

**'STRUCTURE' AS CONCEPTUAL RIGOR:
The Collaboration of Cecil Balmond and Rem Koolhaas**

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Abstract

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Cecil Balmond (1943-), the Sri Lankan born, British structural engineer, creates with a profound sense of spatial definition. This definition is underscored by Balmond's conceptual rigor, 'Structure is architecture' and his theoretical framework of the 'informal'. His keen spatial sensibilities, use of mathematics, and gravity-defying structural compositions in a number of architectural projects in the latter half of the twentieth and early twenty-first centuries are witness to this transformative impact. In so doing, Balmond, as a structural engineer, has earned early on in the design process, a seat at the proverbial architectural design table.

Balmond's most significant contributions are seen in his collaborations with the Dutch architect, Rem Koolhaas (1944-). Previous scholarship considers Balmond's work from a purely structural engineering perspective, or considers the built works as a product of the architect's genius, thus limiting the reading of their collaborative production and the conceptualizing role of Balmond as a structural engineer. Using the lens of Balmond's theoretical approach to architectural design provides a new, yet complementary way of reading their co-authored built

works. This thesis recasts their collaborative works as a display of Balmond's architectural sensibilities along with Koolhaas', deserving joint/equal authorship for the projects.

Furthermore, this thesis explores Balmond's contribution to shaping Koolhaas' early 'built' architectural career, and it highlights the transformation of both these individuals from differing backgrounds into multi-dimensional architects.

This thesis analyzes critical built works based on Balmond's framework – 'informal', and Koolhaas' construct – 'bigness'. The Kunsthal in Rotterdam, The Netherlands; the Seattle Public Library, Seattle, USA; and the Casa da Musica, Porto, Portugal, are case studies that this thesis focuses on to emphasize and exhibit this unique interdisciplinary collaboration. The research examines the trajectory of this collaboration through archival research – drawings, images, correspondences, and newspaper articles; interviews; public lectures; published manifestoes; and through the experience of visiting the case study buildings.

To the future.

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ⁱ Sandra Bullock, “Two Weeks’ Notice.”

INTRODUCTION

The *Maison à Bordeaux*, a residence in France built in 1998 was a small, but powerful manifestation¹ of interdisciplinary architectural design in the twentieth century. Its strong conceptual idea based on the client's specific needs, innovative use of structural components and technology, and its historical references in the contemporary built form led to a deeper questioning of the designers and the design process. This building design is famously associated with the name of the architect, Rem Koolhaas. Further research revealed the significant role of the structural engineer in not only shaping the form of the building but also in contributing to the conceptual development of the design. That individual became the protagonist for this thesis study, the structural engineer, Cecil Balmond. This thesis is a result of the questions that began regarding the interdisciplinary practice of architecture between the Sri Lankan born, British structural engineer, Cecil Balmond and the Dutch architect Rem Koolhaas. In specific, it considers the collaborative relationship that incorporates theoretical frameworks along with the practice of architecture to define designed spaces. The transformative impact that follows is studied closely from the conceptual ideas through the final built product. By providing a close reading of the individuals, guiding theories, published manifestoes, and co-authored built works, this thesis seeks to illuminate the role of the collaborative, creative, and conceptualizing structural engineer, Balmond.

“Architects and engineers have learned to work together, not everywhere, not always, but sometimes, and that has made possible some very fine buildings. It has also changed things, and the message will go on spreading until it will no longer be possible for architects and engineers not to work together as a team.”²

~ Peter Rice

¹ Niklas Maak, "Domus," *Maison à Bordeaux: A Textile Revisitation*, accessed March 10, 2016, <https://www.domusweb.it/en/architecture/2013/03/25/maison-a-bordeaux-a-textile-revisitation.html>.

² Rice, Peter. "A Celebration of the Life and Work of Ove Arup." *RSA Journal* 137, no. 5395 (1989): 425-37.

During the late-twentieth century and beyond, Cecil Balmond became a creative collaborator on many of the modern world's iconic buildings, with some of the biggest names in architecture, including architects James Sterling, Daniel Libeskind, Toyo Ito, Alvaro Siza, Eduardo Souto de Moura and Rem Koolhaas to name a few. These collaborations have brought forth a body of built and unbuilt works additionally initiating intriguing theoretical frameworks for thinkers and practitioners alike in the built environment. This thesis examines some of the key collaborative works of Cecil Balmond and Rem Koolhaas between the years of 1986 and 2012.

Cecil Balmond is a rather understated figure in the history of the built environment, but who as a structural engineer, has been closely involved with the creation of iconic architectural spaces. Balmond transcends the notions one has of structural engineers, by his theories and approaches to architectural spatial design. Past historical narratives describe collaborative work between architects and engineers like Peter Rice with Renzo Piano and Richard Rogers; August Kommandant with Louis Kahn and with Moshe Safdie; Ove Arup with Jørn Utzon; Fazlur Khan with Bruce Graham, etc. Each of these collaborations has created architectural marvels through their work together. These collaborative efforts put on display the technical knowledge and expertise of the engineer in the innovative use of technology or material. Balmond however, is unique in that, besides working inventively with the above-mentioned qualities of an engineer, he is also concerned about the shaping of the architectural space, and this he achieves with his theory of the 'informal' and through his conceptual rigor of 'structure is architecture'. This approach has found him a seat very early on in the design process, proverbially at the architect's table, conceptualizing and shaping a project in ways more like an architect alongside the architect, than the traditional ways in which an engineer is known for his work.

Now, concept development is central to architectural projects. Developing a strong concept for a design helps direct or ground a project. This is common to the architectural design process and to how architects are trained for practice. It is less common to see an emphasis on conceptual and theoretical ideas to shape the form and space of a building as a contribution from the structural engineer. Balmond however, distinguishes himself as an engineer in his collaborations by his early conceptual inputs that he provides to spatial design. According to Balmond, our ideas about a designed space is influenced by one of three conceptual models, The first is the classical model – ordered within a boundary and things inside are orthogonally arranged, which has been the way architects have been designing traditionally; The second model, seen in recent years displays a more disruptive idea of space – created by the disoriented arrangements and in essence, is a deconstruction of the space. The third model is the one that Balmond subscribes to, in which events or arrangements are not bound within the boundary, releasing it from hierarchical formalism. This provides a self-organized, non-linear characteristic to design. This Balmond calls the ‘informal’, which through his structural interventions in projects provide a conceptual rigor to spatial design and to architectural form-making.

Beginning with the interpreting of Cecil Balmond’s work as expressions of “*structure is architecture*” and “*what Rem calls the input conceptual rigor,*”³ this study focuses on Balmond’s collaborative works specifically with the Dutch architect, Rem Koolhaas as a framework for interpretation. Though the study is contained within select collaborative efforts between these two individuals in form generation and definition of architectural space, it places Balmond’s collaboration with Koolhaas in the broader context of his numerous other collaborations with other architects. The years 1986 – 2011 are particularly considered, that being the period in which

³ Ruth Baumeister and Sang Lee, *The domestic and the foreign: architecture in globalization* (Rotterdam: 010, 2006), 318.

Cecil Balmond worked with the structural engineering firm, Arup and evolved his freedom of thought, expression, and analysis of spatial designs. Balmond's seminal written work "Informal" provides the necessary primary source material and the foundation for this thesis. This thesis analyzes Balmond's approach to architectural form, his approach to design, and his contemplations that are based on the broader use of structures, geometries, and mathematical rules that support the making of architecturally designed spaces.

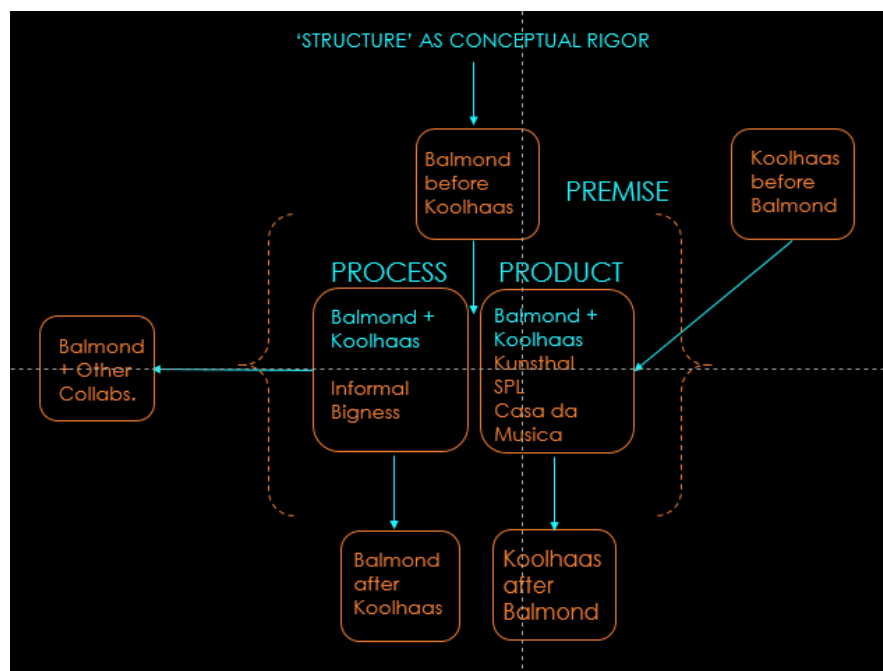


Image 1: Diagram showing the framework of the research and the layout of the thesis, B. Joy

Based on the framework in Image 1, the thesis examines the background; the theories, and the built architectural works of the collaborations to discover the underlying patterns and basis by which Balmond creatively engages with architectural space. The thesis represents an analysis

of the morpho-spatial flows which exhibit an architectural freedom from “structural correctness and compulsive repetition,”⁴ as was conventionally seen in architectural designs.

The architectural design and building professions are moving toward a highly collaborative, interdisciplinary, and non-hierarchical process. This provides for greater interactions among individuals and teams from varied concerning fields. One very close exchange that has a substantial impact on architectural design is the collaboration between architects and structural engineers. Changes in the profession of architecture have allowed structural engineers to assume an increasingly significant role in the generation of building form. The involvement and influence of structural engineers in architecture have formerly been behind the scenes and often late in the process, except in sporadic incidents. Nevertheless, recent trends in architecture have given structural designers a significant role in shaping buildings. Advances in material, constructional technology, and the aid of digital tools have allowed form to become a key driver of spatial design. The approach to architectural form-making and spatial design has drastically evolved since the second half of the twentieth century. Balmond’s theoretical perspective introduces a fresh outlook about structural compositions to architectural form-making, grounding ideas in a conceptual rigor. ‘Structure, as conceptual rigor’ is an examination of how structural interventions and compositions become the driving force in shaping architecturally designed spaces.

The focus of the research here is on the collaboration between Cecil Balmond and Rem Koolhaas that specifically studies the move from formal expressions (classical model) of spatial designs to the informal manifestations (third conceptual model) of the complex, the emergent,

⁴ Cecil Balmond, Christian Brensing, and Jannuzzi Smith, *Informal* (Munich: Prestel, 2002), 75.

and the non-linear systems through structure⁵. This is seen explicitly on the surface (envelope), or implicitly through the many structural interventions and compositions of the built work, and can be described by what I refer to as, ‘morphological flows’. This thesis research examines Balmond’s and Koolhaas’ work on the Kunsthal, the Seattle Library, and the Casa da Musica as case studies. The primary aim in examining these buildings is to understand how Balmond’s theories are applied to the design process, how they are exhibited in practice and in the built space, and to investigate how his conceptual rigor crafts spatial character and emphasizes morphological flows through the building.

The research displays that the collaboration between these two personalities forged a unique conceptually grounded, interdisciplinary notion of the architectural design process. Both arrive at this juncture from different backgrounds to architecture – Koolhaas from a journalistic, film-making (artistic, literary) background into architecture and Balmond from an engineering background (rational, mathematical) to architecture. Working with Balmond’s ideas of ‘Structure as rigor’, and Koolhaas’ ideas of ‘bigness’, program, and circulation has enabled both these individuals to bounce ideas off of each other in creating spatial solutions. Scholarly research that elaborates this collaboration is limited in its approach with considerations provided individually or with the main focus on the architect. This thesis sheds light on the collaboration with Cecil Balmond that catapulted Koolhaas’ “built” architecture career, changing in part the trajectory of his work from being largely theoretical constructs to becoming significant built works. Considering how unique this partnership has been over three decades, it provides for the need for scholarly inquiry.

⁵ Ibid., 112-113.

This collaboration between Balmond and Koolhaas is investigated through archival research, visits to case study buildings, recorded forms of interviews, published manifestos, through news articles, etc. In this time and age when architectural design is pluralistic in nature, with not just a single significant way to build, the collaborative approach of Koolhaas in association with Balmond, anticipates grounding many a contemporaries in architecture and enabling the establishment and growth of architectural think tanks not just in the western world but also around the globe.⁶ This collaboration represents the blurring of the boundaries of the two professions of architecture and engineering. This is significant because both Balmond and Koolhaas are influential agents of change⁷ breaking commonly perceived boundaries⁸. The research also shows that the collaboration between Balmond and Koolhaas catapulted Koolhaas' early career by directing the trajectory of Koolhaas' work from being largely theoretical to being built works – in essence, into 'being' an architect.

This thesis contributes to new knowledge by acknowledging and highlighting the significant contribution of the engineer in the creative, conceptual, and theoretical aspects of the architectural design process in addition to the rational, logical, and mathematical ideas. Though Koolhaas is a significant name in contemporary architecture, Balmond, a lesser known factor, as a catalyst in the process of Koolhaas' significant "built works," is not explored. Recent literature focuses on Koolhaas' work but does not bring to light the collaboration with Balmond in-depth, neither does it consider the subsequent effects of this collaboration. This is crucial in

⁶ Markus Heidingsfelder, Min Tesch, Crock Krumbiegel, Isabel Schosnig, Curiously Bright Entertainment, Arthouse Films, and New Video Group. *Rem Koolhaas: A Kind of Architect*. Arthouse Films (Series); 013. ([New York]: Distributed by New Video Group, 2010).

⁷ Jeffrey Kipnis, 'Recent Koolhaas', *El Croquis*, no 79, 1996, quoted in, Rem Koolhaas and Véronique Patteeuw, *Considering Rem Koolhaas and the Office for Metropolitan Architecture: what is OMA* (Rotterdam: NAI Publishers, 2003), 6.

⁸ Jennifer Kabat, "The Informalist." *Wired*. April 01, 2001. Accessed November 20, 2016. <https://www.wired.com/2001/04/balmond/>.

understanding, acknowledging, and awarding joint authorship in the projects. In this regard, the research question is how Balmond's theoretical approach of the 'informal' and his conceptual rigor using structures in the design of built spaces has shaped and prescribed a new perspective. Additionally, it considers what Cecil Balmond's role was in the growth of Rem Koolhaas as an architect and the reasons that make Balmond a 'Person of Interest' in the investigations of collaborations between engineers and architects.

*"...your work with architects has been characterized by intense partnerships that are closer to co-authorship than the typical structure of an engineer working for, rather than with, an architect..."*⁹

~Julian Rose interviews Cecil Balmond for the Artforum

While Rem Koolhaas is a household name in the contemporary architectural world today, an understanding of his works is a complex matter. This thesis examines nearly three decades of collaborative years and analyzes how Koolhaas' transformation to being an architect from being a journalist and a theoretician is seen by the volume of work carried out in collaboration with Cecil Balmond. The key factor being that Balmond thinks like how an architect is trained – his diagrams speak for his thoughts, not only his calculations, which make him relatable to the architects he works with (Images 4, 5, and 6). A common language is key in the making of collaborative design work, one of which is architectural sketches.

The entire body of work Balmond has produced is to be considered since his collaborations are not limited to only his work with Koolhaas. It can be seen that though his largest number of works in the period considered in-depth for the thesis study is with Koolhaas, there are other architects whom Balmond has engaged with and demonstrates this joint working spirit. This

⁹ Julian Rose, (2014, 10). Code breaker. *Artforum International*, 53, retrieved from <https://search.proquest.com/docview/1609534493?accountid=14784>, 245.

collaborative spirit comes in large from his rich roots in and from the history of the structural firm Arup. Arup is a multinational services firm that was started by Mr. Ove Arup, an English engineer most famously known for the design and construction of the Sydney Opera House along with the architect Jørn Utzon. Arup, the engineering firm, has long held up the innovative banner in construction and structural solutions with their core belief in teamwork. This translates from the head of the firm right through all the people working in the firm. Balmond with his long years of work at Arup has it inbuilt in him to collaborate. This, I believe, is a strong factor that contributes to the reason behind how Balmond's and Koolhaas' work happens.

The first chapter, 'Premise: People and Theories,' sets the stage for the investigation. It builds on an understanding of the background story about the protagonist in this thesis – Cecil Balmond. At the same time, it also sheds light on Koolhaas and his story when he meets Balmond in the mid-80s and further explores the platforms which they were engaged in. This chapter delves into engaging with what they were involved in before their collaborative years. It also introduces Balmond's theory of the 'informal', his concept of 'Structure as conceptual rigor is', and Koolhaas' theory of 'Bigness', which together form the framework for the research analysis.

Chapter two, 'Process: Collaboration,' studies the multiple implications of these theories and the ways in which the joint application of the ideas surface in built form. Based on the 'informal' the chapter examines the tenet, 'Structure as conceptual rigor is architecture.' It also dissects the ideas of complexity, non-linearity and emergence to understand Balmond's approach. Additionally, it focuses on 'Bigness' as a theory and how that theoretical construct plays in conjunction with Balmond's conceptual framework. In focusing on Koolhaas, this chapter tries to understand the role of programmatic, circulatory rigor in design that leads to 'transformations'.

Chapter three, 'Practice: Product,' forms the crux of the thesis, examining the collaboration and the particular case studies to see how all the aforementioned ideals of the collaboration plays out in the built work. In particular, the study focuses on three buildings that have become significant in their own identities and in becoming a common denominator to the works of the Balmond-Koolhaas brand. The first building under the analytical microscope is the Kunsthal, Rotterdam, in the Netherlands. This built work is significant because it was the first work that the duo was able to bring into built form after few attempts before this with competition projects. The Kunsthal is almost an experimental project, running the various ideas of their shared theoretical constructs and in manufacturing the finished "goods" i.e., the architectural design. The other two buildings in focus are the Seattle Public Library (SPL), Seattle, Washington, USA and the Casa da Musica, Oporto, Portugal. The Seattle Public Library was a game changer in terms of juxtaposing public space with the use of material, technology, and structural systems. The Casa da Musica is a concert hall in the city of Porto that is symbolic of the transformative pluralism, in its typology, scale, and location. Its unique form and structure express the innovative nature of the discipline of architecture and more so of the manifestations of conceptual ideas of the engineer in creating this built space.

This chapter also illustrates, in depth, the comparison between the library and the concert hall, as they were in most part simultaneously built, but in two different locations. The SPL and the Casa Musica are compared and contrasted through this analysis. The argument considers the theories of 'Bigness', as explained by Koolhaas and additionally through 'Informal', as expounded by Balmond. These two theoretical constructs form the basis on which the case studies are investigated for a clear development of the narrative that is created through their joint work. The form, structure, material, location, politics, program, etc. all contribute to the larger understanding of knowing how this collaboration develops into built works of architecture.

The specific collaborative aspect of the design process underscores the engineer's role significantly. Scholarship generally tends to highlight Koolhaas individually or considers OMA's work as a collective, but underplays or most often eliminates the role that the structural engineer, Cecil Balmond played in conceptualizing the collaborative works. It also does not emphasize the role that Balmond played in Koolhaas' early career. The research for this thesis reveals the critical role Balmond played in being the sounding board and creative partner for Koolhaas in his growth as an architect who 'builds', becoming the 'star-architect' that he is today. This research also displays through the events in time and the projects that were worked on, that Koolhaas is able to with a number of his large projects build out his theoretical constructs. He is able to move from being a theoretical 'paper' architect to being a 'constructing' architect. Through the approaches of a strong theoretical framework, structural composition, and spatial innovation in bringing together structures and architecture, this thesis argues that Cecil Balmond is the pivotal force (along with the architects) that has shaped many built works in the constellation of global iconic architecture.

Besides their individual works and theories, the collaboration not only displays their ideas in the physical built form but also points to the ways in which this particular narrative of collaborative endeavors encourages new trajectories of building for the twenty-first century and are re-writing the conventional notions of architectural spatial design. This particular partnership also indicates the possibilities of change in the architectural and structural engineering pedagogies and encourages a joint constructive creativity. In addition to the three particular case studies evaluated in the thesis, the research also briefly looks beyond the work of Balmond with Koolhaas, considering his associations with other architects to see how the 'informal' is expressed in their collaborative work. The last project that Koolhaas and Balmond worked on together is the China Central Television Headquarters tower, Beijing, China which was completed in 2012.

Notably, Balmond and Koolhaas as a team have not worked together on projects beyond that. This tells us of the changing dynamics between the designers and speaks of the evolvement of both people and practices.

The methods of inquiry include multiple modes: 1. Experiencing the built space through case study visits, 2. Textual analyses, 3. Interviews, 4. Archival material: drawings, correspondences, 5. Written manifestoes, 6. Secondary sources. Considering the ways in which architects and engineers collaborate, we see most often that responsibility makes engineers conform to ideas – restricting them, but the collaboration between Balmond and Koolhaas on any project and continues because of the attitudes of 1) an open agenda 2) being highly speculative 3) being aggressively critical about contemporary conditions, etc. Balmond’s and Koolhaas’ collaborations are centered on conceptualizing ideas together – with a mutual give-and-take of ideas. This makes their integrated work unlike other architect-engineer collaborations, where commonly the architect brings the idea and the engineer calculates. This provides a sense that there is more to how Balmond as an engineer contributes toward the architectural process. In the following chapters, the thesis unfolds this narrative and clarifies this pivotal role through:

- (A) PREMISE: People and Theories → The bios and theoretical ideas
- (B) PROCESS: COLLABORATION → The collaborative process of the theories
- (C) PRACTICE: PRODUCT → Analysis of the form and space of the built environment.

“I’m interested in a more interactive, integrated approach, based on my belief that the world is irreducibly complex.”¹⁰ ~Cecil Balmond

¹⁰ Julian Rose, (2014, 10). Code breaker. *Artforum International.*, 53, 248.

CHAPTER 1: PREMISE: PEOPLE AND THEORIES

Image 2: Cecil Balmond, (Source: Cecil Balmond et al., Cecil Balmond = Seshiru Barumondo. Tokyo: A + U, 2006, 290)



Image 3: Rem Koolhaas, (Source: https://commons.wikimedia.org/wiki/File:Rem_Koolhaas_-_portrait_03.jpg)

1A. CECIL BALMOND AND THE ‘INFORMAL’:

*“In architecture, the pride of man, his triumph over gravitation, his will to power, assume a visible form. Architecture is a sort of oratory of power by means of forms.”*¹¹
 ~ Friedrich Nietzsche quoted by Philip Johnson

Cecil Balmond (1943-) (Image 2), the Sri Lankan born, British structural engineer, designer, artist, author, and teacher creates with a profound sense of spatial definition. This definition is underscored by his conceptual rigor, ‘*Structure is Architecture*’, and his theory of the ‘*informal*’ to transform architectural form and space. With the use of mathematics, gravity-defying structural interventions, and artistic spatial sensibilities, Balmond has been a significant influence on a number of architectural designs of the late twentieth and early twenty-first centuries. His longest and the most collaborative work is with the Dutch architect Rem Koolhaas and his firm Office for Metropolitan Architecture (OMA). This thesis examines the specific collaboration between Balmond and Koolhaas and analyzes their co-authored built works through Balmond’s theoretical lens of the informal to provide new, complementary, and expanded perspectives to these built works.

CECIL BALMOND:

Cecil Balmond was born in 1943 in Sri Lanka and lived there until 1961. Balmond’s family moved to Ibadan, Nigeria when they had to leave the island country to escape the strife of the civil war. In 1961, Balmond joined his parents in Nigeria for a brief two years before making Britain his new home. In Britain, Balmond studied civil engineering at the University of Southampton. In the year 1965, he returned to Nigeria and in 1966 joined Ove Arup and Partners at their Ibadan

¹¹ Philip Johnson, "The Seven Crutches of Modern Architecture." *Perspecta* 3 (1955), 44.

office. When the Biafran war broke out, Balmond returned to London in 1967 and joined the multi-disciplinary engineering firm Arup. In 1971, Balmond joined the Imperial College of London to do his graduate studies and was awarded the MSc. DIC. Soon after, in 1972, he returned to Arup in London and stayed on with the firm till the year 2011, when he last held the position of Deputy Chairman. During his time at Arup, he started the Advanced Geometry Unit (AGU), a design wing within Arup with a deeper design research focus to engineering.¹²

“Ingenieur”, the French word for engineer is derived from its Latin root-word ‘ingenium’ which is, ‘to have a natural capacity’, or ‘an innate quality’, or is also understood as, ‘a genius’. Balmond as an engineer has been referred to as being a genius¹³, and rightly so for his ingenuity. Like his predecessor at Arup, Peter Rice, Balmond has contributed exceptionally as a structural designer to the world of architecture¹⁴ through his many collaborative and independent built works which is evidenced in the numerous accolades he has been awarded¹⁵ for his contributions to the built environment. His realm of collaboration with architects crosses over from the strict notions of mathematical, rational, and structural solutions to that of architectural, conceptual, and theoretically grounded creations. A traditional notion of a structural engineer is viewed as ‘advising the architect’ about structural elements like columns and beams for a building. This process was seen as a linear, hierarchical progression beginning with the architect and later reaching the engineer after most of the spatial conceptualization is completed. However, Balmond shatters this tiered approach to design and takes on an integrated, collaborative approach to design conceptualization and execution.

¹² Cecil Balmond and Nobuyuki Yoshida, *Cecil Balmond = Seshiru Barumondo* (Tokyo: A U Publishing Co., 2006), 291.

¹³ David Owen, "The Anti-Gravity Men." *The New Yorker*. June 18, 2017.

¹⁴ Jennifer Kabat, "The Informalist." *Wired*.

¹⁵ RIBA Charles Jencks Award for Theory and Practice (2003); Sir Banister Fletcher Prize for ‘informal’ (2005); Thomas Jefferson Foundation Medal in Architecture (2014); Officer of the Order of the British Empire for Services to Architecture (2015), to name a few.

Balmond's early years of work in Africa and the Middle East with the engineering firm Arup provided for a tremendous training, as he met with and was critiqued regularly by his mentor, Ove Arup, the founder of the firm. This training was an extension of the work culture and ethic that has been a foundation to all members of the Arup engineering firm across the world. The work ethic encourages members to be seekers of quality, purpose, forms, harmony, planning, and an "economy of construction leading to the concept of "Total Architecture"¹⁶, as Ove Arup refers to it. "Total Architecture" for Arup was an idea developed by alliancing work between "like-minded firms".¹⁷ These alliances with related fields such as architecture, environmental engineering, planning, etc. have enabled the firm (Arup) to develop its long-lasting construction legacy and be an impact not only on individuals in the firm but to other inter-disciplinary organizations as well. This collaborative spirit becomes critical as Arup sees this as the company's commitment to quality, and values the close joint workings of the many disciplines.

According to Ove Arup, "*The term 'Total Architecture' implies that all relevant design decisions have been considered together and have been integrated into a whole by a well-organized team empowered to fix priorities.*"¹⁸ This model though difficult to fulfill at all times, is welcomed so as to produce "artistic wholeness" and "excellence" in practice.¹⁹ Balmond emerges from this platform to interact with, and engage in spatial form-building as an equal collaborator on architectural designs. Balmond's Arup background offers a glimpse into the productive constructional history of building 'big', complicated works either as infrastructure construction or architecture as early as the 1970's.²⁰ Balmond's rich experiences with Arup proves to be a

¹⁶ Ove Arup, 'The Key Speech', Arup Organization Meeting, 9 July 1970; reprinted in *Arup Journal*, 20 (I), spring 1985.

¹⁷ *Ibid.*

¹⁸ *Ibid.*

¹⁹ *Ibid.*

²⁰ ARUP's Scottish office has been offering multidisciplinary engineering services for buildings since the 1970s.

helpful knowledge base and a great professional support in practical ways, encouraging him to engage in ever more daring projects with his many collaborators. Ove Arup wanted to create “Architecture with a capital ‘A,’”²¹ providing meaning through the creation of a wholesome, nourishing, enriching, value-adding, and beautiful architecture. I believe this translated immensely into Balmond’s work with Rem Koolhaas as they both approached architectural projects with the determined intent of finding new ways of tackling problems, and finding innovative, poetic solutions.

CECIL BALMOND’S THEORETICAL CONSTRUCT:

Balmond’s approach leans more to the making of well-integrated architectural designs with the concept of ‘*structure as rigor*’. Cecil Balmond’s theoretical framework which supports his design approach and methodologies are founded in the crux of his theories. Design tenets that involve the ‘informal’ approach and the multi-disciplinary ideological crossovers as methodologies of design sway lightly between architecture, structure, mathematics, and aesthetics. “*Arup is hi-tech, our traditional image is hi-tech, and the hi-tech aesthetic is a certain belief in structural comprehensibility,*” says Balmond to provide a distinction about what he does²². The Sydney Opera House, built in 1973 was a marker in the possibilities and the significant role of the structural engineer, Ove Arup in Modern Architecture. With its creative solution that came from making the shells out of the same curvature unlike what was proposed by the architect Jørn Utzon, by which the shaping of that design became a reality.²³

²¹ Arup, Ove N., Art and Architecture, Royal Gold Medal Address. *RIBA Journal*, (73)8, 1966, 350-359, quoted in, Uihlein, M. “The Structural Engineer: Finding the Philosophy of the Profession.” *Structures and Architecture: Concepts, Applications and Challenges - Proceedings of the 2nd International Conference on Structures and Architecture, ICSA 2013*, 2013, 2028.

²² Jennifer Kabat, "The Informalist." *Wired*.

²³ Nicolai Ouroussoff, "An Engineering Magician, Then (Presto) He's an Architect." *The New York Times*. November 25, 2006.

*“I realized that engineering was more than calculating,” he said. “I became intrigued with the way that forces shaped things, the way you assemble structures in series. The idea that we could help shape things — all that was in the air.”*²⁴

This realization – distinguished Cecil Balmond as a structural engineer to be more than just a number cruncher, and become the visionary reimagining architectural designs of/with architects. With built works in every corner of the globe, from Seattle (Seattle Public Library), China (China Central Television Headquarters Tower), or London (Serpentine Gallery Pavilions), etc., Balmond’s collaborative presence marks the built environment with architectural innovations grounded in the conceptual rigor ‘structure is architecture’.

THE ‘INFORMAL’:

Balmond’s investigations into connections between form and meaning led him to the great ancient Greek philosopher and mathematician, Pythagoras, and to James Gleick’s book published in 1987, *Chaos* inspiring him in his search for creating more than just “meaningless containers of form.”²⁵ What began as an exploration for Balmond as early as 1991 became his working manifesto by 1995, which he delivered at a lecture in Berlin. He further published his ideas, manifesto, and work as a book in 2002 in an elegant presentation of both ideas and format (Image 7), emphasizing the idea of the informal through its design. So what is the ‘informal’ according to Balmond?

²⁴ Ibid.

²⁵ Jennifer Kabat, "The Informalist." *Wired*.

THREE MODELS OF SPATIAL DESIGN:

Balmond's concepts (Image 4) began first with the knowledge of how spaces are designed. He discerned that space that is designed falls under one of three conceptual models²⁶. According to Balmond, the first model of designing is the traditional, linear format which he calls the classical model. In the classical model, conceptually, space is defined with a center and an enclosing boundary and things are organized orthogonally within this boundary (Image 5). The second model, seen in more recent years, is where the center is moved, sometimes closer to the boundary. In this model, there is a sense of disruption that is caused by moving the center closer to the boundary edge, a sense of disorientation and a deconstruction of the space (Image 5). The third model is what Balmond subscribes to where, the center is not within the enclosed boundary, thus releasing it from the hierarchical formalism, allowing it to self-organize, creating a non-linear characteristic of design (Image 5). This, Balmond calls the '*informal*'²⁷.

CHARACTERISTICS OF THE 'INFORMAL':

The informal carries within it certain characteristics, according to Balmond. He refers to them as *Local, Juxtaposition, and Hybrid*²⁸ (Image 6). Local, is an event or action that has an independent nature and is the initial action working to influence its surrounding. Balmond explains this with music saying, "...*local is a single note or sound. But just as a single note is not one dimensional, a local event radiate overtones.*"²⁹ Juxtaposition, is the characteristic of the

²⁶ Balmond Studio, "Cecil Balmond Hans-Ulrich Obrist Interview 1 of 7.avi," YouTube, December 09, 2010, accessed December 05, 2016, <https://www.youtube.com/watch?v=uRO-YD6h4hw>.

²⁷ Cecil Balmond et al., *Informal*, 113.

²⁸ *Ibid.*, 116.

²⁹ *Ibid.*

informal when two events or actions happen beside each other or when they collide and influence each other to create, by its proximity, a new entity. *“Time is an essential component in juxtaposition, not sequential as we know it, but a tectonic space-time of arrested moments.”*³⁰ With music, Balmond explains juxtaposition as *“tempo”*³¹. The third characteristic of the informal is Hybrid, which is when actions overlap each other and the events start to mutually share of independent natures. The *“hybrid is chordal, a mix of separate notes sounding together.”*³² These characteristics go on to influence and shape the ways in which the informal becomes the grounding design idea in Cecil Balmond’s many collaborative built works (Image 6). These characteristics lead Balmond’s designs from their point of inception.

‘INFORMAL’ AND ‘STRUCTURAL RIGOR’:

Balmond stages the notions of the informal in his book (Image 7) with a number of short descriptions and phrases: *“The informal is opportunistic...”* The idea of the informal is a deviation away from “the principles of rigid hierarchy” to “an intense exploration of the immediate”³³, as he calls it.

*“But in the method of design, of small differences in the start points leading only to the unpredictable, I looked into the non-linear and its special character, and was intrigued.”*³⁴

He explains further that this is not a seemingly ad-hoc method that brings forth chaos, but a deliberate “methodology of evolving start points, that by emergence, creates its own series of orders.”³⁵ Balmond began developing forms that were unique and were based on an engineered

³⁰ Ibid.

³¹ Ibid.

³² Ibid., 117.

³³ Ibid., 220-221.

³⁴ Ibid., 219.

³⁵ Ibid., 223.

rigor. Through Balmonds's approach to design, both the theoretical framing of ideas and the structural interventions, architects are investigating forms which used to be considered unbuildable.³⁶ In a presentation³⁷ of his ideas and work followed by an interview with Hans-Ulrich Obrist, curator and artistic director of the Serpentine Galleries, London, Balmond talks about how he collaborates with architects and how his work merges with the architect stating that, "*I actually work as an architect, in terms of the way I engage the space. So although I am trained as an engineer, I engage space with the sensibilities of an architect.*"³⁸ Balmond notices that often architecture tends to absorb into itself the engineering of the building; however, if there are clear suggestions of structure, then he sees that people notice and think about the possibility of a deeper collaboration. He also attributes this to the fact that he is more known in the architectural, design, and engineering circles, and that people have started to recognize and acknowledge the influence of his interventions, though historically, it was understood that the architect designs "and the engineer makes it work."³⁹

In this attempt to understand the unique ways of Balmond's design approach, there arises the thought if his work 'shows-off the structure' or, if it is more organic and internal. Balmond sees his work as being more subtle with a sense ambiguity to it. He is "interested in releasing architecture from structure, whereas other engineers trap the architecture through the structure."⁴⁰ He recalls the idea of the coral which is an intriguing piece of structure and an architectural delight, because it is, he says, a "spatial map, a kind of growth."⁴¹ To the question, if

³⁶ Ibid.

³⁷ At the 'Architecture as an open culture', Open Source International Seminar, Cecil Balmond, 12 June, 2010, Casa da Musica.

³⁸ Balmond Studio, "Cecil Balmond Hans-Ulrich Obrist interview 4 of 7.avi," YouTube, December 09, 2010, accessed August 02, 2017,

³⁹ Nina Rappaport, "Constructs Fall 2002." Yale Architecture. Accessed October 07, 2016. <https://www.architecture.yale.edu/publications/35-constructs-fall-2002>.

⁴⁰ Ibid.

⁴¹ Ibid.

non-linear work provides more collaboration than other types of engineering, Balmond feels that it will force “true joint enterprises”⁴². He would like to have the skewed nature of the parts played by the various entities in the design process like architects and engineers to change for the better. He wants architecture to be seen as being entwined in engineering, without an actual separation between the two leading to true sense of integration. While beginning to work on his theoretical framework and his collaboration with architects, he “*learned a great deal on this job, especially from a technical point of view. Significantly during this period, Ove Arup himself was reviewing my work once every month. The critique sessions that I had with him were marvelous. Not only did he evaluate my work as an engineer, but also as a designer, and the experience was very informative for me.*”⁴³ Balmond attributes these experiences as enabling him to better develop his spatial sensibilities.

*"I know there are some problems now, where I lose out on the ideas and they get taken and appropriated, but I have something deeper than the idea. They take the shape, maybe, but I've got something ahead of them, because structure for me is about the connection of ideas. I want to blaze a new path in the philosophy of structure. That's a bigger agenda than architecture, and I guess that's where I am."*⁴⁴

STRUCTURAL EXPRESSION:

Structural expression in architecture is evident from the early modern works of the twentieth century, for example, the work of Bruno Taut’s Glass Pavilion, designed and built in 1914 or, in Erich Mendelsohn’s Einstein Tower built between 1919 and 1921. More rigorous structural analyses guided Antoni Gaudi, the Catalan architect, who used catenary string models

⁴² Ibid.

⁴³ Guy Nordenson, Félix Candela, and Museum of Modern Art. *Seven Structural Engineers: The Felix Candela Lectures*, 51.

⁴⁴ Jennifer Kabat, "The Informalist." *Wired*.

for a number of projects, and Eero Saarinen's work channeled the underpinnings of sculptural form into a highly functional Dulles International Airport, Virginia, the USA in 1962. Saarinen's structures, though they express a certain degree of structural expression, does not carry the force-flows as seen in the works of Balmond, which lean more toward the generative nature of design. Structure was also significantly expressed in the high-tech era of architectural history. These architectural movements encountered the use of the latest technology and material but also showcased these in the visual identity of the building. This flaunting nature is less explicit in Balmond's designs through the attempts to seamlessly integrate technology, material, and function with the overarching ideas of form-generation.

The advances in technology and material over the centuries sustained progress in architecture, enabling complex buildings to be designed and built. Designs like that of the Pompidou Center by Renzo Piano and Richard Rogers along with the structural engineer Peter Rice, revolutionized the nature of museums, in the way that its mechanical and structural elements were exposed on the exterior constitution of the building. The architect and engineer, Santiago Calatrava's designs communicate an understanding of the practice of expressions of structure in architecture inspired by elements in nature like that of a skeletal frame of a bird (Milwaukee Art Museum, Wisconsin, USA) or, of that of an eye (The City of Arts and Sciences, Valencia, Spain) is a bold approach with an expressive structural emphasis in the design.

In the history of construction and architecture, frame structures can be considered to be a good example of expressions of force flows. These continue to be used in today's architectural designs in both simple and complex ways. The idea of framed structures liberated the building industry providing it with a degree of freedom not known until then. These framed structures enabled building designs the capacity to break the spanning limitations that existed and develop

complex and ingenious spatial responses. In the case of Balmond, structure transcends these ideas by adding to it a generative and patterning aspect that adds to the form of the design. This thesis considers how this process leads to the spatial formation. In questioning how the concept of structural rigor has steered Balmond's designs, an understanding of his collaborative flair in specific with Koolhaas and his support system through Arup comes to the forefront. Thus, this thesis considers the time frame between 1973 (Balmond's first collaborative architectural design project with the Danish architect Knud Munk) and 2012 (current last project with Rem Koolhaas ended) (Image 9).

*"I contend that structure is architecture, because I see structures as a punctuation of space, episodic and rhythmic. These are wholly architectural concerns. I feel that I am interrogating space when I carry out a design."*⁴⁵

An evaluation of Balmonds' work across the late twentieth century reveals a quintessential form developing that becomes visible through the theoretical lens of the structural engineer. His treatment of the process of architectural design is pivoted on the professional collaborations he has built over these four decades. The relationships generate a platform for an architectural tango with a strong emphasis on the interdisciplinary partnering through the design process. Analyzing Balmond's buildings during the specified timeframe, the point of departure for the thesis is the conceptual rigor, '*structure is architecture*' and the analysis considers a new reading of these collaborative works of architecture.

A crucial argument in the thesis lies in the dual, inward and outward look at the ideas of movement from chaos to order or from order to chaos. "'Order' is really latent chaos-the 'fact' that may be pulled apart by the next chance, but not yet tripped up by the path taken so far."⁴⁶ By the

⁴⁵ Ibid.

⁴⁶ Cecil Balmond, *Element*, Template 11, 298.

process of dynamic viewing of immediate patterns and by the approach of ‘disruptive innovative’⁴⁷ challenge, these spatial forms and their inherent morphologies can be understood for their dynamic natures based on the applied theories. In Balmond’s work, structural systems in spatial morphology through organized patterns become the connective path for the two seemingly independent disciplines of architecture and structural engineering to merge seamlessly. From the theory of the ‘informal’, chaos becomes multiple, simultaneous states of order⁴⁸. It explores the illusion of randomness, of that which dynamically alludes itself to states of chaos and of order by looking from the inside out or the outside in.

Order←Chaos [BUILT WORK] Order→Chaos

This is an attempt to re-characterize the operative or functional criteria that evolves from the analysis of the ‘informal’ as an architectural language. This is also a new reading of the collaborative works of architecture through the lens of Balmond’s informal. The idea of the informal need not carry with it the negative inferences of being uncertain, inaccurate, or that of being without intellectual precision. Filipe Balestra, the Brazilian architect assigns positive attributes to the understanding of the informal, which he defines as ‘relaxed, anarchic, tolerant, friendly, confident, hopeful, strong, deep, and open’⁴⁹. The informal allows for sameness to be interrupted. The informal has hierarchy broken. But underlying this break away from the formal, the informal is motivated by rhythm and pattern that provides control and feedback into the creation of the form. “*Architecture is the experience of form within shape – the rhythm and patterns that organize creativity*”⁵⁰, states Balmond.

⁴⁷ Joseph L. Bower and Clayton M. Christensen, “Disruptive Technologies: Catching the Wave,” *Harvard Business Review* (January–February 1995), Pp. 43–53.

⁴⁸ Cecil Balmond et al., *Informal*, 224–225.

⁴⁹ As mentioned by Balestra through personal correspondence with Matias Echanove on April 5, 2010 noted in the working paper: Matias Echanove, “Beyond the Informal: Reconceptualizing Mumbai’s urban development”, MMG Working Paper13-13 ISSN 2192-2357.

⁵⁰ Michael Blackwood, Sanford Kwinter, Sarah Herda, Cecil Balmond, Joëlle D Schon, and Mead Hunt, *Cecil Balmond: Visionary Engineer and Architect*. (Fullscreen. ed. New York, NY: Michael Blackwood Productions, 2009).

The informal is focused on the emergent and the immediate rather than on the outcome, thus providing a release from expectations and granting freedom of exploration. The emergent idea of the informal develops from the third model of design where the idea of boundary is broken and the events (design) take on the characteristics of the informal (local, juxtaposed, and/or hybrid). A deeper analysis of the idea of structure as a conceptual rigor sheds light into structure as not being just bare aggression nor as it being a dumb skeleton, but a “*thread propelling a story,*” thus, structure becomes “*a generating path, rather than laying an unthinking grip map of columns and beams over the subdivision of space*”⁵¹, explains Balmond (Image 5).

Balmond provides a challenge to students and professionals alike through his methods and approach to architectural design. He employs the idea of future integrated collaborations between engineers and architects with his approach and his theories. Balmond’s theories and his practice display a poetic approach – a subjective understanding of concepts, an unexplainable directness knowing, and a sense of inner wisdom that articulates his designs. The concept of the ‘informal’ in architecture according to Balmond is not the idea of only being spontaneous or, even the understanding of architecture which displays temporary measures or a make-do-with kind of architecture. But, being the conjurer of a new structural expression in the built environment, Balmond helps break the barriers between the disciplines of architecture and engineering, enabling a new methodology in architectural design process. His dynamic technique of arriving at chaos through the condition of being in a mix of several states of order results in structural morphology of spatial designs that incorporates immediacy, emergence, and a non-linear interpretation.

⁵¹ Cecil Balmond et al., *Informal*, 72.

Artists most often pride themselves on being unconventional. Balmond, being an artistic creator and influencer of spaces, sees himself as being unconventional through his approach, though he is critiqued for it as well. Jonathan Glancey writes that Balmond “*subverts convention partly for the sake of it*”⁵². Though that may partly be the case, Jonathan Glancey also praises Balmond as the “*high priest of structural design*”⁵³, alluding to Balmond’s approach to be nearly a form of religious ritual of sorts. Balmond’s designs do not confine its boundaries within the dogmas of modernism, nor does it shout out its tenets by just existing willfully or in purportedly witty forms as was commonly seen with post-modern building designs, but does so in a manner that owns its beauty. Balmond’s works inspire an understanding of the quality of the time and space captured within each of his designs through the complex associations that are formed across teams, cultures, and construction techniques. Over the course of history of mankind, the nomadic life has been associated with that of tensile natures of construction with their tents and teepees, whereas the settlers were associated with a compressive nature of forces in their construction with the building with bricks, stones, mortar etc. Architectural and structural engineering history exhibits breakthroughs that have occurred which have subsequently allowed for the dissolving of limitations and constraints in the act of building and enabled new methods. Here with Balmond, there is a new perspective and a visionary milestone reached through his collaborations that add to the dissolving of formal, hierarchical limitations with the qualities of the ‘informal’ and through ‘structure as conceptual rigor’.

The central focus of Balmond’s theoretical approach is in the changing language of architectural design, from rigid formalism to the new informal approach derived from structural compositions and interventions forming the conceptual rigor (Image 5). Balmond’s theories,

⁵² Cecil Balmond, Michael Juul Holm, Kjeld Kjeldsen, Louisiana. *Cecil Balmond: Frontiers of Architecture I* (Humblebæk, Denmark]: Louisiana Museum of Modern Art, 2007), 12.

⁵³ *Ibid.*

when applied to the design of an architectural space transcends many factors including typology, scale, and location. This transcendental nature extends even into the simple act of representation of designs in drawings which are articulated in a way that is exquisitely unique in comparison to that of other engineers or even architects (Image 6). Balmond's attempts rely on reaching a state of equilibrium, knowing well that at its core lies the duality of chaos and order, of balance and imbalance, of randomness and specificity intricately woven together. In so doing, he continues to be an outlier.

Balmond's longtime fascination with instability, uncertainty, a focus on the immediate, and the delicate balance between order and chaos could be associated with the patterns of his life and circumstances – the civil war first in Sri Lanka and then in Nigeria having to relocate his life twice due to wars, the tsunami that he and his family survived when it hit the coast of Sri Lanka in 2004. In this bubble, mathematics, geometry, algorithms, rules help to have more grounding. Situating himself through the chaos here can be understood as moving through several 'simultaneous states of order' translating to the ideas of the 'informal'.

STRUCTURAL RATIONALITY IN SPATIAL DESIGN: COMPLEXITY, NON-LINEARITY, AND EMERGENCE:

Form in modern architecture was primarily driven by program and function. While ideas of structure were present, and often exposed in modernist buildings, only recently has a rigorous, optimized understanding of structure contributed significantly to the generation of architectural forms. Cecil Balmond's approach is an attempt to break the existing barriers and develop an architectural language that has a conceptual rigor through structures as its foundational building block. This rigor is processed in and through the ideas of complexity, non-linearity, and

emergence. The idea of complexity is quite often intertwined in the assumption that something is incomprehensible/convoluted. Complexity in architecture is derived from the many layers in the approach to an idea and the resulting expressions in designs. In the case of Balmond's approach to the design process, this is understood as multiple meanings or interpretations, and the numerous possibilities that ideas could eventually take on. Similarly, non-linearity is the notion of the lack of growth and development of ideas and systems in a direct path, but more so as a development from multiple points of interest. Emergence is the way by which something is developed from systems that may or may not be specifically connected or directly related. This also leads emergence being due to the presence of a feedback looping mechanism in an established system. The quality of emergence grows from the factor of recognizing the inherent natures and applying rules to the systems to incur a flow of continued movement. These factors that build the structural rationale of Balmond's theoretical approach is analyzed through his built works.

“One plank of Arup's philosophy that architects liked to display structure without knowing much about it – sometimes as a substitute for understanding it. That he found vain and rhetorical”⁵⁴. “Structure defines space”⁵⁵, how? Nature – its non-linear makeup and geometries experiment with organization of structural systems. The structural engineer, Peter Rice, believed that mathematics, as a tool, could verify the use of a structural system, but not find a solution to a structural system in mathematics. Balmond however, seeks to bring engineering and architecture closer by having a voice in both through his in-depth use of mathematics, number, and geometry and his theoretical rigor. “What remains constant is the motivation to keep entering

⁵⁴ Andrew Saint, *Architect and Engineer: A Study in Sibling Rivalry*. (New Haven [Conn.]; London: Yale University Press, 2007), 376.

⁵⁵ Paulo J. S. Cruz, *Structures and architecture: proceedings of the first International Conference on Structures and Architecture, ICSA 2010, Guimarães, Portugal, 21-23 July 2010*. (Boca Raton, Fla: CRC, 2010), 2026.

that creative dialogue between architecture and engineering and the creating of new stories.”⁵⁶ Balmond starts his projects looking and feeling for the patterns that allow for organizations within a chaotic system. “...the standard picture is that the architect thinks and the engineer does”⁵⁷, not with Balmond.

Cecil Balmond’s conceptual diagrams are influential in his process development. These exquisite and self-explanatory sketches become the driving agent of the expression of his analyses (Image 6). These diagrams become the interface between the architects and the structural engineers because of the unique and rich spatial qualities that are expressed. “I do not imitate nature...” stripping away the metaphors and using simple diagrams. Balmond speaks of his inspiration from the American mathematician Robert Ammann on tessellation, in his work on the Victoria and Albert Museum with the architect Daniel Libeskind. This inspiration leads to Balmond’s probable influence also by Maurits Cornelis Escher, the Dutch graphic artist most famous for his illustration of the never-ending stairway. This inspiration on tessellation can be seen demonstrated in the works of tiling and mathematical structures of Balmond’s designs. Balmond’s research leads in way where form becomes structure; structure becomes form. Balmond’s design typologies range from different scales: Residential, Bridges, Pavilions, Libraries, Offices, Museums, and Concert/Music Hall etc.

The bulk of Balmonds’ collaborative work has been with the Dutch architect Rem Koolhaas and his firm Office for Metropolitan Architecture (OMA). The unique partnership of Balmond and Koolhaas has seen some of the best architectural works of the late twentieth and twenty-first centuries. This leads to looking closely at the Rem Koolhaas to understand the collaboration.

⁵⁶ Cecil Balmond et al., *Informal*, 227.

⁵⁷ *Ibid.*

1B. REM KOOLHAAS AND 'BIGNESS':

Rem Koolhaas (1944-) (Image 3), the famous Dutch architect was a journalist and a filmmaker before he began his career as an architect. While Koolhaas' father was a novelist and screenwriter, his maternal grandfather was an architect who designed a number of buildings in the Netherlands with a large amount of work for the Dutch airline company KLM, which included their corporate headquarters in The Hague, Netherlands and for Shell.⁵⁸ Koolhaas did his architectural education at the Architectural Association School of Architecture (AA) in London. As part of his coursework at the AA, he documented the Berlin Wall for a project (1970/71). In the process, he realized that architecture has the power of inclusion or exclusion. This brought forth in 1972, his imaginative project, 'Exodus, or the Voluntary Prisoners of Architecture' with Elia Zenghelis, Zoe Zenghelis, and Madelon Vriesendorp which became a catalyst to opening the collective architectural firm Office for Metropolitan Architecture (OMA) in 1975.⁵⁹ Although Koolhaas founded the OMA in 1975, he did not have significant success with being able to build many of projects.

In the early years of his career, Koolhaas became both, an architect who writes and a writer who designs. The first ten years of his career, Koolhaas had limited built work and was known more as a theorist than as an architect. As a theorist during his early architectural career stage, he put forth his theories on urbanism, junk-space, bigness, etc. with an understanding of and influence by the Situationists, Russian Constructivism, Chaos theory, etc. Koolhaas' approach to

⁵⁸ Charlie Rose, "Rem Koolhaas: The reason I became an architect (Jan. 14, 2016) | Charlie Rose," YouTube, January 14, 2016, accessed June, 04, 2017, <https://www.youtube.com/watch?v=D9ICoeNDF1g>.

⁵⁹ Rem Koolhaas et al., "Rem Koolhaas, Elia Zenghelis, Madelon Vriesendorp, Zoe Zenghelis. Exodus, or the Voluntary Prisoners of Architecture: The Strip (Aerial Perspective). 1972 | MoMA," *The Museum of Modern Art*, accessed March 01, 2017, <https://www.moma.org/collection/works/104692>.

design also deliberately permits for unpredictable moments to occur, this again, could be linked to the ideas of chaos, immediacy, and feedback loops. Koolhaas was influenced by Constructivism and Kazimir Malevich and through his interaction with the Dutch artist Constant Nieuwenhuys whom he interviewed in 1966 for the *Haagse Post*. Nieuwenhuys was originally a painter who later became a member of the Situationists. For the Situationists, criticizing urbanism was key to criticizing life in general. It is perhaps from there that Koolhaas focused his energies on the criticisms of urbanism, and in turn of life. Koolhaas imitates Nieuwenhuys by creating innovative public spaces in the city. This attempt to create innovative spaces in urban settings, is how most of Koolhaas' work can be seen as, as he continues to experiment on the ideas of the *"Social Condenser: a machine to generate and intensify desirable forms of human intercourse."*⁶⁰ Although this thesis primarily is concerned with an examination of the role of Cecil Balmond as an inventive structural engineer and his conceptual approach to design, this development is framed particularly within his collaborative works with Koolhaas. That being the case, this thesis also considers in depth the effects of this collaboration on Koolhaas towards transforming himself into becoming an architect who 'builds', particularly through his collaboration with the structural engineer Cecil Balmond whom he met in the mid-1980s.

Balmond says, *"Rem is also a person who takes programmatic concerns to the ultimate. He ensures that each building has a programmatic drive. And we come together to make forms out of those drives, and then I and then [we] invent back interventions in the program again."*⁶¹

Some of the aspects that Koolhaas' designs focus on are the program and circulation and the tools he uses in creating designs involve diagrams, models, and conceptual ideas or theories

⁶⁰ Rem Koolhaas, *Delirious New York* (1978; New York: Monacelli Press, 1994), 152.

⁶¹ Markus Heidingsfelder et al., *Rem Koolhaas: A Kind of Architect*.

like Manhattanism, Bigness, Junkspace, Generic Plan, etc. of which ‘Bigness’ as a construct is used in the analysis of his work with Balmond. These concepts along with his numerous projects are arranged according to the size of the project and was published as his tome titled *S, M, L, XL* (Image 8) in 1995. Given his background as a writer and film-maker, Koolhaas considers that “*scriptwriting and architecture are very close,*” “*...because for both, you have to consider a plot and different episodes...*”⁶² and that “*...books, movies, places can be inaccessible, but architecture is not inaccessible.*”⁶³

Scholarship shows the analysis of Koolhaas’ work and his theories of Junk Space, Delirious New York etc. for urban analysis. This thesis considers ‘Bigness’ as a theoretical construct to analyze his collaborative work with Cecil Balmond in displaying this trajectory of ideas. ‘Bigness’ and the ‘informal’ are theoretical considerations in understanding the built spaces. These theoretical frameworks in light of his collaboration with Balmond become significant from some of their earliest works together but definitely through the critical case studies that this thesis focuses on.

BIGNESS:

*“Beyond a certain scale, architecture acquires the properties of ‘Bigness’. The best reason to broach bigness is the one given by climbers of Mount Everest: “because it is there.” bigness is the ultimate architecture”*⁶⁴ and that “*Beyond a certain critical mass, a building becomes a ‘Big Building’. Such a mass can no longer be controlled by a single architectural gesture, or even by any combination of architectural gestures.*”⁶⁵

⁶² Ibid.

⁶³ Ibid.

⁶⁴ Rem Koolhaas and Bruce Mau, *S, M, L, XL* (New York: Monacelli Press, 1998). 495.

⁶⁵ John Rajchman, “Thinking Big-Dutch Architect-Rem Koolhaas- Interview,” *Artforum*, December 1994.

As much as the buildings in question are designed by Koolhaas and his team at OMA, it is significant to note the role of the engineer in providing more than just pragmatic engineering solutions, rather providing spatial resolutions through structural compositions and conceptual rigor to shape the space. This critical nature in the working of architects and engineers together is brought about early on in the project by Balmond and Koolhaas with almost equal power dynamics between them in the creation of the product.⁶⁶

“But in spite of its dumb name, Bigness is a theoretical domain at this fin de siècle: in a landscape of disarray, disassembly, disassociation, disclamation, the attraction of Bigness is its potential to reconstruct the Whole, resurrect the Real, reinvent the collective, reclaim maximum possibility.”⁶⁷

Koolhaas continues, *“Only through Bigness can architecture dissociate itself from the exhausted artistic/ideological movements of modernism and formalism to regain its instrumentality as a vehicle of modernization.”⁶⁸* With a similarity in thought, as seen with Balmond, Koolhaas is also at the cusp of wanting to break away from the formal notions and ideologies of architectural making at that point in time and to develop virtually a new paradigm in architecture. Bigness according to Koolhaas destroys – destroys all preconceived ideas of organizing space. But with the destruction of ideology, Koolhaas believes that it reassembles what it breaks for a new beginning. Despite and more so through its rigidities, Koolhaas predicts that Bigness *“is the one architecture that engineers the unpredictable.”* By symbiotically organizing both independence and interdependence within a larger entity without conceding specificity, but rather intensifying it, *“...only Bigness can sustain promiscuous proliferation of events in a single container.”⁶⁹*

⁶⁶ Rem Koolhaas and Véronique Patteeuw, *Considering Rem Koolhaas and the Office for Metropolitan Architecture: what is OMA* (Rotterdam: NAI Publishers, 2003), 88.

⁶⁷ Rem Koolhaas and Bruce Mau, *S, M, L, XL*, 510.

⁶⁸ Ibid.

⁶⁹ Ibid.

“...Bigness returns to a model of programmatic alchemy.”⁷⁰

“Of all the possible categories, Bigness does not seem to deserve a manifesto; discredited as an intellectual problem, it is apparently on its way to extinction – like the dinosaur- through clumsiness, slowness, inflexibility, difficulty. But in fact, only Bigness instigates the regime of complexity that mobilizes the full intelligence of architecture and its related fields.”⁷¹ And thus, Bigness allowed for vastly richer program according to Koolhaas. “Bigness is where architecture becomes both most and least architectural; most, because of its enormity of the object; least, through the loss of autonomy – it becomes an instrument of other forces, it depends.”⁷² “Bigness is impersonal; the architect is no longer condemned to stardom.”⁷³ The approach that Koolhaas takes to the designs incorporated in this thesis, in the context of collaboration, it is evident that the priority of the project is always the use of space or the experience of space by the user or consumer, and reduces the emphasis of the design on aesthetics, style. In the words of people in the OMA office, “it is a question of program and utilization.”⁷⁴

With the background of these individuals and their theoretical frameworks, this thesis further examines the collaborative nature and displays through this integrated effort a loss of autonomy to the star-status of the architect, as is commonly perceived, while symbiotically being co-dependent on other forces, such as the structural interventions and compositions through the conceptual rigor of the structural engineer Balmond.

⁷⁰ Ibid., 512.

⁷¹ Ibid.

⁷² Ibid., 513.

⁷³ Ibid.

⁷⁴ Rem Koolhaas and Véronique Patteeuw, *Considering Rem Koolhaas and the Office for Metropolitan Architecture: what is OMA*, 57.



Image 4: Balmond's sketches conceptually representing his projects, (Source: Cecil Balmond et al., *Cecil Balmond = Seshiru Barumondo*. Tokyo: A + U, 2006, Cover Page.)

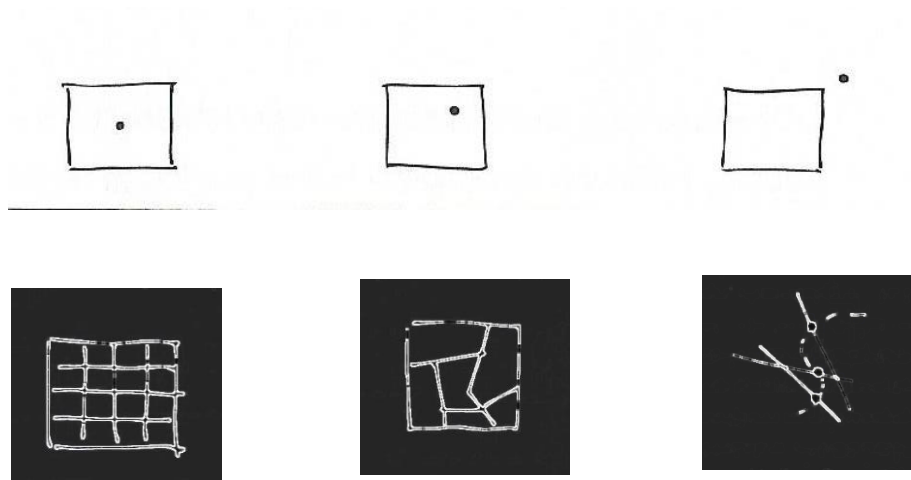


Image 5: Balmond's concept diagrams: Three models of design: Classical, Deconstructive, Informal, Above: Location of center in comparison to boundary; Below: Organization of elements (Source: Above: Cecil Balmond, *Element*, 314; Below: Promotion brochure, Balmond Studio)



Image 6: Balmond's concept diagrams: Local, Juxtaposition, Hybrid (Source: Cecil Balmond et al., *Informal*, 117)

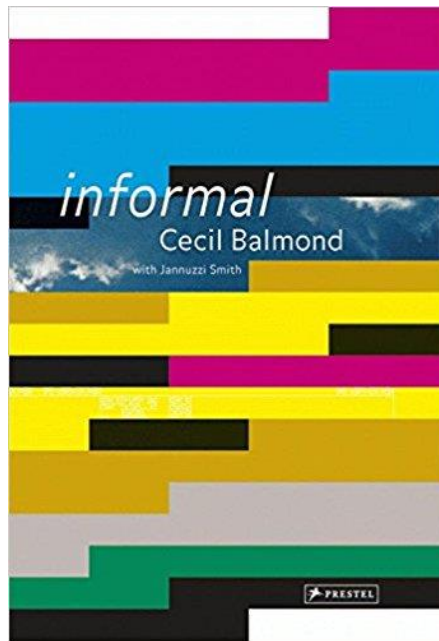


Image 7: Cover of Cecil Balmond's book 'Informal' (Source: Cecil Balmond et al., Informal, Cover)

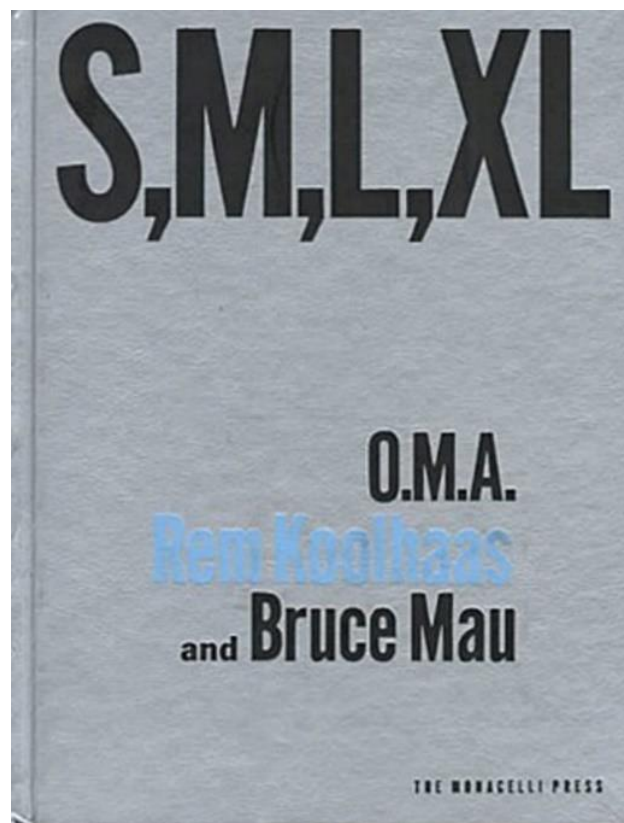


Image 8: Cover of Rem Koolhaas' book 'S, M, L, XL' (Source: Rem Koolhaas et al., S, M, L, XL, Cover)

CHAPTER 2: PROCESS: COLLABORATION

*"Architecture is the experience of form within shape – the rhythm and patterns that organize creativity. Everything we do is underlined by a rigor even if it appears informal; and, not unlike music, it is given a life, a beat with the rhythms created by not only patterns but folds and branches that we study. These are solids that explore the void from zero to infinity."*⁷⁵ ~ Cecil Balmond

*"He was patient with our unreasonable demands, and sometimes took our amateurism seriously. Our growing intimacy with each other's disciplines – in fact, a mutual invasion of territory – and the corresponding blurring of specific professional identities (not always painless) allowed us, at the end of the eighties – when to our consternation, Bigness emerged like a sudden iceberg from the mist of deconstructivist discourse...to explore the redesign and demystification of architecture, this time experimenting on ourselves."*⁷⁶ ~ Rem Koolhaas

Process: Collaboration, helps significantly in shaping this thesis. This chapter examines how the collaboration between Balmond and Koolhaas is specifically unique. This uniqueness is evaluated through the framework of 'Structure is architecture', based on the theory of the 'informal', and with the idea 'bigness'. To understand Balmond's work with Koolhaas, the thesis first evaluated his body of work to develop a clearer understanding. Below is list of works by Balmond in the past few decades which shows the many projects on which he has collaborated on with other architects. The following list provides an overview of the design works in which Balmond has had a leading contributory and noteworthy role toward the concept and design of the project, and in shaping the architectural space.

The timeline lists Balmond's selected early collaborative 'architectural' works that set the stage for many other projects to follow, but primarily records the collaborative projects with Rem Koolhaas/OMA.

⁷⁵ Michael Blackwood et al., *Cecil Balmond: Visionary Engineer and Architect*.

⁷⁶ Rem Koolhaas, *S, M, L, XL*, 666-667.

2A. TIMELINE OF CECIL BALMOND'S COLLABORATIONS:

1970: First architectural project for Balmond⁷⁷: The Carlsberg Brewery (1973)⁷⁸ with Knud Munk.

1975: University of Qatar Phase 1 (1984) with Kamal Kafrawi.

1978: Worked on The Stuttgart Staatsgalerie (1984) with James Sterling: This project and collaboration was unique since Balmond “*took on issues that were wholly architectural..., arguing for spatial qualities from an architectural point of view,*”⁷⁹ at the same time validating his position using his structural expertise.

1986: Balmond was first introduced to Rem Koolhaas, and began his long collaboration.

1988: Hague City Hall: First competition win with Rem Koolhaas/OMA; Project was given to another architect by the City of Hague.

1988: Kunsthal: First significant built work with Rem Koolhaas/OMA (1994)

1989: Congrexpo, Lille, France (1994), Rem Koolhaas/OMA

Zeebrugge Ferry Terminal, Zeebrugge: Competition project with Rem Koolhaas/OMA

1990: Agadir Convention Centre: Competition project with Rem Koolhaas/OMA

1993: Bibliotheque de Jussieu, Paris, Competition with Rem Koolhaas/OMA

1998: Maison, Bordeaux, France (1998), Rem Koolhaas/OMA

IIT Student Center, Chicago, USA (2003), Rem Koolhaas/OMA

1999: Seattle Public Library, Seattle, USA (2004), Rem Koolhaas/OMA

Casa Da Musica, Porto, Portugal (2005), Rem Koolhaas/OMA

2000: Prada, Los Angeles, California, USA (2002), Rem Koolhaas/OMA

2003: China Central Television Headquarters (CCTV), China (2012), Rem Koolhaas/OMA

2006: Serpentine Gallery Pavilion, London, UK, (2006) Rem Koolhaas

⁷⁷ Before this, Balmond as a structural engineer worked on infrastructure constructional projects in the Middle East and in North Africa.

⁷⁸ Year completed marked within parenthesis.

⁷⁹ Guy Nordenson et al., *Seven Structural Engineers: The Felix Candela Lectures*, 52.



TIMELINE AND COLLABORATIONS (contd.)

Image 9: Balmond's collaborations with Koolhaas and other architects, B. Joy (Source of individual images: www.oma.eu, balmondstudio.com)

2B. COLLABORATIVE MORPHOLOGICAL EXPLORATIONS: CECIL BALMOND AND REM KOOLHAAS.

*“Cecil has changed my outlook on structure and enabled me to rethink architecture.”*⁸⁰

~Rem Koolhaas quoted in *The Guardian*.

*“It is Rem’s eye and his vision, and my vision and my eye, about space.”*⁸¹

~Balmond, interview, *Yale School of Architecture magazine*

Historically, engineers and architects have had a long-standing collaboration in bringing built works to fruition, then why is this collaboration uniquely important or different? What makes the joint work of Koolhaas and Balmond any different from other engineer-architect collaborative works? Notably, since the legacy of collaboration already exists within the setting of Arup, why does Balmond’s work with Koolhaas call for such a detailed and in-depth inquiry? This thesis argues that Balmond’s contribution is fundamentally different from other engineers given his strong conceptual rigor, theoretical framework, and the new models of design approach that he injects into the design (Image 9). This brings about the changing nature of both the process of design as well as the product of the design, blurring the lines and simultaneously building bridges between the two distinct disciplines of architecture and structural engineering. The acknowledgments and credits Balmond has received from his collaborators speak volumes to his contribution. Balmond finds himself being a catalyst as he contests conventional norms and thus carves out new paths through which architectural designs are created. He finds that most often inspired collaborators to respond positively and innovatively to experimentation. This changes the antiquated notion that architecture is only the vision and the genius of the hero, the architect.

⁸⁰ Jonathan Glancey, "Jonathan Glancey on radical architect Cecil Balmond," *The Guardian*, July 23, 2007.

⁸¹ Nina Rappaport, "Constructs Fall 2002." Yale Architecture. Accessed October 07, 2016. <https://www.architecture.yale.edu/publications/35-constructs-fall-2002>.

In the closing keynote address of the 2016 American Institute of Architects (AIA) annual convention, Koolhaas conveys to Mohsen Mostafavi, Dean of the Harvard Graduate School of Design that architectural design today does not rely only on its architects – a strong sentiment echoing the collaboration explored in this thesis. He states, *“I really hate this demeaning of architecture as an icon... Because of the reading of architecture as icons, there’s a really unfortunate way that contributions of other partnerships and other forms of knowledge are ignored. The best work is half engineering and half architecture and therefore completely dependent on the contribution of engineers.”*⁸²

In the mid-1980’s (~1985-86), in his early career stage, Koolhaas initially met Balmond after hearing about his work. When they began to collaborate, they first worked on a competition project. To Cecil this process of going through The Hague project that they won, but could not build, and then subsequent projects that they worked together on (refer page 40 and Image 9), was a means to better define the journey – one where both Koolhaas and Balmond were discovering, in a way, how to ‘be’ architects. Koolhaas believes in the idea of ‘collective intelligence’ which alludes to the idea where one does not know where (or, with whom) one idea begins and where one stops. The idea of teamwork is central in Rotterdam, perhaps because as a country they have been working collectively and innovatively toward thriving in a geographical region that is fighting against natural destructive forces. Koolhaas’ office is also set up in such a way that interdisciplinary working is very common – architects, graphic designers, writers, editors, etc. Similarly, Balmond’s current firm (Balmond Studio) in London, UK and Colombo, Sri Lanka and another in the works⁸³ carry on the ideal from his Arup days of collaborative ethics. This, when

⁸² Diana Budds, "Rem Koolhaas: "Architecture Has A Serious Problem Today"," Co. Design, August 03, 2016, accessed September 16, 2017, <https://www.fastcodesign.com/3060135/rem-koolhaas-architecture-has-a-serious-problem-today>.

⁸³ Gathered by author from an interview with James Balmond, Cecil Balmond’s son, at the Balmond Studio’s Colombo office, Sri Lanka.

dissected again, is one expression of the principles of non-linearity, emergence, and complexity, seen even in the organizational patterns of the firms. ‘Informal’, as an approach is also expressed in the text of his book by the same title (Image 7).

“[We] make ‘opportunism’ work...our teams got to know each other. We work as a collective, almost.”⁸⁴ ~ Cecil Balmond, about his work with Koolhaas.

“It’s Mies, Corb, Wright. Those three grabbed the century and by 1960, the imprimatur on intellectual rights on design was wholly appropriated by the architectural establishment. And of course, it was a self-serving thing...perpetuating this myth of the architect: the god the hero. But technology was changing.”⁸⁵

Balmond’s and Koolhaas’ collaboration is unique. Along with Koolhaas’ architectural vision, the joint projects are actively and shaped early on by Balmond’s creative evolving ideas – grounded firmly with his conceptual rigor. The roles played by Balmond and Koolhaas are based on a partnership vision that in turn shapes their collaborative architectural works. The architect and the engineer work as symbiotic entities through the design process from the early conceptual stage of the design, which is a rather relatively new model of collaboration, especially in the interdisciplinary realm of architecture and structural engineering. Thus, the spatial design is clarified not only through the inputs of the architectural team, but is also actively shaped by the structural interventions and assertions made through the qualitative inputs by the engineer. Rem’s Koolhaas’ initial built works were informed, and in part, made possible by Cecil’s Balmond’s approach⁸⁶ to designing spaces with the strong background in Arup. This research exhibits Koolhaas strengthening his ideas of ‘bigness as a manifesto’, released in 1995 in his 1396-

⁸⁴ Markus Heidingsfelder et al., *Rem Koolhaas: A Kind of Architect*.

⁸⁵ Special issue: Co-productions (special issue on the relationship between architects and engineers – includes: Interview with Cecil Balmond, engineer, article by Philip Nobel), *l’Architecture d’Aujourd’hui* no.329 July/August 2000, 48.

⁸⁶ Markus Heidingsfelder et al., *Rem Koolhaas: A Kind of Architect*.

page tome, *S, M, L, XL* (Image 8). Koolhaas' manifesto, with the help of Balmond, was able to be realized as constructed/built work. Here the knowledge and craft in the built works bridge the gap between architecture, engineering, and theoretical dialogue. In this case, 'informal' and 'bigness' serve as 'knowledge' and the collaboration reveals the 'craft'.

Koolhaas and his firm OMA are famous for their diagrammatic representations in project analyses (Image 53). Diagramming as a tool to visualize complex relations has benefited Koolhaas. This works as a common platform or a language through which he communicates his ideas. Further, through the collaboration, the idea of architectural sketches and spatial diagrams (Images 35 and 36) become in a sense one of the languages for communication between the architect in Koolhaas and the engineer in Balmond. Though architectural sketches are not uncommon to an architect, engineering drawings most often than not, focus on the rational, calculable, mathematical expressions. This unique feature that Balmond uses brings a complementary facet to the design at the brainstorming table. The engineer being at the conceptual design table is in itself a drastic change to the uniqueness of this collaboration. Diagrams (Images 28, 35, and 36), especially, those that speak to the quality of space and not only to the quantitative, mathematical solution of the design, are what keep Balmond's approach to the collaborative design with Rem Koolhaas innovative. Along with this is the deep research and involvement in understanding the specific vocabulary of patterning (Image 9). Beyond these, Balmond and Koolhaas came up with a strategy which they used from early on in their designs with a strapline that they called "*Stupid, but smart.*"⁸⁷ In using 'opportunism' to their advantage in projects, the duo works out ideas which may seem stupid but work in a smart way for the particular situation. Examining Balmond's sketches (Image 10) as a language/tool of

⁸⁷ Balmond Studio, "Cecil Balmond Hans-Ulrich Obrist interview 4 of 7.avi," YouTube, December 09, 2010, accessed August 02, 2017, <https://www.youtube.com/watch?v=kf4rCmX4ZqQ&t=1s>.

communication in comparison to architectural sketches and in particular to Koolhaas', shows the engineer's mind that responds to architecture from beyond the accepted ideas of a structural engineer's mathematical and quantitative productions.

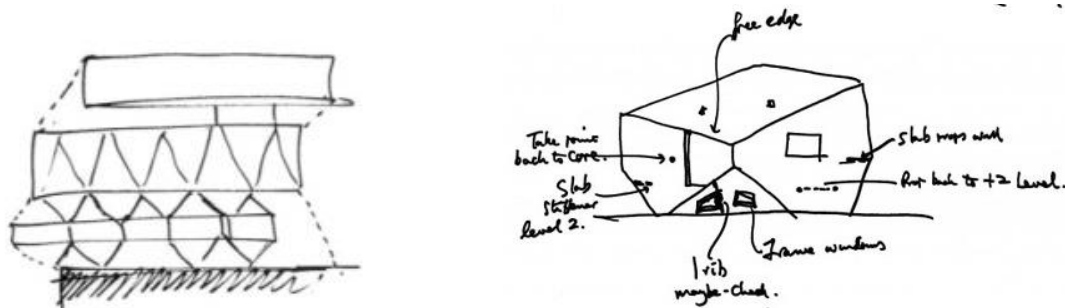


Image 10: Balmond's sketches (Source: Cecil Balmond et al., *Cecil Balmond = Seshiru Barumondo*. Tokyo: A + U, 2006, 264, 268)

Balmond's design vocabulary is specific in expressing his theoretical framing and his conceptual rigor (Image 11). From that vocabulary, a dynamic view is drawn through a simultaneous analysis, looking inward and outward, to the perceptions of 'order and chaos' that is grounded in the theory of the "Informal". These approaches question how the structural engineer in Balmond theorizes his work, and ultimately engages with them in practice. Koolhaas describes Balmond's structures as articulating "*doubt, arbitrariness, mystery, and even mysticism*", "*instead of solidity and certainty.*"⁸⁸ Balmond's work can be interpreted as a process of "disruptive innovation,"⁸⁹ a concept that was introduced in business management by Clayton M. Christensen and co-researchers in 1995. Disruptive innovation is a process where a new market is evolved just by a disruptive action/change to the existing market. Balmond's approach to design brings a sense of innovative disruptiveness to the conceptual design table along with his structural

⁸⁸ Deyan Sudjic, "Architecture: Cecil Balmond on the unsung talents of engineers," *The Observer*, October 26, 2002, accessed July 20, 2017, <https://www.theguardian.com/books/2002/oct/27/arts>.

⁸⁹ Joseph L. Bower and Clayton M. Christensen, "Disruptive Technologies: Catching the Wave," *Harvard Business Review* (January–February 1995), 43–53.

expertise (Image 11). This strengthens his collaborative work with other architects and justifies the persistent chase after a poetic spatial design through structurally intervening opportunities through the ‘*Informal*’ approach to architecture. In considering the many collaborative works, it is evident that his works vary in scale, geographic location, and typology. Art installations (Marysas), residential designs (Bordeaux Maison), bridges (Weave Bridge), pavilions (Serpentine Gallery pavilions with Rem Koolhaas, Toyo Ito, etc.), libraries (Seattle Public Library(SPL)), student centers (McCormick Tribune Campus Center (MTCC)), Museum (Kunsthal), Music Hall (Casa da Musica), and the office tower (China Central Television Headquarters (CCTV)) are some of the many Balmond contributions to design (Image 9). The ‘*informal*’ is Balmond’s way of understanding, seeing, and doing. This has helped his collaborative approach with Koolhaas, who himself is a spatially innovative architect. Even though collaborations between structural engineers and architects have been going on historically for long, Balmond’s approach and presence in the projects vary the outcome drastically and from early on in the design process. Balmond’s idea of structure⁹⁰:

STRUCTURE = 1. CONFIGURATION 2. FORM
CONFIGURATION = Metaphor + Network + System
FORM = System + Proportion + Network
METAPHOR = Compositional Field + Pattern
NETWORK = Pattern + Connectivity
SYSTEM = Connectivity + Geometry
PROPORTION = Geometry + Material

Image 11: Table showing Balmond’s idea of structure (Source: Modified from Cecil Balmond et al., *Informal*, 384)

⁹⁰ Reproduced with aesthetic modification from: Cecil Balmond et al., *Informal*, 384.

Cecil Balmond's 'Informal' involves a breaking away from the Cartesian logic because of its basis on theoretical ideas of 'opportunism' and 'immediacy', expressed through structural interventions through the principles of complexity, nonlinearity, and emergence. Balmond in his interview with Artforum states, "*I was uneasy with this thinking, which seemed to be a consequence of modernism and its stripped-down measures.*"⁹¹ His 'Informal' is a way to architectural form generation that is based on the new approaches to form, a new Avant-Gardism in morphological-spatial generation, an architecture that was "fluid, improvisational, relative."⁹²

*"Architects started to work with me because they saw I was attempting to shift the boundaries of architecture-literally. Structure was no longer a constraint, and architects found that very liberating. We could just talk about form and space, rhythm and texture."*⁹³

~Cecil Balmond's interview with Artforum International

"*In the 'Informal' compiling an interval is better than spacing the gap,*"⁹⁴ which Balmond explains is the notion of having to develop an inner logic to a design which enables a rigorous compilation over figuring out what gaps should be between elements. This method of unraveling space, though on the surface looks prosaic, provides a poetic viewing and experience of the space with an added a component of understanding a space within an understanding of time as well. Accordingly, the understanding of designed space which in traditional, linear models of design is defined by the architect, and the structural elements, which are in general, defined by the structural engineer, so to speak, have a cohesive response from both individuals when in collaboration with Balmond. Balmond's informal approach "*considers space rich but unknown,*

⁹¹ Julian Rose, (2014, 10). Code breaker. *Artforum International.*, 53, 245-246.

⁹² *Ibid.*, 248.

⁹³ *Ibid.*, 253.

⁹⁴ Cecil Balmond et al., *Informal*, 122.

one point or 'puncture' requiring a storyline to unfold,"⁹⁵ where interpretation, experimentation, and discovering patterns become natural.

Nature, to Balmond, is a "*pattern maker of infinite skill. The simple and the complex inform each other in a collective exchange where their hierarchies are lost in an ultimate loop. Nature is also information, its algorithms a combination of iteration and a tendency for coherence.*"⁹⁶ The patterns extracted from nature become the foundational building blocks in the structural composition of spatial design and as mediators between metaphor and reality.⁹⁷ This helps better understand Balmond's concept of the 'informal' and helps analyze the premise, process, and products that encompass this idea. Through the 'informal', Balmond's focus is on the immediate, the emergent, and on the shaping of his process. Balmond goes against the grain while making decisions about the structural aspects of a design when he talks about "*how not necessarily to take the structural training and traditions at face value but to work something out on first principles.*"⁹⁸ These first principles both of mathematics and philosophy, which are foundational propositions, help in Balmond's development of conceptual rigor. This continues in all of Balmond's works. Sarah Herda, curator of the exhibition of Cecil Balmond's work at the Graham Foundation Gallery, Chicago remarks that structure works as a "creative act" in Balmond's creative explorations.⁹⁹

⁹⁵ Cecil Balmond and Nobuyuki Yoshida, *Cecil Balmond = Seshiru Barumondo* (Tokyo: A U Publishing Co., 2006), 132.

⁹⁶ Vesna Robert, "Perception of Order and Ambiguity in Leonardo's Design Concepts." *Nexus Network Journal* 10, (no. 1, 2008), 106.

⁹⁷ Guy Nordenson et al., *Seven Structural Engineers: The Felix Candela Lectures*,

⁹⁸ *Ibid.*, 53.

⁹⁹ Michael Blackwood et al., *Cecil Balmond: Visionary Engineer and Architect*.

Architecture for Balmond is experiencing the “*form within shape – the rhythm and patterns that organize creativity*”¹⁰⁰ (Image 10). And in the case of Rem Koolhaas, architecture is the coming together of complexity and shape.¹⁰¹ Over the years, Balmond’s approach to exploring spatial designs with Koolhaas uses minimum structure initially which is then propped or further reinforced as “remedial action” through other structural interventions only when the element “gets in trouble”. This approach “*is an ad-hoc procedure that is not smoothly ironed out but that we feel gives a great dynamic to the space.*”¹⁰² Similarly, Koolhaas likes to work on ideas which supposedly seem simple but later through their use or with reexamination, exhibit deeper complexities.¹⁰³ This idea runs in parallel to Balmond’s ways of defining space and thus complement their work together. Balmond notices that other architects would perhaps not take too easily to these attitudes and where they perceive what he does to be “meddling.” However, Koolhaas “*has always understood that form and structure aren’t separate concerns.*”¹⁰⁴

From their early projects, this attitude of experimentation has been the way. Balmond reminisces about one of his initial meetings with Koolhaas for a competition project for a bank which they eventually lost, “*This is a bank. There’s never been a bank like this. We’re not going to win this one.*”¹⁰⁵ Balmond recalls that at that point in time, Koolhaas design was “in a more traditional sense.”¹⁰⁶ Their nascent collaboration may have been unsteady as Koolhaas approached Balmond with the project as an architect would approach an engineer – as a

¹⁰⁰ Ibid.

¹⁰¹ Markus Heidingsfelder et al., *Rem Koolhaas: A Kind of Architect*.

¹⁰² Guy Nordenson et al., *Seven Structural Engineers: The Felix Candela Lectures*, 54.

¹⁰³ Markus Heidingsfelder et al., *Rem Koolhaas: A Kind of Architect*.

¹⁰⁴ Daniel Zalewski, "Architecture After the Skyscraper," *The New Yorker*, July 06, 2017, accessed October 24, 2017, <https://www.newyorker.com/magazine/2005/03/14/intelligent-design>.

¹⁰⁵ Special issue: Co-productions (Interview with Cecil Balmond by Philip Nobel) in *l'Architecture d' Aujourd'hui* no.329 July/August 2000, 48.

¹⁰⁶ Ibid.

supporting cast in the design process, not in playing main roles. However, the volume and quality of works in the decades beyond those years are far from traditional and express Balmond's pivotal role in the design process, as the architect and structural engineer share the stage. In the Kunsthal project, there is a deliberate disruption of the Cartesian grid causing an interruption to the monotony and letting the space entertain.¹⁰⁷ *"A considered unique path of structure is often more valid than the unquestioned assumption of a distributed solution, subdivided equally through a cross-section or a plan,"*¹⁰⁸ suggests Balmond. This attitude varies from other collaborative processes, mainly because the structural engineer in Balmond is not approaching the project at hand from plans and sections as many engineers do (Image 10), in figuring out how structural systems fit into an already designed building. In Balmond's case, the design process, like that of an architect, begins with (almost) a blank piece of paper or a word that Koolhaas mentions over a phone conversation when a new project comes up.¹⁰⁹

*"Arup thought it misguided pedantry on the part of modernist architects to insist on expressing the means of the structure. But he also accepted that the further a structure departs from logic and economy, the less reasonable, objective, and truly dialectical becomes the relationship between architecture and engineer."*¹¹⁰ In reference to this, Balmond shares his thoughts on the crossovers between the architecture and engineering disciplines in his interview with Philip Nobel in 2000 saying, *"I thought we should intellectualize this [engineering] profession, bring it right up so it's not some kind of subservient field...I started challenging the architectural premise about space. I found the abstractions I offered gave insights into form and*

¹⁰⁷ Cecil Balmond et al., *Informal*, 62.

¹⁰⁸ Ibid.

¹⁰⁹ Markus Heidingsfelder et al., *Rem Koolhaas: A Kind of Architect*.

¹¹⁰ Andrew Saint, *Architect and Engineer: A Study in Sibling Rivalry*, 128.

organization.”¹¹¹ This interdisciplinary relationship that he has meticulously crafted with Koolhaas, focuses specifically on his role as an ideal mediator between the disciplines by his theoretical approach, spatial sensibilities, and his structural foundations.

The obsessions of the technical and the technological *avant-gardism* were seen in the hi-tech designs of the late twentieth century. Balmond’s attitude to design separates itself from the hi-tech engineers, particularly the work of Arup (the firm), in the belief that structure need not be explicitly comprehensible. Furthermore, Balmond believes that there is “no need for structure to be recognized as a basic functional skeleton”¹¹² – designs were not about expressing structure for structure’s sake. This leads to looking at designs as assembling a puzzle instead of only interpreting the structure exhibiting his ideas of ‘structure is architecture rigor’ does not become a “naked aggression nor is it a dumb skeleton.”¹¹³ The virtue of the informal is that of not being obvious or being a statement structure. The formal approach to understanding architecture defines simple lines as, ‘the edges of and gives shape to planes,’¹¹⁴ Balmond rethinks even the idea of the simple line, ideating it to be dynamic as ‘a traveling point.’ Such notions of design stimulate the process and animate the spatial design ‘informally’. Some other cohesions between Balmond and Koolhaas sets them apart. Balmond’s and Koolhaas’ distinct cultural (European-Asian) identities also conceivably influenced their interactions and approaches to collaborative work, informing their thought on spatial design, organization patterns, and structural compositions in design projects. Viewing architecture from the perspective of the engineer, Balmond becomes the harbinger of a new collaborative alliance between architecture, structures, and art. Like the

¹¹¹ Special issue: Co-productions (Interview with Cecil Balmond by Philip Nobel) in *l’Architecture d’Aujourd’hui* no.329 July/August 2000, 48.

¹¹² Cecil Balmond et al., *Informal*, 64.

¹¹³ *Ibid.*, 72.

¹¹⁴ Francis D. K. Ching, *Architecture: form, space, & order* (New York: John Wiley, 2007), 8.

Renaissance man, Balmond is an expert at multiple things – a mathematician, a musician, structural engineer, designer, author, educator, to name a few.

In his monumental publication *S, M, L, XL*, Koolhaas refers to the intervention of events¹¹⁵ in decision making. The meeting with Balmond and collaborative work with him can be viewed as one such decisive event, drastically changing Koolhaas' career path from being a theorist and possibly being known as a 'paper architect' then, but whose "architecture has today become the most debated and influential in the world"¹¹⁶ (Image 9). The significant outcome to be noted from the collaborative relationship between Balmond and Koolhaas is that of the mutual inspiration and influence they have been to each other's professional abilities – as designers, creators, radical thinkers, authors, and educators. Their collaboration has contributed to Koolhaas facilitating Balmond in evolving into an engineer-designer-theorist-author, while Balmond has contributed to Koolhaas' spatial resolution of ideas from the particular perspective of 'structure as conceptual rigor.'

*"He is involved in the most intimate moments of the architectural processes and has spawned a generation of hybrids of engineering and architecture, where previously separate identities have merged,"*¹¹⁷ ~Rem Koolhaas

Besides the collaborations with Koolhaas, Balmond has also actively been involved in projects with other architects. The following section examines briefly his other works and the inter-connected influences and dialogues as they translate from his foundational ideas of his conceptual rigor.

¹¹⁵ Rem Koolhaas and Bruce Mau, *S, M, L, XL*, 518.

¹¹⁶ Jeffrey Kipnis, 'Recent Koolhaas', *El Croquis*, no 79, 1996, quoted in, Rem Koolhaas and Véronique Patteuw, *Considering Rem Koolhaas and the Office for Metropolitan Architecture: what is OMA* (Rotterdam: NAI Publishers, 2003), 6.

¹¹⁷ Cecil Balmond et al., *Informal*, 10.

2C. CECIL BALMOND'S COLLABORATIONS WITH OTHER ARCHITECTS AND ARTISTS

"I was very fortunate that the Carlsberg Brewery in Northampton, UK was my first major project (1973). It was a seminal experience in my formative years as an engineer, as I was beginning to move toward architecture."¹¹⁸ ~Balmond

"What Cecil Balmond has done, for these distinguished and imaginative, architects among many others, is to stretch their idea of what structure, and thus architecture, might be."¹¹⁹ ~Jonathan Glancey

"Cecil Balmond is the world's leading thinker on form and structure. He's the power behind the throne."¹²⁰ ~Charles Jencks

In an interview by A+U journal, Toyo Ito talks about his collaboration with Cecil Balmond. When asked about how he thinks Balmond arrives at his structural solutions, Ito says that Balmond applies algorithms to produce rules and gives the example of the Serpentine Pavilion (Image 9) that he and Balmond worked on in 2001.¹²¹ Ito goes on to expound the difference in Balmond's particular approach and to highlight why his ways vary. Ito explains that Balmond asserts, how when people try to imagine randomness on their own they run out of ideas very quickly and instead begin to think of conventional spaces. According to Balmond, an approach based on algorithms offers greater freedom. It enables the creation of unpredictable complexity and hybrid situations. This, Ito explains is the characteristic of Balmond's approach to architecture, space, and mathematics. He adds further that Balmond's approach to design is "as a philosopher rather than as a specialist in structures."¹²² "Geometry is never mentioned in the normal course of designing a building; it is taken for granted as a system of isolated bounded

¹¹⁸ Guy Nordenson et al., *Seven Structural Engineers: The Felix Candela Lectures*, 50.

¹¹⁹ Cecil Balmond et al., *Cecil Balmond: Frontiers of Architecture I*, 4, 8.

¹²⁰ Jennifer Kabat, "The Informalist." *Wired*.

¹²¹ Cecil Balmond and Nobuyuki Yoshida, *Cecil Balmond = Seshiru Barumondo*, 172-173.

¹²² *Ibid.*

shapes.”¹²³ However, in the design of the Serpentine Gallery Pavilion with Toyo Ito in 2002, geometry becomes central to shaping the design. With varying approaches, those not limited to the strict notions of structural elements, in Balmond’s work “slabs may fold...beams bifurcate and change shape, columns can serve as beams, the ingredients are all there to evolve form in fascinating ways.” And these ideas lead to the crux that, “the challenge is to make structure the new discipline in a re-examination of space.”¹²⁴

Delving into Balmond’s philosophical approach to architectural design, the argument that Jencks makes in his book *‘Architecture of the jumping universe’* becomes relevant here. Jencks brings about the ideas of the ‘sudden jumps’ in historical narratives and in the way built spaces are created by the bounds made in technological advancements and through theories that these new designs are founded on. He refers to them as being a part of the non-linear architecture.¹²⁵ This non-linear approach to spatial form-making in Balmond’s work takes on different roles in projects through structural interventions and conceptual rigors. It also enables Balmond in the process of collaborating with architects to integrate architectural and structural compositions together in designing the project. Balmond speaks against buildings just being facades, which is what he believes new shapes and blobs in recent designs become if they are just held up by traditional columns and beams.¹²⁶ The definitions of space with ‘structure as conceptual rigor’, take on a new nature to provide meaning to the design in that, “a form does not stand alone. The form is almost a product of the content,”¹²⁷ here, structurally intervening content.

¹²³ Cecil Balmond, *Informal*, 14.

¹²⁴ *Ibid.*

¹²⁵ Charles Jencks, *The architecture of the jumping universe: a polemic: how complexity science is changing architecture and culture* (New York: Wiley, 1998), 13.

¹²⁶ *Ibid.*

¹²⁷ Ruth Baumeister and Sang Lee, *The domestic and the foreign: architecture in globalization*, 319.

Balmond's attempt in broaching the 'informal' was to break away from the reductivist, formulaic ideas of Modernism that he found himself surrounded by in the mid to late nineties. In the collaboration with Peter Kulka and Ulrich Konigs on the Chemnitz stadium in Germany, Balmond was intrigued by the concept of the project which was to have a stadium which was a non-stadium; to have trees and clouds and forest. The design took on the form of a geometry created by the overlapping movements of multiple orbits. At this point, very early in his creative collaborative years (1992), we see Balmond's nascent ideas on chaos theory, algorithms, etc. engaging with the spatial design in the creation of architecture, which was before his "algorithmic days."¹²⁸ He was convinced that that concept was going to liberate them from conventional ideas of a stadium. The Balmond believes that even what seems irrational, has structure¹²⁹ and that "structure is architecture... structure is about organization." The structural interventions in space "create episodes" by the manner in which they intersperse the space.¹³⁰ Structure is also a network – "the admittance of pattern is crucial; local, juxtaposition, hybrid are the overlaps in accepting complexity as irreducible."¹³¹

"The new humanism is to recognize the power of pattern, multilayered and catalytic, for we are a part of it. Pattern is hard-wired into our consciousness in many ways, from a simple aggregation of molecular structure to the spatial coiling within nature's landscape. When we design we strike resonance with deep buried archetypes of form."¹³²

Johnathan Glancey in his article in *The Guardian* regarding what the future of architecture holds, writes, "*It is a revolution - rich, complex, sometimes baffling, often beautiful*

¹²⁸ Canadian Centre for Architecture (CCA), "Cloud and Forest," Canadian Centre for Architecture (CCA), accessed September 15, 2017. <https://www.cca.qc.ca/en/issues/4/origins-of-the-digital/41003/cloud-and-forest>.

¹²⁹ Cecil Balmond and Nobuyuki Yoshida, *Cecil Balmond = Seshiru Barumondo*, 131.

¹³⁰ Ibid.

¹³¹ Ibid.

¹³² Ibid.

- *in the making.*"¹³³ To that end, Balmond, his conceptual rigors in architectural design, and his collaborations actively engage in realizing this revolution to the twenty-first century. Charles Jencks comments about Balmond's versatility and his dynamic approach to architecture in the forward in Balmond's book 'informal', commenting,

*"Whenever there is a revolution, or fast change in architecture, professional barriers break down as specialists exchange roles. Architects become sculptors, engineers become designers, artists turn into architects, and all these job descriptions become fuzzy. This happened in the Early Renaissance, during the building of the dome for Florence Cathedral, when Ghiberti and Brunelleschi switched professions from goldsmith to sculptor and artist to architect. It happened countless times in the 19th and 20th centuries when the avant-garde was reconstituted again and again. It happened with Eiffel and Tatlin, with Duchamp and Le Corbusier, and indeed it is one good measure of an avant-garde. If professionals do not give up their job descriptions, their trade unions, there is no avant-garde, no breaking of barriers, no radical creativity. The work of Cecil Balmond again proves this rule. Engineer, designer, architect, thinker with numbers, speculative mathematician, writer: what is he if not all these things? Why? Because he is part of the creative edge that is moving architecture. Architectural movements, as the metaphor suggests, move the boundaries of the discipline and they characteristically do this by challenging assumptions, the conceptual framework behind the profession."*¹³⁴

Cecil Balmond's collaboration with architects is reinforced by meaningfully responding to the architectural language used by the architects. Simultaneously, Balmond's informal rigor through structural interventions provides a new vision for projects. In his 1995 lecture at the AA, Balmond presented his work on the Expo Pavilion in Lisbon for Expo '98 (Image 9) which he worked on with the Portuguese architects Alvaro Siza and Eduardo Souto de Moura. Balmond comments how his initial thought was to have a lightweight structure that was a cable-net design. Then, he re-thought Alvaro Siza's design identity of concrete as a material, and decided to work to keep that as a grounding factor in his work, but adding his own twist to work the material and to engineering the design. Thus, there is no imposition of ideas for the sake of it, but integrated non-hierarchical work with the architect to render new designs. Balmond believes that formal

¹³³ Jonathan Glancey, "Jonathan Glancey on radical architect Cecil Balmond," *The Guardian*, July 23, 2007.

¹³⁴ Cecil Balmond, *Informal*, 6, 7.

hierarchy makes spaces reductive and is mostly concerned with appearance, and that the “the informal is to grow from within.”¹³⁵ Balmond striving for the creative collaboration between different architects and artists can be seen as a continuation of his inbuilt Arup training legacy. Arup’s founder Ove Arup, can be credited with preserving his organization with the strong sense of creative contributions for a holistic development from all teams working on a project - architects, engineers, etc. Over the years, in interviews that Balmond has provided to journals, he reveals his critical contributions to architectural works, though he feels some of his contributions seemed to be disregarded. However, his books and interviews in the recent past deliberate the collaborative projects with varying architects and shed light on him as a large contributor to the designs even if not an equal partnership.¹³⁶ This leads us to evaluate how Balmond’s various conceptual attributes and the collaborations manifest in the built works. The next chapter of the thesis focuses on examining three critical case studies through archival research, visiting case study buildings, interviews, published sources (Image 12), etc. How do the Kunsthal, the Seattle Public Library, and the Casa da Musica reflect Balmond’s conceptual rigor, ‘Structure is Architecture’? How do they express the theories of complexity and dynamic interventions? And, how complexity and dynamism are seen not only as a theory, but as also a physical experience in architecture.

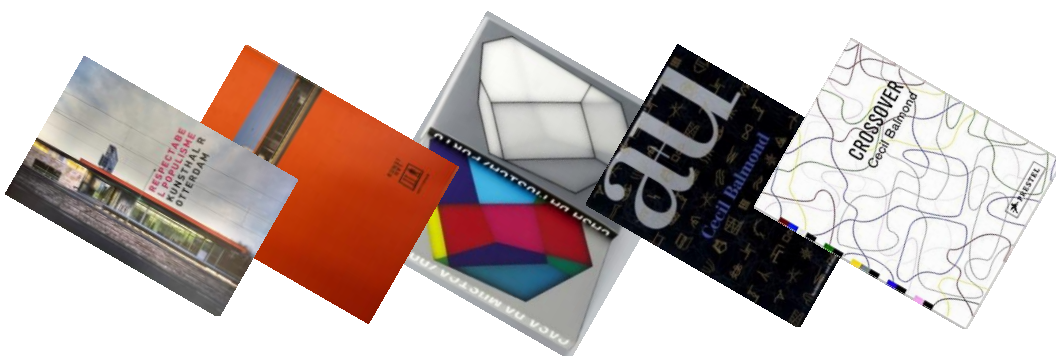


Image 12: Covers of published source – pivotal to informing this research (Source: Covers)

¹³⁵ Ibid.

¹³⁶ Deyan Sudjic, "Architecture: Cecil Balmond on the unsung talents of engineers," *The Observer*, October 26, 2002, accessed July 20, 2017,

CHAPTER 3: PRACTICE: PRODUCT



Image 13: Kunsthall



Image 14: Seattle Public Library



Image 15: Casa da Musica

(Sources: Modified/aesthetically formatted from: oma.eu, balmondstudio.com)

“Every phenomenon – a physical object, an organic form, a feeling, a thought, or group life – owes its shape and character to the duel between opposing tendencies; a physical configuration is a product of the duel between a native constitution and outside environment.”¹³⁷

This chapter analyzes the built works of the Kunsthall (Image 13), the Seattle Public Library (Image 14), and the Casa da Musica (Image 14) through Balmond’s theoretical constructs ‘informal’ and ‘Structure is Architecture’. In parallel to the evaluation of these spaces through Balmond’s conceptual rigor, the effect of Koolhaas’ theory ‘bigness’ is also deliberated upon in rendering an understanding of their joint venture as seen in the built form. This chapter examines the physical manifestation of the making of the interdisciplinary work in the form of the study of the house of art (The Kunsthall, Rotterdam), the house of books (Seattle Public Library (SPL), Seattle), and the house of music: (Casa da Musica, Porto).

ART: KUNST; BOOKS: BIBLIO; MUSIC: MUSICA

¹³⁷ Gyorgy Kepes, *The new landscape in art and science* (Chicago: P. Theobald, 1956), 326, quoted in Robert Venturi, Museum of Modern Art, and Graham Foundation for Advanced Studies in the Fine Arts. *Complexity and Contradiction in Architecture*. (2nd ed. Museum of Modern Art Papers on Architecture. New York: New York: Museum of Modern Art in Association with the Graham Foundation for Advanced Studies in the Fine Arts, Chicago; Distributed by Harry N. Abrams, 1990), 82.

The Kunsthal (Image 13), is significant in that it was the first built work of their collaboration, hence to begin this analysis with the Kunsthal, was critical. The Seattle Library and the Casa da Musica were begun in the same year (1999) and was completed five and six years later. These two buildings clearly manifest close connections to form-generation and provide the reader of the space an opportunity to see the arrayed architectural and structural responses that can be brought forth through the lens of the informal. These works of architecture also address the larger context of built environments through the interaction of spatial aesthetic nuances with that of the rational engineered solutions. In attempting to codify Cecil Balmond's language of architectural design in collaboration with Rem Koolhaas, a number of primary sources are analyzed (Image 12), which included visits to the built work to understand the nature of the space through a user experience. Archival research was also conducted to examine drawings, notes, correspondences, etc. of the various interactions and design decisions through the creation process. A number of interviews and newspaper reports were also taken into account as evidence for this thesis. Secondary sources of published books, research articles etc. played a significant role as well in studying the premise, processes, and products from multiple viewpoints. The built works stand as a testament to the specific interdisciplinary crossovers, and as Balmond refers to it saying that it is a "*negotiation between an idea you have and the final product. It's an up and down, back and forth, meandering process.*"¹³⁸ This approach and attitude to the architectural design process specifically from the structural engineer's perspective provides a fresh perspective on the built work and proves to be innovative to the interdisciplinary notions of architectural design.

¹³⁸ Balmond Studio, "What is Crossover? Cecil Balmond explains." YouTube, July 29, 2015, accessed February 19, 2017, <https://www.youtube.com/watch?v=NounkgS4BtE&t=1s>.

3A. BRACE, SLIP, FRAME, JUXTAPOSITION: THE KUNSTHAL, ROTTERDAM, THE NETHERLANDS

*“Trapped by a Cartesian cage I wanted to break out. The informal beckoned...that opportunity came with Rem Koolhaas and the Kunsthal in Rotterdam,”*¹³⁹ writes Balmond in his manifesto, ‘informal’. The Kunsthal translates from Dutch to English as ‘Art (*Kunst*) Hall (*Hal*)’. And this, was what the client required, an art hall that would be a space to host temporary exhibitions. Given its typological character of hosting a variety of artists and contemporary cultural figures, the nature of the Kunsthal, “is a structure in constant flux”¹⁴⁰ which is manifested even in the built space as it features the constant changes in spatial definition as one experiences the different interiors and exteriors. This expression becomes manifold through the deliberate spatial and structural responses in the creation of the building. The Kunsthal was a ‘multi-sequencing of frames’, according to Cecil Balmond. Balmond in his Interview with Hans Ulrich Obrist, talks about how Herzog and de Meuron mentions to Koolhaas that the Kunsthal, to them, seemed to be a project about ‘structures’ and expressed their surprise at knowing that Koolhaas was doing ‘structural projects.’¹⁴¹ Here, the designed space is understood by the user as formulated by defined structural compositions. At the same time, this dialogue and its further clarifications by the author of the space points additionally to the greater visions of the architecture.

Located at one end of the Museum Park, envisioned and designed by Koolhaas/OMA, the Kunsthal plays the role of inviting display of art as culture through the variety of artists and shows

¹³⁹ Cecil Balmond, *Informal*, 59.

¹⁴⁰ "Institution as medium - towards a critical architecture of institutions," Issue 2 - ONCURATING, accessed October 12, 2017, <http://www.on-curating.org/issue-2.html#.WotUiejwbDc>.

¹⁴¹ Balmond Studio, "Cecil Balmond Hans-Ulrich Obrist interview 4 of 7.avi," YouTube, December 09, 2010, accessed August 02, 2017, <https://www.youtube.com/watch?v=kf4rCmX4ZqQ&t=1s>.

that it hosts. The Kunsthal is a space designed to take on many accommodative roles. It is visualized as “simple volumes” to see if “the box” could hold a secondary role, and if “dumb forms” could take on “complex programs” and thereby create unexpected attention¹⁴² (Image 17). The Kunsthal stands as a symbol of seemingly insignificant beginnings but subsequently rises to be pivotal in this collaborative understanding. It is one of the first few significant built-works by Koolhaas and also the first built work in collaboration with Balmond. The aspect of significance that is attributed to Koolhaas, this thesis argues, needs to also be co-attributed to Cecil Balmond for the specific design involvement from the very conceptual stages through professional collaboration (Images 18, 20, 22, and 24).

Holding a built-up area of approximately 32,300 sq. ft., the Kunsthal with its zigzag paths, sloping floors, and tilted columns becomes a mirror to the network of Rotterdam’s museums, public plazas, and open spaces, snugly fit between a highway (Maasboulevard) on a dike on the northern end and the museum park to its south. The Kunsthal is so simple a box from the exterior, except for the quirky statue of a camel and a Bedouin on its roof edge, the extending orange beam, and the road that goes through it. These cause spectators, visitors, and passersby to wonder what the building is about (Images 29-31). Each façade of the Kunsthal is different. It comprises of four distinct structural systems contrasting each other, at the same time creating a whole. The slanted columns and the ramp-circulation creates a compressed sense of space, destabilizing the gridded arrangement of space that is formal in approach. In contrast, it presents the enclosed environment in an ‘anti-grid’ manner. When the building is viewed through the lens of the conceptual rigor, ‘structure is architecture’, the Kunsthal communicates what that rigor looks like. Structure, material, circulation, and function meld into each other to create a design that is not only distinctive and unassuming but is also a contrast in its typology.

¹⁴² Rem Koolhaas et al., *S, M, L, XL*, 405.

In terms of the structural composition of the building, Balmond proposes four distinct systems: *Brace, Slip, Frame, and Juxtaposition*. These systems each speak of the underlying structural rigor and enables the space to be read distinctly (Images 18-25). Additionally, they render themselves to a collective reading of the ‘informal’. When one engages with the space, not all of these structural systems are easily readable. However, they do present themselves as structural interventions in the space – as an engagement of the ‘informal’. Certain elements like the red line/arc in the ceiling, the imposing ramp circulation, the sloping columns, and the differing elevational facades all add to the story of the element of doubt, questioning, and a sense of mystery – a poetic sense of architectural space in the Kunsthal. These elements were salient to me as I visited the building after reading about these spaces through published literature. The site visit undoubtedly provided a richer understanding of the space and enabled the viewing of the design of the building as intended by the architect-engineering duo.

Analyzing the Kunsthal through the kaleidoscope of ‘structure as rigor’, makes evident the theoretical construct that was engineered through the joint minds at work. The Kunsthal exhibits both, the engineer’s and the architect’s varying degrees of rebelliousness against the tides of the ‘archaic, formal’ rules, the perceived primness of modern architecture, and against the wit and tackiness of post-modernism. This indicates the deliberate effort in fostering the entropic essence of the ‘informal’. An unassuming building in contrast to the icons of Rotterdam, like the Cube Houses by architect Piet Blom or the Erasmus Bridge by the architect Ben van Berkel, the Kunsthal is not an iconic building in the city. However, in the trajectory of this thesis, it holds a prime position as it was the first significant built work by Koolhaas and Balmond when it was completed in 1994 and the first built work in which a number of theoretical constructs were tested.



Image 16: Western Façade of the Kunsthall, B. Joy



Image 17: South Façade of the Kunsthall along the highway (oma.eu)

BRACE, SLIP, FRAME, AND JUXTAPOSITION.

Brace: In understanding bracing, one is reminded of the traditional braces, that of cross-bracing across two parallel lines. This is seen in the design of tall buildings, or where bracing is an opted structural solution. Balmond in contrast to the traditional method of bracing uses a different approach to create a statement through a subtle design decision. Balmond says regarding the ‘Brace’ (Images 18, 19) in the Kunsthall, *“Instead of the truss language bound in constraining parallel lines, an orbit in space releases the beautiful shape of an arch; the pattern of diagonal ties juxtaposed with a thin running curvature promotes structure as evolving pattern.”*¹⁴³

¹⁴³ Cecil Balmond et al., *Informal*, 75.

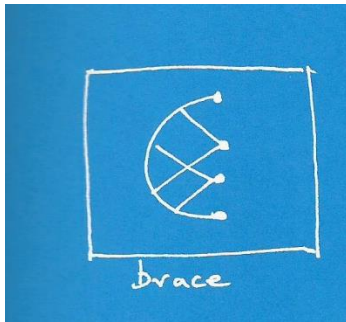


Image 18: Diagram of the brace, (Source: Cecil Balmond, *Informal*, 73)

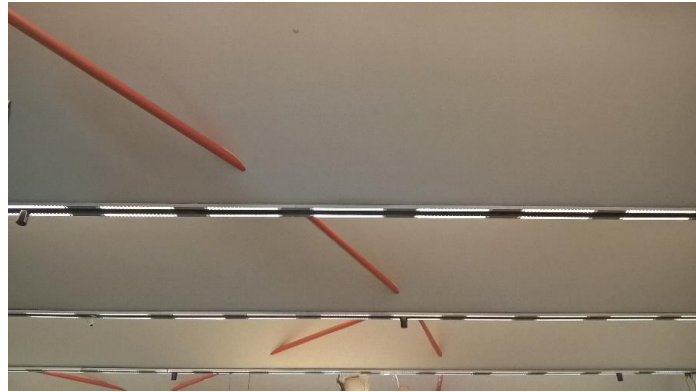


Image 19: Thin red line running through the hall- showing pattern, structure. B. Joy.

Slip: “Architecture is freed from structural correctness and compulsive repetition.”¹⁴⁴ Balmond elaborates in his book that the informal was the primary deviation from the formality of Modernism. This is a deliberate attempt at breaking the Cartesian logic, especially evident in the way it is used. The columns are designed in such a manner that they ‘slip’ past each other (Images 20 and 21), missing the regular orthogonal grid format that they are generally arranged in designs.

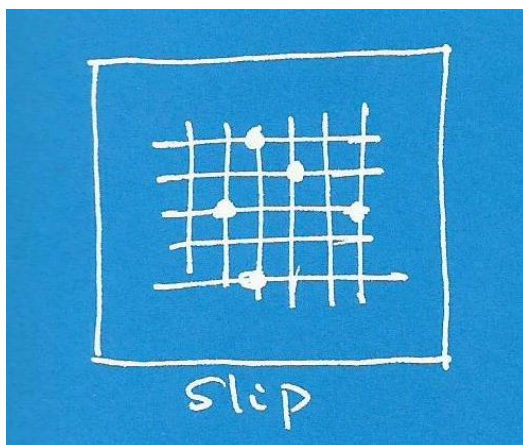


Image 20: Diagram showing the idea of slipping columns, breaking the Cartesian logic. (Source: Cecil Balmond et al., *Informal*, 73)



Image 21: Columns in the exhibition hall in an ‘anti-grid’ pattern. B. Joy

¹⁴⁴ Ibid.

The crux of expressing ‘informal’ through ‘slip’ is achieved by making one row of columns that are in alignment with another row of parallel columns to go beyond them. Thus, liberating the room of any rigid structure or Cartesian order. Here Balmond was able to open the floor plan through the diagonal arrangement of the columns, thus making the room one space and not a “two-ring-fenced zones”. *“The ‘slip’ on plan undid the containment, each column having an independence.”*¹⁴⁵

Frame: The leaning columns in the lecture theatre was a stability threat. When a column leans, it has to be countered to provide stability. This came in the form of the building adjacent to the dike, *which served as a supporting block to the immense forces*. The raking columns and sloping plane are held together with a moment frame (Images 22 and 23)

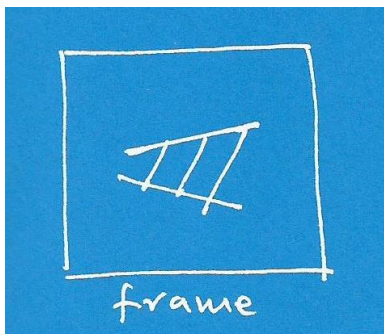


Image 22: Diagram showing the idea of framing with leaning columns. (Source: Cecil Balmond et al., Informal, 73)

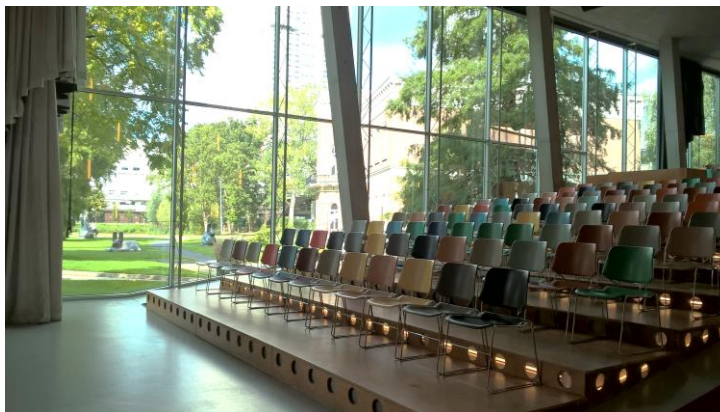


Image 23: Leaning columns of auditorium in the Kunsthalle, B. Joy

Juxtaposition: The columns on the south porch of the Kunsthalle are of three different kinds. Their variations create a ‘clash’. Balmond refers to them as an “ad-hoc”-ness (Images 24 and 25) that renders a sense of “new energy” as people enter the space. This new energy in the approach

¹⁴⁵ Ibid., 79.

“poses a puzzle”. This vagueness can be seen as is a way of the ‘informal’, where there is no validation of the “familiar or fashionable” and where there exists “no one statement structure either”¹⁴⁶

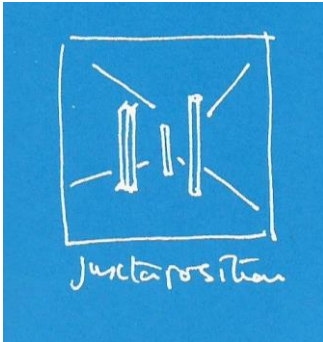


Image 24: Diagram of juxtaposition by Cecil Balmond. (Source: Cecil Balmond et al., Informal, 73)



Image 25: Varying columns juxtaposed with each other on the south façade of the Kunsthall. B. Joy

“Strange as it is exciting, raising questions about a bigger adventure, structure ‘talks’ in the Kunsthall. The dialogue is with architecture; one discipline provokes the other.”¹⁴⁷

In this collaboration of the architect and the structural engineer, the Kunsthall expresses their uniqueness. From the perspective of the architect, it is viewed with an approach to address the program and the circulation of the building. To achieve a sense of surprise and immediacy, the architect and the engineer break free from previously held notions of formalism. In his book *S, M, L, XL*, Koolhaas categorizes the Kunsthall under ‘Medium’, but this thesis analyzes it under the microscope of ‘bigness’ because, within the collaborative notions of built space, the idea of bigness is not only about scale but also serves to understand multiple complexities that work together within the idea of ‘bigness’.

¹⁴⁶ Ibid., 107.

¹⁴⁷ Ibid., 72.

“This approach compresses disparate events within a single container, allowing them to interact freely in something resembling a ‘programmatic alchemy’”¹⁴⁸

To the common user experiencing this building, with no knowledge of Balmond’s or Koolhaas’ architectural theories, one thing becomes obvious, the designers’ conscious attempt to engage the user of the space with the circulation. This conscious effort makes salient the movement through space, which is defined by the built work, purposefully chiseled to invoke the sense of “What is this?”, “What lies around the corner?”, or, “What is next?” Aarati Kanekar argues that it was ‘montage’¹⁴⁹ that drove the design of the Kunsthal. She looks at the various structural conditions that come together as a form of montage in becoming what Koolhaas calls the “whole and the real,”¹⁵⁰ and what Balmond refers to as the “chameleon”¹⁵¹, in reference to the Kunsthal’s changing nature. The method that she refers to as montage can be seen as the combination of the ‘informal’ and the properties of ‘bigness’ used by Koolhaas and Balmond in creating the interventions and the juxtapositions. This additionally adds to the narrative in which this building portrays and clarifies the intent of both Koolhaas and Balmond as designers.

Having read about the Kunsthal before visiting it, I knew what to look forward to and what spaces would surprise me. While the spaces held within the Kunsthal causes some confusion, it reflects its complexity in the varied facets that it takes on. Further, after returning from visiting the site and re-reading published literature on the Kunsthal, I found that the ‘informal’ published by Balmond provided the closest conceptual reading of what the experience was in reality in the building, more so than even what is written about it by OMA, or any other author. This certainly

¹⁴⁸ Harry Francis Mallgrave and David Goodman, *Introduction to Architectural Theory: 1968 to the Present* (Malden, MA: Wiley-Blackwell, 2012), 185.

¹⁴⁹ Aarati Kanekar, *Architecture’s Pretexts: Spaces of Translation* (London; New York: Routledge, Taylor & Francis Group, 2015), 140-144.

¹⁵⁰ Rem Koolhaas et al., *SMLXL*, 508-509.

¹⁵¹ Balmond Studio, accessed September 05, 2016, <http://www.balmondstudio.com/work/kunsthal-rotterdam.php>.

shows that the depth of conceptual rigor applied to the building from the engineer's perspective in layering meaning into the building, representing a complexity that is truly significant to this contemporaneous built work.

In many ways, the element of surprise and unexpectedness that is experienced in the works of Balmond and Koolhaas, reinforce the nature of the postmodern. Adding an element of complexity through structural rigor adds to the justification of 'why', though many times, through subtle expressions, like the red arch bracing on the ceiling. In this regard, the Kunsthal helps solidify the idea of the application of the conceptual rigor 'structure is architecture'.

"In addition to the more traditional typologies of galleries, museums, and kunsthallen, the investigation also included institutions that have consciously avoided conventional institutional models, in order to promote them with caution, undermine them, give them new meaning or combine them in different ways. At this juncture it became clear that art institutions have increasingly become spaces of production."¹⁵²

Balmond does not emphasize the need for the structural solutions to buildings to be completely discernable or overt. He does not make obvious the structural systems that make the building but believes in the subtlety of the structural system as part of the architectural design. This idea considers an approach that is so imbibed within the architectural and spatial design that there is almost a sense of ambiguity and a sense of mystery that is overlaid in the making of a structural solution for an architectural design¹⁵³ (Images 26 and 27).

The Kunsthal (Images 37-40) is significant because it has undergirded the theories that Balmond was starting to develop and work on in the early nineties and it certainly became the

¹⁵² "Institution as medium - towards a critical architecture of institutions," Issue 2 - ONCURATING, accessed October 12, 2017, <http://www.on-curating.org/issue-2.html#.WotUiejwbDc>.

¹⁵³ Cecil Balmond, *Informal*, 64.

foundational built project for the collaborative work together between Koolhaas and Balmond for the next few decades.



Image 26, 27: Images of the Model of the Kunsthall (Source: The archives of The New Institute, Rotterdam)

“A building has at least two lives - the one imagined by its maker and the life it lives afterward - and they are never the same.”¹⁵⁴

~Rem Koolhaas

The analysis of this building shows the emergence of built space from the many theories that both the protagonists are grounded in, it is clear to see that the design of the building is a manifestation of those theoretical frameworks and an expression of their collaborative work (Images 33 and 34).

¹⁵⁴ Rem Koolhaas, "The Invention and Reinvention of the City." *Journal of International Affairs* 65, no. 2 (2012), 115. <http://www.jstor.org.offcampus.lib.washington.edu/stable/24388222>.

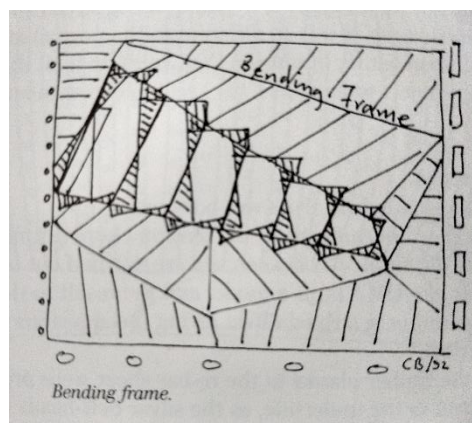
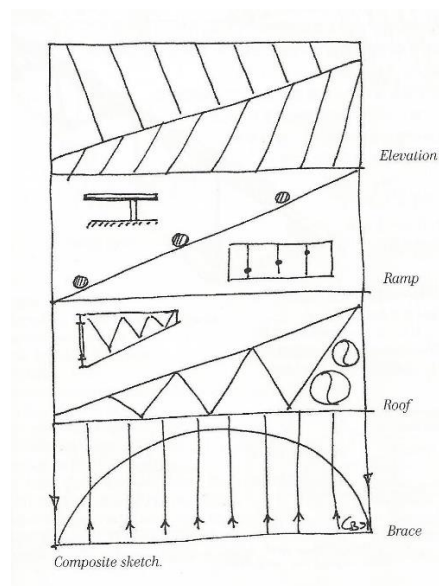
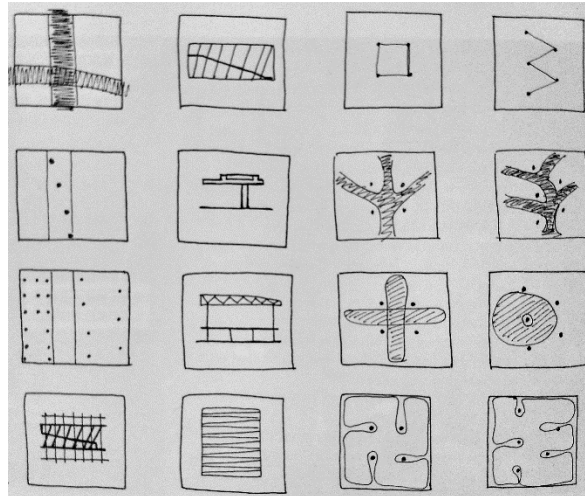


Image 28: Balmond's sketches, conceptual and technical (Source: Cecil Balmond et al., Cecil Balmond = Seshiru Barumondo. Tokyo: A + U, 2006, 252, 253)



Images 29-31 (Clockwise): Facades of the Kunsthall. B. Joy



Image 32: OMA/Koolhaas' conceptual drawing of the Kunsthall (Source: The archives of The New Institute, Rotterdam)

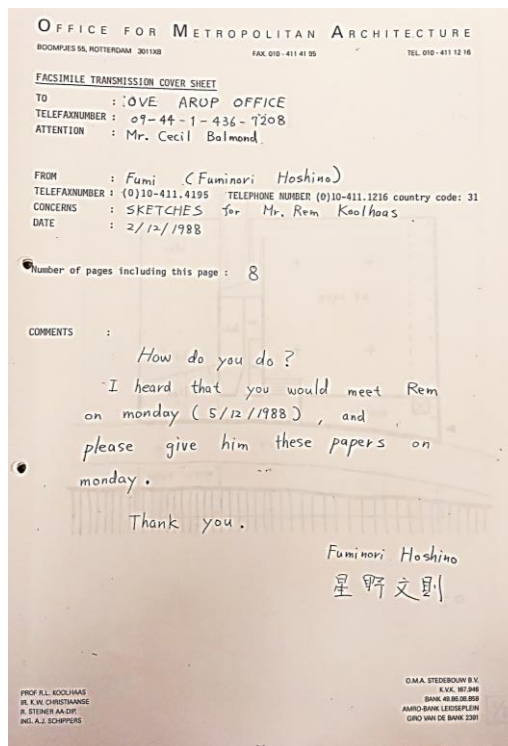
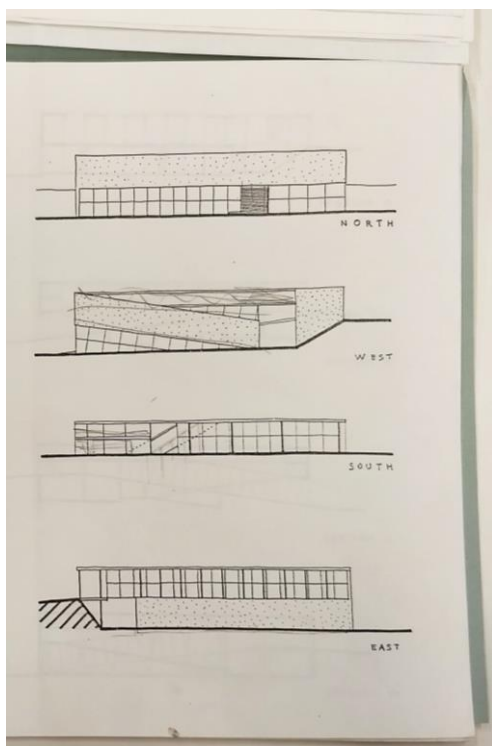


Image 33, 34: Archival drawings of the Kunsthall; Correspondence between OMA and Cecil Balmond
(Source: The archives of The New Institute, Rotterdam)

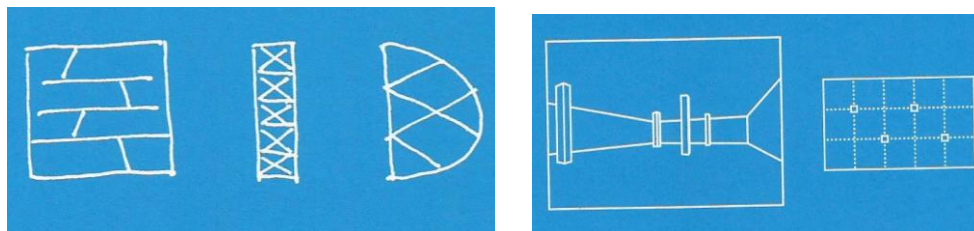


Image 35, 36: Diagrams and sketches of Balmond explaining concepts
(Source: Cecil Balmond et al., *Informal*, 75, 78)



Image 37-40: Interiors of the Kunsthal. B. Joy.

3B. GEOMETRY AND THE DIAGRID: THE SEATTLE PUBLIC LIBRARY, SEATTLE, USA

“Geometry is information and material. Geometry was, is and always will be the source of architecture. Geometry defines our space. Loose geometries, fixed geometries, classical geometries, Einsteinian geometries...it’s all geometry. For me, it is a material, definitely. It is a scalpel to aesthetics, a forensics.”¹⁵⁵

The ideas of geometrical extrapolations are evident in the works of Balmond. They demonstrate new possibilities in architectural design that were conceived through a keen structural understanding and with a strong theoretical rigor. Lateral supports, in the structural design sense, is the tackling of lateral forces to strengthen a structure against loads from winds or earthquakes. Laterality also refers to the lateral modes of thinking or doing, in this case, in creating architecturally designed spaces. Often, lateral forces in building design are not designed for by architects at the very beginning of the conceptualization of a project. It is more often worked on after the initial design of the building is charted out and the parameters for required lateral supports are developed for the entire design when structural engineers are brought into the process of the design to try and make the ‘already designed building, safe’. This is a linear process in design. Balmond’s and Koolhaas’ integrated approaches to design includes the voice of the structural engineer early on, encouraging the use of innovative ways to design for lateral forces from the very beginning. Lateral support members to a design enable building designs to be safe, especially in regions that are greatly affected by wind loads or are earthquake-prone. Lateral supports as a ‘conceptual rigor’ to shape and delineate a space provides an opportunity to architects and structural engineers to overcome challenges in a significant and efficient manner, thus generating some of the most daring structures in the history of built works, for example, The China Central Television headquarters in Beijing, China (Image 9) which is a looping skyscraper, reaching a height of 768 ft., also by Rem Koolhaas and Cecil Balmond, was the last of their projects

¹⁵⁵ Emily Abruzzo, Eric Ellingsen, and Jonathan D Solomon, *Models*. (First ed. 306090; v. 11. New York: 306090, 2007), 32.

together. Another earlier example that ties together these ideas of patterns, geometries, lateral forces, and rhythm through the theoretical framing and through tangible means is the Seattle Public (Central) Library (Image 41). In the Seattle Public Library, the void and the diagrid enclosing the void (Image 42) become a statement of the ‘complexity’ in design. Here, the diagrid becomes a form-generating factor. Again, Balmond’s input early on in the design, particularly through the conceptual design phase enables the diagrid in being the fundamental influential factor in this design.

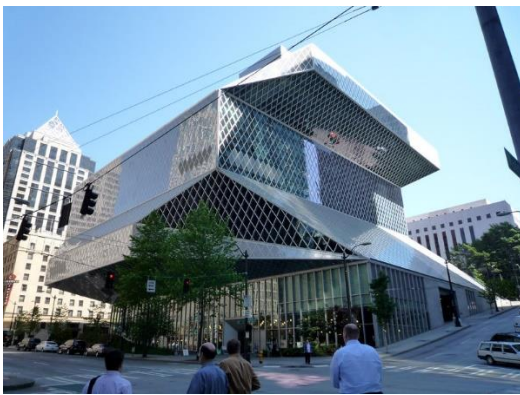


Image 41: Exterior of the Seattle Public Library



Image 42: Interior of the Seattle Public Library

(Sources: Wikimedia.org)

The Seattle Public Library (SPL) design is the central library for Seattle’s 28-branch library system. The construction of the structure began in 1999 and the building was completed and opened to the public in 2004. This building was designed and built by the collaborative efforts of a number of teams. Architect Koolhaas’ firm OMA along with architect Joshua Prince-Ramus of REX (now), previously part of OMA, New York, and the Seattle-local architecture firm LMN Architects formed the main architectural team. They worked in collaboration with structural engineers from Arup and MKA (on-site engineers, Seattle) and a number of other collaborators¹⁵⁶. At this stage of Koolhaas’ and Balmond’s collaboration, the duo has had other projects that have been successfully

¹⁵⁶ OMA, “Seattle Central Library”, accessed October 30, 2016, <http://oma.eu/projects/seattle-central-library>.

completed. So, given the history of collaboration, it was natural that Balmond would play an integral role in the design development and conceptual design stages of the project.

The program of the building is predominantly contained within three seemingly suspended rectangular boxes. These rectangular boxes slide in and out of the central vertical axis creating around them voids designed to accommodate public spaces. Due to the lack of a regular stacking of the boxes one on top of the other, and due to the creation of the voids, traditional framing systems were no longer an option as a structural system. This led to the design of a skin that would act as a containing element as well as a structural element wrapping around the entire designed space. Thus, the diagrid became an apt solution to the zig-zag interior (Image 43) and became the key aspect in the design to handle the seismic forces in Seattle.

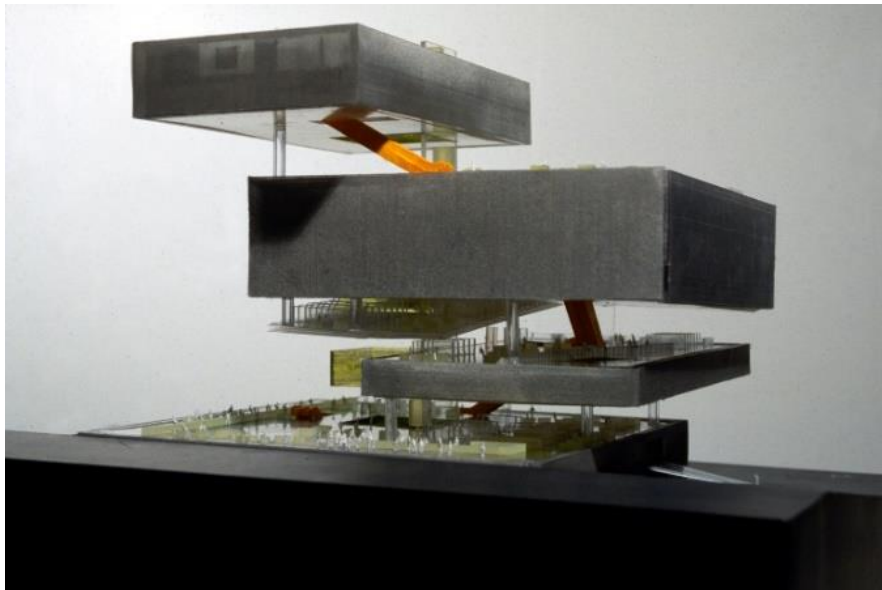


Image 43: Model of spatial entities (response to program), (Courtesy: OMA, Sources: archdaily.com)

Balmond and his structural team at Arup proposed the diagrid (diagonal-grid) as a structural system to be used in the library building design and is an expression of the conceptual rigor ‘Structure is Architecture’. Here, the solids, which are the rectangular programmatic boxes

(Image 43), and the voids, which become the spaces between the boxes, are all tied together within the encompassing shape of the building, by the form of the diagrid. The presence of the diagrid, both as a structural response to challenges in the design and as a form through which the conceptual rigor is evidenced becomes a significant and defining feature of the building. The library's design incorporates and expresses the ideas of complexity, non-linearity, and emergence through the geometries and patterns that emerge due to the application of the rigor. The versatile structural element of the diagrid (Image 44) resolves both the questions of connecting the programmatic elements of the building and also responds to the structural and seismic challenges that exist in the specific site and the earthquake-prone region of Seattle in the Pacific Northwest.

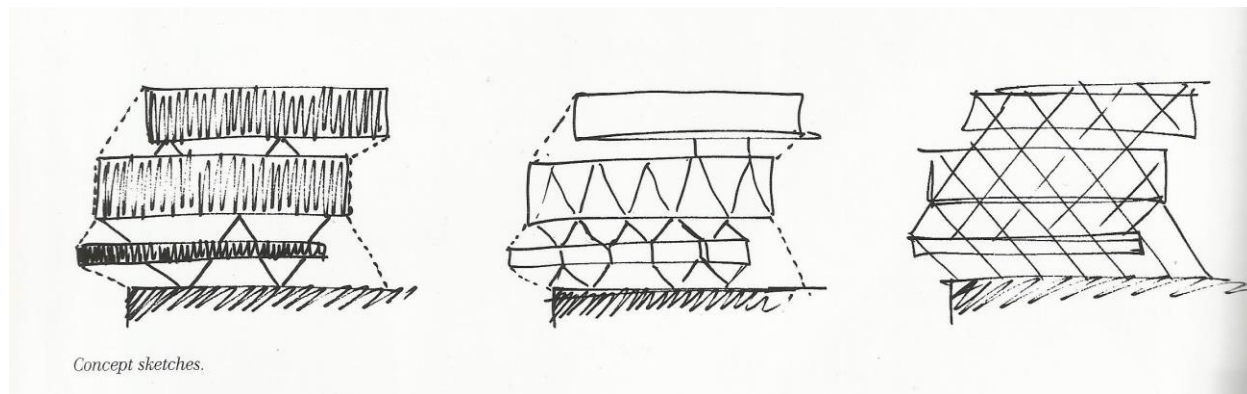


Image 44: Balmond's conceptual sketches of the Seattle Public Library (Source: Cecil Balmond et al., Cecil Balmond = Seshiru Barumondo. Tokyo: A + U, 2006, 264)

The diagrid, which forms the most pronounced element of the building design even overshadows the large staggered boxes within, emerging from the function of a patterned structural element to become architecture (Image 44). Previous scholarship focuses on how the Seattle Public library design is Koolhaas' project along with Joshua Prince-Ramus and local architects LMN. However, this thesis argues that Balmond as the conceptualizing engineer also made a critical contribution to shaping the building. This project is another feather in the cap of their long-standing professional collaborative work. Their joint work over the last two decades when this project was finished continued to grow at that point in time (2004).

In the design of the Seattle Library, the theoretical construct of 'bigness' is evident with an 'embrace-all' property in the programmatic requirements. However, the difference in the approach with this design in comparison to that of a skyscraper is that the library design encompasses the "whole" in a broken space by horizontal shifts of the blocks creating large vertical shafts of openness. These common spaces (Image 46) serve further as social gathering areas, in a sense as 'condensers of social activity'. Here, 'bigness' and the 'informal' are used as strategies to analyze the library and the conceptual rigor 'structure is architecture' is evaluated through the built form.

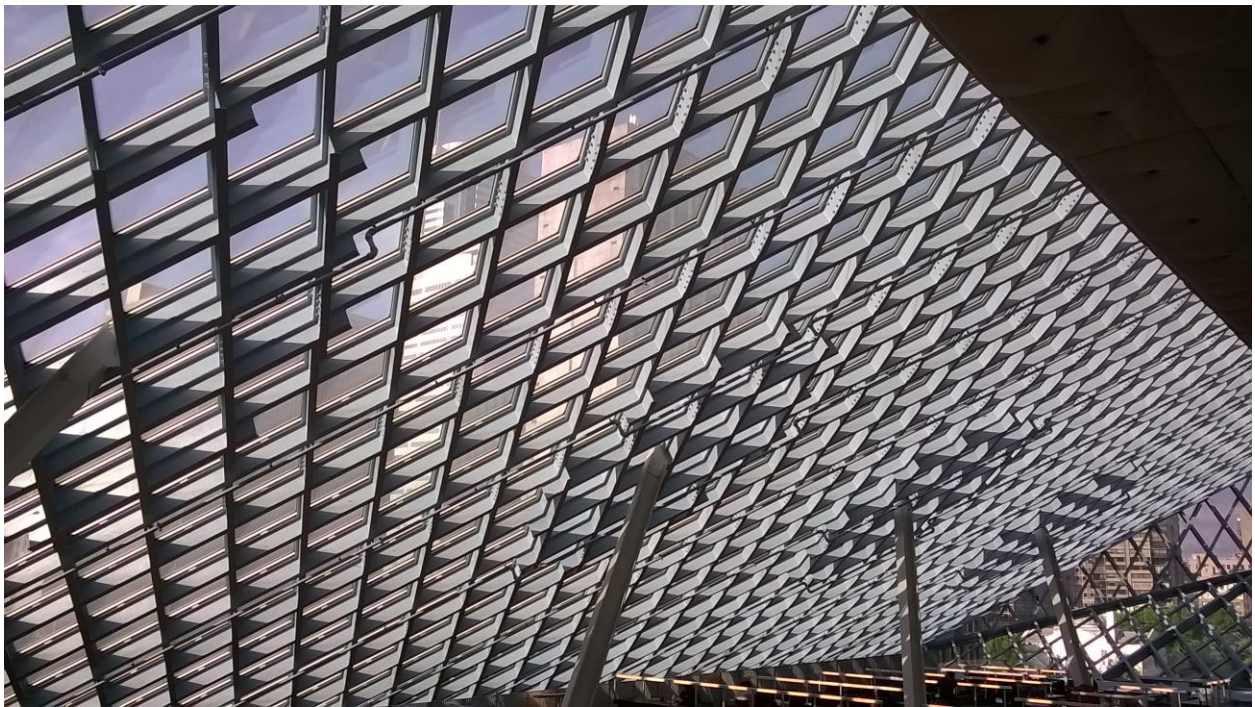


Image 45: Interiors of the Seattle Public Library, B. Joy.



Image 46, 47: Interiors of the Seattle Public Library, B. Joy.

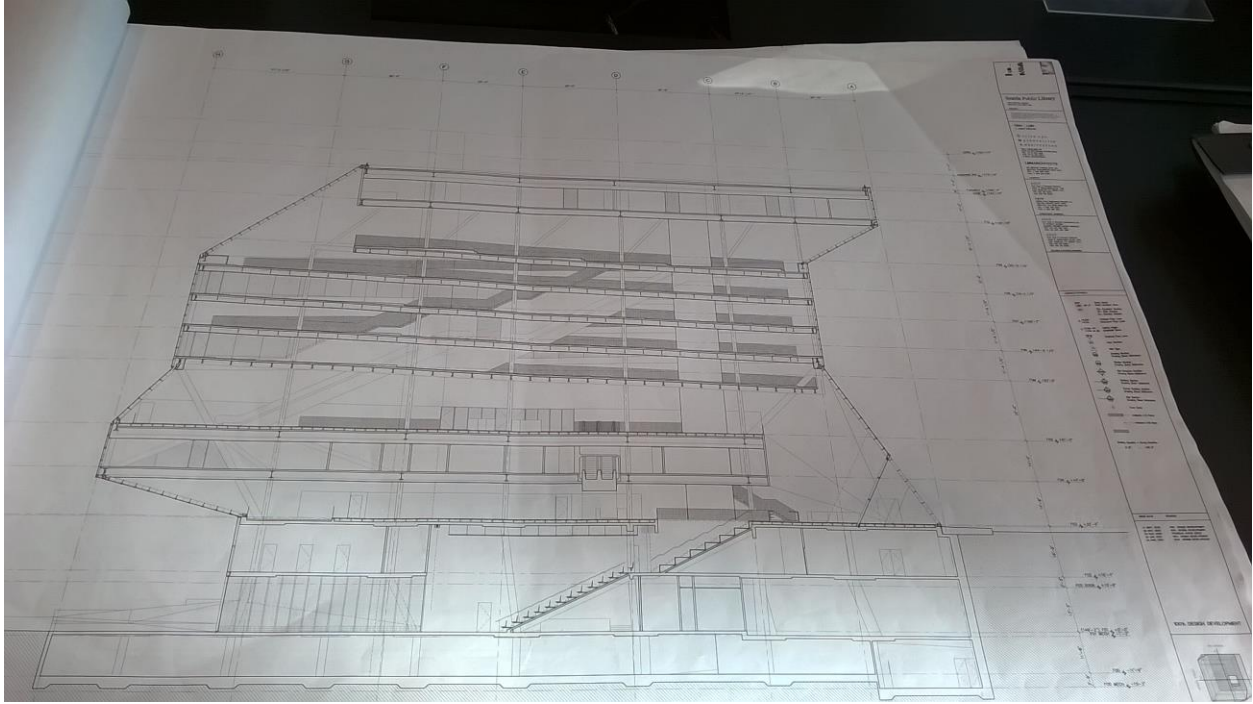


Image 48: Archival architectural drawings of the Seattle Public Library, (Source: SPL Archives)

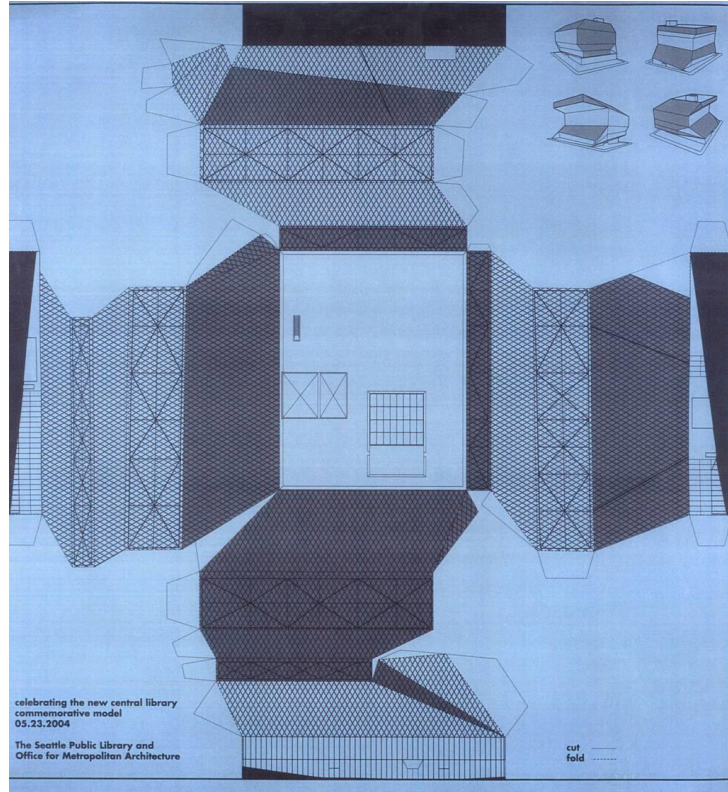


Image 49: Image of the commemorative model of the SPL in a foldable format (Courtesy: OMA)

Rigor, refers to the rule or the discipline applied to something to achieve the desired result. In the case of the collaborative built work by Balmond and Koolhaas, it can be seen that this rigor is not only clear, but looking further, it is evident that it has been effective in the making of these built works. In the case of the Seattle Library, one can read the building in the way Koolhaas writes about bigness, “*Bigness no longer needs the city, it is the city.*”¹⁵⁷ Being located in the heart of downtown Seattle and becoming a major landmark city, the library tends to stand out as a city in itself. I say that it stands out as a city in itself with multiple layers of meaning to it. It definitely becomes a repository for the medium of books, which is why I refer to it as the *house of biblio*. It also functions as a ‘social condenser,’ a place of social interactions that “*encourage dynamic coexistence of activities to generate through their interference, unprecedented events,*”¹⁵⁸ as Koolhaas defines in his book, *Content*. The social aspects of the ‘condenser’ are not elaborated further in this research as it lies outside the current scope of the thesis. However, visiting the space and becoming a user of the space suggests the ways in which the space does work as a social condenser.

The history of the Seattle Library building is long and winding. It was begun as a decision to replace the long-standing Modernist building as the space was becoming insufficient to users and to the collection of books in circulation. This prompted the librarian, Deborah Jacobs to initiate the need and the means to have a newly designed space to house their facilities.

*“...architecture and structure become part of each other in this project with external cascade and internal drift. The void itself becomes the shaping factor.”*¹⁵⁹
~ Balmond

¹⁵⁷ Rem Koolhaas et al., *S, M, L, XL*, 515.

¹⁵⁸ Rem Koolhaas/OMA, *Content*, (Köln: Taschen, 2004), 73.

¹⁵⁹ Cecil Balmond and Nobuyuki Yoshida, *Cecil Balmond = Seshiru Barumondo*, 264.

In attempting to recognize the essence of these building designs, which are driven by the conceptual structural rigor, the question raised by Gevork Hartoonian regarding the excess or moderation of ‘theatricality’ becomes relevant (Images 45 and 47). *“Is our fascination with structures like the Eiffel Tower and the work of engineers at the turn of the last century, and even the recent structures conceived and built by Santiago Calatrava and Cecil Balmond due to the absence of excess?”*¹⁶⁰ This theatricality in the library is seen expressed through the collaborative efforts between architecture and engineering – particularly, the architect and the engineer. Here the void, the slanted columns, the diagrid, and the boxes which form the programmatic elements interact with each other as immediate and momentary interventions. The ‘informal’ comes alive in the virtual ad-hocness (Image 45) ascribed through the transfers between chaos and order. These expressions in shaping the space are similar to that of the shaping of the void in one of their other works together, the Casa da Musica, which was designed and built in parallel to the Seattle library. Both these designs can be seen as active engagements with the void. Though, in the Casa da Musica (Porto, Portugal), the product is defined very differently than in the library (Images 49 and 56). Balmond, in his interview with Hans-Ulrich Obrist, talks about how the Library was an “inverse project”¹⁶¹ compared to the Casa da Musica. In the library, the architectural designer engineers the void and the engineer designs the solid, specifically, the solid plane enveloping the void, i.e., the diagrid. Both the projects have a sense of deep angular projections of planes and are engaged in the active conversation with the void. The projects also convey a sense of creating a ‘global marker’ for the city by its presence, and it certainly engages the designed space with the city as a ‘condenser’, within and around, by its presence. The ‘living room’, as the architects categorize the common space on the third level of the library design

¹⁶⁰ Gevork Hartoonian, *Architecture and Spectacle: A Critique*. (Farnham, Surrey, England; Burlington, VT: Ashgate, 2012), 37.

¹⁶¹ Balmond Studio, "Cecil Balmond Hans-Ulrich Obrist interview 4 of 7.avi," YouTube, December 09, 2010, accessed August 02, 2017, <https://www.youtube.com/watch?v=kf4rCmX4ZqQ&t=1s>.

functions as the social condensing space forming the connection to the city beyond. The Seattle Library is an extrapolation of what is seen initially with Balmond's and Koolhaas' first collaborative built work, the Kunsthal – in its structural, spatial, and conceptual rigor. The library structure displays a certain degree of further daring explorations in the ideas of *Brace, Slip, Frame, and Juxtaposition*.

These buildings mirror the collaboration that has been established over the years between Balmond and Koolhaas, i.e., the essence of the marrying of the architectural and structural qualities to form a bond that becomes a creative whole – a oneness that suggests that they bounce ideas off of each other and dialogue with each other (Images 50-52). This connective work collaboration is reminiscent of the great structural engineer who imagined, Peter Rice¹⁶², and his work with the architects Renzo Piano and Richard Rogers, particularly on the Pompidou Center in Paris, France. The library as a typology still retains its formal activities discrete from its public functions. The envelope in the Seattle library works as a binding factor of these distinct yet connected formal and informal spaces. The form of the Seattle Library is a derivative of the skyscraper and one that almost seems distorted randomly. But behind the face of random twists and turns, pulls and pushes, lies a rigor that is both spatially and structurally resolved architecture (Image 45).

“As scriptwriter Koolhaas magnified the importance of the program in architecture. Already established from Modernism’s outset in one form, amplified by Team X in another, the notion of the plan as scenario became central to the work of OMA, growing in importance to the point where it became a bureaucratic tyranny. In the present predicament – and in retrospect – it is easy to recognize the shortcoming involved in neglecting the quintessence of form. Despite our radical drives, we were allergic to the label of ‘formalism’ – the most misused, despotic and callous misrepresentation of meaning exploited by institutional modernism, in its calculating and opportunistic abuse of the ‘ism’ classification.”¹⁶³

¹⁶² Peter Rice, *An Engineer Imagines*. 2nd ed. London: Ellipsis, 1996. Print.

¹⁶³ Lara Schrijver, "OMA as tribute to OMU: exploring resonances in the work of Koolhaas and Ungers," *The Journal of Architecture* 13, (no. 3 (2008): doi: 10.1080/13602360802214927), 243.

These architectural designs by Koolhaas and Balmond articulate the strong interactions between the built spaces and its immediate urban surrounding. OMA refers to this connection being foundational between its work and the effect on or from the city. This goes to establish further that the very essence of the firm is also grounded in the ideas for urbanism. Thus, projects that are worked on, develop from an in-depth and rigorous analysis of the program in the context of the city. Even when scholarship critiques the non-contextualism of Rem's work these buildings signify that contextuality, grounded in urbanism, is strongly evident in the very foundational aspects of OMA.

The Seattle Library from the exterior (Image 41), to a first time viewer of the building, brings up questions of "how does it stand?", or "will it topple over?", but further encourages the viewer to experience the inside. Once on the inside, the building transforms not only the experiences of place and space-making but also provides a sense of how the building stands, provides a sense of how the social interactions work, and the communicates advanced technologies. All of these various elemental features that play a role in the design of this library are held together in the 'diagrid'. This structural feature, plays a versatile conceptual role in the design, more than being only structurally and seismically providing stability. Although the diagrid in a single plane may be viewed as being monotonous, the varying planes at different angles create the sense of slip and juxtaposition, reaffirming the ad-hocness or informality that naturally develops from the play of programmatic elements in 'bigness'.

Through this specific analytical lens of bigness and the informal, the library epitomizes the strongest theoretical and philosophical concepts of both Balmond and Koolhaas. The success of this building certainly pushed the courageous spirit in adventuring into the China Central Television (CCTV) building design in Beijing, China. Scholarship refers to the *Wolkenbugel*, Moscow (1923-1925) designed by the Soviet artist and architect El Lissitzky as being a source of

inspiration to Koolhaas in the design of the CCTV¹⁶⁴. This is perhaps true. However, this thesis additionally maintains that the conceptually understood ‘cloud hanger [iron]’¹⁶⁵ spaces of the *Wolkenbugel* is accomplished in the design of CCTV and in buildings like the Seattle Public Library and Casa da Musica, through Balmond’s pivotal role. Balmond not only engineers the structure of the building but also conceptualizes the form and enclosed spaces along with Koolhaas to make the design a reality. The programmatic and structural rigor applied to the design of buildings and in particular, to these critical case studies, clarify the theoretical standpoint: “For me,” says Koolhaas, “it is a building that is at the same time old-fashioned in terms of resurrecting the public (realm), and contemporary in terms of addressing the key issue whether the book is still relevant.”¹⁶⁶ In the Seattle Library, disassociation of the main structure from the wrapping envelope can be found as an evolution from the modern skyscraper – slabs with columns and skin, is comparable to the Miesian idea of structure, but here, driven by conflicting forces of the twenty-first-century avant-garde idea, the ‘informal’. Looking at these buildings in isolation will not lead to the extent of collaborative power between Balmond and Koolhaas. However, with the collective study of these critical case studies, it evidences the same. In general, the SPL is primarily noted as the work of OMA-LMN architects along with Arup. This could be argued to be true as Arup historically has not been an organization that was built on the success or prominence of a single person but always saw in their work the collective, collaborative, interdisciplinary effort. Even though this may be the case, Koolhaas and the other architects that Cecil Balmond has collaborated with on projects, testify to and acknowledge not just the entity of Arup in the support of architectural projects, but specifically name Balmond being the person

¹⁶⁴ Alexander Tzonis and Liane Lefavre, *Times of creative destruction: shaping buildings and cities in the late C20th* (London: Routledge, Taylor & Francis Group, 2017), 268.

¹⁶⁵ Ibid., referred to as “...horizontal structures up in the air to be used as functional and social places.”

¹⁶⁶ Repeat - Rem Koolhaas Seattle Public Library - Sleekness in Seattle, accessed February 20, 2017, <http://lynnbecker.com/repeat/seattle/seattlepl.htm>.

with whom they are willing to (most often than not) share the credit for these designed spaces (Images 50-52).

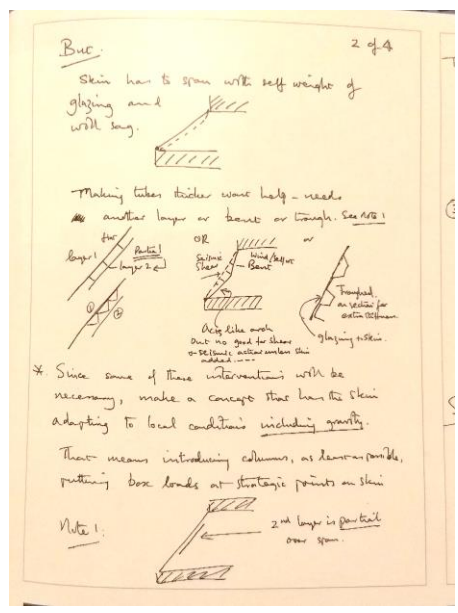
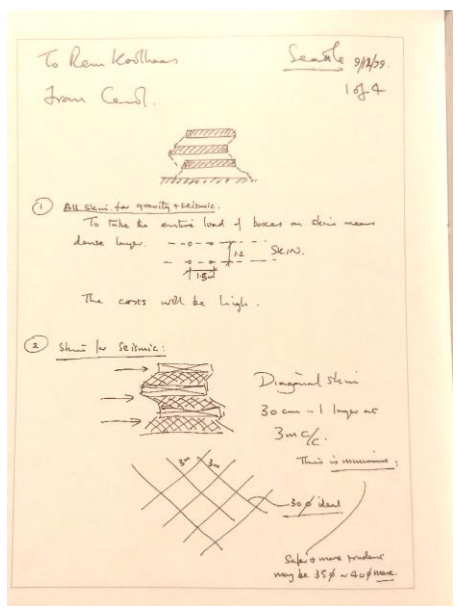


Image 50-52 (Clockwise): Balmond's notes and sketches of the Seattle Public Library (Source: Cecil Balmond et al., Cecil Balmond = Seshiru Barumondo. Tokyo: A + U, 2006, 264, 265)

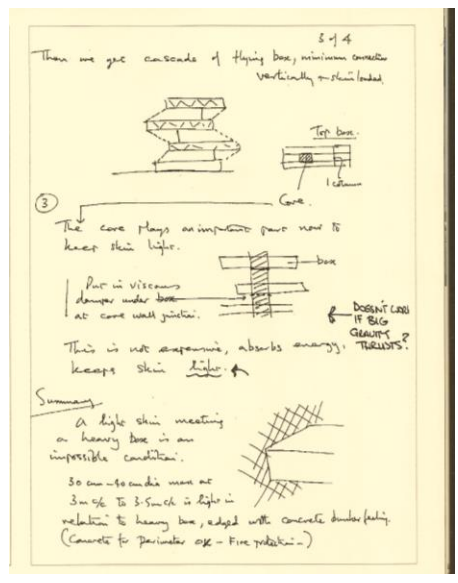


Image 53: Diagrammatic representation of the SPL spaces (Courtesy: OMA, Source: spl.org)

3C. GRAVITY – THE TYRANT TO STRUCTURES: WORKING THE VOID:

THE CASA DA MUSICA¹⁶⁷, PORTO, PORTUGAL

The Casa da Musica (Image 71), its literal translation means the ‘House of music’ and quite true to its name, holds one of the most significant music houses or concert halls built in the twenty-first century. The building sits wrapped in a concrete cocoon with views into the city that connects to its strong cultural heritage. The Casa da Musica serves a greater purpose than just as a concert hall. When Porto solidified its vantage position in the European Union as a prominent economic, cultural, and political presence, the then Minister of Culture along with the city of Porto initiated urban and cultural interventions,¹⁶⁸ for which the Casa Musica held a prominent position. The Casa Musica is made with a concrete shell that acts as a layer of both, structure and envelope. The ‘theory of Bigness’ when applied to the Casa da Musica, enables the building to be independent in itself and at the same time connects with its surrounding. *"Bigness...is the one architecture that engineers the unpredictable."*¹⁶⁹ This thesis shows that, this is precisely what Koolhaas has been able to orchestrate as he collaborated on his works with Cecil Balmond as the engineer on many of his projects, including the Casa da Musica in Porto, Portugal.

At the Casa Musica, Koolhaas and Balmond (along with other teams of acoustic engineers, interior designers, etc.) weave the historical setting of Porto into the surfaces of the interiors of the space creating a sense of belonging that connects to its rich heritage (Image 54). Its rippled glass surface (Image 72) which is a feature that is seen only in this concert hall ever, where two surfaces of the concert hall are made of glass also shows the innovativeness that is explored by the architect-engineer combination in addressing the spatial quality and the structural core. From

¹⁶⁷ Also referred to as Casa Musica or Casa.

¹⁶⁸ "Casa da Musica / OMA" 15 Apr 2014. ArchDaily. Accessed 27 Feb 2017.

<https://www.archdaily.com/619294/casa-da-musica-oma/>, ISSN 0719-8884.

¹⁶⁹ Rem Koolhaas et al., *S, M, L, XL*, 511.

this building, it is clear that there is no form that follows the traditional function of the concert hall. Here, except for the primary concert space, the functions of the design are tailored to become part of the form of the building, e.g., the circulation in the building. This building design evolved originally from the design of a house for a Dutch client. The Y2K House (Image 60) envisioned based on a few unique specifications – an aversion to mess, the ‘Y2K bug’ that created skepticism for the client about the year 2000, and his familial relationships – that were complex. All of these specifications to the program of the building shaped an architectural design that was lavish in storage, a decision to not do anything in the building until the year 2000 when the client was sure of safety, and spaces that allowed the family to “live separately”, yet “be together.”¹⁷⁰ The design of the house resulted being focused around a central void. However, since that project was not going to be built, Koolhaas transformed that design to strategically fit the needs of the competition project that came up with the design of the concert hall at Porto. The void, however, continued to be central even through the transformation in the design. Koolhaas says, “*I’ve always been interested in failure as an option.*”¹⁷¹ The transformations in scale, location, typology, building material, the inclusion of Balmond on the project, etc. among other aspects came together in realizing the complex design of the Casa Musica. These characteristics also display a sense of experimentation – that could have failed.

The Casa Musica sits on a parcel of land abutting the Mouzinho de Albuquerque Square, commonly referred to as the Rotunda da Boavista¹⁷², in tribute to the general Joaquim Augusto Mouzinho de Albuquerque, one of the noteworthy military officers of the African campaigns (1894-1895). Historically, this site held in its place for many years the tram stop. The change in

¹⁷⁰ Wigley, Mark, Rem Koolhaas, Guta Moura. Guedes, and André Tavares. *Casa da Música, Porto*. (Porto, Portugal: Fundação Casa da Música, 2008), 155-156.

¹⁷¹ *Ibid.*, 185.

¹⁷² OMA, “Casa da Musica.” Accessed February 11, 2017. <http://oma.eu/projects/casa-da-musica>.

the use of the site from being a tram stop - a functional, utilitarian, urban entity to being transformed to be a site of cultural intervention reflects the many alterations in the society. It symbolically represents the cultural significance that the contemporary society attributes through the building (Images 66).

This can be viewed as an attempt through the discipline of architecture to make accessible the culture of music to the people. These built works can be viewed as a continuing language of built ideas, starting with the built work for the culture of art with the Kunsthall, the intellectual culture of the Seattle Library, and here, with the Casa Musica, as a representation of the culture of music. The location of the Casa da Musica in Porto is also historically famous as a region for its exquisite Port Wine. Surrounded by the idyllic town buildings with their distinct red tiled roof (Image 59), the Casa Musica creates an iconic mass in the urban fabric. The monument at the center of the rotunda, onto which the Casa Musica looks out, has a sculpture of a lion crushing an eagle. The lion in the statue symbolically represents the alliance of the Portuguese and British forces and the eagle being the French army forces. The Casa da Musica makes a visual connectivity, not particularly only with this monument, but also to the city beyond. This represents a sense of bringing the city into the building and exhibits the 'bigness = urbanism vs. architecture'¹⁷³ theory according to Koolhaas, but in this context of the Casa Musica, 'bigness = urbanism + architecture'. Here, the thesis argues that 'bigness' is not only about the scale of the building and the fact that "*beyond a particular scale, buildings acquire a particular property, that of bigness,*"¹⁷⁴ and here, bigness constitutes the complexities of the entire structure.

The form of the building looks like one of the many unpolished pieces of diamonds, yet to find its glorious and shiny ends in the landscape of a diamond jeweler's plate. However, the

¹⁷³ Rem Koolhaas et al., *S, M, L, XL*, 515.

¹⁷⁴ Ibid.

building stands bright as a cultural intervention in the city with its lackluster, white angular concrete planes that are positioned daringly against the Portuguese skies. (Image 66). A concert hall, for all its programmatic history, has been known, recognized, and acknowledged by its shoe-box shape, limiting the possibilities to new spatial imaginations. However, the Casa da Musica attempts to break this mold in a number of ways, with its connections beyond its four walls, its circulation, the use of material, and the structural compositions that helped realize this vision. The thirteen-floor building with its unique form holds within it a complex plan which is centered on one of two Koolhaas' core design elements - the circulation. The main focus of the building is its concert auditorium seating about 1500 people, a second smaller auditorium that accommodates 300, and additional administrative and service areas. The three floors below grade go down to about 50 ft. and rise above the ground to a height of 132 ft. (Image 70). The dimensions of the building, when measured at an intermediate level, show the design to be 230 ft. X 263 ft. The building's outer shell is made of 1.3 ft. thick inclined white reinforced concrete panels. The external shell core made of these concrete panels becomes the primary structural supports for the internal slabs. The concrete shell serves as both, an envelope for the space and a structural system for the building design. Granite aggregate mixed with the white concrete renders a hint of blue to the final look of the surface.¹⁷⁵ Through the particular structural interventions – inclined strut-columns, the reduced thickness of the exterior concrete panels, etc. Balmond was able to incorporate his theories of the informal in defining the form and the space of the Casa Musica.

The inclusion of the blue tile work, *Azulejos*, which are home to Portugal call to reference the historical ties to the artwork of the region (Image 54). This aspect of the collaboration articulates the ideas of juxtaposition - the very reason that the new and the old, through the use

¹⁷⁵ AFA Consult, "Technical articles | afaconsult – Engineering Designs." Excelência. Accessed January 05, 2017. <http://www.afaconsult.com/en/news/technical-articles>.

of material, technology, flat vs. undulated surfaces, etc. all create a sense of contrast and intrigue to the building. The undulating glass façade (Image 72) provides a sense of continuity to the structure as users pass from one space to the other through the circulation path – representing and revealing a sense of continuity in complexity. This is seen with the diagrid in Seattle Library as well, and the ramp surface in the Kunsthal – a sense of place making. These elements and ‘interventions’ as Balmond refers them, individually become the carriers of the ‘informal’ – that of connections and meaning in the immediate. Much of the interior and exterior is in contrast to each other with its austere external surface and almost lavishly ‘decorated’ interior with Petra Blaise’s designs for the wall surface in the main concert hall, the use of blue richly painted traditional tile work of Portugal in the VIP room, and the repetitive acoustical material.

“There’s also the afterlife of a building to consider. In relation to the urban fabric, the Casa da Música is actually a soft and contextual building. On the outside, it has no color; all the color is provided by the context. This is a very fragile position, it needs these other buildings around it. At some point, it was clear that if we didn’t argue for the preservation of this material, the building would in no time be surrounded by more Siza, at best, or at worst, more flatness or mirror-glass.”¹⁷⁶



Image 54: Interior of the Casa da Musica (Christian Richters for OMA, Source: oma.eu)

¹⁷⁶ Mark Wigley et al., Casa da Música, Porto (Porto, Portugal: Fundação Casa da Música, 2008), 208.

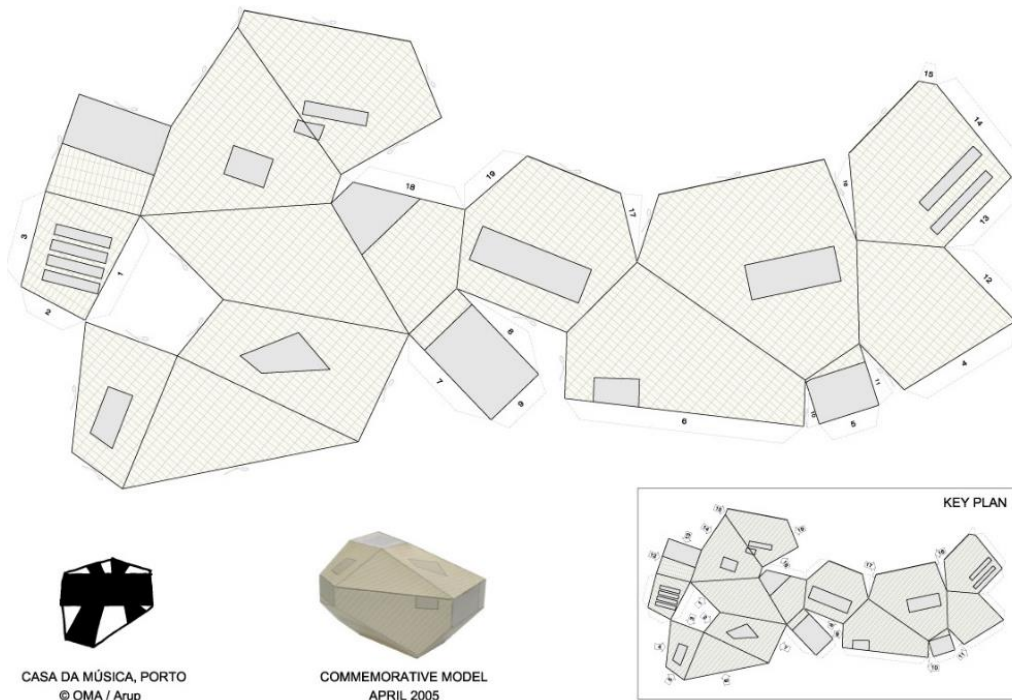
After visiting the case study buildings, it was seen that the surface of the Casa da Musica subtly reflects the surface feature of the SPL, though not in the material. The diagrid pattern that is seen on the library is seen featured in a delicate way through the formwork for the concrete panels (Image 55). This echoes the effects of the simultaneous design development of both the Casa Musica and the Seattle Library. Though the angular planes have linear bands that are prominent on the elevations, the diagrid-like pattern can be faintly seen when intently studied. The form of the Casa goes through a discursive morphological evolution that grows in terms of both the theoretical constructs – bigness and informal. I argue this because though in terms of the specific size of the building, it is not the largest or the most expansive for its typology, it does embody the essence of ‘bigness’ in its complexity, and the idea of ‘informal’ in its design.



Image 55: Exterior of the Casa da Musica, B. Joy.

In analyzing the Casa through the lens of the ‘informal’, one can see the juxtaposition in the angular walls, the bracing seen with the tilted columns in the need-based ad-hocness (Image

73), which further exemplifies the ideas of ‘structure as conceptual rigor’ in the immediacy of active structural members or interventions. The form of the building as designed, can be viewed not only as the 3D angular form, but also as a planar form that communicates further the emphasis on the void (Image 56).



*Image 56: Image of the Casa da Musica in a flattened, foldable format
(Courtesy: OMA, Source: archdaily.com)*



Image 57: Interior of the Casa da Musica, B. Joy

Charles Jencks writes about Balmond in conjunction with the Victoria and Albert (V&A) museum, London (Image 9) – another one of Balmond’s projects in collaboration with Daniel Libeskind, saying, “Six boxes push through each other, part cubes, part rhomboids like the ace of diamonds. The flat intersecting walls, as calculated by the engineer Cecil Balmond, actually become the structure, allowing column-free interiors, so the crushing shapes have a functional rationale.”¹⁷⁷ Similarly, the design of the Casa was also spatially and structurally resolved by the creative contributions made by Balmond (Image 58).

According to Koolhaas, the fax machine created a sense of invisible discipline. Koolhaas’ team (especially a large one, and one that was so geographically displaced), subscribed to the inherent working with this. The fax machine made sure that drawings, images, notes, sketches

¹⁷⁷ Charles Jencks, *The architecture of the jumping universe: a polemic: how complexity science is changing architecture and culture*, 12.

etc. all got transferred and transmitted via the same mode, providing for an underlying structural sense to the process of design. Koolhaas in this interview with Mark Wigley talks about how the fax liberated him, especially from the crunch of time and of meetings.¹⁷⁸

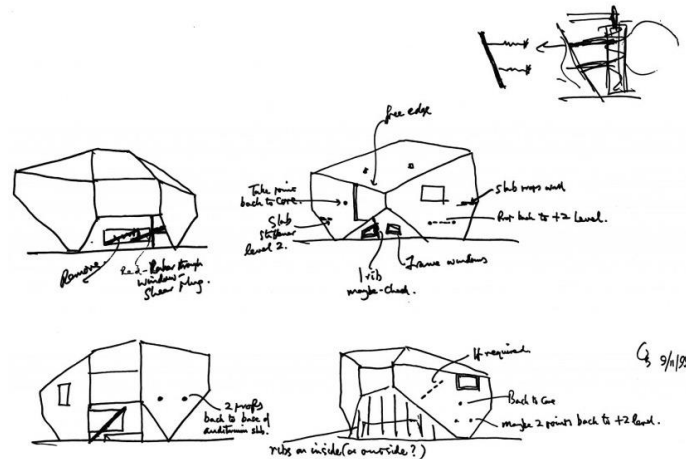


Image 58: Balmond's sketches of the Casa da Musica, (Source: Cecil Balmond et al., Cecil Balmond = Seshiru Barumondo. Tokyo: A + U, 2006, 268, 269)

The Guardian notes, "But Koolhaas will not thank you if you describe Porto's Casa da Musica as 'his' building. For Koolhaas, the notion of the architect as lone genius is a myth that is badly in need of dismantling: 'Tragically, in the contemporary idolatry of architectural stars, all teamwork is drained from discussion,' he suggests. 'The more ambitious we are, the more we depend on team effort. 'And it's perfectly true that the contribution of Cecil Balmond, the gifted Arup engineer, who has worked on every major Koolhaas project, was invaluable."¹⁷⁹

Again, how does this continued collaboration between Balmond and Koolhaas work? A number of varying responses fit the picture together. A great working rapport, an attitude to break the mold that architecture has been, seeking for something similar – a newness to the way they envisioned creating architectural form and space, to list a few lead to their unique collaboration. This was also influenced by their deep appreciation for new sense of order, mystery and

¹⁷⁸ Mark Wigley et al., Casa da Música, Porto (Porto, Portugal: Fundação Casa da Música, 2008), 173.

¹⁷⁹ Deyan Sudjic, "Architecture: Rem Koolhaas/Casa da Musica," *The Observer*, April 09, 2005, accessed September 02, 2016, <https://www.theguardian.com/theobserver/2005/apr/10/1>.

immediacy, the wide range of interests they have had, and in part because of a number of deliberate actions or events that happened: Balmond moving to work in a creative way on architectural projects (late 1970s); Koolhaas' partner at OMA leaving the firm; Koolhaas meeting and approaching Balmond to work together on a competition project; Balmond's capability to handle large projects; their conceptually rigorous approaches; and the practical backing from Arup are some of the reasons that factor into defining this collaboration and their combined built works. The collaborative work on the Casa Musica recalls the legacy of the building of the great Sydney Opera House. Designed by Jørn Utzon closely working with structural engineer Ove Arup in finally bringing the design to a reality after a number of years. Here, as in the Sydney Opera, the structural engineer plays a critical role in shaping the project in a compelling manner.



Image 59: Casa da Musica, Aerial image set in the urban background (Source: oma.eu)

The image above captures the time component of the built environment in the sculptural monument in the foreground, the contemporary Casa Musica in the middle, and the red-tiled

roofs of houses of the neighborhood beyond that make up the fabric of the city of Porto woven together. Much like the Guggenheim in Bilbao, Spain, by Frank O' Gehry, the Casa Musica is an attempt of the city to make a mark on the cultural map. The Casa Musica also serves to revitalize a port town, to lift the working class – the industrialized little town of Porto and make it an example of cultural significance. With its extreme angular planes, the crystalline form of the Casa Musica is challenging. It exerts a commanding force on its surroundings. It is not easily woven into the threads of the urban fabric in terms of its form but stands as a presence that establishes a political, cultural, and social significance in its immediate neighborhood and across the globe.

Even if Koolhaas doesn't view himself to be a star, or as the hero of architecture, through these projects it is evident that the architecture certainly acquires an alchemistic property in transforming the city into one that is acknowledged and hailed globally, from being a small town obscure place. This aspect is solidified by the qualities that Balmond brings to the table as an engineer of these creative, complex spaces. Thus, we see the sharing in the role of architectural-urban alchemy through not only the role of the architect in the design, but also through the engineer providing both qualitative and quantitative thought to the projects. In the past, great engineering feats were achieved through the efforts of structural engineers. Bridges, dams, etc. connected and provided infrastructure for people. This collaboration between Balmond and Koolhaas also looks at engaging in great feats of architectural works in the world, resolving the programmatic, spatial, and structural aspects with a finesse that is achieved through the close working of interdisciplinary minds.

“The “Casa da Música” is one of those jobs in which architecture and engineering are inseparable and strengthen each other. The challenge was to fit a complex functional programme into an object with an atypical form while also ensuring that the support structure should be an integral part of the architect's spatial concept. For Koolhaas, the elements which engineering needs are opportunities and themes that give form to the space. Making structural sense, pillars and sloping walls are formally worked on and integrated into the project, not by

disguising them but sometimes by giving them an unexpected leading role.”¹⁸⁰

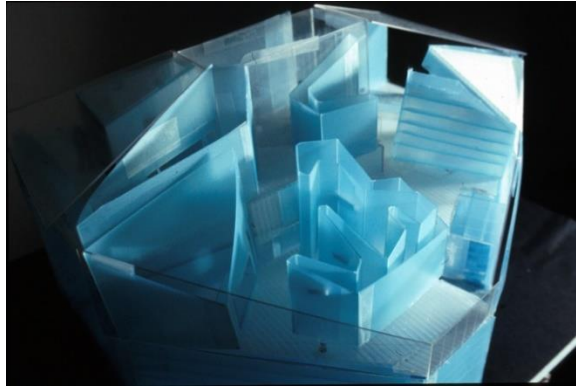


Image 60: Model of the Y2K house later transformed into the design of the Casa da Musica (Source: oma.eu)

These works of architecture exhibit how engineering them has enabled a profound appreciation of structural compositions, of the role of the engineer, the need for interdisciplinary understanding, and the spirit of collaboration. According to Koolhaas’ bigness theory, beyond a certain critical mass, a building acquires the properties of “bigness”. Is that the stage when collaboration especially with the structural engineer, and particularly with Balmond becomes critical to the project? Koolhaas mentions, *“Cecil Balmond was very involved in the whole competition for Porto, but we never would have shown him the phases of the Y2K House”¹⁸¹* Thus, “bigness” does not only have the properties of scale, but also complexity. And in this regard, the properties of transformative spaces.

“Bigness through its very independence of context, is the one architecture that can survive, even exploit, the now-global condition of the tabula rasa: it does not take its inspiration from givens too often squeezed for the last drop of meaning; it gravitates opportunistically to locations of maximum infrastructural promise; it is, finally, its own raison d’etre.”¹⁸²

¹⁸⁰ Technical articles | afaconsult – Engineering Designs," Excelência, accessed January 05, 2017, <http://www.afaconsult.com/en/news/technical-articles> (Engineering the Casa da Musica, AFA consultants).

¹⁸¹ Mark Wigley et al., *Casa da Música, Porto* (Porto, Portugal: Fundação Casa da Música, 2008), 199.

¹⁸² Rem Koolhaas et al., *SMLXL*, 515.

This is true of the Casa. When the Casa is viewed through the lens of ‘Bigness’ and the ‘informal’, the aspect of context, is seen within the interior wall finishes, whereas the exterior provides none. The use of glass wavy facades on either end of the concert hall in the Casa liberates the typology of concert halls from the traditional, modernist nature of the ‘shoe-box hall’. This was imperative in the effort to advance contemporary architectural theory and praxis through the breaking free from modernist and postmodernist notions, and forging ideas from an analytical platform which questions the generally held notions. Approximately 410,000 sq. ft. of built space stands as a testament to the cultural character and structural inventiveness. This additionally manifests architecture as a language of expression, a cultural expression.

“The building's strong visual dominance would weigh on its choice, in keeping with the purpose of Porto 2001 Society to seek a new identity, landmark, icon and reference point for the city.”¹⁸³

The iconic status is in creating a landmark for the city and thus attempting to project the little winemaking town of Porto on the global architectural and cultural map through this building project. The Casa da Musica in its past identity as the Y2K house was seen in the removal of, i.e., in the extraction of mass to create a designed space. Here, the removal of a solid volume generates the void – the concert hall of the Casa da Musica (Images 67-70). *“The building becomes an architectural adventure,”¹⁸⁴* this is how the House of Music Casa da Musica, home to the national orchestra of Portugal is referred to by Koolhaas. The common strand of continuity that can be drawn from the three projects studied in this thesis – the Kunsthal, the Seattle Library, and the Casa da Musica, provide an intriguing reading of “adventure” that is created by the collaborative work of both the structural engineer and the architect, a team that looks at keeping the mystery

¹⁸³ "Casa da Música - A obra," Casa da Música - Sala de concertos, Porto, Portugal, accessed June 20, 2017, <http://www.casadamusica.com/en/a-casa-da-musica/a-obra/>.

¹⁸⁴ OMA, "Casa da Musica." Accessed February 11, 2017. <http://oma.eu/projects/casa-da-musica>.

in design and spatial experience through their in-depth conceptual analyses and unique approaches to finding solutions, grounded in open dialogue.

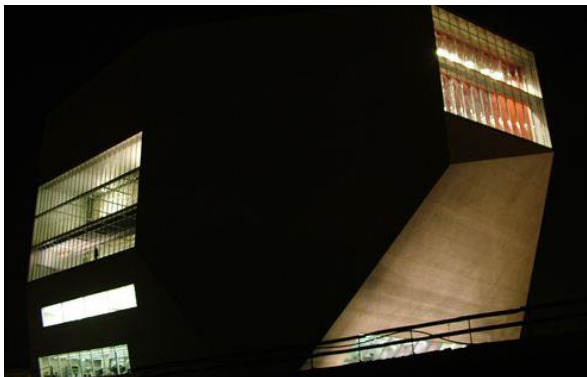


Image 61-66: Construction process of the Casa da Musica (Source: afaconsult.com)

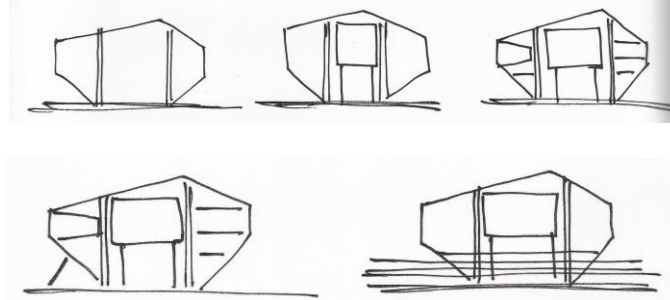


Image 67, 68: Balmond's sketches of the Casa da Musica (Source: Cecil Balmond et al., Cecil Balmond = Seshiru Barumondo. Tokyo: A + U, 2006, 268, 269)

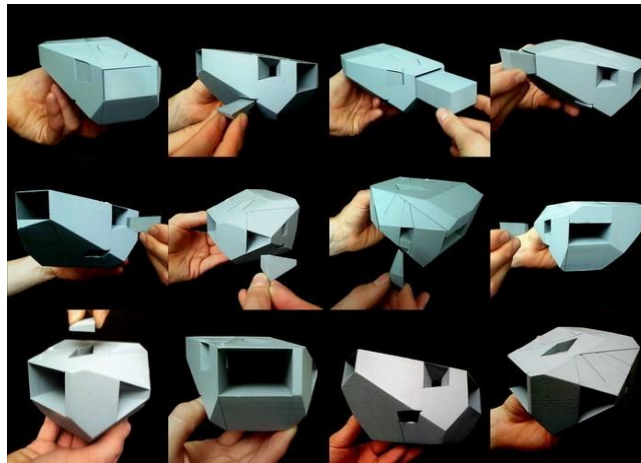


Image 69: Transformative models of the Casa da Musica showing the working of the central void (Source: oma.eu)

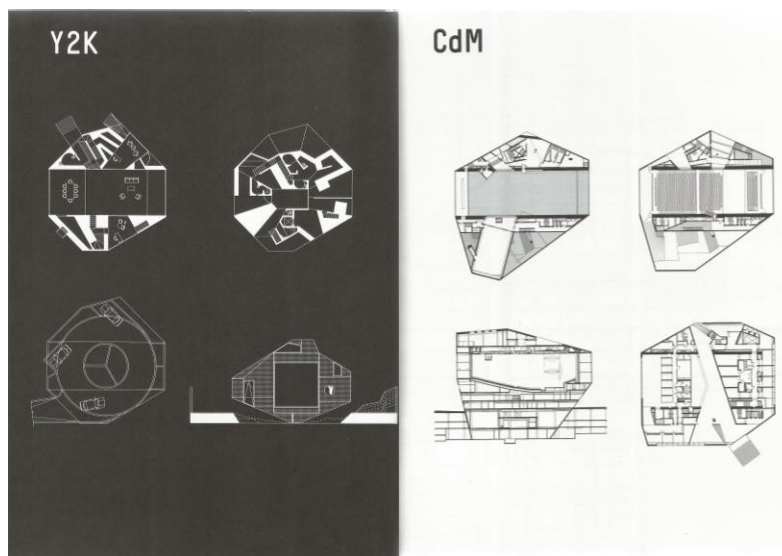


Image 70: Comparative drawings of the Y2K house and the Casa da Música (Source: Mark Wigley et al., Casa da Música, Porto, 162, 163)



Images 71-73 (Clockwise): Images showing the exterior and the interior of the Casa da Musica, B. Joy.

CONCLUSION

The underlying idea of ‘structure’ as conceptual rigor is manifest in the actual planning and execution of the key case studies of the Kunsthall, the Seattle Library and the Casa Musica. Balmond’s engineering and spatial design contribution has proved to be critical to these projects with Koolhaas and has in effect created a new aesthetic, one that is grounded in ‘structural rigor’.¹⁸⁵ The Kunsthall, the Seattle Library, and the Casa Musica are rather simple geometric forms in comparison to other contemporary building designs that are formed and built using advanced software and architectural technologies. However, this box and these polyhedra share a complexity that unfolds inside the space, a complexity that is also a reflection of its designers. This constellation of works is also not defined by a single period or a single location, but traverses across time. It begins its influences with the Constructivist, socialist ideologies that believed in an avant-garde for everyday life; later, in opposition to Modernism; further keeping its distance from the witty post-modern; and finally, embracing the new avant-garde expressions grounded in collaboration and conceptual frameworks.

Cecil says, “*I see the Seattle Library and Casa da Musica as an end of an eighteen-year progression, and that the next horizon is the CCTV building in Beijing, as another scale jump.*”¹⁸⁶ Balmond refers to this experience like the philosopher Hans-Georg Gadamer, who explains experiences as different levels of understanding and, a change understanding or experiences to be the fusion of various horizons¹⁸⁷. To Balmond, the collaborative work is seen as growing or enlarging experiences of complexity. He also talks about it in terms of scale jump, meaning the

¹⁸⁵ Nicolai Ouroussoff, "An Engineering Magician, Then (Presto) He's an Architect," *The New York Times*, November 25, 2006, accessed, September 20, 2016, http://www.nytimes.com/2006/11/26/arts/design/26ouros.html?pagewanted=1&_r=1&ref=arts

¹⁸⁶ Markus Heidingsfelder et al., *Rem Koolhaas: A Kind of Architect*.

¹⁸⁷ Hans-Georg Gadamer, *Truth and Method*. (Continuum Book. New York: Seabury Press, 1975), 367.

enormity of the built work is astonishing and very different from what Balmond and Koolhaas have worked together on in the past.

In referencing buildings such as the Guggenheim in Bilbao Spain, the Gherkin in London, Krista Sykes mentions in her introduction, “*Such iconic buildings are intentionally complicit systems, employing form and visibility as a marketing technique.*”¹⁸⁸ This is found to be the case particularly with the Seattle Public Library and the Casa da Musica, generating an interest in architecture through the iconic status of the design (Images 41 and 66). Critics question if it is his ego that pushes Balmond to move from the engineering role and take over the role of the architect; will it sidetrack his brilliant work as an engineer, they ask. These speculations will have to be analyzed through the works beyond the time of collaboration when Balmond began his own architectural firm. That, is beyond the scope of this current thesis. However, Balmond does provide some thought to these speculations, when he explains that his view on architecture and engineering was “more intuitive than it was mathematical”, and explains saying, “I was always looking at patterns — in music, literature,” he said. “It was never only about structure”¹⁸⁹ (in the traditional meaning).

Balmond after Koolhaas: Balmond Studio: Beyond his collaboration with Koolhaas, Balmond has collaborated with other architects and artists. In 2010, he founded his own design research firm (Balmond Studio) with offices in London and Colombo. These offices continue his research-oriented form-finding spatial designs. He calls Balmond Studio as an idea generator with research at its heart. The CCTV tower was the last of the collaborations, as of now, between Koolhaas and Balmond. There could be more. The reasons why there have been no more

¹⁸⁸ Krista Sykes, *Constructing a New Agenda: Architectural Theory 1993-2009*. (1st Ed. New York: Princeton Architectural, 2010), 24.

¹⁸⁹ Ibid.

collaborations between them may be attributed to a few reasons: Balmond leaving the Arup office, Balmond starting his own firm, which is speculated to be in competition against other architects, with whom he has collaborated in the past. However, it can be seen that their paths once crossed and they have gone their own ways, currently. To see how that has affected their work, is yet to be ascertained. Balmond speaking in an interview with CLOG about Koolhaas' work beyond their years of collaboration says, "*I have no idea what Rem is up to.*"¹⁹⁰

Koolhaas after Cecil: Other projects: People are not indispensable. Koolhaas continues his work with Arup London being structural consultants for some projects, but there is no presence of Balmond on these projects. It is yet to be determined what the impact of the lack of Balmond's contribution to these projects looks like. Koolhaas has worked on a variety of projects beyond his collaboration with Balmond, but these don't have the specific vision and input of Balmond's creative conceptual rigor applied to them.

...IN CONCLUSION

This study shows that the collaborative efforts of the structural engineer, Cecil Balmond and the Dutch architect, Koolhaas are greatly influenced and grounded in the conceptual rigor 'structure is architecture'. This effect is particularly witnessed in the built works but also in both their architectural careers. Rem Koolhaas' early career growth through their collaborative built works can be attributed to this collaboration with Cecil Balmond. Balmond's theories and its manifestation in built works express the nuanced designs that have been accomplished with a poetic essence through Balmond's conceptual rigor and his structural interventions in shaping and forming space. Thus, he plays a pivotal role as an equal contributor deserving co-authorship

¹⁹⁰ Rem Koolhaas, *Rem*. CLOG (New York, N.Y.: Clog, 2014), 132.

to architectural design. His theory of the ‘informal’ expressed through the non-linearity, complexity, and emergence is seen in the controlled chaotic order applied to form-making of these built works. This rethinking of spatial designs is realized through an open, collaborative dialogue.

Balmond’s form-making process is the result of conceptual rigor systemically applied. A rejection of the linear conventional approach to architectural design creates the emergence of patterns and spaces that are rich and complex displaying the ‘informal’ approach. This methodology questions and changes the notions of stability as have been commonly held true in architecture. The argument rises that rules and algorithms are restrictive, but, Balmond uses these very tools to make them extremely liberating concepts to design. These are not limiting conceptual notions when used within the framework of the ‘*informal*’. These design ideologies have become the very foundation of the works of the polymath, Cecil Balmond. Thus, by the analyses of the theories, interviews, site visits to the built works, archival research, through the interpretation of published textual works, and drawings of buildings it can be noted that Balmond has reinforced and reimagined the creation of architectural designs, and in particular with Koolhaas. These projects in conjunction with the specific design principles, leads to the conclusion that Balmond’s theories, methodology, and approach become an innovative language in architectural form-generation with structure as a conceptual rigor.

Moreover, this thesis also sheds light on this collaboration which fostered a unique position and a change of the structural engineer in the process of architectural design. It has created an opportunity for an equal position at the design decision table. It prompts the question of how engineers and architects could integrate their expertise in shaping the built world around us, and it calls for change in the architectural pedagogy of the built environment to be more cohesive from both the structural and architectural perspective.

Analyzing the various sources of evidence, it is determined that Balmond played a pivotal role in impacting the thinking of Koolhaas' designs. It also shows that the growth to being the architect that Koolhaas is today, has been shaped by his association with Balmond. Further, the later years of their collaboration display that their collaborative journey together also helped in the making of Balmond, the engineer-architect/designer. Thus, at this point the thesis exhibits the journey of creating 'two architects' - one from the engineering side to the architectural side and the other from a journalistic, film-maker side into being an architect, and one of the most influential of our contemporary times¹⁹¹. Additionally, Balmond as a theorizing engineer has been bestowed with a number of accolades including, the Riba Charles Jencks Award for Theory and Practice (2003), the Sir Banister Fletcher Prize for his book 'informal' (2005), the Thomas Jefferson Foundation Medal in Architecture (2014), the Officer of the Order of the British Empire for Services to Architecture (2015), etc. These accolades justify the large contribution that Balmond has made to the built environment, and also addresses the changing nature in the making of global architectural practice today.

The future of collaboration between architects and engineers can be made exemplary by the partnership of Balmond and Koolhaas. There have been a number of offshoots or think tanks through the legacy of Koolhaas/OMA in collaboration with Balmond/Arup like the Advance Geometry Unit (AGU) within Arup, started by Balmond; Balmond Studio, Balmond's own design firm; Non-linear Systems Organization (NISO), a research and design unit at the University of Pennsylvania, started by Balmond when he was a visiting professor; Architecture Media Office (AMO), started by Rem Koolhaas. These think tanks suggest that the ideas with which Balmond

¹⁹¹ Jeffrey Kipnis, 'Recent Koolhaas', *El Croquis*, no 79, 1996, quoted in, Rem Koolhaas and Véronique Patteuw, *Considering Rem Koolhaas and the Office for Metropolitan Architecture: what is OMA*, 6.

and Koolhaas worked on are being carried forward to be further explored in the contemporary ideas in the built environment.

Beyond this, it provides a re-reading of these built works of architecture to be shaped through the theoretical approaches of a conceptualizing structural engineer. Balmond's work warrants co-authorship and equal partnership with architects. This collaboration also highlights the significant career impacts on both these individuals. It challenges the long held notions of distinct disciplines and encourages interdisciplinary work early on to impact work, to generate new pedagogies, and dialogues in the practice of architecture. Further, it raises the questions of applying the idea of the 'informal', to other aspects in design, or in the conceptualization of architectural and urban designs. It calls to a deeper merger between the arts and the sciences, and encourages future innovative experimentation, as Balmond states, "*at the end, all of it is one, big, massive experiment.*"¹⁹²

¹⁹² Balmond Studio, "Cecil Balmond Hans-Ulrich Obrist Interview 5 of 7.avi," YouTube, December 09, 2010, accessed August 02, 2017, <https://www.youtube.com/watch?v=eLrMCotGLzM>.

SIDEBAR:

A: Interview with James Balmond:

In the interview at Balmond Studio in Colombo, Sri Lanka in the summer of 2016, James Balmond (Cecil Balmond's son) spoke with me regarding Cecil Balmond's projects, his conceptual ideas, and his role in the designs of these projects. Though the interview in part seemed like an opportunity to speak about the fairly newly formed studio, the work being focused on strong conceptual rigor was emphasized. Being the creative director of the Colombo office, the details of Cecil's Balmond's collaboration with Koolhaas was only briefly addressed. However, this visit and the interview provided details to further research connections and sources in London.

B: Interview Rob Corser:

The Interview with Prof. Rob Corser, Associate Professor at the University of Washington, Seattle revealed various facets of the workings of Cecil Balmond at the Advanced Geometry Unit (AGU) – the design research wing within Arup. Prof. Corser's year at the AGU as an architect provided for a proximal understanding of the application of design theories and design approach as envisioned by Balmond along with many of his co-contributors at Arup. Prof. Corser was particularly involved in the design of the Battersea Project in south London, a large multi-purpose land use redevelopment. This interview also helped justify and re-established the theories compared to the literature review done on the topic.

C: Interview with Hans-Eric Blomgren:

Mr. Hans-Eric Blomgren is a structural engineer who works for Arup in their Seattle office. He worked with MKA before his time at Arup. He was part of the team that built the Seattle Public library. Mr. Blomgren walked me through the many spaces within the library as he spoke about the construction details and the structural challenges that the team faced, but resolved. He spoke of how the large spans of staggered volumes in the library were resolved with the steel diagrid

structure with additional layering (thickness) and columns only when required, confirming the idea of the informal – going back to Balmond’s theoretical positioning of ‘opportunism’ in the conceptual notions of the ‘informal’. In regard to that, the almost ‘ad-hoc’ columns in the large spans of the library displays “*an approach to design that seizes a local moment and makes something of it.*”¹⁹³

¹⁹³ Cecil Balmond et al., *Informal*, 220-221.

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IMAGE CREDITS

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- Image 54: Richters, Christian for OMA, *Interior of the Casa da Musica*, Source: <http://oma.eu/projects/casa-da-musica>, Accessed May 05, 2017.
- Image 55: Joy, Babita *Exterior of the Casa da Musica*, Digital photograph, August 2017.
- Image 56: OMA, *Image of the commemorative model of the Casa da Musica in a flattened, foldable format*, Source: <https://www.archdaily.com/619294/casa-da-musica-oma/552c914fe58ece2cfd0001c1-diagram>, Accessed December 10, 2016.
- Image 57: Joy, Babita, *Interior of the Casa da Musica*, Digital photograph, August 2017.
- Image 58: Balmond, Cecil, *Balmond's sketches of the Casa da Musica*, Cecil Balmond et al., *Cecil Balmond = Seshiru Barumondo*. Tokyo: A + U, 2006, 268, 269.
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