AUGMENTING ACCESS & MOBILITY

DESIGNING FOR THE PROSTHETIC HUMAN

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DEDICATION

TO DIEDERIK STRUIJCK

Your journey is numinous - I remain fearful yet fascinated.

I hope you are left feeling free by the ideas presented in this thesis.

ACKNOWLEDGEMENTS

Chris Moller, you are a force to be reckoned with. Your energy is whirlwind and this had made my final years so stimulating. Thank you for your continued support, passion and dedication. I have really appreciated your attitude, your in-depth thinking and thought-provoking responses.

To Simon, thank you for your provision of this thesis.

To my family - freedom fighters - thank you for your relentless love and support over the last six years. It has been invaluable.

To all my friends, thank you for making these years the best so far.

To Sammy, thank you for your love, faith and patience. It is beyond amazing having you beside me through everything.

ABSTRACT

With the needs of the disabled person at the forefront of research and design, this thesis questions how the 'Prosthetic Human' can be an architectural catalyst to augment access and mobility. Access and Mobility is identified as an underdeveloped field of architectural enquiry. To improve how disabled individuals experience space, this thesis investigates and tests access and mobility through the lens of design. This thesis extends to the notion of access and networks as defined by Jeremy Rifkin through an architectural exploration into innovation centres. Workplace design strategies directs the design process to formulate stimulating environments that facilitate creative and reflective thought. The theoretical frameworks of Marquard Smith and Joanne Mora, Elizabeth Wright and Mark Wigley, concerning post-human conditions are critically discussed and theoretical notions are transposed into design investigations that explore the building as a prosthetic entity. Specifically, this thesis introduces the disabled body – The Prosthetic Human – as a new figurative referent and proportional system in the design of architecture. Corbusian principles and methods are examined and appropriated for the Prosthetic Human. The proportions of the Prosthetic Human informs the architecture at macro, messo, and micro scales. This research finds that by designing for the Prosthetic Human, the architecture is, holistically representative of a body that requires enhanced access and mobility within space. The research is purposeful; the process celebrates difference and in turn, a calm and embracing architecture is presented in hope for those impaired to be free from spatial discrimination in our environment.

CONTENTS

INTRODUCTION

Twenty percent of New Zealand's population has some kind of disabling condition.[1] For impaired individuals, the lack of access and mobility in the built environment directly affects their experience and quality of life.[2]Disability is a multi-faceted phenomenon, covering physical and mental impairments, activity and situational limitations, either temporary or permanent.[3] The term 'disabled' even extends to feelings of being unable, incapable or not competent to carry out tasks in certain situations. It is in these situations individuals feel disadvantaged, excluded and feel discriminated against in everyday life.[4] The New Zealand compliance document *Designing for Access and Mobility – Buildings and Associated Facilities* states that 'architectural barriers cause the most difficulty in respect to access, not only for people with disabilities but also for…the very young and the elderly."[5] The document advocates the need to apply the concepts of accessibility, approachability and usability in design to arrive at universal buildings.[6] However, discrimination in the built environment still exist, as only the minimum functional and

1 New Zealand. Department of Building and Housing, *Compliance Document for New Zealand Building Code: Clause D1,Access Routes*, 15.

2 "Disability Access Upgrades Scrapped - Story - Campbell Live - TV Shows - 3 News."

3 "WHO | Disabilities."

4 Fischer and Meuser, "Projects," 13.

5 Standards New Zealand, *Designing for Access and Mobility: Buildings and Associated Facilities: Superseding NZS 4121:1985 and NZMP 4122:1989*, 7.

6 Ibid., 8.

Figure 1. *Entry to shop with stair access only.*

Figure 2. *Accessible ramp blocked off.*

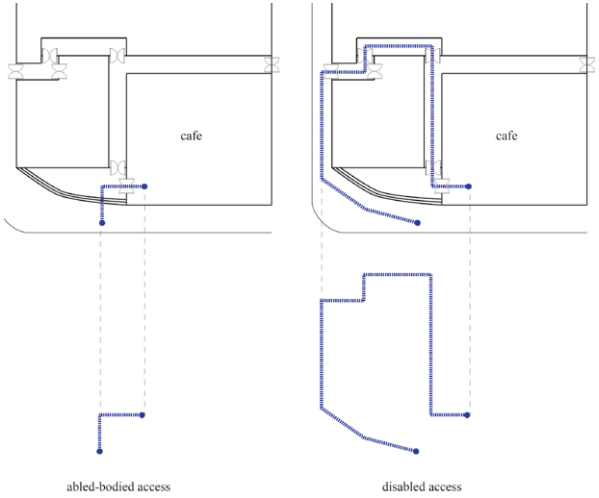

Figure 3. *Movement map for abled and dis-abled.*

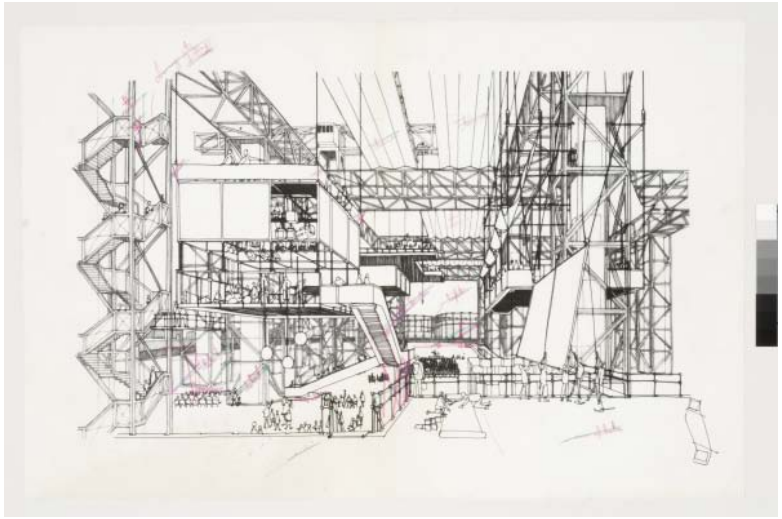

Figure 4. Open Buildings. "Fun Palace." *Open Buildings: Buildings*, 2011. http://openbuildings.com/buildings/fun-palace-profile-39265#!buildings-media/5.

performance requirements are followed, which creates spatial layouts insensitive to the disabled user.

Access and mobility is identified as a field that is undeveloped in terms of architectural enquiry. This current lack of design research surrounding access and mobility in architecture will be used as a constructive rudimentary point from which this thesis will progress. Cedric Price and Archigram were agitated by Modernistic sterility and lack of human consideration. Price's *The Fun Palace* exercised the idea of inter-accessibility through exploitation of technology, multiplicity of services and flexibility in use.[7] Ryston Landau reflected Price's work and concluded that "the bureaucratization of modern architecture as widely found in the British Public Sector was revealing an insensitivity to individual difference and showed no awareness of the possibilities of individual human potential. People had been reduced to standards, and standards had been further reduced to economics. The modern movement had espoused an enterprise which demanded a deterministic restrictiveness and left no room for individual movement."[8]

7 Price, *Cedric Price: Works 2 Architectural Association*, 7.
8 Landau, "A Philosophy of Enabling," 11.

This research is a design-led enquiry, adopting "research for design" and "research through design" reference[9]. Research for design explores topics such as access and mobility, innovation and prosthetics to increase disability specific knowledge. This research helps to develop an understanding from which to explore, test, and extend ideas in the design form (research through design). The investigation is further enriched by explorations into prosthetics and anthropometric models. Prosthetics as the 'domino variation'[10] introduces new principles into the architectural field to unlock new ways of thinking and defines new parameters that extend architectural capability.[11] The architectural outcomes are exhibited in the design of an innovation centre, situated in Seaview Marina, Petone.

RESEARCH INTENTION

The main intention of this thesis is to research how access and mobility in architecture can become more universally inclusive. It proposes an anthropometric return in architecture with the introduction of the Prosthetic Human that defines new geometric proportions to be applied design of architecture.

THESIS STRUCTURE

This thesis investigates and tests access and mobility through the lens of design. The research follows a design research methodology. By investigating into phenomena such as circulation, innovation, prosthetics, anthropomorphic models, and analyzing a series of small case studies, specific principles are isolated. The principles are tested and transposed into spatial conditions through analogue and digital modelling. Subsequently, a design discussion examines the success and limitations of the design iteration from which the final design objectifies. The testing ground is an innovation centre, situated in Seaview Marina, Petone, which is enriched by explorations of the prosthetic human.

The structure of this thesis is divided into six chapters. *Chapter One: Access and Mobility in Architecture* explores circulation and the importance of access and mobility in architecture. The research into six different case studies outline how architects have designed for movement through space and integrated circulation devices into the spatial fabric. Principles learnt in this chapter are further extended into the design of the first iteration.

C*hapter Two: Site* introduces Seaview Marina as the site for further architectural investigations. The design process will respond to contextual and environmental conditions uncovered through site analysis.

Research into local building plans prescribe the need for more innovative industries which leads into *Chapter Three: Innovation Environments*. This chapter offers insights into innovation and how spatial conditions facilitate and enable creative thought. The research provides fundamental principles that will be spatially explored in the second iteration of the design.

9 Downton, *Design Research*, 39.
10 Ibid., 8.
11 Ibid., 7.

Figure 5. Fischer, Joachim, and Meuser Philipp. *Construction and Design Manual: Accessible Architecture*. Singapore: Page One, 2009. 4

Chapter Four: Extension through Prosthetics aims to develop an understanding of prosthetics and prosthetic theory to extend the emergence of architectural space that is designed as a prosthetic entity.

Chapter Five: Vitruvian Man, Modular Man and the Prosthetic Human is an enquiry into the history of the body's relationship with architecture. The investigation provides context for the introduction of the Prosthetic Human as the new anthropomorphic model from which to design architecture.

Chapter Six: Final Design reviews and refines the design iterations into a concluding design.

Chapter Seven: Critical Design Discussion will discuss feedback from reviewers through the design process and ends with a series of critical conclusions that situate the research within the current accessibility field and define further development from this research.

The scope of this thesis has been narrowed to focus on a particular type of disabled body and the resulting architecture has been designed to cater for these types of bodies – a body in a wheelchair. The research concludes that by challenging access and mobility and introducing the Prosthetic Human, the design and discursive component presents scope to further develop the concept of accessibility that embraces emancipatory drives for all disabilities.

CHAPTER ONE: ACCESS AND MOBILITY IN ARCHITECTURE

This chapter describes current attitudes and examples of access and mobility in architecture. In this thesis, access and mobility of architecture will be explored through circulation – the perceptual thread that connects interior and exterior spaces of the building. Interface fluidity and continuous movement routes, in both horizontal and vertical directions, optimize the flow of people and spatial experience. The aim is to engage in a critical discussion around four case studies that are exemplary studies in accessible architecture and projects that portray the building itself as movement. In each case study the sensibility of designing for movement through space and between thresholds and the integration of circulation devices into the spatial fabric of the building is analysed.

A building usually has a series of interfaces and transitions through different situations. Overcoming these transitions is a question of access and mobility. Functional linking devices such as travelators, escalators, lifts, stairs and ramps enable horizontal and vertical access through a building. However, the New Zealand Standard NZS4121: *Designing for Access and Mobility* highlight ramps, lifts, hoists, powered lifting platforms and powered stair lifts as devices that help facilitate movement for those individuals with a disability.[12] The Standard further prompts that accessible architecture should encompass "accessible routes" that are continuous and unobstructed with a minimum width of 1200mm.[13]Any powered devices are non-operational in an event of a fire. This means that wheelchair users have no other means of escape.

It is necessary to interrogate fire egress issues through design to ensure individuals, with limited mobility, can safely evacuate the building through a continuous route. The design component will experiment the use of accessible devices to ensure ease of movement through the building and to allow a continuous accessible route to allow occupants to safely escape the building. The case studies were selected because they engage with this idea of 'accessible routes' with a specific use of innovative solutions. The circulation explorations provide ideas that expand into the architecture through the first design iteration.

12 Standards New Zealand, *Designing for Access and Mobility: Buildings and Associated Facilities: Superseding NZS 4121:1985 and NZMP 4122:1989*, 5–6.

13 Ibid., 20.

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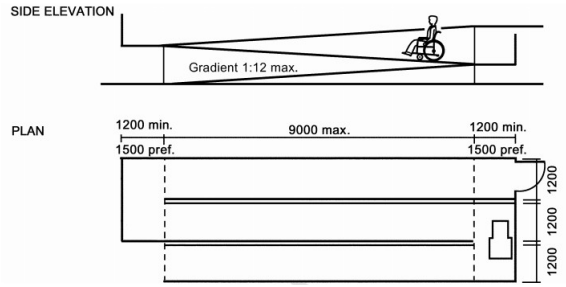

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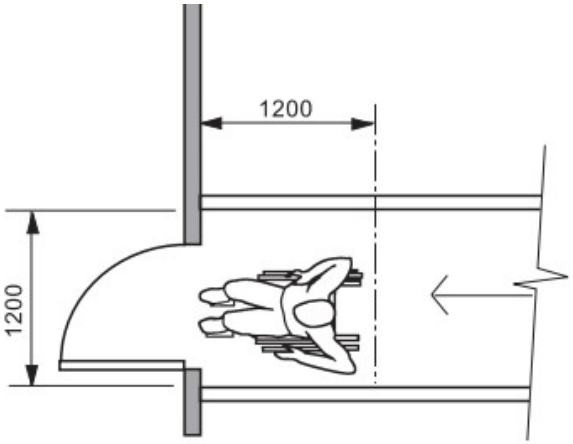

Figure 6 & 7. Standards New Zealand. *Designing for Access and Mobility: Buildings and Associated Facilities:* Superseding NZS 4121:1985 and NZMP 4122:1989. Wellington, New Zealand: Standards New Zealand, 2001. 34,37

SINGLE FAMILY HOME / FLORIAN HOFER

Florian Hofer designed the 'Single Family Home' for his client Roman Schnellbach, who had previously survived a fatal accident which left him paraplegic and confined to a wheelchair. His brief was to design a single-family home devoid of unnecessary obstacles, with maximized space, to incorporate flush thresholds and wheelchair-friendly hardware, and for the design to be an artistic solution that does not portray a medical sensibility[14]. Hofer aimed to create a house that would give his client "wings despite being wheelchair-bound".[15]The result is a two-storey home, featuring a ramp that is a dominant feature in the internal layout and expressed on street-side elevation. The window treatment mimics the slope of the ramp to showcase circulation of the building. The success of the architecture lies in the idea that the wide ramp and the elevator are the only means of circulation modes meaning that all occupants use the same movement pathways. The Single Family Home is universal as all occupants use the ramp and the visual accentuation of circulation routes exemplifies an architecture that does not spatially discriminate. These two principles facilitate ease of movement through space which will be further investigated in the design component.

14 Fischer and Philipp, *Construction and Design Manual: Accessible Architecture*, 123.

15 Ibid., 126.

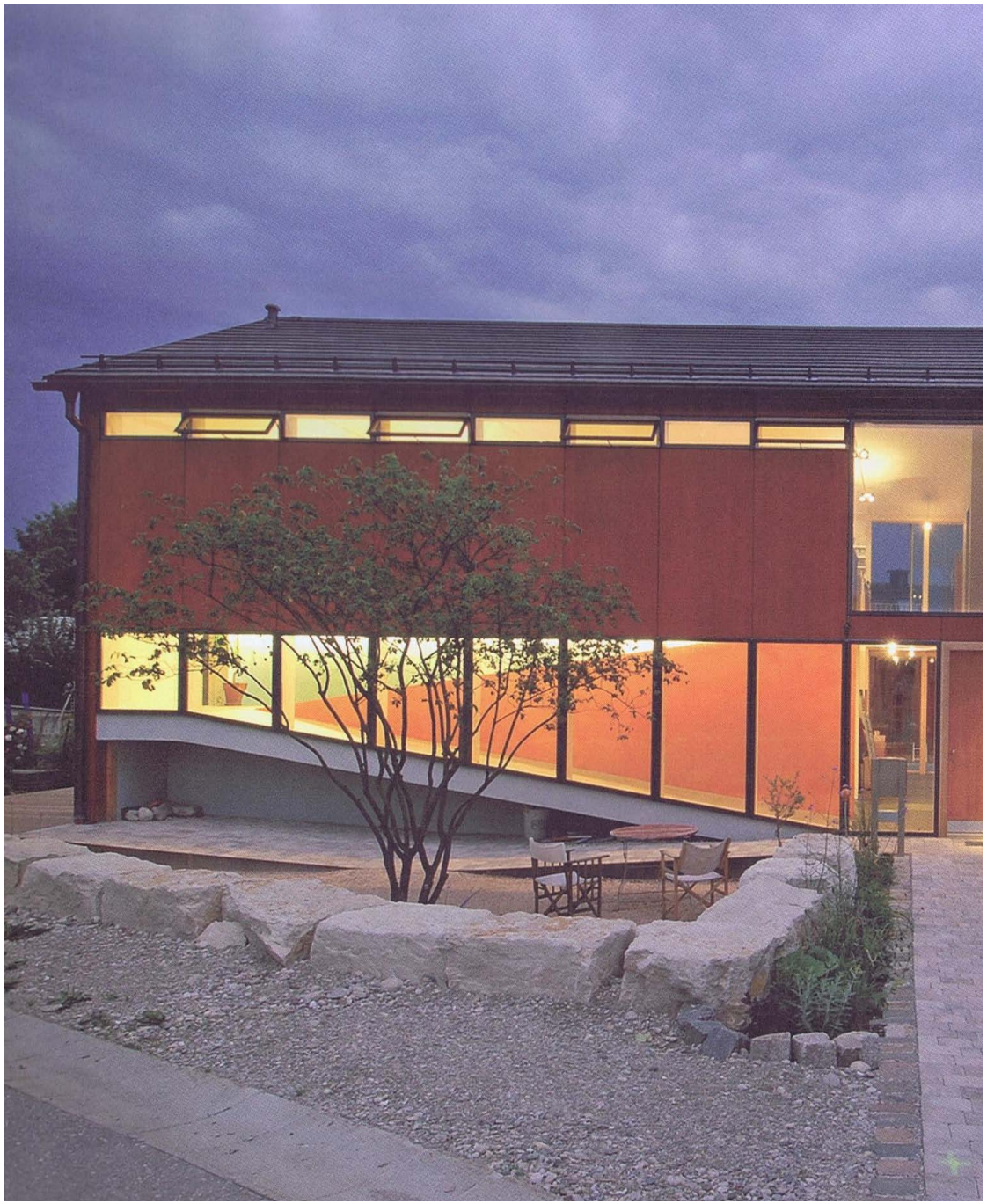

Figure 8. Fischer, Joachim, and Meuser Philipp. *Construction and Design Manual: Accessible Architecture*. Singapore: Page One, 2009. 132

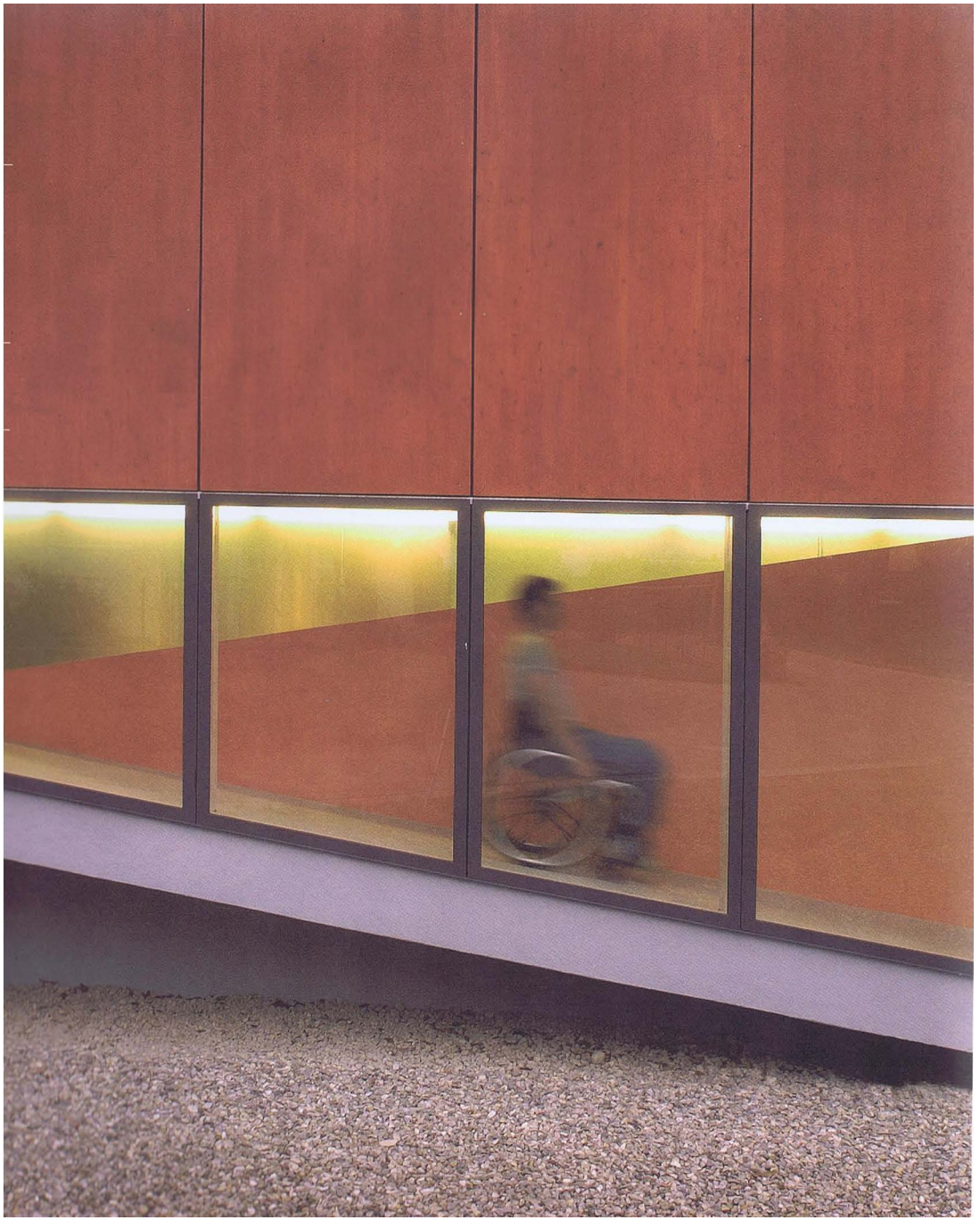

Figure 9. Fischer, Joachim, and Meuser Philipp. *Construction and Design Manual: Accessible Architecture*. Singapore: Page One, 2009. 120

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Figure 10 & 11. Fischer, Joachim, and Meuser Philipp. *Construction and Design Manual: Accessible Architecture*. Singapore: Page One, 2009. 134-135

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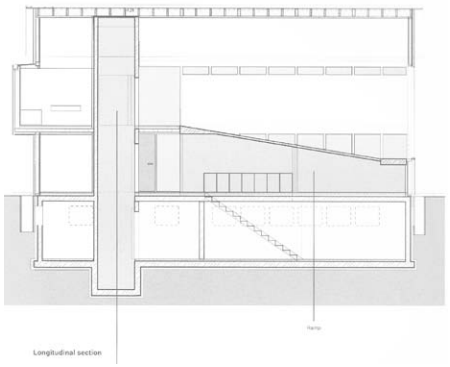

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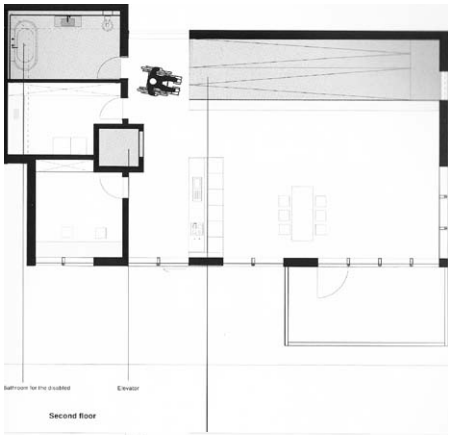

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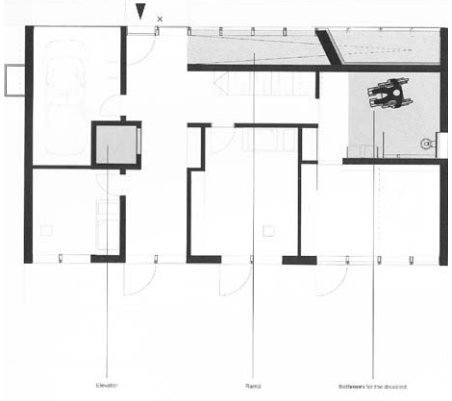

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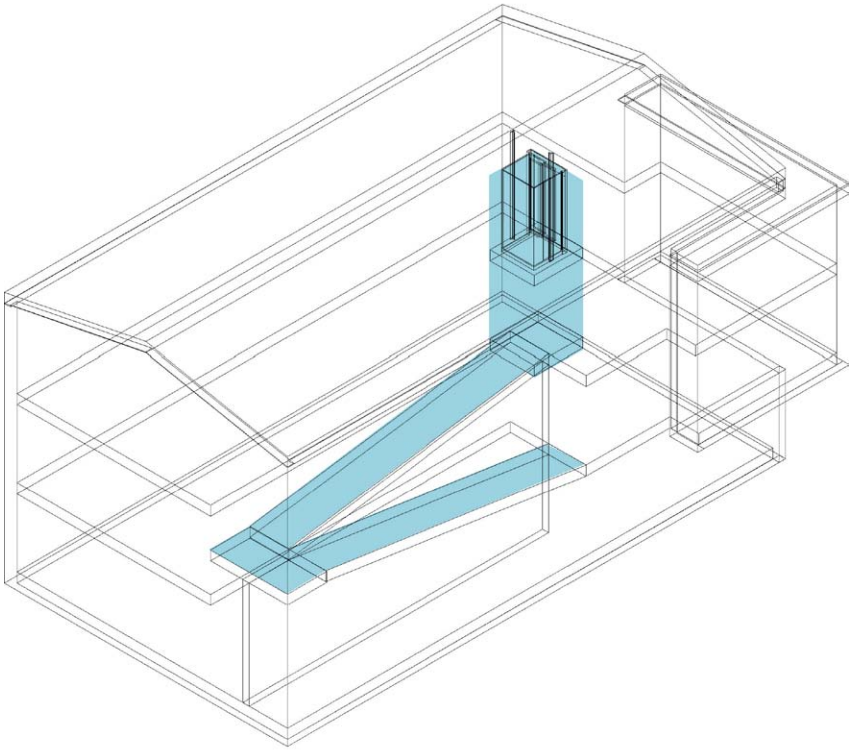

Figure 12-14. Fischer, Joachim, and Meuser Philipp. *Construction and Design Manual: Accessible Architecture*. Singapore: Page One, 2009. 131,128,129

Figure 15. *Circulation integration within spatial fabric.*

BORDEAUX HOUSE/ REM KOOLHAAS

A French publisher, left confined to a wheelchair after a serious car accident, commissioned Rem Koolhaas to design a house that was suitable for the needs of himself and his family.[16] The client approached Koolhaas stating: "I do not want simple house. I want a complex house, because the house will define my world."[17]The circulation of the house became the design parti. The house was designed for maximum mobility in response to physical and psychological needs of the client where the house "compensates for the heavily imposed restrictions on the client's life, and allow for an inhabitation of the house in the imagination as well as by the body."[18] The house features a three by three and a half metre moving platform, referred to as the 'heart of the house', which vertically links the client to the kitchen, living space and master bedroom. The movement of the platform creates an architecture that is in a state of flux and, strikingly, showcases a feature that gives increased mobility and freedom for the user. This idea of a building as a machine, composed of moving elements is an approach that will be further explored in *Chapter Four: Extension through Prosthetics* and the subsequent design iteration testing prosthetic conditions.

16 Ibid., 189.
17 Melhuish, *Modern House 2*, 95.
18 Ibid.

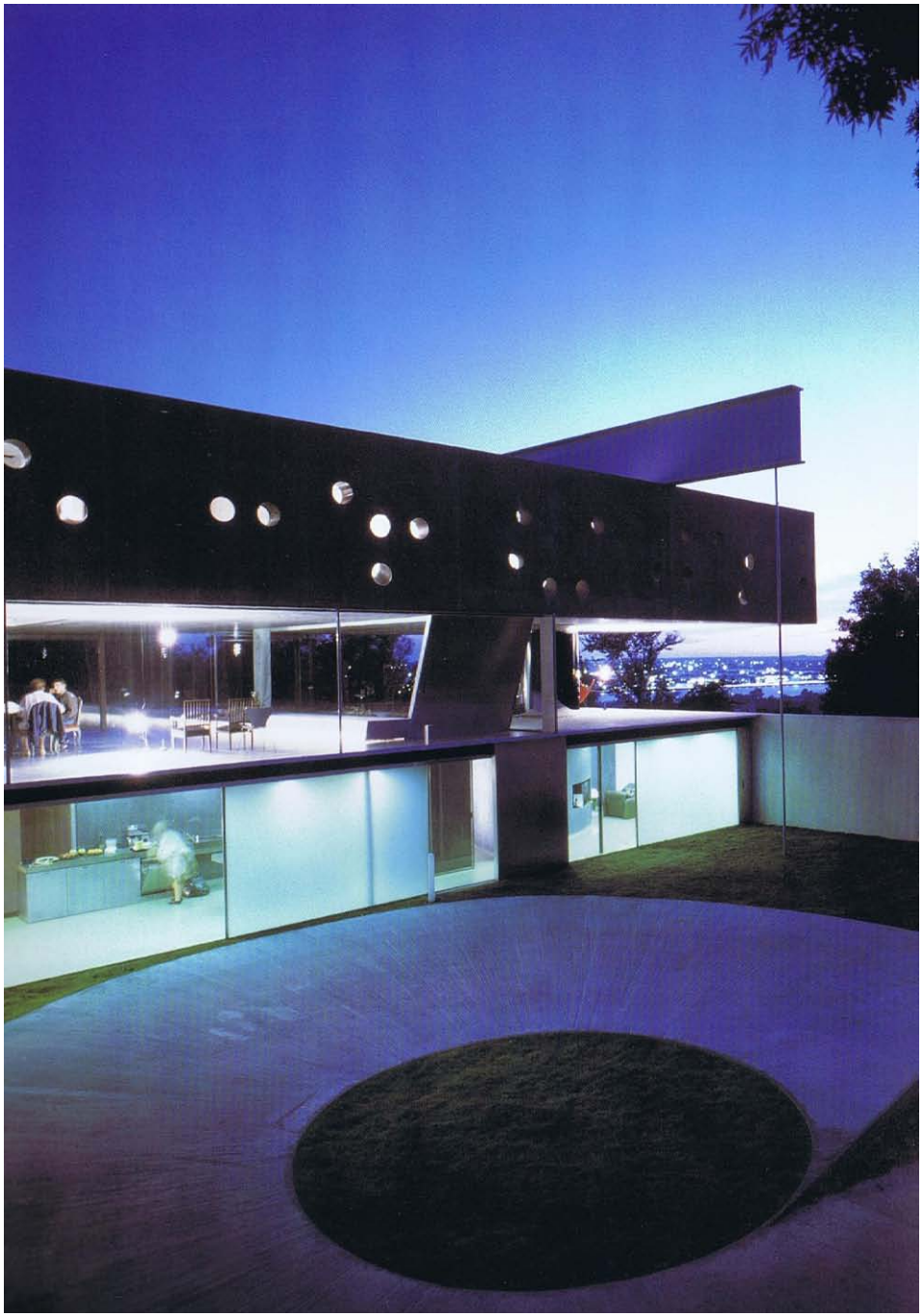

Figure 16. Melhuish, Clare. *Modern House 2*. London: Phaidon, 2000. 94

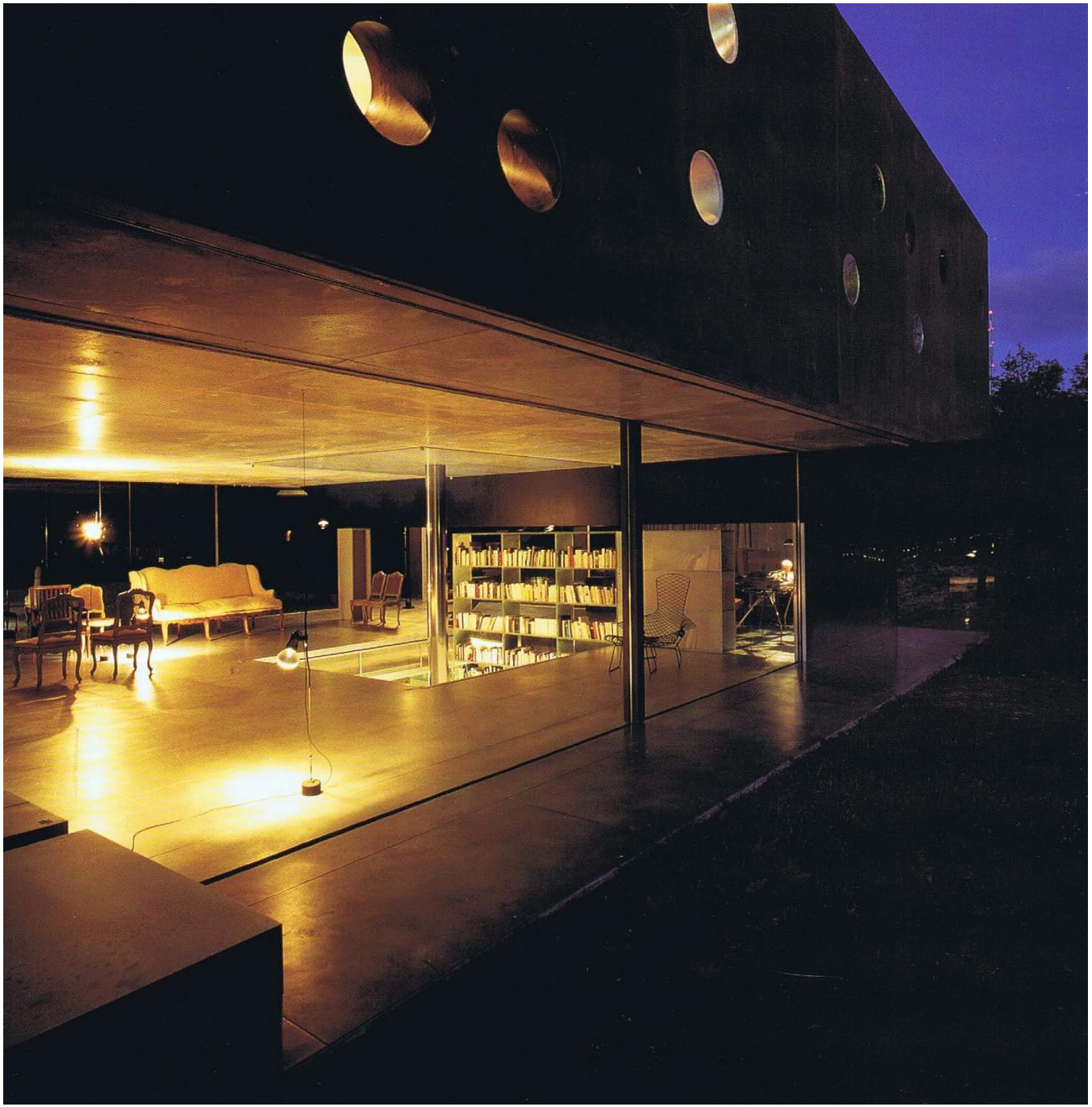

Figure 17. Melhuish, Clare. *Modern House 2*. London: Phaidon, 2000. 99

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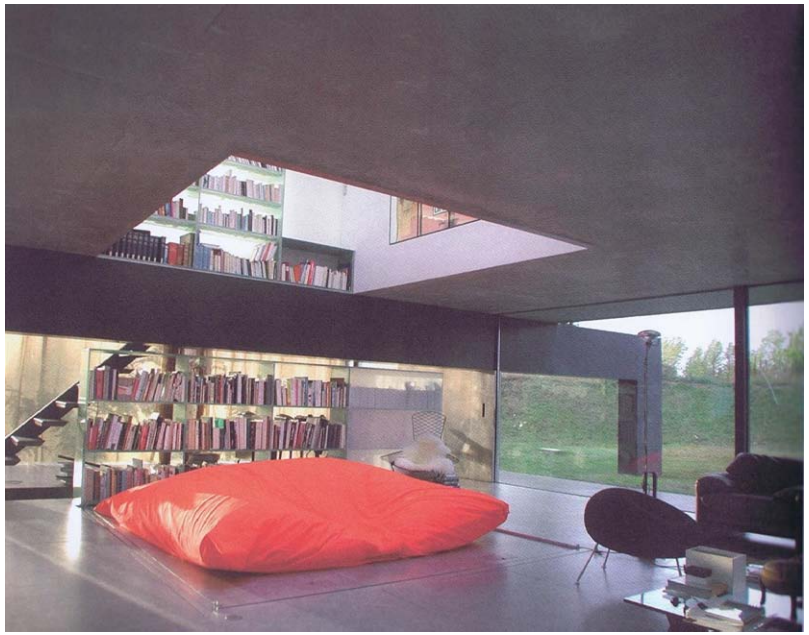

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Figure 18 & 19. Fischer, Joachim, and Meuser Philipp. *Construction and Design Manual: Accessible Architecture*. Singapore: Page One, 2009. 193, 196

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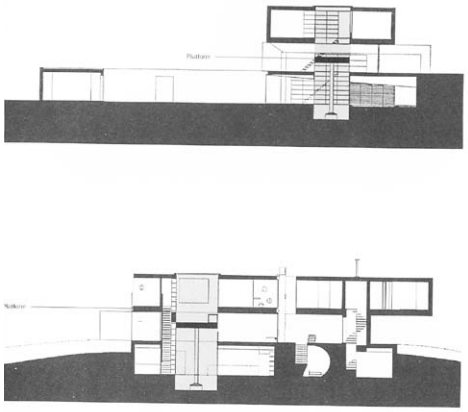

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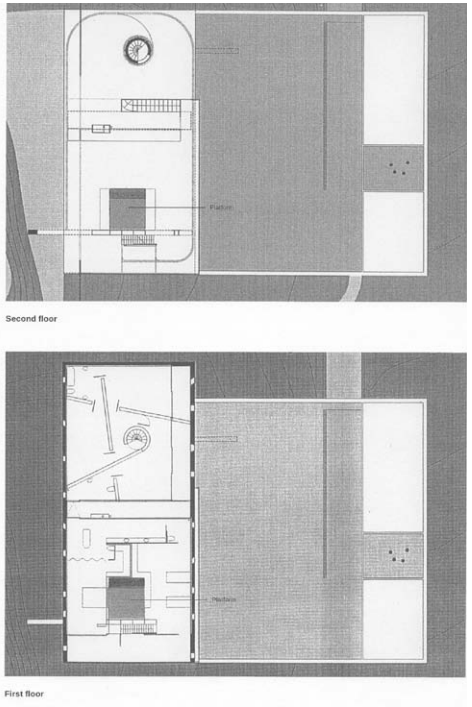

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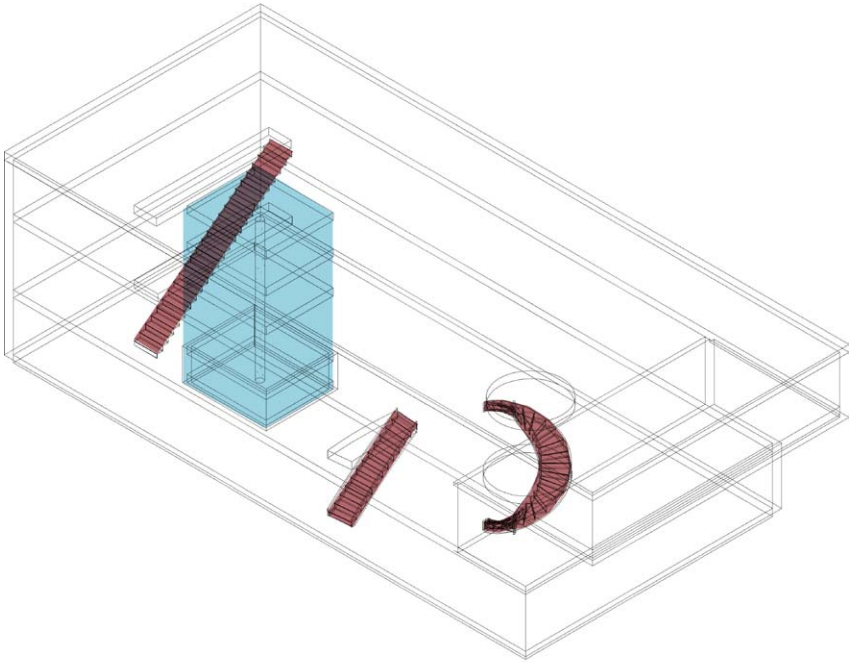

Figure 20 & 21. Fischer, Joachim, and Meuser Philipp. *Construction and Design Manual: Accessible Architecture*. Singapore: Page One, 2009. 190-191

Figure 22. *Circulation integration within spatial fabric.*

SOLOMON R. GUGGENHEIM MUSEUM / FRANK LLOYD WRIGHT

Frank Lloyd Wright's Solomon R. Guggenheim Museum, distinctly contrasts New York's rigid geometry against its inherent plasticity of organic and fluid form through the coil form. The hardware of the architecture is a curvaceous inverted ziggurat, constructed from white rendered reinforced concrete, which coils into the sky.[19] A continuous ramp circles the atrium and connects all six stories in one fluid thread. In terms of software, Wright's vision was to "whisk" visitors to the very top of the museum in an elevator so visitors could, then, descend through the building along the continuous ramp. The procession allowed the visitor to experience and focus on contemporary art, without losing awareness of other visitors before and behind them. The open ramp allows visitors to see several bays of work on different levels at one time, heightening visual access of space.[20] The exploitation of the ramp presents a sense of grandeur and complements the circular form of the building. The sense of grandeur is not well planned in the holistic experience of the building due to dismal location and size of the elevators. The design would have been more successful if the ascend to the top of the rotunda was as overwhelming as the descent through the building.

19 Drutt, "The Frank Lloyd Wright Building."
20 Perez, "AD Classics."

Figure 23. Drutt, Matthew. "The Frank Lloyd Wright Building." *Guggenheim: New York: About,* 2015. http://www.guggenheim.org/new-york/about/frank-lloyd-wright-building.

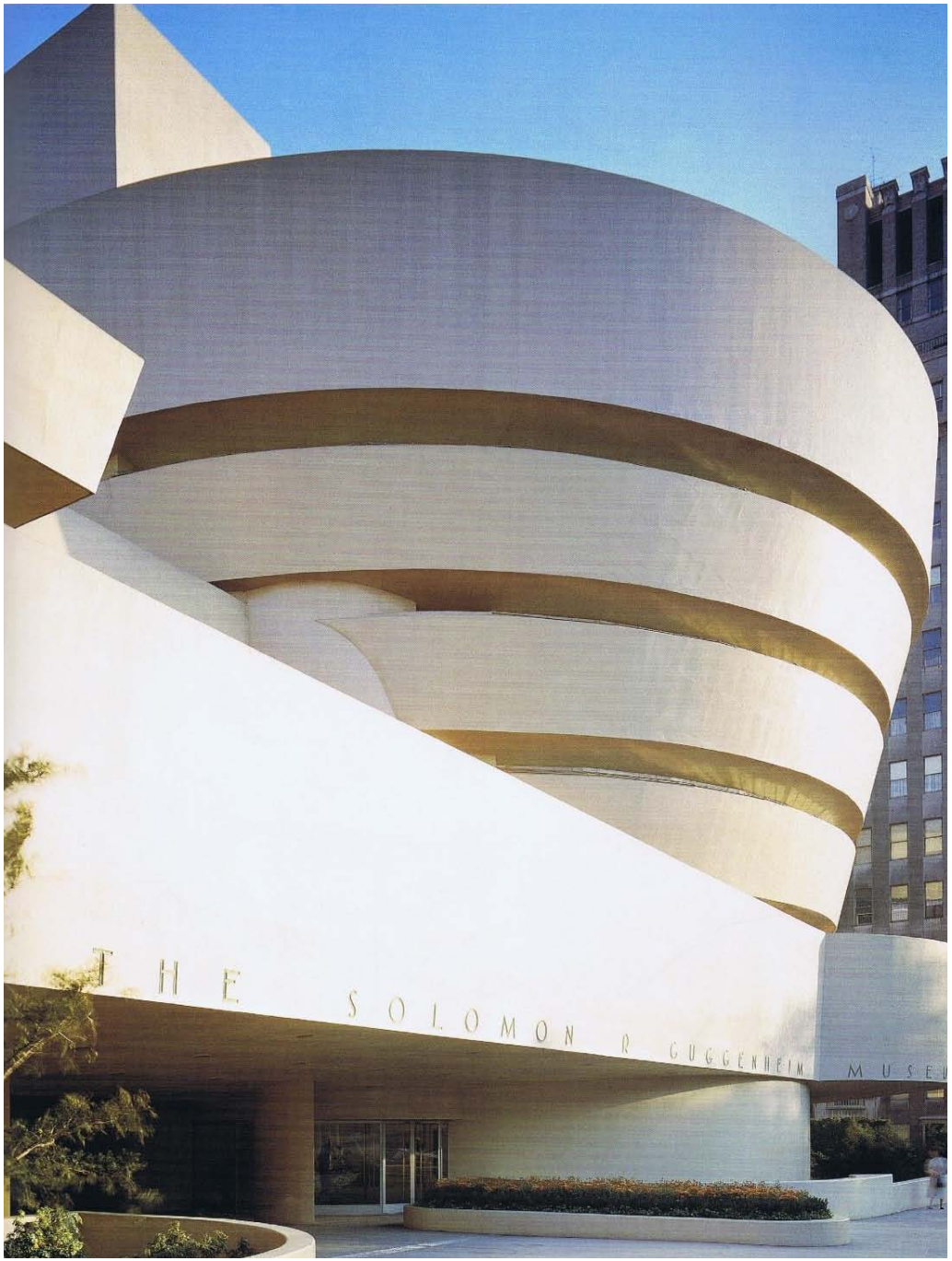

Figure 24. Sewing, Werner. *Architecture: Sculpture*. Munich, London: Prestel, 2004. 39

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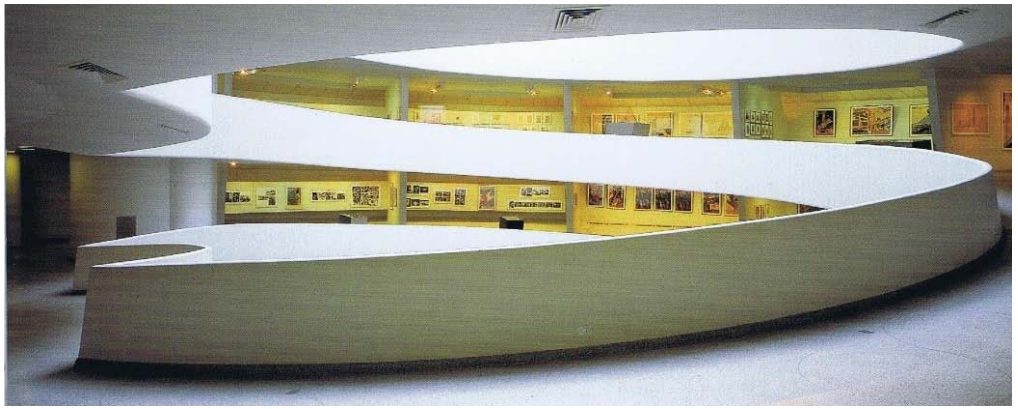

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Figure 25. Baron, Robert. “Against Nature: An Exhibit of Architectural and Landscape Photography.” *Gallery 44*, 2007. http://www.studiolo.org/pix/gallery44.htm.

Figure 26. Sewing, Werner. *Architecture: Sculpture*. Munich, London: Prestel, 2004. 38

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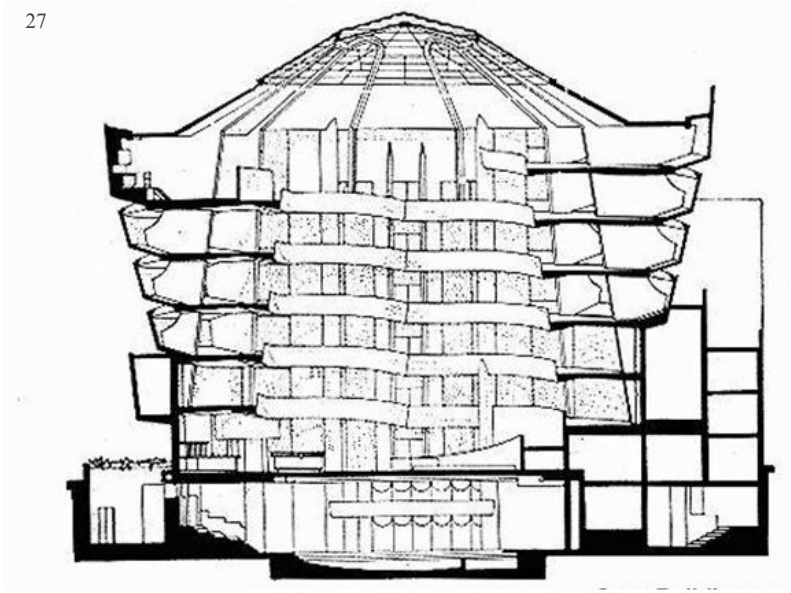

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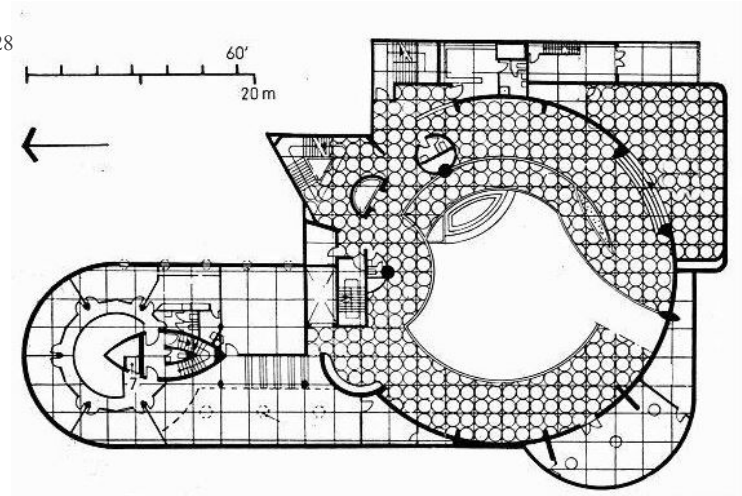

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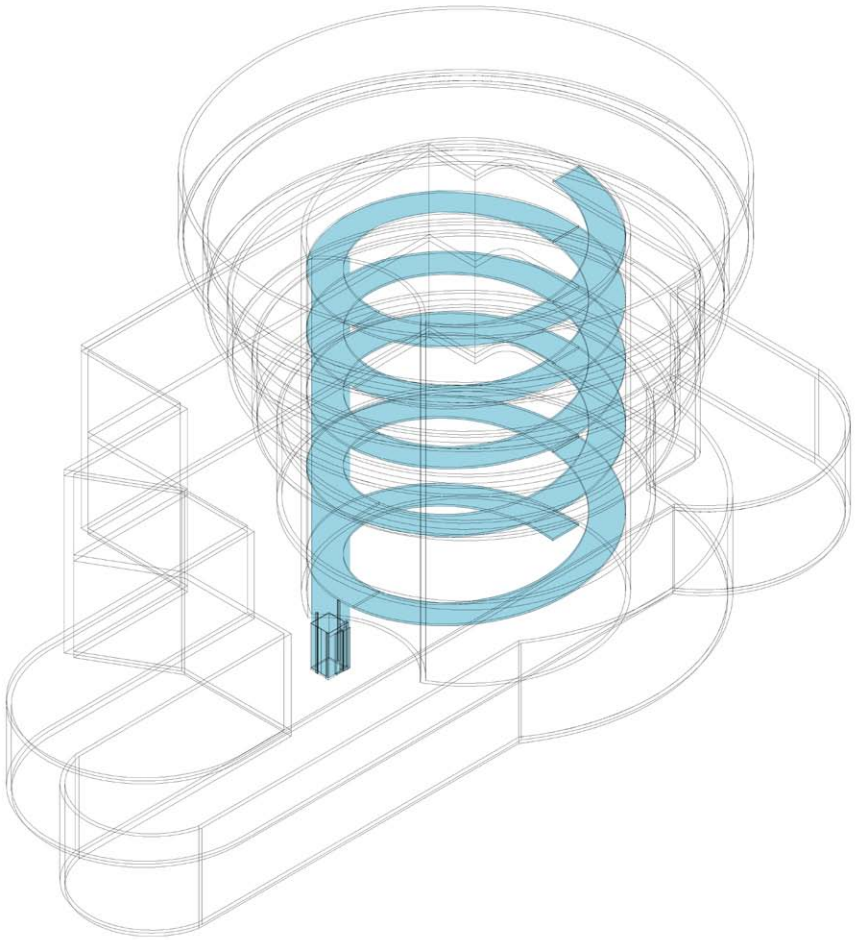

Figure 27 & 28. Perez, Adelyn. “AD Classics: Solomon R. Guggenheim Museum / Frank Lloyd Wright.” *ArchDaily*, 2010. http://www.archdaily.com/60392/ad-classics-solomon-r-guggenheim-museum-frank-lloyd-wright/.

Figure 29. *Circulation integration within spatial fabric.*

VILLA SAVOYE / LE CORBUSIER

The Villa Savoye's composition creates an endless series of spatial relationships where interfaces are dealt with elegance and fluidity. In this design, the ramp is a prominent feature and is representative of the machine age. Celebrating the industrial principle of efficiency, Le Corbusier extends the function of the ramp from a vehicular ramp to a pedestrian ramp. The ramp is a promenade from the ground floor to the open-air rooftop, presenting both a gentle turning ramp to flow into a rectilinear form. It causes visitors to slow their pace and enjoy their experience of meandering through space.[21] The design is particularly compelling as the architecture provides continuous movement through differing levels and spaces of the building.

21 Kroll, "AD Classics: Villa Savoye/ Le Corbusier."

Figure 30. Kroll, Andrew. "AD Classics: Villa Savoye/ Le Corbusier." *Archdaily,* 2010. http://www.archdaily.com/84524/ad-classics-villa-savoye-le-corbusier/.

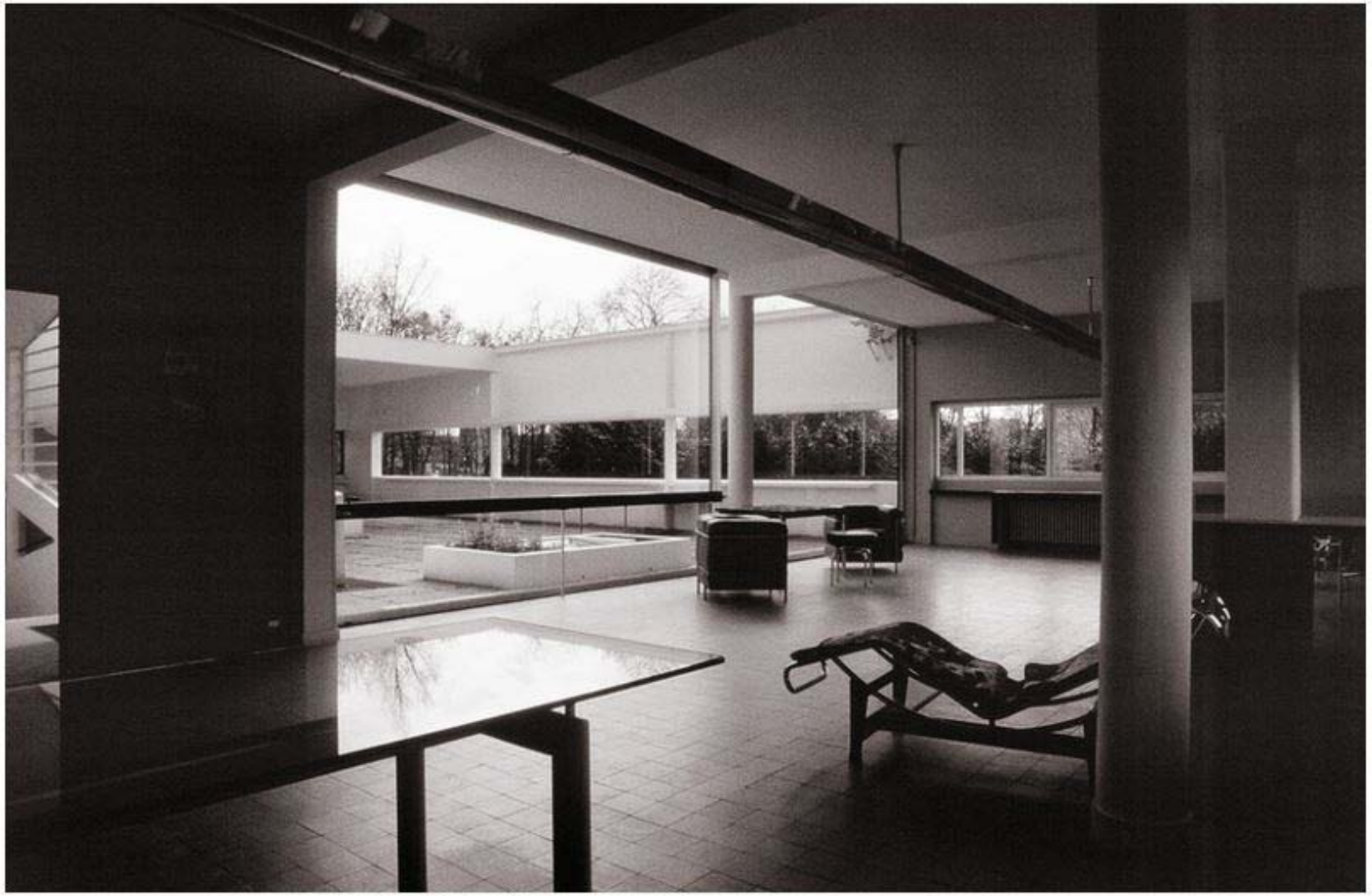

Figure 31. Kroll, Andrew. “AD Classics: Villa Savoye/ Le Corbusier.” *Archdaily,* 2010. http://www.archdaily.com/84524/ad-classics-villa-savoye-le-corbusier/.

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Figure 32 & 33. Kroll, Andrew. “AD Classics: Villa Savoye/ Le Corbusier.” *Archdaily*, 2010. http://www.archdaily.com/84524/ad-classics-villa-savoye-le-corbusier/.

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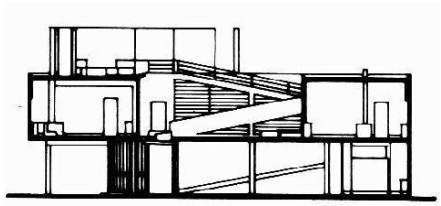

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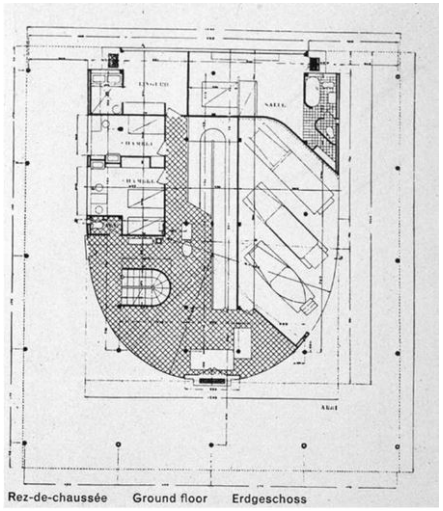

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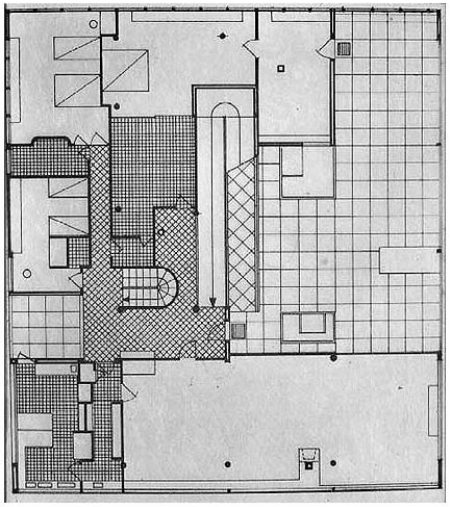

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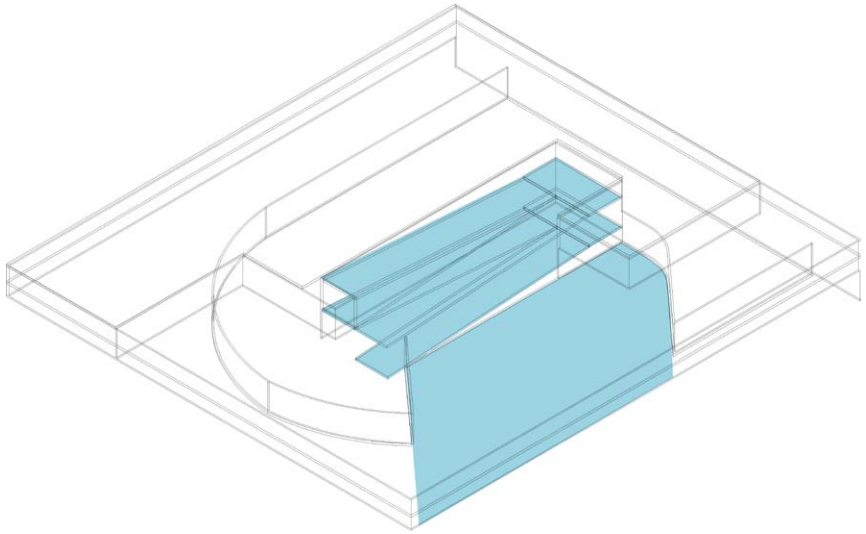

Figure 34-36. Kroll, Andrew. “AD Classics: Villa Savoye/ Le Corbusier.” *Archdaily*, 2010. http://www.archdaily.com/84524/ad-classics-villa-savoye-le-corbusier/.

Figure 37. Circulation integration within spatial fabric.

CASE STUDY CONCLUSION

The case studies exemplify fluid transitions through space which enables ease of movement. Ramps and lifts are the dominant features in the architecture as they deeply embedded within the spatial fabric of the building. The centrally located circulation devices brings access and mobility, for all users, to the forefront. The exaggeration of the ramp, internally and externally, will be further developed in the succeeding design iteration.

ITERATION ONE: DESIGN DISCUSSION

The first iteration tests how the ramp can inform architectural form and can operate as a promenade through space and a means of fire egress. The amalgamation of these ideas fosters an accessible architectural expression. As a departure point, conventional ramps are identified. The ramp is, essentially, an inclined plane that is free-flowing in form. Experimentations into the interaction between two inclined planes informs the geometry and layout of interior space. The design iteration encompasses a simplistic yet rigid geometry with an interior and exterior circulation thread that provides ease of movement and fire egress. The geometry moves away from the medical sensibility, often associated with ramps, and moulded into sculptural realms identifiable with the Guggenheim. A limitation of this iteration is that the experimentation purely focused on the initial aesthetic of the building. The design is not follow New Zealand Building Code access compliance requirements in terms of width, slope or required interval landings between inclines. Further development of the ramp will arrive at a ramp design that is aesthetically pleasing, functional and attains performance criteria.

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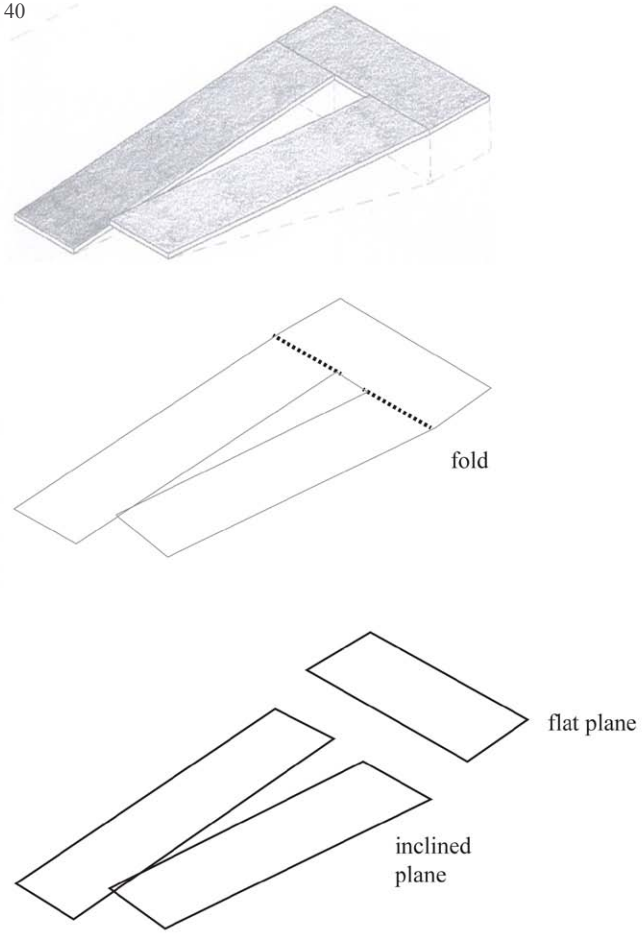

Figure 38. *Conventional ramps.*

Figure 39. *Ramp as inclined planes*

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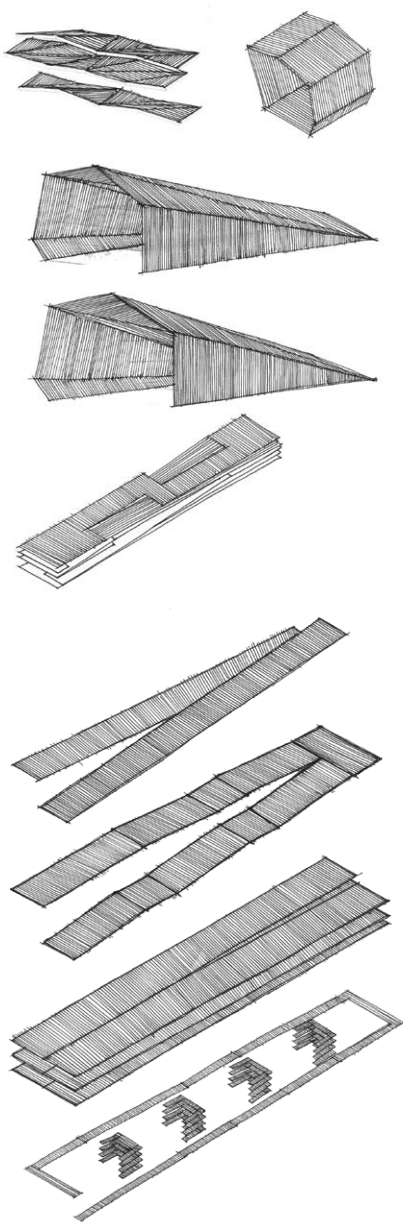

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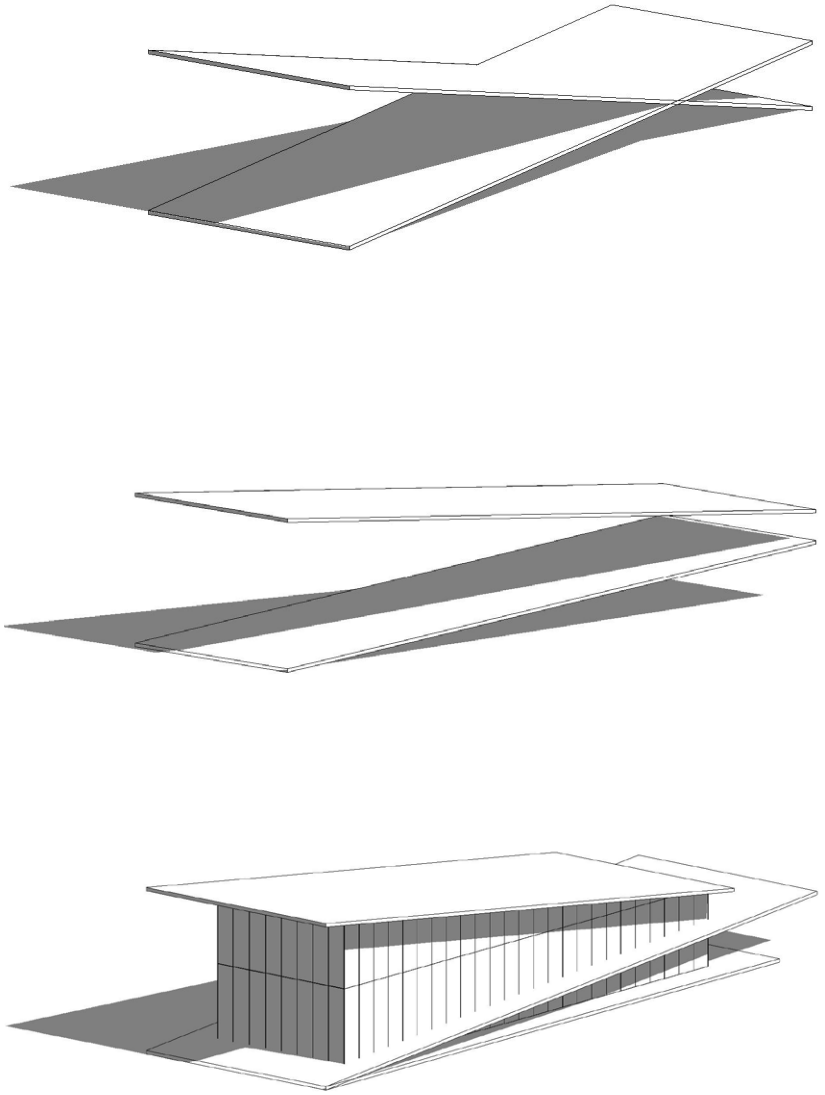

Figure 40. *Iterations of inclined planes as roof, wall, roof, and circulation,*

Figure 41. *Development of inclined plane as architecture.*

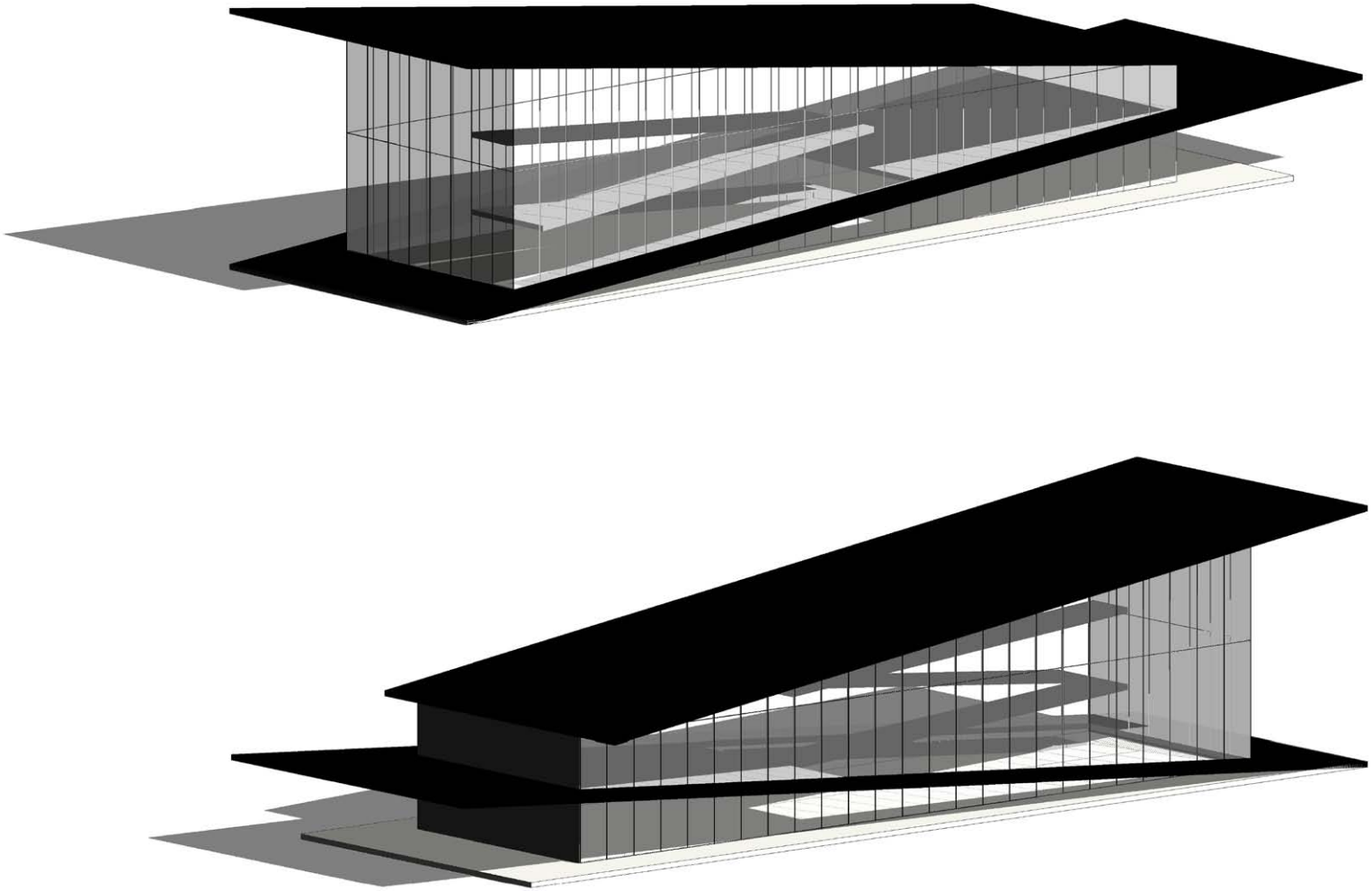

Figure 42. *Architectural form accentuating inclined plane.*

CONCLUSION

This chapter considered circulation and researched the importance of access and mobility in architecture. The exploration of four case studies analysed how architects have designed for movement through space and the integration of circulation devices into the spatial fabric. The expression of circulation as the dominant aesthetic o denote ease of movement through space. The first iteration arrives at a simple yet sculptural aesthetic and forms the geometric form of the architecture. This iteration develops the base building from which further ideas can be forged into. The following chapter will introduce the site that will serve as an architectural testing ground for this thesis.

CHAPTER TWO: SITE

This chapter introduces the marina in Seaview Gracefield, Wellington as an architectural testing ground and outlines contextual and environmental conditions that the design should negotiate. The aim is to respond to the particularities of the site to help define and enhance aesthetics, functionality and usability of the prosthetic architecture proposal.

Seaview Gracefield is an opportunity for architectural experimentation to revitalize the areas historical success in industry, research and technology. Its uniqueness lies in industrial and research facilities; large flat topography, accessibility to transportation modes, close proximity to collaborate with "like-minded" businesses; access to local industrial raw materials, technology; and labour.[22]

The surrounding architectural context has an industrious aesthetic with long, narrow forms and a strong use of steel, corrugated metal and translucent plastic sheets that allows the building forms to seem lightweight and ephemeral. The aesthetic is utilitarian, as the architecture is dedicated more to industrial processes than its aesthetics. Some buildings house hazardous material so fire egress is prevalent. Fire stairs sweep the exterior faces of the buildings and become a focal point of the building and exposes movement of people.

Figure 43. *View of Seaview Marina from Point Howard.*

22 Hutt City Council, "Final: Vision Seaview Gracefield 2030," 17.

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Figure 44. *Seaview buildings encompassing industrial architecture.*

Figure 45. *Lightweight construction material creates ephemeral conditions.*

Figure 46 & 47. *Fire stairs sweeping exterior faces of buildings.*

Seaview Gracefield has an idyllic marina with pockets of under-utilized or inaccessible areas such as the beach area which currently lacks visual appeal and recreational value.[23] The site is not large enough to site a building that will provide amenity and attract visitors to the area. The breakwater, however, presents an opportunity for architectural experimentation. The siting of a building over the breakwater would extend the industrial area of Seaview. The spatial layout of the architecture should consider the exposed site and negotiate sun paths, picturesque views and blustery summer to spring north-westerly winds and winter southerly winds.[24]

This thesis aims to coincide with objectives of local government. The Hutt City Council states that any new proposal should: "nurture innovation"[25]; create a "culture that facilitates collegial exchanges of ideas"[26]; and promote Seaview Marina as a "place to experiment new ideas / innovations and prototypes."[27] These intentions encourage future proposals to develop Seaview Gracefield as the "hub for industrial and scientific activities throughout the Hutt Valley and surrounding regions. The development of industrial activities inadjoingin areas is vital for the expansion and growth of Seaview Gracefield."[28]

23 Ibid., 28.
24 Maclean, "Wellington Region."
25 Hutt City Council, "Final: Vision Seaview Gracefield 2030," 18.
26 Urban Perspectives, "Vision Seaview/Gracefield 2030: Implementation Strategy and Work Plan," 6.
27 Ibid.
28 Ibid., 18.

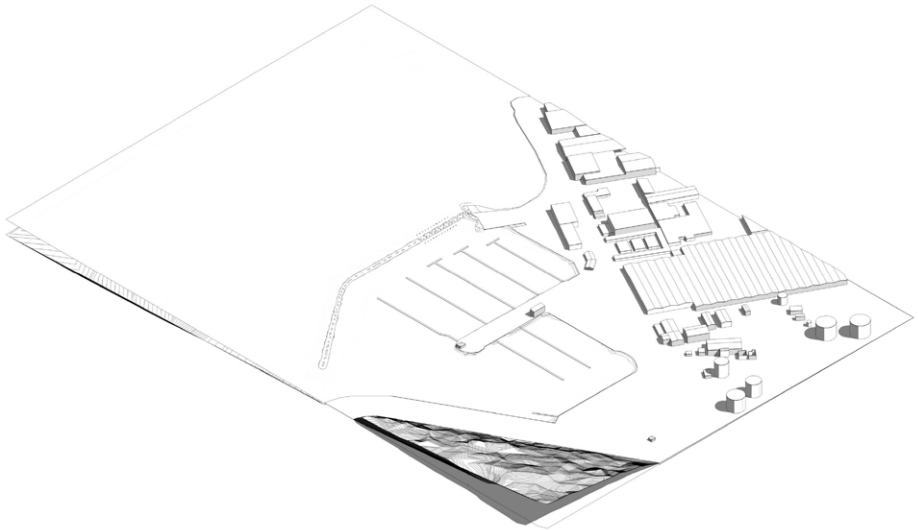
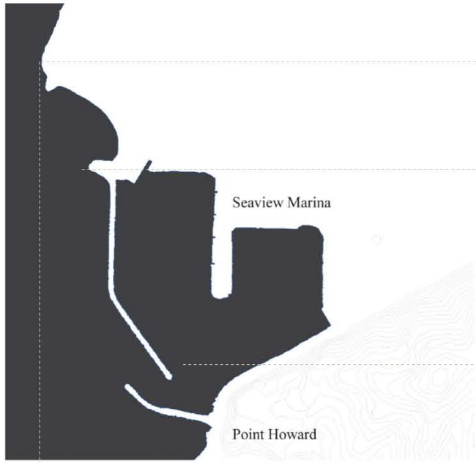
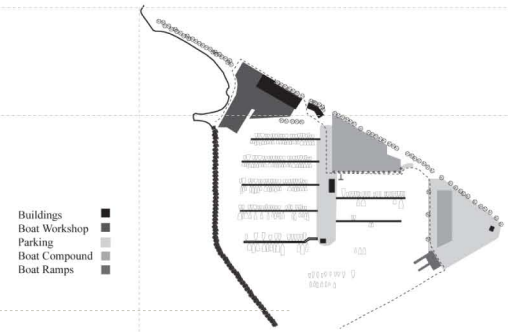


Figure 48. *Three-dimensional site model of Seavuew Marina.*

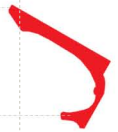
Right page: Figure 49. *Site analysis of Seaview Marina.*



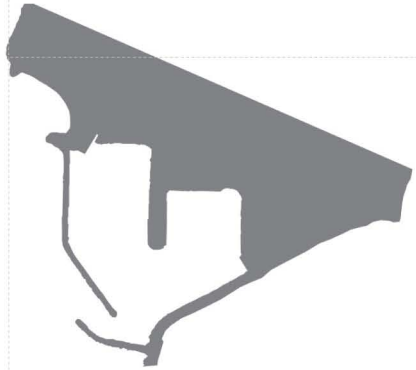
LAND AND WATER



MARINA ZONES

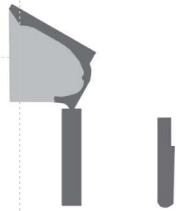


INACCESSIBLE ZONES

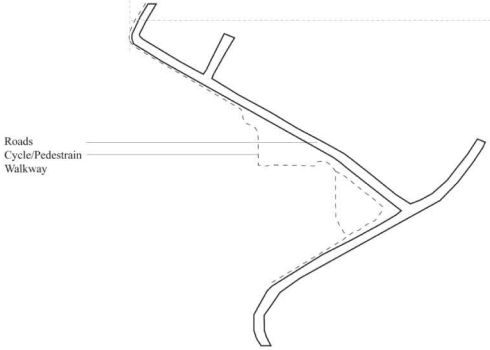


LAND

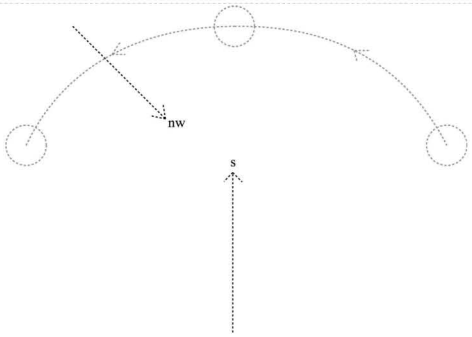
FIGURE GROUND & GREENERY



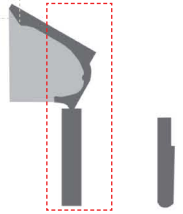
DEVELOPMENT ZONES



MOVEMENT



CLIMATIC CONDITIONS



DEVELOPMENT ZONES

Image 30: Gravel walkway to architectural testing site

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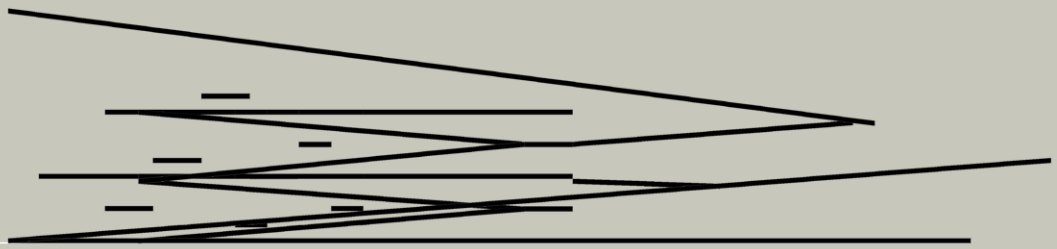
Figure 51 & 52. *Contextual images of breakwater site.*

CONCLUSION

This chapter discussed Seaview Marina and specifically beach and brreakwater as the site for architectural experimentation. The analysis outlined key considerations that the design proposal should respond to in order to tune the architecture into the surrounding and environmental context. To align this thesis to local vision plans, the research will investigate an ‘Innovation Centre’ as the architectural testing ground.



CHAPTER THREE: INNOVATION ENVIRONMENTS

The preceding chapter briefly acknowledged Hutt City Council's intention for future proposals to nurture innovation through creative industries. This chapter discusses innovation theory, identifies strategies through the analysis of five case studies and establishes a set of principles that are further explored and transformed into spatial conditions in iteration three. This chapter concludes that innovation environments are instrumental in designing for access and mobility and as a way to access the mind and mobilise creative thought and reflective processes.

Innovation is a creative construct that thrives when disciplines collaborate to think beyond "referential systems"[29] to harness new knowledge and ideas. Jeremy Rifkin, economic theorist, believes our epoch is the 'Age of Access' as Generation Y is "comfortable conducting business and engaging in social activity in the worlds of electronic commerce and cyberspace, and they adapt easily to the many simulated worlds that make up a cultural economy."[30]According to Rifkin, access is the "openings to whole new worlds of possibilities and opportunities" and is "after all, about distinctions and divisions, about who is to be included and who is to be excluded."[31] From a business perspective, it is access to "critical ideas, knowledge, and expertise" where wealth is vested in human imagination and creativity.[32] Rifkin explains the economy in the Age of Access is defined as a "network economy" typical market transactions are replaced with "strategic alliances, co-sourcing, and gain-sharing agreements".[33] Rifkin suggests that groups or firms should "network" and collaborate to share "valuable knowledge and expertise in the research-development of product lines." By doing so, spontaneity and creativity ignites and ideas are moved around more quickly leading to sped-up innovation and product turnover. Rifkin advocates the need to establish strong feedback loops to critique product development. As a result, the product will have a "collective edge" and the product and company will have greater success in the high-tech economy.[34] Access and networking are powerful metaphors in the Age of Access.[35] Utilizing these terms as design drivers will arrive at effective and creative workplace designs that have the power to manipulate the emotional and spiritual well-being of the workers.

29 Balmond et al., *Cecil Balmond: Frontiers of Architecture I*, 70.
30 Rifkin, *The Age of Access: The New Culture of Hypercapitalism Where All of Life Is a Paid-For Experience*, 12.
31 Ibid., 15.
32 Ibid., 5.
33 Ibid.
34 Ibid., 21–24.
35 Ibid., 15.

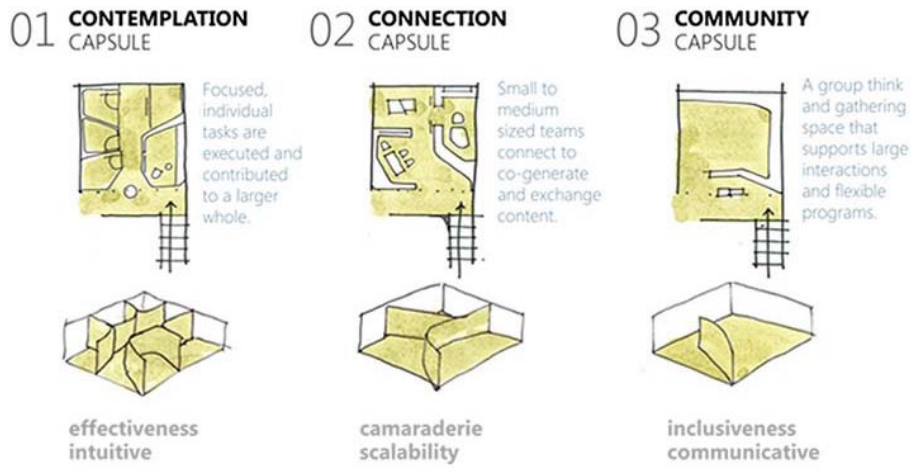


Figure 53. Workdesign Magazine. "This Office Encourages Working, Playing, and Winning Together." *Work Design Magazine: Projects*, 2015. http://workdesign.com/2015/02/pluralsight-encourages-working-playing-winning-together/.

INNOVATION ENVIRONMENTS

To better accommodate the network economy, traditional workspaces are transformed into "network environments"; environments that have open-ended access. These environments encompass work spaces that enable innovation and foster greater productivity. The Innovation Centre should initiate the transformation of individuals into creative, inventive, discoverers who are capable of doing new things.[36] According to Rifkin, workspaces are social spaces which encourage: face-to-face communication; individuals to work in groups and collaborate; and continual sharing of knowledge. Meeting rooms and large areas should be included in the design to facilitate brainstorming session and all corridors should be wide to encourage "pick-up" conversation.[37] Marshall McLuhan states that these types of spaces should encourage people to be "creative and develop their imagination [which] is necessary to maintain our competitive edge and ensure that we do not fall behind other countries."[38]Spaces should be about "discovery… and explorations."[39] Creative processes requires intuitive

36 Bruce Mau Design, O'Donnell Wicklund Pigozzi and Peterson, Architects Inc, and VS Furniture, *The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning*, 54.

37 Rifkin, *The Age of Access: The New Culture of Hypercapitalism Where All of Life Is a Paid-For Experience*, 30.

38 Bruce Mau Design, O'Donnell Wicklund Pigozzi and Peterson, Architects Inc, and VS Furniture, *The Third Teacher: 79 Ways You Can Use Design to Transform Teaching & Learning*, 52.

39 Ibid.

thought. A multitude of different spaces should serve individual needs as well as meeting points for groups to interact, research and discover.[40] These spaces should be enjoyable to allow individuals to be spontaneous and free their imagination, opening a "full range of human sensibilities to blossom."[41] Following key workplace strategies, designers create environments that successfully forge innovation through enabling healthy, focused work, sped-up learning, and encouraging cross-pollination between a diverse range of people and work settings.[42] In *The Third Teacher*, Bruce Mau, OWP/P Architects and VS Furniture outline 79 design strategies to transform teaching and learning spaces. The design strategizes have been synthesized into seven criteria to change traditional workplace environments into innovation environments.

1. Universal design – Spaces should be accessible to a broad range of human ability to ensure that all spaces are a benefit to all users.

2. Flexible spaces – Multiple office configurations encourage different options for participation and allows users to adapt space to their needs.

3. A variety of learning spaces – diversity in space, materials, color, transparency, and connectivity allows users to choose where they work best. Choice heightens user's strength and control over their work. The variety includes: gardens; discovery studios with outdoor space for experimentation; collaboration studio; reflective studio; presentation studio; lecturing studio; seminar room; small group areas; resource areas; and cafes.

4. Alcoves – Alcoves in corridors promotes pause moments to slow the pace.

5. Collaborative learning – Spaces where users can work in groups unleash intellectual and social energy

6. Connection to outside world – Spaces should dissolve the dichotomy of exterior and interior so users feel more comfortable. Close proximity to nature clears and refocuses the mind.

7. Natural daylight – Natural lighting improves concentration and learning and uplifts user's well-being and health.

Four case study projects identify different design approaches from architectural practices designing high performing innovation environments. The success of each project is determined through the analysis of its design parti; typology; floor plan; spatial layout; flexibility of space; visual connections; and accessibility. The analysis exposes limitations and insights that will assist in the subsequent iteration of a new Innovation Centre to Seaview Gracefield.

40 "Lupin Research Park by Malik Architecture - Dezeen."

41 Rifkin, *The Age of Access: The New Culture of Hypercapitalism Where All of Life Is a Paid-For Experience*, 261.

42 "Like Bees to Honey: Yahoo! And the Future of Mobile Work - Workplace Strategy and Design - Architecture and Design."

Figure 54. Workdesign Magazine. “Pluralsight HQ Encourages Working, Playing, and Winning Together Work Design Magazine,” 2014. http://workdesign.com/2015/02/pluralsight-encourages-working-playing-winning-together/.

CENTRAAL BEHEER HEAD OFFICE / HERMANN HERTZBERGER

The Centraal Beheer Head Office building is collection of sixty cubes and is divided into four quadrants, interconnected with wide overpasses on each floor. The composition of this building enhances visual connectivity and interaction between users. The central core is designed to be a vertical (atrium) and horizontal street. It is a social space aimed to mimic the feeling of freedom in a real street; a bustling environment where there are chance encounters and moments to clear the mind.

STRENGTHS:

Cafes located at each corner, on each level, where staff and visitors engage in informal meetings.

Spaces are open to maintain visual contact horizontally, vertically and diagonally between all floors.

On a micro scale, the workspaces are intimate and connected.

WEAKNESSES:

At large scale operations, the regularized layout does not offer any flexibility in adapting spaces for different uses.[43]

The Beheer Head Office workplace as a social space will be further explored in Chapter Three and the continuity of visual sight lines throughout the building will be further developed though design inquiry.

43 Architectuur Studio HH, “Centraal Beheer Head Office.”

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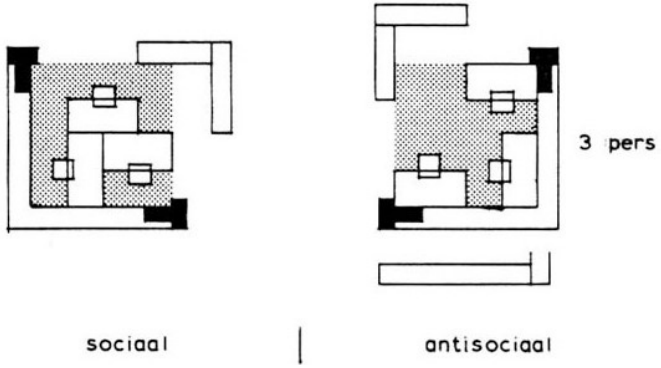

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Figure 55 & 56. Architectuur Studio HH. “Centraal Beheer Head Office.” *Architectuur HH: Projects: Commerce & Industry*. Accessed June 8, 2014. http://www.ahh.nl/index_en.html.

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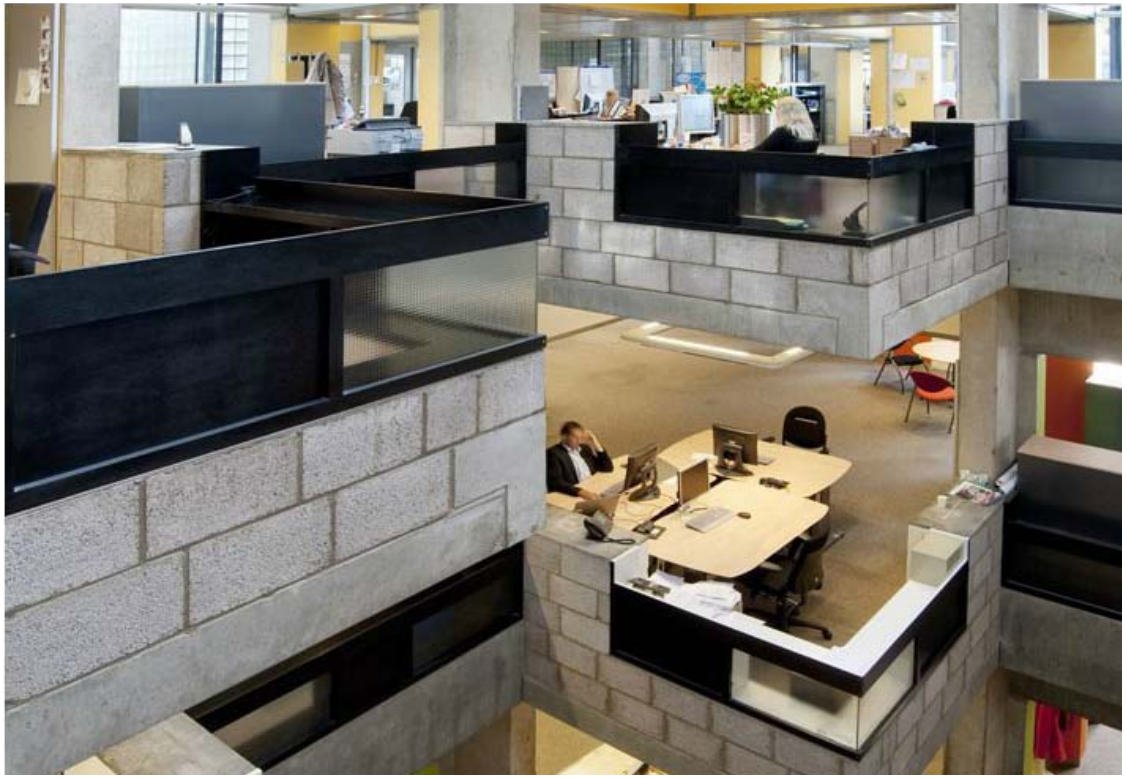

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Figure 57 & 58.Architectuur Studio HH. “Centraal Beheer Head Office.” *Architectuur HH: Projects: Commerce & Industry*. Accessed June 8, 2014. http://www.ahh.nl/index_en.html.

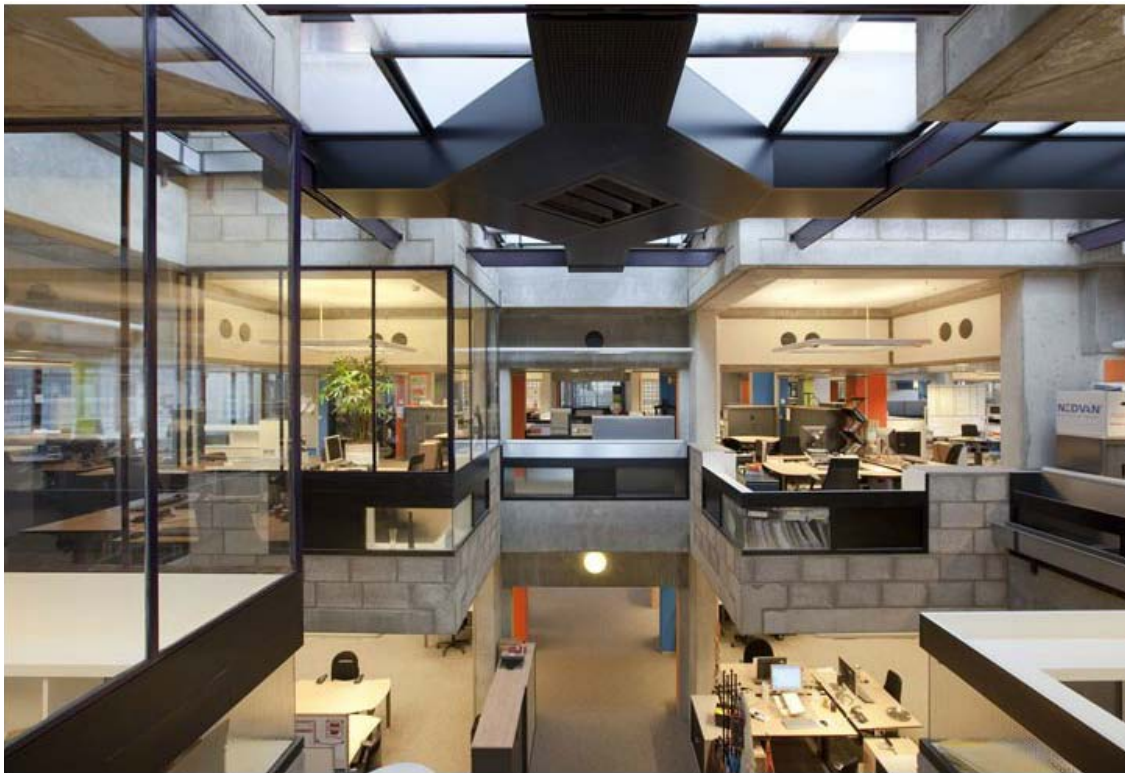

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Figure 59 & 60. Architectuur Studio HH. “Centraal Beheer Head Office.” *Architectuur HH: Projects: Commerce & Industry*. Accessed June 8, 2014. http://www.ahh.nl/index_en.html.

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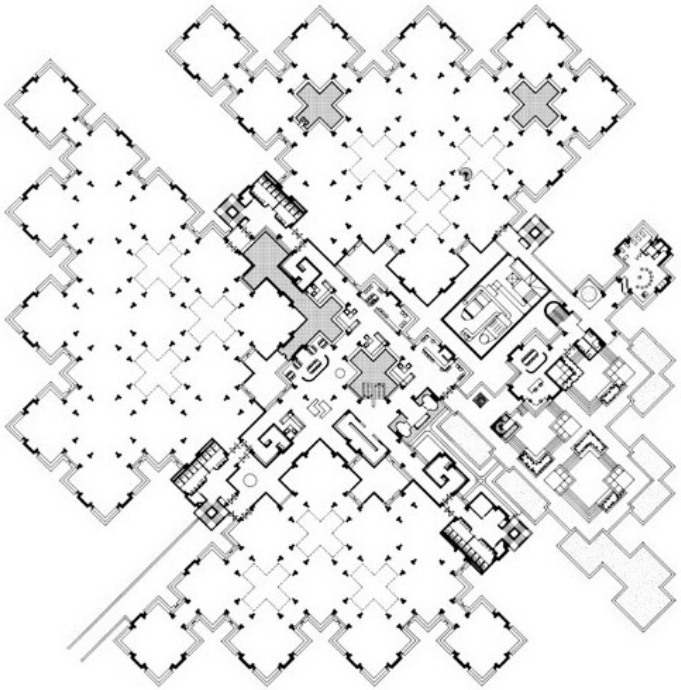

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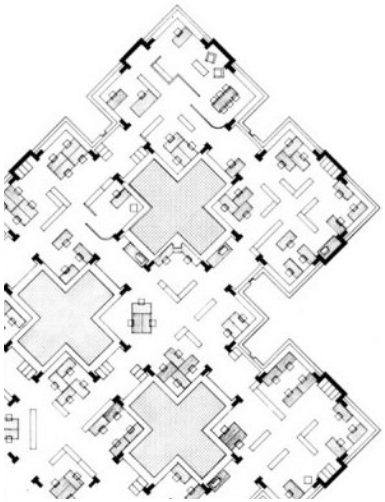

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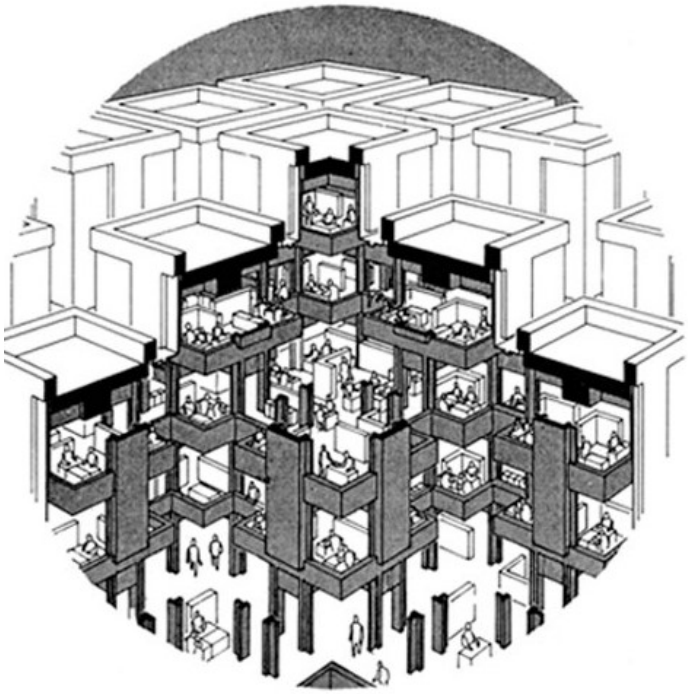

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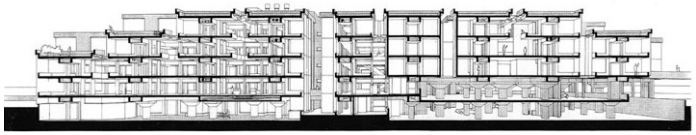
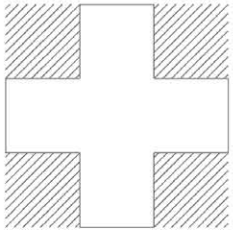
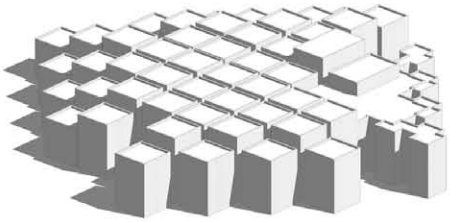


Figure 61-64. Architectuur Studio HH. “Centraal Beheer Head Office.” *Architectuur HH: Projects: Commerce & Industry*. Accessed June 8, 2014. http://www.ahh.nl/index_en.html.

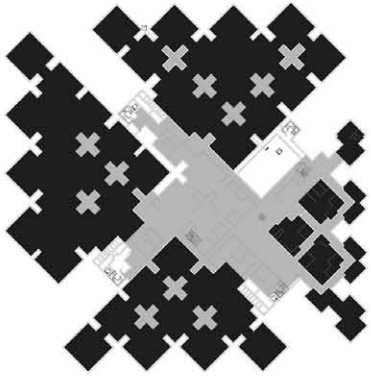


DESIGN PARTI

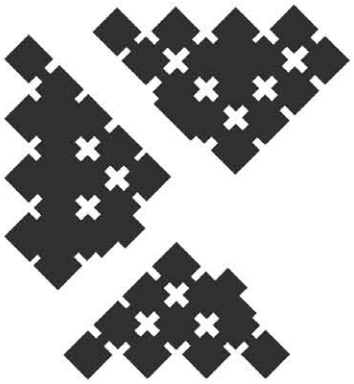


TYPOLOGY

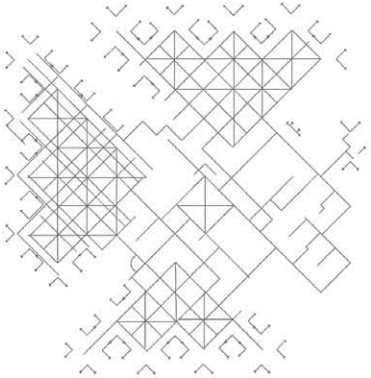
FLOOR PLAN



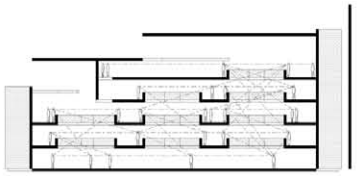
SPATIAL LAYOUT



FLEXIBILITY



VISUAL CONNECTIONS
(PLAN)



VISUAL CONNECTIONS
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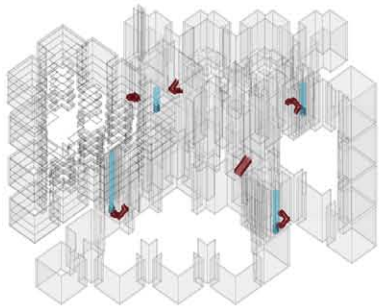

ACCESSIBILITY

Figure 65. *Workplace design strategy analysis for Centraal Beheer Office.*

HEINZ INNOVATION CENTRE / AECOM

The design of the centre endeavors to encourage staff to creatively develop food flavour, packaging and bring “cutting edge” products to European markets through testing, collaboration, knowledge sharing and maintaining networks.[44] To nurture a fruitful working research and development environment, boundaries between technical areas and workspaces are blurred.

STRENGTHS:

Workspaces include a multitude of spaces for different creative processes such as: open workspaces for project teams, quiet rooms for individualized thought, and conference meeting rooms for large masses.

Flexibility exists between the café/restaurant and the exhibitions/ display cooking facility spaces as walls are movable to create one large floor space for larger presentations.[45]

A minimalist structural framework create open spaces that ensure freedom and free-flowing movement

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44 Heinz Company, “Your New Work Environment - Heinz Innovation Centre.”

45 “Heinz Innovation Centre - Design + Planning - AECOM - A Global Provider of Architecture, Design, Engineering, and Construction Services.”

Figure 66.“Heinz Innovation Centre : Nijmegen.” *Rollecate: Projects: Heinz Innovation Centre*, 2015. http://www.rollecate.nl/ru/projecten/heinz-innovation-centre.

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Figure 67-68.“Rollecate. “Heinz Innovation Centre : Nijmegen.” *Rollecate: Projects: Heinz Innovation Centre,* 2015. http://www.rollecate.nl/ru/projecten/heinz-innovation-centre.

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Figure 69-70.“Rollecate. “Heinz Innovation Centre : Nijmegen.” *Rollecate: Projects: Heinz Innovation Centre*, 2015. http://www.rollecate.nl/ru/projecten/heinz-innovation-centre.

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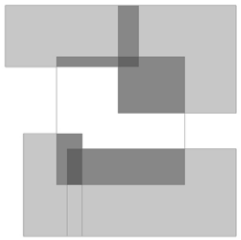
Figure 71 & 72.“Rollecate. “Heinz Innovation Centre : Nijmegen.” *Rollecate: Projects: Heinz Innovation Centre*, 2015. http://www.rollecate.nl/ru/projecten/heinz-innovation-centre.



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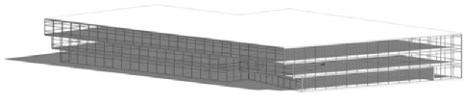
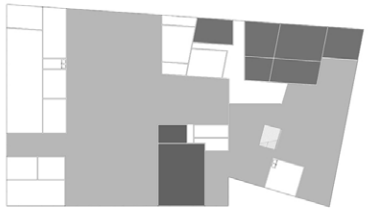
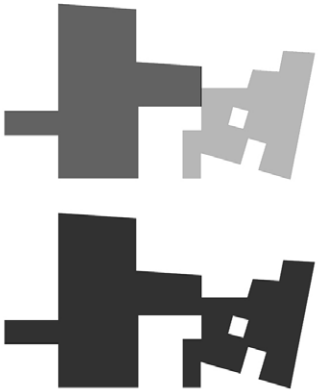


TYPOLOGY

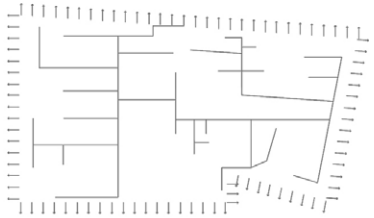
FLOOR PLAN



SPATIAL LAYOUT

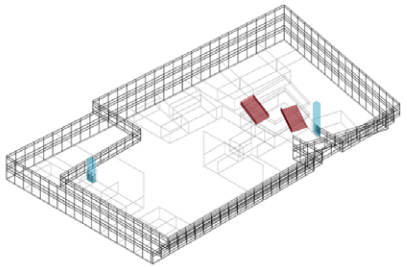


FLEXIBILITY



VISUAL CONNECTIONS
(PLAN)

VISUAL CONNECTIONS
(SECTION)



ACCESSIBILITY

Figure 73. *Workplace design strategy analysis for Heinz Innovation Centre.*

RABOBANK WESTELIJKE MIJNSTREEK ADVICE CENTRE / MECANOO ARCHITECTS

The design of the bank defied traditional bank designs that are embedded with the idea of privacy. Instead, Rabobank introduces ideas of collaboration and information sharing between staff and entrepreneurs. Upon entry, the building is understood in one glance.

STRENGTHS:

1. Ground floor is entirely open to public where both staff and customers can use workspaces in the auditorium
2. A diverse range of workspaces are provided: small rooms for focused work; individual workstations; niches for moments of pause; medium rooms for project teams; open areas for informal meetings; and private conference rooms
3. Glass separations ensure privacy whilst still maintaining visual connections between occupants
4. Flexible spaces are created through a 60m long track with a transparent curtain can be moved around to create “diverse spaces and atmospheres” [46]
5. Glass and curtains are devices that ensure fluidity from one situation to the next.

46 Archdaily, “Rabobank Westelijke Mijnstreek Advice Centre / Mecanoo.”

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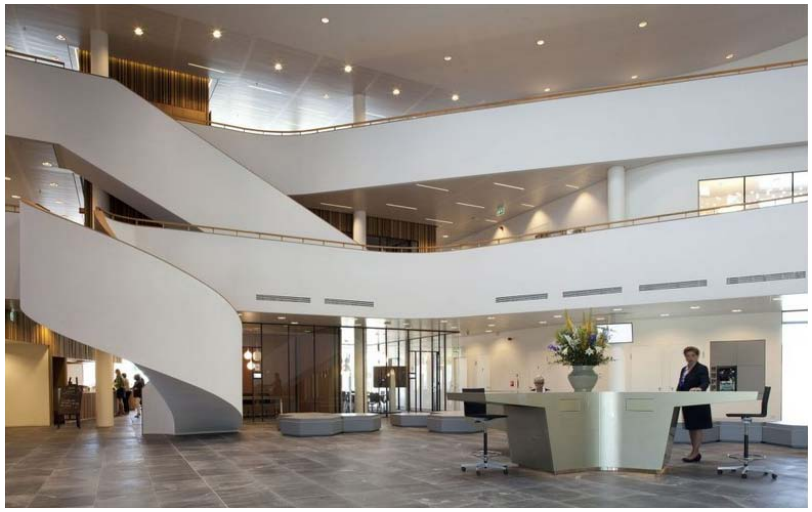
Figure 74 & 75. Archdaily. “Rabobank Westelijke Mijnstreek Advice Centre / Mecanoo.” *Archdaily Selected Works*, July 2, 2014. http://www.archdaily.com/523008/rabobank-westelijke-mijnstreek-advice-centre-mecanoo/.



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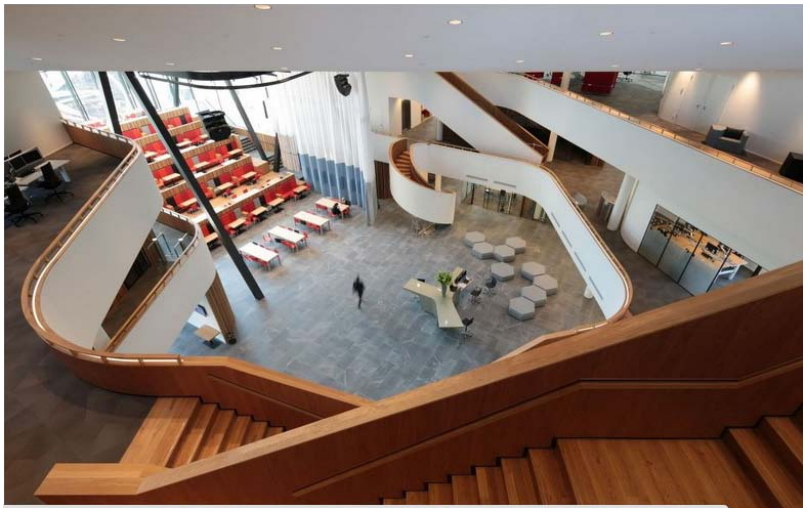

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Figure 76 & 77. Archdaily. “Rabobank Westelijke Mijnstreek Advice Centre / Mecanoo.” *Archdaily Selected Works*, July 2, 2014. http://www.archdaily.com/523008/rabobank-westelijke-mijnstreek-advice-centre-mecanoo/.

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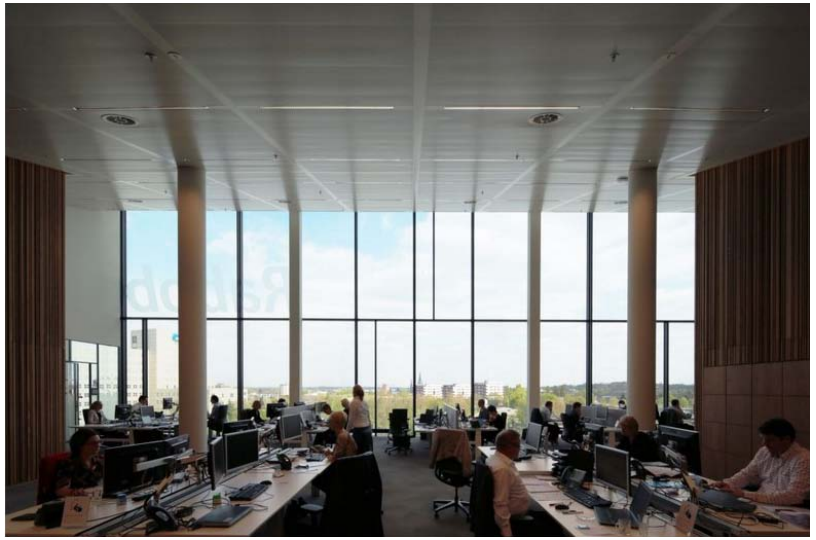

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Figure 78 & 79. Archdaily. “Rabobank Westelijke Mijnstreek Advice Centre / Mecanoo.” *Archdaily Selected Works*, July 2, 2014. http://www.archdaily.com/523008/rabobank-westelijke-mijnstreek-advice-centre-mecanoo/.

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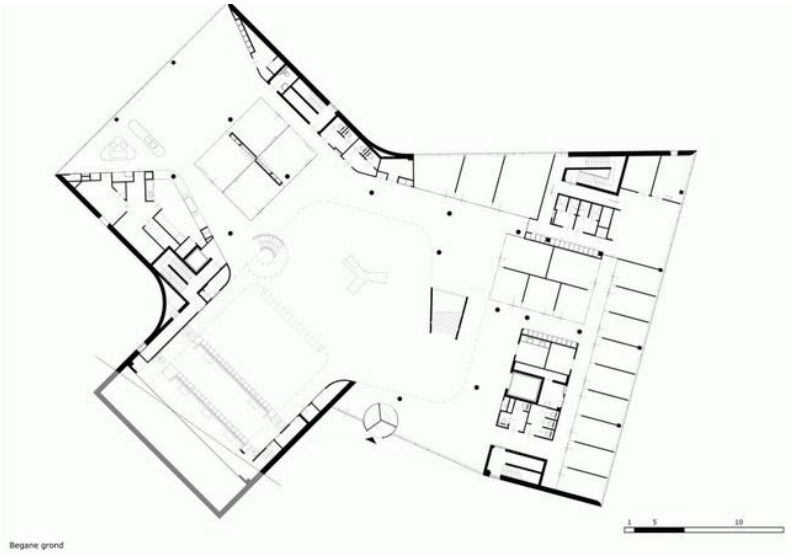

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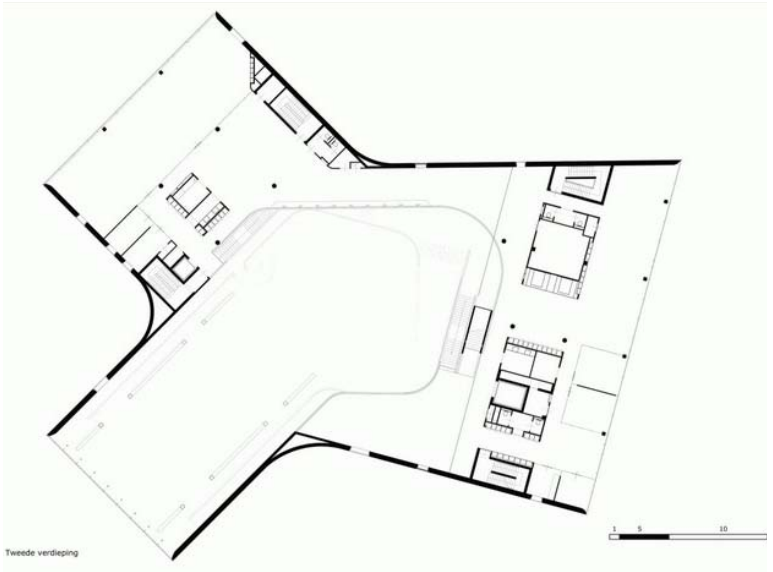

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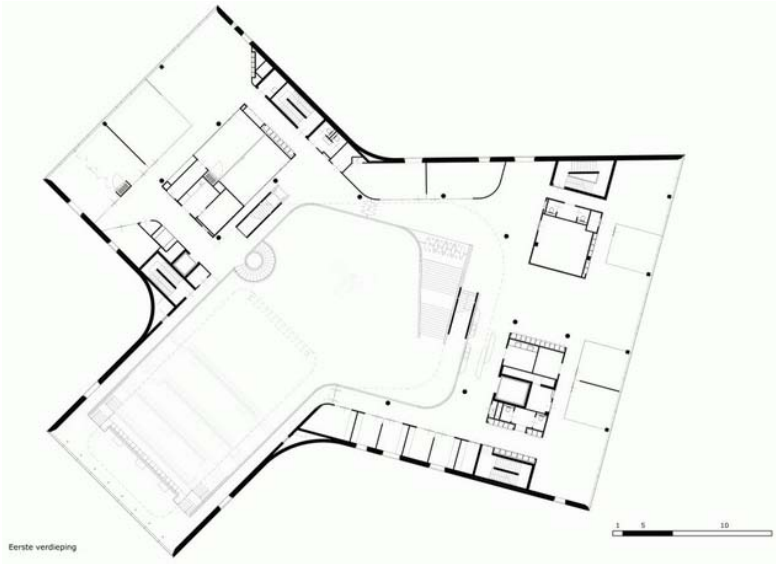

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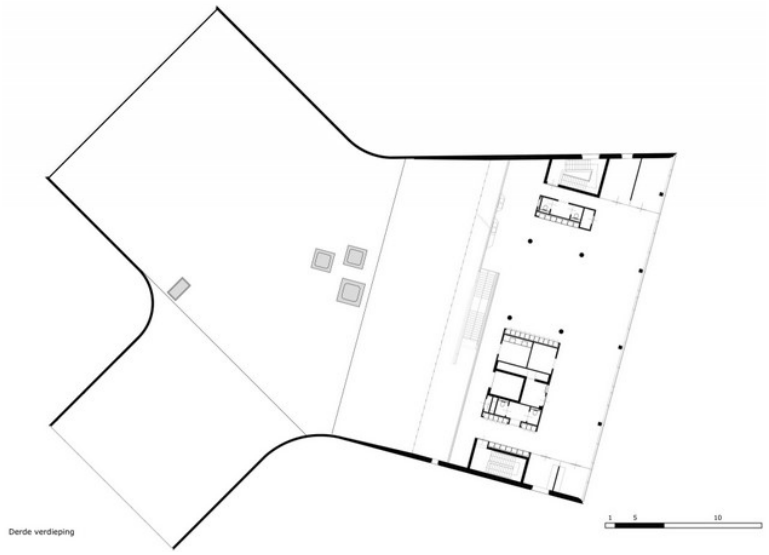
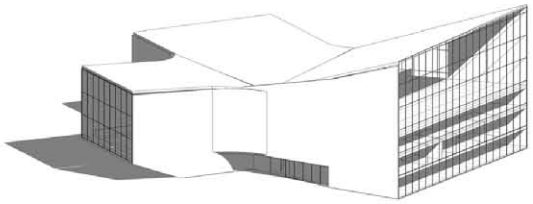
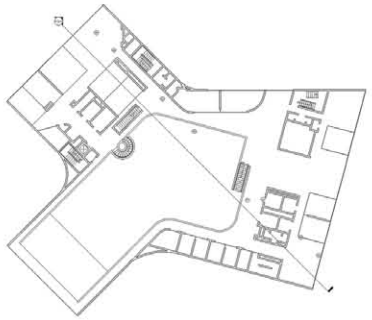


Figure 80/83. Archdaily. “Rabobank Westelijke Mijnstreek Advice Centre / Mecanoo.” *Archdaily Selected Works*, July 2, 2014. http://www.archdaily.com/523008/rabobank-westelijke-mijnstreek-advice-centre-mecanoo/.

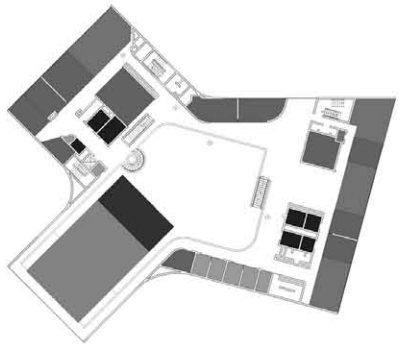
DESIGN PARTI



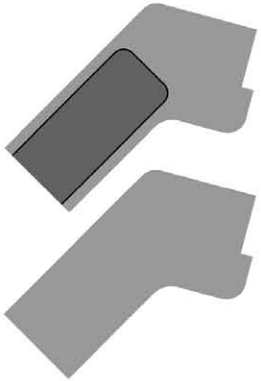
TYPOLOGY



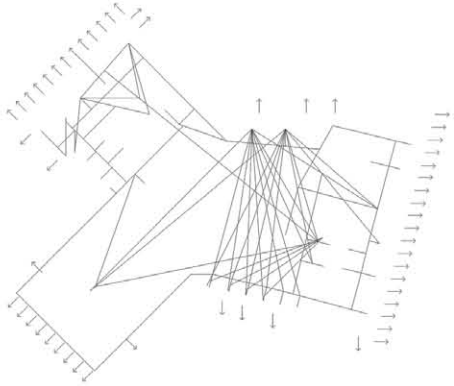
FLOOR PLAN



SPATIAL LAYOUT



FLEXIBILITY



VISUAL CONNECTIONS
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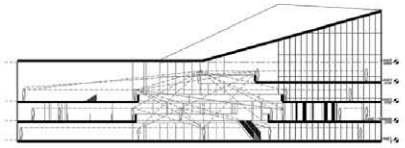
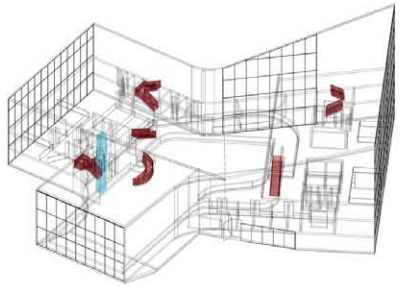


VISUAL CONNECTIONS
(SECTION)



ACCESSIBILITY

Figure 84. *Workplace design strategy analysis for RabobankWestelijke Mijnstreek Advice Centre*

YELP! / STUDIO O+A

The relocation of Yelp, developer of online urban guide, into a high-rise building in San Francesco, posed challenging design implications for architects Studio O+A. To facilitate group interaction between people who work on different floors, theYelp! Becomes a ‘vertical campus’.

STRENGTHS:

1. Campus is self-contained.
2. Each floor features a particular destination to appeal all workers, on all floors such as reception, general store, coffee bar, relaxing booths and kitchen to ensure that all staff move between floors
3. Occupants can recharge in new environments and have the opportunity to interact with other staff members.[47]

These strategies will be instrumental when refining the program and spatial layouts in the design component of this thesis.

47 Studio O+A, “Yelp! | O+A.”

This research is synthesized into five design considerations that will be into the ensuing design iteration. The Innovation Centre will be a:

1. Hybrid environment of many different components – research, information and urban experiences (work and play)
2. Stimulating, interactive and collaborative environments to enable innovation and greater productivity
3. Multitude of different spaces to cater for different creative learning processes.
4. Flexibility in hardware and software – create efficient, flexible and adaptive spaces that can altered to meet changing environments.
5. Connection with nature.

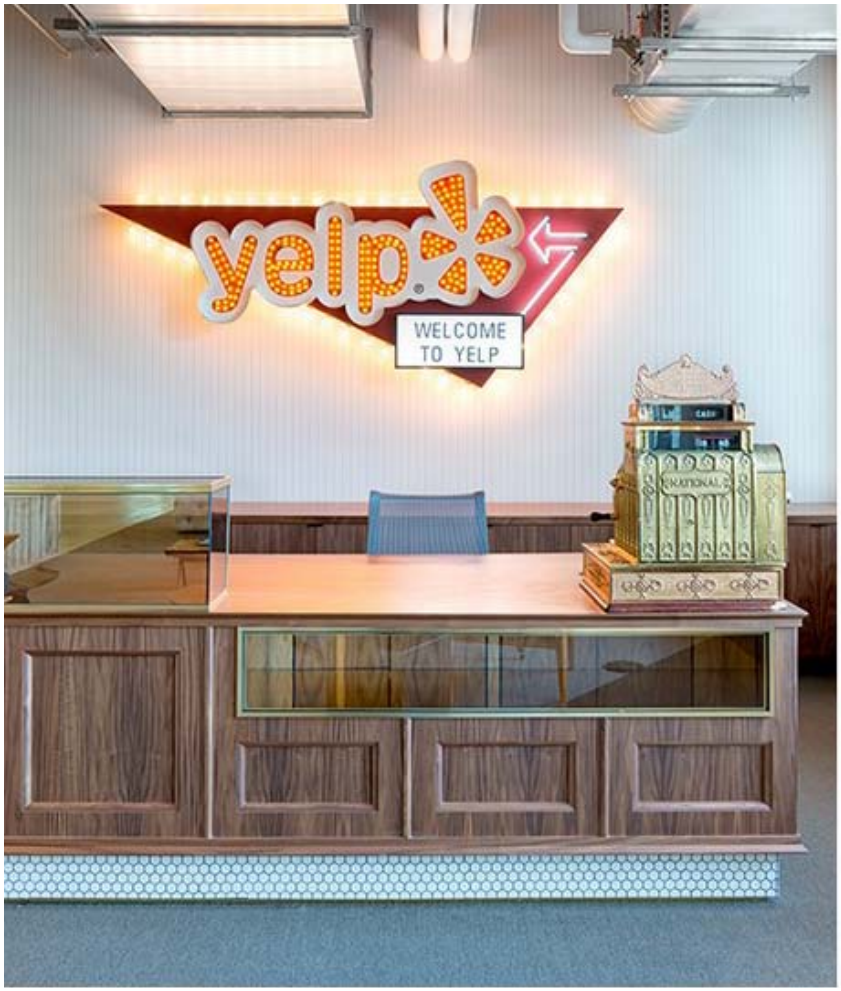


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Figure 85 & 86. Studio O+A. “Yelp! | O+A.” *O+A: Work: Yelp!*, 2011. http://www.o-plus-a.com/portfolio/yelp-2/.

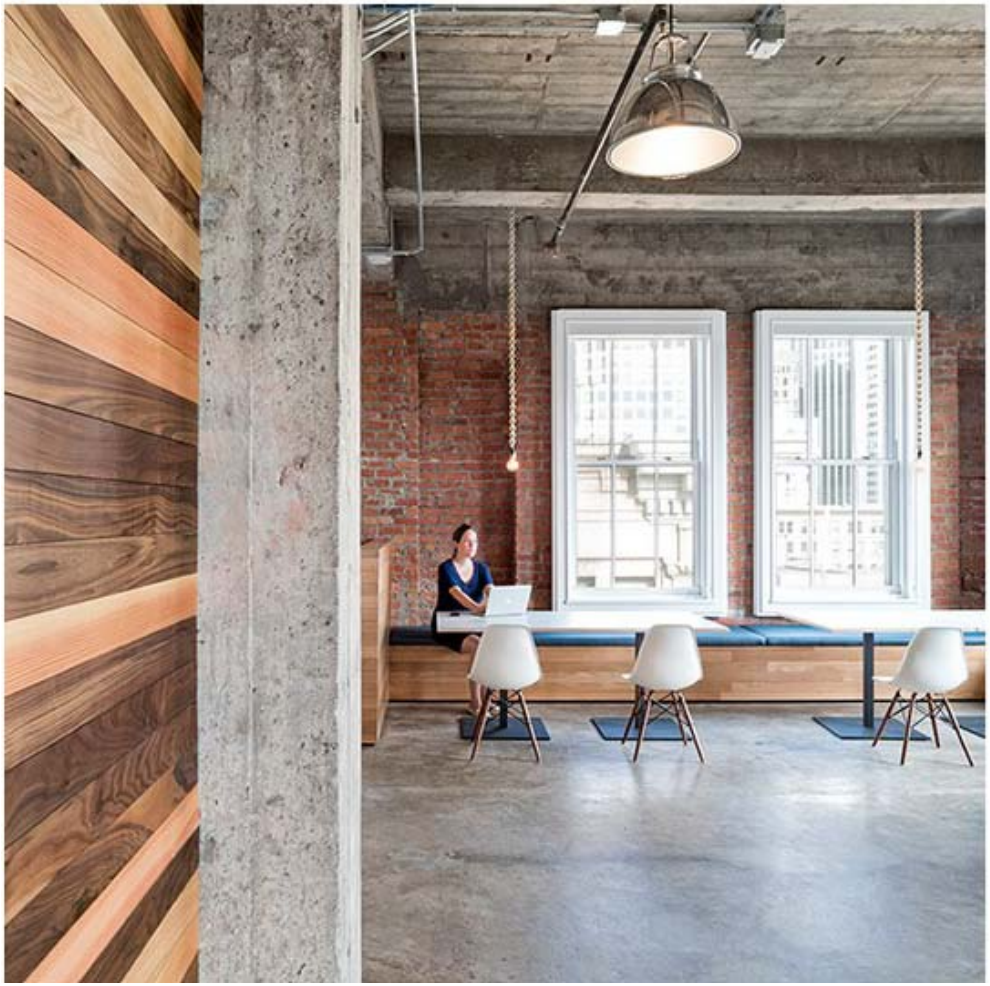

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Figure 87 & 88. Studio O+A. “Yelp! | O+A.” *O+A: Work: Yelp!,* 2011. http://www.o-plus-a.com/portfolio/yelp-2/.

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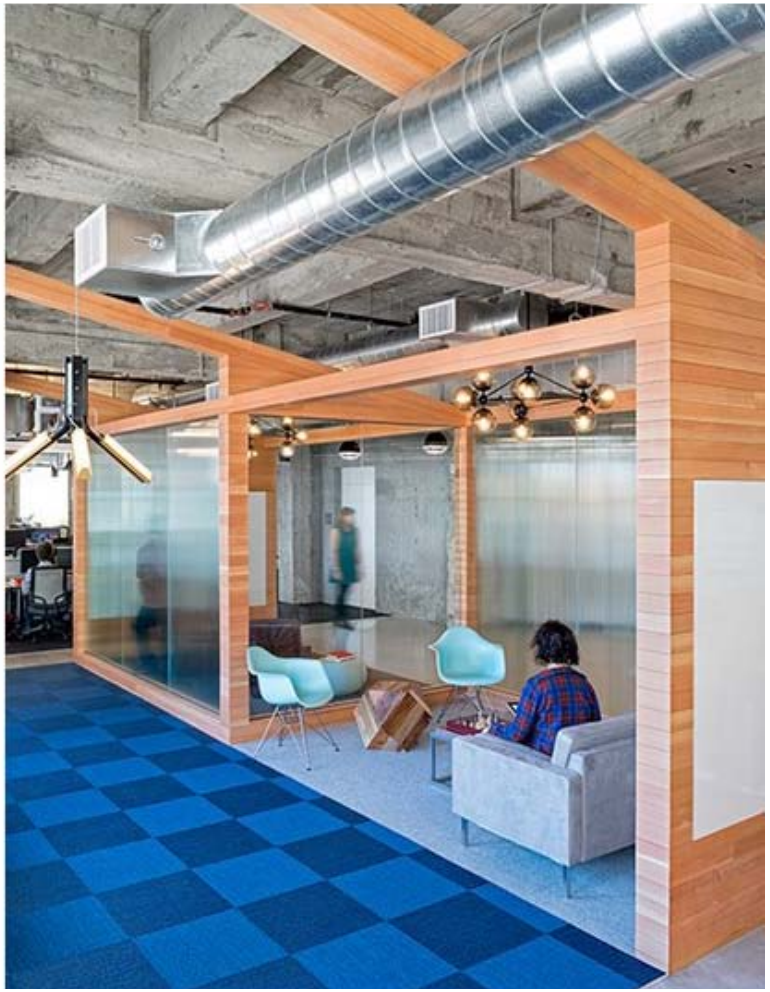

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Figure 89 & 90. Studio O+A. “Yelp! | O+A.” *O+A: Work: Yelp!*, 2011. http://www.o-plus-a.com/portfolio/yelp-2/.

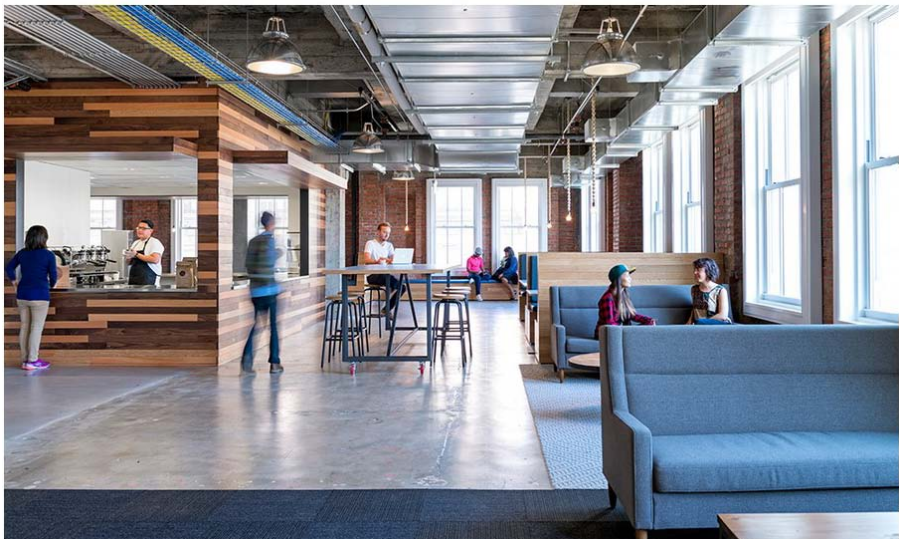

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Figure 91 & 92. Studio O+A. “Yelp! | O+A.” *O+A: Work: Yelp!,* 2011. http://www.o-plus-a.com/portfolio/yelp-2/.

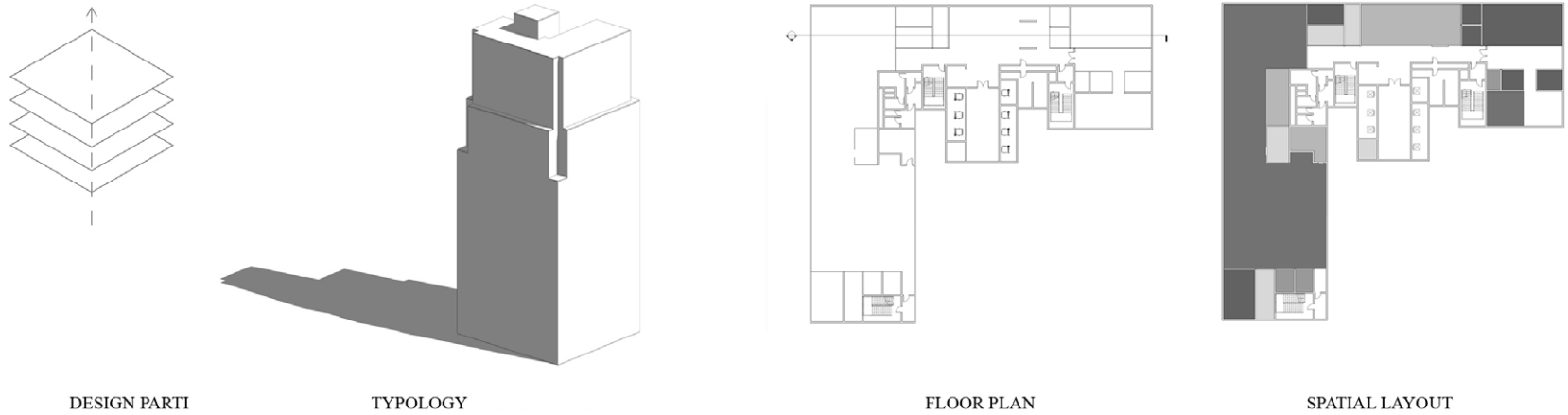


Figure 93. *Workplace design strategy analysis for Yelp!*

ITERATION TWO: DESIGN DISCUSSION

This design iteration uses the inclined planes circulation derived in iteration one from your disability case-study analysis as the central form to build on with these new five principles. A three metre wide grand ramp inclines gently through the building providing access for all users between the floors. The intention of the wide ramp allows it to function as a circulation route and a space to pause and engage in conversation.

Functioning as a flexible and a collaborative workspace, the spatial layout includes differing degrees of openness where spaces vary from open and public to private and enclosed. To heighten the sense of connectedness within space, glass separations create partially enclosed spaces for more focused individual or group work.

The location of collaborative spaces flank circulation spaces to encourage people on the move to join group discussions to foster different mindsets to expand group creative thinking. Individual and private work spaces are situated further away to bring in the idea of escape. Meeting rooms that the public can hire are also located close to primary circulation routes for ease of access and to limit movement of external persons through the rest of the building. Moveable walls in the auditorium and exhibition hall define flexible spaces where the room can expand or compress for different types of meetings, presentations, training, speeches or discussions.

A café/ restaurant on the ground floor and a bar on the second floor provide a service to the staff and invites other workers in the Seaview Marina into the building. These facilities inspire informal meeting spaces where workers can relax.

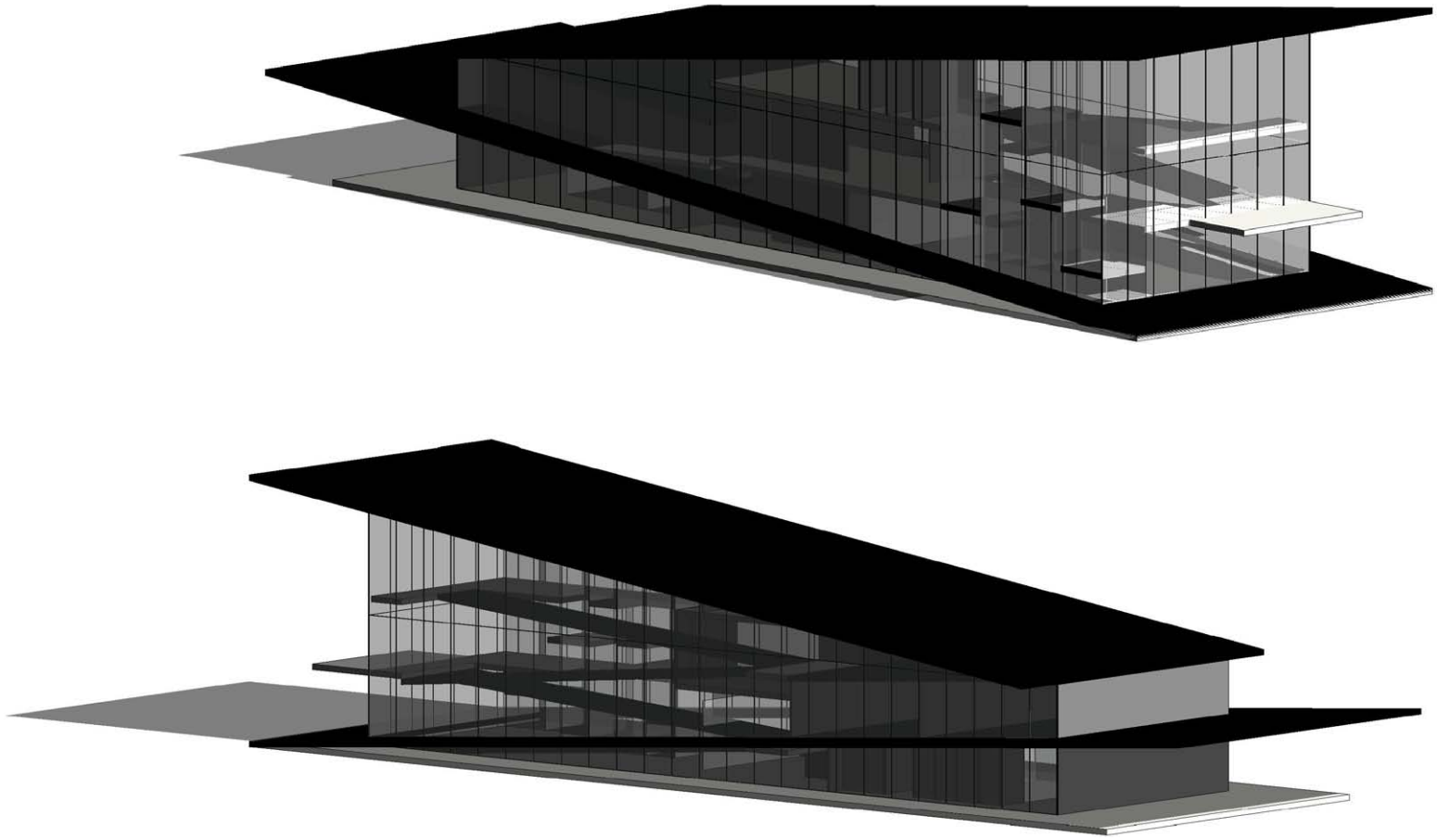


Figure 94. *Axonometric views of Iteration One design.*

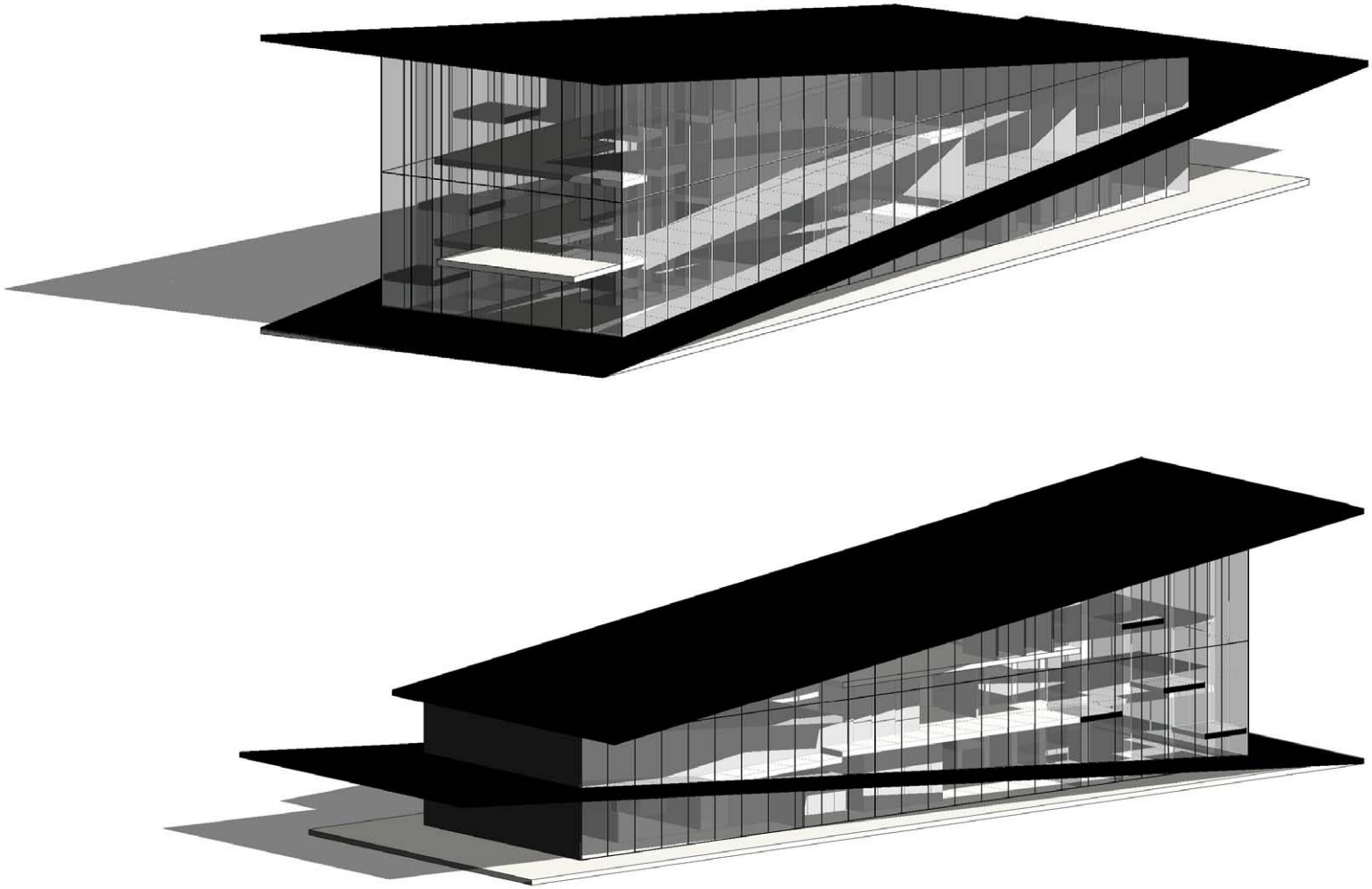
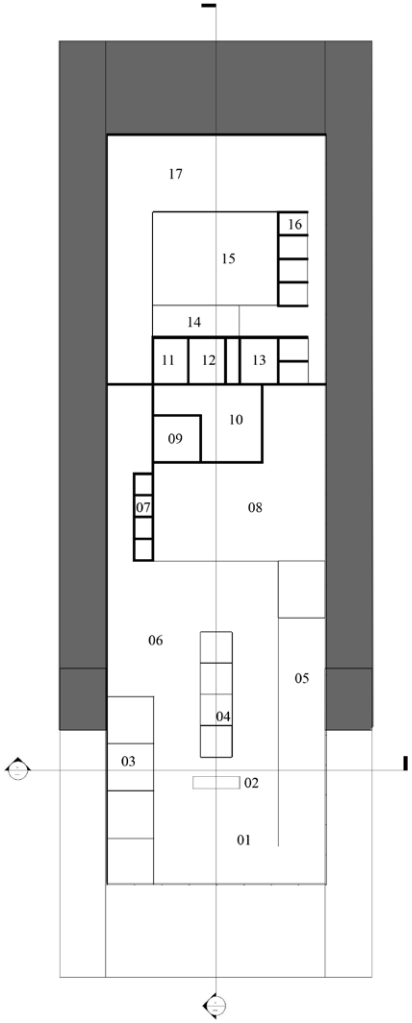
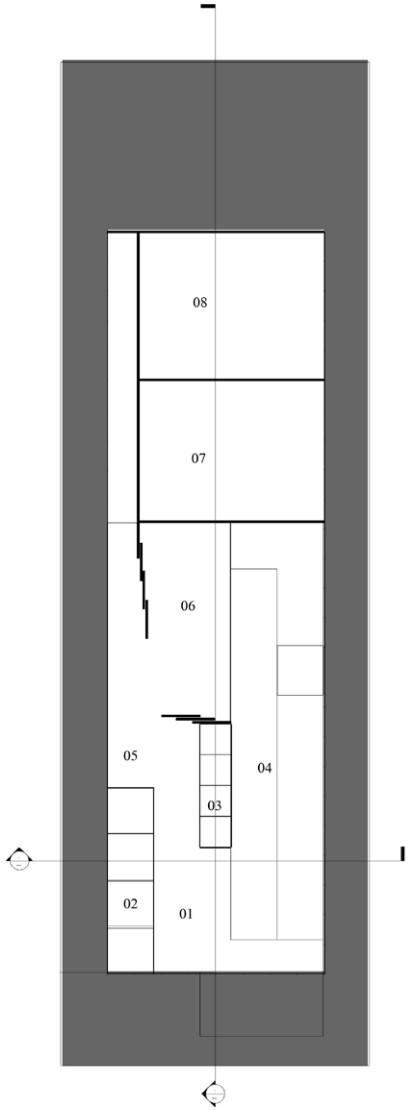


Figure 95. *Axonometric views of Iteration One design.*



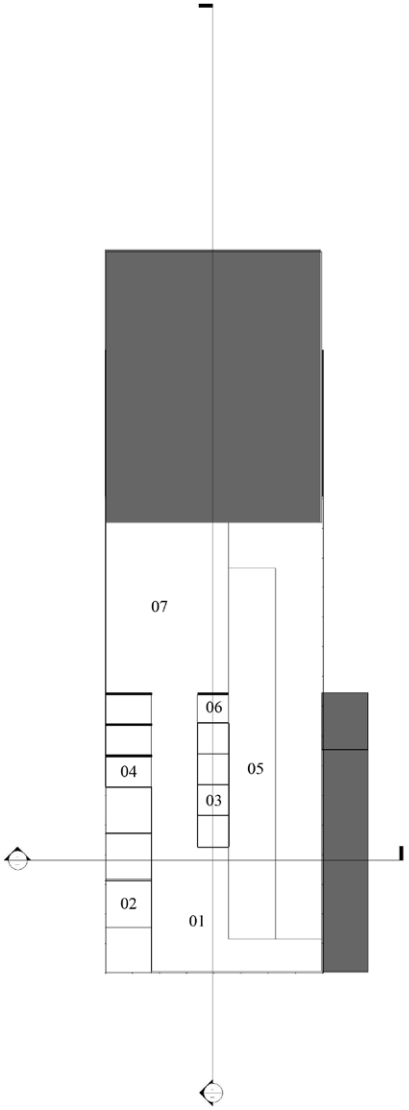
GROUND FLOOR SPACES

01 Active space
02 Reception
03 Bookable Meeting Rooms
04 Lifts
05 Ramp
06 Active space
07 Individual Learning Pods
08 Restaurant Dining
09 Toilets
10 Kitchen
11 Equipment Room
12 Material Room
13 Changing Room
14 Preparation Room
15 Laboratory
16 Individual write-up Pods
17 Open workspace



FIRST FLOOR SPACES

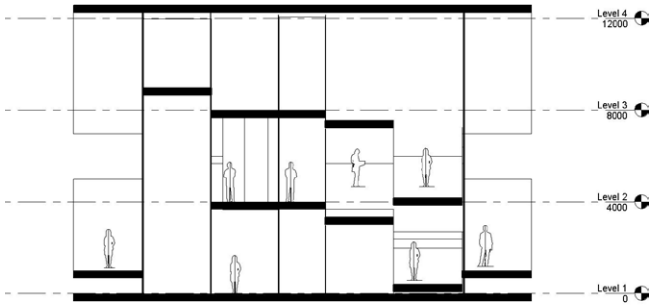
01 Active space
02 Bookable meeting room
03 Lifts
04 Ramp
05 Bar
06 Exhibition space
07 Lecture space / Auditorium
08 Lecture space / Auditorium



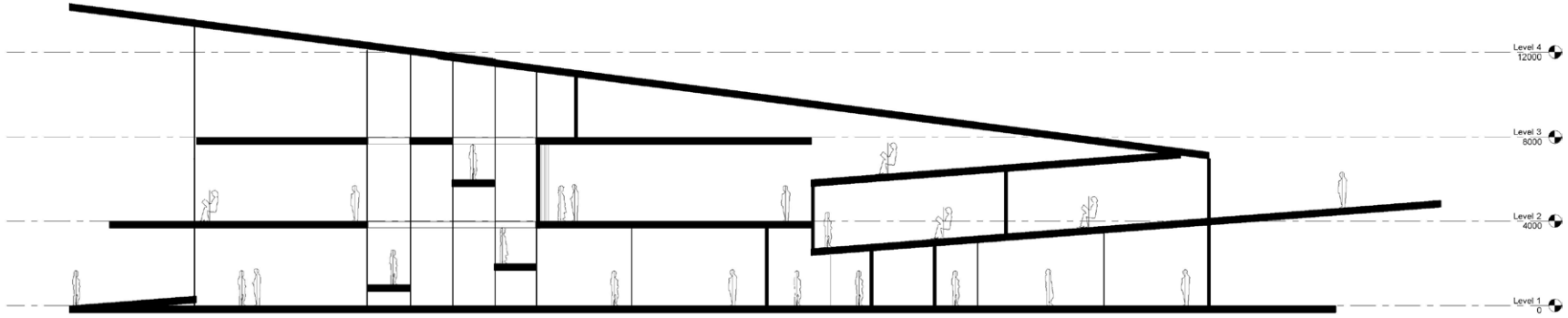
SECOND FLOOR SPACES

01 Active space
02 Bookable meeting room
03 Lifts
04 Individual learning pods
05 Ramp
06 Group pod
07 Open workspace

Figure 96. *Iteration One floor plans*



SECTION



SECTION

Figure 97. *Iteration One Sections.*

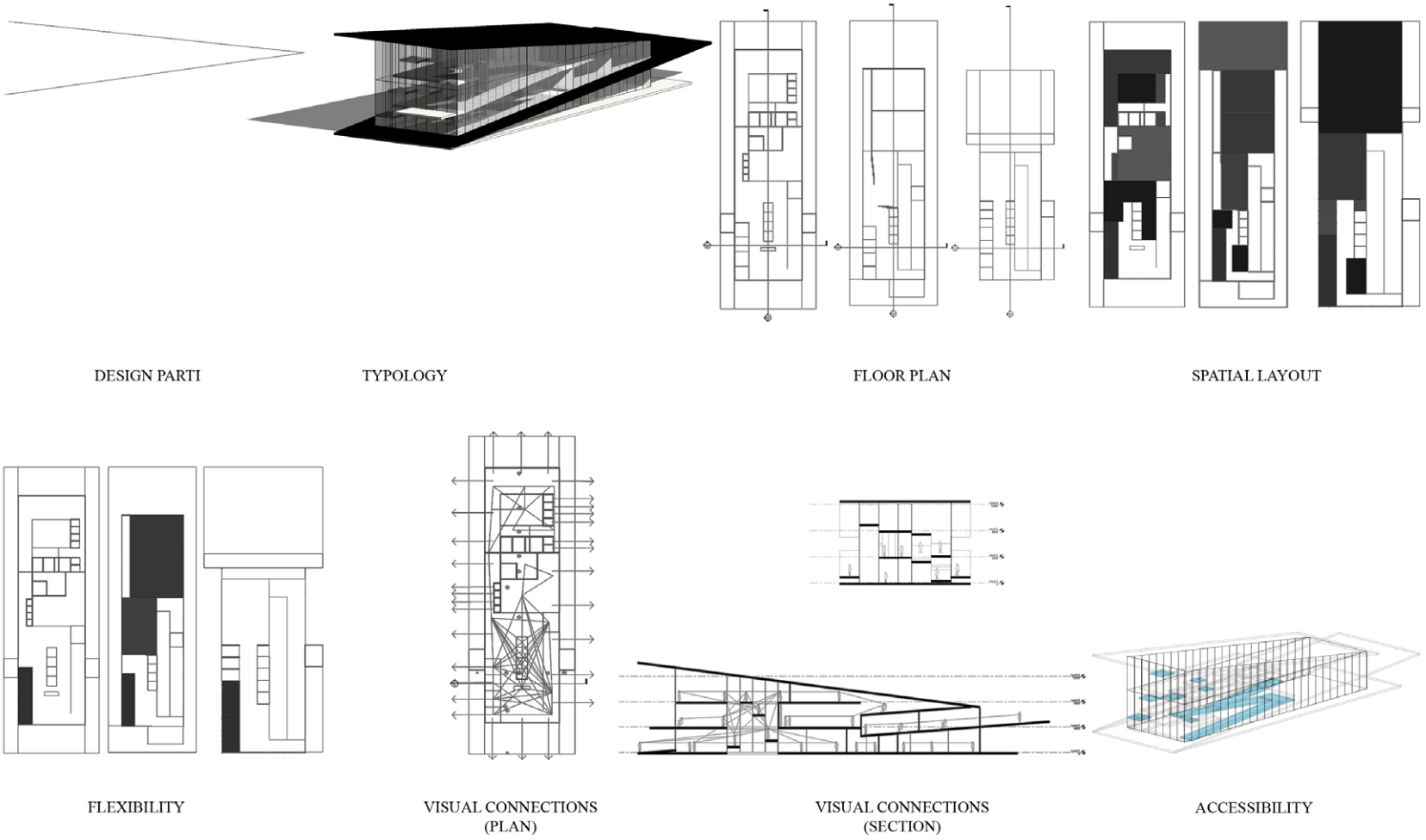
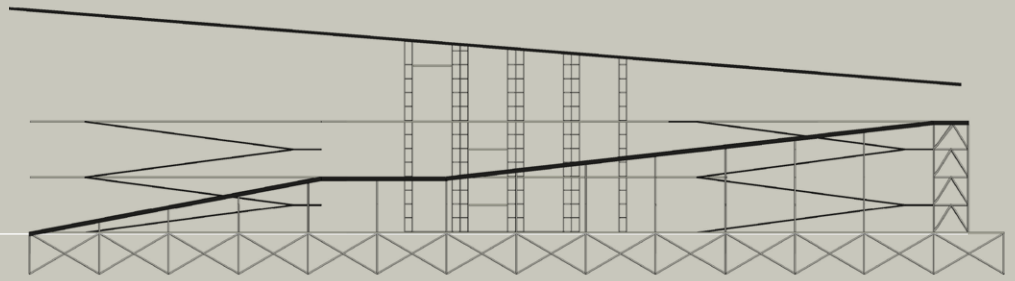


Figure 98. *Workplace design strategy analysis for Iteration One.*

CONCLUSION

This chapter introduced the notion of access and networks as defined by Jeremy Rifkin. This discussion was followed by a critical review of workplace design strategies embedded in existing innovation centres. The seven criteria were transposed into spatial condition in Iteration Two. Each iteration further extends the ideas of access through design. The ramp formulated physical access to and within the building, yet the design of a stimulating environment provides encourages creative and reflective thought. Limitations in the design include the lack of vertical surfaces for presentation pin-ups and the lack different sized spaces to cater for different sized groups. The south end of the building presents an area for further development in terms of enhancing visual access. In flexible environments, movement exists: spaces compress, expand, and increase in variety of use[48]to heighten performance of space. The next chapter extends to the idea of prosthetics and prosthetic theory. As the intent of the research is to augment access and mobility, the use of the idea of prosthetics are designed to enable lost functions such as movement. Chapter Four will offer insights into how architecture can behave and operate in a prosthetic manner to enable and extend capability.

48 "Measuring Performance: The Difference Between a Seat and a ChairWork Design Magazine."



CHAPTER FOUR: EXTENSION THROUGH PROSTHETICS

This chapter aims to develop an understanding of prosthetics and prosthetic theory to extend the emergence of architectural space towards being a prosthetic entity. It presents the relevant and functional properties of prosthetics that enhance and extend health, beauty and intelligence of the human body. Next, theoretical frameworks defined by Marquard Smith and Joanne Mora, Elizabeth Wright and Mark Wigley outline a post-modern conditions, covering different levels of embodiment between body and technology and the differing phenomenological and material properties. After discussing prosthetics' integration into architecture, this chapter will bind the research and experiment with how architecture can behave prosthetically to further mobilise the building and its occupants.

The relevance of prosthetics in this research is that prosthetics gives those with a disability an empowered face – it is about the transformation from *dis*-abled to *abled*-bodied. Prosthetics is discussed in terms of its definition of enhancement and extension which augments health, beauty and intelligence. They are attachments, applications, or insertions; an artificial device which either replaces a missing or defective body part or is an extension of human capability. A prosthetic can reconstitute an existing condition through augmentation by integrating and fusing body and technology. Prosthetic devices are enabling devices that can replace loss of function in an attempt to "normalize" the body with technological devices. In *The Prosthetic Impulse: From a Posthuman Present to a Biocultural Future,* Marquard Smith and Joanne Morra conclude that the use of prosthetics as a metaphor for the relationship between body and technology. The gradual infiltration of science, technology and information to our body alters our identity, embodiment, conscious, perception and memory. Smith and Morra make reference to Catherine Hayle who explains how a post- human body, an original prostheses, learns to manipulate the body through prosthetics. The body is understood as a "heterogeneous component…whose boundaries undergo continuous construction and reconstruction."[49] It is the idea of continual augmentation of the body and convoluting the borders of the body.

The body is the site of experimentation where it is re-conceptualised by re-wiring; re-configuration and transformation to sharpen the senses and make one more aware of its utility or superhuman abilities. Artists have endeavoured to question the existing limits of the body to showcase the "capacity for becoming other".[50] However, in this quest to become more human or "superhuman", Thomas Daniell ascertains that by doing so we become less as we "embed oneself in the machine but then allow it to take control, to act as little more than a spectator or surfer going with the cybernetic flow."[51]

49 Lingis, "The Physiology of Art," 11.

50 Cartwright and Goldfarb, "On the Subject of Neural and Sensory Prostheses," 192. See also Deleuze, Gilles, and Felix Guattari. *A Thousand Plateaus: Capitalism and Schizophrenia*. Minneapolis: University of Minnesota Press, 1987, 151

51 Daniell, "But the Flesh Is Weak."

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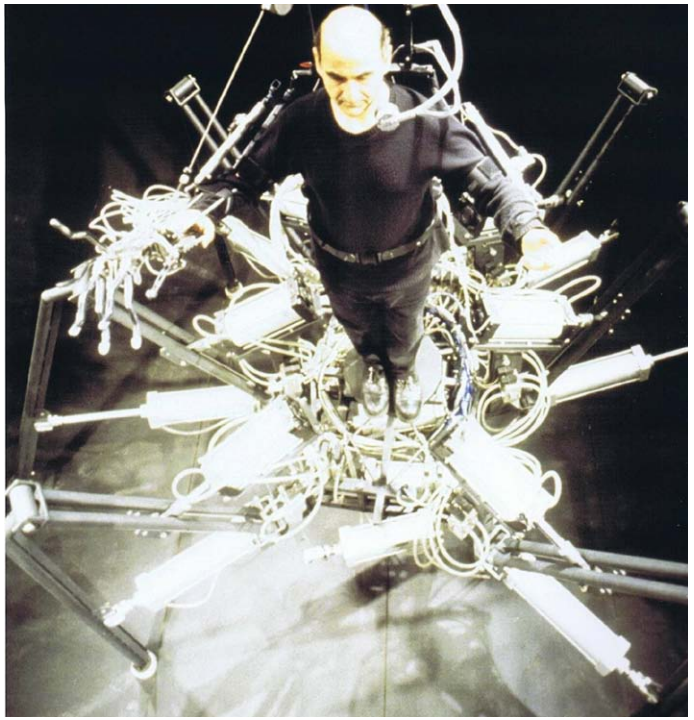

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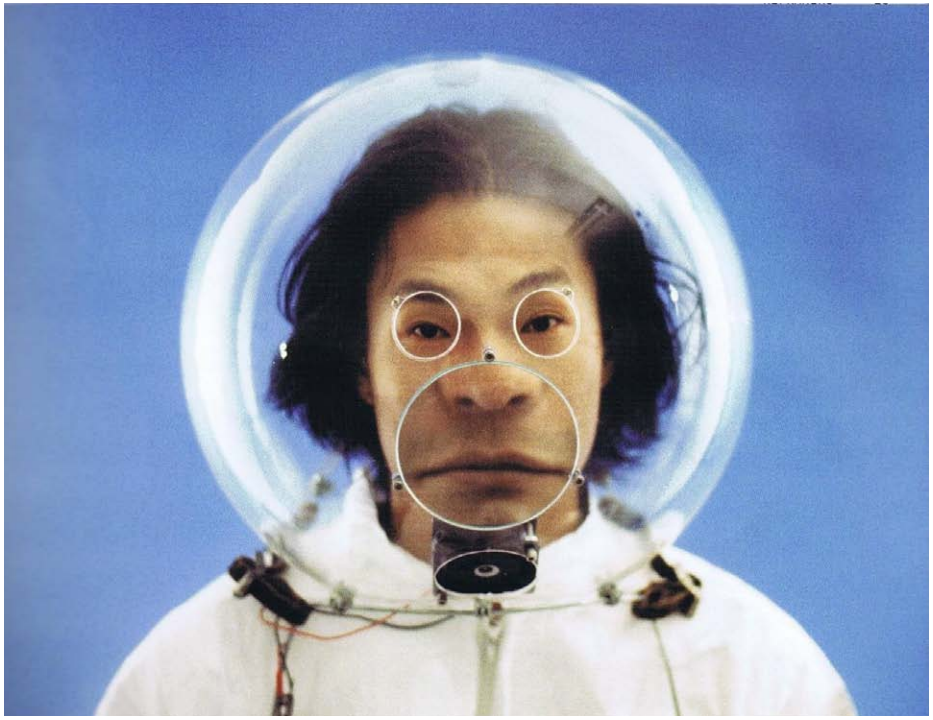

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Figure 99. Unconfined Life Institute: Live an Unconfined Life. "Unconfined Life Wheelchair Challenge: Bring Awareness to the Dehabilitating Power of Segregation and Discrimination." *Unconfined Life*, 2015. http://unconfinedlife.com/unconfined-life-challenge/wheelchair-challenge/.

Figure 100. Agrawal, Raj. "eLEGS - An Exoskeleton That Helps The Paraplegic Walk Upright." *Upcoming Technology.Org*, July 2014. http://www.upcomingtechnology.org/elegs/.

Figure 101 & 102. Schwartzman, Madeline. *Seeing Yourself Sense: Redefining Human Perception*. London: Black Dog Publishing Limited, 2011. 25, 107

EMBODIMENT

Elizabeth Wright in her paper *My Prosthetic & I: Identity Representation in Bodily Extension*, presents three compelling distinctions between body and prosthetic integrations in terms of embodiment:

1. Body as subject and prosthetics as (technological) object
2. Prosthetics as subject and body as object
3. Body and prosthetic as both subject, entwined as one entity

In the first instance, the prostheses is the "topological replacement of a missing body part" connected outside of the body schema to, simply, restore function and aesthetics and hence the individual feels "whole" and therefore "normal" again.[52] It is a relationship where the prosthetic causes the body to adopt a new aesthetic/identity to showcase the synergy between body and technology. Phenomenologist Merleau Ponty in *Phenomenology of Perception* conveys how prostheses supports the impaired body, operating as extensions to the body and its senses:

> The blind man's stick has ceased to be an object for him, and is no longer perceived for itself; its point has become an area of sensitivity, extending the scope and active radius of touch, and providing a parallel to sight[53]

52 University of Edinburgh Journal Hosting Service., "MY PROSTHETIC AND I: Identity Representation in Bodily Extension | Elizabeth Wright |," 1.

53 Merleau-Ponty, *Phenomenolgy of Perception*, 165.

Figure 103. BBC. “In Pictures: Arty Artificial Limbs.” *BBC News Magazine*, September 29, 2012. http://www.bbc.com/news/magazine-19477930.

The second instance denotes the idea of the prosthetic as the subject that defines the body (object). This situation occurs when prosthetics are used as a mask to "shield true self", where their "identity is so entwined with what they come to represent" to protect "against the aesthetic 'difference' that the impairment establishes.[54] Smith explains this relationship to be conflict between invisibility and visibility. The success of prosthetics is "determined by hiding the truth, making invisible the body's "disability" and the very thing that makes it "abled-body" again". Disability becomes visible when the user has an "irregular gait…or backache suffered by the patient that evokes a memory."[55]

54 University of Edinburgh Journal Hosting Service., "MY PROSTHETIC AND I: Identity Representation in Bodily Extension | Elizabeth Wright |," 7–11.

55 Sobchack, "A Leg to Stand On: Prosthetics, Metaphor, and Materiality," 22–23.

104

Figure 104. Anything Brilliant. “Aimee Mullins - Disabled or Superabled?” *Tag Archives: Aimee Mullins*, August 27, 2014. http://anythingbrilliant.com/home/?tag=aimee-mullins.

105

Figure 105. French, Christopher. “Matthew Barney: Cremaster 3.” *Glasstire: Texas Visual Art,* March 2, 2003. http://glasstire.com/2003/03/02/matthew-barney-cremaster-3/.

In the last instance, a seamless integration of body and technology is the most desired relationship that reveals the uncanny – a strange phenomenon that brings about the idea of corporeal wholeness. Wright alludes to a situation where structure, function and aesthetics of both body and machine are seamlessly integrated, and both entities are "not 'into' or "on" but 'as subject' – the body and machine are 'whole'[56]. Wright, in reference to her own experience of wearing prosthetic legs, divulges that the prostheses are:

> Precious to me, it enables me, gives me mobility and an aesthetic that would cease if it was removed from me. Within my body schema, my prosthetic is as much a part of my body as my skin, blood, organs… my mind and body feel that it is "my" leg

It is the interpretation that body and mind are a whole entity where the "self" is subtly extending into the "other" – the prosthetic. [57]

56 University of Edinburgh Journal Hosting Service., "MY PROSTHETIC AND I: Identity Representation in Bodily Extension | Elizabeth Wright |," 10.

57 Ibid., 1 & 6–10.

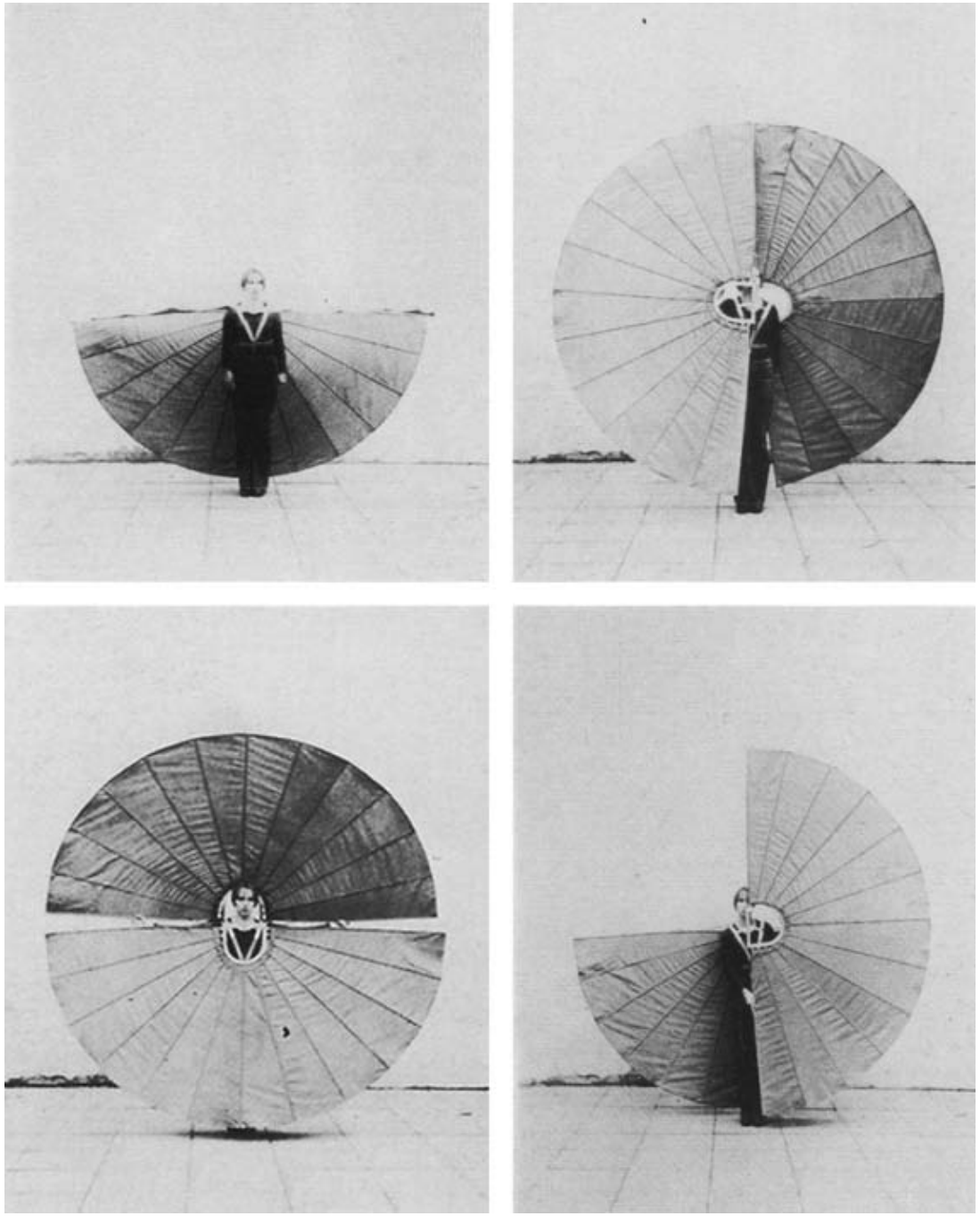


Figure 106. Benard, Gonzalo. “Out of the Blues: Rebecca Horn White Body Fan 1972.” *2HeadS*, April 13, 2014. https://gbenard.wordpress.com/2014/04/13/out-of-the-blues-v/rebecca-horn-white-body-fan-1972/.

PROSTHETICS AND ARCHITECTURE

The prosthetic metaphor extends beyond conventional devices that counterbalance deficiencies as everyday tools and architecture can be understood as a type of prosthetic device which heighten human capability. Mark Wigley, *Prosthetic Theory: The Disciplining of Architecture,* makes reference to Le Corbusier who expresses the need for the body, "born naked and with insufficient armor", to be supplemented with "auxillary limbs" such as the "primordial cell of the house; filing cabinets and copy letters."[58] In *Civilisation and its Discontents,* Sigmund Freud further extends to this and states that, with auxiliary tools, "man is perfecting his own organs" and "when he puts in all his auxiliary organs he is truly magnificent; he is, then, regarded as a "prosthetic god". Prosthetic tools supplements human capability as:

> Ships and aircraft neither water nor air can hinder his movements; by means of spectacles he corrects defects in the lens if his own eye; by means of the telescope he sees into the far distance; and by means of the microscope he overcomes the limits of visibility set by the structure of his retina[59]

58 Wigley, "Prosthetic Theory: The Disciplining of Architecture," 7–9.

59 Freud, *Civilisation and Its Discontents*, 42.

An analysis into the mechanics of a wheelchair compensates for the limited movement of the individual. The wheelchair, operating as an exoskeleton, enables the limited body to become mobile. The wheelchair has the capability to adjust to the human body. At a greater scale, architecture as a prosthetic device is called into question. How could architecture behave and operate as "a second sort of body, incorporating into and extending our corporeal powers"[60] It is critical, then, to analyse existing prosthetic devices, found on site, to understand how their composition and actions enable and enhance capability. The analysis shows that the devices have the capability to:

1. Lock and unlock different elements
2. Connect and disconnect different elements
3. Slide, turn, roll, rotate, extend, and fold to adjust to size and form
4. Compress and expand space

60 Teyssot, "Hybrid Architecture," 81.

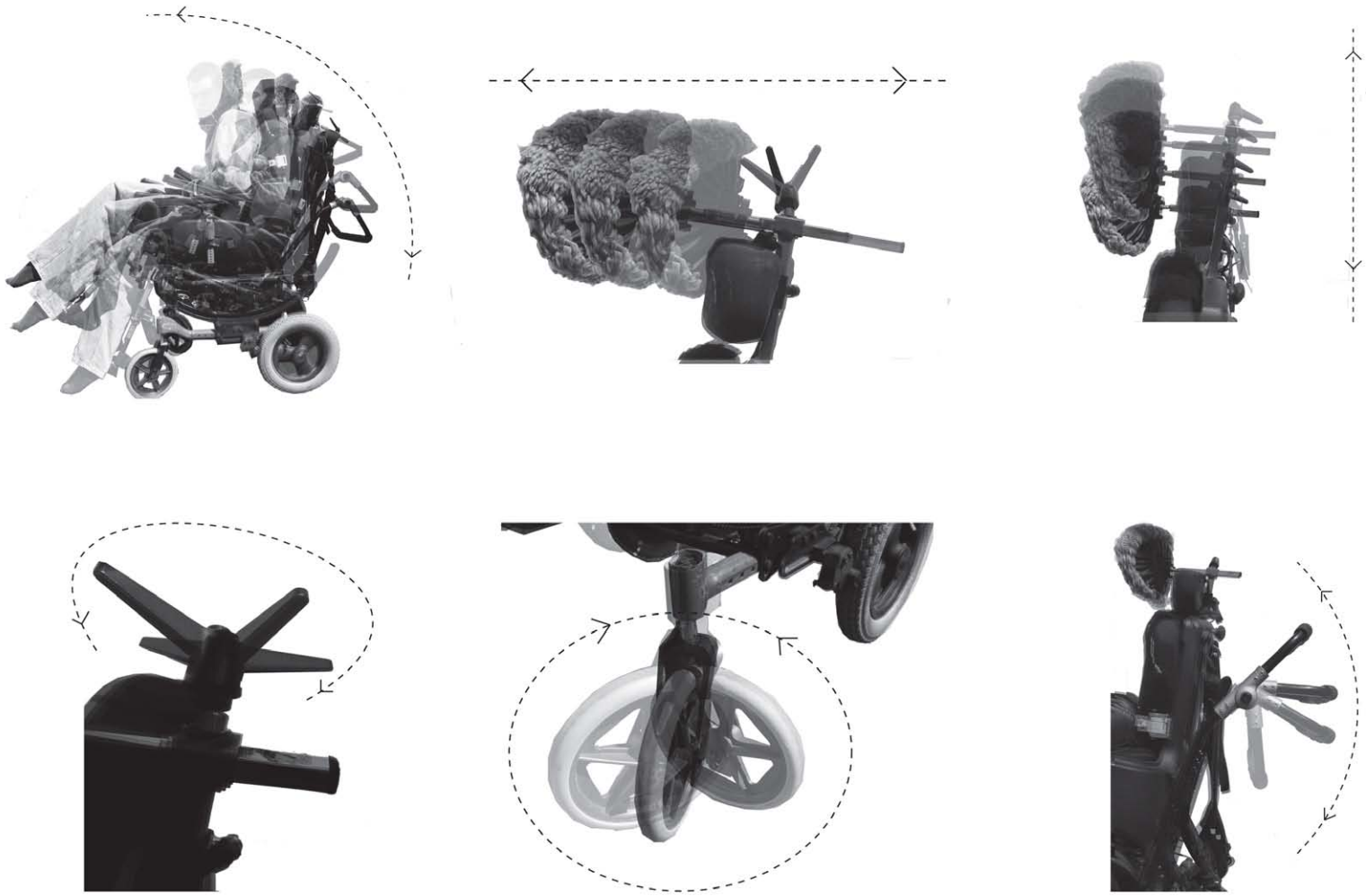


Figure 107. *Movement analysis of a wheelchair.*

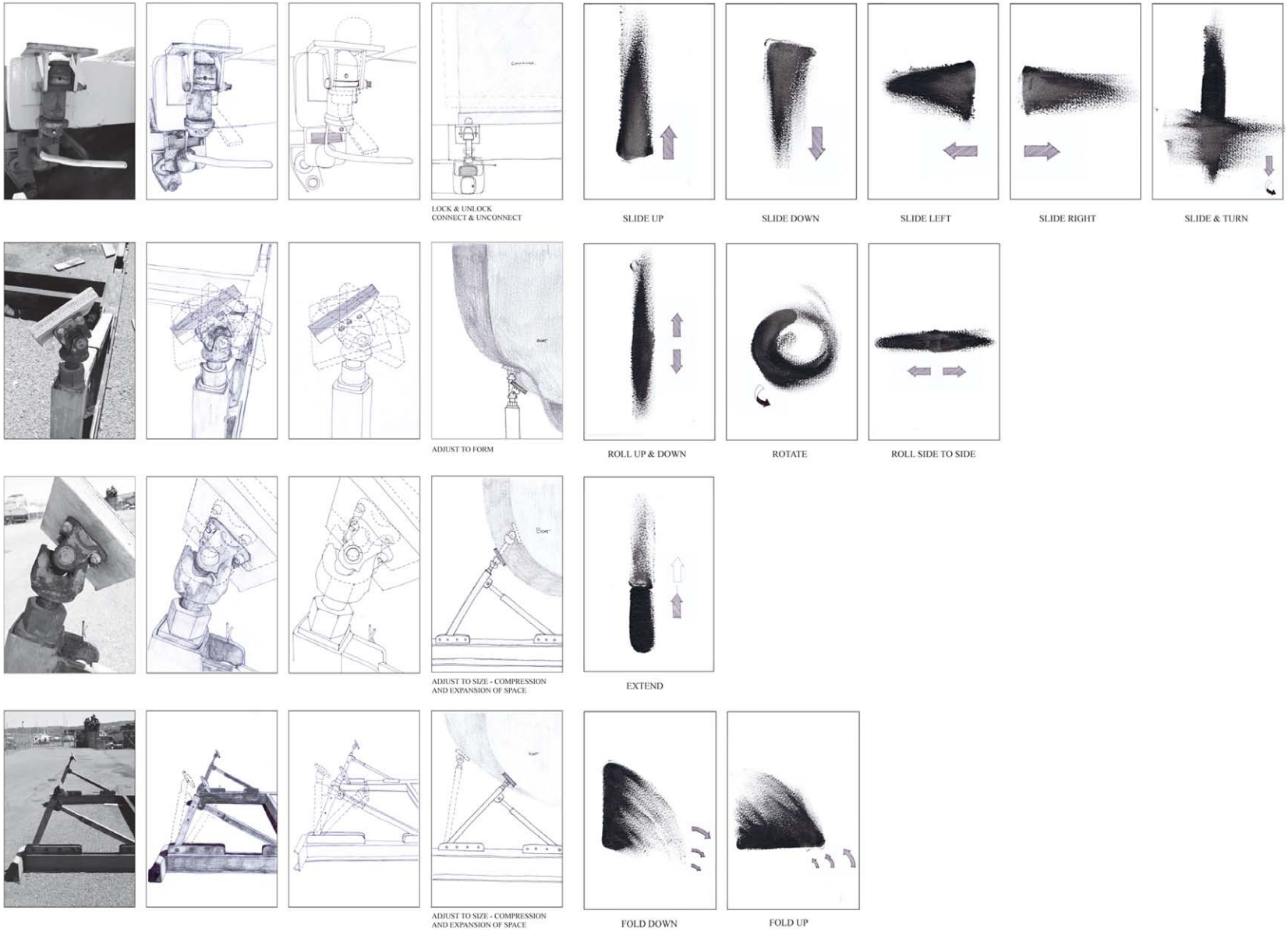


Figure 108. *Movement analysis of prosthetic devices found near site.*

This analysis questions and prompts how existing architectural elements can be re-conceptualised, re-wired and re-configured with the application of the above movement research of existing prosthetic devices on site. The application of prosthetic movement of elements found on site to the design proposal will result to an architectural solution that further responds and engages with site.

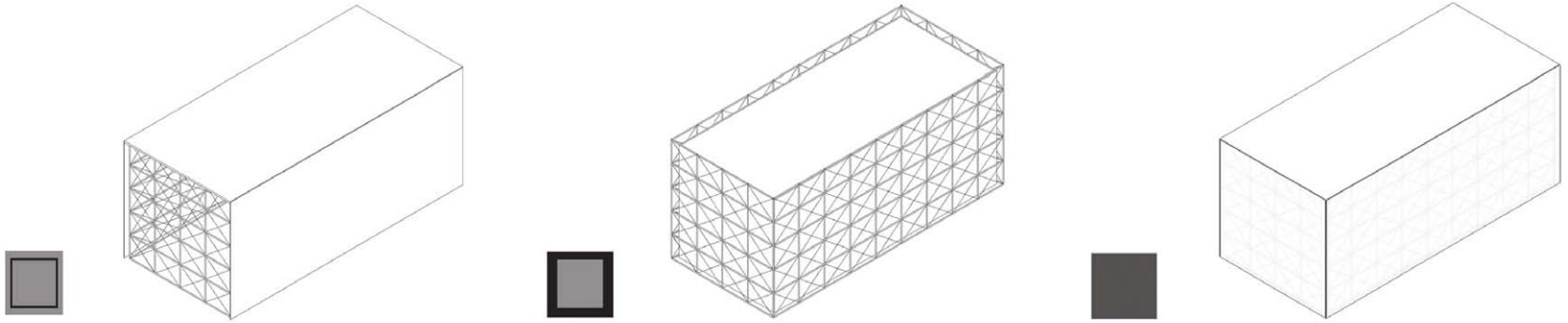
Like the previous chapter, to summarise the research into prosthetics, a set of design considerations are established and experimented with in the subsequent design iteration:

1. Include three different body/machine integrations:
2. Reconceptualise existing architectural preconceptions of space, horizontality, materiality and circulation to transform architectural capability
3. Construct and reconstruct through adjusting, augmenting, and adapting to needs and to adopt new identities and functions
4. Design at different scales
5. Utilise lightweight materials

ITERATION THREE: DESIGN DISCUSSION

Iteration Three tests how architecture can be understood as a "prosthetic tool" that supplements human capability "by means to correct" access and mobility in space. Firstly, the design of the façade is a prosthetic condition, informed by Elizabeth Wright's three distinctions of body and machine integration where the body representative of architecture and prosthetics as the structure. The exposure of structure is tested in three configurations with opaque glass planes: 1) structure as object – exposed structure, 2) structure as subject - hidden structure and; 3) body and structure as subject - ephemeral structural aesthetic that insinuates a seamless integration between both. Secondly, the body in a wheelchair, running blades and eLegs present differing compositional characteristics that can be abstracted to define differing compositions of architecture. These investigations provide a choice of different "shell" configurations for the design of prosthetic architecture. The iteration utilizes a cross-braced structure at the base to support the body of the building. A black sheath protects the building with the steel columns of the structure below piercing the cladding to embrace the idea of "corporeal wholeness." Carving out the ramp promenade, against the opaque glass, accentuates the inclined planes in the design, further expressing the idea of access.

The analysis of the prosthetic devices and their movement and capability informed how the building moves, performs, and behaves in response to users' needs. As a result, the iteration encapsulates an architecture in-flux that enables higher capability by offering new functionality and aesthetics. Meeting rooms, behaving like hoists, can shift between floors and visitors can choose what level or view they would like to hold the meeting. The exhibition walls encompass a sliding component, shifting between the use of a wall, display wall or low space partitions. The café has the ability to roll away from the building, towards the beach, allowing visitors to relax away from the work environment to provide recreational amenity to the beach area.



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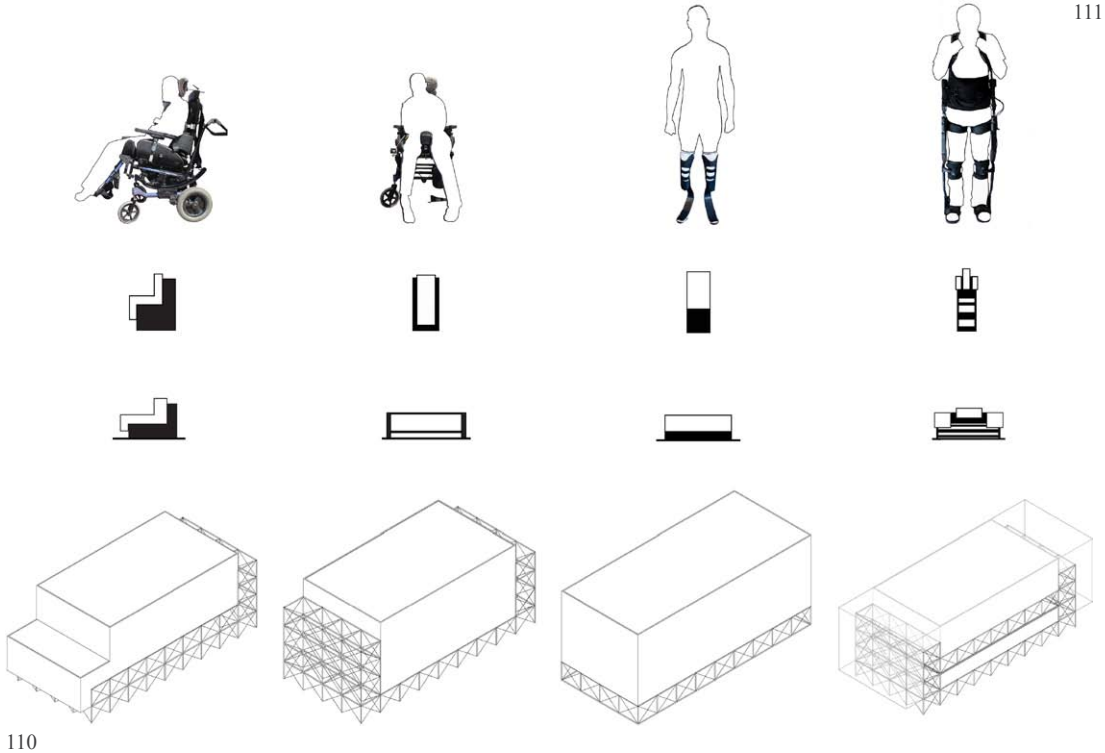

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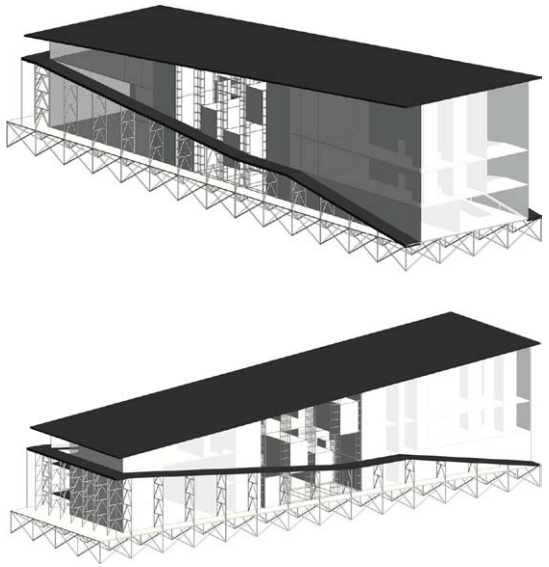


Figure 109. *Integrations between building and structure.*

Figure 110. *Body and prosthetic composition exploration to inform architectural composition.*

Figure 111. *Axonometric views of Iteration Three.*

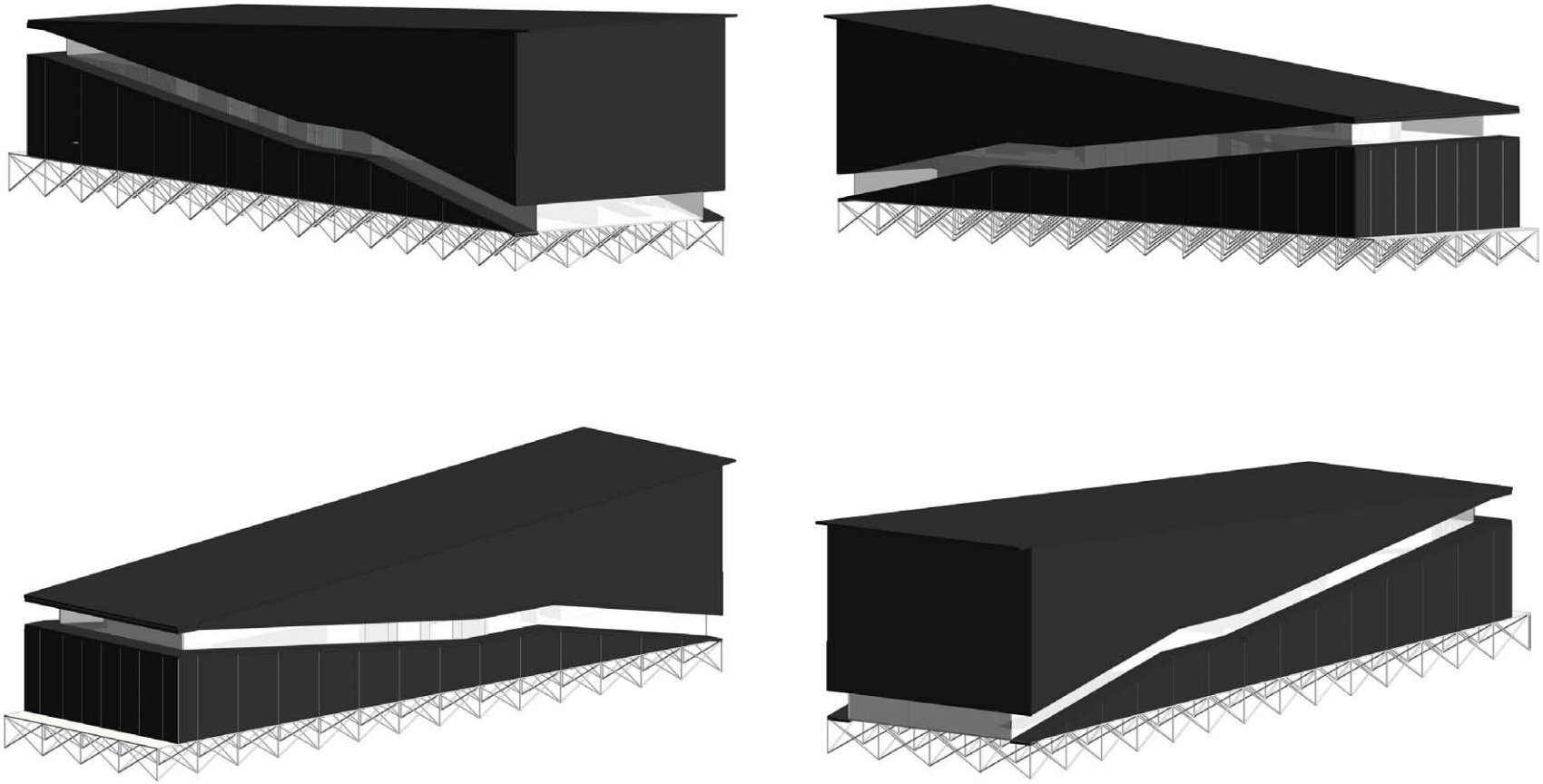
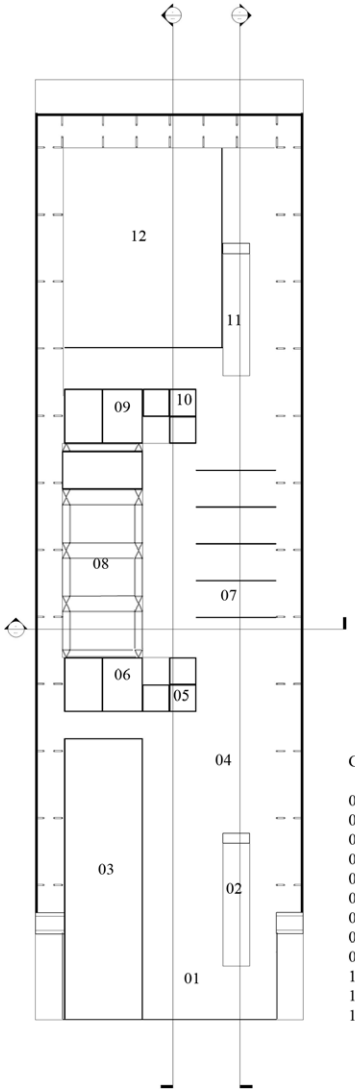
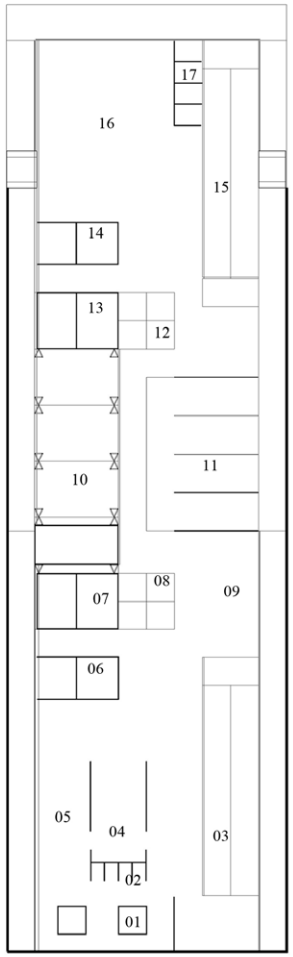


Figure 112. *Axonometric views of supplementary design to Iteration Three.*



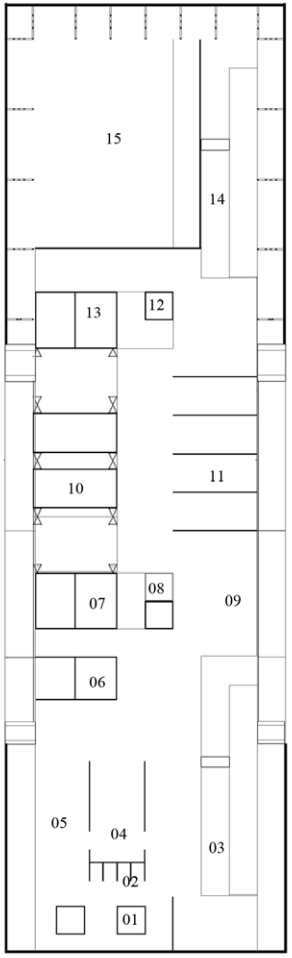
GROUND FLOOR SPACES

01 Entrance
02 Ramp
03 Cafe
04 Active Space
05 Lifts
06 Toilets
07 Exhibition Space
08 Bookable Meeting Room
09 Toilets
10 Lifts
11 Ramp
12 Auditorium



FIRST FLOOR SPACES

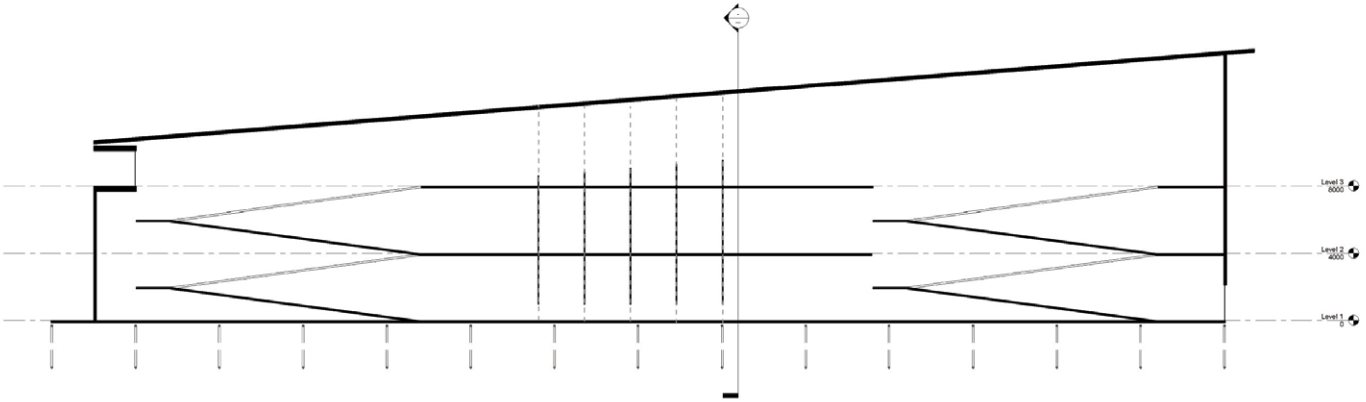
01 Group Focused Pod
02 Group Booth
03 Ramp
04 Kitchen
05 Open Workspace
06 Meeting Room
07 Toilets
08 Lifts
09 Active Space
10 Bookable Meeting Room
11 Exhbition Space
12 Lifts
13 Toilets
14 Meeting Rooms
15 Ramp
16 Open Workspace
17 Individual Focused Pod



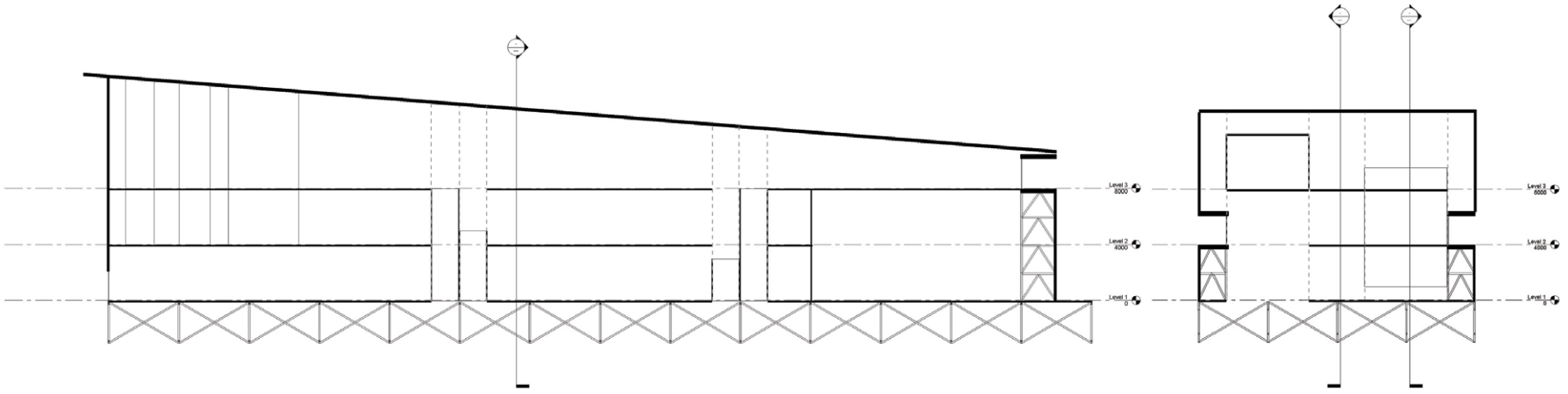
SECOND FLOOR SPACES

01 Group Focused Pod
02 Group Booth
03 Ramp
04 Kitchen
05 Open Workspace
06 Meeting Room
07 Toilets
08 Lifts
09 Active Space
10 Bookable Meeting Room
11 Exhbition Space
12 Lifts
13 Toilets
14 Seminar Room
15 Ramp

Figure 113. *Floor plans of Iteration Three*



SECTION 1



SECTION 2

SECTION 3

Figure 114. *Cross sections of Iteration Three.*

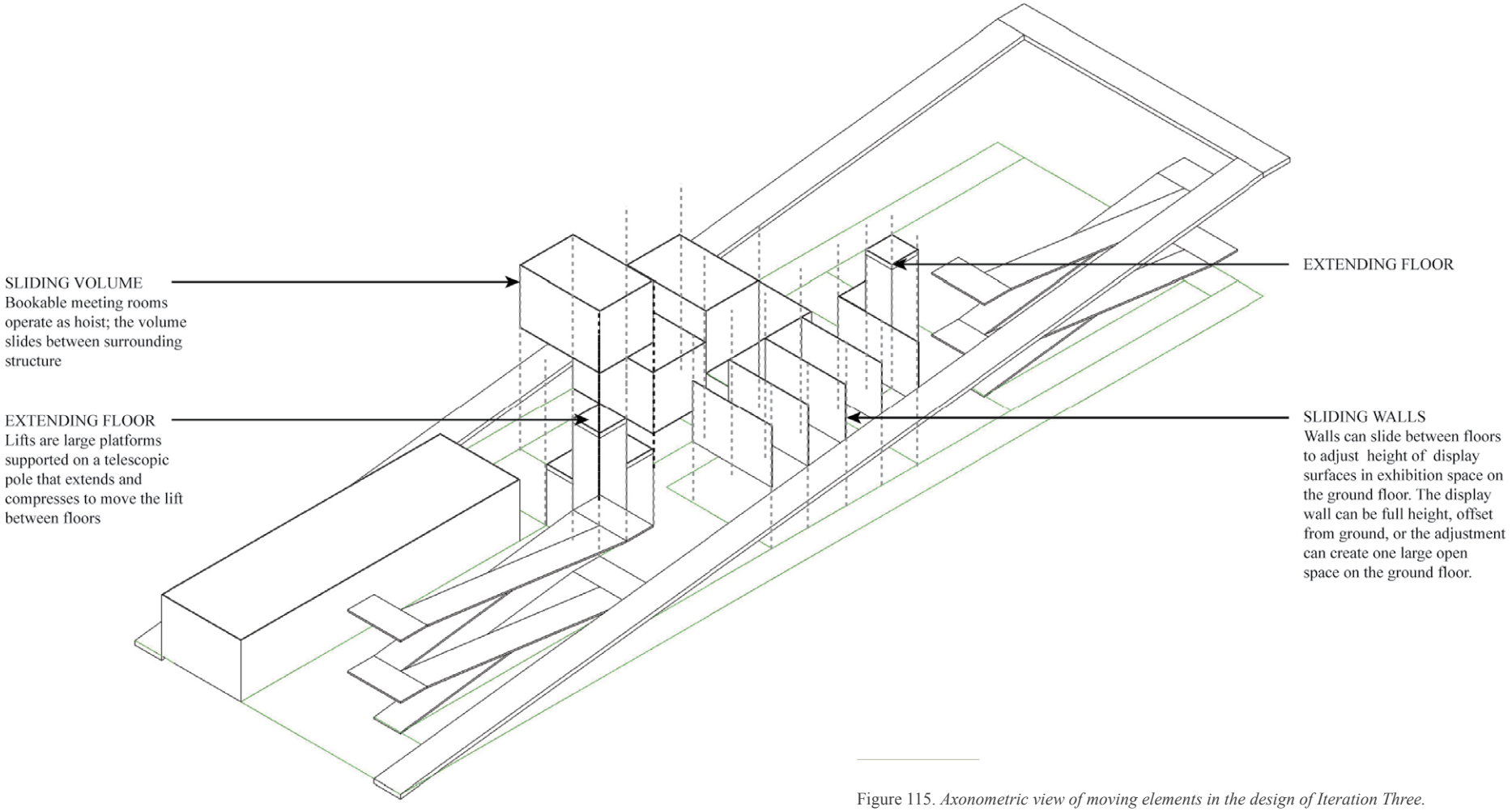


Figure 115. *Axonometric view of moving elements in the design of Iteration Three.*

CONCLUSION

This chapter developed an understanding of prosthetics and critically discussed theoretical frameworks of Marquard Smith and Joanne Mora, Elizabeth Wright and Mark Wigley, concerning the post-human condition. Distinctions outlined by Wright transposed into design investigations around the idea of embodiment between body and structure of the building. The analysis of site prosthetic devices provided insight into how architecture might behave to reconstitute conventional notions through extending capability of architectural elements. The design iterations showcases how architecture can behave prosthetically to further mobilise the building and its occupants. In critique, the design holds strict and taut aesthetic, denoting a machine aesthetic. The cross-braced frames reference the wheelchair and exoskeleton structure. The running blades, on the other hand, express a dynamic and curvaceous nature which references to the organic forms of the human body. The running blade behaves in compression as the carbon fiber compresses and bends under pressure, releasing the stored energy like a spring.[61] The abstraction of the blade arrives at catenary arch forms. Catenary arches have the ability to support great weight with minimal lightweight construction materials.[62] Like the blades, catenary arches are elegant and slender structures. To exemplify the compressive behavior of the blades, the structure will be constructed from concrete. The vertical columns provides greater support. The vertical struts rise and protrude through the building to formulate an integrated phenomena between building and structure.The findings of this iteration review will be integrated and developed in the final design component. However, this chapter discussed seamless integrations between body and machine thus the global design should illustrate both strict and organic characteristics.

61 Ossur, “Flex-Run.”

62 Escher Math, “The Geometry of Antoni Gaudi.”

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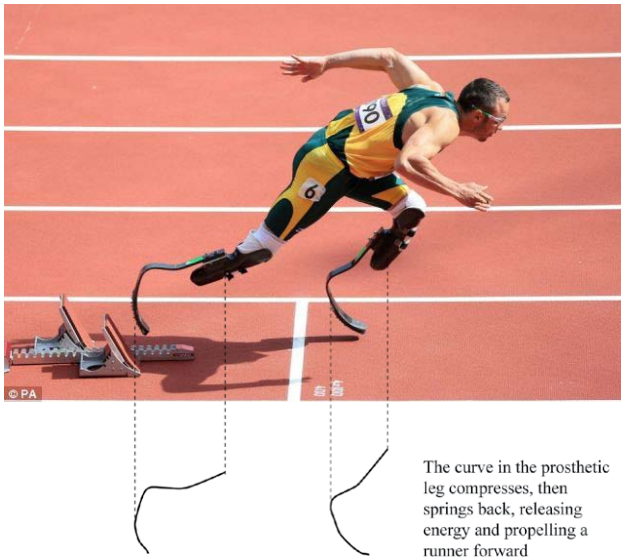

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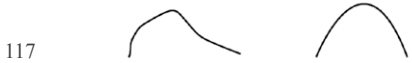

Figure 116. Reilly, Jill. “Oscar Pistorius: ‘Blade Runner’ Sprints into History Books to Become 1st Double Amputee to Compete at Olympics.” *Mail Online: News,* August 4, 2012. http://www.dailymail.co.uk/news/article-2183556/Oscar-Pistorius-Blade-Runner-sprints-history-books-1st-double-amputee-compete-Olympics.html.

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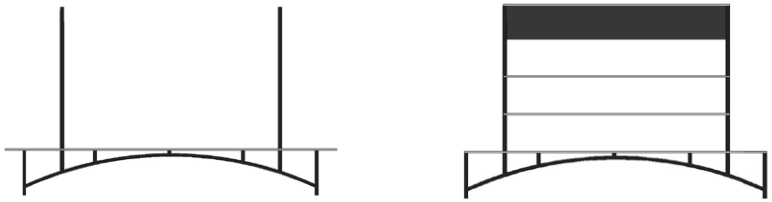

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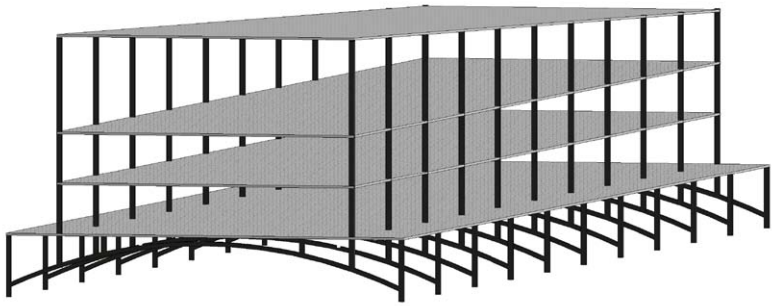
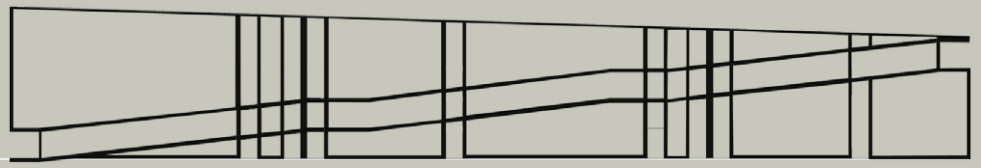


Figure 117. *Abstraction of the blade form and introduction of parabolic curve.*

Figure 118. *Shallow parabolic arch with vertical struts to support building.*

Figure 119. *Axonometric view of structural composition protruding through design.*



CHAPTER FIVE: VITRUVIAN MAN, MODULOR MAN & PROSTHETIC HUMAN

The preceding chapter provided a detailed discussion into prosthetic theory. Drawing on from Sigmund Freud's "prosthetic god," this chapter establishes a method to design for the Prosthetic Human. Firstly, the chapter discusses the privileged position the body has held within architectural history and how the architecture can be understood as a representation or abstraction of the body. Next, insight into the Vitruvian Man is presented to outline the foundation of anthropomorphic analogy. A comprehensive study into the Modular Man provides an understanding of Le Corbusier method of designing universal buildings. It is intended to adopt Le Corbusier methodology and appropriate it for the Prosthetic Human. This chapter will conclude that the figurative referent model is instrumental in designing architecture that the Prosthetic Human can relate with and extend itself to.

The utilization of the body as a model in the design of buildings, accounted for the creation of desirable and harmonious relationships between body and environment. Reference to the body in design emerged with a purely aesthetic analogy with the body, and over time, responses to other complex influences such as emotional (perceptions), and functional (rational sheltering of the body) registers have been experimented with. Thus, altered ideas of the body were established and consecutively modified the sensibilities of architecture[63].

In classical theory, the preoccupation of the body as a measuring mechanism bestowed "every ratio and proportion by which God reveals the innermost secrets of natures"[64] and when forged into architectural form, the building, sacred temple or city stood for and represented notions of corporeal perfection such as authority, proportion, composition and symmetry. Vitruvius, Roman architect, elucidated the connection between the "perfect" numbers of 6,10, and 16 with the human body as "6 is foot is one-sixth of a man's height; 10 because of the "ten 'digits', five on which make a palm and four palms make a foot", and 6+10 combine the "most perfect" number of 16. These numbers were fundamental as a measuring standard in architectural design and practice.[65] Based on Vitruvius's proportion studies, Leonardo da Vinci illustrated a male figure superimposed in two positions with his navel at the centre and his arms and legs outstretched, bound within a circle and square – the Vitruvian Man; a key mathematical and figurative model embraced by Renaissance theorists Leon Battista Alberti to Franscesco di Giorgo and Giorgio Vasari in their architectural pursuits[66].

63 Anthony Vidler presents a historical outline of body analogy with architecture. See Vidler, Anthony. *Architectural Uncanny: Essays in the Modern Unhomely*. Cambridge, Massachusetts. London, England: The MIT Press, 1992.

64 Tavernor, "Contemplating Perfection through Piero's Eyes," 85.

65 Tavernor, *On Alberti and the Art of Building*, 40.

66 For greater detail in Di Giorgio's work see Simon. "Body, Diagram, and Geometry in the Renaissance Fortress." In *Body and Building: Essays on the Changing Relation of Body and Architecture*, by George Dodds and Robert Tavernor, 114–25. Cambridge: MIT Press, 2002. For further explanation of Vasari's work see Steadman, Philip. *The Evolution of Designs: Biological Analogy in Architecture and the Applied Arts*. Oxon: Routledge, 2008.

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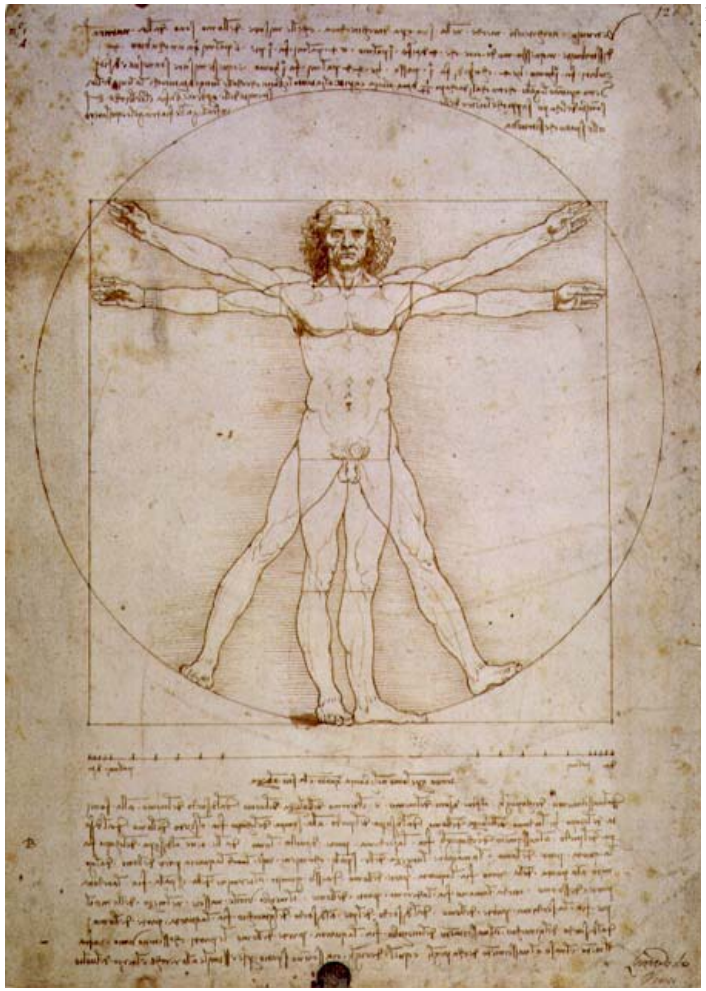

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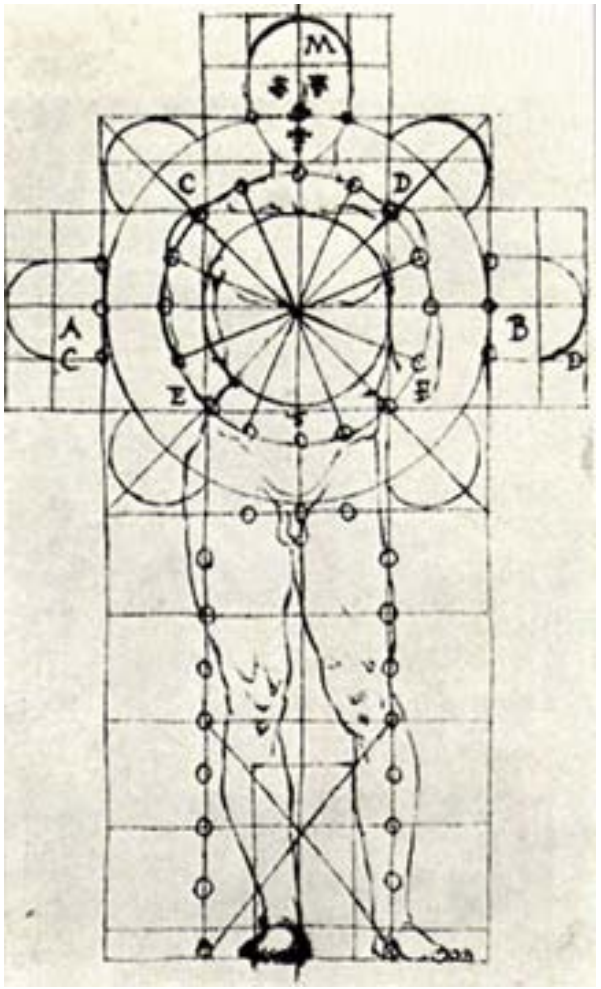

Figure 120 BBC. “Leonardo Da Vinci: Vitruvian Man.” *BBC: Science & Nature*, September 17, 2014. http://www.bbc.co.uk/science/leonardo/gallery/vitruvian.shtml.

Figure 121. Center for Palladian Studies in America. “Palladio’s Literary Predecessors.” C*enter for Palladian Studies in America,* 2010. http://www.palladiancenter.org/predecessors.html.

On the contrary, modernist architecture was dedicated to the functionalist idea of sheltering the body and mass production. Witness to the dislocation between body and architecture caused by manufacturing, Le Corbusier re-appropriated the Vitruvian man for the twentieth century – The Modulor Man. The model stood for universality, movement, sensation and proportion.[67] For universal comprehension in architecture, buildings should account dimensions relatable to the human body.

Corbusier based the Modular Man on the height of the tallest man: 1.83m tall and 2.26m with his arm upraised. By selecting a height at an extreme end of the scale denotes that any measurement is suitable for every individual.[68] Proportions from the Modular scale formulated the "Modular" grid that provides an abundance of different harmonious outcomes to be used in the design of art, architecture, furniture and manufacturing.[69]

For example, the Unite D'Habitation at Marseilles comprises 58 apartments and houses 1600 inhabitants. The very essence of the building is embodied by the proportional system as the volume of each dwelling is 3.66 (twice the height of man), the height is 2.26 (height of man with his arm upraised), and all cupboards are 1.13 (half the height of man). In Cote d'Azur, Le Corbusier's holiday cottage has the height of 2.26m and is twice the length

67 Vidler, *Architectural Uncanny: Essays in the Modern Unhomely*, 75.

68 Le Corbusier, *The Modulor: A Harmonious Measure to the Human Scale Universally Applicable to Architecture and Mechanics*, 63.

69 Zaknic, *Le Corbusier: The Final Testament of Pere Corbu: A Translation and Interpretation of Mise Au Point*, 166.

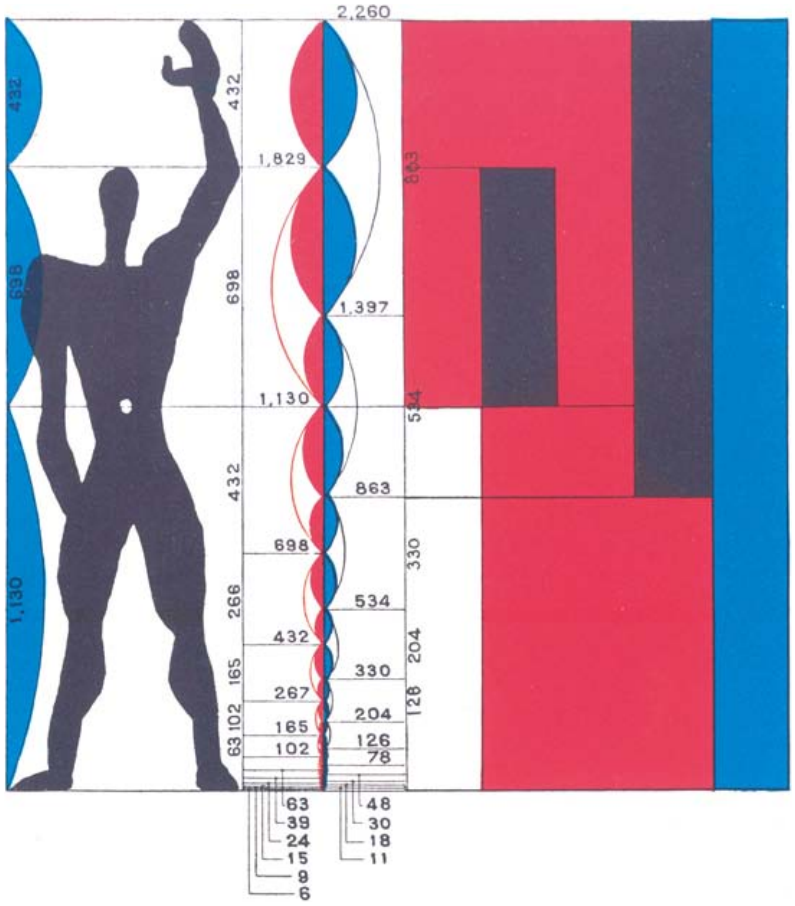

Figure 122. Wiles, William. "Modulor Man." *Icon I: International Design, Architecture and Culture*, 2014. http://www.iconeye.com/component/k2/item/3815-modulor-man.

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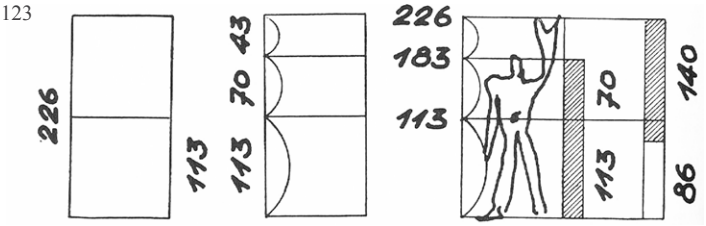

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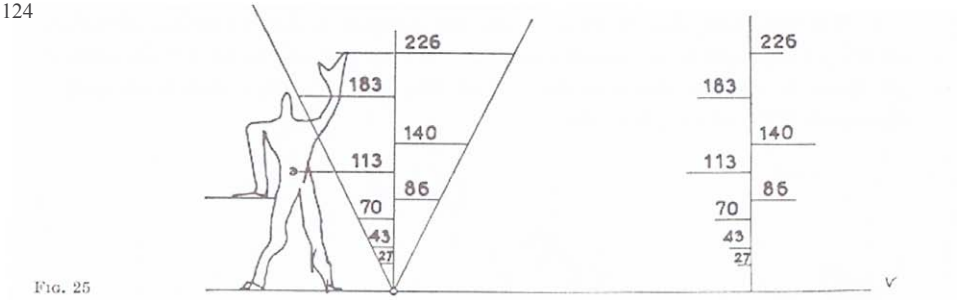


Fig. 25

They may be drawn as follows:

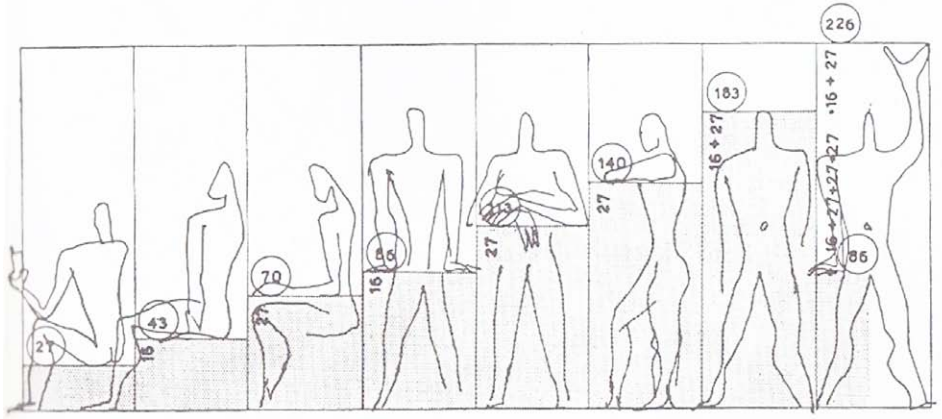
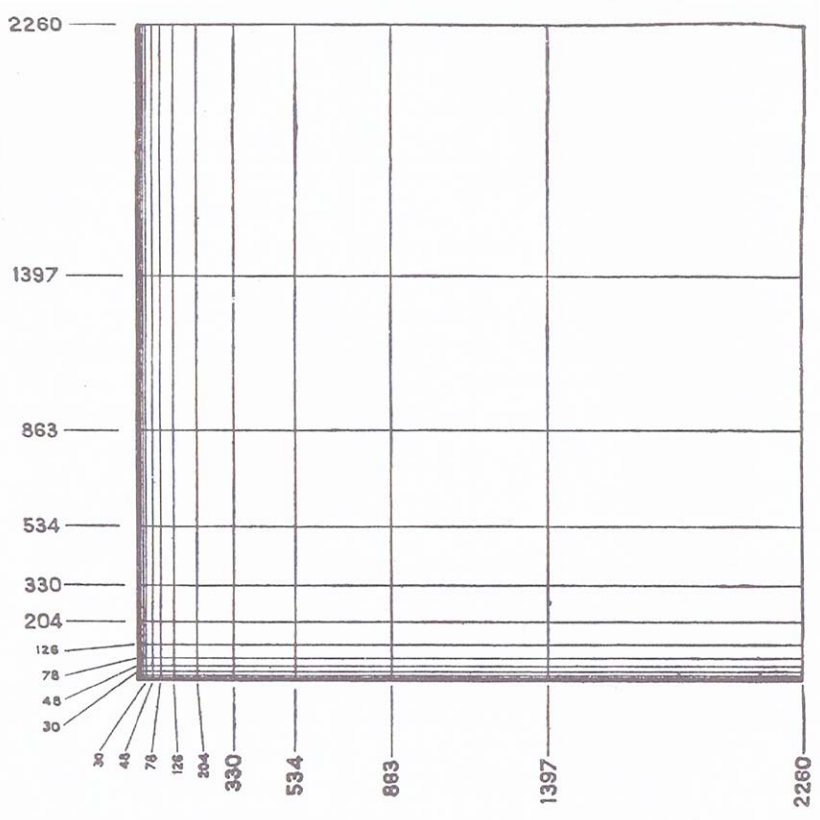


Figure 123 & 124. Le Corbusier. *The Modulor: A Harmonious Measure to the Human Scale Universally Applicable to Architecture and Mechanics.* London: Faber and Faber Limited, 1961. 66,67



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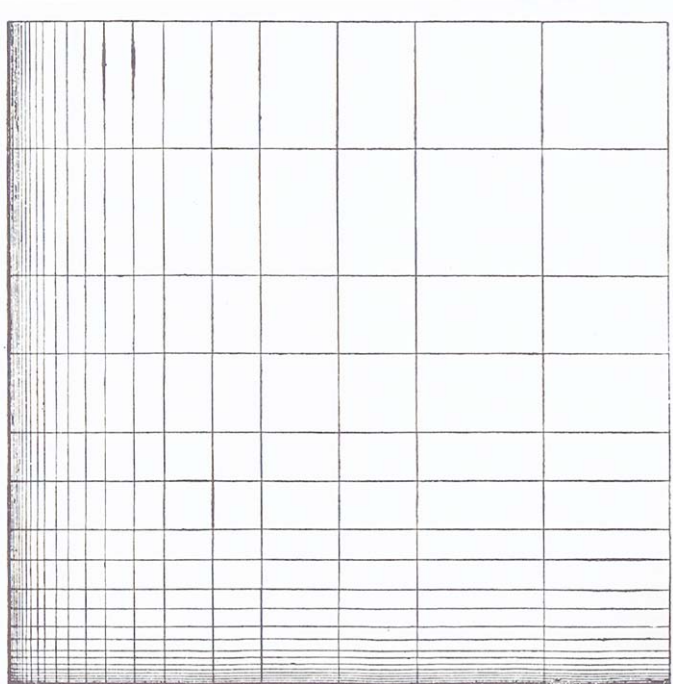

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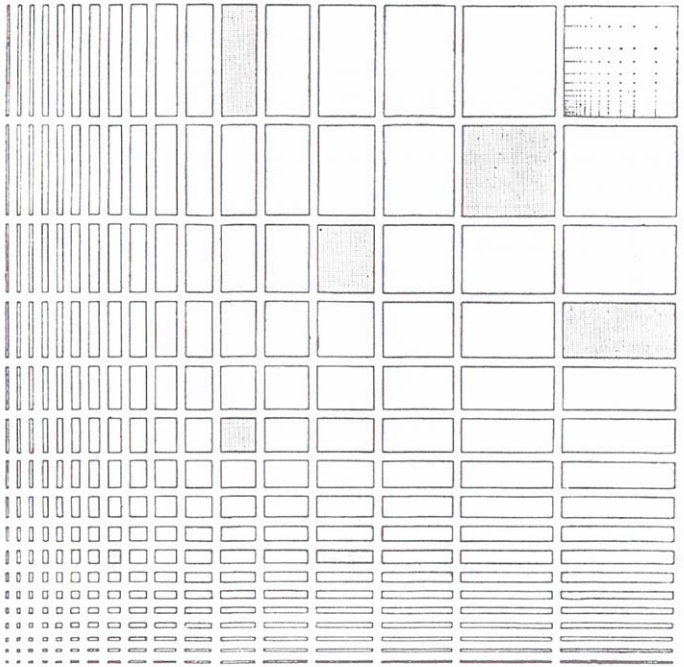
Figure 125 & 126. Le Corbusier. *The Modulor: A Harmonious Measure to the Human Scale Universally Applicable to Architecture and Mechanics*. London: Faber and Faber Limited, 1961.86,87



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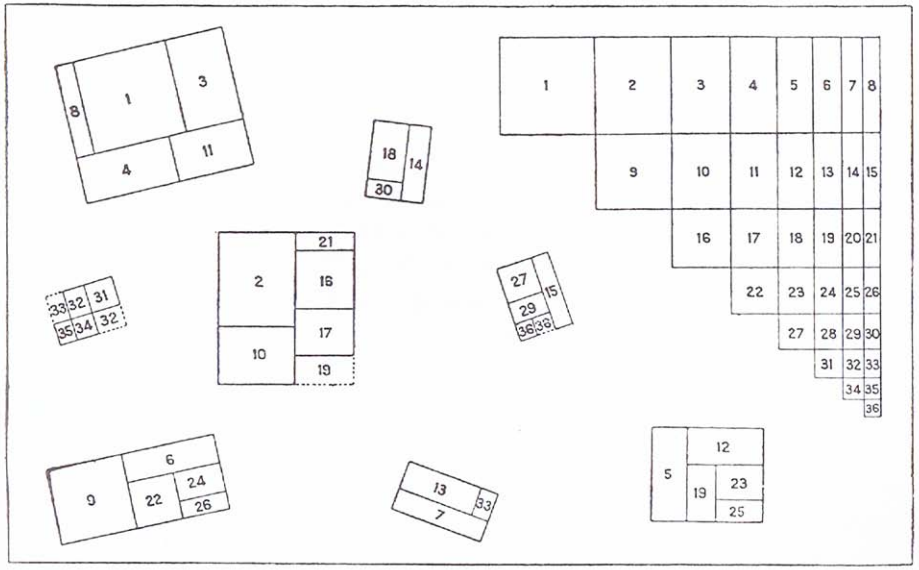

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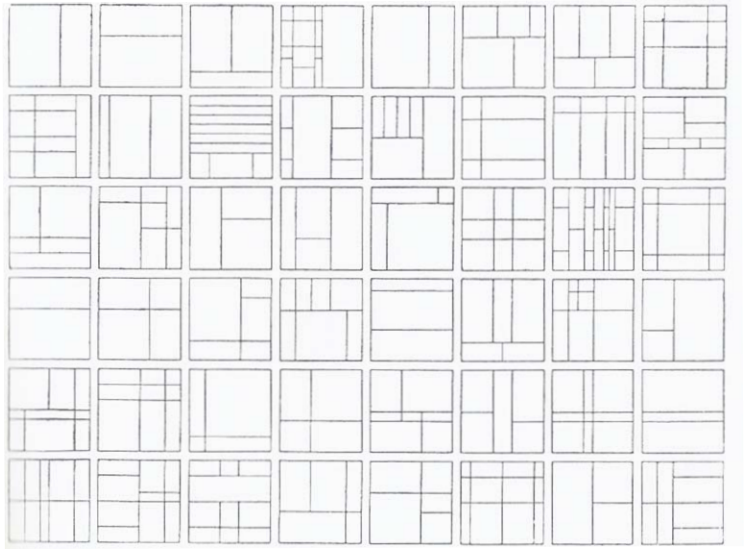
Figure 127 & 128. Le Corbusier. *The Modulor: A Harmonious Measure to the Human Scale Universally Applicable to Architecture and Mechanics*. London: Faber and Faber Limited, 1961.89, 91



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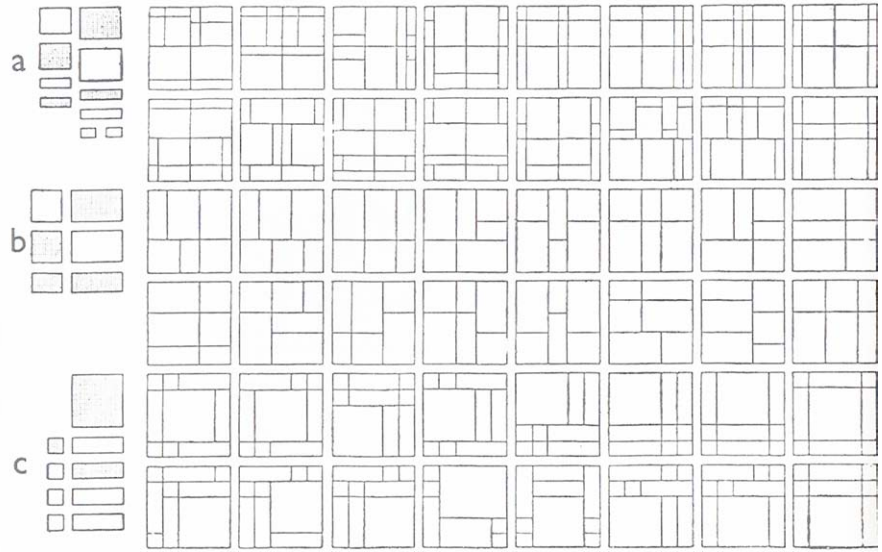

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Figure 129 & 130. Le Corbusier. The Modulor: *A Harmonious Measure to the Human Scale Universally Applicable to Architecture and Mechanics*. London: Faber and Faber Limited, 1961. 93-94

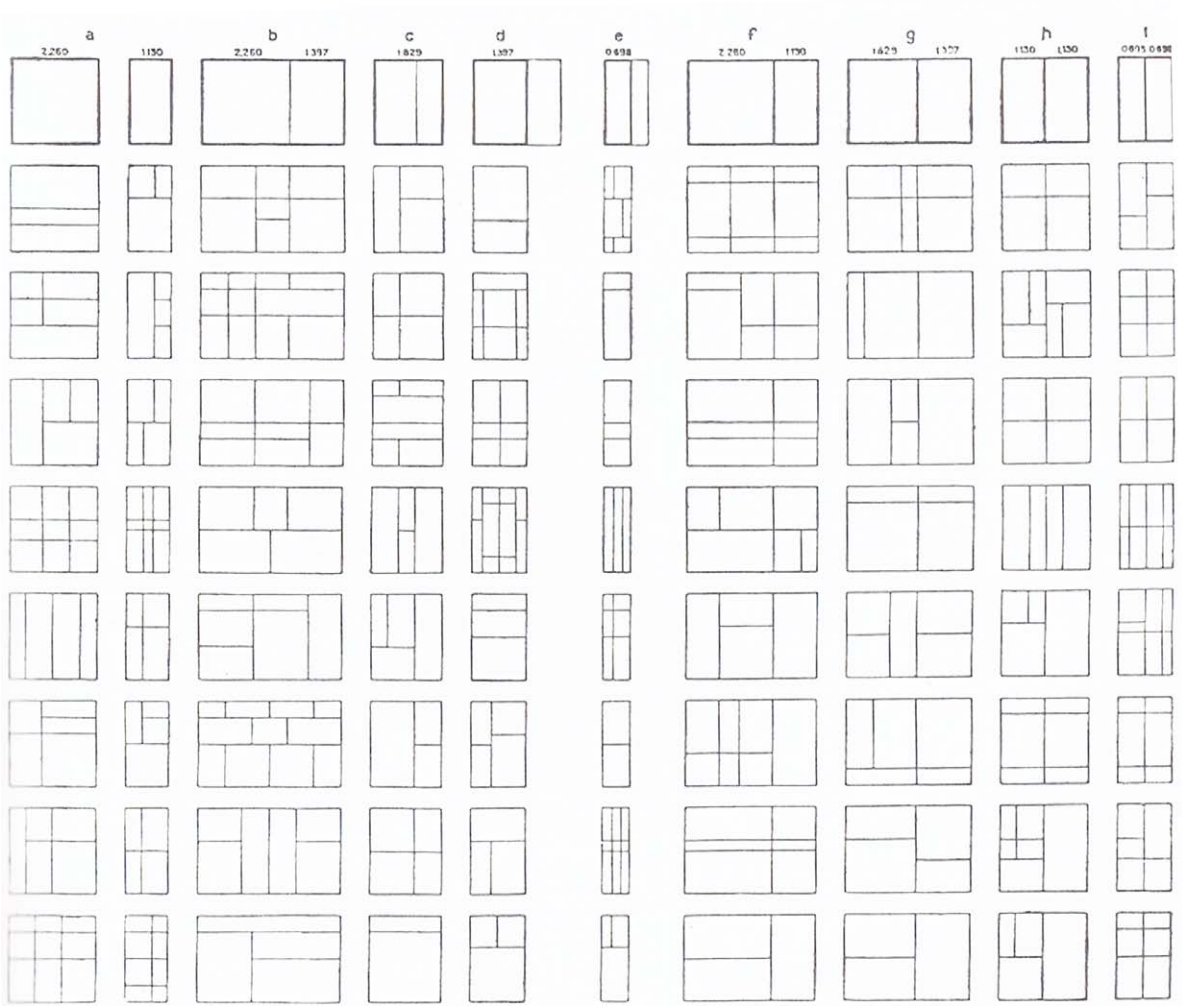

Figure 131. Le Corbusier. *The Modulor: A Harmonious Measure to the Human Scale Universally Applicable to Architecture and Mechanics. London: Faber and Faber Limited, 1961. 95*

Figure 132. Fondation Le Corbusier. "Unité D'habitation, Marseille, France, 1945." *Fondation Le Corbusier: Works: Architecture: Buildings*. Accessed March 12, 2015. http://www.fondationlecorbusier.fr/corbuweb/morpheus.aspx?sysId=13&IrisObjectId=5234&sysLanguage=en-en&itemPos=58&itemCount=78&sysParentId=64&sysParentName=home.

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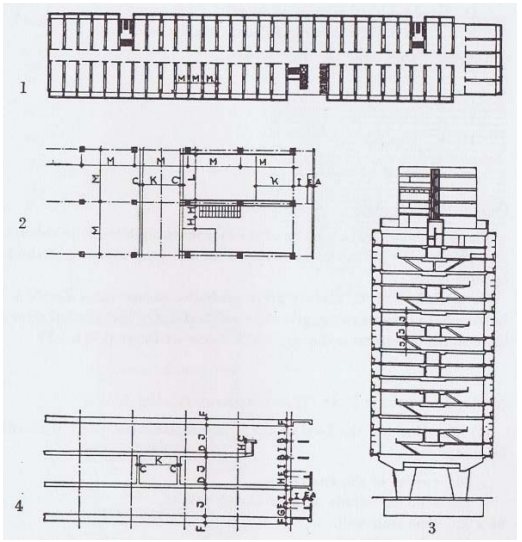

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Figure 133. Le Corbusier. *The Modulor: A Harmonious Measure to the Human Scale Universally Applicable to Architecture and Mechanics*. London: Faber and Faber Limited, 1961. 133

Figure 134. Fondation Le Corbusier. “Unité D’habitation, Marseille, France, 1945.” Fondation Le Corbusier: Works: Architecture: Buildings. Accessed March 12, 2015. http://www.fondationlecorbusier.fr/corbuweb/morpheus.aspx?sysId=13&IrisObjectId=5234&sysLanguage=en-en&itemPos=58&itemCount=78&sysParentId=64&sysParentName=home.

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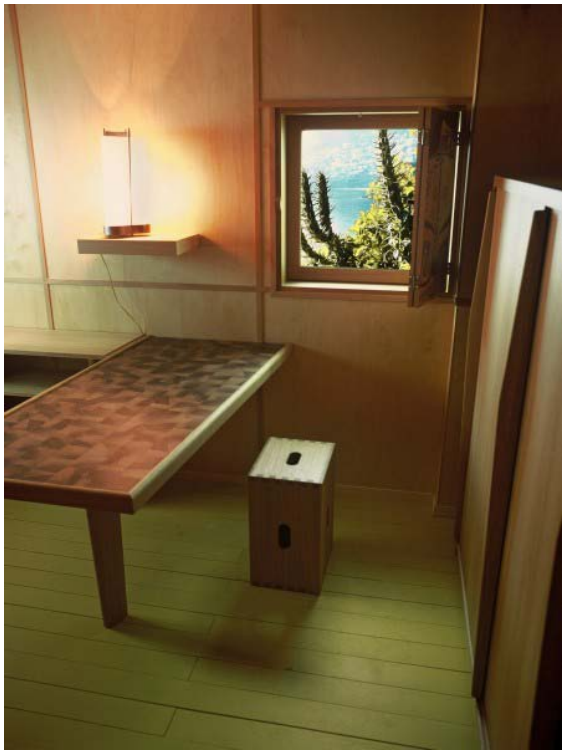

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Figure 135-137. Metropolis Magazine. “Living Simply with Le Corbusier.” *Point of View: February 2009: Living Simply with Le Corbusier*, February 17, 2009. http://www.metropolismag.com/Point-of-View/February-2009/Living-Simply-with-Le-Corbusier/.

Figure 138. Dezeen. “Instrumented Bodies by Joseph Malloch and Ian Hattwick.” *Dezeen Magazine*, August 12, 2012. http://www.dezeen.com/2013/08/12/instrumented-bodies-by-joseph-malloch-and-ian-hattwick/.

of a six foot man.[70]

In an effort to continue the body-building paradigm, Braham and Emmons introduce the flexible body; a body understood as a “dynamic interconnected system” that “exists in collaboration with its environment.”[71] Moreover, the flexible body is “surgically or technically enhanced” and an “accessorized” body[72] can be projected onto architecture to create buildings that, in turn, are flexible systems where form, configuration, use, appearance and identity can be adapted to condition and use.[73]

70 Gaudin, “Back to Basics,” 58.
71 Braham and Emmons, “Upright or Flexible? Exercising Posture on Modern Architecture,” 292.
72 Ibid., 299.
73 Ibid., 292.

Aligning to the flexible body, thesis presents the disabled body –the Prosthetic Human - as a new figurative referent and proportional system in the design of architecture.

In a linguistic context, “man,” as used in the Vitruvian Man and Modular Man, designates a historic meaning of “one” or “person, or more directly an “adult male”. It designates a difference, a particularity. In a posthuman condition, posthuman is not singular. It is a universal state and multiple identities are created thus “human” is more encompassing. As posthuman seeks to re-conceive the body, the “Prosthetic Human,” then, specifically questions the salient line between body and technology.

The Prosthetic Human stands for universality, accessibility and mobility where imperfection is the new ideal. The Prosthetic Human grid and scale offers a series of measures that reconcile to a human being in a wheelchair. The different combinations and proportions can be utilized in any design project to determine the composition of the building. By employing this tool in design, unlimited choice of combinations is given and the design is relatable to a limited person.

Following Corbusian perspective of universality, a large wheelchair has been utilized which will pertain to larger architectural dimensions to ensure that the model is accessible to a greater range of people. The end result should enable good approachability, accessibility and mobility through space.

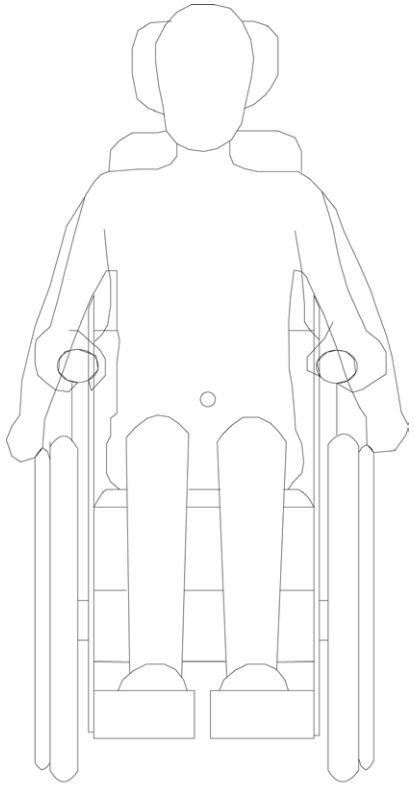
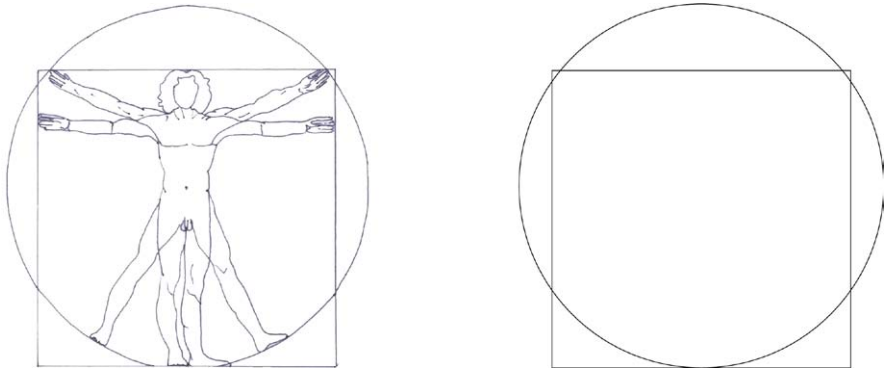


Figure 139. *Illustration of the Prosthetic Human - new proportional model.*



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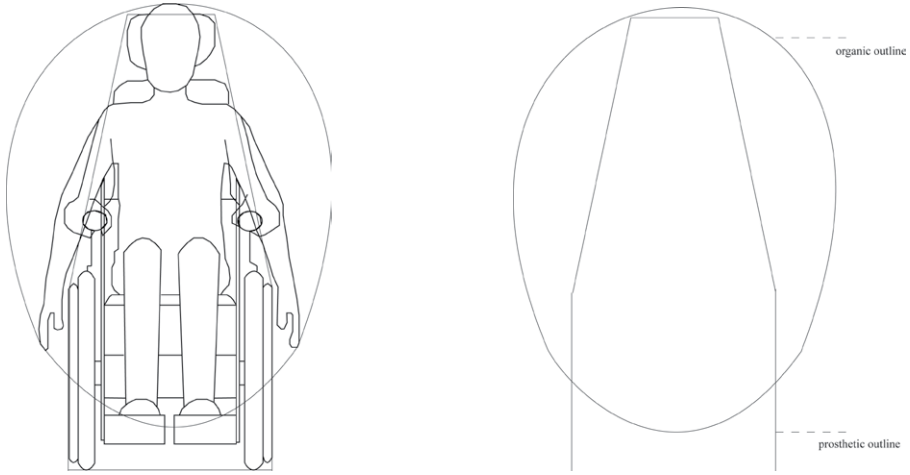

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ITERATION FIVE: DESIGN DISCUSSION

Firstly, the translation of Vitruvian and Corbusian models were appropriated for the Prosthetic Human. The Prosthetic Human distinguishes new geometries and numerical values.

In a Vitruvian disposition, superimposing the outline of the wheelchair and the body created an asymmetrical configuration; a reference to the impaired body. Next, the Prosthetic Human was measured to gain a set of numerical distances between wheel and foot, foot to armrest, navel, to armrest, navel to headrest. In effect, these numbers can be realized as "prosthetic numbers" that represent the relationship between body and machine. In Corbusian spirit, the Prosthetic Human was analyzed in terms of volume/mass. Whilst the volume of the Modular Man increased with height, the volume/mass of the Prosthetic Human shows a concentration of small masses in the centre of the figure and larger, open volumes at either poles. This is a play of densities and presents an opportunity to design spatial conditions in the design component. Reconstructing the Modular Grid, the proportional numerical values of the Prosthetic Human have been applied into horizontal and vertical divisions, devising the "Prosthetic Grid". This grid can be dissected into individual forms that can be configured into different arrangements that that will help inform and define building occupation volume, floor layouts, sections or elevations.

Figure 140. *Symmetrical geometry study of the Vitruvian Man.*

Figure 141. *Asymmetrical geometry study of the Prosthetic Human. .*

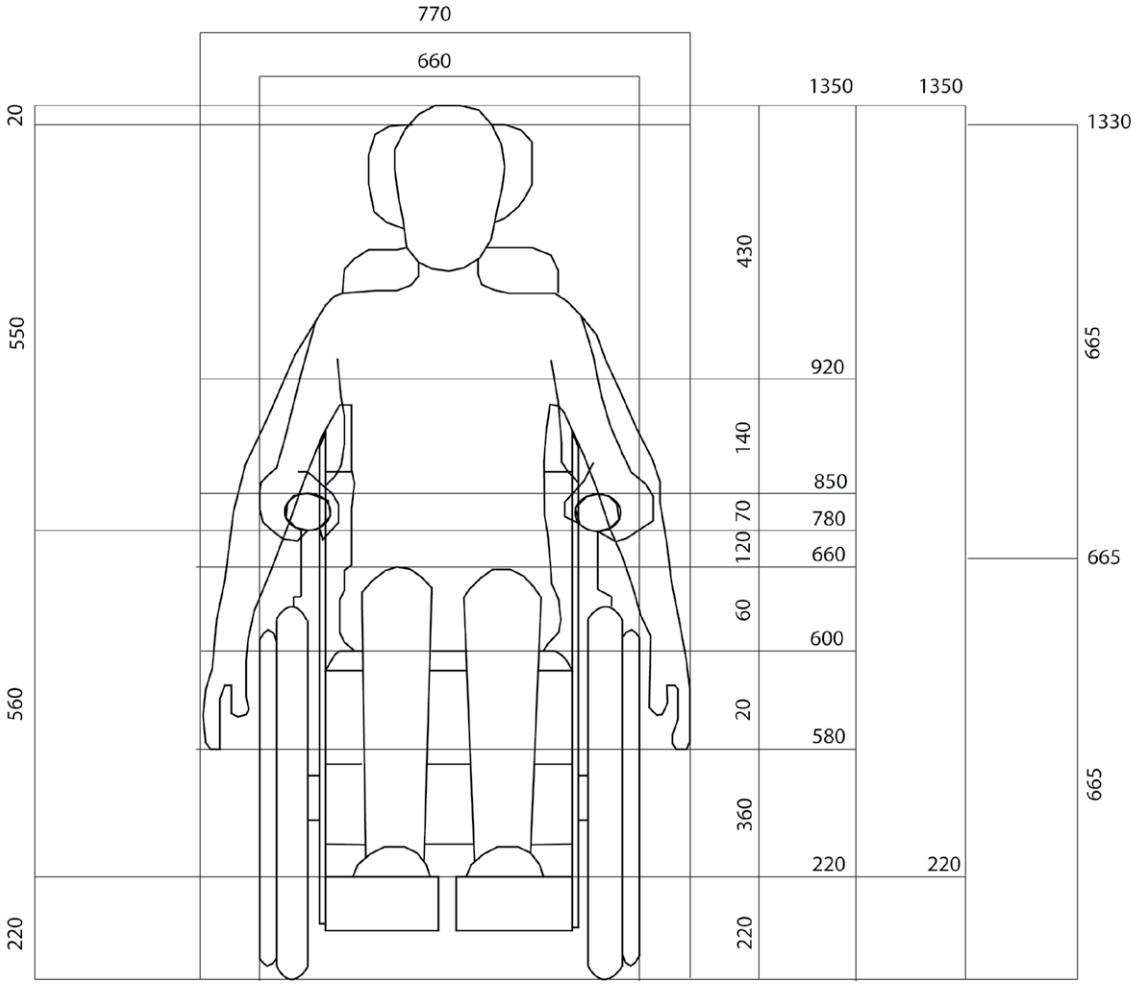


Figure 142. *Illustration showing dimensions between different parts of the body and wheelchair*

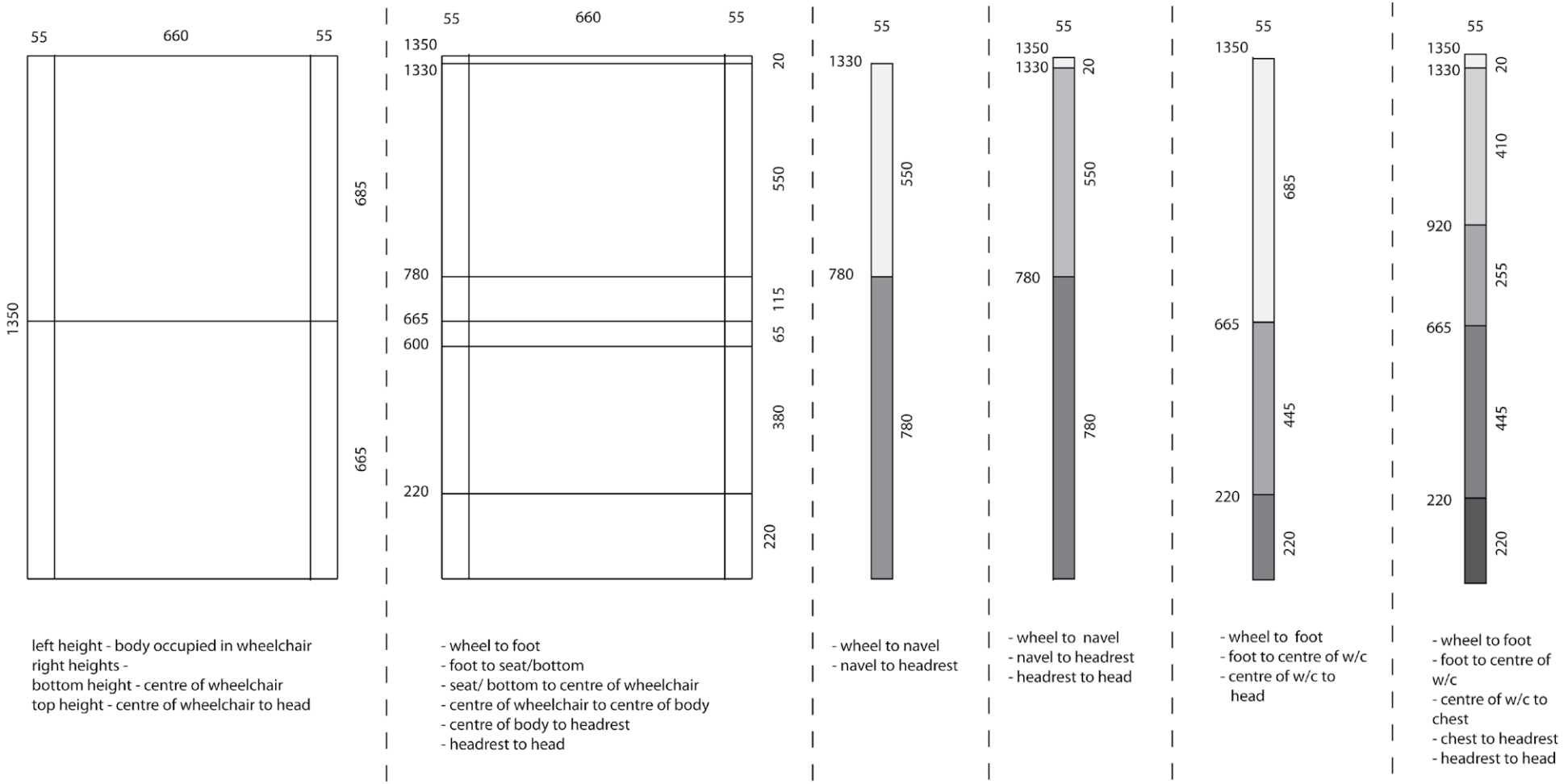


Figure 143. *Illustration showing the exercise of isolating dimensions and testing proportions.*

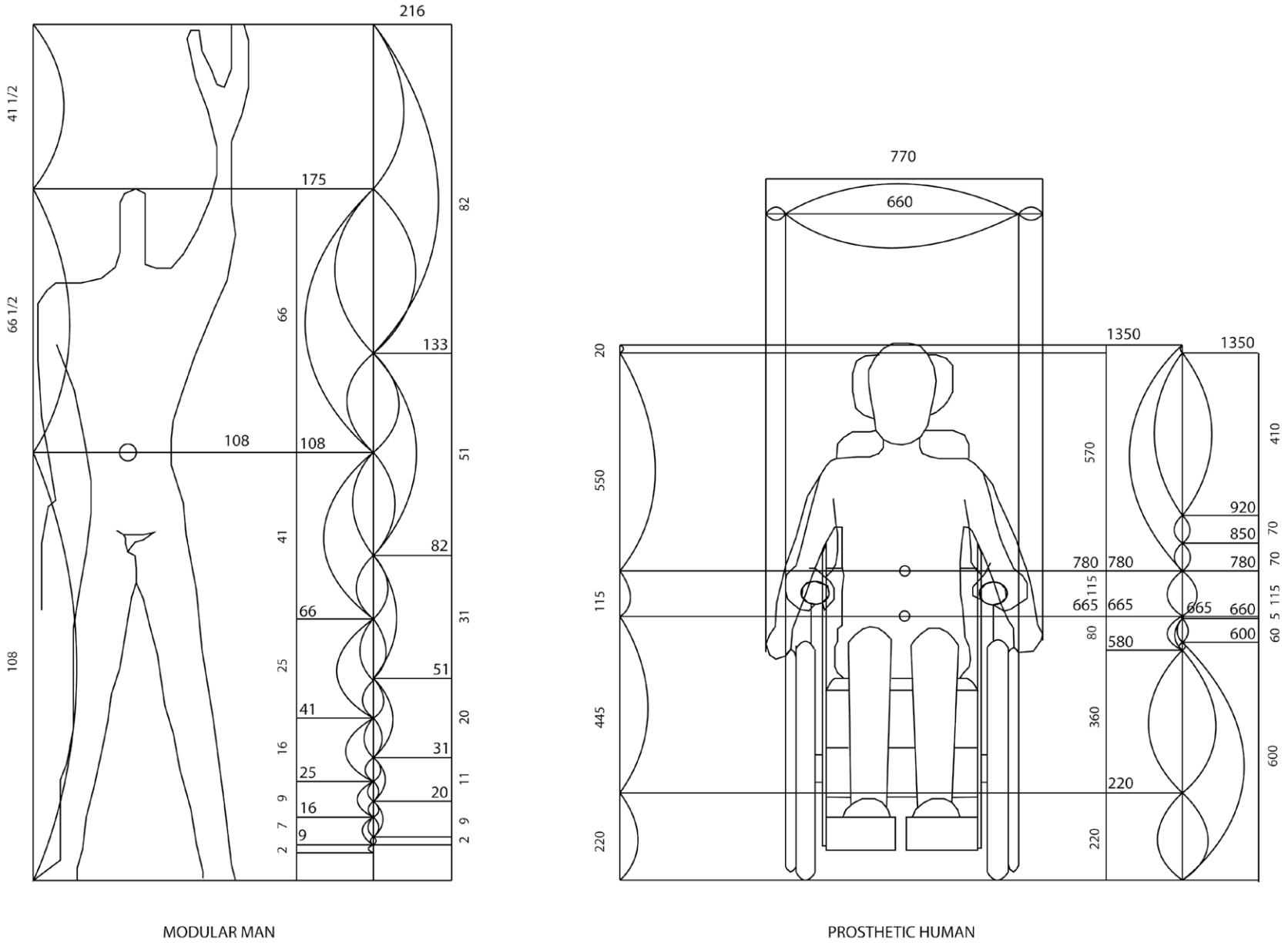
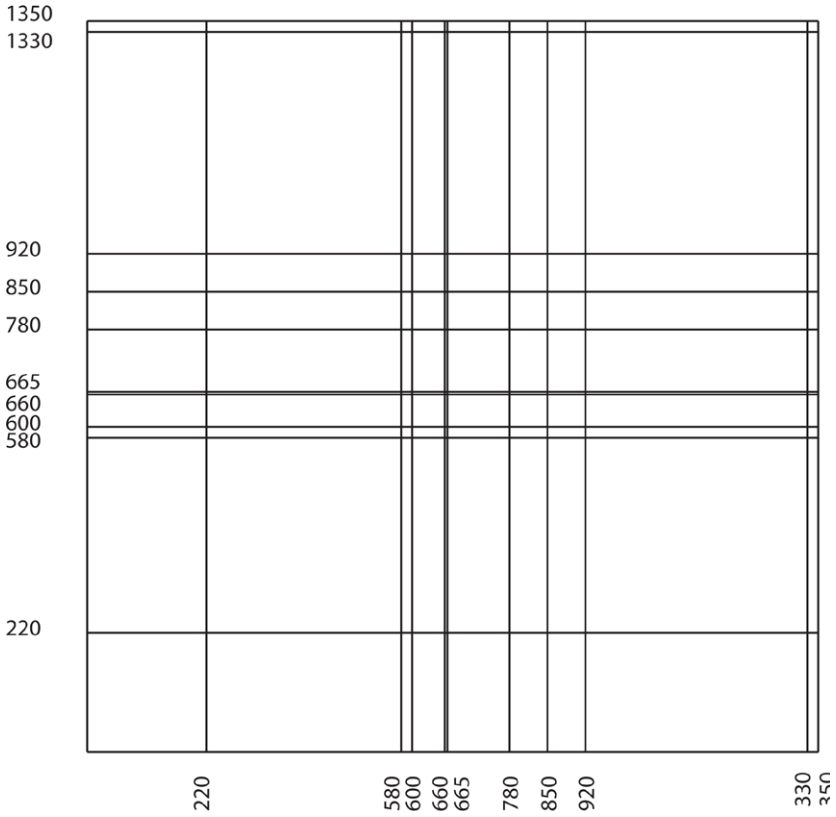


Figure 144. Illustrations showing the differing proportions and sinusoidal curves of the Vitruvian Man and the Prosthetic Human.



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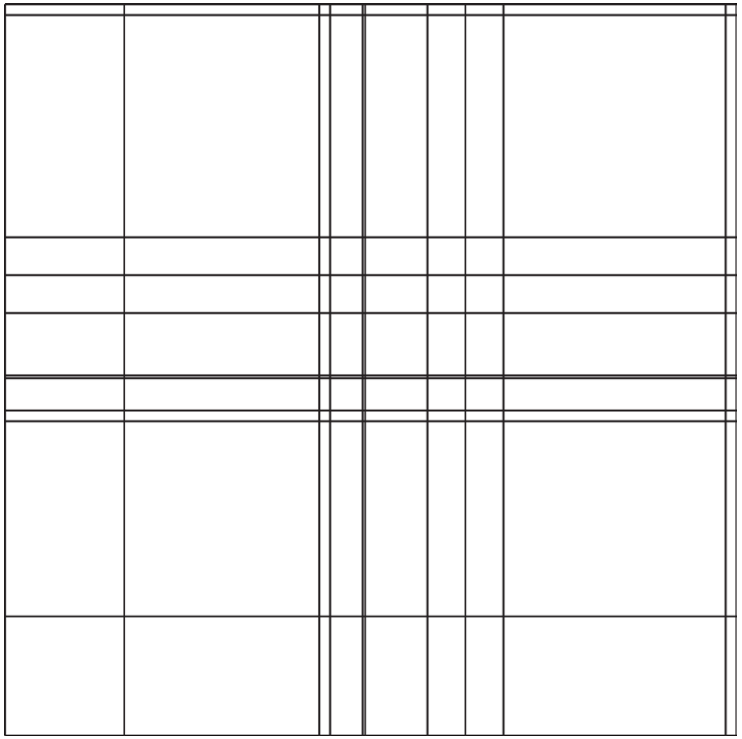
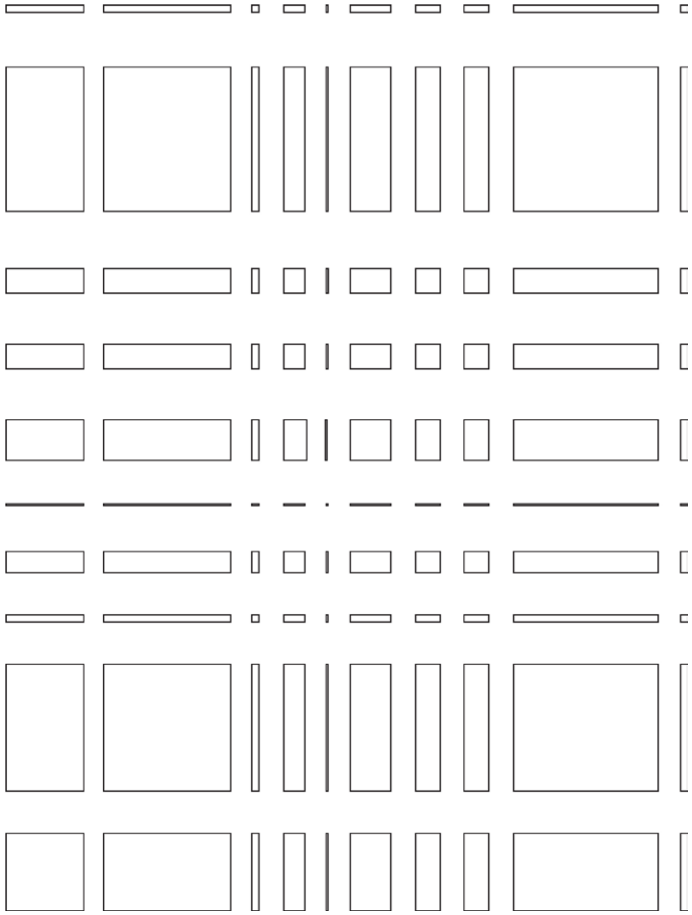


146

Figure 145. *Line graph to highlight prosthetic intersections.*

Figure 146. *Line graph to highlight prosthetic intersections without 'prosthetic' values.*



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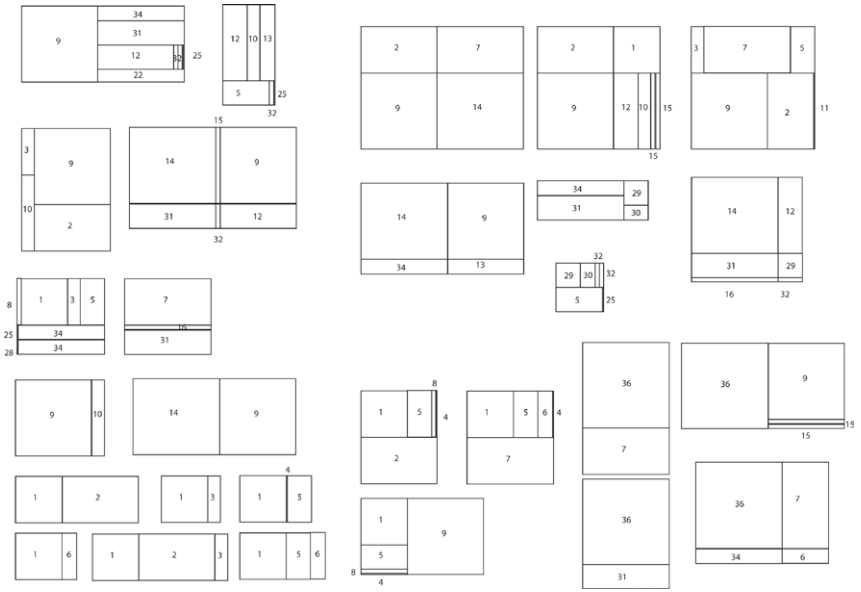
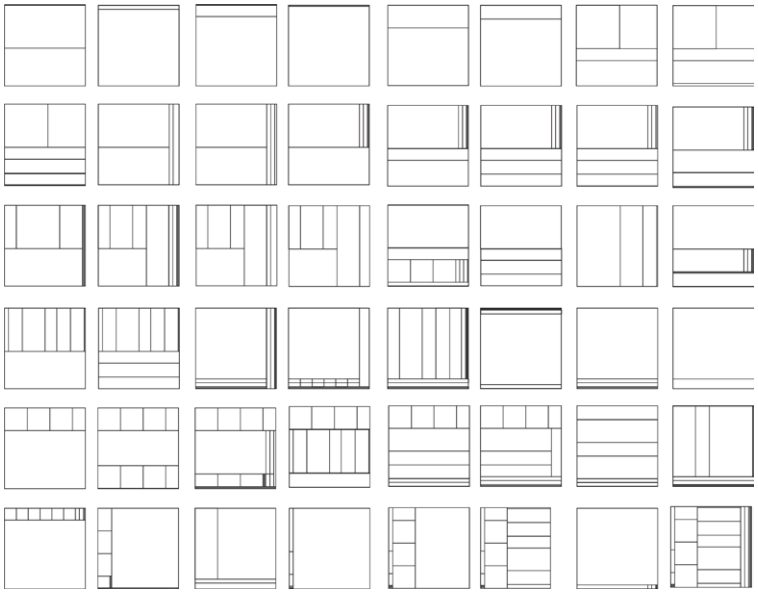


147

Figure 146. *Illustration showing the graph exploded to highlight ‘prosthetic’ volumes.*

Figure 147. *Illustration showing the grouping of different volumes to generate configurations.*



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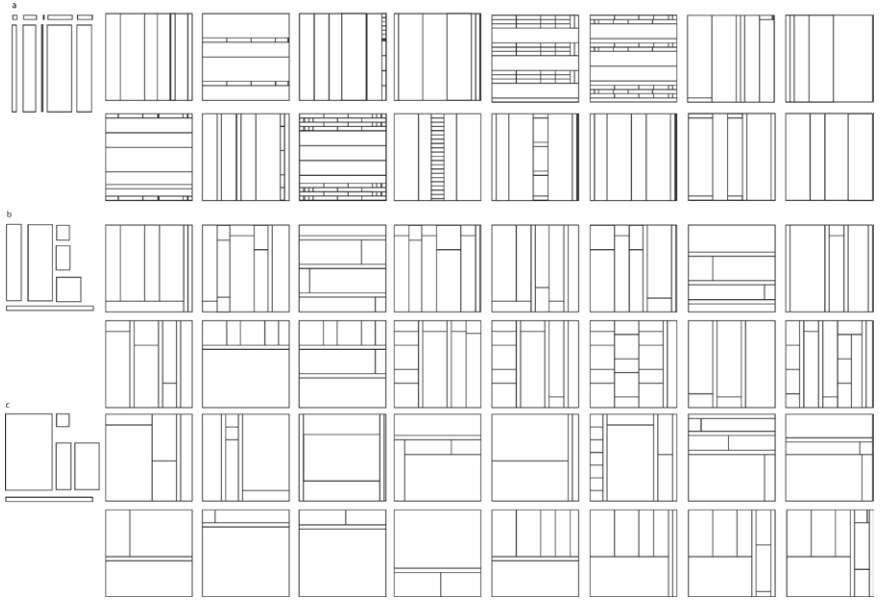


149

Figure 148. *Illustration of the 'Prosthetic Grid' that showcases a multitude of configurations to apply to design.*

Figure 149. *Illustration showing isolated areas and how they are composed to create different configurations.*

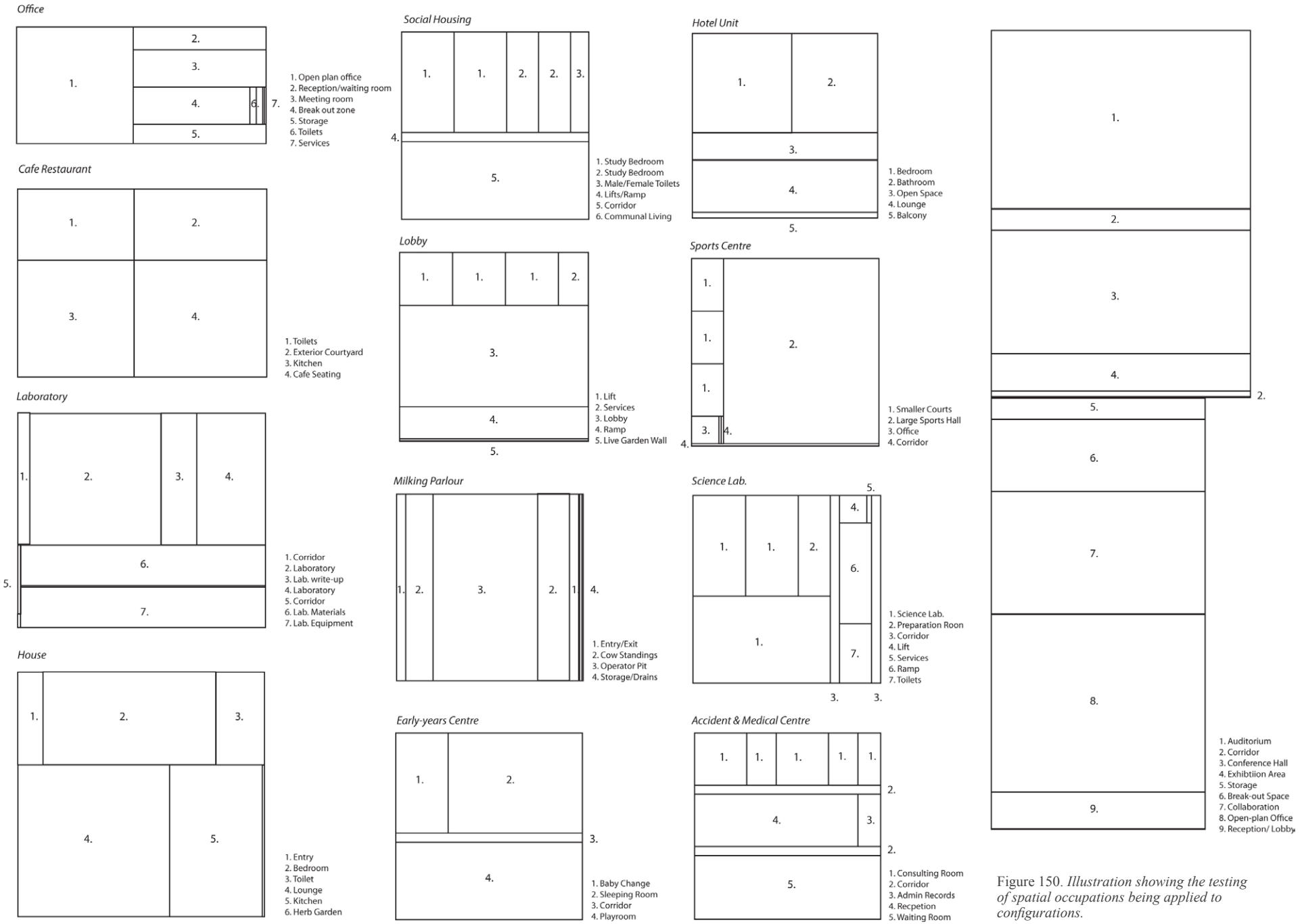
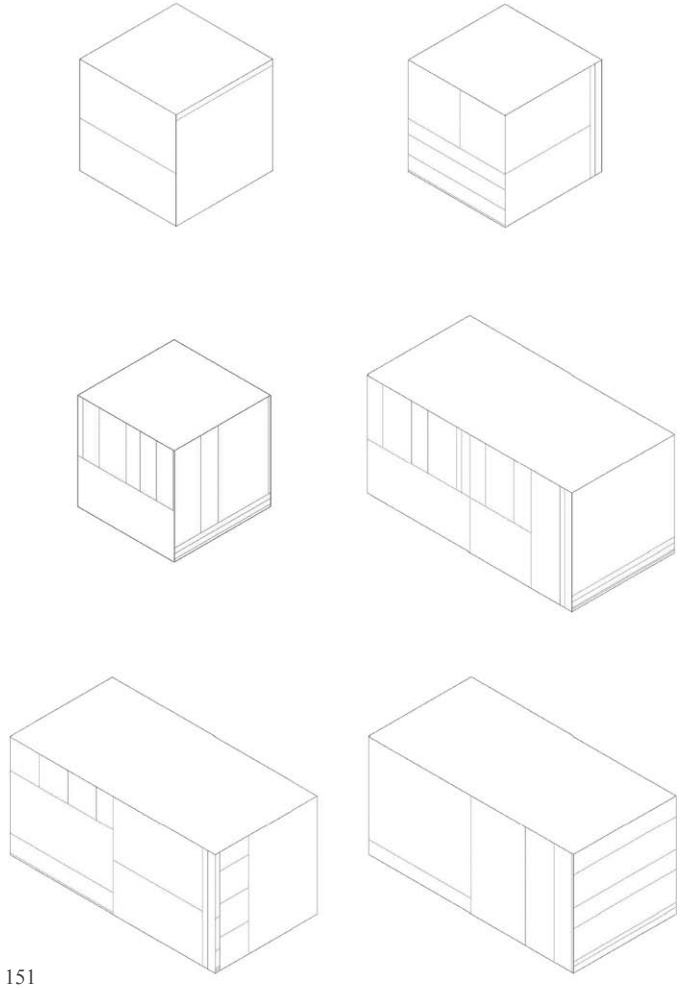


Figure 150. *Illustration showing the testing of spatial occupations being applied to configurations.*



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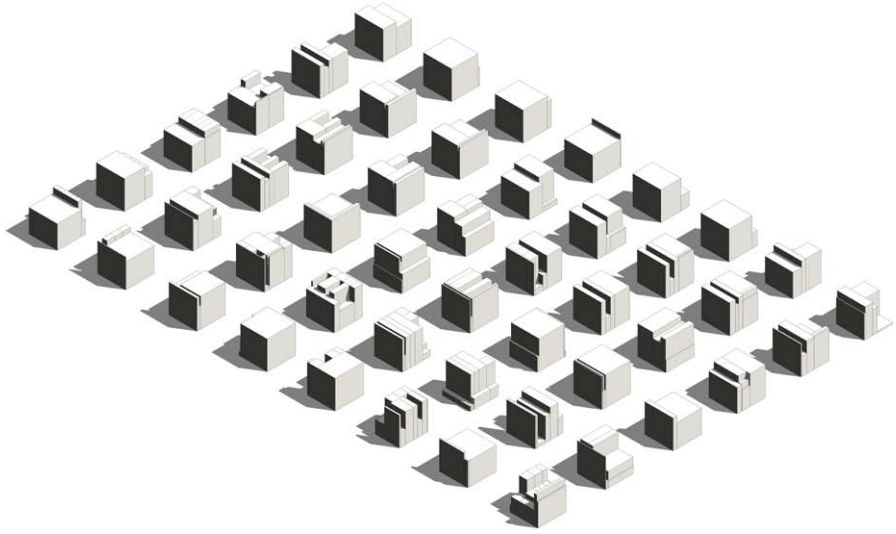


152

Figure 151 *Illustrations showing configurations applied to facades. The confiigurations could inform the size of windows or different wall materiality.*

Figure 152. *Illustration showing the testing of the configurations as a volume.*

Next, grids that represented the required spatial layouts for an nnovation centre were amalgamated into a linear form then tested on site. The dimensions of the volume were dictated by the number of prosthetic human heights: the width of the building is 12 prosthetic humans wide (16.2m), 60 prosthetic humans long (81m), six prosthetic humans high (8.1m) and the ceiling height is two prosthetic humans high. A selected arrangement of proportions is superimposed on the elevation and each vertical line can denote a window opening. To specify the width of the window, the width of one prosthetic human (0.77m).

In development, the exterior ramp was integrated into the proportionally informed volume. Furthermore, each façade was designed individually in response to sun, daylight and views:

Elevation	Width (height of prosthetic human)	Metric (metres)
North	4	5.4
East	3	4.05
West	2	2.7
South	1	1.35

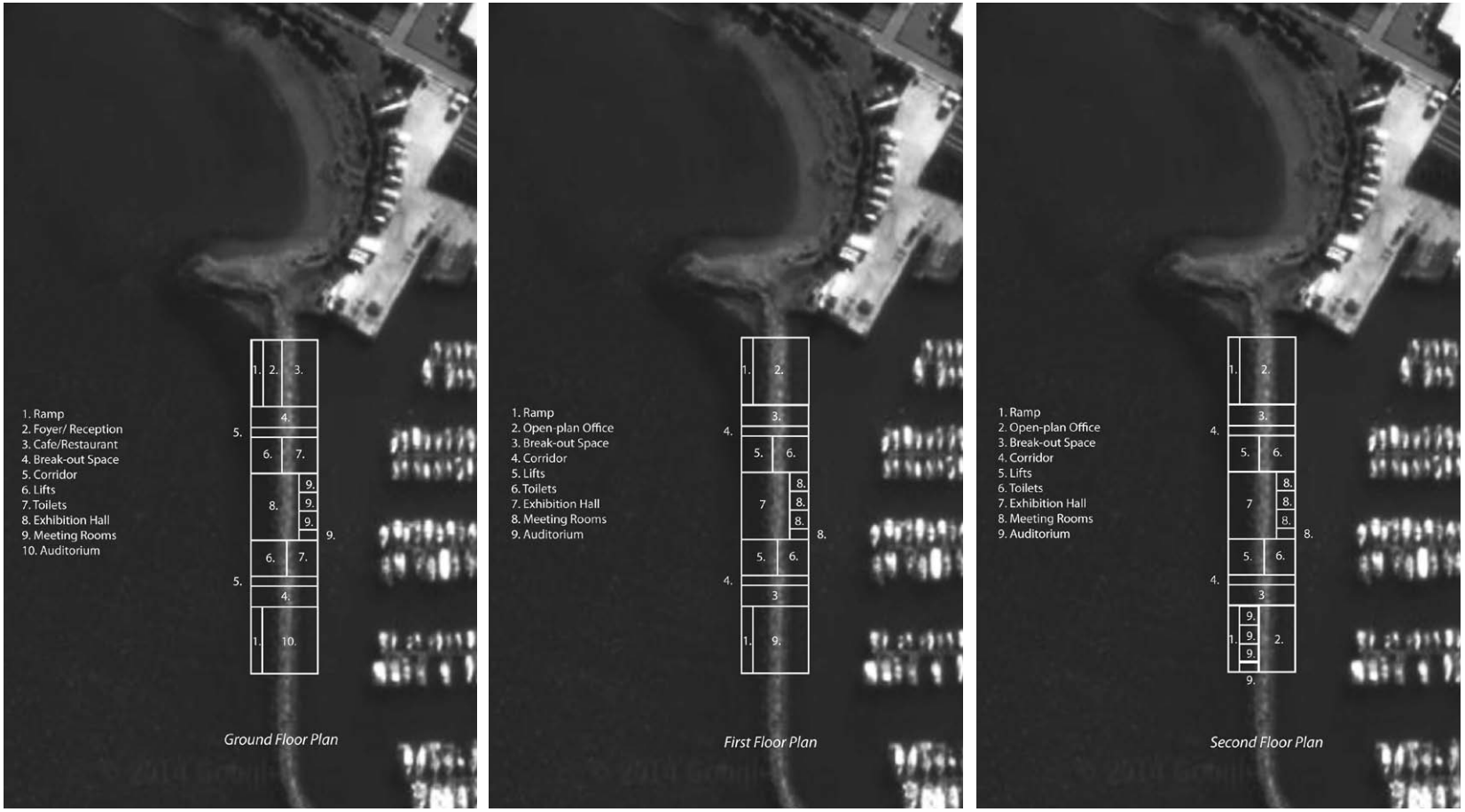
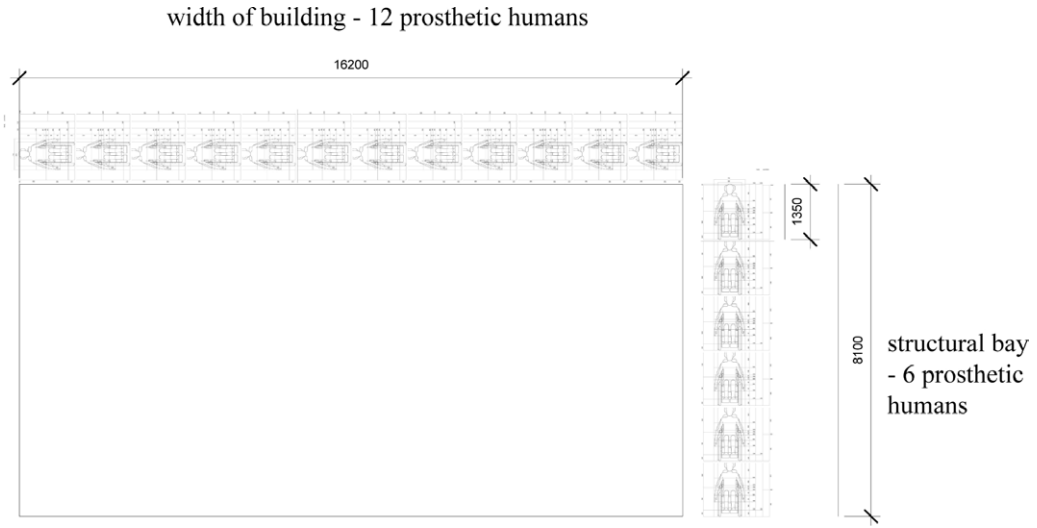


Figure 153. *Configurations for each floor applied to site.*



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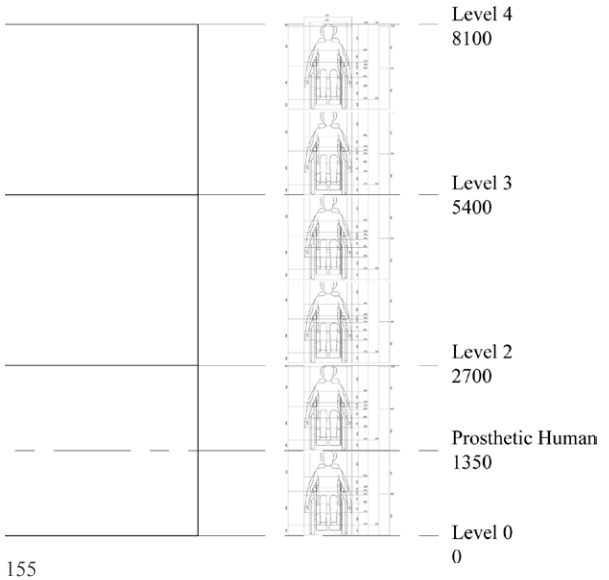

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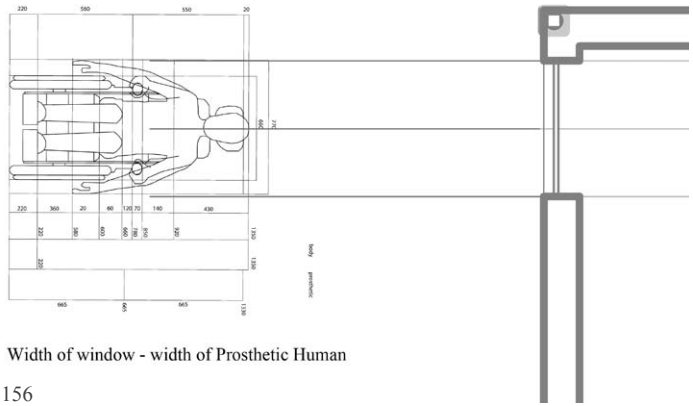
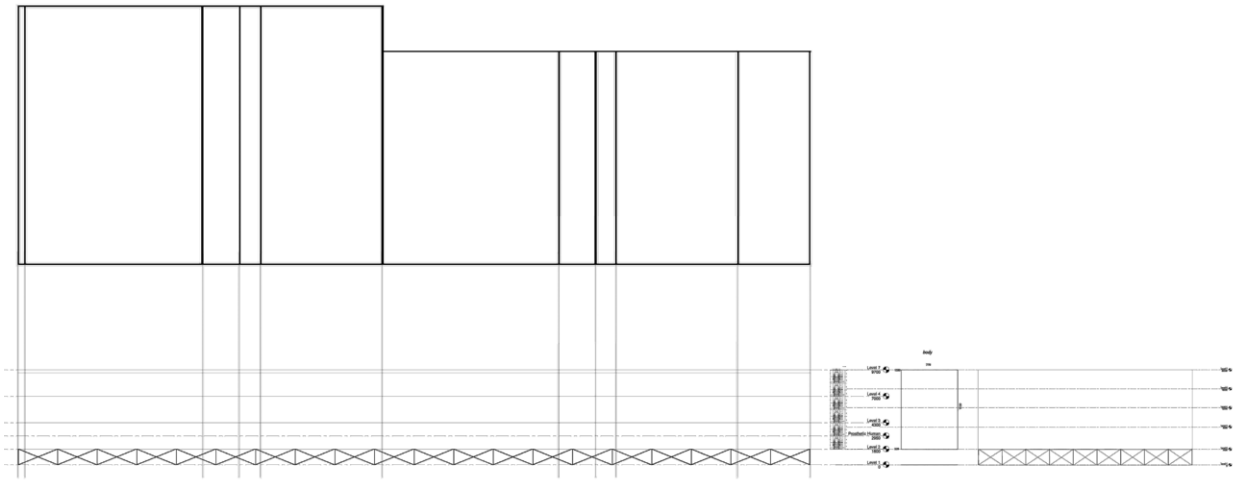


156

Figure 154-156. *Illustrations showing the testing of the prosthetic human informing the dimensions of the building.*



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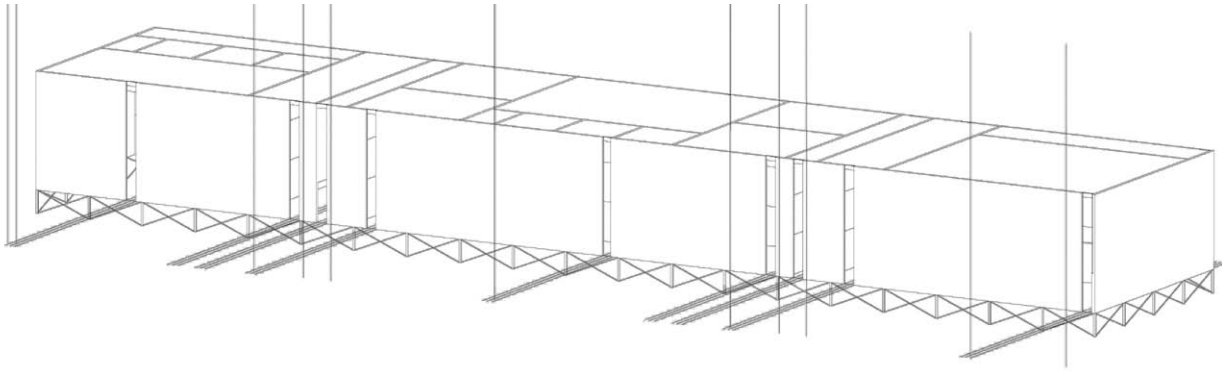

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Figure 157. *Configuration informing elevation of the building.*

Figure 158. *Development of the elevation where the separating lines inform window placement.*

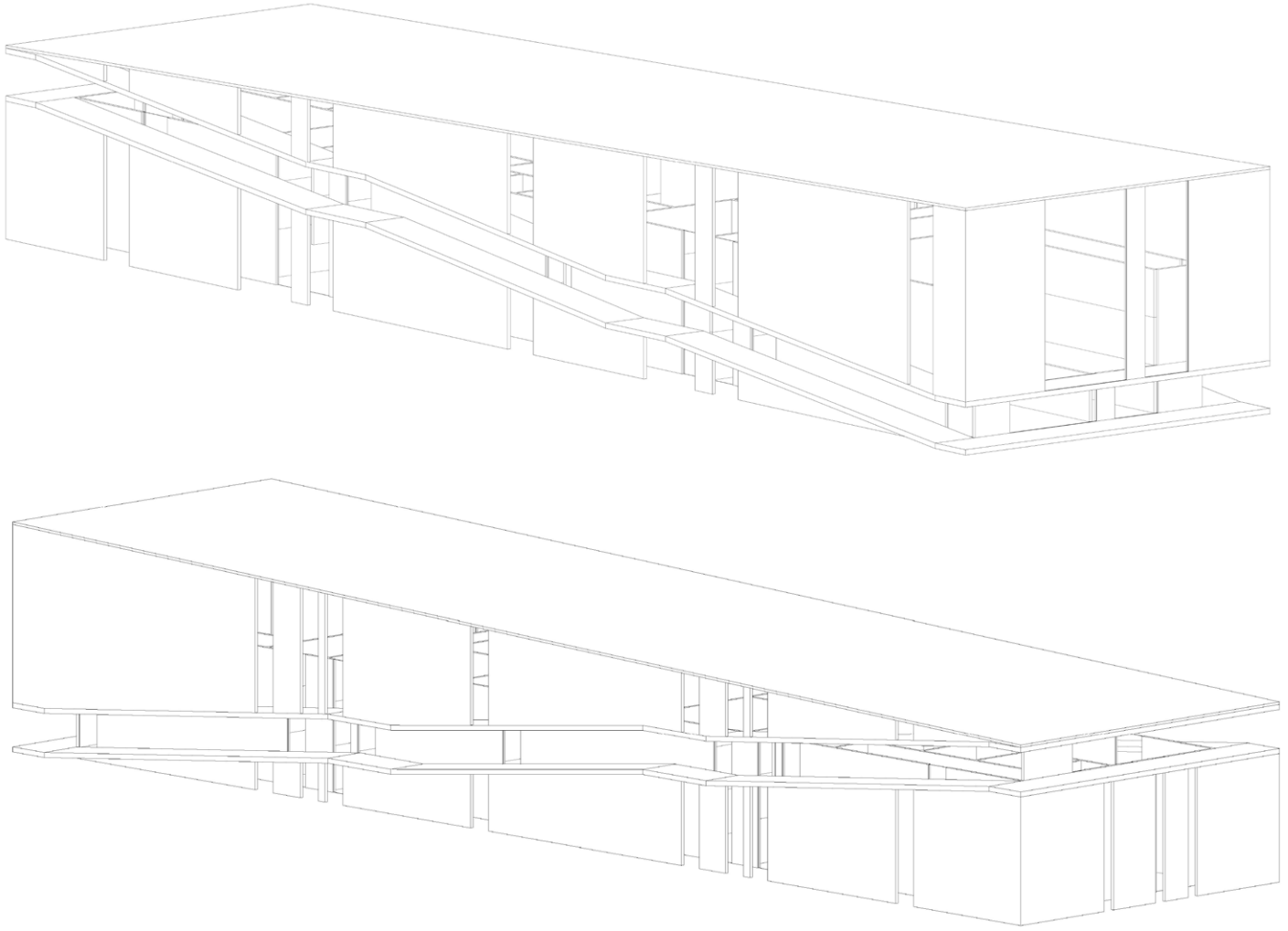
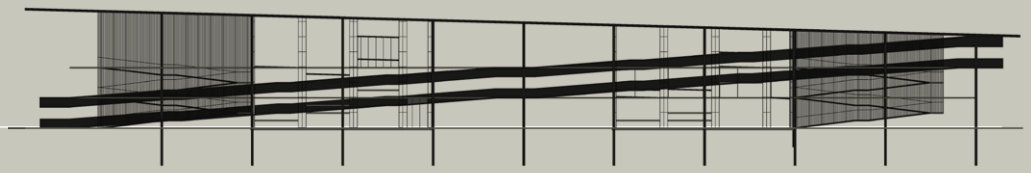


Figure 159. Axonometric views of Iteration Four.

CONCLUSION

This chapter discussed the privileged position the body has held within architectural history and provided insight into the Vitruvian Man and the Modular Man as anthropomorphic models. Le Corbusier method is adopted and appropriated for the Prosthetic Human. The proportions of the Prosthetic Human informed the volume, spatial layout, elevations and dimensional properties of some architectural elements. However, to design holistically, the proportional values should be applied at macro, messo, and micro scales, such as: ramp promenade, internal ramp promenade, balustrade, doors, corridors, and furniture. By doing so, the architecture is in accordance to prosthetic proportions and is representative of the body that requires enhanced access and mobility within space.



CHAPTER SIX: FINAL DESIGN

In this conclusive design iteration, the potential of the designing for the prosthetic human was furthered in a detailed design for the Innovation Centre. This chapter presents an architecture with enhanced access and mobility, for both body and mind. The result is the creation of an architecture that celebrates difference and in turn, a calm and embracing architecture. It is presented in hope for those impaired to be free from spatial discrimination in our built environment. The design assembled all the objectives in each chapter and further developed the limitations that were outlined after each design iteration.

THE OUTCOME

The use of ramps and lifts that serve both a functional and aesthetical purpose, creates accessible routes for individuals to safely move between spaces and escape the building freely and independently. The exterior ramp is two prosthetic humans wide (2.7m) and the ramp is designed to meet New Zealand Building Code regulations in respect of fire and accessible routes. The black rendered exterior ramp, contrasts with the clear and opaque glass facades to accentuate the inclined promenade. Platform lifts have been exaggerated in the design as they are, in fact, transformed into vertically moving rooms. The resulting iteration is functionalistic in design through enhanced circulation and ease of movement through space.

Figure 160. *Contextual view of final design on site.*

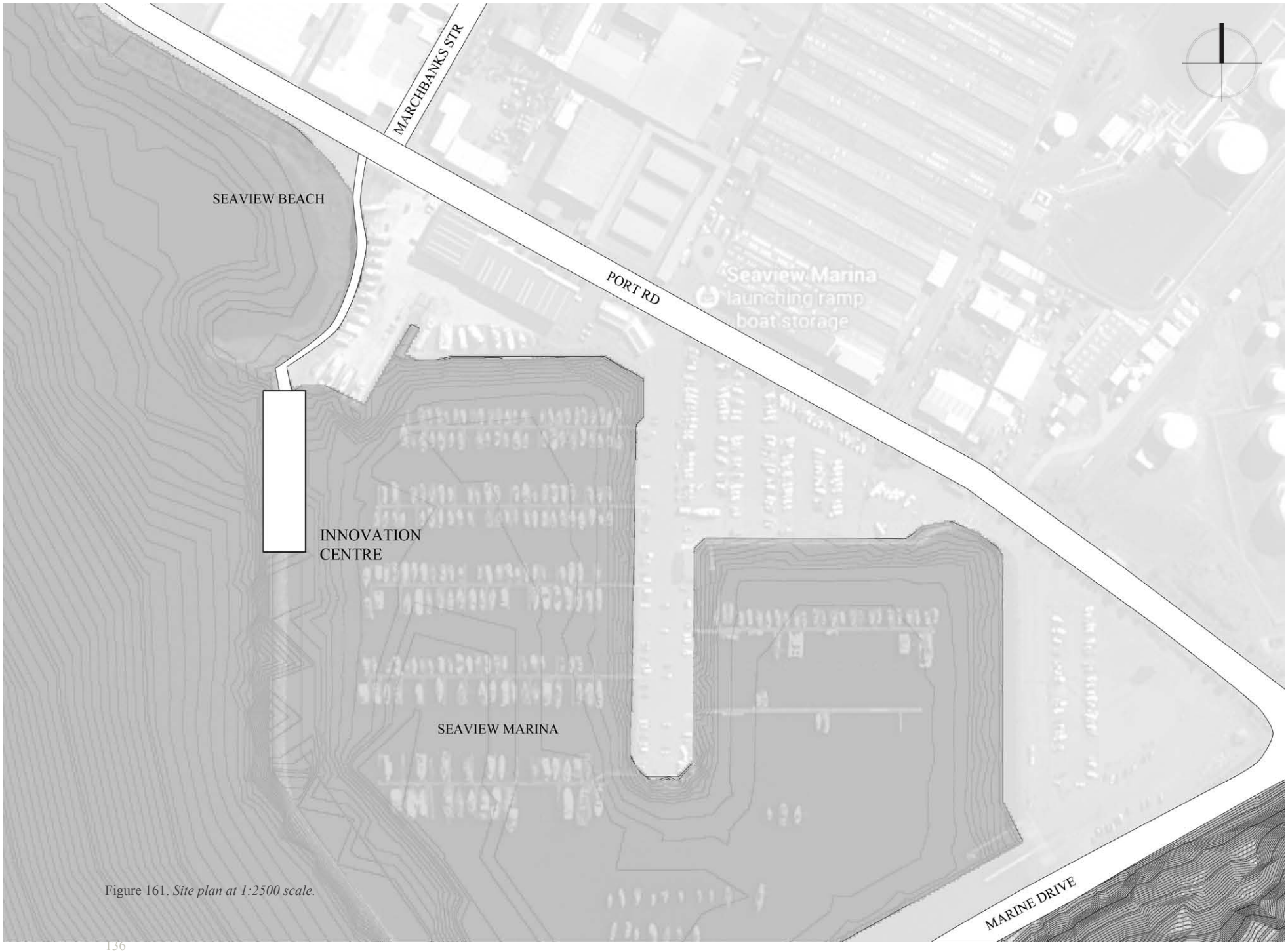


Figure 161. *Site plan at 1:2500 scale.*

Figure 162. New accessible walkway approach to Innovation Centre.

Figure 163. Approach to Innovation Centre positioned over breakwater.

Figure 164. *North elevation of Innovation Centre.*

Figure 165. *North-west perspective of Innovation Centre.*

Figure 166. *Contextual east elevation of Innovation Centre.*

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Figure 167. *Contextual south-east view of Innovation Centre.*

Figure 168. *View to the harbour from promenade.*

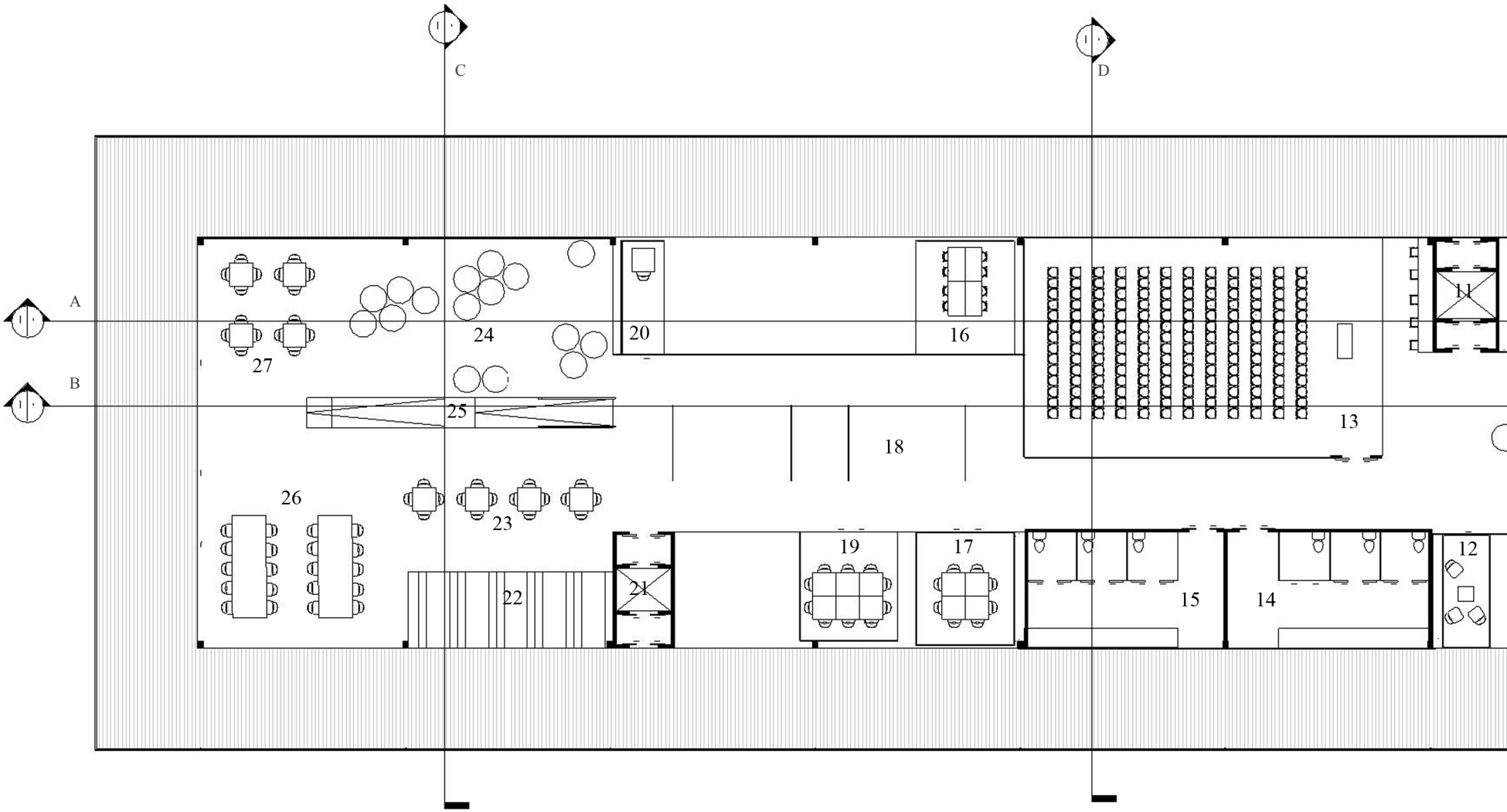
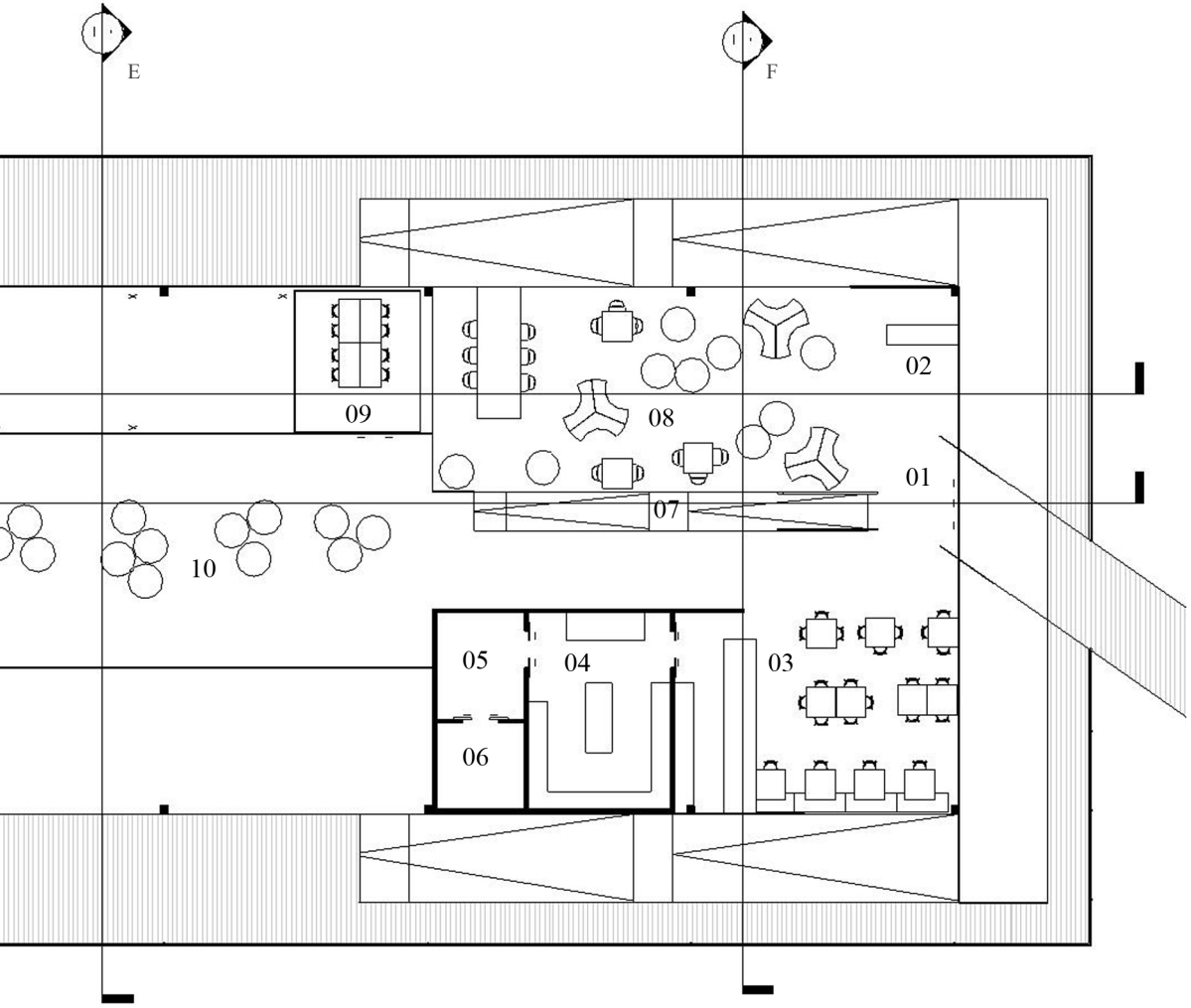


Figure 169. *Ground Floor Plan at 1:200 scale.*



GROUND FLOOR SPACES

01 Entrance
02 Reception
03 Cafe Dining Area
04 Kitchen
05 Pantry
06 Chiller Room
07 Ramp
08 Collaborative Zone
09 Meeting Room
10 Collaborative Zone
11 Lift
12 Meeting Room
13 Public Auditorium
14 Male Toilets
15 Female Toilets
16 Meeting Room
17 Meeting Room
18 Exhibition Zone
19 Meeting Room
20 Meeting Room
21 Lift
22 Collaborative Zone
23 Collaborative Zone
24 Collaborative Zone
25 Ramp
26 Individual Work Zone
27 Collaborative Zone

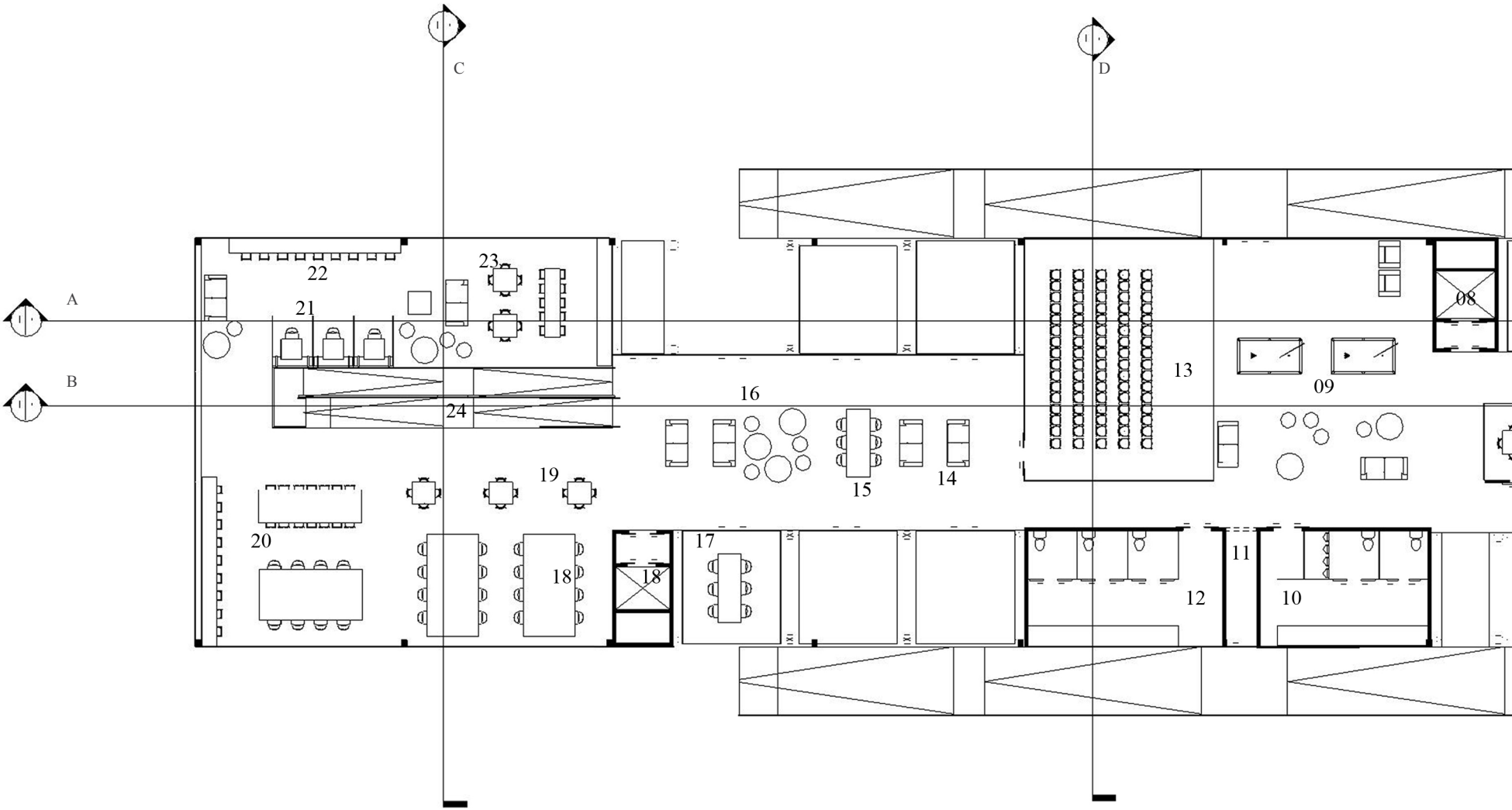
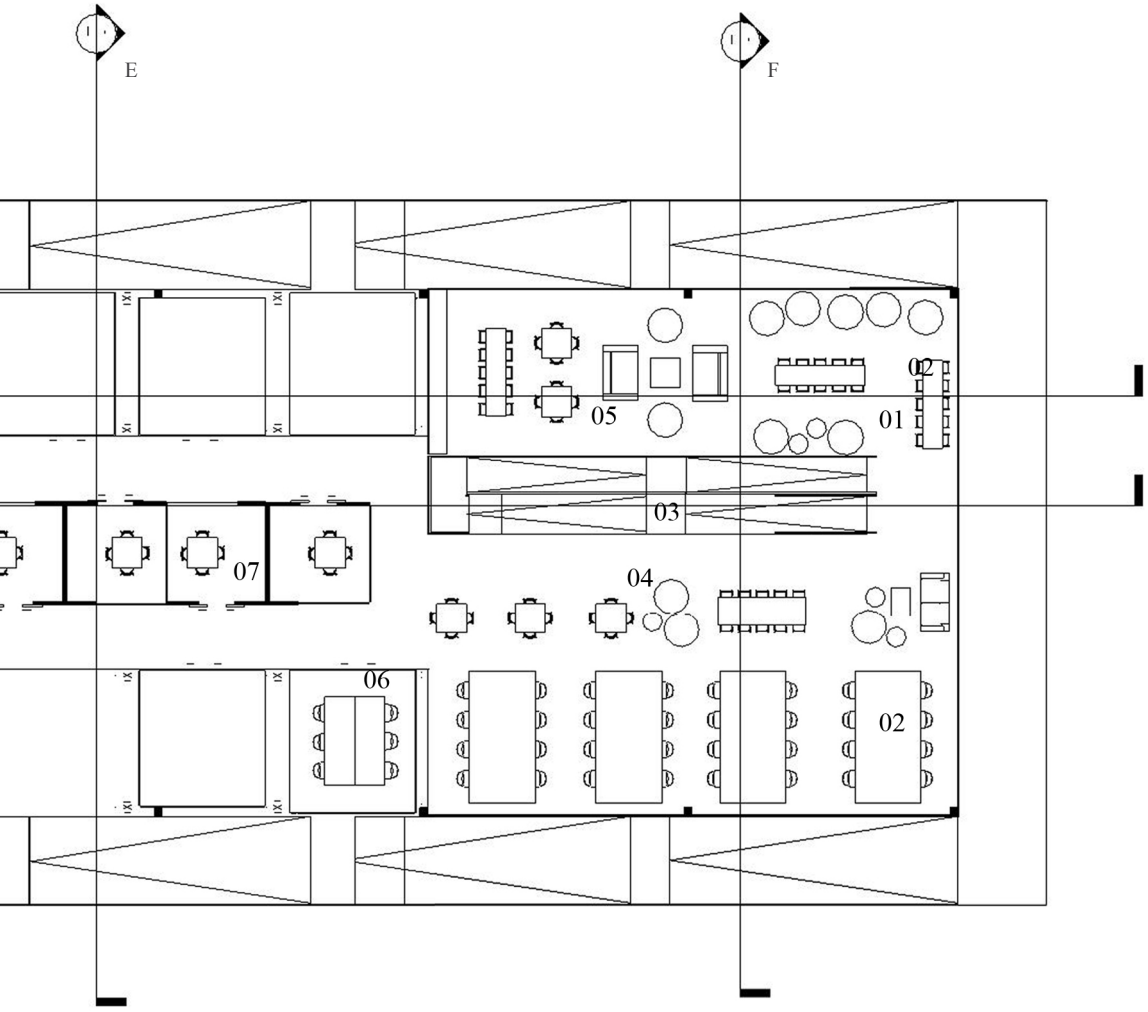


Figure 170. *First Floor Plan at 1.200 scale.*



FIRST FLOOR SPACES

01 Collaborative Zone
02 Individual Work Zone
03 Ramp
04 Collaborative Zone
05 Bar & Dining Zone
06 Meeting Room
07 Collaborative Zone
08 Lift
09 Break-out Zone
10 Male Toilets
11 Exit to exterior ramp
12 Female Toilets
13 Lecture Room
14 Collaborative Zone
15 Individual Work Zone
16 Collaborative Zone
17 Meeting Room
18 Lift
19 Collaborative Zone
20 Individual Work Zone
21 Individual Work Zone
22 Individual Work Zone
23 Collaborative Zone
24 Ramp

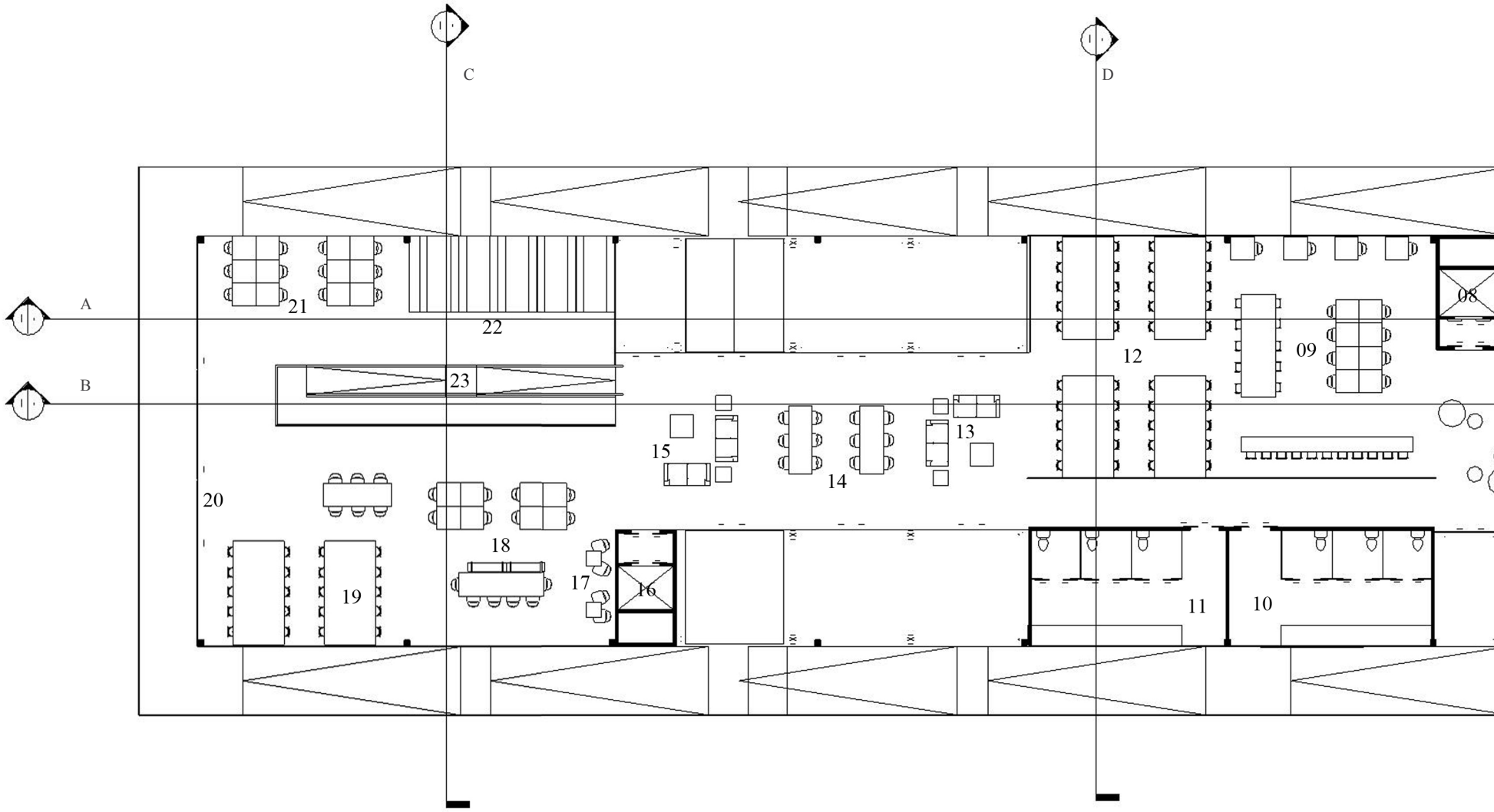
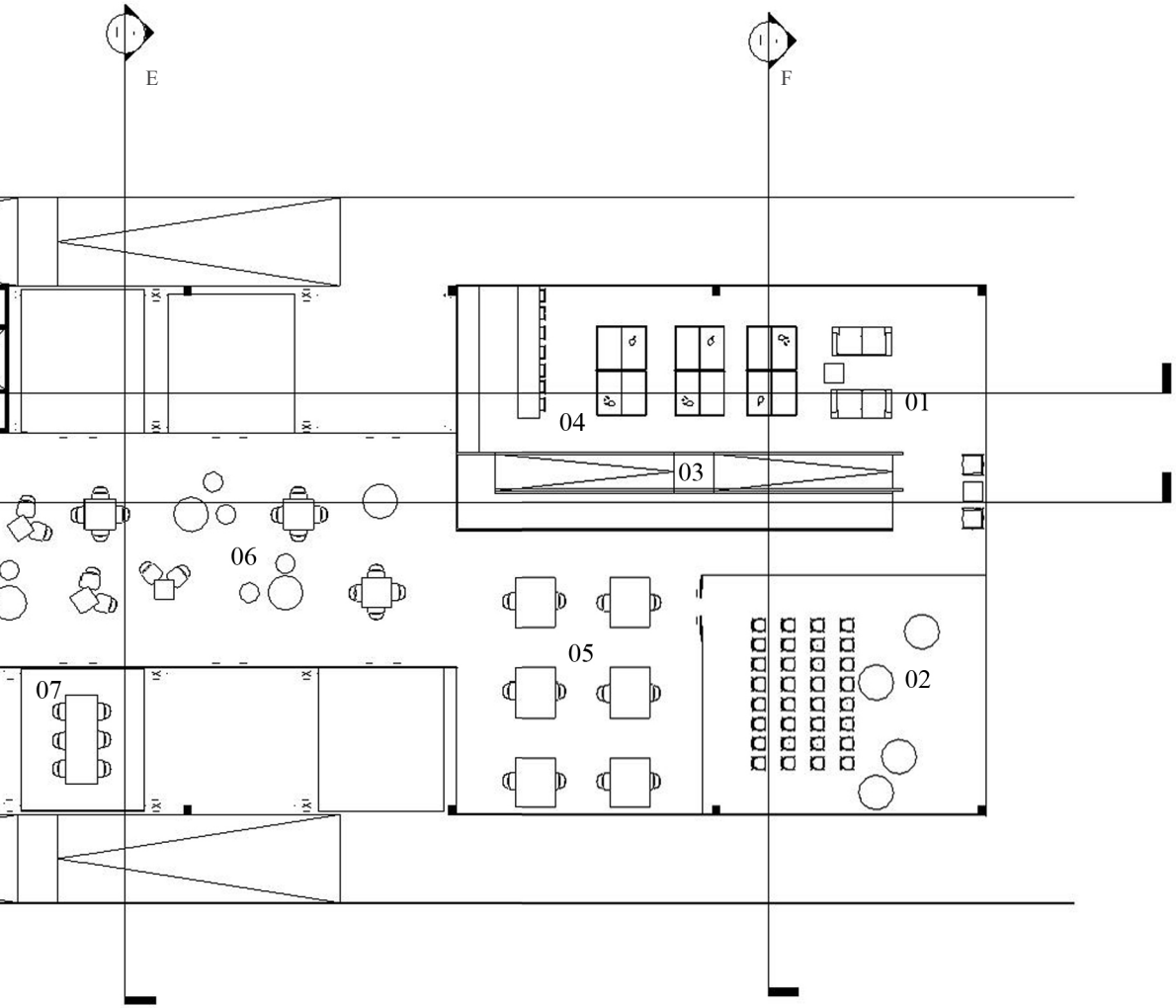
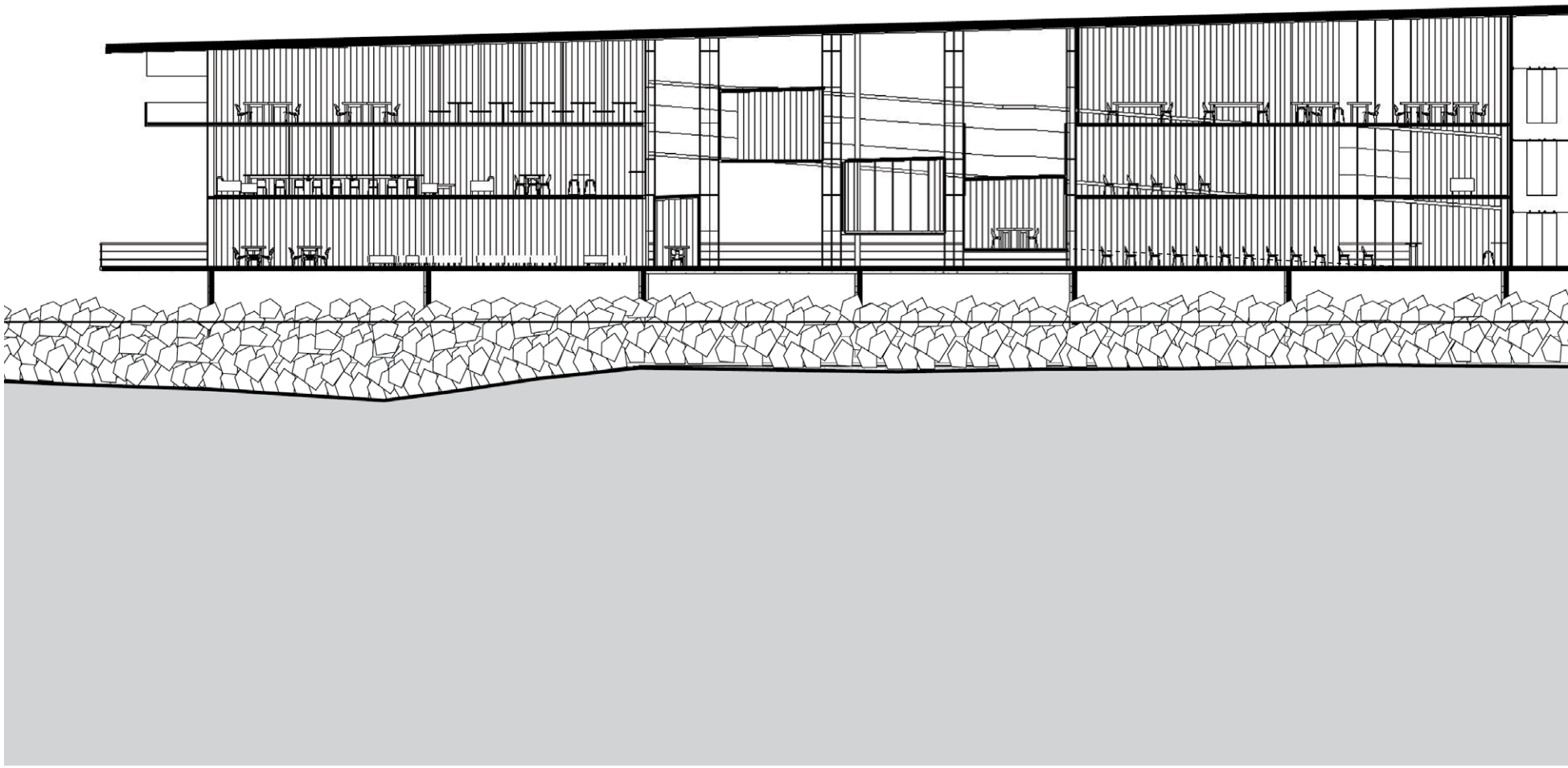


Figure 171. *Second Floor Plan at 1:200 scale.*



SECOND FLOOR SPACES

01 Collaborative Zone
02 Seminar Room
03 Ramp
04 Bar & Break-out Zone
05 Collaborative Zone
06 Collaborative Zone
07 Meeting Room
08 Lift
09 Individual Work Zone
10 Male Toilets
11 Female Toilets
12 Individual Work Zone
13 Collaborative Zone
14 Individual Work Zone
15 Collaborative Zone
16 Lift
17 Collaborative Zone
18 Individual Work Zone
19 Individual Work Zone
20 Exit to exterior ramp
21 Individual Work Zone
22Collaborative Zone
23Ramp



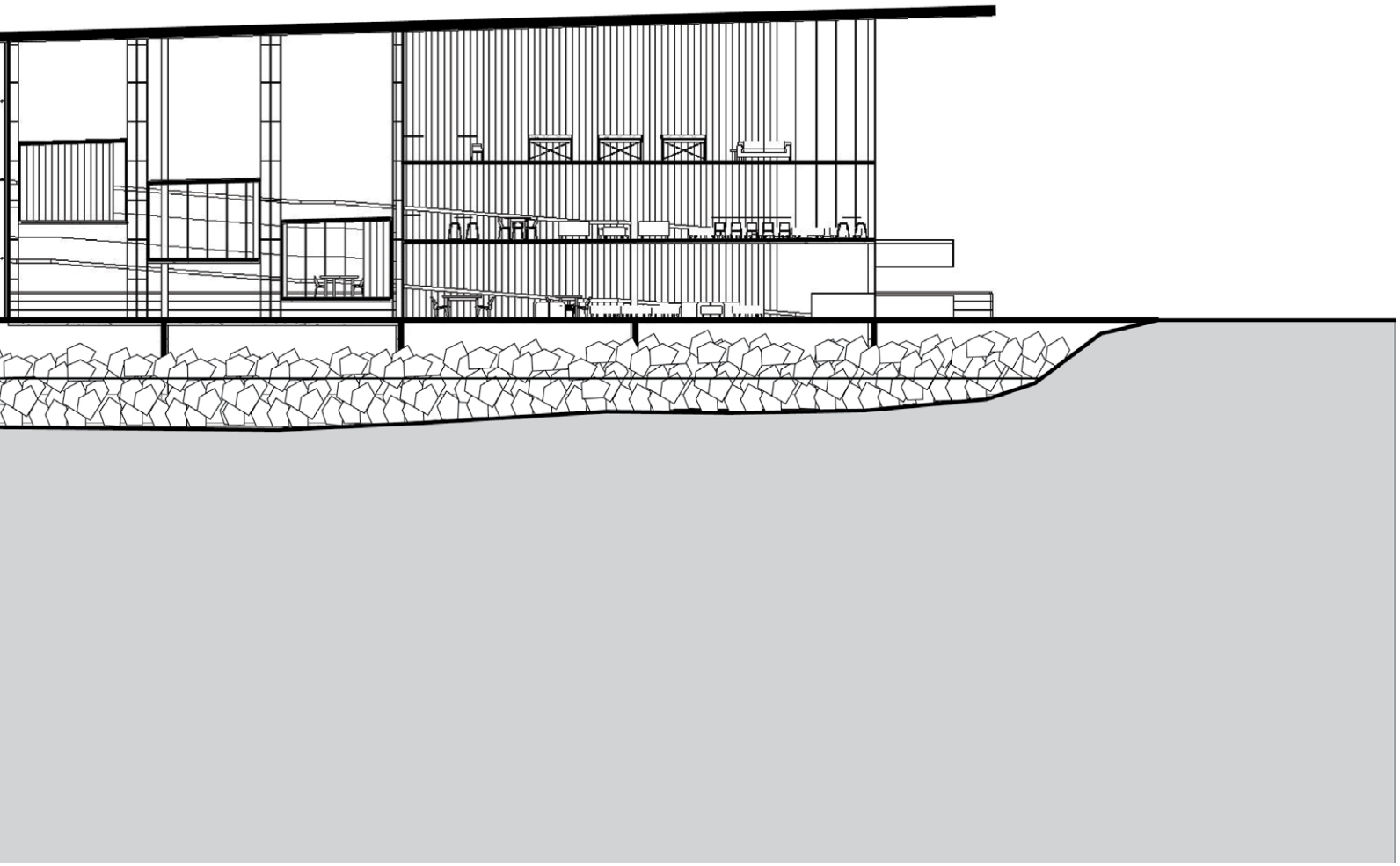
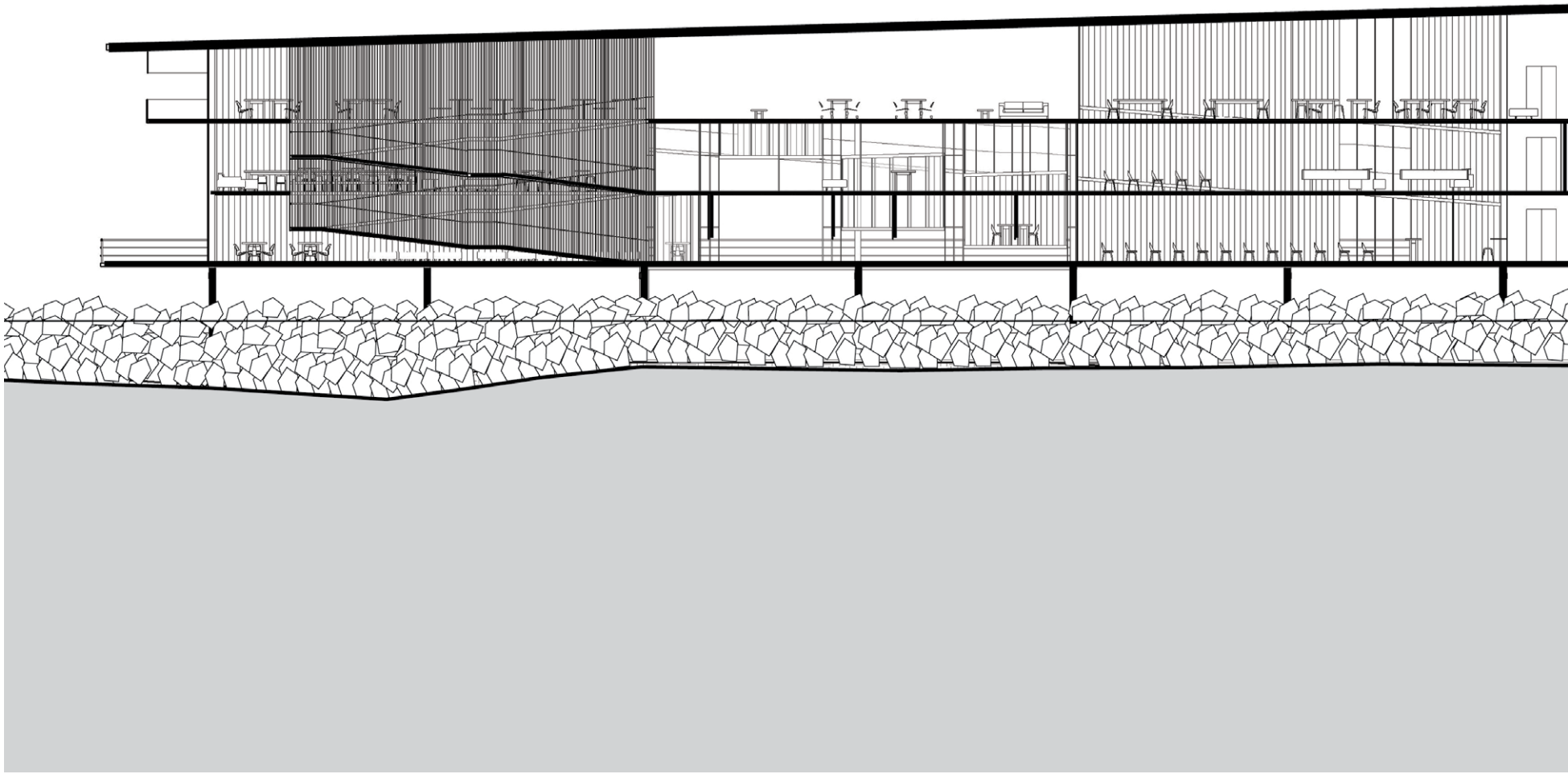


Figure 172. *Section AA' at 1.200 scale.*



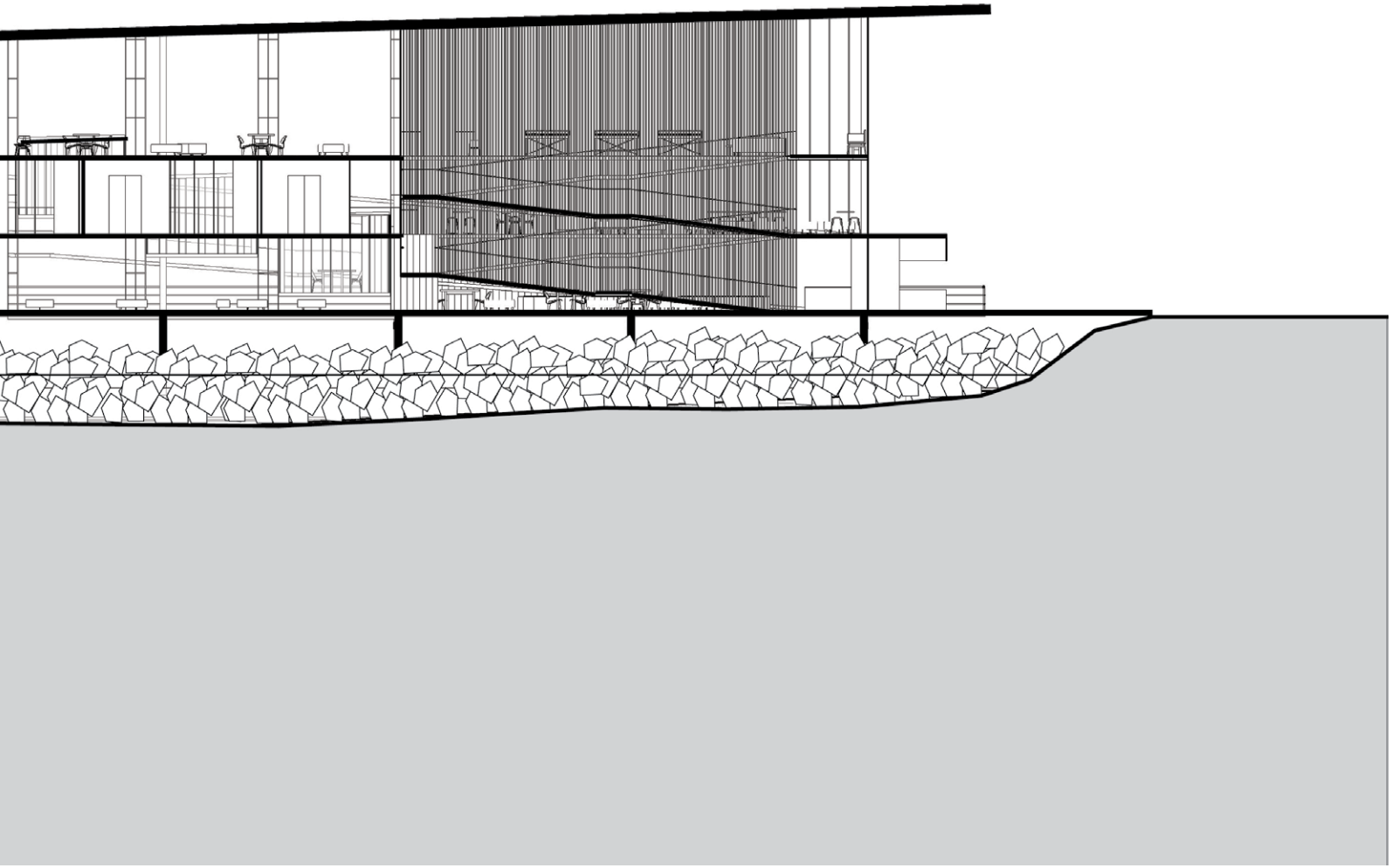


Figure 173. *Section BB' at 1:200 scale.*

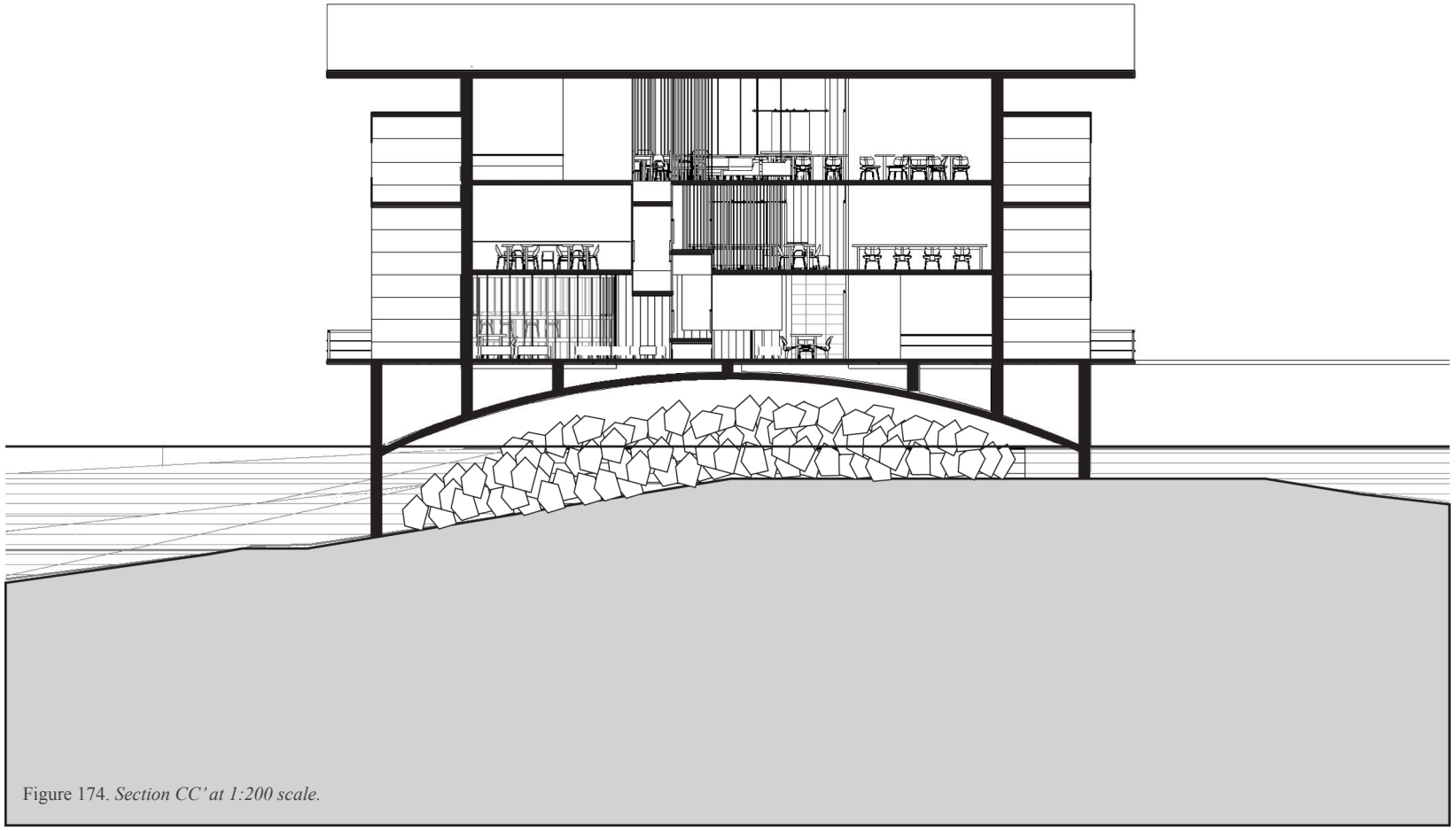


Figure 174. *Section CC' at 1:200 scale.*

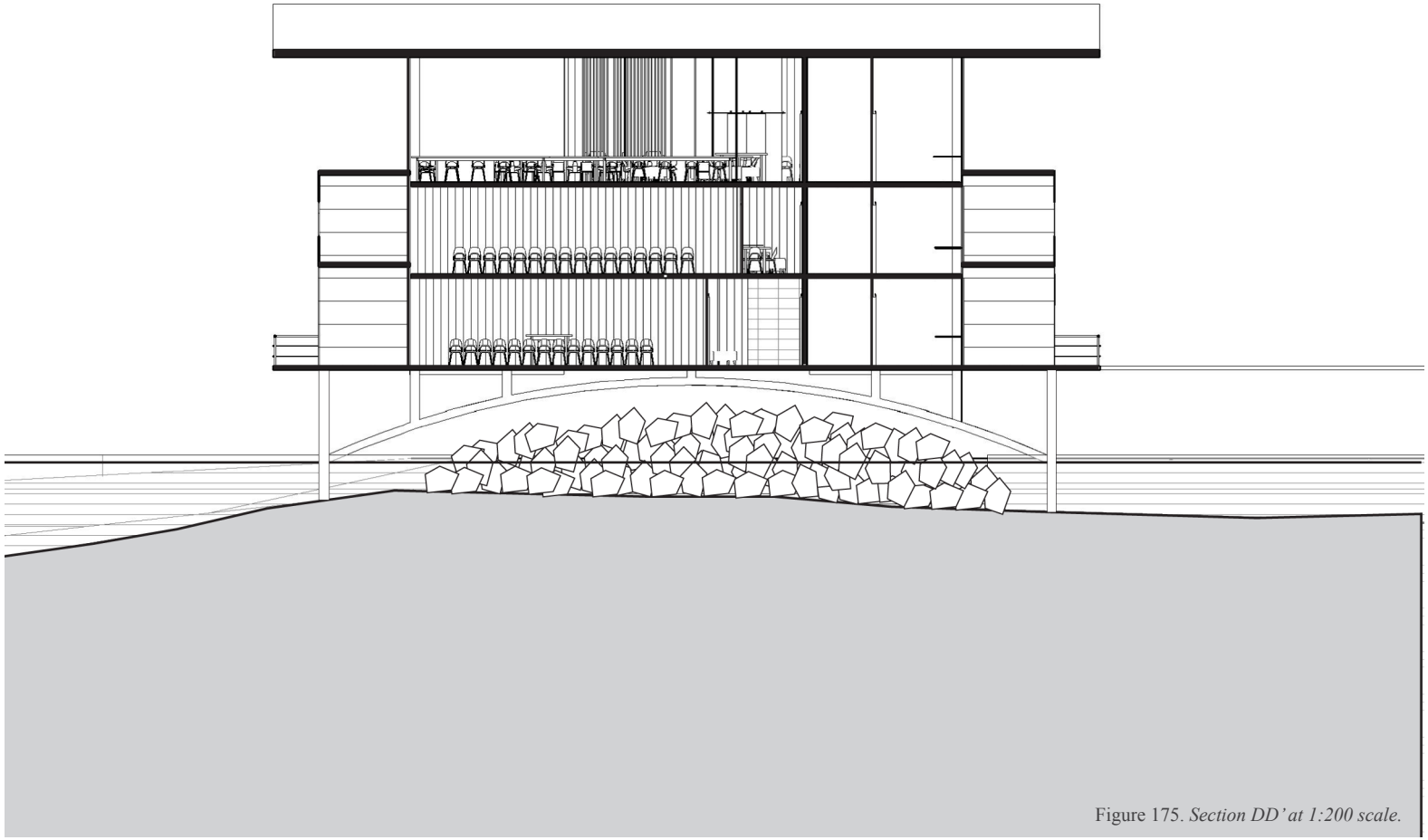


Figure 175. *Section DD' at 1:200 scale.*

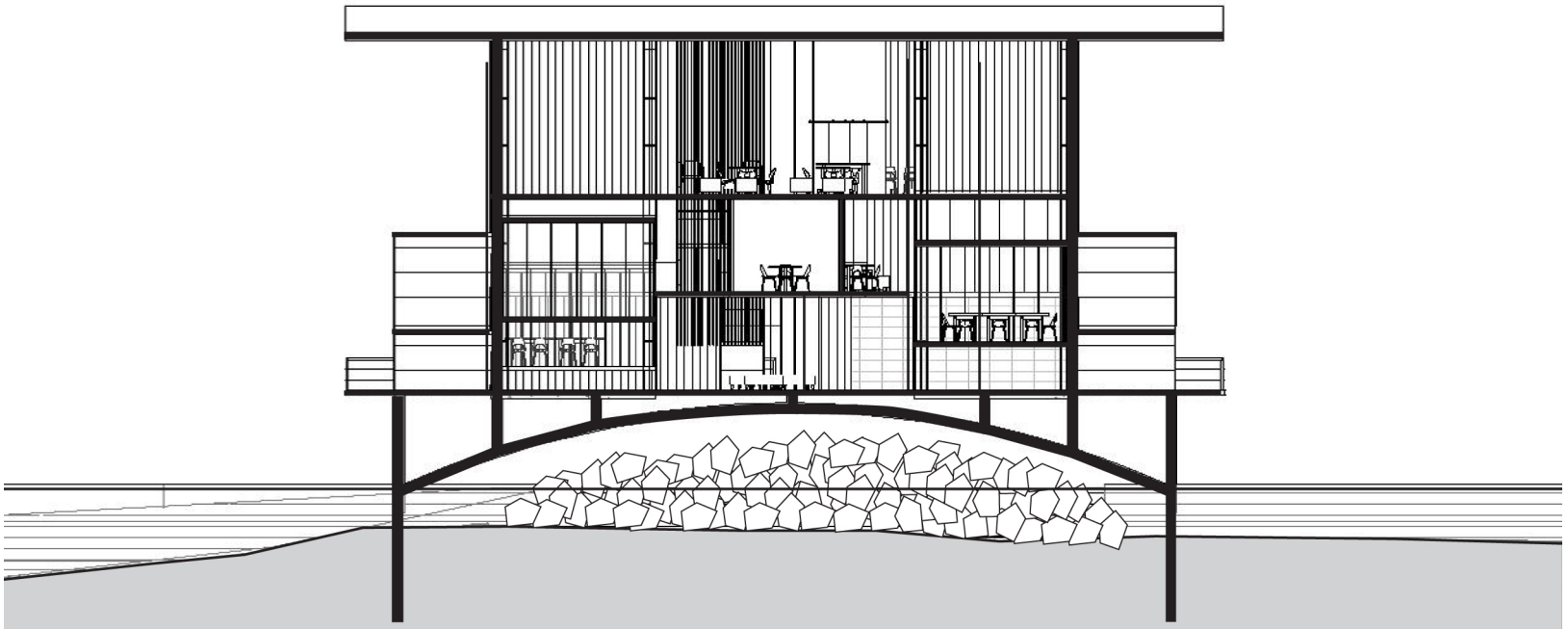


Figure 176. *Section EE' at 1:200 scale.*

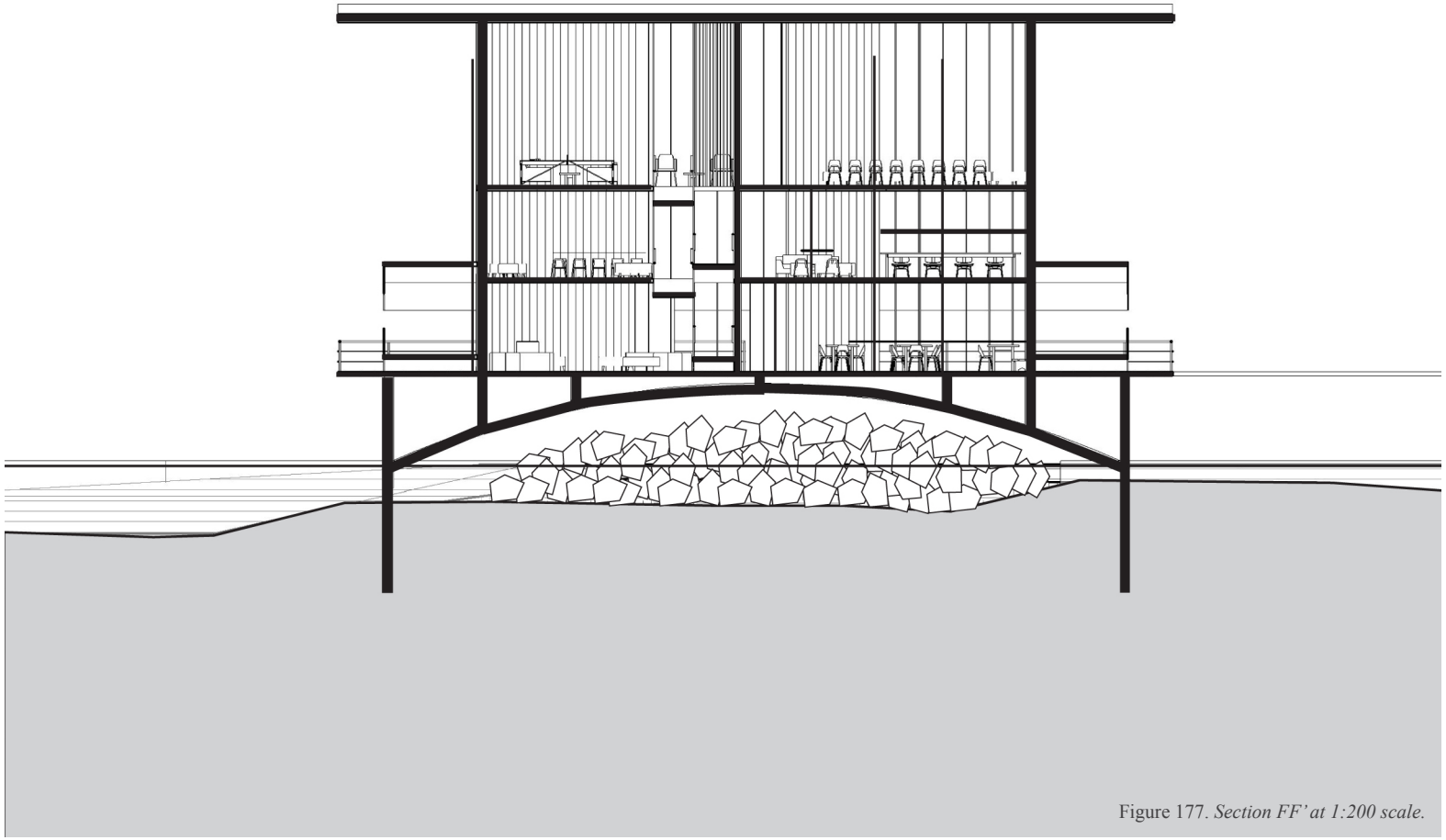


Figure 177. *Section FF' at 1:200 scale.*

The spatial layout of iteration two includes a multitude of different, informal and formal, spaces to cater for different working processes. Spaces include: ‘break-out’ zones that are large and open and include work desks for development of spontaneous ideas; bookable meeting or seminar rooms for 2-12 people; an auditorium that seats 180 people for public and private presentations; exhibition area for public and private presentations; open-plan workspaces that includes cluster, group and individual workstation; semi-private booths for informal group discussions and individual booths for reflective and contemplative processes; and ‘think-tank’ rooms for group brainstorming that includes pin-up areas. These spaces are interactive and collaborative that stimulate creative thought processes to enable innovation and greater productivity.

Flexibility in the software and hardware of the design create efficient, flexible and adaptive spaces that can be altered to meet changing environmental needs. For example: loose furniture to change layout of spaces; variety of use of spaces, and the walls of the auditorium and lecture rooms can fold away to create one large open space to increase working space for hold larger functions. An urban experience, an element of ‘play’ is integrated into the layout to include a café, pool tables and video game zone with bars, and ping pong tables with snack bar for staff to relax the mind. As influenced by Yelp!, each activity is positioned on different floors to encourage staff to move between floors and interact with other staff who work on different floors. By doing so, new synergies are created. The interior and exterior ramps provide a promenade within and around the building to

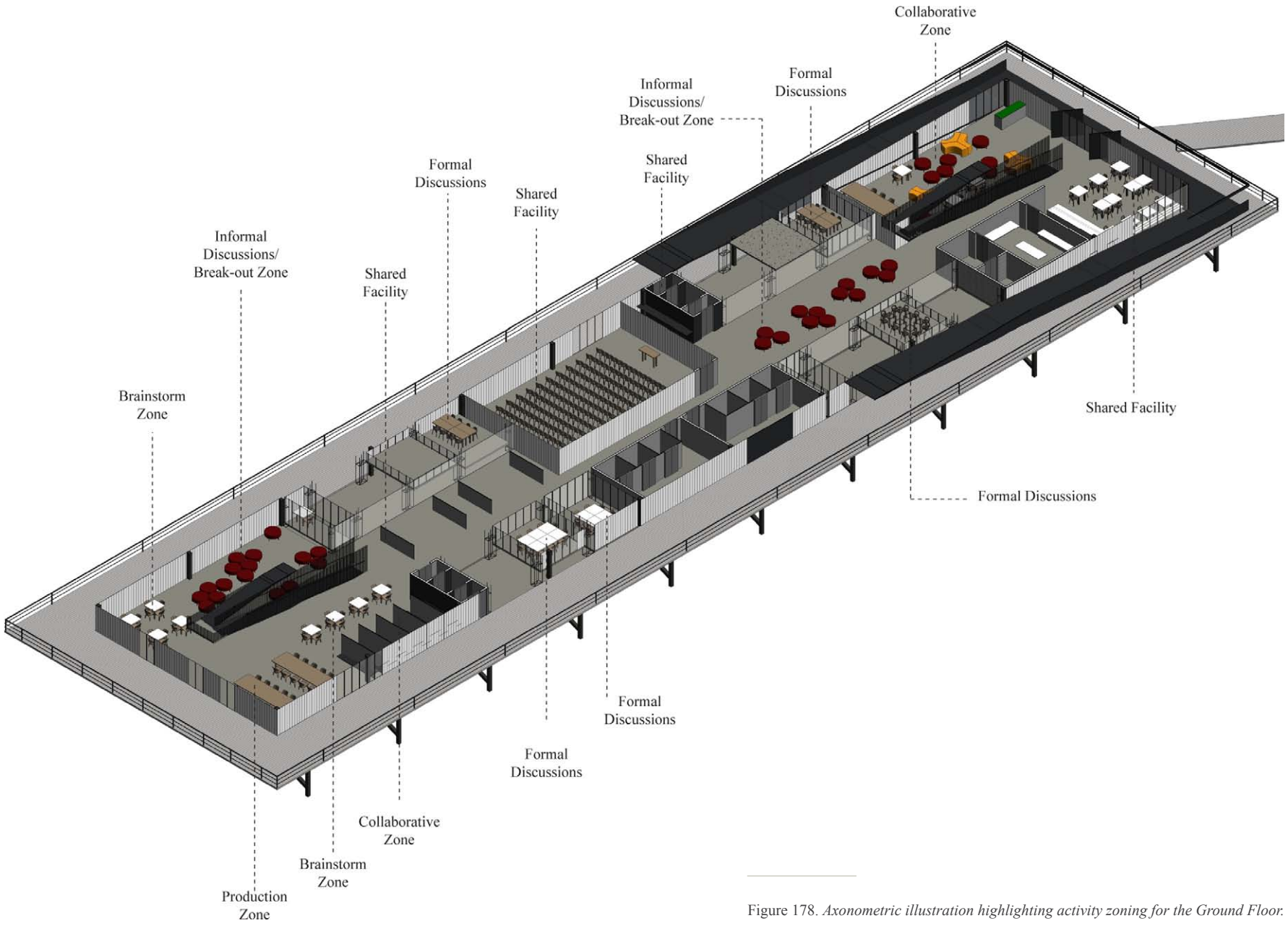


Figure 178. *Axonometric illustration highlighting activity zoning for the Ground Floor.*

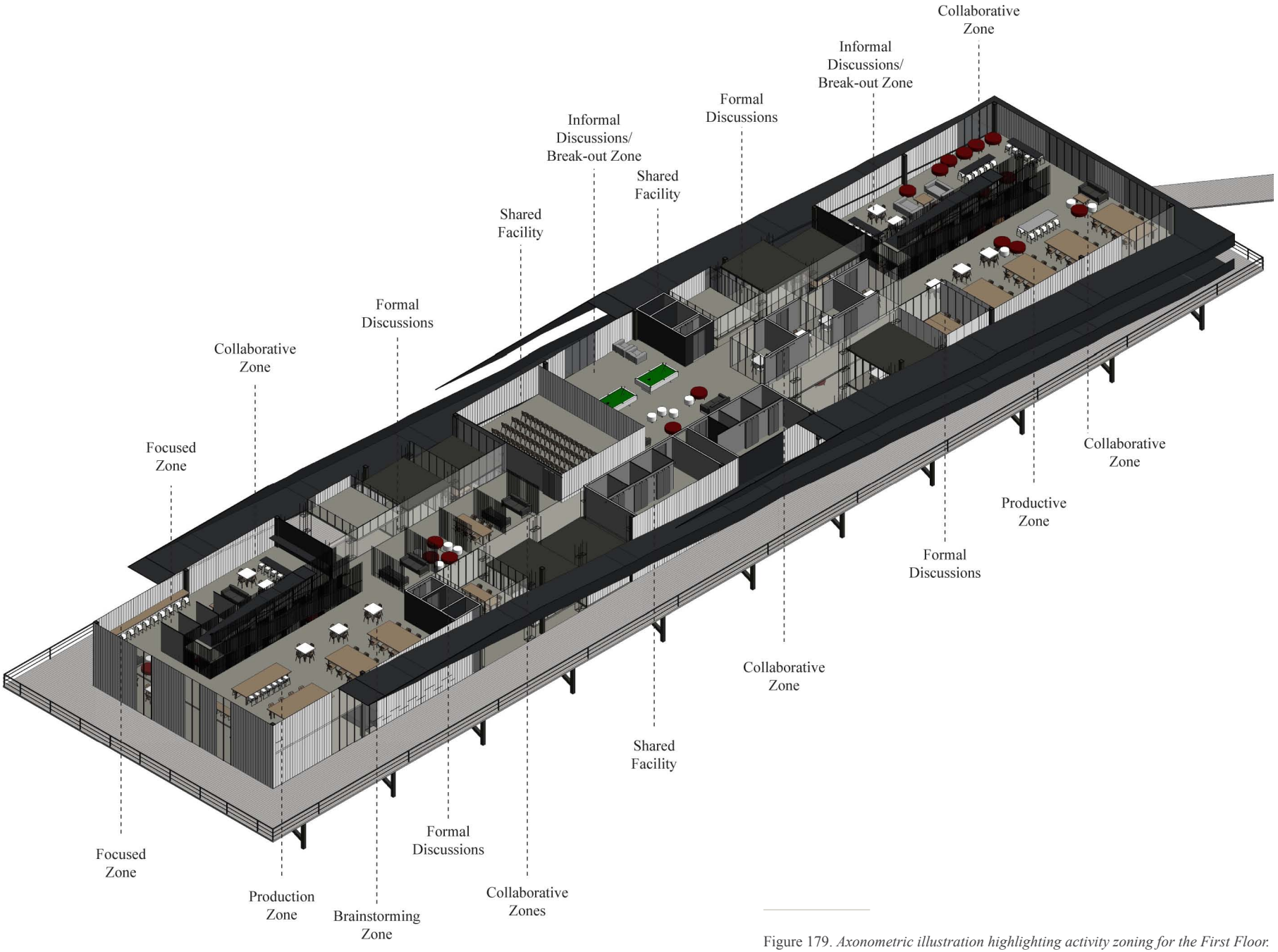
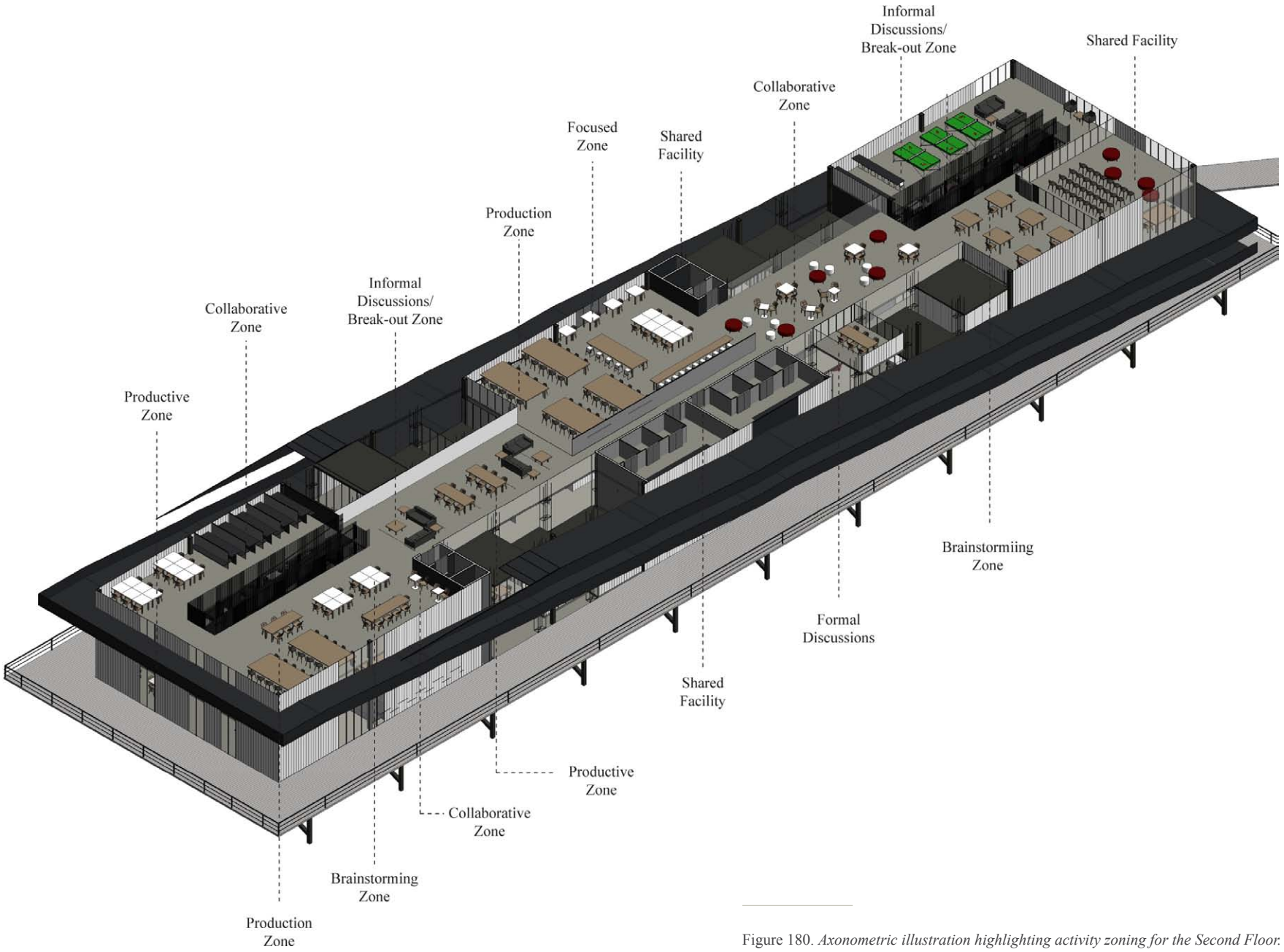


Figure 179. *Axonometric illustration highlighting activity zoning for the First Floor.*



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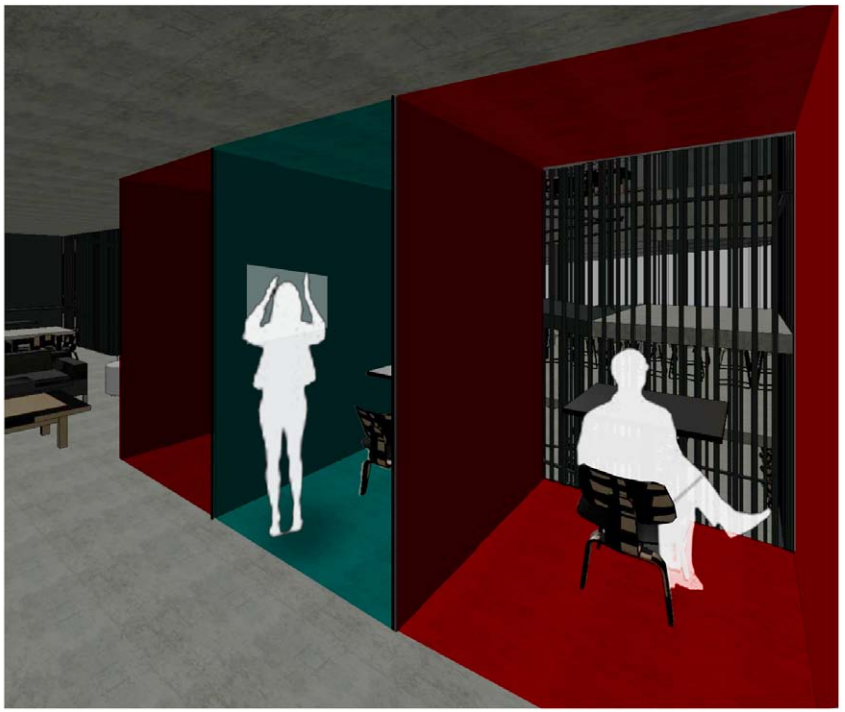

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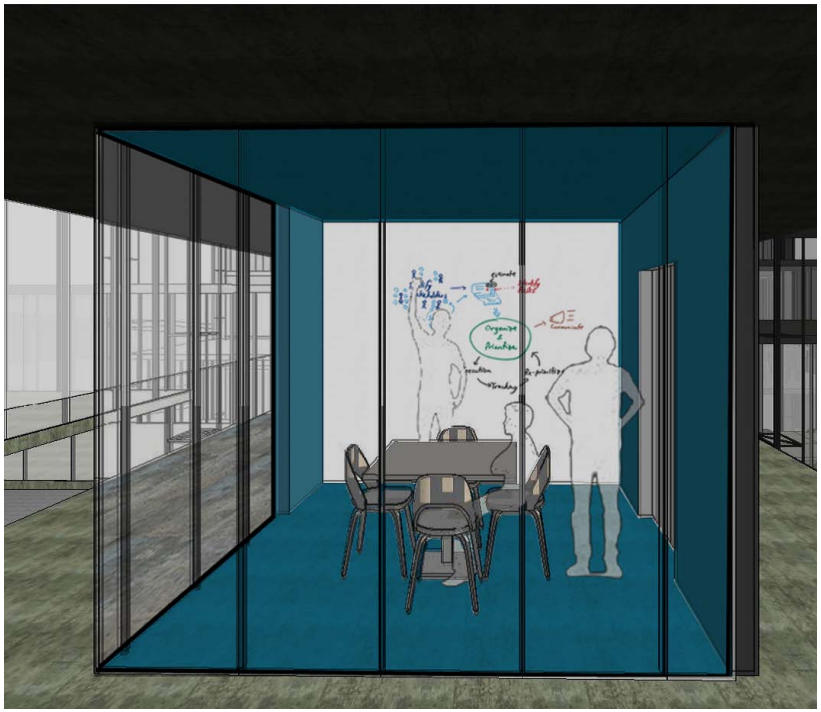

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Figure 186. *Perspective of informal discussions/ break-out zones.*

allow users to mobilise their body. The exterior promenade acts as an extension to the beach area, providing a connection with nature to allow staff an uninterrupted view of Wellington region and acquire some fresh air.

With the aim of corporeal wholeness the catenary arch columns protrude through the building, supporting each level and clear and opaque glazed façade. The exposed substructure is representational of the prosthetic supporting the body and signifies prosthetics as object as Wright distinguishes. The use of clear and opaque glazed facades exposes and gives a shadow effect of the columns denotes the seamless integration of body and machine.

The Innovation Centre encompasses prosthetic characteristics that strengthen the idea of mobility of architecture. The floor of the auditorium can be adapted to be flat or inclined. Thus the space has enhanced capability to be altered to function as an auditorium, conference, lecture room or be part of a large, flat, open space for larger functions. The meeting rooms behave as a hoist, mobilizing people vertically through the building, giving access to every floor so they can easily be transported to other floors for further expertise. Walls in the auditorium, lecture rooms and exhibition areas have the capability to slide, horizontally and vertically, and rotate on rollers to adjust to new spatial requirements.

The Innovation Centre design portrays the aesthetic characteristics of the Prosthetic Human as the body of the building is supported by a catenary substructure. The sinusoidal curve of the Prosthetic Human is expressed through the design of the ramp atria. The ramps are centrally located at either ends of the building and feature black powder coated metal rods from the ground to the underside of the roof. These rods add visual density to an otherwise open and large building.

The building expresses an holistic architecture informed by Prosthetic Human proportions. The following table below presents the design elements informed in terms of the height of Prosthetic Humans. The second table presents a list of architectural elements and specifies the prosthetic proportional values applied to its design. The building is the result of designing for the prosthetic body defined by prosthetic proportions.

Architectural Element	No. of Prosthetic Human (height)
Ramp	2
Corridor	1
Doors	1
Café Bench	3 & 4
Tables	2,3 & 4
Kitchen Bench	2.5
Promenade	4
Maneourving Space	1
Glazing Panels	0.5
Learning Pods	1 & 2
Meeting Rooms	4

Architectural Element	Prosthetic Human numerical value
Roof	220
Floor	120
Glazing thickmess & Stair Rods	20
Columns	360
Railing	920
Carcase	70

CHAPTER SEVEN: CRITICAL RESEARCH AND DESIGN DISCUSSION

This chapter contemplates on the result of implicating the Prosthetic Human, discussed in previous chapters, as a catalyst to design of an architecture with augmented access and mobility. This chapter begins by discussing questions raised by reviewers in each design review. The discussions helped forge the direction of the design inquiry. Next, through the design inquiry, limitations and further potentials of this project will be outlined. Finally, the amendments made after the design iterations will be reviewed.

Resulting from a design critique, held in early May 2013, a question In the initial review arose whether the intent was to, purely, deconstruct the accessibility codes and create a "prosthetic code" from which to refine architecture or in fact, to design a "prosthetic" architectural solution. Creating a new code was purposeful if designers/architects encountered an issue for different disability and could reference solutions for set of design principles. However, it was discussed that a research inquiry that resulted in an architecture, encompassing prosthetic conditions, would be more successful.

Throughout the research, there was concern about designing with prosthetic proportions and arriving at an architectural solution where abled persons could not easily inhabit. The discussion was two-fold. Firstly, designing for a disabled body would generate an architecture designed, specifically, for their needs. One condition that was mentioned was spaces with lowered ceilings to allow people in wheelchairs to feel more enclosed within space. In spaces with low ceilings, abled bodied persons would have to bend down to move through space. This particular direction is risky and provocative due to the architecture inducing abled-bodied persons to feel disabled within space as ease of movement is restricted. It would define the architecture to be discriminative towards abled persons.

To mitigate this, a second option emerged to design for both abled and disabled, to arrive at accessible architecture that accommodated for both. A suggestion was to superimpose an abled and disabled person to investigate similarities and differences or the transformative process, between the two entities, into spatial conditions. However, it was discussed that it was more fundamental to research and design test an architecture informed by the disabled body to investigate new aesthetics, geometry and performance that would define a prosthetic architecture. The research was molded to explore this further to "fill" a research gap whereby the disabled body as the figurative anthropomorphic model in the design of architecture. Being mindful of discrimination towards abled-persons, the design was prepared to be articulated to cater for all people. The final design is specifically designed around the Prosthetic Human yet, unexpectedly, the design possesses more maneuvering space, including increased ceiling height allowing all users to carry out normal process within the building.

Access and mobility, in the public environment, had been identified as an area in need of improvement to prevent spatial and social discrimination. Public facilities require all individuals

to carry out normal processes thus a generalized approach has been adopted. This research only solves access and mobility for an office building, however the use of the ramp and proportional studies can be applied to multiple public occupations. At a more intimate scale, residential projects are more client specific where the design should respond to their specific disabling condition. However, certain aspects of this research can be applied to residential projects where houses operate and encapsulate prosthetic conditions. The integration of an internal ramp into the floor plate and applying the proportional study of the Prosthetic Human to volume, floor layouts, sections, and the elevations can be further researched and developed. Due to the limitations of this design research, this thesis has focused specifically on a person in a wheelchair but can extend to those with crutches, walking frames, pregnant persons and parents with prams. Further investigations into differing disabilities and their inherent characteristics has the potential to be developed further to create a disability-specific response or an all-encompassing architecture to suit all disabling conditions.

CONCLUSION

A lack of access and mobility implicates the experience and quality of life for those impaired individuals of the environment. Therefore, Access and Mobility was identified as an undeveloped field in terms of architectural enquiry. This thesis investigated and tested Access and Mobility through the lens of design. The research followed a design research method. By investigating phenomena such as circulation, innovation, prosthetics, anthropomorphic models and analyzing a series of small case studies, specific principles were isolated and tested. These were transposed into spatial conditions through analogue and digital modelling. Subsequently the design was reflected upon and the success and limitations of the design iterations examined. The results were carried through to the final design iteration.

The resulting building, sited over breakwater in Seaview Marina, Petone, emerges as a prosthetic entity and challenges existing notions of access and mobility. With the needs of the disabled person at the forefront of research and design, the result challenges the divide between abled and disabled, dissipating any barriers through enhancing access and mobility of architecture. The concluding design augments access and mobility for both body and mind. The exaggeration of the circulation paths highlight the physical means of movement through the building whilst the Innovation Centre provides spatial environments that are stimulating to access the mind and mobilise creative thought.

Theoretical frameworks of Marquard Smith and Joanne Mora, Elizabeth Wright and Mark Wigley, were critically discussed about the post-human condition. Three embodiment integrations between body and machine, as defined by Wright, were transposed into design experiments that investigated compositions between body of the building and structure. The analysis of site prosthetic devices provided insight into how architecture could behave to reconstitute conventional notions through extending capability of architectural elements. The design iterations showcase how architecture can behave prosthetically to further mobilise the building and its occupants.

An exploration into the Vitruvian Man and the Modular Man exemplies the privileged position the body has held within architectural history. Corbusian principles and design method was adopted and appropriated for the Prosthetic Human. The proportions of the Prosthetic Human informed the architecture at macro, messo, and micro scales. By doing so, the architecture is, holistically, in accordance to prosthetic proportions and is representative of the body that requires enhanced access and mobility within space. The introduction of the Prosthetic Human enables a new anthropomorphic model in the design of architecture, informing spatial and aesthetical proportions. The research concludes that by challenging access and mobility and introducing the Prosthetic Human, the design and discursive component presents scope to further develop the concept of accessibility and creating seamless designs that embrace emancipatory drives. The research is purposeful; the process celebrates difference and in turn, a calm and embracing architecture is presented in hope for those impaired to be free from spatial discrimination in our environment.

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