobaeza/441033302/sizes/l/in/photostream/>

[Last accessed August 28, 2011]



Figure 41. De Blas House outside of the concrete box, door detail

Source: <http://www.flickr.com/photos/campobaeza/441045837/sizes/o/in/photostream/>

[Last accessed August 28, 2011]

The contrasting forms, the perfectly carved out concrete box and the transparent glass box provides the experiences of forgetting and remembering and relating oneself with the environment. The solid, opaque concrete box sitting firmly on the ground emphasizes its sense of gravity, while transparent, simple, light glass-steel structure almost disappears into the landscape. These experiences created by the help of material and construction tectonics, provides space richness, more with less. The technical and material aspects of the concrete construction emphasize the meaning and the content as well. While isolating the body from the environment the concrete structure becomes a part of it.

The concept of De Blas House reminds the early Greek temples. However elemental forms of temple improves meaning in De Blas House as indicated by the *Stoffwechsel* theory of Semper. The masonry work for the podium of temple is transformed to a single volume by the concrete construction. Carrying forward the vestiges of the earlier material style, the new material concrete exposes its potentials as a monolithic volume creating spaces. Influenced by the Mies van der Rohe's Farnsworth House, Campo Baeza takes the platform idea one step further by the help of concrete material's possibilities. The stereotomic-tectonic duality of Mies is strengthened in De Blas by the massive, volumetric, single concrete box.



Figure 42. Mies van der Rohe's Farnsworth House

Source: http://www.e-architect.co.uk/images/jpgs/chicago/farnsworth_house_gmad06_8.jpg

[Last accessed August 28, 2011]



Figure 43. Mies van der Rohe's Farnsworth House

Source: http://www.e-architect.co.uk/images/jpgs/chicago/farnsworth_house_gmad06_2.jpg

[Last accessed August 28, 2011]

Campo Baeza treated the concrete material as part of his design concept from the very beginning. Architectonic expression of the material enforced his conceptual framework. Undesirable qualities of concrete, such as massiveness, dullness, roughness, are all transformed into an architectural reality.

CHAPTER 4

CONCLUSION

4.1 Concluding Remarks

Primarily considered as a constructional material, concrete both as an old material and a new one, have been approached as an architectural expression tool of designer in this study. Although first projects of concrete construction have been put forth by engineers, from the beginning of twentieth century architects have been producing new solutions with concrete material and construction system for the creation of architectural space and form. Employed as an architectural material, concrete plays an essential role in the determination of architectural production. Hand in hand with technological developments, concrete as an experimental material offers quite possibilities of innovative designs, not only in finding superior solutions for constructional problems but also for transforming building into an art-form.

The pioneering material of the modern architecture, concrete is mostly defined with its bad connotations, such as heavy, dull, rough, cold. However, it is possible to convert disadvantages of concrete to design advantages. Consuming concrete as a standing-reserve without considering its possibilities results in the "concrete conglomerate" phrase. In fact, it depends on how concrete is used in an architectural production. In Heideggerian terms, it is the "unconcealment" of the

possibilities of concrete for each unique design. Understanding the material and constructional reality of concrete will be helpful for the poetic expression of design. Referring to Heidegger's definition of "poiesis", innate possibilities of concrete go forward into presenting from nonpresent and become the reality of architectural space. Closely related to technology, concrete is not mere an engineering tool which is consumed for structural creation. Concrete has challenged the autonomy of technology. Considering the "essence of technology", which includes "techne" as an ontological bond between science and art indicated by Heidegger, it is "bringing-forth" the innate properties of concrete as artistic creation congenial with the technique for the poetic expression.

Building is first an act of construction and use of materials. However, architecture is not mere revelation of constructional techniques or materials but exposing the expressive potentials of construction and material. Structure, form, space, surface, texture created by concrete material become the architectonic elements of building revealing aesthetic meanings. Accepting the "knot" as the oldest technical symbol referring to Semper, elaboration of each joints, surfaces, details of concrete material will transform the whole construction into an artistic production.

Ontological and representational, material and production techniques, poetic construction, tectonic are the terms that constitute the conceptual framework of the study. Through this framework, the objects of analysis are interpreted as the contemporary examples of "concrete architecture." For each building, concrete is evaluated as part of the design concepts. The use of concrete material in architecture is investigated considering the abstract procedures of Semper, "textiles",

"ceramics", "tectonics" and "stereotomy". Each technical skill introduces possibilities of concrete for architectural production. In this frame, Table 1 illustrates the possible variations of concrete in architectural creations with close relation to production techniques. Instead of being a technical given, each technique reveals concrete material as an "architectural construct." When examined through the tectonic theories of Bötticher, Semper and Frampton, concrete material in each design is seen not just a constructional mean but also expression of architectural context.

Concrete use in architecture has displayed various applications in between two extreme poles throughout history. Rectilinear, mass production, post and lintel reinforced concrete frame constructions are one end, and experimental, sculptural, free forms of concrete buildings are the other end. In between these approaches there are quite possibilities of concrete use in architectural production. Table 1 exemplifies concrete use within different architectural contexts and provides a wide perspective for the evaluation of concrete use in architectural expression. Instead of evaluating concrete in a materialist view, the table proposes handling concrete as a design parameter, subservient to design idea with the possibilities it implies.

Different than other materials, only within the limits of structural calculations for the sake of construction stability, concrete offers a wide range of design solutions limited merely with architect's imagination. Molded in any shape and texture, final product is beyond constructional exigency, concrete use in architectural production becomes a cultural issue. Exposed or covered, colored or painted, smooth or textured, concrete use displays different meanings within different architectural concepts. What goes into the mixture of concrete, how the surface is finished, what makes the mould have a great impact on the end result.

Construction techniques, available materials, climate, landscape, and culture vary from country to country. That's why instead of merely being a "material", concrete is a "process" reflecting diverse ways of design solutions according to conditions. As indicated previously, architects have different use of concrete. While for Auguste Perret frame construction is the economic way of concrete use, Le Corbusier puts concrete use to extremes with the plastic potentials it reveals. Also for different circumstances different solutions are found out by the architect. While Le Corbusier indicates plastic potentials of concrete use in Chapel of Notre Dame du Haut, in Unité d'Habitation block the architect reveals the mass production possibility of the material. For each circumstances concrete displays different meanings in harmony with the design concepts. It is not lost in construction process, but becomes an architectural construct.

Formwork is the inseparable constituent of concrete construction. It provides a language for the expression of concrete with various techniques. Formwork brings concrete to life, the material becomes tangible. While achieving this, formwork characterizes concrete according to designer's aim. Different than other materials, for each design concrete becomes a "unique" material animated only for that design.

Relating the building history first to the production of textiles, Semper indicates the importance of coherency between material and production techniques. Concrete displays every application that it is exposed to, and it can be transformed to an advantage for the design concept. As analyzed through the examples, especially for the Church of Light, concrete walls remind a "textile" that combines nature of material and production logic resulting in an artistic creation. The patterns created as

a result of construction technique become the tectonic revelation of the art-form. Each concrete wall units of the church with their tie-voids and seams gathered in a unity, which seems to be weaved as an artistic enclosure. All the details constituting the artistic image of the building, indicates the construction logic behind this artifact. The "image" is the direct exposition of the "tool" merging in a unity. While these constructional details are not shown up even in the drawings of the project, mastered properties of concrete material to its full extent ensure the art-form.

Concrete has the ability to act as an architectural material that not only forms the structure and erect the building simply for gravitational problems. Structural possibilities of concrete is extended beyond engineering calculations of the material. Regarding the tectonic understanding of Frampton, defined as "poetics of construction", concrete structures can be transformed to a "constructional craft". Instead of displaying a "figurative" art, tectonic reality of concrete structure is revealed as the art-form. Structural logic, details, and the material possibilities of concrete are handled so as to develop a vocabulary for the demonstration of architectural concept. In the example of 11 11 Lincoln Road Parking Garage, instead of searching for a scenographic production, the architects emphasized the tectonic reality of building, taking the advantage of concrete material and construction. Column and slab structure, which is closely associated to concrete material, goes beyond a simple structure meaning and exposes itself as the architectonic image of the building. The garage exists as a "thing" rather than being a "sign" with its "all muscle without cloth." Freeing itself from the envelope, exterior expression of the interior structure exposes the tectonic potentials of concrete. The repetitive, monotonous character of the column-slab structure is

abandoned by the plasticity of concrete, by its possibility to take any shape according to formwork. So each unique concrete column is revealed as an artistic creation. The ontological existence of the concrete elements are transfigured into art form.

With its representative character, "dead-stone" concrete is animated by unclothing its latent qualities. Concrete material embodies many discrepancies within itself: liquid and solid, light and heavy, smooth and rough, achromatic and colorful, curved and linear. Depending on the concept of architectural production, each feature can play an essential role for the expression of the design idea. Concrete material's latent qualities, resting in a formless condition, are resolved into a dynamic expression. While in the example of the MUMUTH concrete displays a liquid, mobile, light character, for the De Blas House its solid, massive, rough character is put forward. Concrete material is embodied with the meaning ascribed by the architect. Treating the concrete material congenial with design ideas retrieve it from its vacuous existence. Within the architectural context, it bears a poetic quality.

In the example of the MUMUTH, concrete is a key element of the design concept. Concrete structure with its sculptured form contrasts with the linear steel frame construction, the fluid form at the heart of the static structure. Monolithic and plastic character of concrete provides a sculptural form that goes beyond its structural reality, and becomes the nodal point of the building communicating with the environment with its organic form which awakens feelings. Without any distinction between slab, wall, and ceiling, the continuous surface of concrete binds all parts into a single whole.

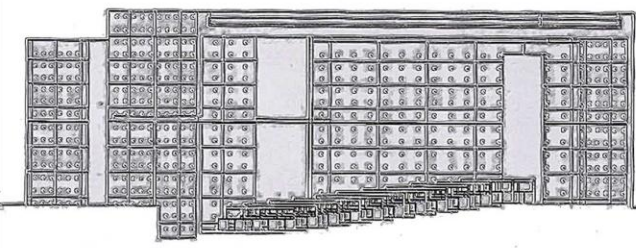
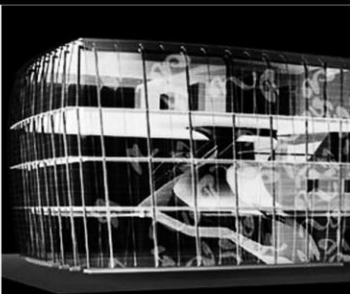

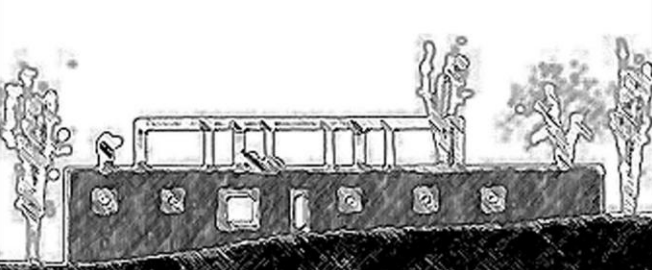
Another example of concrete material use in architecture is De Blas House which reveals the stereotomic character of the concrete construction. Tectonic-stereotomic contrast, as the general concept of the building, is emphasized by the massive character of concrete. Instead of smooth surfaces, the rough formwork prints articulate the concrete mass, giving it natural expression which seems to grow up from earth. This closed concrete looks like a natural rock, carved out from earth, belonging to the context. The textured outer-surface and smooth, painted inner-surface of concrete box indicates the outside-inside realities of the spaces created. Instead of exhibiting the building to the outside world, closed concrete mass creates an inner world, only taking framed-views of outer world to the inside.

Technological developments diversified production techniques in architectural field. Within these production techniques, various architectural expression forms can be find out for concrete material, for the most used constructional material. Referring to Semper's abstract procedures, concrete material can be manipulated as an architectural element. Considered as a "process", instead of being a mere material, possibilities of concrete can be revealed as an architectural expression tool with the diverse production techniques. Although concrete industry has tended to encourage the view that concrete is simply a "material" in the way that stone or timber, concrete exists only when cement and aggregates are combined with human labor and it is the human skill and invention that is brought forth for each unique design. Transforming concrete into artistic creation is achieved only by understanding the opportunities it offered by the help of production methods.

Whether covered with another material, painted or exposed, concrete is an architectural material that has the ability to express design idea and

create architectonic spaces. All the specific examples analyzed in the frame of tectonic theories, represent the use of concrete as a tool for the achievement of architectural creation. However, this "tool" is not consumed up as a mean for an end, but instead "concrete tool" becomes the part of each unique design, produces architecture, spaces and tectonic forms with its revealed meanings. Only by proper treatment, by complete technical perfection of concrete the material can be forgotten and goes beyond its reality. Complete mastery of concrete will result in meaningful symbolic forms. Semper's practical aesthetics - the properties of the material, the technical process, and the function of the object- is the only way to reveal meanings behind concrete. As long as the relation between form and meaning is achieved, concrete material becomes an ethic one.

Table 1. Tectonic diagram of the concrete use in the analyzed architectural productions. Prepared by the author.

abstract procedures	project	illustrations	Tectonic Approaches		
			Structure / Symbol Karl Bötticher	Material / Method Gottfried Semper	Clear Structure / Joints Kenneth Frampton
textile	Church of Light by Tadao Ando		There is a delicate balance between structure and symbol. The cross gap created by the solidity of the concrete. Spirituality of space is enriched by the dark-light contrast over concrete surfaces.	The transition from tatami to concrete (Semper's Stoffwechseltheorie) construction has been handled with care. Construction details (seams and joints) are elaborated as part of architectural elements.	The concrete structure is clear and joints are telling the logic of the construction. With its full technical manner, structure is legible in harmony with the concrete material.
ceramics	The MUMUTH by UN Studio		Concrete twist provides a direct relationship to music with its fluent, continuous form.	The plasticity of concrete provides a unifying space, an illustrative example of Semper's "hearth", gathering people, as the nodal area.	The concrete structure appears as the focal point with its sculptural form. The concrete form, connecting the different layers, transforms to an art-form with its material property.
tectonics	11 11 Lincoln Road Parking Garage by Herzog & de Meuron		Each concrete columns with their various shapes become the architectural elements of the design. Concrete column and slab "core-form" reveals itself as the "art-form".	Concrete provides a free plan, and frees structure from envelope. Dramatic concrete shapes are the result of different loads over columns.	The tectonic reality of the building becomes the architectural expression. Concrete structure is comprehensible and reveals itself as the monument to the city.
stereotomy	De Blas House by Alberto Campo Baeza		The massive, closed, concrete box is exposed as the "cave" contrasting to the light structure above.	The monolithic character of concrete provides the single volume appearance with some openings like carved out. The framework textures makes the concrete box belonging to the natural environment.	Simple geometry of the concrete box exposes its construction logic. The stereotomic expression of the form is the true structure.

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