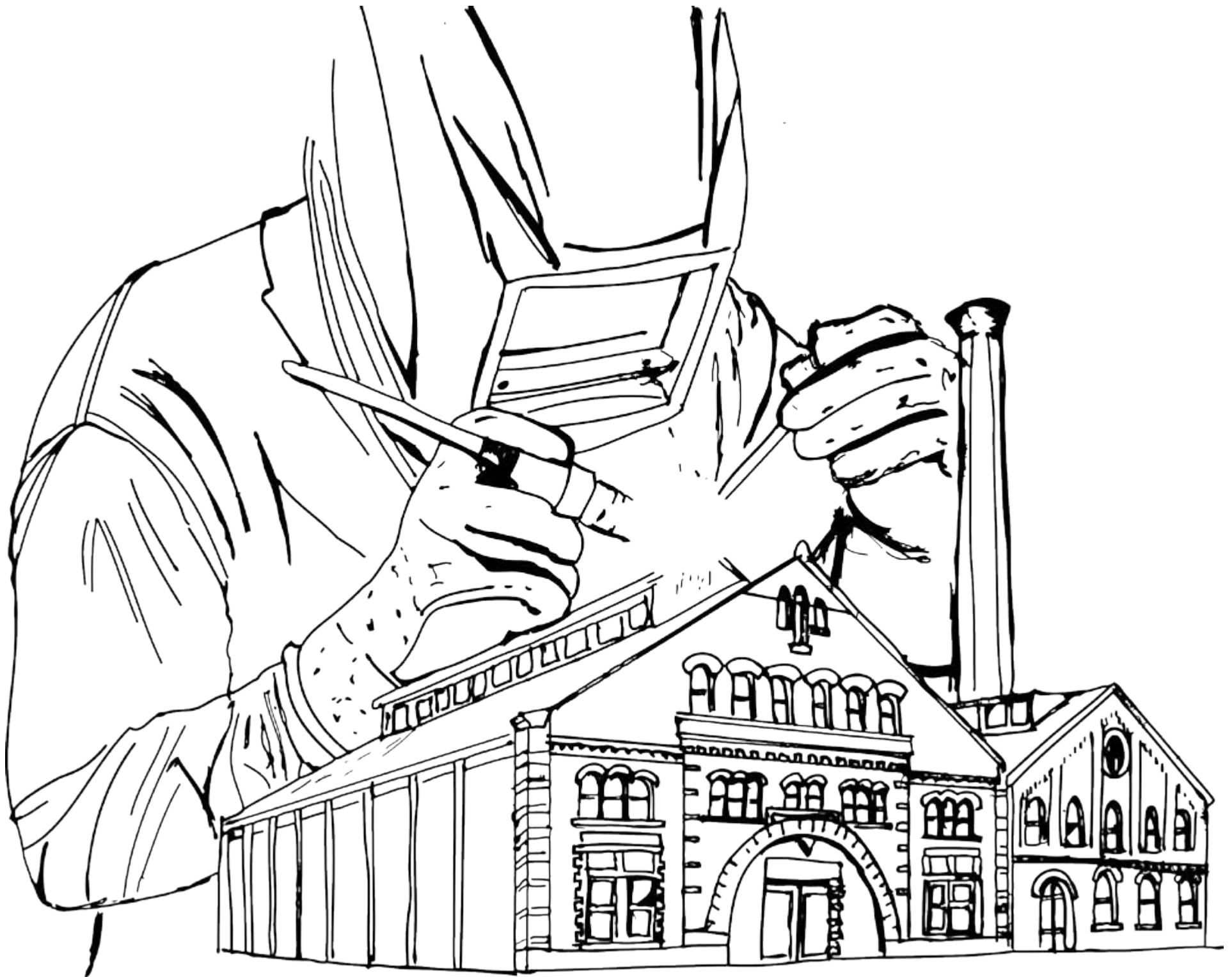


# THE CULTURE IN FABRICATION

THE 21<sup>ST</sup> CENTURY MAKERSPACE AS A FLEXIBLE, OPEN SOURCE TOOL TO INSPIRE  
A MAKER COMMUNITY.

UNIVERSITY OF THE WITWATERSRAND. M.ARCH. CLAUDIA BOZZONETTI. 534685



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SUPERVISOR:

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BY CLAUDIA BOZZONETTI

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I WOULD LIKE TO THANK MY FAMILY, FRIENDS, LECTURERS AND FELLOW COLLEAGUES WHO HAVE SUPPORTED ME THROUGH MY  
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SPECIAL THANKS TO: MY SUPERVISOR DIRK BAHMANN FOR INTRODUCING ME TO A NEW WORLD OF CREATION, MY FRIENDS  
FOR THEIR CONSTANT ENCOURAGEMENT AND VALERIO, PAOLA AND GENNA BOZZONETTI WHO SUPPORTED ME IN EVERY SUCCESS  
AND FAILURE IN MY ACADEMIC CAREER.



# DECLARATION

I, Claudia Bozzonetti (534685) am a student registered for the course Master of Architecture (Professional) in the year 2016.

I hereby declare the following:

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# ABSTRACT

The world is standing on the cusp of a third industrial revolution that will see an explosion of creativity, knowledge creation and innovation. South Africa is at the forefront of a different revolution, one that is concerned with the access to knowledge and education. While these revolutions are somewhat different, they fight for the same ideal; that is a world where information and education are available to all, such that people are inspired to innovate, create and empower themselves through the development and use of new knowledge. These revolutions will be facilitated by a number of factors, but what is architecture's role?

This research report discusses a makerspace as an architectural response to the coming knowledge revolution and what this typology means in the context of Johannesburg, South Africa. The author makes reference to the theoretical understanding of maker culture as the celebration of creativity and innovation and that a makerspace facilitates access to the tools and space required so that anyone can make.

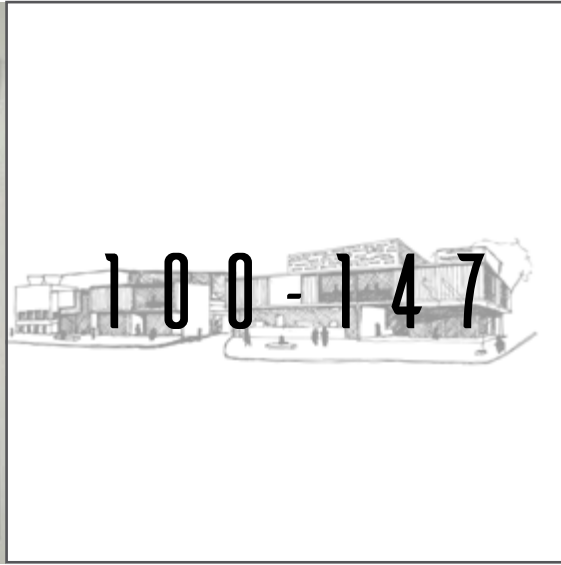
The intent of this research report is to create an architectural intervention based on extensive research of related theories, careful analysis of the context and various precedent studies. The key issue is determining how the typology affects and is affected by the context. The author utilises the context of Newtown, Johannesburg for the intervention due to its history as a primarily industrial area that grew into a cultural hub of the city.

In a World where knowledge has become a privatised commodity, this research report explores how architecture, specifically in the form of a makerspace, can democratise access to information, empower the individual and the community, and boost a stagnant local economy through the encouragement of entrepreneurship.



FIG 1. What is a Maker? (Bozzonetti, 2016)

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\* Please Note. All photographs are taken by the author unless otherwise stated.

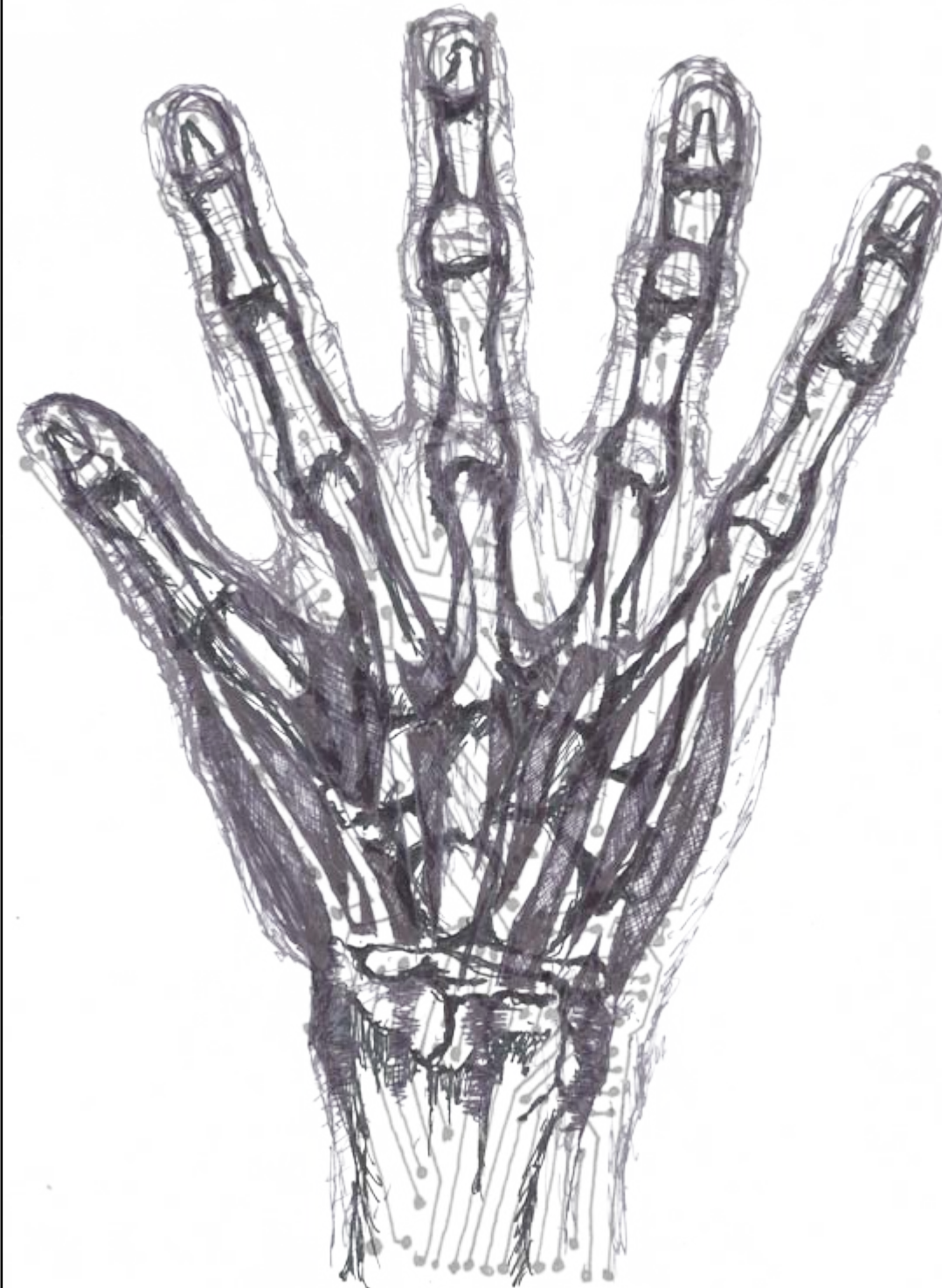


# OVERVIEW

Access to information, education and the tools of innovation is at the forefront of South Africa's education system. (Samanga, 2016) This lack of access has contributed to a decrease in entrepreneurship, a decrease in self-empowerment and the stunting of the local economy. The theoretical premise of this research report is that the establishment of a makerspace in Newtown could bridge the gap and facilitate this access as well as begin to empower the individual and the community. This research report aims to explore what is involved in the maker culture, what makerspaces entails and what the typology of a makerspace means in the context of a South African city.

The research report draws inspiration from the Fees Must Fall movement, developments in disruptive technologies and the author's experiences with making. The aim is to address a different approach to education as well as to show, through theoretical discourse, precedent investigation and theory-based research, how a makerspace can encourage innovation and entrepreneurship by facilitating teaching, learning and collaboration through equipment and architecture. The author also intends to discuss why this intervention would be appropriate in the urban setting of Newtown. Newtown was once an industrial area that became a cultural precinct. Attempts to develop the area stunted cultural development in the area. A makerspace in Newtown could be a catalyst for the further evolution of this cultural precinct.

In carrying out this research report, both qualitative and quantitative research has been performed. The understanding, influences and qualities of the maker culture and their spaces are defined based on information from different literary sources, visits to local makerspaces, precedent studies and interviews with people who have experience in the field of study. An understanding of Newtown was achieved by consulting literary sources as well as conducting various site analyses. From this information, a design brief was formulated. This research culminates in a new makerspace in Newtown, the design of which is influenced by site conditions and the alterations of the typology when places in the context of Johannesburg, South Africa.

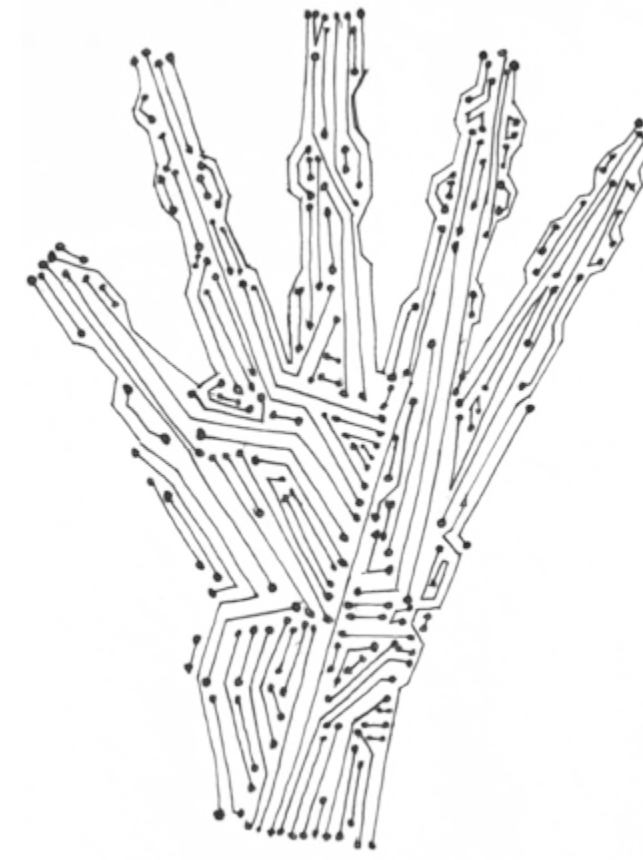
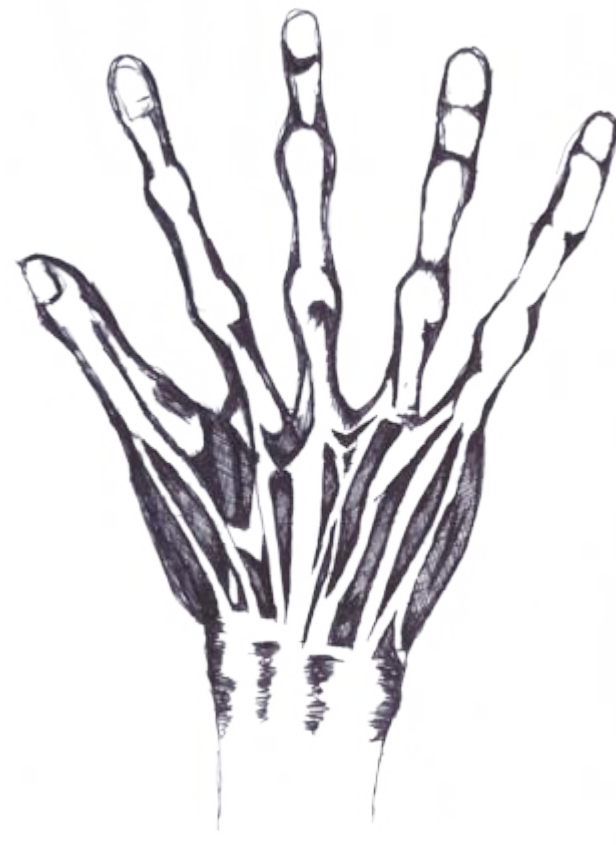
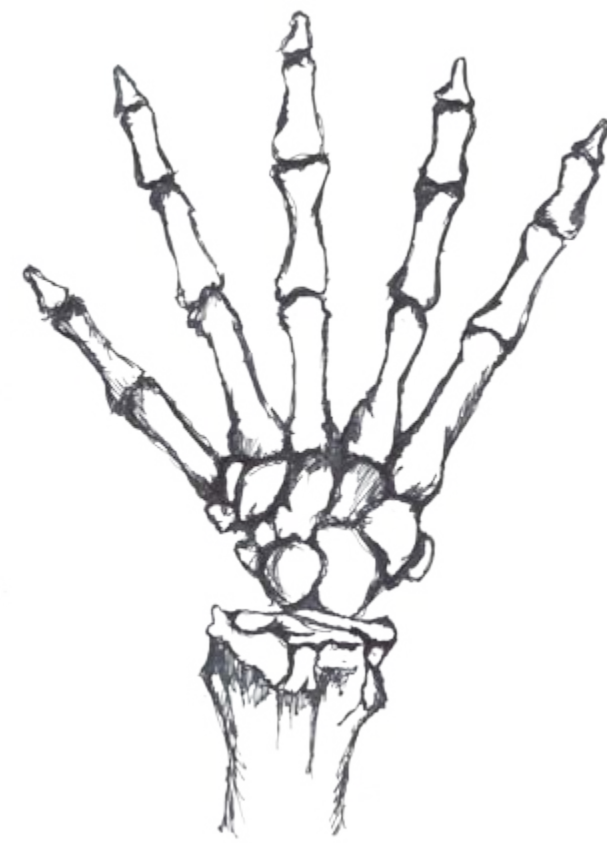




# INTRODUCTORY ESSAY

According to Mark Hatch in *The Maker Movement Manifesto*, the world is currently standing on the foundation of possibly the largest explosion of creativity, knowledge creation and innovation in history (Hatch, 2014. Chapter 13. 0 min), but perhaps the opportunity to take advantage of this creative boom is not accessible to all. The last year has seen a movement called ‘Fees Must Fall’ formed by students from various tertiary education institutions across South Africa in response to a proposed 10.5% increase in fees, this according to Rufaro Samanga in the article *#FeesMustFall: Where Do We Go From Here?* (Samanga, 2016) The youth are demanding the democratisation of access to education centres around the cost of tertiary education, but I think it should extend past higher education fees and include the lack of access to the tools and knowledge required to support entrepreneurship, innovation and creativity. One must also consider that not only do some people not have access to tertiary and even secondary education, but some don’t have access to other means of education either, preventing them from learning skills and entrepreneurship. This lack of access leads to a weaker economy and decrease in small scale entrepreneurship. Based on the quest for affordable education it would seem that knowledge has become a privatised commodity. Ideally, knowledge should be made available to all and shared amongst ourselves. To liberate the oppressed, we should ensure that everyone should have the opportunity to access the tool of the next industrial revolution, the maker revolution. (Hatch, 2014) A maker Revolution in South Africa can support a multitude of industries including creative industries. Embracing the movement allows for access to new tools and technology resulting innovative approaches to creativity. The evolution also acts as a platform for budding entrepreneurs to initiate start-up businesses. The economy would benefit greatly from the encouragement of entrepreneurship as the country is now experiencing a 0% growth rate of the economy according to an article by News24Wire entitled *Zero growth for South Africa in 2016: SARB*. (News24Wire, 2016)

Along with the issue of a lack of access to tools and knowledge, people are also faced with the problem of customer sacrifice. (Hatch, 2014) People go shopping with the intention of buying something that fulfils their needs and wants in a particular item. However, when faced with the available product on the market, they find themselves forced to sacrifice certain needs and/or wants that they were looking for and settle for a product that is closest to what they wanted. There is not a wide enough range of selection of products available. Stephen Gray of *The Makerspace* in Durban corroborates this by describing the consumer market as saying “Well I wish I had a cell-phone cover that was like this and this but they don’t have it so I’ll just buy this one.” (Gray, 2016) People are forced to accept what is available on the shelves. Mark Hatch also points out in *The Maker Movement Manifesto* that there is little to no infrastructure in place to help start-up companies (Hatch, 2014. Chapter 5. 19 min). This lack of infrastructure leads to the suppression of new innovative and creative minds and ensures the continued monopolisation of the markets because these minds are not available to think of new ways of doing things. Hatch also writes that should we consider manufacturing to be an important component of our economy, “the distribution and diffusion of easy to use, powerful and cheap access to the right tools are critical to the success of every industrialised economy, particularly ones that leverage the coming technological advances across so many industries.” (Hatch, 2014. Chapter 13. 3 min.) My opinion is that industries in Johannesburg have not yet taken advantage of the new technologies and tools available based on the limited selection discussed above, and this probably is because it is still cheaper and more efficient to use the existing production methods. The continued use of the existing fabrication methods leads to limitations and restrictions with regards to what is manufactures and customer satisfaction.



Given these problems how can one make knowledge and tools more accessible as well as inspire entrepreneurship and innovation that takes advantage of new technological developments in the tools of manufacturing. Mark Hatch states that the maker revolution has the power to democratise education and access to knowledge and that the tools available now days make it possible for anyone to change the world. (Hatch, 2014. Chapter 2. 13 min) He also says that schools are currently not able to afford the activities associated with the maker revolution and for this reason, there is a need for a central resource in the community that facilitates this access. (Hatch, 2014. Chapter 12. 3 min) This resource is called a Makerspace, and this is the proposal for this research report. It would be the most appropriate typology, in my opinion, to play host to various benefits for the individual, the community and the local economy. The exchange of knowledge and skills between people can empower a community as a group and as individuals to take control of their lives and their surroundings instead of relying on large commercial establishments. Through this empowerment, people can also start to realise their potential as a contributor to the economy.

In this research report, I plan to discuss the intervention proposal of a makerspace in the heart of Newtown and how it will benefit the community. It should also demonstrate the aspect of democratising education, gaining knowledge and insight through interactions as well as challenging the threshold between the public and private realm as a conveyor of knowledge. The current education and teaching model will be questioned in favour of one that supports the idea of learning through doing and the celebration of open source information as a significant store of knowledge. The proposed makerspace will be a home to people from different environments such as students, hobbyists, maker and the occasional business person. It should be a civic space that allows for visual and physical engagement through the public domain as well as serving as a repository of information that one can withdraw from or deposit into, learning from peers and predecessors.

" ' EVERYTHING CAN ALWAYS BECOME  
SOMETHING ELSE': THIS IS THE  
LIBERATING SLOGAN INHERENT IN  
CREATIONS THAT TRANSCEND THE  
CLICHÉS OF WHICH THEY ARE MADE. "

[JENKS AND SILVER. 2013. P. 23]

FIG 3. A Makers Hand Layers. (Bozzonetti, 2016)





FIG 4. What is a Makerspace? (Bozzonetti, 2016)

## MAKER CULTURE AND MAKERSPACES

### Maker Culture and the Maker

William Craig describes Maker Culture in his article *What is 'Maker Culture' and How Can You Put It To Work*, as being a social phenomenon and cultural movement that means something different to different people. (Craig, 2015) He goes on to explain that the meaning is relative because the culture represents varying values in accordance with the situation to which it is applied, and can lead to completely different business models, products and philosophies from organisation to organisation. (Craig, 2015) Based on this idea from Craig, maker culture means something different to each maker based on what they want to obtain from it, but what is a maker? As a social movement, the people who inspire the emergence of this cultural phenomenon must be defined. According to Kaleb Kraft from *Makezine*, humans are the natural makers of the world and the maker movement is the celebration of these naturally creative and inquisitive beings (Kraft, 2016). Craig defines makers by discussing how different people learn, saying: "Some are auditory learners and some are visual learners.

Yet another group learns best by doing. These are the makers." (Craig, 2015) Although the description of makers as being creative and inquisitive people that learn best through practice is entirely accurate, this only scratches the surface of what makers are and what they can be. As Mark Hatch writes in *The Maker Movement Manifesto*, makers are people who have made the decision to follow a life-long learning path to not only enrich their lives but also to make life more rewarding, faster and cheaper. (Hatch, 2014. Chapter 3. 15 min)

### Users

According to Deloitte, the publisher of *'Makezine'*, Dale Dougherty has divided makers up into 3 different stages; Zero to Maker (learning skills and applying them), Maker to Maker (collaborating with fellow makers) and Maker to Market (making with the intention of commercial appeal) (Deloitte University Press, n.d. p. 6)



FIG 5. The Maker Man Elevation. (Bozzonetti, 2016)

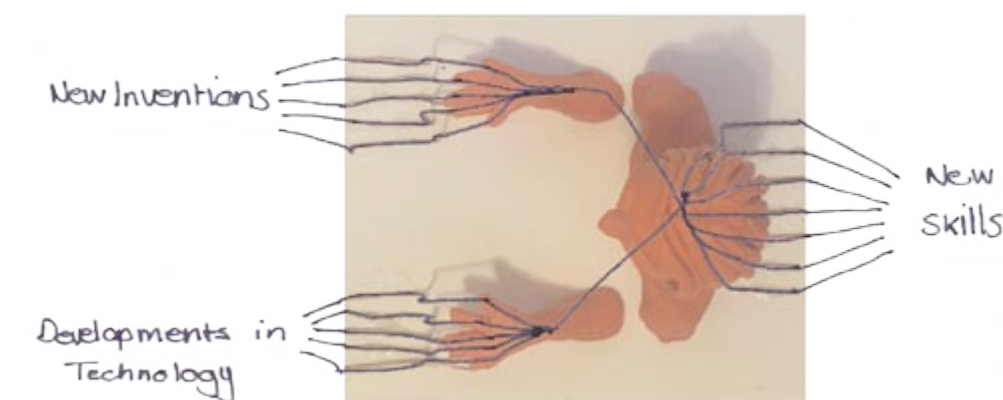


FIG 6. The Maker Man Birds Eye. (Bozzonetti, 2016)

"MAKERS AND THE MAKER MOVEMENT REPRESENT A MICROCOSM OF BROADER TRENDS IN TODAY'S WORLD. YET, WITH THE EVER-GROWING NUMBER OF PARTICIPANTS AROUND THE WORLD, THERE IS NO SINGLE MAKER PROFILE."

[DELOITTE UNIVERSITY PRESS, N.D. P. 6]



The zero to maker stage is sparked by the inspiration to create and invent according to the Deloitte article, *A Movement in the Making* (Deloitte University Press, n.d.). Makers of this stage imagine new approaches to everyday activities and perhaps start attending maker fairs where they are introduced to a new environment. These makers find a makerspace in their community to gain access to the necessary tools and technologies start to learn the appropriate skills through practice as well as through the stores of information available on online platforms. These information platforms have been compiled by those who have done it before and wish to share their knowledge to a novice (Deloitte University Press, n.d.).



FIG 7. Zero to Maker. (Bozzonetti, 2016)

The maker to maker stage involves the collaboration with other makers to share expertise and then build a team of makers around a project (Deloitte University Press, n.d.). The article reads that people in the maker to maker stage contribute to existing platforms and build on the foundations of what has already been established by other makers to devise better ways to produce a product and improve upon methods (Deloitte University Press, n.d.).

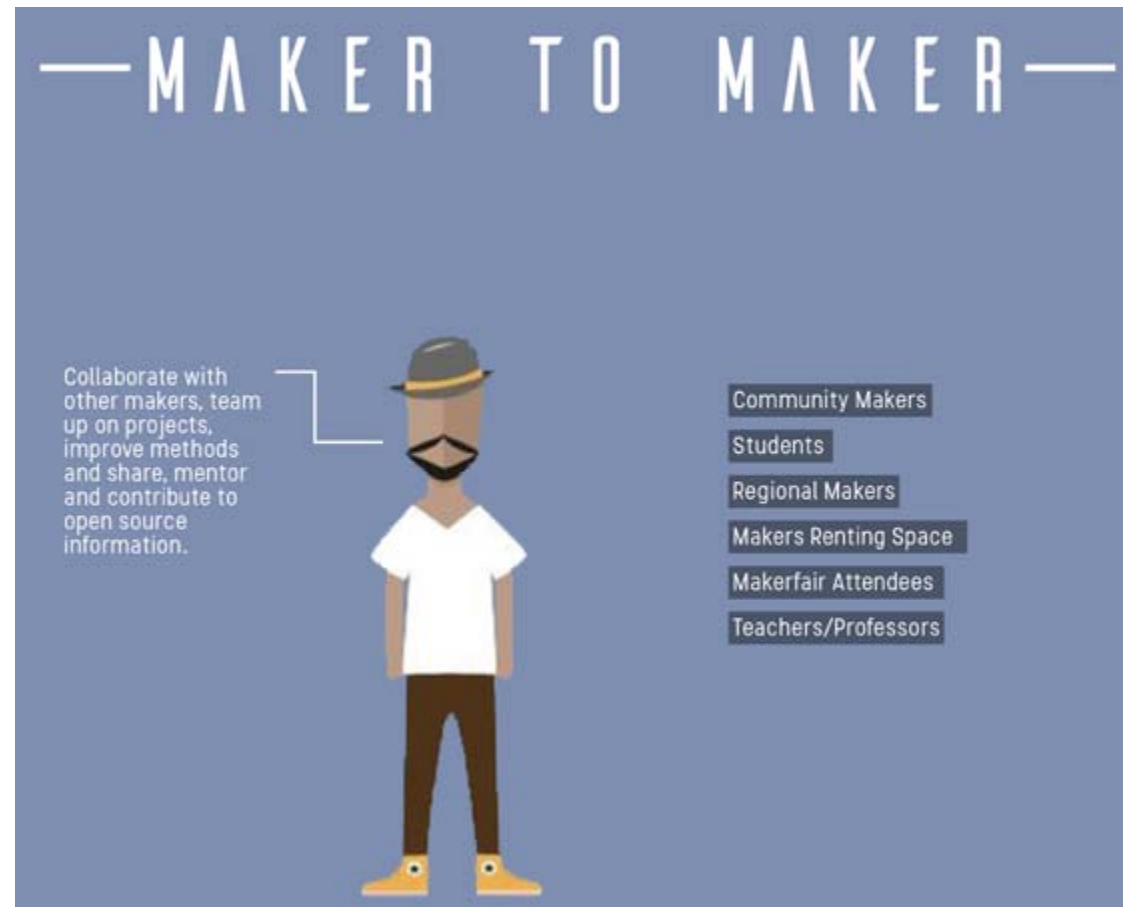
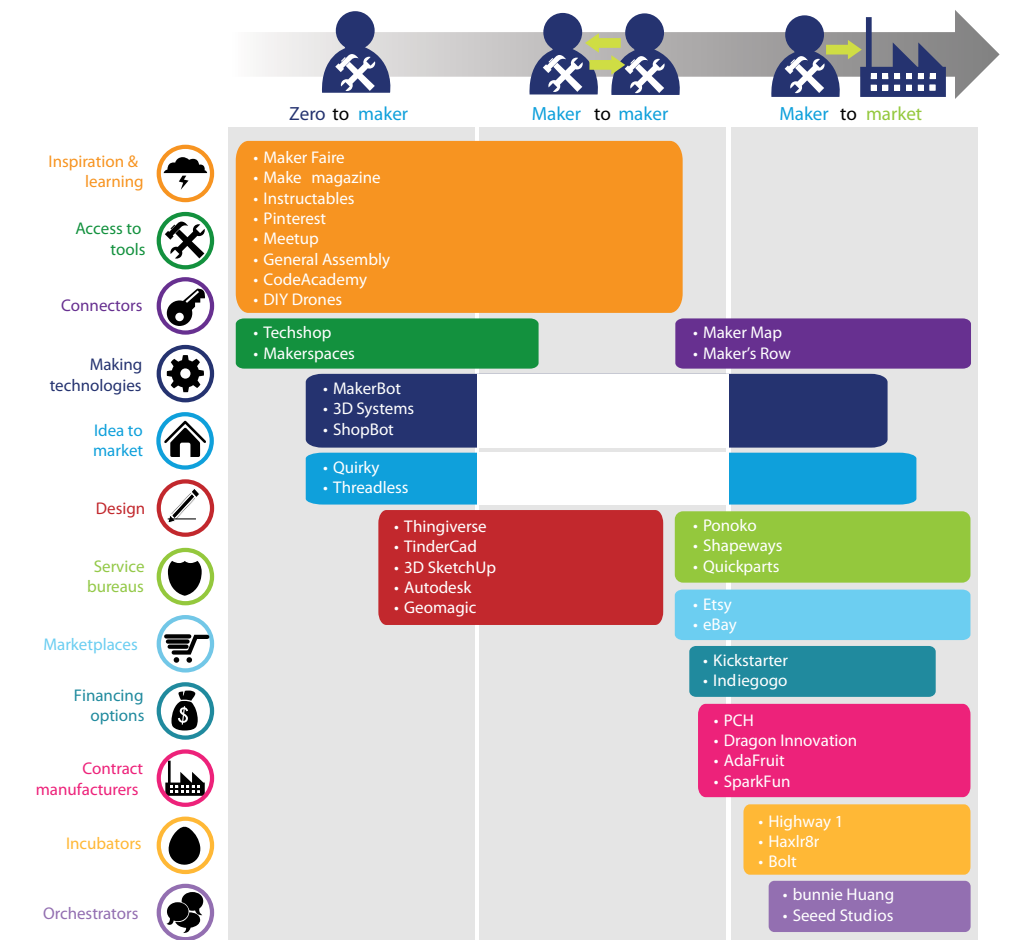


FIG 8. Maker to Maker. (Bozzonetti, 2016)



FIG 9. Maker to Market. (Bozzonetti, 2016)

The Open University wrote in *Innovating Pedagogy 2013* that the interactions that occur between makers is informal and involves a network of peer-led and shared learning (Open University, 2013). The movement sees the integrations of a wide range of domains including the high-tech and craft skills that would traditionally remain separate. Included is the idea that experimentation is encouraged and is approached from a playful standpoint where risk is necessary and welcomed, and that social interactions in all forms, including websites and social media, is the key to success of a maker community (Open University, 2013). In *What is 'Maker Culture' and How Can You Put It To Work*, William Craig mentions the dependence of the maker culture on Constructivism; the idea that learning is best achieved through doing, which was often the approach adopted by artisans when training their apprentices. (Craig, 2015)



Source: Deloitte Center for the Edge.

Graphic: Deloitte University Press | DUPress.com

FIG 10. Some representative players in the maker ecosystem. Many of these entities play multiple roles in the ecosystem. The roles are evolving, and new entrants emerge daily. (Deloitte University Press. n.d.)



## Constructivism

According to ‘Concept to Classroom’, Constructivism is an educational, philosophical approach that revolves around the idea of learning through doing and how people learn through observation and scientific study (Concept to Classroom, 2004). Students, having built a personal understanding of the world through reflecting on past personal experiences, must use this understanding to decide how to approach new information, either accepting it or disregarding it (Concept to Classroom, 2004). The theory suggests that we are the creators of our knowledge, and we build upon this knowledge by constantly asking questions, exploring the outcomes and assessing the answer. There is an encouragement to use active techniques to learn, to reflect on processes taught and to speak about the understanding of it to develop the ability to integrate new information. The teacher’s role becomes to provide students with tools to solve problems and guide students to use their knowledge to hypothesise, test theories and draw conclusions from their findings. Ultimately the student should be a passive recipient of information and be an active participant in the learning process (Concept to Classroom, 2004).

‘Concept to Classroom’ discuss the benefits of a constructivist approach to learning in *Constructivism as a Paradigm for Teaching and Learning*. They state that people tend to enjoy learning more when they are more actively involved in the process and are concentrating on thinking and understanding (Concept

to Classroom, 2004). It is also stated that this educational approach gives the learner ownership of what they learn and that the learner develops the ability to express knowledge in different ways (Concept to Classroom, 2004). This ability could lead to people becoming more confident in themselves and improve the self-worth of those that feel as if they have nothing to offer the intellectual world. Lastly, constructivism also promotes social and communication skills which teach people to negotiate and to evaluate the contributions of others which will ultimately aid in real-world situations (Concept to Classroom, 2004).

Regarding a makerspace, the constructivist approach to educating members is key. A maker is the creator of their knowledge in that they are taking the active step to learn new skills to make new creations. It is through their own choice and interest that they start becoming a maker. A maker builds upon that knowledge from interacting with other makers to learn new skills and then master those skills through application. A maker can further his knowledge by exploring and analysing what comes out of applying these skills. In a way the makerspace becomes the teacher, providing the students or makers with the tools to solve problems and facilitating the growth of a body of knowledge.

Mark Hatch also emphasises the involvement and importance of ‘open-source’ or ‘knowledge sharing’ in the maker culture as written in *The Maker Movement Manifesto* (Hatch, 2014).



FIG 11. Fak’ugesi Festival Pass Assembly. (Bozzonetti. 2016)

## Open Source

‘Open-Source’ is described by Margaret Rouse in *What is Open Source* as being any program where the source code; that is the original code written by the programmer; has been made available to public users and developers to use and/or modify resulting in a free public collaboration development. (Rouse, 2009) Thomas Warger writes in the article *The Open-Source Movement* that open-source came about as a “response to the predomination of commercial, proprietary software” (Warger, 2002. p. 18). People were looking for alternatives that better served their needs and sought to return control from big corporations back to the users. According to R.E. Wyllys in the article *Overview of the Open-Source Movement*, this world-wide movement consists of people who feel that the best software is produced through the collaboration of skilled programmers who are willing to work for no pay and are inspired by producing high-quality programs. (Wyllys, 2000)

In *What does Open Source mean*, HowStuffWorks.com talks about open-source encouraging the modification and customization of programs to create something more useful and error-free in the long term (HowStuffWorks.com, 2000). The qualities of an open-source are that the product must be freely distributed, the original source code must be included, anyone should be allowed to modify the code, the modified versions should be redistributed,

and the accompanying licence must not interfere with other software (HowStuffWorks.com, 2000).

Regarding applying the qualities of open-source and finding correlations with the maker movement, one must first consider what the maker source-code is. Within the maker movement, many online databases make the instructions and requirements to make something public to anyone, for example: Instructables, Makezine and Popular Mechanics to name a few. Similar to the open-source movement, makers are inspired to use these public projects as a base on which to improve and customise. Then they are encouraged to upload their version of the project to these databases and the cycle continues. Each version becomes a collaboration of all of the makers who have ever had a hand in the project and result in a more robust and efficient product with each variation and ensures continued learning for all involved. This sharing of knowledge and ideas on these platforms lead to inclusive social interactions between makers and democratises the access to these knowledge bases.

Mark Hatch says that makers share knowledge and know-how both formally and informally (Hatch, 2014. Chapter 3. 11 min). To facilitate these interactions and the growth of the movement, makers need space to produce; makers need a makerspace.



FIG 12. Fak’ugesi VR Car Racing. (Bozzonetti. 2016)



FIG 13. Fak’ugesi theMakerSpace Table - CNC Routing. (Bozzonetti. 2016)



A makerspace, according to Educase, is described as “a physical location where people gather to share resources and knowledge, work on projects, network, and build” (Educase, 2013). They go on to say that this space is to be a community building where members have access to necessary tools and that there is often an association between makerspaces/hackerspaces and the fields of engineering, computer sciences and graphic design. Educase states that a makerspace takes much inspiration from the hacker culture (Educase, 2013). Based on this statement, it is clear that to understand what is required of a successful makerspace; one must understand hacker culture and hackerspaces.

## Hacker Culture

A makerspace, according to Educase, is described as “a physical location where people gather to share resources and knowledge, work on projects, network, and build” (Educase, 2013). They go on to say that this space is to be a community building where members have access to necessary tools and that there is often an association between makerspaces/hackerspaces and the fields of engineering, computer sciences and graphic design. Educase states that a makerspace takes much inspiration from the hacker culture (Educase, 2013). Based on this statement, it is clear that to understand what is required of a successful makerspace; one must understand hacker culture and hackerspaces.

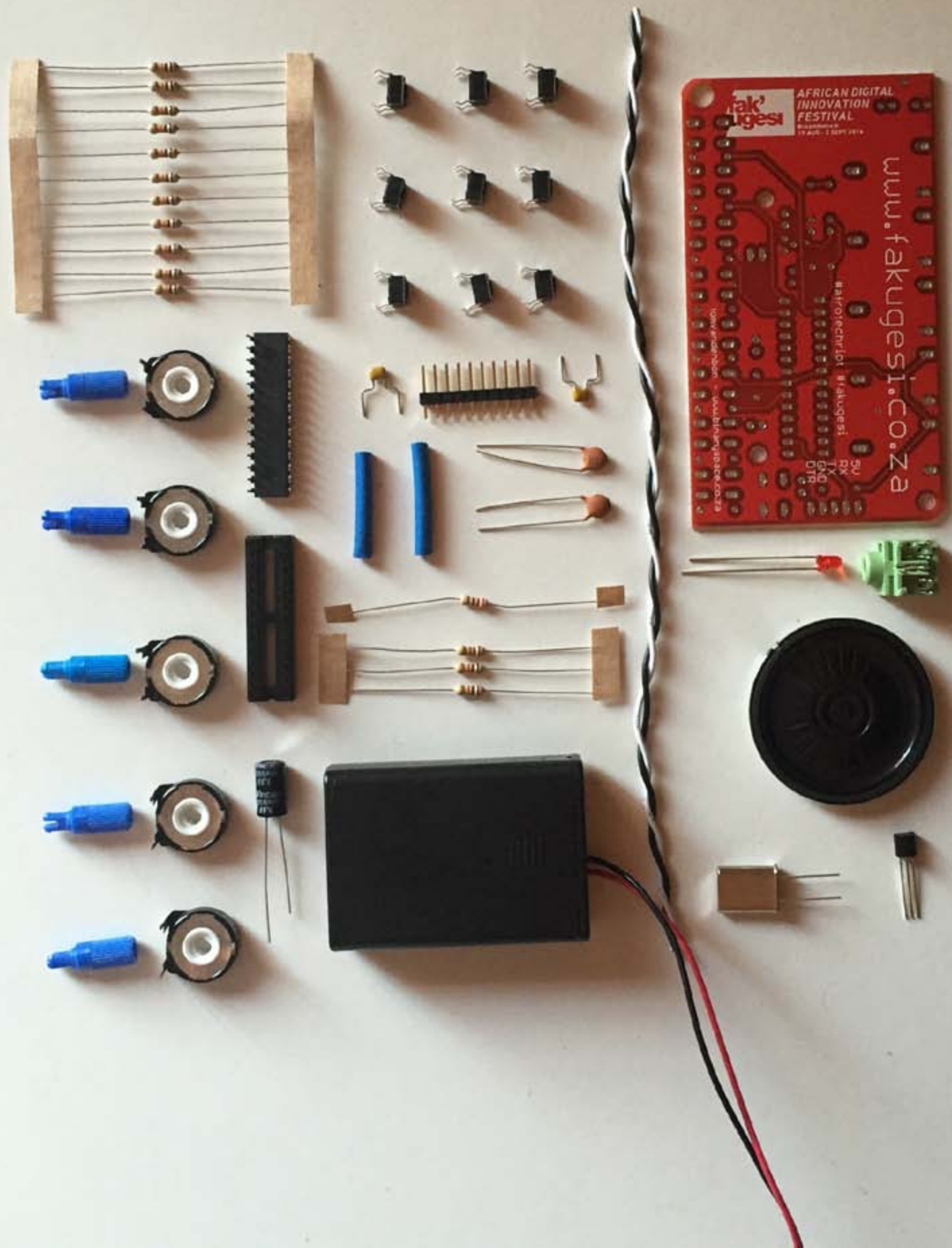
The hacker culture relies on collaboration between creators and publicly available knowledge stores that the hackers draw from to improve and alter existing information systems. In an article entitled *How Hackers Work*, Jonathan Strickland writes that some hackers make an effort to recreate improved software and strengthen security measures. He also says hackers support open source software to learn from other hackers (Strickland, 2007)

The hacker culture understanding that relates the most to the maker movement is the programmer subculture of the overall hacker culture. subcultureslist.com explains that originally an academic movement, the programmer subculture deals with free software and open-source where programmers write software that they share with the public, believing that information should be free (subcultreslist.com, n.d.). In *Is it a Hackerspace, Makerspace, TechShop or FabLab?* Gui Cavalcanti states that the term hack no longer means to program but rather includes the idea of making something. The movement centres around the idea of repurposing hardware, working on electronic components and programming (Cavalcanti, 2013)

“Hackers believe that essential lessons can be learned about the systems—about the world—from taking things apart, seeing how they work, and using this knowledge to create new and more interesting things.” (Levy, 1984. In Schlesinger, Islam and MacNeill, 2010. p. 17)

In an academic paper entitled *Founding a Hackerspace*, Joseph Schlesinger, Md Monirul Islam and Kelly MacNeill discuss hacker ethic by making reference to *Heroes of the Computer Revolution* by Steven Levy. They state that there are five principles of hacker ethic: sharing, openness, decentralisation, free access to computers and world improvement (Levy, 1984. In Schlesinger, Islam and MacNeill, 2010. p. 17). This ethic is similar to the maker culture ethic which is concerned with sharing, openness, collaboration and hands-on interpretation. The maker culture, as it was inspired by the hacker culture, also aims to be a social equaliser across education, race, age and gender. I understand the maker culture as being a way for a community of people with a similar interest in making and innovating to come together and not only learn from one another but also to collaborate on projects, using their different strengths to design and build. I think it also a culture that embraces new ways of making things through digital fabrication on a personal scale and taking advantage of the progression of technology.

The maker culture is inspired by the hacker culture in that there is an importance of sharing knowledge and information and they believe information should be freely available to all, as this will lead to new and improved renditions. Both cultures place a high value on the freedom of enquiry and the ability to satisfy their enquiries through open-source information. They share an ideal of trying to find clever solutions to problems where the solution is thought to be near impossible, and they use existing methods in unique ways to achieve the desired outcome.





"HACKERS BELIEVE THAT ESSENTIAL LESSONS CAN BE LEARNED ABOUT THE SYSTEMS - ABOUT THE WORLD - FROM TAKING THINGS APART, SEEING HOW THEY WORK, AND USING THIS KNOWLEDGE TO CREATE NEW AND MORE INTERESTING THINGS."

(Levy, 1984. In Schlesinger, Islam and MacNeill, 2010. p. 17)

## Hackerspaces

Schlesinger et al. cite Hackerspaces.org describing a hackerspace as a real, physical location where like-minded individuals come together to hack (Hackerspaces.org, 2010. In Schlesinger, Islam and MacNeill, 2010.). The authors also say that it is a social environment where people share information, tools, expertise and ideas (Schlesinger, Islam and MacNeill, 2010.) According to Gui Cavalcanti, the concept of the hackerspace originated in Europe with a collection of programmers sharing a physical space. He also states that when the idea reached the United States, circuit design/manufacturing and physical prototyping were added to the activities hosted by a hackerspace and these facilities started offering classes and access to tools on a membership basis (Cavalcanti, 2013).

In describing the qualities of hackerspaces, Schlesinger et al. make reference to *Hacktivism* by Jarrko Moilanen (Moilanen, 2009 in Schlesinger, Islam and MacNeill, 2010.). A hackerspace is a shared space at the centre of a community that is owned and managed by the members. It is a non-profit facility that is more often than not open to the public and is host to the sharing of tools, equipment and ideas where all members are all equal. There is an emphasis on technology and innovation at these spaces, and members are encouraged to invent and go through a process of trial and error to learn. (Moilanen, 2009 in Schlesinger, Islam and MacNeill, 2010.) The social activities that occur at a hackerspace include open houses (showing work to the public), classes, workshops, collaborative projects and fundraising. (Schlesinger, Islam and MacNeill, 2010.)

So why do we need these spaces? Schlesinger et al. answer this question by pointing out hackers' need for tools, ideas and knowledge to complete certain projects (Schlesinger, Islam and MacNeill, 2010.). To accommodate these needs, hackerspaces provide access to tools and technology; facilitate group interaction and sharing; allow for the space required to develop a project; encourage creativity and innovation; and house the equipment necessary to make prototypes of their project ideas. (Schlesinger, Islam and MacNeill, 2010.)

The modern understanding of a makerspace takes much inspiration from hackerspaces. A makerspace, from my understanding, is a space that aims to facilitate innovation and creativity by providing democratised access to the necessary tools and knowledge bases. I do however find that the maker culture and their spaces are more inclusive than hackerspaces because they serve all forms of making and do not solely concentrate their features on technology and programming, although they do include these. Overall a makerspace is far more flexible and understanding of the different mediums of making and creation.

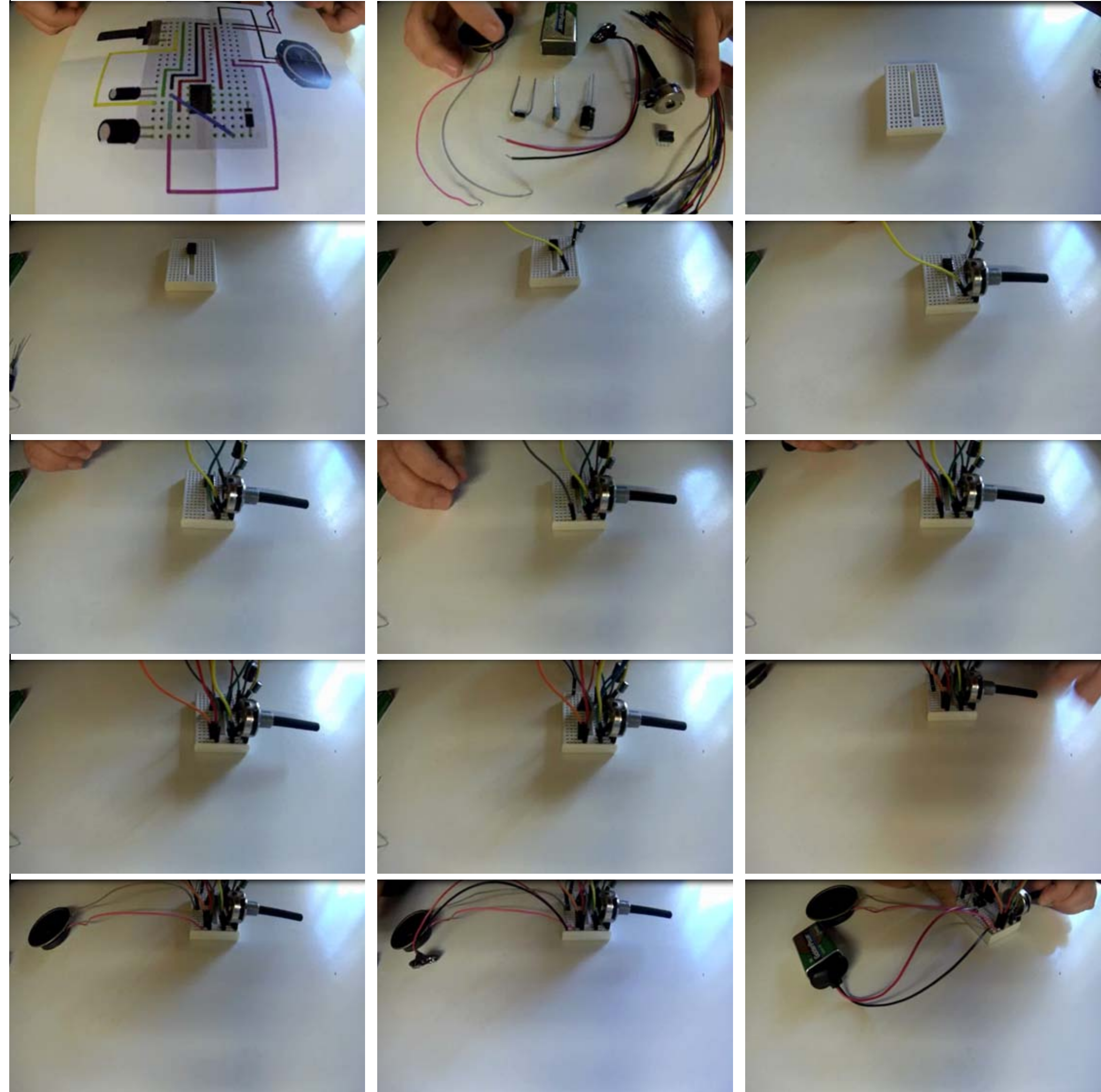


FIG 15. Making a Heart Beat Badge Story Board. (Bozzonetti. 2016)

# A SPACE TO MAKE, A MAKERSPACE

## The Makerspace

According to Gui Cavalcanti in *Is it a Hackerspace, Makerspace, TechShop or FabLab?* (2013), the term ‘Makerspace’ as we know it today only came about in 2005, when Make Magazine was first published. It was used to refer to publicly accessible places where people design and create (Cavalcanti, 2013) spaces.makerspace.com defines a makerspace in *What is a Makerspace*. It is a community centre that houses tools and where an emphasis is placed on the combination of equipment, the community and education. The idea is to provide the necessary resources required for the members of the space to design a project and prototype or create it (spaces.makerspace.com, n.d.). Makerspaces come in various forms including informal spaces and tools shared by individuals; for-profit organisations; non-profit organisations and spaces affiliated with a larger institution such as a school, library or university (spaces.makerspace.com, n. d.) The goal behind makerspaces is to democratise the act of making something or repurposing something that already exists while providing space that allows for as many crafts as possible (Cavalcanti, 2013).

Benedict Dellot writes in *8 Key Take-Aways from Our New Report on Makerspaces* that the nation is becoming more enthusiastic about making and has led to the emergence of makerspaces as something beneficial to society as well as the economy (Dellot, 2015). Makerspaces challenges members with a different way of living, encouraging self-reliance, sustainability and knowledge-sharing (Dellot, 2015) In *The Maker Movement Manifesto*, Mark Hatch writes that once the number of members reaches 300, a makerspace becomes a hub of activity (Hatch, 2014. Chapter 8. 23 min). People want to work in the space, regardless of whether they require access to tools or not. It becomes a place to socialise, hang out and swap ideas while also helping one another on projects or to learn new skills. There is also an opportunity to find business partners, customers, find potential employees and get/create jobs (Hatch, 2014).

Regarding the sizes of makerspaces, Gui Cavalcanti writes *Making Makerspaces: Creating a Business Model* that they can be any size; from small, close-knit community makerspaces to a large community centre (Cavalcanti, 2013) He goes on to list the spaces required in this article.

|                                     |                                                                                                      |
|-------------------------------------|------------------------------------------------------------------------------------------------------|
| Required Spaces (Cavalcanti, 2013): | He also states that offices will need to be provided for the following personnel (Cavalcanti, 2013): |
| Fire Lanes                          |                                                                                                      |
| Welcoming Area                      | Financial Controller                                                                                 |
| Social Food Area                    | CEO                                                                                                  |
| Classroom/Conference Room           | Facilities Manager                                                                                   |
| Workshops                           | Member Services                                                                                      |
| Rental Studios                      | Development                                                                                          |
| Storage Space                       | Programs                                                                                             |
| Gallery/Display Area                | Marketing                                                                                            |
| Retail Area                         | Full-Time Trainer                                                                                    |

Stephen Gray from *The Makerspace* says in an interview that general work areas can be cross-programmed, but some spaces need to be separated (Gray, 2016). For example: “spray booth needs to be separately ventilated, metal work needs to be insulated away for sound”. (Gray, 2016) To keep the general spaces in his makerspace flexible, Gray states that they use trestle tables which they reconfigure to fit their needs. (Gray, 2016) In an interview with Mia Van Zyl of ‘Mia design & make’, Van Zyl discusses a spacious open plan as the ideal space for making, a space that is easily divided, adjusted and adapted (Van Zyl, 2016). She includes that the furniture should be portable and lightweight and that working and floor surfaces should be easy to clean (Van Zyl, 2016).

When discussing how tools and material are becoming increasingly more accessible, Hatch explains that a maker community does not fully emerge until a fully equipped makerspace is provided (Hatch, 2014). He then goes on to give a list of equipment for a complete makerspace.

Equipment List (Hatch, 2014. Chapter 3. 23 Min.):

- Laser cutters
  - CNC Milling Machines
  - Manual Milling Machines with digital read-outs
  - Manual Lathes with digital read-outs
  - 3D Printers (Consumer and Commercial Grade
  - 3D Scanner
  - CNC Water Jet Cutter 4’x 8’
  - Vacuum forming system
  - Heat Strip bending system
  - Injection Moulding System
  - Commercial Grade Sowing Machine
  - Overlock Sowing Machines
  - Quilting Machine – CNC
  - Computer Controlled Vinyl Cutter
  - Powder Coating System and large Oven
  - MIG Welder (Metal Inert Gas)
  - TIG Welder (Tungsten Inert Gas)
  - Handheld Plasma Cutter
  - Sheet Metal Spot Welder
  - Sheet Metal Break 16 Gauge x 50”
  - Rotary Sheet Metal Punch
  - Sheet Metal Corner Notcher
  - English Wheel and Plavishing Hammer
  - Sheet Metal Shear 6 Gauge x 50”
  - Sheet Metal Roller 16 Gauge x 50”
  - Sand Blast Cabinet
  - Metal Grinders and Sanders
- Metal Chop Saw
  - Metal Horizontal Band Saw
  - Metal Vertical Band Saw
  - Electronic testing and soldering equipment
  - Large Format Colour Printer
  - ShopBot CNC Wooden Router Saw 4’ x 8’
  - Paddle Saw
  - Wood Planar
  - Wood Jointer
  - Wood Band Saw
  - Wood Sanders
  - Wood Scroll Saws
  - Wood Lathe
  - Drill Presses
  - Granite Surface Plate with Digital Height gages
  - Compressed air throughout shop
  - Compressed air hand tools
  - 30+ Design Computers (with Autodesk Inventor, Maya, 3DMax, 1 2 3D Make, Autocad Software, Adobe Illustrator, Photoshop, Acrobat,)
  - Member Storage
  - Private Studios for Rent
  - Meeting Rooms and/or classrooms
  - Large Worktables
  - WIFI
  - Retail Store
  - Kitchenette
  - Staff



## Accessibility

According to Will Holman's article, *Maker Space: Towards a new civic infrastructure*, Makerspaces are usually geared towards the middle class because of the constant upkeep of the technologies and facilities and acquiring the latest machinery is not covered entirely by outside investment. Therefore, they tend to rely on a membership fee usually only affordable to the middle class (Holman, 2015). This fee contradicts the maker moral belief that everyone should be able to make and have access to the necessary tools and knowledge. Makerspaces help us master technology for self-fulfilment, learning and enterprise (Dellot, 2015). This ability is why it really should be a facility accessible to all but as Stephen Gray points out by saying that: "Some equipment is very expensive, and so it's not going to be accessible to everyone" (Gray, 2016). So the challenge now becomes how to include those who cannot include themselves because of financial constraints. Gray states that: "people don't appreciate what they don't pay for and so even if it's a nominal fee there has to be some sort of contribution" (Gray, 2016). Even if people were charged a nominal fee for membership, this would still not be enough income to get a makerspace going. Therefore, there would need to be an upfront investment from sponsors and possibly the government to get a facility off the ground. The investment would be quite sizeable because the makerspace will need to be equipped with various tools and technology. The more equipment there is available, the more innovation the space will see.

When asked who would benefit from making, Gray says that everyone would because the movement is so far-reaching, it offers something for everyone. He goes on to say that through their makerspace they "reach everyone from young to old and from rich to poor because the joy of making is universal". (Gray, 2016) This statement means that everyone could find benefits in becoming a maker. Mia Van Zyl says that "If it isn't of value to every member of society in some form of way now or planned to be in the future, the Maker Movement's potential is being underutilised, missed or the people facilitating such maker activities/programs are shortsighted." (Van Zyl, 2016) Gray describes the benefits

as catering for the young and old, rich and poor. For the poorer demographic and the people that do not have self-worth, Gray says that that the maker movement allows them the opportunity to be recognised for a particular skill in the community. He says: "They start talking in the community, that's the guy that can weld, and that's the guy who can do leather craft, and that's the guy who can fix whatever, and they feel a sense of they actually, they can do something and no one's ever told them they're good at anything." (Gray, 2016). He says that without positive reinforcement, it is easy to look at the success of others and start to feel useless, which can lead to poor life choices. (Gray, 2016) For the more well-off demographic, there may be a sense of discontent, so making something can create a sense of value in that person's life (Gray, 2016). However, it is also important to note that the maker movement will not appeal to everyone, but the goal is to reach every demographic to some extent. Gray says that: "it doesn't matter what you do, how you lay it out, how much money you throw at it, you can't change people so you've almost got to start with the idea that it's not for everyone, it's for 10% of people that honor every demographic" (Gray, 2016). Van Zyl says that the movement is so beneficial because it brings people from all walks of life together to engage in positive, shared experiences (Van Zyl, 2016). She also states that a makerspace not only allows for learning and the transfer of new skills but also facilitates the creation of networks (Van Zyl, 2016). She lists the beneficiaries as learners and students, those about to enter the job market, those who are contemplating a job or career change, children and parents/families, entrepreneurs, schools, corporates and 'corporate refugees', corporations, health institutions, teams, retirees, the homeless and jobless, academics, hobbyists and tinkerers (Van Zyl, 2016).

"what I think is so powerful about it is that it's so far reaching, high-tech, low-tech, high-intelligence, low-intelligence and it's all centred about the fact that like let's actually take control and do what we want to do, let's not be passive any more" (Gray. 2016)

## The History of Makerspaces

Will Holman writes in his article *Makerspace: Towards a New Civic Infrastructure* that the makerspace movement was a local phenomenon that is meant to have started in 19<sup>th</sup> century Scotland (Holman, 2015). There are examples of makerspaces dating back from the beginning of the 19<sup>th</sup> century to present day makerspaces, all of which are slightly different regarding their structure, aims and outcomes. I will divide the various makerspaces over the years into typologies based on these differences.

Typology 1: A member- based makerspace for the working class to learn and collaborate to build things for a reasonable price. In *Makerspace: Towards a New Civic Infrastructure*, Holman writes about the history of makerspaces starting with the Maryland Institute for Promotion of the Mechanic Arts, which was established by Benjamin Latrobe in 1826 and sought to educate the working class as mechanics (Holman, 2015). There was a subscription fee for the institute, and it organised industrial arts fairs that brought manufacturers, inventors and merchants to the public. Holman then writes about the establishment of the Mechanics Institute of San Francisco in 1855 that housed libraries, lecture halls, labs and illuminated reading rooms. He quotes their objectives as "The diffusion of knowledge at the least expense to the seeker." (Holman, 2015)

Typology 2: This typology involves makerspaces that revolve around famous inventors. The first example is the research lab that Thomas Edison founded in 1876. This research lab would later be dubbed the 'Invention Factory' (Holman, 2015). The next example is Volta Laboratory started by Alexander Bell in 1877 which became known as 'Bell Labs'. Both inventors saw the value of collaborating with other inventors and made sure that their respective labs were well equipped (Holman, 2015).

Typology 3: Makerspaces as research labs founded by the government. From around 1900 to 1940 there was an increase to about 350 research labs in the United States that at that point were pioneering inventions and aiding in the development of technologies, but they were being used a lot by the government inventing creations for the World Wars (Holman, 2015). After World War 2, the research and development intensified due to not only consumer demand but the space race and cold war as well. (Holman, 2015)

Typology 4: This type of makerspace came about due to the technological boom taking advantage of new machinery and discoveries. One of the first of this

typology was the Tech Model Railroad Club founded in 1946 by MIT. This facility was the first space for computer aficionados to begin bending digital technology into something creative. According to Will Holman, the Xerox Palo Alto Research Centre, another institution embracing technology, was founded in 1960 as a space for collaborative innovation in digital technology (Holman, 2015). He includes that this was the centre that Steve Jobs and Steve Wozniak would later visit in 1979 while designing the Apple personal computer (Holman, 2015). There were also other maker spaces that saw the adaptation of Numerical Control, developed by John Parsons and Frank Stulen in 1948, into Computer Numerical Control that then gave rise to the earliest ideas of 3D Printing in 1984 (Holman, 2015).

Typology 5: This typology is a makerspace that is not for the public but rather for universities and corporations. Holman writes that research and development labs became dedicated to developing sophisticated technologies that were competitive and secretive. These spaces were profit drive and required highly educated researching staff to teach members (Holman, 2015).

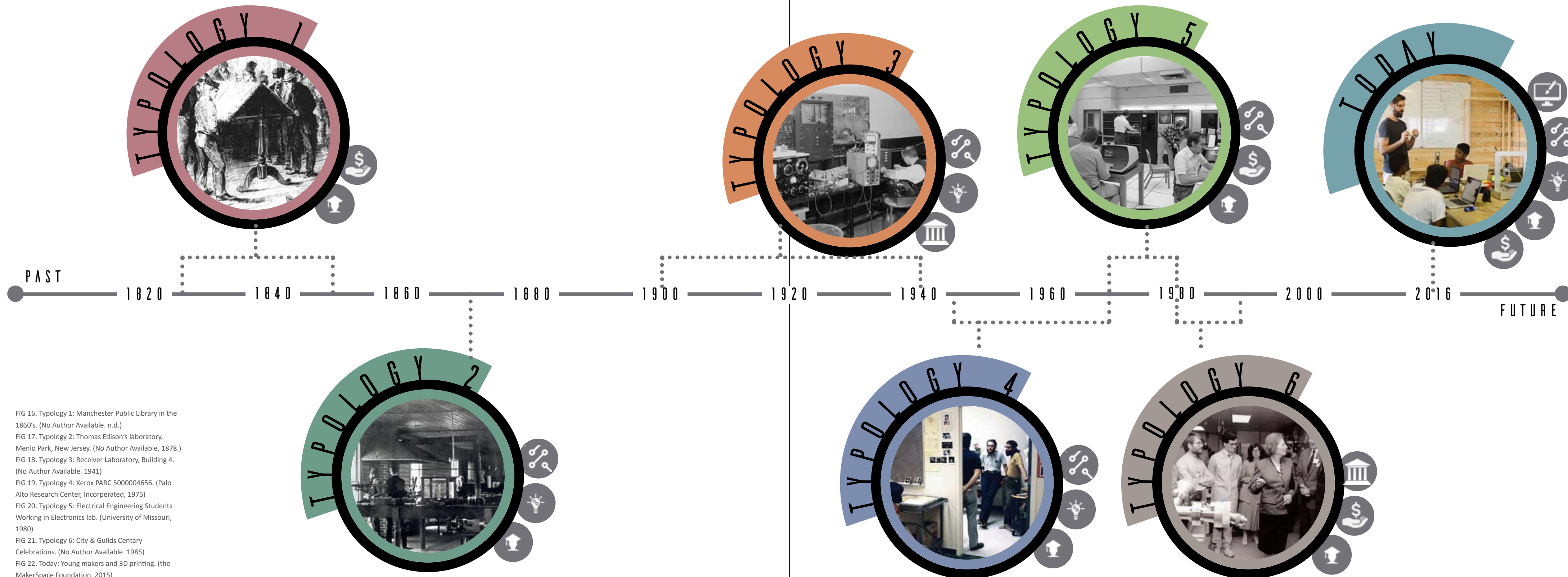
Typology 6: A publicly accessible makerspace made up of shared workshops and machinery to educate the unemployed. The earliest example of this type of makerspace can be found in London in the late 80's where Labour politicians set up five technology networks that consisted of shared workshops providing access to machines and education for unemployed manufacturing workers. The established network was also connected to labour unions and community centres (Holman, 2015). I believe we are now seeing a new version of this typology of maker space that was inspired by people wanting to build something personal to cater to their specific needs rather than to conform to consumerism and accept the monotony of the mass manufactured products. Makerspaces of today are places for people to come and reinterpret products into something new through experimentation and to learn valuable skills from one another.

We are now also in a stage where makerspaces are virtual as well as physical. According to *Makerspace: Towards a New Civic Infrastructure*, Open Desk was founded in 2013 and became the online source for free download instructions and knowledge, all the maker needed was tools and materials (Holman, 2015). These virtual makerspaces have now expanded to include Etsy, Quirky, Kickstarter and Shapeways and open-source software and hardware make it possible to learn how to make almost anything.

"MAKERSPACES ARE NOT SIMPLY START-UP BOOT CAMPS OR FACTORIES OF THE FUTURE."

[HOLMAN, 2015]

# A HISTORY OF MAKERSPACES





# CONTEXT



FIG 23. Context. (Bozzonetti. 2016)



FIG 24. Mary Fitzgerald Square. (No Author Available. n.d.)

## History of Newtown

According to the Newtown Heritage Trail, Newtown is situated just beyond the borders of the original mining town in Johannesburg and incorporated parts of Brickfields, Aaron's Yard and the Indian location (Newtown Heritage Trail, n.d.). Kate Shand writes in *Newtown: A Cultural Precinct – Real or Imagined?* that in the late 1800's the land to the East of where Newtown is situated originally had many clay deposits in the earth and this was why a brickworks was established in Newtown (Shand, 2010. p. 27). It became a place where people of all races lived and worked, but once multiracial slums developed, authorities used the excuse of a bubonic plague break-out to burn the area down and ear-mark it for industrial development (Shand, 2010). The name of 'Newtown' was given to the area in 1904 following the clearance of Brickfields and was redesigned as a commercial and industrial extension of the Central Business District in a strict grid pattern not unfamiliar to the city of Johannesburg (Newtown Heritage Trail, n.d.). In 1906, Newtown became the site for the construction of the first power stations, and by 1913 the area also became host to a lucrative fresh produce market (Shand, 2010).

The Heritage Trail describes Newtown as becoming home to the city's main ports and key industrial utilities (Newtown Heritage Trail, n.d.). By 1936, Newtown saw the construction of three power stations, three different kinds of cooling towers, an incinerator, maintenance workshops, tram sheds, canteens and residential quarters, and in 1939 the public square was renamed Mary Fitzgerald Square (Shand, 2010). The area became the leading trader of fresh produce and the

hub of industrial and manufacturing activities, thus becoming the main stage of industrial strikes and major labour movements (Newtown Heritage Trail, n.d.).

In 1960, the Jeppe Power Station in Newtown was decommissioned, and in 1961, Turbine Hall Closed its doors (Shand, 2010). According to the Heritage trail, this combined with the closure of the tram lines in the late 40's, the construction of the freeway in the 60's, the relocation of the Fresh Produce Market in 1974 all led to Newtown becoming an abandoned area by the mid 70's (Newtown Heritage Trail, n.d.). In 1976, the Market Theatre opened in Newtown, being an area of Johannesburg that was still relatively racially neutral, the theatre attracted cultural activists and creative institutions including: Federated Union of Black Artists (FUBA), Kippies, the Potato Sheds, Art Galleries, The French Institution, Yard of Ale and Couch and Coffee (Shand, 2010). Thanks to the presence of the Market Theatre, when the power station and cooling towers were destroyed in the early 80's, Newtown was declared a cultural precinct (Shand, 2010) and became home to cultural activism and artistic creations. The corporate sector became involved with the theatre and caused it to become one of the most culturally significant spaces in Africa, giving a voice to black actors and allowing for the artists to become political activists. It was in the late 80's that the destruction of a lot of cultural organisations occurred, leading to a Precinct Proposal from Gapp Architects that now included a cultural aspect (Shand, 2010).



It was in the 90's that Newtown seemed to take a downward turn. The decade started off well with the Africana Museum moving to Museum Africa, the establishment of the World Of Beer by South African Breweries (SAB), and FuBA and the French Institute moving their offices opposite to the theatre (Shand. 2010). The cultural identity of Newtown was gaining momentum with new organisations moving in like Afrika Cultural Centre, Dance Factory, Moving into Dance, Mega Music (Now Bassline), Nikki Oasis and Artist Proof Studio. It was the late 90's when the city's vision for Newtown became to sell off the land for high-rise development, and Newtown was given to the Johannesburg Development Agency (JDA) to manage as a major infrastructure upgrade project (Shand, 2010). Originally there was still an interest in maintaining the cultural identity of the area. Shand quotes Avril Joffe reading from the 1999 vision for Newtown "...senses delight of Africa made all the more vibrant by the rich diversity, fusion and cross-over vital energy... coursing through the veins of Newtown... culture is not going to be straight-jacketed into neatly ordered compartments planned but rather spawns its seed into the fertile soil of a precinct ready to receive it. Theatre of the street, theatre of life, is a glue that creeps into the crevices of Newtown... Forges industrial cultural jewels into the crown of culture through the alchemy of urbanism." (Joffe, 2010 in Shand, 2010. p 39.) Shand says that this vision was quite different to the final one produced by the JDA in their business plans of a few years later with its focus on Newtown as a cultural capital and attracting economic investment (Shand, 2010. p. 39). Driven by the idea of consumption and building iconic structures, the JDA adopted a property driven approach that was overall easier and more cost-effective (Shand. 2010).



FIG 25. Original Workers' Electricity Compound (No Author Available. n.d.)

" NEWTOWN HAS FAILED AS A CULTURAL HUB. SO MUCH OF WHAT GOES ON IN JOBURG IS ABOUT HYPE: YOU CAN BRAND ANYTHING. WITH NEWTOWN THE CITY IDENTIFIED THE MOST LOW DENSITY PLACE IT COULD TURN WITH LEAST AMOUNT OF INVESTMENT AND GOT INTERESTING TENANTS BUT THEN LEFT IT TO ITS OWN DEVICES. "

(The Sunday Independent - Life, 2010 in Shand, 2010. p. 81)

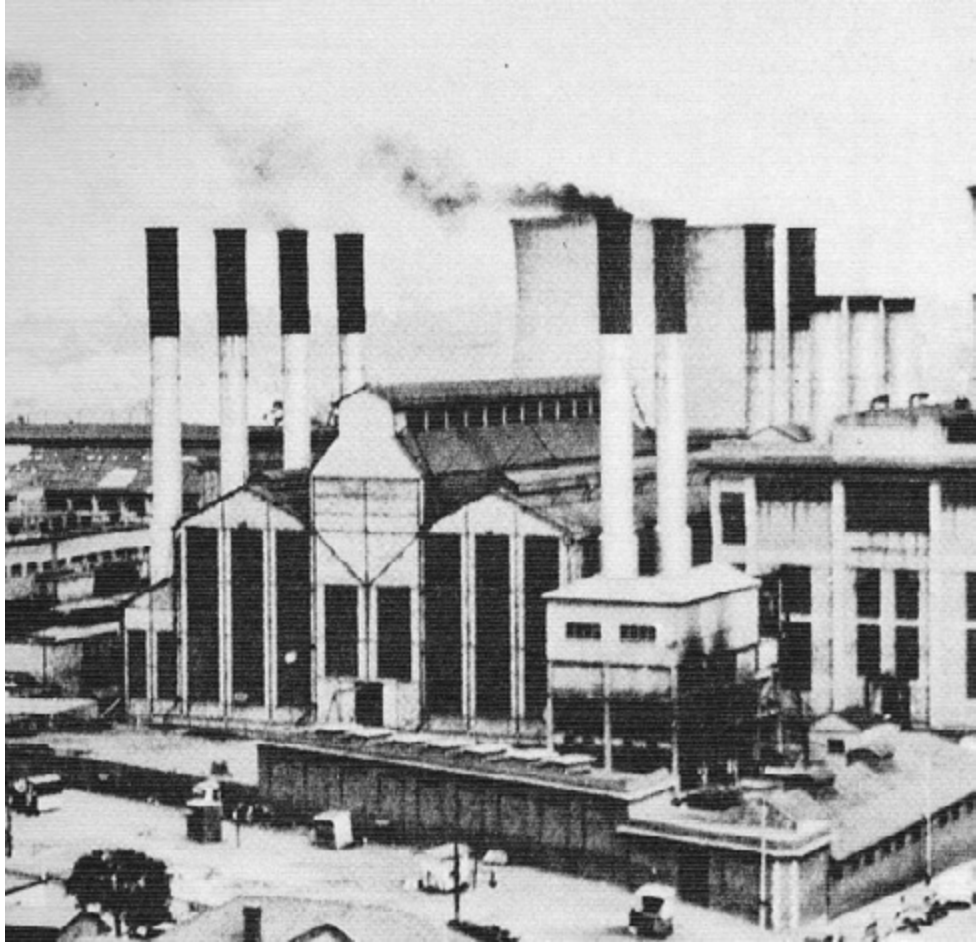


FIG 26. Turbine Hall (No Author Available. 1927)

At the start of the 2000's, the JDA made an effort to initiate the development of cultural elements with the upgrade of Mary Fitzgerald Square from 2001 to 2003, the creation of the Bus Factory and the establishment of SciBono. While these new facilities did aid in strengthening a cultural identity and getting people into Newtown, the issue of budgetary constraints posed a major hurdle and outside investment was scarce (Shand, 2010). From 2010, the JDA started the process of withdrawing from Newtown and transferring management to the Newtown Improvement District (NID) (Shand, 2010). In the last couple of years, cultural development has still been on the back-burner, and retail and commercial development have become front runners with the construction of No.1 Central Place and Newtown Junction. These developments have in some cases had a negative effect on the cultural institutions in Newtown. For example; according to Edward Tsumele in the Sowetan article *Iconic shop shuts down*, Xarra Bookshop had to move from their premises in Newtown to something smaller (Tsumele, 2012). Opening their Newtown Store in 2005, Xarra Bookshop was known for stocking African and South African literature They were forced to close their store at No. 1 Central Place, which is run by the JDA, due to high rentals. (Tsumele, 2012). I think this is the case for a number of similar establishments in Newtown, and this is suppressing the innate cultural identity of the area.



FIG 27. Cool Factory. (Bozzonetti, 2016)

"THE CITY NEVER FOLLOWED THROUGH ON ITS PLEDGE TO NEWTOWN. FORCING THE ARTISTIC COMMUNITY TO SHIFT ITS COMMITMENT TO BRAAMFONTEIN. "

(The Sunday Independent - Life, 2010 in Shand, 2010. p. 61)





FIG 28. Site from Highway. (Bozzonetti, 2016)



# Identity of Newtown

Newtown is made up of three precincts; they are the market precinct, electrical precinct and the transport precinct. The market precinct was where the fresh produce market was located and is the location of Kippies, Newtown Junction, the Potato Sheds, Market Theatre, Museum Africa and Mary Fitzgerald Square. The electrical Precinct was where the Jeppe Power Station was and is the current location of the Electric Workshop, SciBono Discovery Centre, the Workers’ Museum, Turbine Hall and SAB World of Beer. Lastly, the transport precinct was where the tram sheds were located and is now the location of The Mills, Market Photo Workshop, Bus Factory, Market Theatre Laboratories, Dance Factory, Bassline and Moving into Dance.

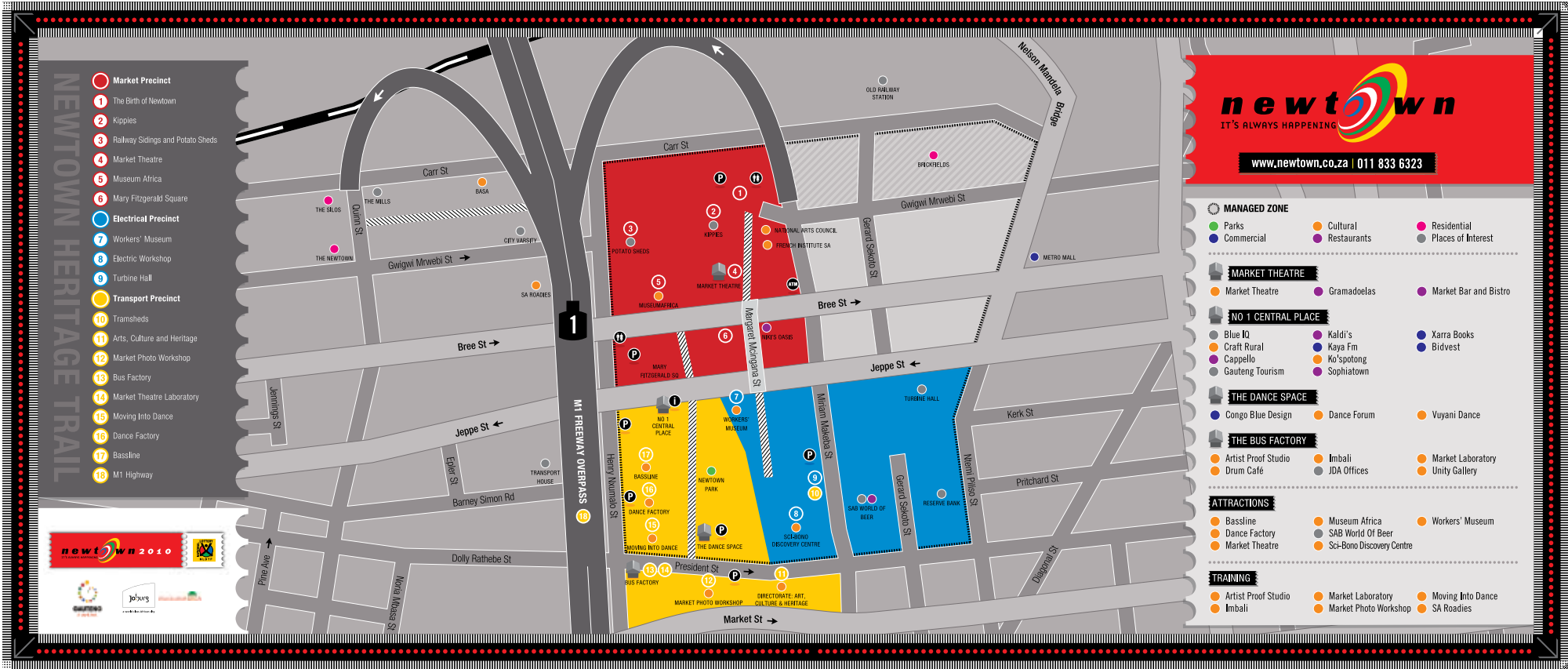


FIG 29. Newtown Map. (Newtown Heritage Trail, 2010)

Newtown has been dubbed as the cultural precinct at the heart of Johannesburg’s cultural landscape by southafrica.net (n.d.). They also describe the precinct as being host to multicultural communities, local artists and craftsman, art gallery aficionados, jazz lovers and dancers (southafrica.net, n.d.). The area is, however, unable to attract the broad middle class to some and spend their money on entertainment (Shand, 2012). To become an economically sustainable cultural hub, the gaps between race and class need to be bridged and then perhaps tourists will also visit, as they now prefer areas like Melville, Sandton and Rosebank. According to Kat Shand, marketing remains one of Newtown’s short-comings (Shand, 2010. p. 73). The current approach to advertising involves such a broad target market that it is near impossible to entice new audiences and especially the emerging middle class who do not venture into the city (Shand, 2010).



FIG 30. Path to Museum Africa. (Bozzonetti, 2016)

Newtown is part of the city that caters for day and night activities. SAB World of Beer, SciBono Discovery Centre, the Workers’ Museum, Museum Africa and the Market Theatre Gallery are open daily to visitors. The Newtown Junction also offers a daytime attraction to visitors, and it becomes a hub of activity during lunch hours. During the evening, Newtown becomes about music, dance and theatre. Bassline offers a Reggae evening every Thursday night and other live music on Fridays and Saturdays. The Market Theatre has their shows in the evening as well and live jazz music can be heard at Niki’s Oasis. Regarding significant events, Newtown still hosts some of Johannesburg’s best events. The Diwali Festival, the Freedom Day Festival and the New Years Eve Event following the Joburg Carnival are all held at Mary Fitzgerald Square. While these events do a lot to draw people into Newtown, the reality is that nothing else is scheduled for the square and other public spaces so they often remain empty. Kate Shand describes Mary Fitzgerald Square as being large, imposing and hostile on an average day; offering no place for intimate moments, lunch-time concerts and impromptu performances (Shand, 2010. p. 75). She goes on to describe Newtown Park as a place to walk through rather than a place where people sit to have lunch, play a soccer game or bring their children to play (Shand, 2010. p. 75). What would have made the square more used was the Flea Market that used to be held in Mary Fitzgerald Square, but it was closed in the early 90’s (Shand, 2010) and never re-established. Without this market or a similar sort of activity, the square remains abandoned and alienating (Shand, 2010).



FIG 31. Mary Fitzgerald Square During the Day. (Bozzonetti, 2016)



FIG 32. Mary Fitzgerald Square During the Evening. (Bozzonetti, 2016)



# —SITE ANALYSIS—

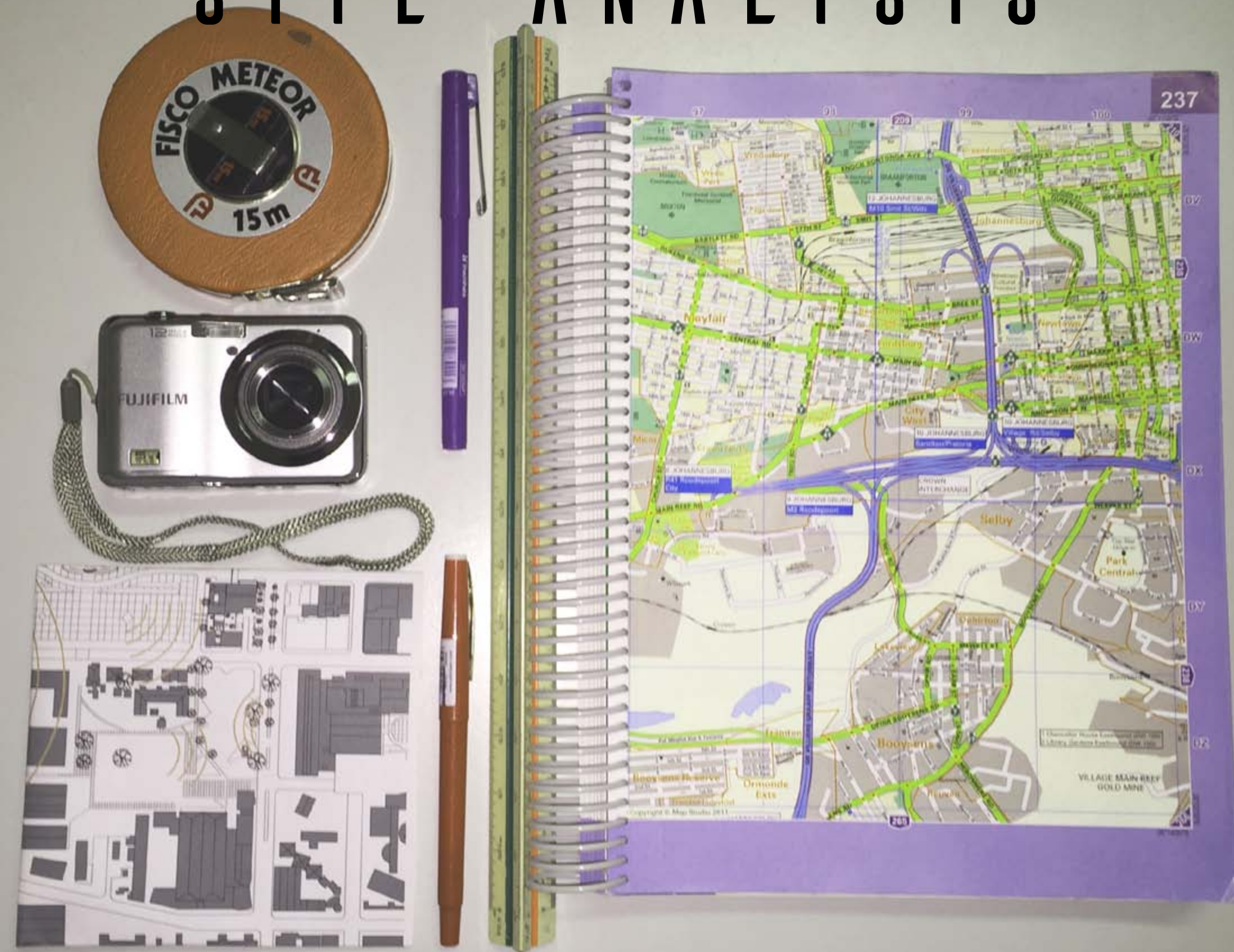


FIG 33. Site Analysis. (Bozzonetti, 2016)

## NEWTOWN, JHB

SITE ANALYSIS

37 | 166

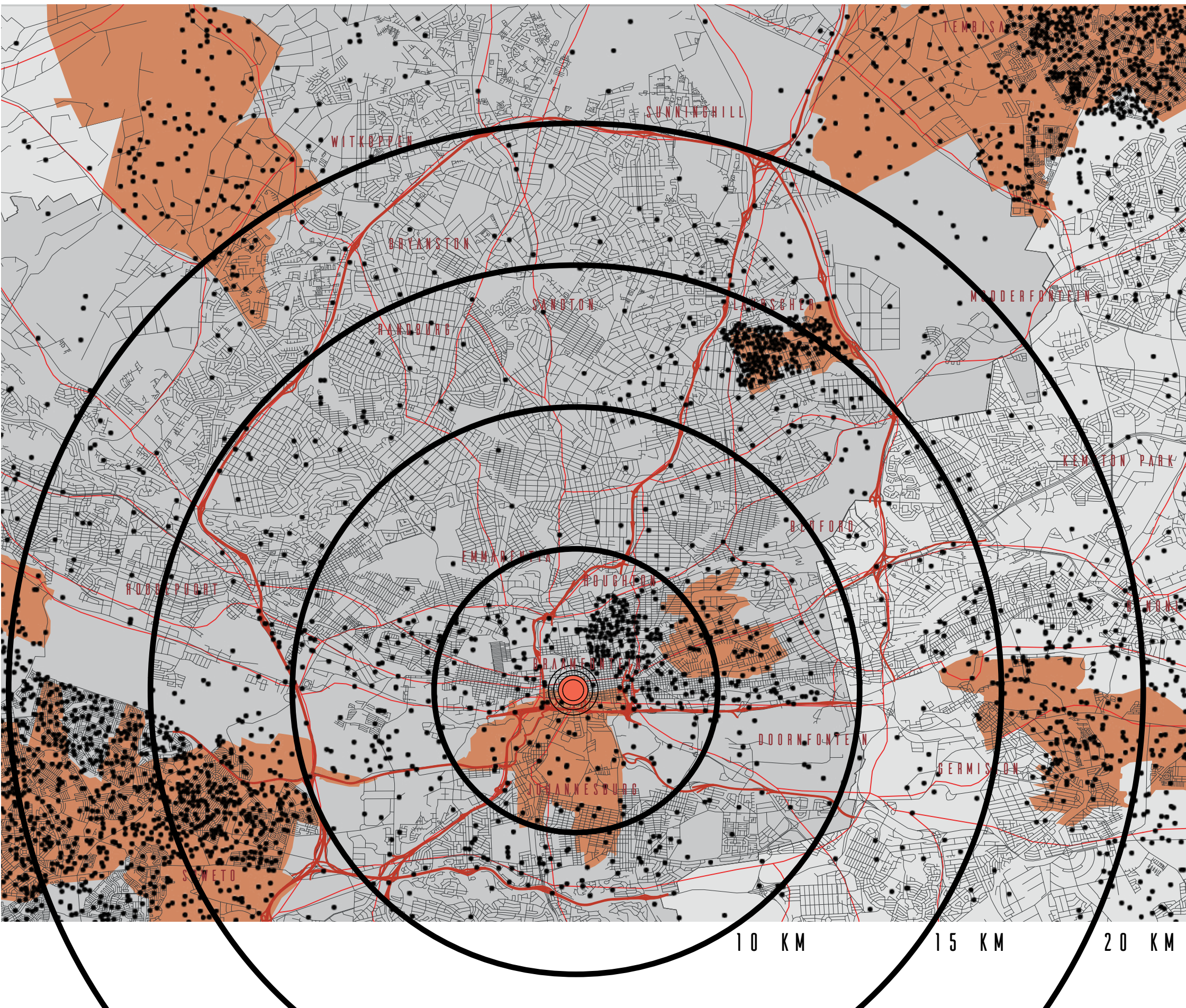


Scale 1:5000

FIG 34. Newtown, JHB. (Bozzonetti, 2016)



# UNEMPLOYMENT IN JOHANNESBURG



## Legend

- Johannesburg Ring Road
- Urban Freeway
- Main Roads
- City of Johannesburg
- Areas where Community feel Unemployment is their greatest problem.
- Unemployed people (1 Dot = 100 People)
- Site



0 2.5 5 7.5 10 km

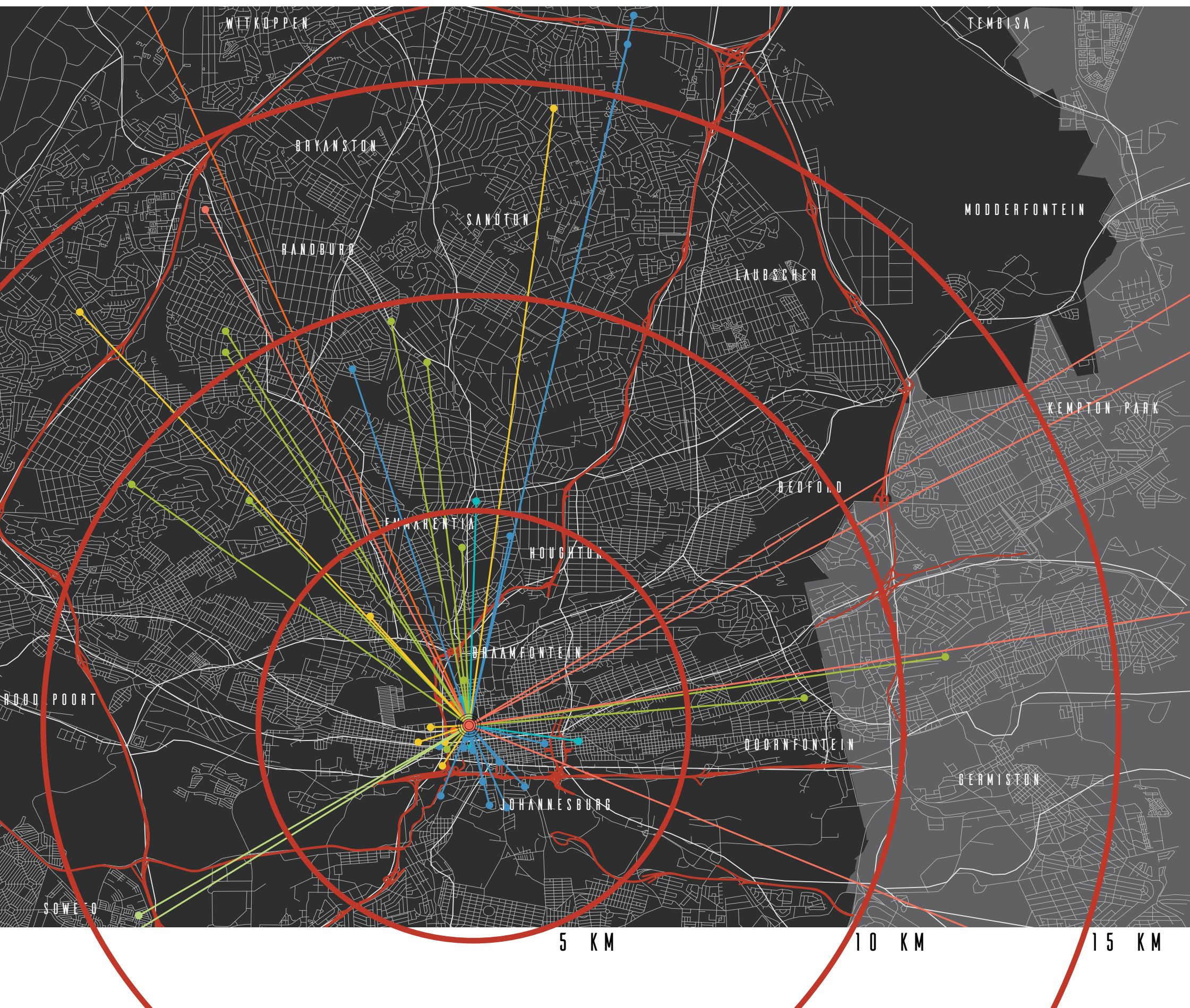
## Analysis

In this analysis, compiled with information from the GCRO online database, the map portrays the condition of unemployment in Johannesburg. Each black dot represents 100 unemployed people. The areas shaded in red are those where the community feel that unemployment is their greatest problem. What is interesting to see is where the high concentration of dots and the red shaded areas overlap. This high concentration occurs in Tembisa, Laubscher, Soweto and parts of Germiston. There seems to be a lot of unemployed people between Houghton and Braamfontein, but the community does not feel that unemployment is their greatest problem. A red shaded area spanning the inner-city and towards Braamfontein show that people in this area feel as if unemployment is their biggest problem. However, the concentration of dots here is relatively sparse.

Ultimately this analysis shows the reach that a makerspace in Newtown would have with the areas that are most affected by unemployment. The extent of this reach is important considering that makerspaces strive to create employment opportunities through the facilitation of entrepreneurship. The makerspace will be most effective in combating unemployment in the communities of Central Johannesburg, Braamfontein and Houghton, all of which sit within a 5km radius of the site. Within a 10km radius, the new makerspace will serve parts of Eastern Johannesburg just North of Doornfontein. Within 15km, the reach extends into Laubscher and Soweto, and at 20km and beyond the space starts to cater for Germiston and Tembisa.



# JOHANNESBURG MAKER NETWORK



## Legend

Johannesburg Ring Road

Urban Freeway

Main Roads

City of Johannesburg

Site

Network

Makerspaces

Hackerspaces

Art Schools

Art Studios

Tertiary Education

Artisan Training

Career Centres



0

2.5

5

7.5

10km

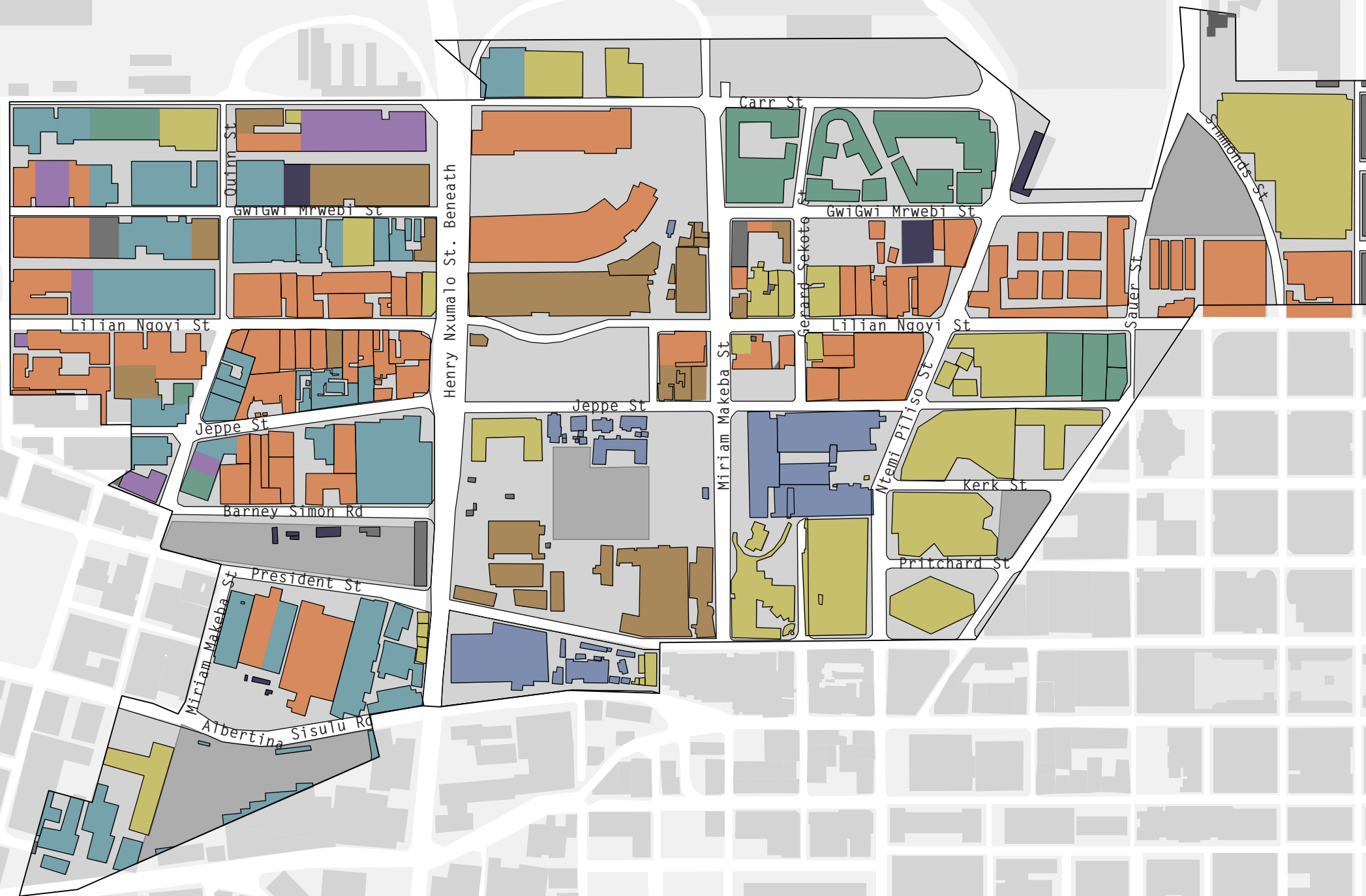
## Analysis

The Johannesburg Maker Network map was made to illustrate the various connections that a makerspace can make with other organisations that have similar facilities in Johannesburg. The categories of organisations include makerspaces, hackerspaces, art schools, art studios, tertiary education institutions, artisan training and career centres. By plotting these kinds of locations on a map of Johannesburg, it becomes clear which organisations a makerspace in Newtown can form the strongest connections with, based on proximity. The idea is that through these links, the different organisations can start to share facilities, expertise, personnel and classes. This leads to a continually expanding maker community.

This analysis shows that there are some art studios, art schools, tertiary education institutions and one or two makerspaces and hackerspaces within a 5km radius of Newtown. A 10km radius sees the inclusion of a few more art studios, art schools and makerspaces as well as a career centre. Another few art schools, an art studio and an artisan training centre can be found within 15km of the selected site.



## LAND USE



## Legend



Scale 1:5000

## Analysis

The broader land zoning map shows that towards the West end of Newtown the area is zoned predominantly as a light industrial area, where some of the land is owned by the council. From SciBono and up towards the Northern end of Newtown, the land has been zoned for residential, retail and cultural development. The Eastern side is zoned as part of the Central Business District (CBD). This analysis shows that the selected site is zoned for cultural development and is surrounded by industrial, retail, residential and commercial buildings.

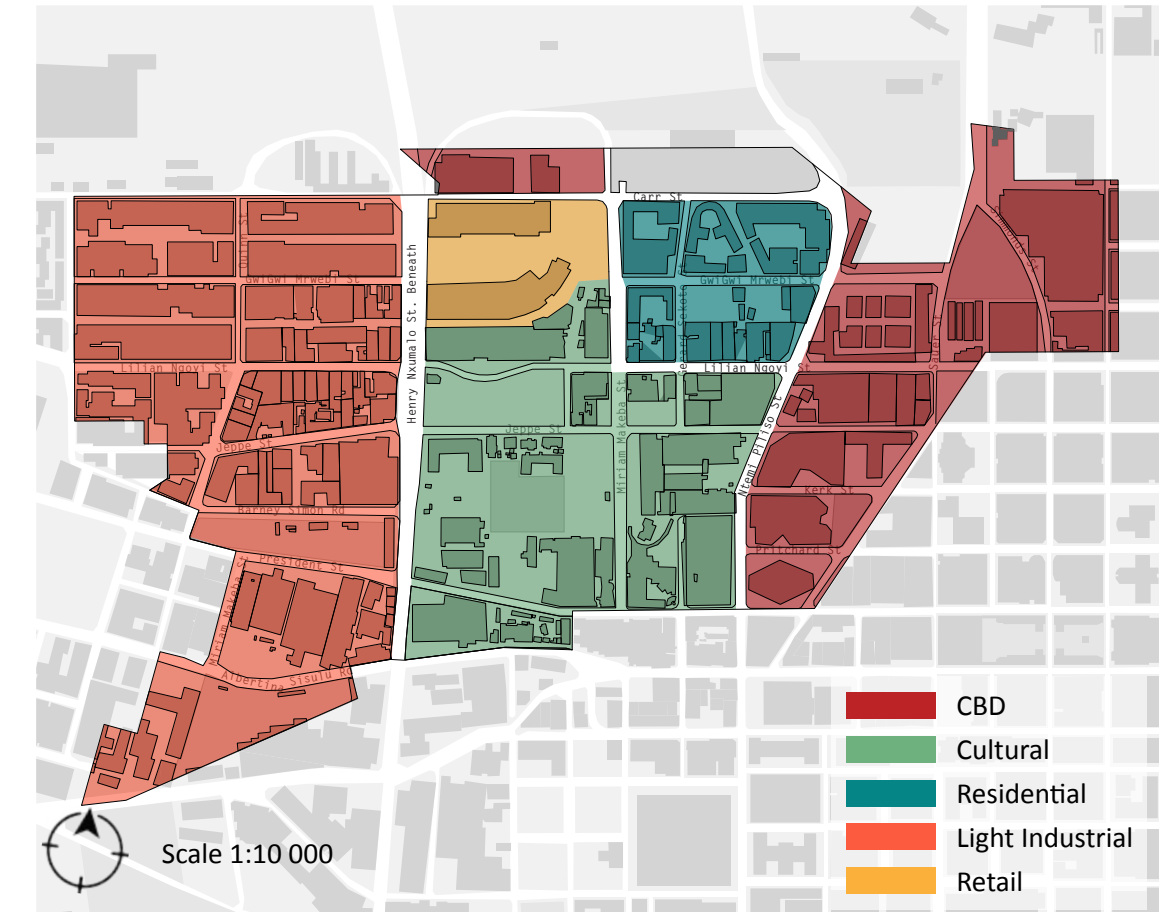
The Land Use map is a more accurate analysis of the broad range of different building uses in Newtown. All the different land use categories present are a testament to the varied history of the area and its current reputation as a multi-racial and multi-disciplinary part of the city where industrialism and art meet.

It is evident from this map that on the Western side of the highway, moving into Fordsburg, most of the buildings are used for industrial, retail and wholesale purposes. From this observation, it could be said that because of the land use and the area being industrially zoned, this part of Newtown is very concentrated on work, labour and production, where people do not linger, and the pace is relatively fast.

Most of the arts and culture and heritage buildings can be found in the centre of Newtown, emphasising the importance of the area being a cultural precinct. The residential buildings sit towards the North are situated between a cluster of retail and office buildings. The Eastern side of Newtown, as mentioned, is zoned as CBD and sees office and retail buildings predominantly. This implies that this area is fast paced and centres around economics and making money.

The selected site sits in a relatively quiet cultural hub nestled between an industrial hub of production and an economic hub. This locality leaves the makerspace in the perfect position to draw people from both the industrial side and the more business savvy side while remaining a cultural building for the people.

FIG 37. Land Use. (Bozzonetti, 2016)

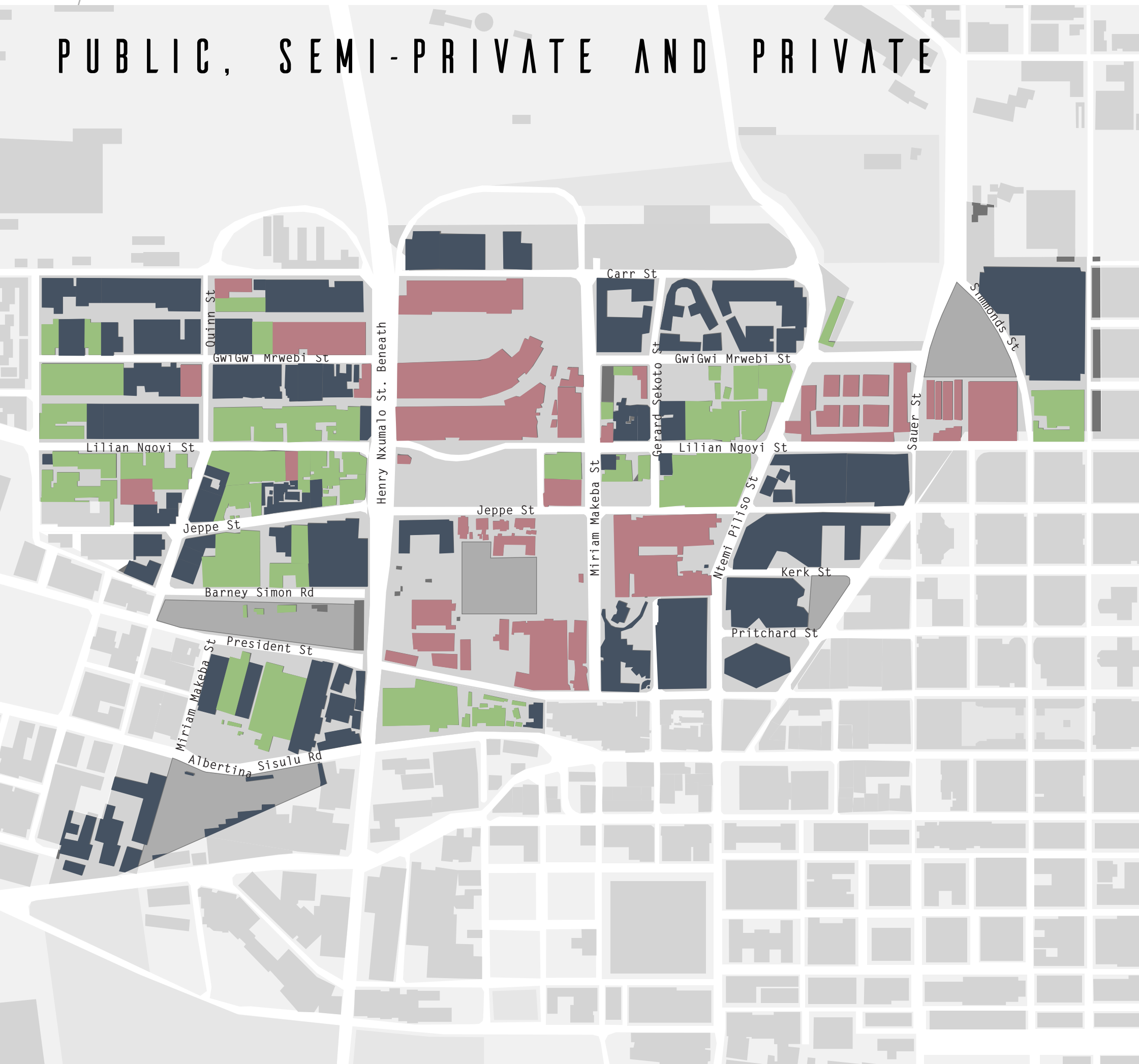


Scale 1:10 000

FIG 38. Zoning. (Bozzonetti, 2016)



## PUBLIC, SEMI-PRIVATE AND PRIVATE



## Legend



Public



Semi-Private



Private



Scale 1:5000

## Analysis

This map shows the distinction between public, semi-private and private buildings. Most of the heritage, transport and retail buildings are publicly accessible. Many of the arts and culture buildings are semi-private, meaning that they are available to the public to a certain point and then becomes privatised. Private spaces include office, residential and wholesale buildings.

Public and semi-private buildings surround the selected site. The makerspace is a typology that encourages engagement with the public while still maintaining its private spaces for safety. This situation, along with the balance of public, semi-private and private buildings, shows that this makerspace would fit in well with its surroundings.



# SIGNIFICANT LOCATIONS



## Legend

- |                                 |                                                                    |
|---------------------------------|--------------------------------------------------------------------|
| 1. Sasol Wax                    | 7. Careers Centre                                                  |
| 2. Pim Street Studios           | 8. Electric Workshop                                               |
| 3. Civicus                      | 9. SciBono Discovery Centre                                        |
| 4. Green Bean Learning Resource | 10. Market Photo Workshop                                          |
| 5. Benny's Welding              | 11. National Union of Metal Workers South Africa Conference Center |
| 6. No.1 Central Place           | 12. National Union of Metal Workers South Africa Headquarters      |



Scale 1:5000

## Analysis

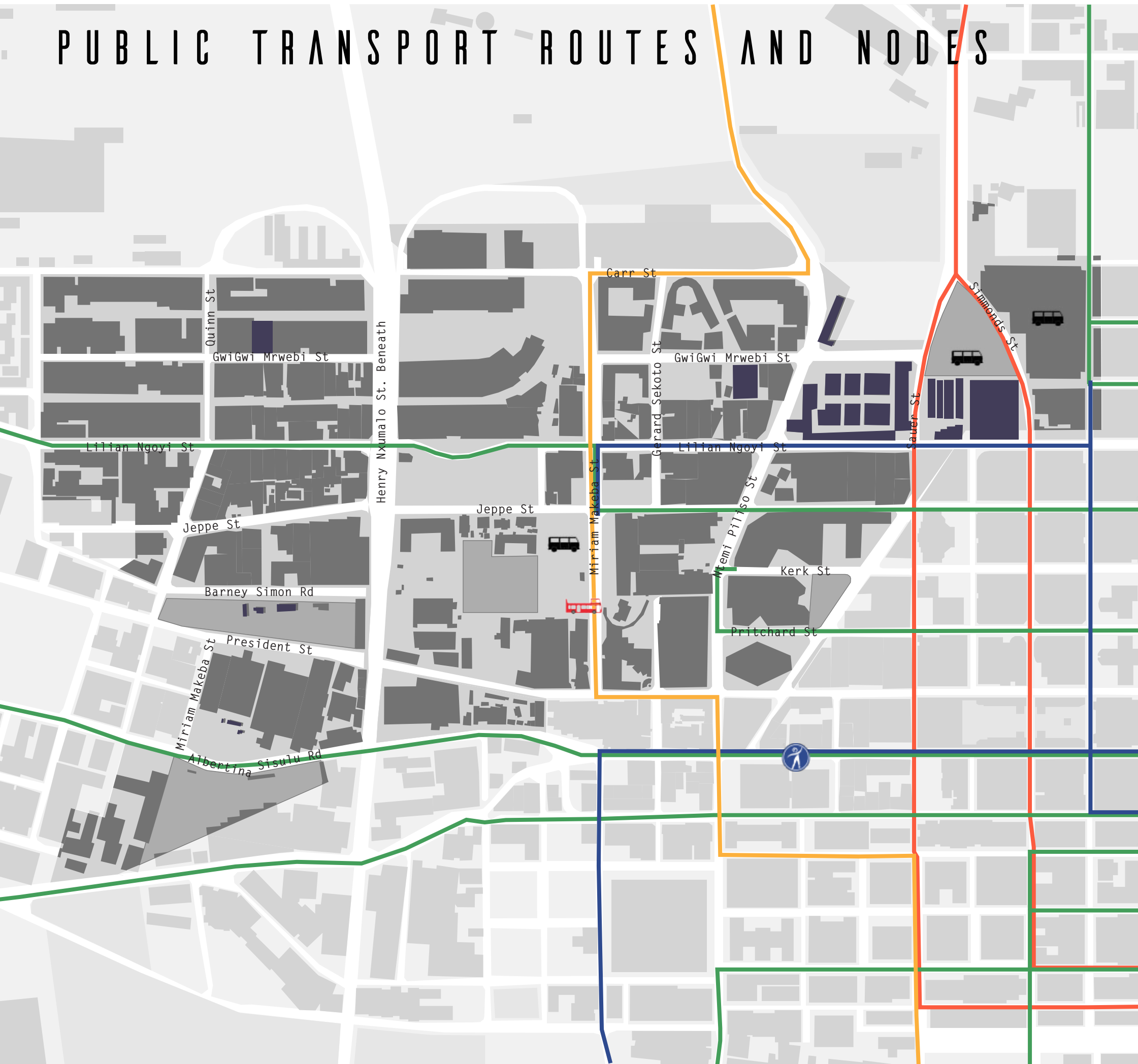
In this site analysis, buildings that could form part of a makerspace network in Newtown have been isolated. These places could either supply resources or simply share skilled personnel with the makerspace to encourage a collaborative maker community.

Sasol Wax could be a supplier to the makerspace, a potential investor or even a future employer of a person who learnt certain skills at the space. Artists from Pim Street Studios could come to learn new creative skills at the makerspace. Civicus, as an alliance for citizen participation, could aid in getting members of the community involved in making. They could also use the space for meetings and events. A mutual arrangement could be made with Green Bean Learning resource where children are encouraged to visit the makerspaces for classes and workshops. Small businesses like Benny's Welding and NUMSA could send their staff to not only teach others their skills but also to learn new skills themselves. No. 1 Central Place could serve as potential office space for start-ups coming out of the makerspace. Not only could the Career Centres hold workshops at the space, but they could also facilitate employment for people at the makerspace. The Electric Workshop, SciBono and the Market Photo Workshop could collaborate with the new makerspace regarding exhibitions, fairs and festivals.

FIG 40. Significant Locations. (Bozzonetti, 2016)



## PUBLIC TRANSPORT ROUTES AND NODES



## Legend

- Gautrain Bus Route
- Metro Bus Route
- BRT Bus Route
- City Sight Seeing Tour Route



Scale 1:5000



Formal Taxi Rank and Metro Mall



Informal Taxi Rank



BRT Bus Station



City Sight Seeing Tour Stop

## Analysis

The selected site that is the parking lot North of SciBono Discovery Centre is well located regarding different transport routes and nodes. The BRT Station is Just South of the site, and the route runs past the site with a stop at the corner of Lilian Ngoyi Street and Miriam Makeba Street. The Metro bus routes run both North and South of the site and the City Sight Seeing Tour Bus Stop borders the site with the route running right past it. The Gautrain Route is perhaps the furthest from the site, but both formal and informal taxi ranks are scattered around Newtown. The site is meant to be used as parking for buses visiting SciBono and spill over parking, but during the hours of about 9:00 to 14:00, the site becomes an informal taxi rank.

The location of the site means that the makerspace will see many people travelling between Bree Street Taxi Rank and Metro Mall or even to one of the other bus stops. It will also see people travelling to and from the North and West of Central Johannesburg and the BRT station in Albertina Sisulu Road.



# PEDESTRIAN ACTIVITY - 7 AM



Pedestrian activity in the morning shows many people travelling to and from the Bree Street taxi rank and the Metro Mall. It also shows busy activity along Albertina Sisulu Road where there is a Reya Vaya Station and Miriam Makeba Street. People also cut across the site and park as a shortcut. This means that in the morning the building should engage with pedestrians specifically on the West and East edges of the site.

FIG 42. Pedestrian Activity - 7 AM. (Bozzonetti, 2016)

# PEDESTRIAN ACTIVITY - 12 PM



In contrast to the morning activity, in the afternoon there is more activity in Mary Fitzgerald Square as people go on their lunch break and head towards Newtown Junction. Again the building will need to start a dialogue with pedestrians on the Western and Eastern edges of the site, but it will also now have to have an active Northern edge. This activation is to attract some of the pedestrians moving through Mary Fitzgerald Square.

FIG 43. Pedestrian Activity - 12 PM. (Bozzonetti, 2016)



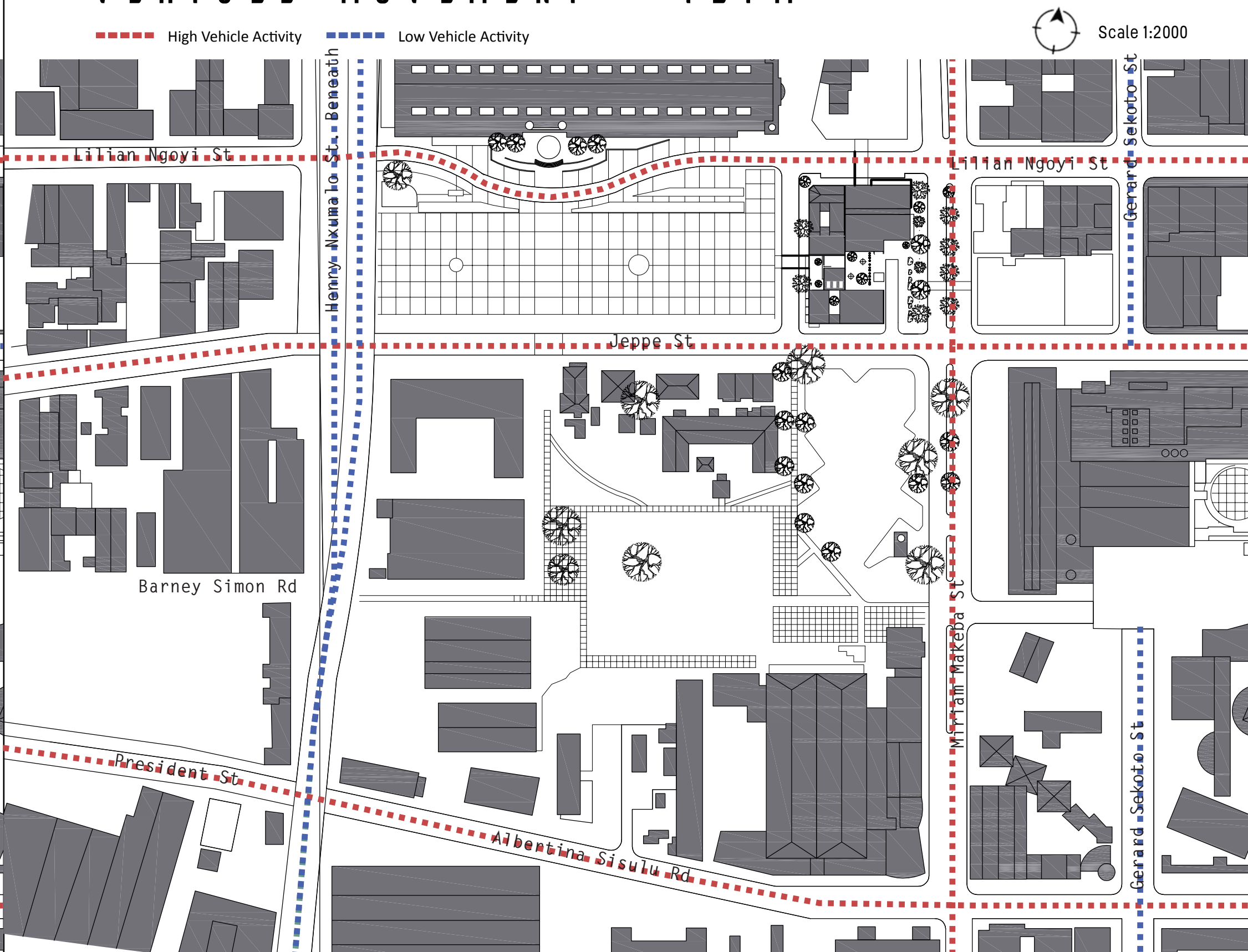
# VEHICLE MOVEMENT - 7 AM



The vehicle movement in the morning shows more traffic along Lilian Ngoyi Street, Miriam Makeba Street and Albertina Sisulu Street. The Highways is also quite busy at this time of day. This analysis shows that it is important to have some sort of display at this time, facing Miriam Makeba Street. The nature of this display should be such that it is easily understood when travelling at a speed and taking a quick glance. The fact that the highway is busy allows for an advertising opportunity, geared towards people stuck in traffic, whether for one of the investors or the makerspace itself.

FIG 44. Vehicle Movement - 7 AM. (Bozzonetti, 2016)

# VEHICLE MOVEMENT - 12 PM

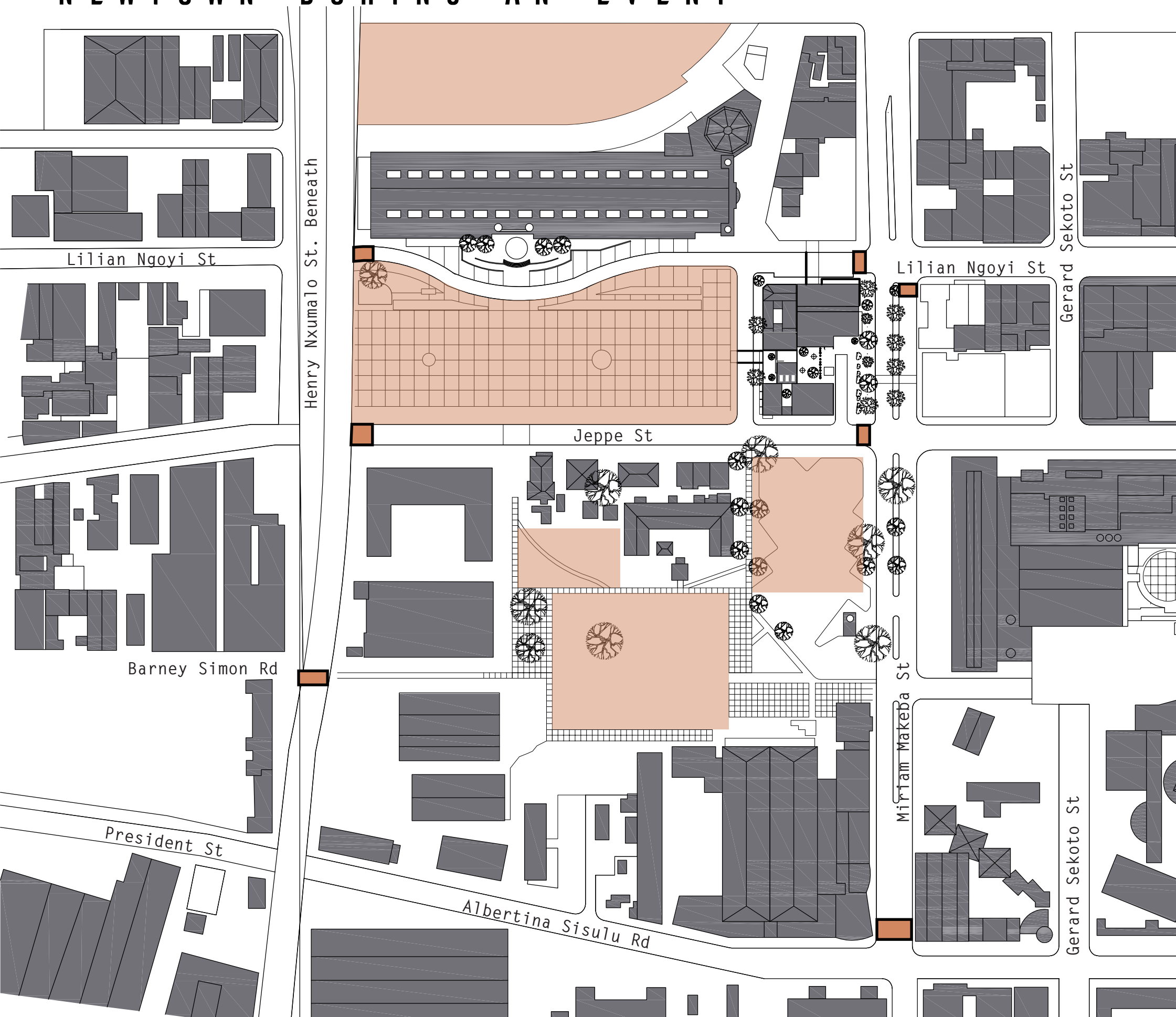


During the afternoon there is less traffic along the highway, but the busy roads remain busy. This time is when most of the engagement with the public will happen at a pedestrian level, and the building should begin to open itself up to the street.

FIG 45. Vehicle Movement - 12 PM. (Bozzonetti, 2016)



# NEWTOWN DURING AN EVENT



## Legend

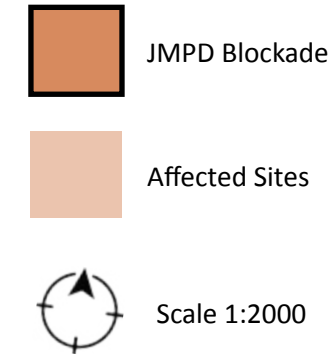


FIG 46. JMPD Blockade Daytime. (Bozzonetti, 2016)



FIG 47. JMPD Blockade Night time. (Bozzonetti, 2016)

## Analysis

Mary Fitzgerald Square is host to various events in Johannesburg, and as a result, the circulation around the area and particular sites are affected. On the 28<sup>th</sup> of May 2016, the Africa Day Concert was held at Mary Fitzgerald Square from 4 pm to 11 pm. During the day, the Johannesburg Metropolitan Police Department blockaded Lilian Ngoyi Street, Jeppe Street and Henry Nxumalo Street; preventing cars from entering these roads. As the evening progressed, Miriam Makeba Street was blocked off between Lilian Ngoyi Street and Albertina Sisulu Road.

The affected sites include the square itself, Newtown Junction, Newtown Park, the empty piece of land North of the park and the parking lot of SciBono Discovery Centre. The square was obviously where the event was held so there was no thoroughfare of pedestrians and it was filled with people attending the concert. Newtown Junction saw people coming to get food before going to the concert or after leaving it and people also parked in their secure parking lot. Newtown Park and the empty piece of land to the North were host to people socialising, eating and drinking, before going to or after leaving the event. The parking lot of SciBono, also the selected site for the intervention, was used as a car park for buses and delivery vans all in service of the concert.

This information shows that should an event be held at the proposed building, in the park or Mary Fitzgerald Square; key roads will be blocked and vehicular access will have to be considered. The analysis also shows that the proximity to public transport is also important as it would be important to encourage the use of public transport so that there aren't too many cars to account for regarding parking. Lastly, it would appear that while the proposed site of the makerspace is used during events, it is not critical to the event.

FIG 48. Newtown During and Event. (Bozzonetti, 2016)



# NEWTOWN STATISTICS

FIG 52. Newtown, JHB. (Bozzonetti, 2016)



## NEWTOWN, JOHANNESBURG. -STATISTICS FROM 2011 CENSUS

Area: 0.85 km<sup>2</sup>

Population: 2505 (2962.65 per km<sup>2</sup>)

Households 861 (1018.30 per km<sup>2</sup>)

Newtown is an area that sees an equal gender division, meaning I should aim to attract both men and women to the makerspace. The population is racially diverse but consists mostly of African people. The most spoken language in the area is isiZulu then followed by English, this is perhaps something to consider in terms of libraries and classes.

FIG 49. Newtown Population Statistics. (Bozzonetti, 2016)

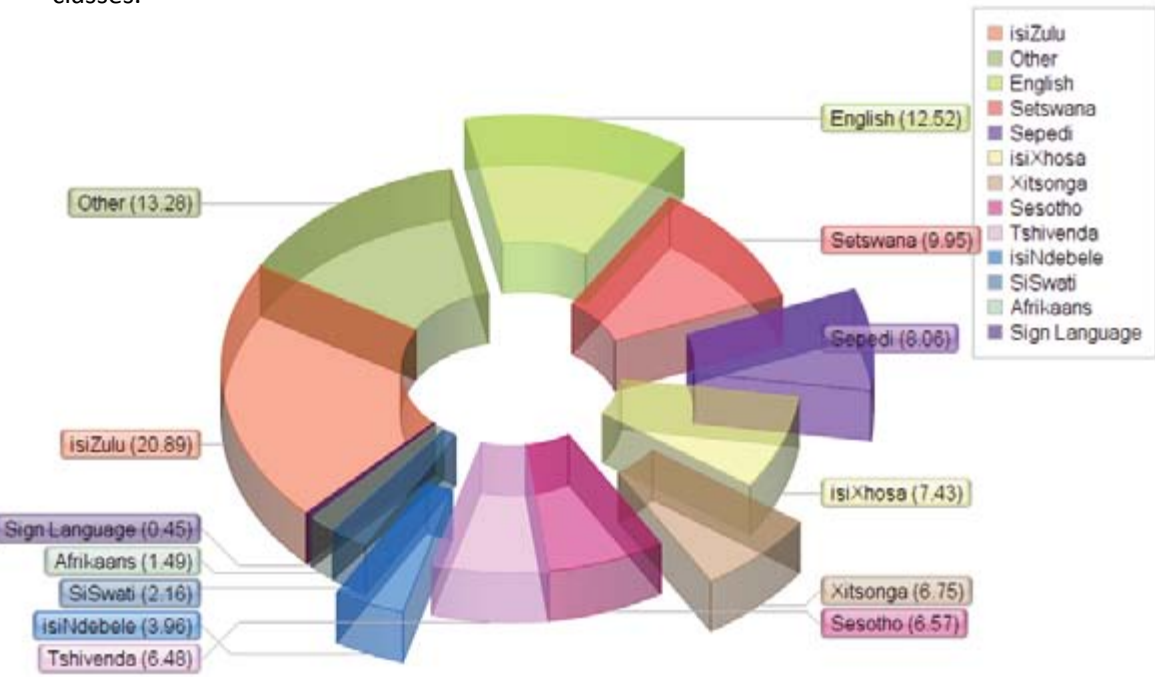
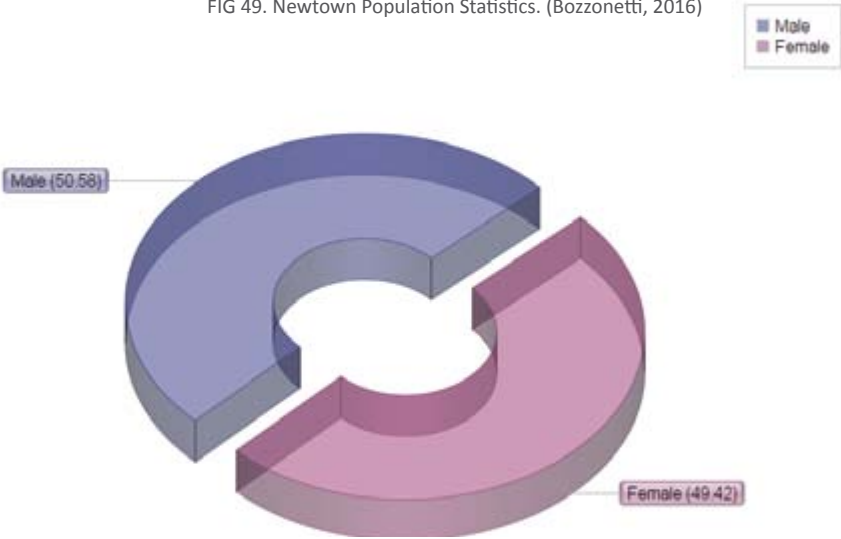


FIG 50. Newtown Population Statistics Continued. (Bozzonetti, 2016)

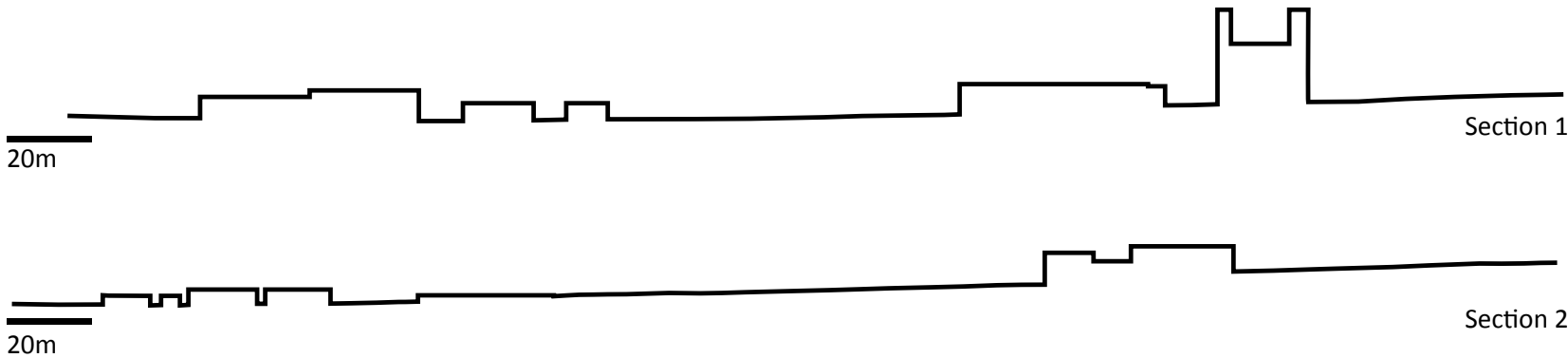
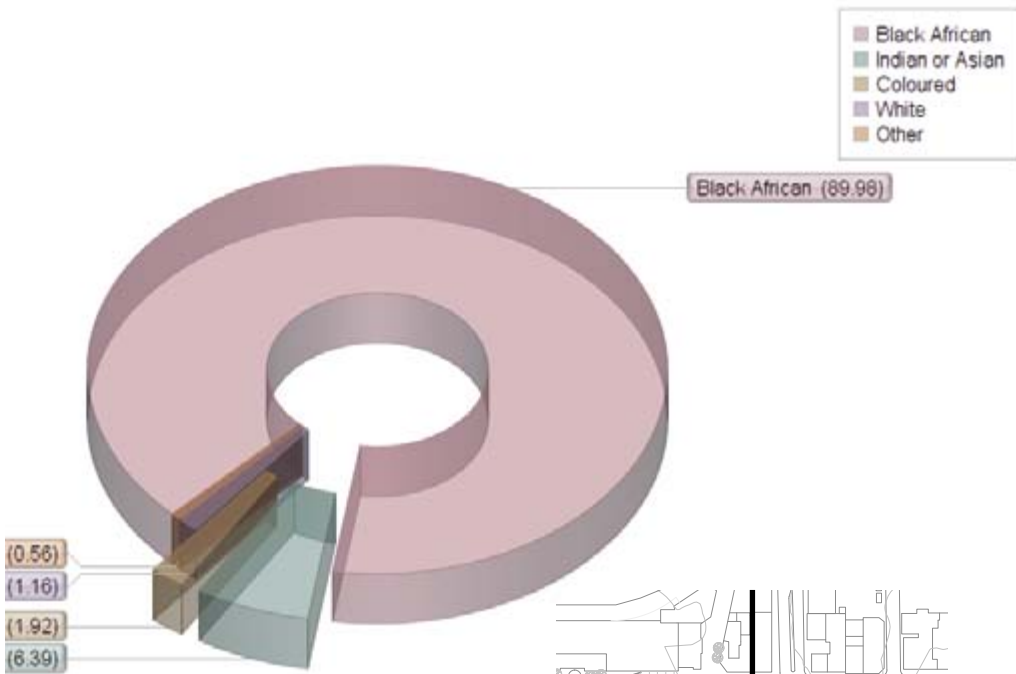
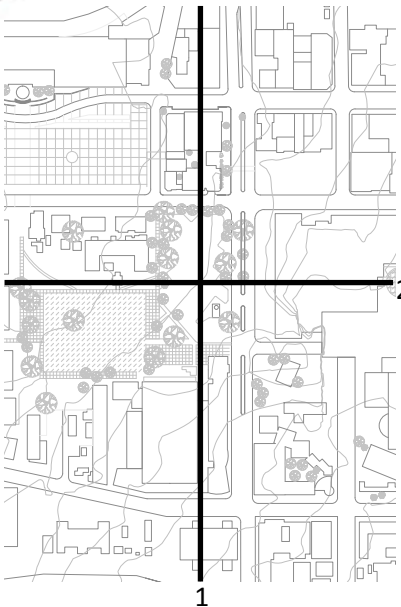


FIG 51. Newtown Site Sections. (Bozzonetti, 2016)



# SITE SKETCHES

These are sketches of the path between the selected site and Newtown Park. The path runs from SciBono to Jeppe Street and sees a lot of foot traffic, especially between lunch hours when people from SciBono and surrounding buildings walk to and from Newtown Junction to get food or take care of errands. During the late morning, Taxi drivers sit along the fence of the Workers' Museum and chat with one another to pass the time until rush hour again. Some of these Taxi drivers and other informal traders then begin to sell food, like pap and gravy or ice-creams, to passers-by and children visiting SciBono walking to and from the centre and their bus. This path also becomes a spot where people come to stand and eat their lunch under the trees.

This information shows that this path is an important pedestrian route and the activities that occur along it should be accommodated. This edge of the site will have to an active edge that engages with pedestrians. There should also be some public space offered along the path to provide space for optional activities.



FIG 53. Path Leading to Newtown Junction. (Bozzonetti, 2016)



FIG 54. Site During Lunch Time. (Bozzonetti, 2016)

# SITE ANALYSIS CONCLUSION

Based on the site analysis conducted, the parking lot to the North of the SciBono Discovery Centre in Newtown is an appropriate place for a community makerspace. The location is prime to form part of a network throughout the creative industry both at a regional and community scale. It also sits in a good position to be a viable educational institution for the unemployed. The area is host to various land uses, and thus the industrial and cultural nature of the building works well in the context. The proposed site is situated in proximity to various public transport nodes making it accessible to those without personal transportation. Due to this proximity, there are a lot of pedestrians and vehicles passing through the site, and therefore it attracts more people



# PRECEDENT STUDIES

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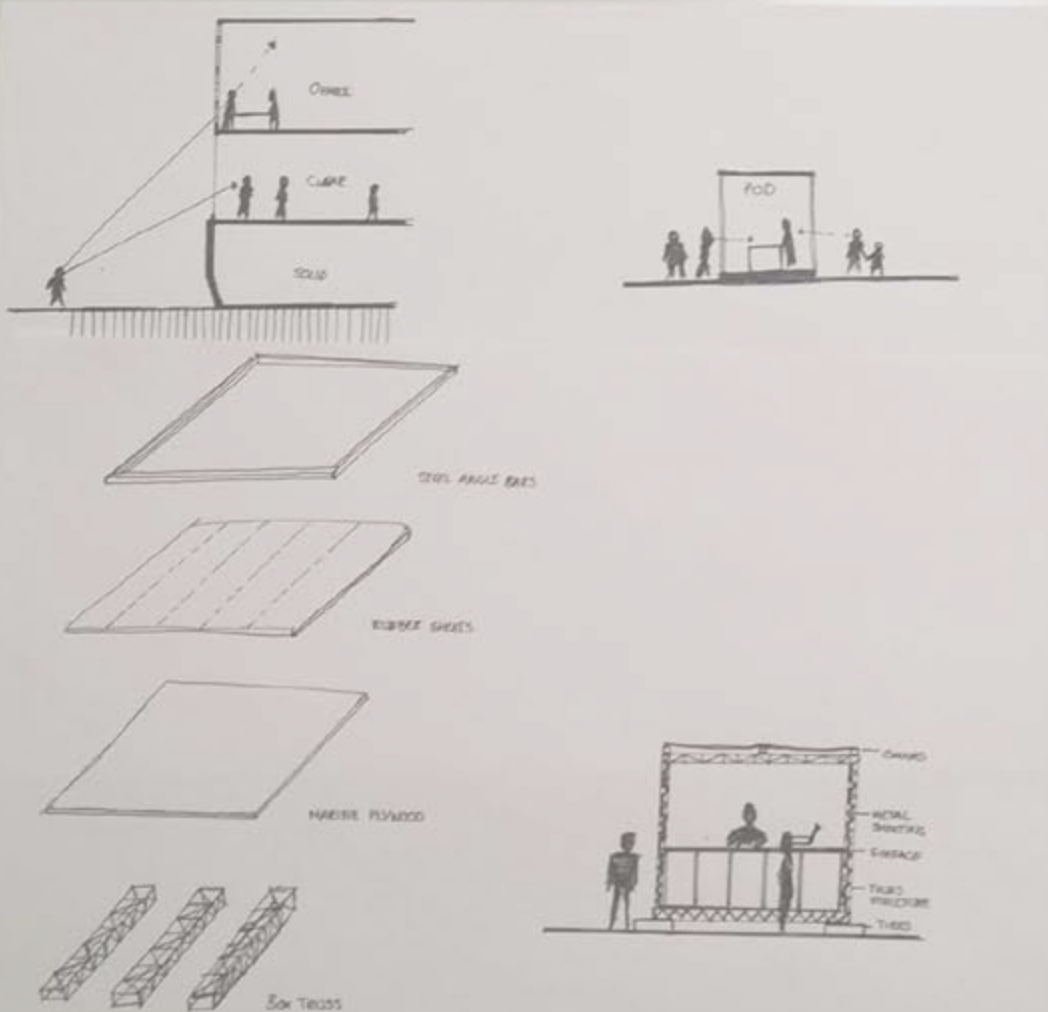


FIG 55. Precedents. (Bozzonetti, 2016)



## PRECEDENTS - ARCHITECTURE

### Burnie Maker's Workshop

Architect: TERROIR

Location: Burnie TAS. Australia

Client: Burnie City Council

Area: 1 500 sqm

Project Year: 2009



FIG 56. Exterior View of Burnie Makerspace. (Boardman, 2010)

This project was initiated as an investment in the post-industrial future. The area of Burnie has a history of the large-scale industry, specifically paper milling, and a strong heritage as a rural centre. The brief given to the architects was to design a new community orientated visitor and cultural facility that combines industry and the museum while acting as a living room for the town.

#### Design

The design by TERROIR involves five spokes that are orientated around a central hub that is openly accessible to the public and features some the items from the museum collection. Each spoke has been allocated a specific function; back of house, paper-making workshop, multipurpose exhibition or theatre, a café and a combined retail and gallery space. There are also individual pods that are specifically for local makers to use to create their designs and interact more directly with the public. At the end of each spoke, a large picture window frames parts of the panoramic view. The design becomes part of the collection of industrial structures along the coast. A translucent Danpalon cladding not only gives the building a lighthouse quality but it also allows for the façade to change continually throughout the day due to the interior activity.



FIG 57. Ground Floor Plan. (TERROIR, 2010)



FIG 58. Interior and Gallery. (Boardman, 2010)



FIG 59. Transparent Facade visible from Street. (Boardman, 2010)



### Successful Aspects

An interesting part of this design to consider is the inclusion of individual pods that can be used by local makers. These pods would allow existing entrepreneurs and makers on site to become part of the daily functions of the building and allow them to take advantage of the building rather than denying them access or ignoring their needs. Another beneficial aspect of this design is the use of a translucent material for the cladding. This cladding a visual connection to be formed between the people inside the building and the people outside. That connection sparks an interesting dialogue between public and private activities that can result in the transfer of information.



FIG 60. Framed View Opportunity. (Boardman, 2010)

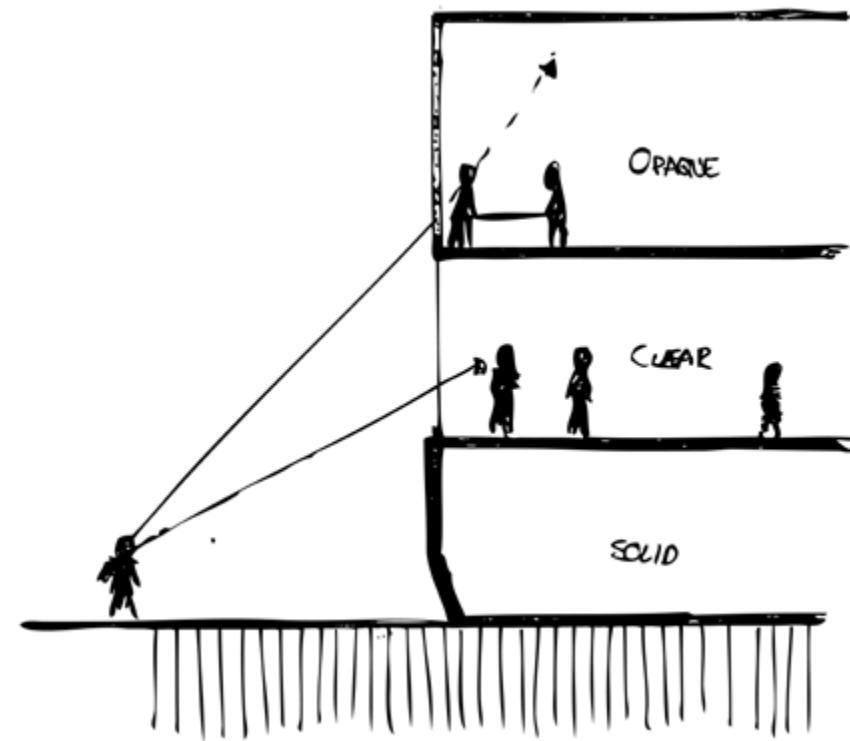


FIG 61. Public Visibility Opportunities. (Bozzonetti, 2016)

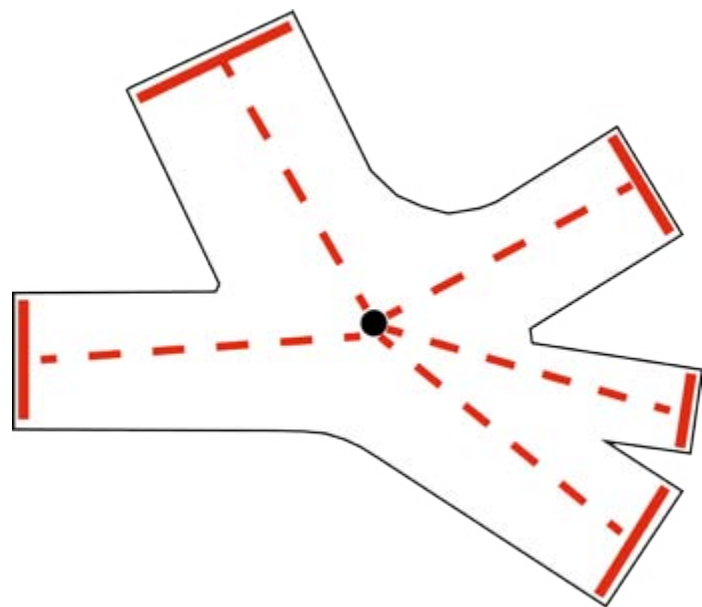


FIG 62. Lines of Visibility from Centre to Framed Views. (Bozzonetti, 2016)

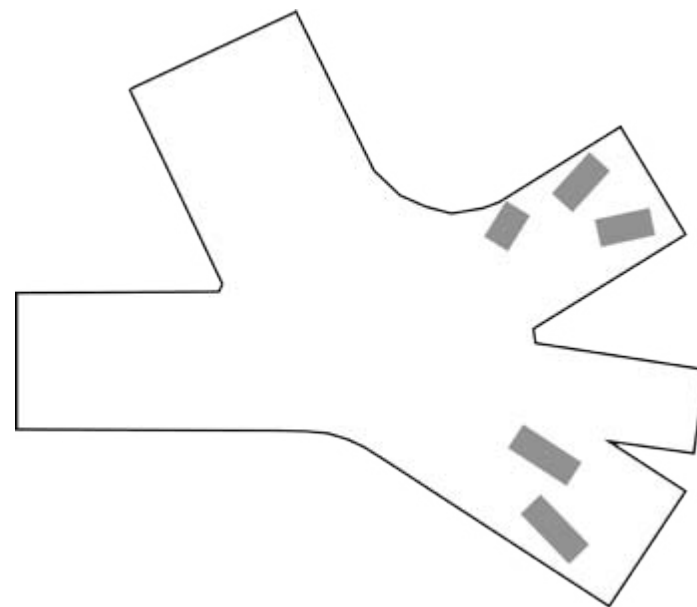


FIG 63. Location of Maker Pods. (Bozzonetti, 2016)

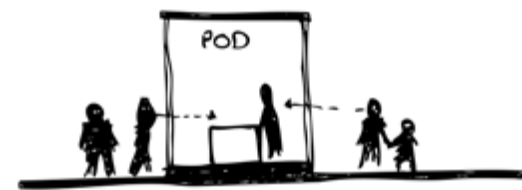


FIG 64. Maker Pods. (Bozzonetti, 2016)

### Agbogbloshie Makerspace Platform

Architect: Yasmine Abbas and DK Osseo-Asare

Location: Agbogbloshie. Ghana

Client: Agbogbloshie Makerspace Platform

Project Year: 2016



FIG 65. Makerspace Platform in Use. (Lanoo, 2016)

The AMP project aims to create a network of makerspace structures that stretches across the largest dumping site of e-waste in the world, Agbogbloshie, Ghana, to make the former wetland more habitable. There was already an existing network of technicians and electricians who repair and refurbish things they find at the dump and sell them to low-income customers. The idea is to make use of what already works for the existing makers and to design something that works across classes religions and tribal strata.

### Design

Abbas and Osseo-Asare have designed a mobile, modular structure, made from locally sourced materials and recycled components from the scrap-yard, that serves as a platform for local scrap dealers and makers to make, trade and learn new skills. The structure is an urban-scale, outdoor manufacturing workshop come lab that allows for recycling, making, sharing and trading. It takes six people under two hours to assemble the steel and iron frame which is then infilled with available materials, insulated panels made from refrigerator doors and a roof canopy. A pulley system allows work surfaces to be neatly stored out of the way and tools and equipment are available to makers on a checkout system. In keeping with maker ethics, AMP has made the construction information and diagrams of the structure available to all online.



FIG 66. Truss Structure. (QAMP, 2015)



FIG 67. Interior View. (Lanoo, 2016)



FIG 68. People Gathered around Platform. (Lanoo, 2016)



### Successful Aspects

This approach to designing a makerspace is deeply rooted in its context. What can be seen as a problem has been transformed into an opportunity. The informal workshops are quick and easy to assemble and also make use of locally sourced materials meaning that it is possible for almost anyone to construct these structures. The design also shows that sometimes all that is needed for a maker to make is a small, simple structure and a work surface, emphasising the idea that everyone can make.

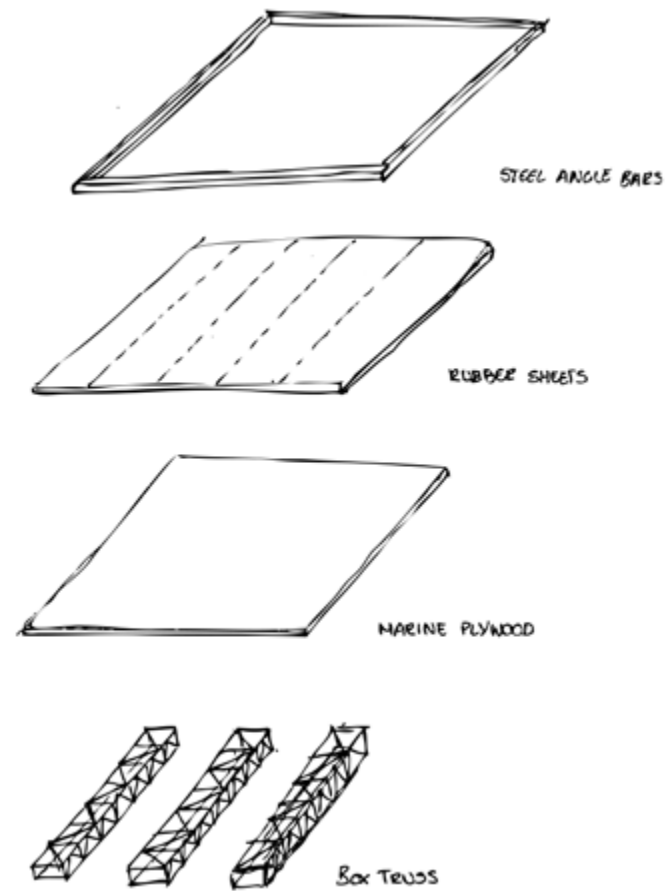


FIG 69. Exploded Axonometric of Structure. (Bozzonetti, 2016)



FIG 70. Maker repairing Electronics. (Lanoo, 2016)



FIG 71. Roof Sheetting and Steel Truss Structure. (Lanoo, 2016)

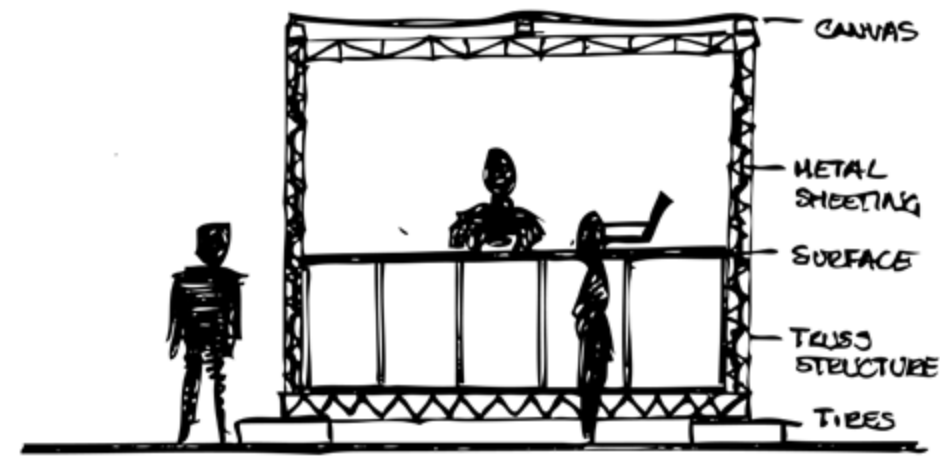


FIG 72. Illustration Showing Materials. (Bozzonetti, 2016)

### SIEC - Sustainable Industries Education Centre

Architect: MPH Architects

Location: South Australia

Client: Government of South Australia – Department of Further Education, Employment, Science and Technology

Area: 43 000 sqm.

Project Year: 2013



FIG 73. South Facade. (Sievers, 2014)

The aim behind the initiation of the building was to reduce operating costs of the Tafe SA Building and Construction Trade Training programs by putting all five departments into one new flexible education facility within the former building that provides opportunities for innovation and improves the engagement with the community.

### Design

To re-use the old building and adapt it, 90% of the steel structure was retained. The programme now includes a variety of learning spaces. The use of glazed partitioning not only exposes the interior activities and steel structure to the public, but it also ensures that most of the building has access to daylighting. The architects have made the building itself a teaching tool of construction by expressing the existing steelwork, keeping the services exposed and by having minimal internal applied finishes.

MPH have used a simple grid of 24m x 12m in their design. They include a primary internal street along which the central staircase is located and at each end, one can find public entries. Intersecting this primary internal street are secondary lanes. These lanes lead to teaching spaces, learning spaces, administration and workshops. Above these knowledge areas are the staff offices and the meeting rooms which overlook the workshop. Trade workshops are located along the edges of the knowledge areas to achieve flexibility and allow for growth. The storage area of the building extends from the West to the width of the building and provides for the handling and distribution of the materials to the workshop.



FIG 74. Entrance into Centre. (Sievers, 2014)



FIG 75. North South Section through Workshop. (Sievers, 2014)



FIG 76. Finishing Workshop. (Sievers, 2014)



Although the façade consists mainly of a black ribbon of metal cladding and fins, at ground level the façade is continuous glazing, enhancing the learning experience through visual connections. Timber Screens defines the new building along the façade, and an inorganic zinc silicate finish has been added to the existing steel structure. Colour has been used inside of the building sparingly, only to aid in wayfinding and service and safety nodes. Otherwise, the finishes are quite minimal and focus on a raw industrial identity. The building is near public transport and also provides bicycle parks, lockers and showers to encourage visitors to cycle. There is also a grey water collection and storage system in place to recycle waste.



FIG 77. South Workshop. (Sievers, 2014)



FIG 78. Ground Level Plan. (MPH Architects, 2014)



FIG 79. Level 1 Plan. (MPH Architects, 2014)

### Successful Aspects

The SIEC building is a successful design approach to education buildings because it aims to be flexible as well as teach through the construction of the actual structure itself. By choosing to express the steel structure, expose the services and use minimal and raw finishes, the building starts to reveal how it is built and works which creates a dialogue with the public. People passing by develop both visual and physical connections with the building, learning something about construction. The design incorporates demarcated circulation zones which allow for free movement, but because glazed walls are used in the interior, people in the circulation areas still get involved with the activities occurring within the workshops and teaching spaces. This exchange occurs along the exterior walls at ground level as the façade at this level is all glazed. The proximity of the centre to public transport means that it becomes more accessible to all and engages visually with many commuters.

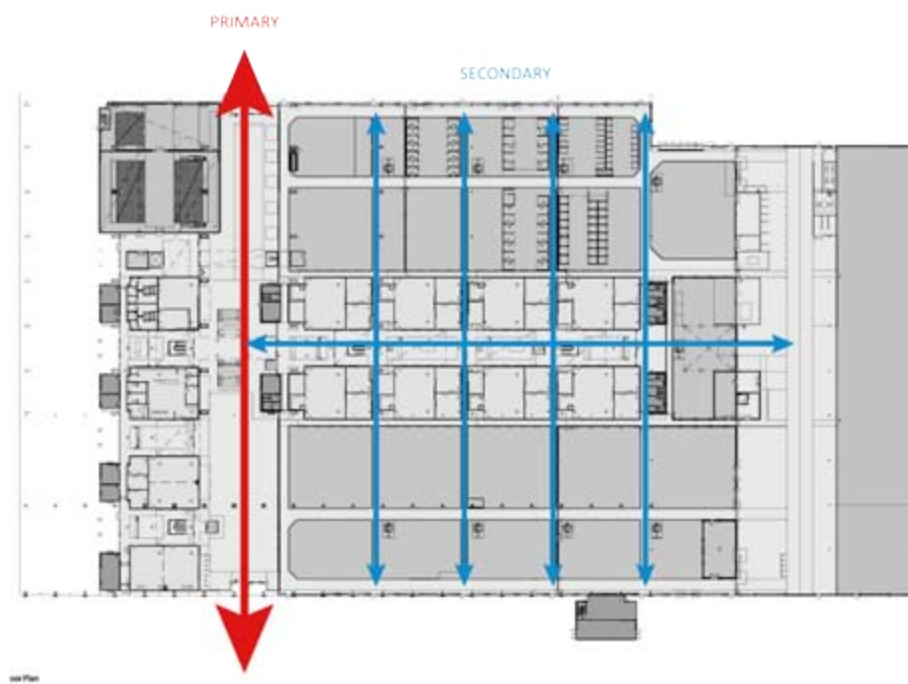


FIG 80. Primary and Secondary Paths. (Bozzonetti, 2016)

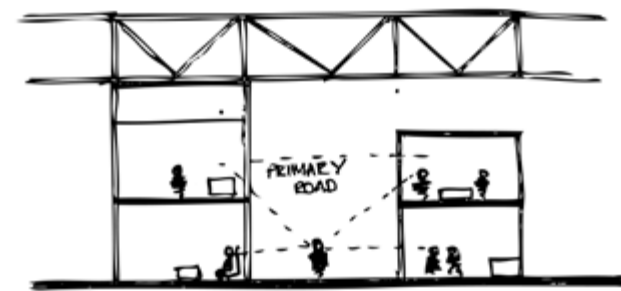


FIG 81. Visibility from Primary Road (Bozzonetti, 2016)

## YMBA Micro Factory

Architect: Harry Wei

Location: The Bowery, New York, USA

Client: Young Makers Bowery Association

Project Year: 2013

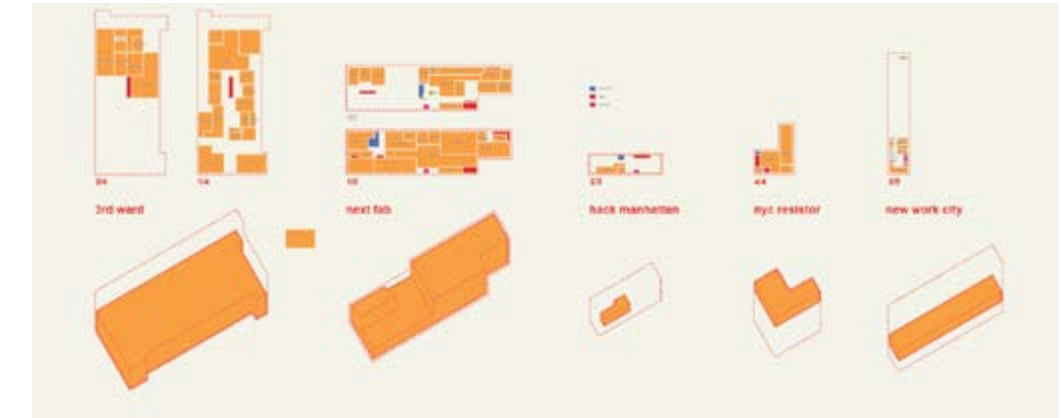


FIG 82. Programme Massing. (Wei, 2013)

This project was designed by Harry Wei during his time at Princeton University and centres around the emergence of maker culture as a phenomenon that has inflated to an important revolution in the manufacturing economy. This revolution requires planners and architects to start considering manufacturing in the consideration of city design again.

### Design

The design implements the idea of the factory being a place for collaborative enterprise through the programme. Wei combined hackerspace, small-scale urban micro-factories and e-waste management to design a building that revolves around the maker and houses a new eco-system of production and consumption. The building design facilitates the dumping of e-waste by the community and the disassembly of the waste and sorting of parts. The building also sees raw material inventory and plastic recycling in-house from which new products are manufactured. Some parts are salvaged from the waste to be used by the makers to make prototypes and any left-over parts are to be recycled by the city. So the building sees both the manufacturing and end sale of the products.

### Successful Aspects

What is interesting about Wei's design is that it celebrates the maker movement as being an impending revolution that should be celebrated. By combining the collection, recycling, manufacturing and sale of e-waste, the building becomes self-sustainable in its functioning. The different activities occurring within one building make it a hub of interesting events and interactions.



FIG 83. Perspective Section. (Wei, 2013)



FIG 84. Detailed Section showing activity. (Wei, 2013)



FIG 85. Floor Plans. (Wei, 2013)



## Commonwealth Community Recreation Centre

Architect: MacLennan Jaunkalns Miller Architects

Location: Edmonton, AB, Canada

Client: City of Edmonton and Edmonton Eskimos Football Club

Area: 220 000 sqm.

Project Year: 2012



FIG 86. Exterior View of Entrance. (Arban, 2012)

This project was initiated as a joint use partnership by the City of Edmonton and the Edmonton Eskimos Football Club to create a centre that combines football operation, stadium programming and a recreation centre. They wanted a 24/7 urban park and community destination that re-used the 1978 Stadium Fitness Centre. The brief outlined the program as including a basin aquatic hall, a field house, fitness centre, running track, gymnasium, community space, administration and operations.

### Design

The field house, aquatics hall and gymnasium make up the three primary masses of the design. The architects chose to work with the triangulated geometries of the site in their design of these masses used them to frame the central lobby space, thought of as the social heart of the building. As a result of their positioning, three exterior forecourt spaces are created. The planning of the site aims to attract the public from three sides into the social core of the space. In the design of the building, the scale and dynamic nature of the stadium was considered and incorporated. The façade consists of a cost effective silver cladding that has been carved into such that the tessellated phenolic wood panel system beneath becomes visible and large openings are framed.

### Successful Aspects

Useful aspects to take away from this project are the idea to frame a space with masses and the planning of the building. The architects designed masses that housed the main activities of the buildings and then used these masses to frame a space that would become the social heart of the building. People move from these action-packed parts of the building to an open space where they can begin to socialise across programs. The planning of the building shows that the architects activated three edges of the building to engage with public street life. This activation maximises the attraction of people not only into the building but also into the lobby space where socialising occurs. By activating more than one edge, it is more likely that the building will successfully draw the public life into the building.



FIG 87. Level 01 Plans. (MacLennan Jaunkalns Miller Architects, 2012)

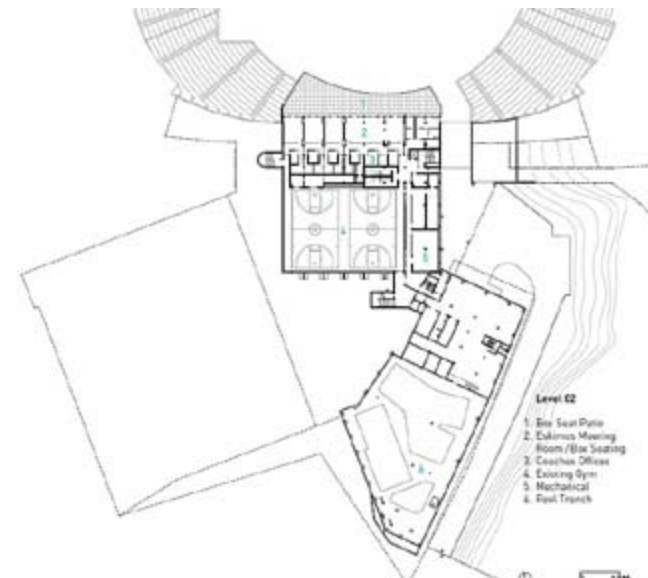


FIG 88. Level 02 Plans. (MacLennan Jaunkalns Miller Architects, 2012)



FIG 89. Level 03 Plans. (MacLennan Jaunkalns Miller Architects, 2012)

## Flexible Learning Environment

Architect: HMC Architects

Location: Los Angeles, USA

Client: Los Angeles Unified School District

Project Year: 2010



FIG 90. Render of Full Proposal. (HMC Architects, 2010)

This design by HMC Architects was completed as a competition submission for a flexible learning environment organised by the Los Angeles Unified School District. The competition brief called for a flexible solution to replace the portable education facilities across Los Angeles.

### Design

HMC Architects took an approach to education, before designing the building, whereby teachers answer questions from students with questions such that discussion and debates begin and information is transferred from student to student. Therefore, the design became about encouraging dialogue. HMC Architects noted that usually, there is a teaching wall in classrooms that all the students face and that the other three walls are used for displaying work and posters. As a result of this configuration, the corners are not used for instruction and become areas for informal storage and clutter. Their response to this was to design a hexagonal layout for a classroom where both the standard classroom configuration and informal teaching can both occur, and there is the opportunity for connections between classrooms.

The design approach to sustainability involves ensuring quick assembly and disassembly of the structure, using recycled materials and using a uniform shape so that the structural components can be mass-produced and reconfigured to accommodate different types of spaces. Other sustainable strategies include photovoltaic panels, green screens, rainwater harvesting, chilled beam system, dry fixtures, greywater re-use, low carbon materials and zero waste construction.

### Successful Aspects

HMC Architects challenged the typical classroom design in their investigation into flexible learning spaces to allow for informal learning to occur. Informal learning prompts dialogue and discussion among students such that they begin to learn from one another as well as from their teacher. The modular shape of the design makes reconfiguration possible so the spaces become very flexible and can support various activities.



FIG 91. Internal Rendering of Classroom. (HMC Architects, 2010)

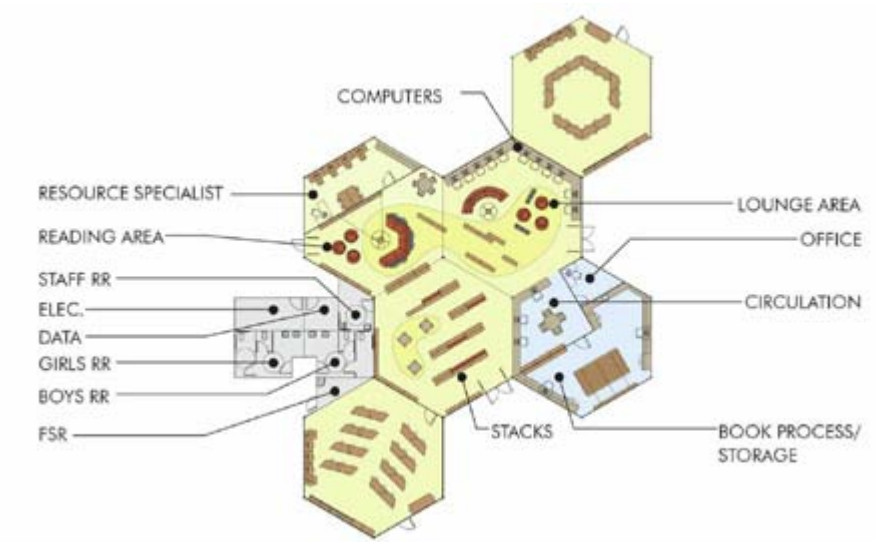


FIG 92. Design Plans. (HMC Architects, 2010)



# PRECEDENTS - MAKER MODELS

The following facilities are good examples of successful makerspace models that have incorporated the community workshop and community education facility to create a sustainable system that constantly builds up the area and empowers the members.

**Incite Focus:** Incite Focus is a production and training lab started by Blair Evans as a community-based organisation that aims to support a sustainable local economy. According to their website they list their main areas of interest as digital fabrication, permaculture, experiential learning and appropriate technology (Incite Focus. Unknown Date). Their holistic approach to sustainable community building is, as they describe, to create a group of thinkers (teenagers to young adults) that collaborate in a learning space and realise their ideas through technology (Incite Focus. Unknown Date). Their motto is “Work and spend less, create and connect more”(Incite Focus. Unknown Date).

**Made Right Here:** Made Right Here was started by Bernie Lynch as a makerspace that, according to William Holman in *Makerspace: Towards a New Civic Infrastructure*, hosts an educational program that focuses on teaching unemployed adults hard and soft skills, broadening their training in project management, product development and digital fabrication (Holman, 2015). He goes on to say that they have partnered with Carnegie Melon University, local foundations as well as a few start-ups to open doors into the public school curriculum and apprenticeships to create a strong employment line (Holman, 2015). They also have an arrangement with the Department of Labour to recognise skills learnt at the Made Right Here facility.

## Case Study - Make Santa Fe

**Make Santa Fe**  
The Make Santa Fe initiative is described as a non-profit community makerspace for the people to access tools, resources, mentors and workshops to make, invent, repair or create anything they want. (Unknown Author; n.d)

Initiation and the decision to build.  
Make Santa Fe started as a series of 10 pop-up events (7 of which occurred during the contract period of April 1<sup>st</sup> to July 31<sup>st</sup> 2015) being held in various locations around the area. At each of these events, the organisers took the opportunity to distribute surveys to the public to collect information about how they think a makerspace in their community should operate. Typical activities that happen in makerspaces were demonstrated at these events to show the interested people what they could be capable of with the help of their own makerspace, and this generated much enthusiasm. From the interest created through the pop-ups and the surveys, the organisers were able to guarantee users of the makerspace, and due to the positive feedback, they decided to go

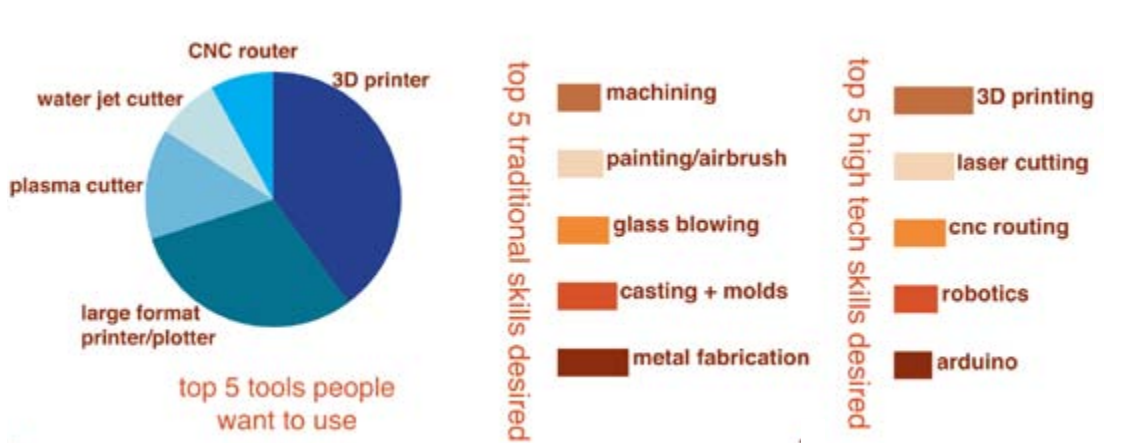


FIG 93. What's Exciting? (Make Santa Fe, 2015)

ahead and turn Make Santa Fe into a physical makerspace.

The Brief  
The brief for the makerspace was ultimately the result of a collaboration of the community, Make Santa Fe board members and all the organisations that Make Santa Fe had partnered with to make it a success. In the surveys distributed at the pop-up events, the community was asked what kind of activities and tools they would like to be taught in a community makerspace. From this, they deduced that regarding technical skills; the community would like to learn 3D printing, laser cutting, CNC routing, robotics and Arduino. This means that a digital fabrication lab, 3D fabrication room, an electronics lab and a workshop would eventually need to be provided. In terms, traditional skills the community wanted to learn machining, painting/airbrushing, glass blowing, casting, moulding and metal fabrication. This desire would lead to the inclusion of a creative arts room, a kiln room, a metal-shop and wood-shop being included in the ideal program brief.



FIG 94. Using the Makerspace. (Make Santa Fe, 2015)

It was also very important not only to the founders of Make Santa Fe but also to other organisations that they have partnered with (MIX, US AID, Santa Fe Chamber of Commerce, Start Up Santa Fe and Generator) that the community also be exposed to classes and activities that teach them how to start small businesses, how to manage a successful businesses and strategies for success and best practice. This way the makerspace not only teaches the community how to make things but also facilitating them to start their own businesses and start creating an entrepreneurial ecosystem in their community.

Influence of Financial Considerations  
During the pop-up events organised by Make Santa Fe, it was their objective to attract future members but also to attract investors. They are a non-profit organisation trying to move into a physical space and needed financial backers to achieve this and also to buy equipment and for utilities. Through these events, they attracted museums, educational institutions and individuals as potential donors. This funding was not enough to get them their own space so Make Santa Fe have partnered up with Meow Wolf, an arts production company. They have now moved in with Meow Wolf in their exhibition space where they have shared areas for education and separate areas for the use of heavier tools. The agreement was that Make Santa Fe would manage all the tools and Meow Wolf would be able to use these tools to make their exhibition. This agreement reduced their initial investment in tools and technology and enabled them to teach a workforce development skill set.

Make Santa Fe are still trying to get their own building and to do this they are running funding campaigns and tool drives. Their aim is to use these sources as well as money from donors and investors to build their own makerspace by the end of 2016. The space will probably be designed in collaboration with the community again and is likely to be either a traditional design led tender or a design and build turn-key package deal tender.

Site Selection  
Although a specific site for the building has not been selected yet, the reason the makerspace is being proposed in Santa Fe is because of the existing community of artists, tinkerers, engineers and creators in the area already. There are also other makerspaces throughout New Mexico including ones in Taos, Albuquerque and Las Vegas. These locations allow the makerspaces to create a Network of makerspace campuses in New Mexico that can organise a reciprocal membership program so they can share workshops, instructors and teachers, and they can pursue funding together as a unit.

By who and how is it managed?  
At this point, Make Santa Fe is still operating out of the shared space with Meow Wolf. The classes there are taught by regional makers from around New Mexico, and the equipment that has been sponsored is managed by Maker Santa Fe but is used by Meow Wolf as well as the members. The whole organisation is run by a board made up of six people ranging from Professors to artists to Librarians. This board is in charge of any major decision making. Four additional staff members help to coordinate various aspects of the running of the facility. Other organisations that they have partnered with are brought in to teach the community how to formulate business plans, the basics of running a business how to organise a start-up.

Conclusion  
Ultimately, through going through this process, I find that community, non-profit makerspace in Newtown, Johannesburg is a viable proposal with the right partnering and financial backers. It would be successful because it will create jobs, inspire new enterprises, teach skills that will be sought in the future in the age of disruptive technology and create a network bringing maker communities together.

Important Principles that made Make Santa Fe Successful  
In initiating the Make Santa Fe makerspace, the organisers started by talking to the community and finding out what they thought which made them feel like they were involved in the process allowing them to take ownership of the idea and guarantee some users of the facility. They also organised public demonstrations of what it means to be a maker, which attracted potential users and excited the community about becoming makers themselves.

The brief was not handled by one party alone but was a result of the collaboration of everyone involved, the client and the funders. From the surveys, they deduced the most popular technology and machinery requested for a community makerspace and used this to dictate their program. Along with teaching the community maker skills they also plan to teach them how to manage a business and create an entrepreneurial ecosystem in their community

Regarding investors, Make Santa Fe tried to attract potential funding through their pop-up events, these acted as advertising for the facility and helped to get investors on board. They used an area where there was an already existing population of artists and tinkerers to site their makerspace and due to the lack of funding their collaboration with another initiative dictated their specific location. Make Santa Fe is managed by a board that consists of people from different fields of expertise, which allows for a more realistic approach that considers all sides of a makerspace.



# TYPOLGY IN CONTEXT

## WHAT DOES A MAKERSPACE IN NEWTOWN LOOK LIKE?

Placing a makerspace in the inner-city of Johannesburg, South Africa leads to interesting and pertinent considerations. Being that the city is considered an unsafe space by some, there is the need to consider that a makerspace will house expensive equipment in a relatively public building leaving it vulnerable to crime. Along with security, there will be a need to formalise the informal education method of the maker culture for skills to be recognised by the department of labour such that people can gain employment from their maker experiences.

Considering Newtown's past and current successes and failings, I believe that the intervention would be well suited here. As Kate Shand says "Newtown, despite the best intentions of the authorities, planner and consultants, has retained the tension needed for creativity to flourish but not because of all the grand frameworks and plans, but despite them." (Shand, 2010. p. 99) A makerspace in Newtown could be a starting point in the celebration of cultural organisations in the area again. Creativity will once again be encouraged, and the artists of Newtown might regain their power over their part of the city. I would say that a makerspace is the perfect typology to celebrate the area's past as an industrial sector as well as a cultural precinct as it is the marriage of science and art, practicality and creativity. This space would also serve as an attraction to the middle-class as well as the working class and the unemployed, and could be the bridge between the class gap because as Mia van Zyl said in an interview

with her: "it's reach and value spans across social, racial, gender and economic boundaries." (Van Zyl, 2016). A typology that serves to democratise the making process and return power to the individual would, in my opinion, be welcomed in Newtown.

The selected site for this makerspace is the parking lot opposite SciBono on the corner of Jeppe Street and Miriam Makeba Street in the Electrical Precinct. This site is the nucleus of a strong and relevant network including; educational institutions (such as Unisa, Wits University and University of Johannesburg), educational civic spaces (like SciBono and the Worker's Museum), institutions (such as the National Union of Metalworkers of South Africa and the Careers Centre) arts and culture centres (like the Market Photo Workshop, the Bus Factory and Pim Street Studios), and lastly local businesses (like Bennies Welding and the Green Bean Learning Resource). There is a lot of pedestrian traffic through the site because most people are walking to and from major transport nodes. The site is near major transport interchanges, like the Bree Street Taxi Rank, as well as being along various public transport routes, making the facility more accessible to those who use public transport. The resultant activity makes the site appropriate for a community makerspace that will aim to make an impression even on the individual walking past to imprint knowledge on the passer-by.

FIG 95. Typology in Context. (Bozzonetti, 2016)



FIG 96. Photograph of Site looking South. (Bozzonetti, 2016)



# BRIEF

The brief for this makerspace is to design a partially publicly accessible building that allows for the sharing of knowledge both visually and physically through the public domain. It should also serve a repository of information that one can withdraw from or in which to deposit. This makerspace will be a non-discriminatory community centre that becomes home to students, hobbyists, makers, hackers and businesspeople.

The core principles I wanted to plug into this inner-city makerspace are Production, Education, Creativity and Community. Various functions can make these principles possible. Production and education can be achieved through skills training. Education and Creativity can be attained through Invention. Creativity and Community can be accomplished through community collaborative expression. Production and Community can be reached through the encouragement and facilitation of entrepreneurship.

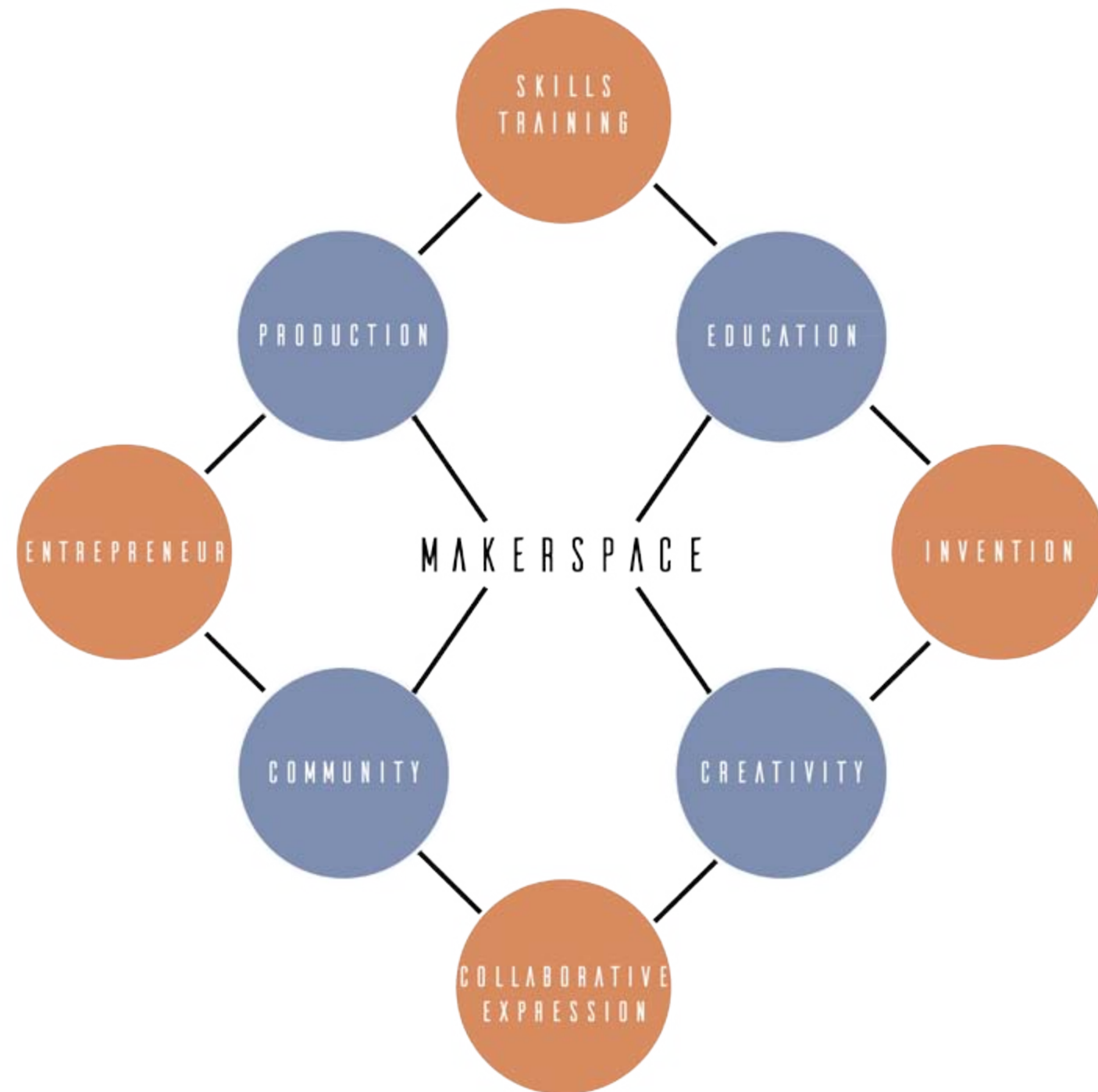


FIG 97. Illustration of Makerspace Programme Breakdown. (Bozzonetti, 2016)

Ideally, the building should have 24-hour activity. From 8 PM to 6 AM the building will be used predominantly by makers. From 6 AM to 9 AM, displays and exhibitions lining the street edge will aim to engage with the person going to work. From 9 AM to 5 PM The building will be occupied predominantly by community members learning and using the workshop. Workshops will run from 5 PM to 8 PM to catch the people coming home from work.

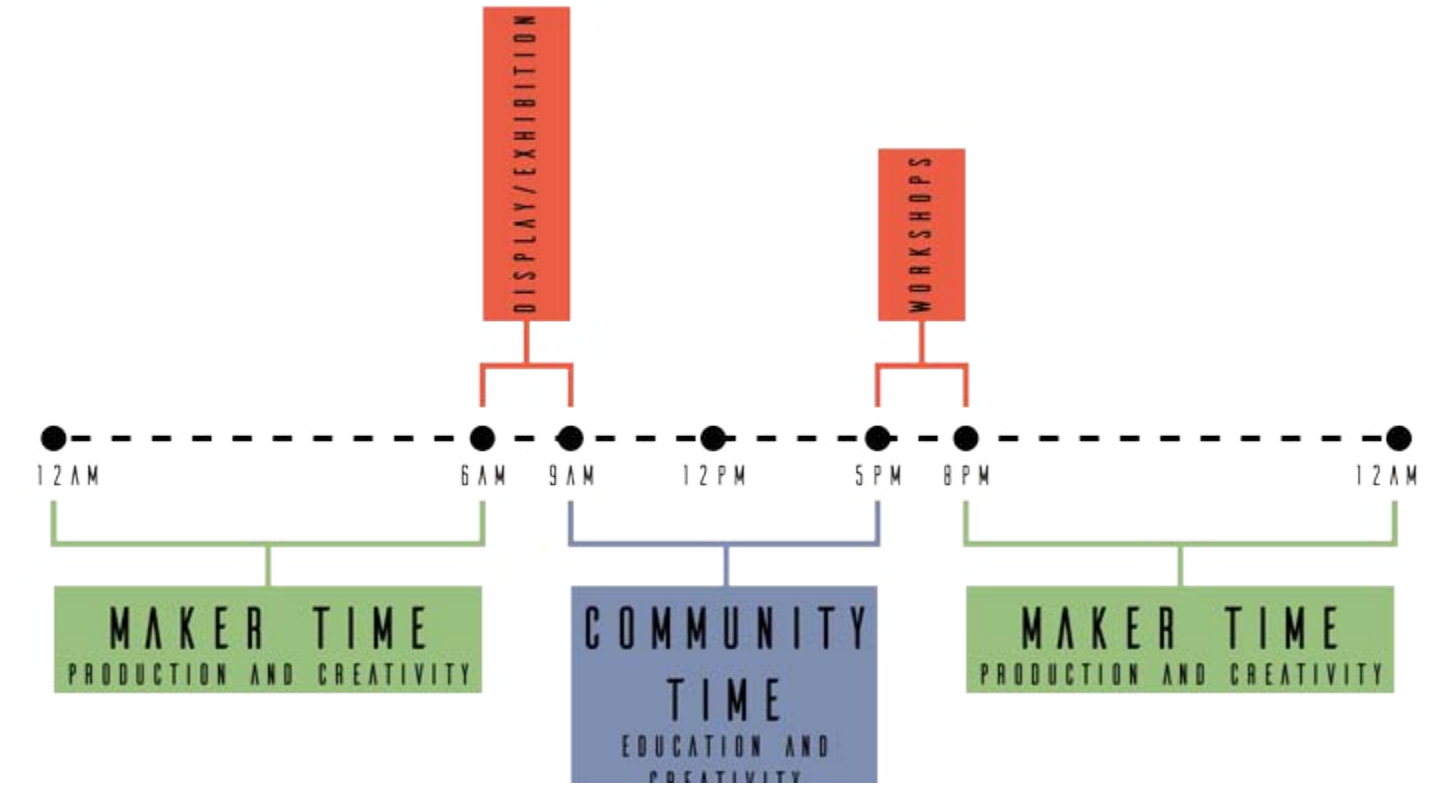


FIG 98. Illustration of Makerspace 24-hour Activity. (Bozzonetti, 2016)

## Programme

The programme I have set out for the proposed building can be categorised into workshops and labs; education facilities; community facilities and support facilities.

### Workshops and Labs

- Wood Shop
- Metal Shop
- Electronics Lab
- Digital Fabrication Lab
- 3D Fabrication Room
- Creative Arts Room
- Rental Studios
- Maker Pods
- Outdoor Studio
- Display/Exhibition
- 

### Education Facilities

- Lecture Rooms
- Classrooms
- Seminar rooms
- Digital Library
- Tool Library

### Community Facilities

- Entrance/Foyer
- Common Room
- Member Kitchen
- Market Space
- Cafe
- Radio Station

### Support Facilities

- Management Office
- Staff Offices
- Staff Kitchen
- Security Office
- Personal Storage
- Storage
- Service Plant Room
- Public Toilets
- Showers and Change-rooms



## Suitable and Appropriate Clients

Makerspaces are typically started by a community of makers and tinkerers that would like a space to collaborate as well as a facility that has the necessary equipment. This building typology requires expensive upfront investment, and this is why they usually start off in someone’s garage, with very little equipment, and start growing when there are enough community members involved to invest in a bigger space and better equipment jointly. In this way, the maker community is founded before the building is built or space found. Although the makerspace I propose will similarly be developed in stages, growing in size and members, it will be in an already established and equipped location. This type of makerspace is called a ‘landlord-founded makerspace’. This approach starts with the facilities being built, and once finished, attracting members of the surrounding community to start experimenting with making, hacking and tinkering, ultimately creating a community of makers through the ‘build it and they will come’ approach. This approach, however, is more challenging in that there are not guaranteed users of the facility and is thus less attractive to upfront investors. With this in mind, who should be approached as the client to fund the creation of this building?



FIG 99. Illustration of Typical Approach. (Bozzonetti, 2016)

To identify suitable and appropriate clients, I would need to decide whether the makerspace will be for-profit or non-profit. Where the goal is ultimately to empower the community as well as the individual and to make people realise their potential through turning away from commercialism and embracing the make-it-yourself culture, the most appropriate model, in keeping with the maker spirit, would be a non-profit one.

The client most suitable for a non-profit makerspace in Newtown, Johannesburg is an NGO. In this case, I propose that Create Africa in collaboration with Isobar NowLabs and the community of Newtown become the clients, but not the funders, of this project. Create Africa and Isobar NowLabs could facilitate the design, funding and construction of this building and then eventually pass on ownership as sectional title units to the community or possibly other maker collectives. Create Africa is a collective that arranges events and workshops that bring the worlds of technology, culture and education together. Isobar NowLabs is an international initiative that aims to accelerate innovation through the celebration of technology; this is to explore and embrace the ever-changing digital world. I believe that these two initiatives would successfully be able to collaborate with the community to develop a clear and concise brief for a community makerspace. It will serve as space for people in the community to come and learn skills, to use the facilities, for children to attend after school activities, for makers to collaborate with other makers and for companies to make prototypes of products for market testing. The users of the makerspace will not be solely from one sector but rather from all different sectors, and this is why perhaps various sectors should be involved in a joint grant or sponsorship ventures, such as Education establishments, NGO’s and the community.

Create Africa and Isobar NowLabs as clients are the facilitators of this project, but they are not necessarily the funders. For funding, I will propose a public-



FIG 100. Illustration of Landlord Approach. (Bozzonetti, 2016)

private partnership between the government and private organisations. Tertiary institutions like Wits, University of Johannesburg and Unisa could contribute to the financing of the makerspace. In return students of these institutions would become automatic, non-paying members of the makerspace, saving the institutions from building or expanding their own fabrication labs and workshops. Professors and teachers at these institutions would also gain free membership to learn new skills and pass them on to their students. It would also be possible for lectures to be occasionally taught at the makerspace facilities where the equipment and machinery are relevant to the lecture at no cost to the university or technical college.

SciBono could help sponsor the building as an extension to their Discovery Centre, teaching young children about new technologies and what they are capable of with the aid of these technologies. Should SciBono want to get involved in or host maker fairs in Johannesburg, they could make use of the proposed makerspace facilities and market space to accommodate the visiting makers. They could also create a partnership between their careers centre and the makerspace to create some new employment opportunities as well as being able to head hunt accomplished makers from the makerspace. Both the educational institutions and SciBono Discovery Centre will be able to take advantage of the view of the site from the double-decker highway through graphic advertising.

The third possible source of funding could come from Government. A makerspace would apply and play to various departments in Government. Regarding the Department of Arts and Culture, the makerspace serves as a facility that encourages new expressions of art, being a facilitator of creative expression and is trying to create a new culture of maker communities. The department of education would benefit from having a facility where students

from public schools can come to learn skills that could better equip them for the outside world after they matriculate, it will also serve as a study for a new approach to education where students learn through doing. With regards to the Department of Labour, they could recognise the skills learnt at the proposed makerspace as a qualification to help unemployed people find employment. Through providing funding for necessary technology and machinery, the Department of Science and Technology could get the makerspace to test out various technologies before they introduce them elsewhere. The department of social development could treat the proposed typology as an experiment in a way to bring a community together and create economic opportunities, as the makerspace would also serve as an effort to combat education issues,

unemployment and encourage local entrepreneurship. Finally, the Department of Trade and Industry can learn about new forms of industry and embrace the disruptive technology influenced trade as new forms of local trade. They could also get involved with teaching the community valuable lessons on running a business, like the organisations that partnered with Make Santa Fe and taught the community valuable business skills.

An important consideration for funders and investors would be that the maker culture values its independence as a community in making decisions for their space. A funder of this typology would need to be accepting of this relinquishment of all decision making to the community and client.

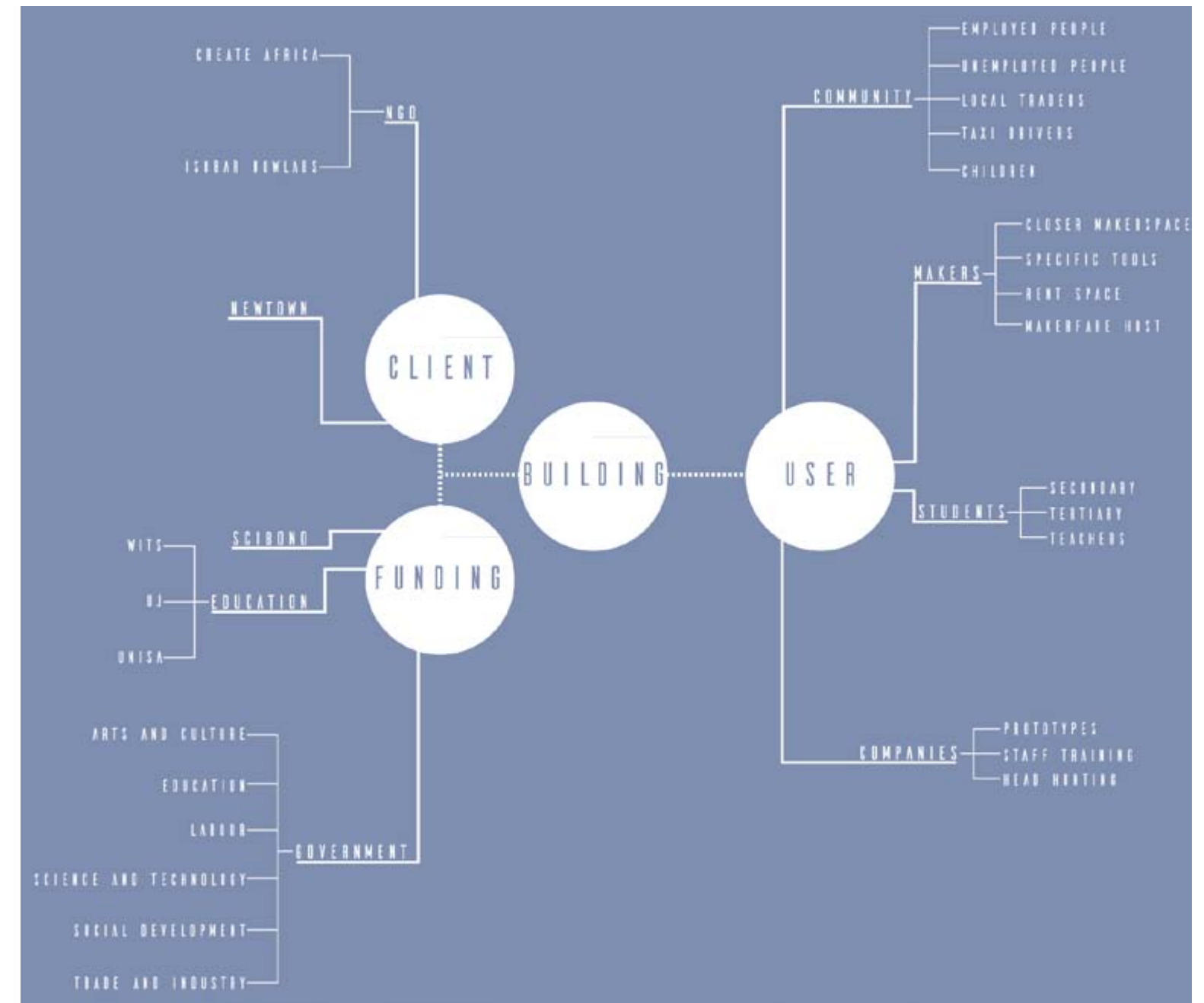


FIG 101. Illustration Breakdown for Client and User. (Bozzonetti, 2016)



## Practical and Sustainable Financial Models of Development

As mentioned above, the proposed makerspace in Newtown will be a non-profit organisation where the objective is to share knowledge and skills with the community to empower them as a group and as individuals to take charge of their lives and their surroundings and not rely on large commercial corporations. Economic development is also an important consideration as makerspaces can produce entrepreneurs that start small businesses, create jobs at the makerspace, make an individual more employable through learning new skills and lead to spin-off companies.

According to an article called *Makerspace: Towards a New Civic Infrastructure*, makerspaces are now dividing along the lines of non-profit and for-profit (Holman, 2015). An example of a for-profit makerspace, which I find to be the most common form of makerspace now, is the TechShop franchise that locates its spaces in upscale areas where there is access to more high profile technologies but at a price. The members not only pay for the membership to use the space but also pay for safety and usage classes as well. This fee has become too expensive for the members, and the TechShop has now had to collaborate with large enterprises and organisations such as Autodesk to subsidise fees and maintain the quality of technology and facilities.

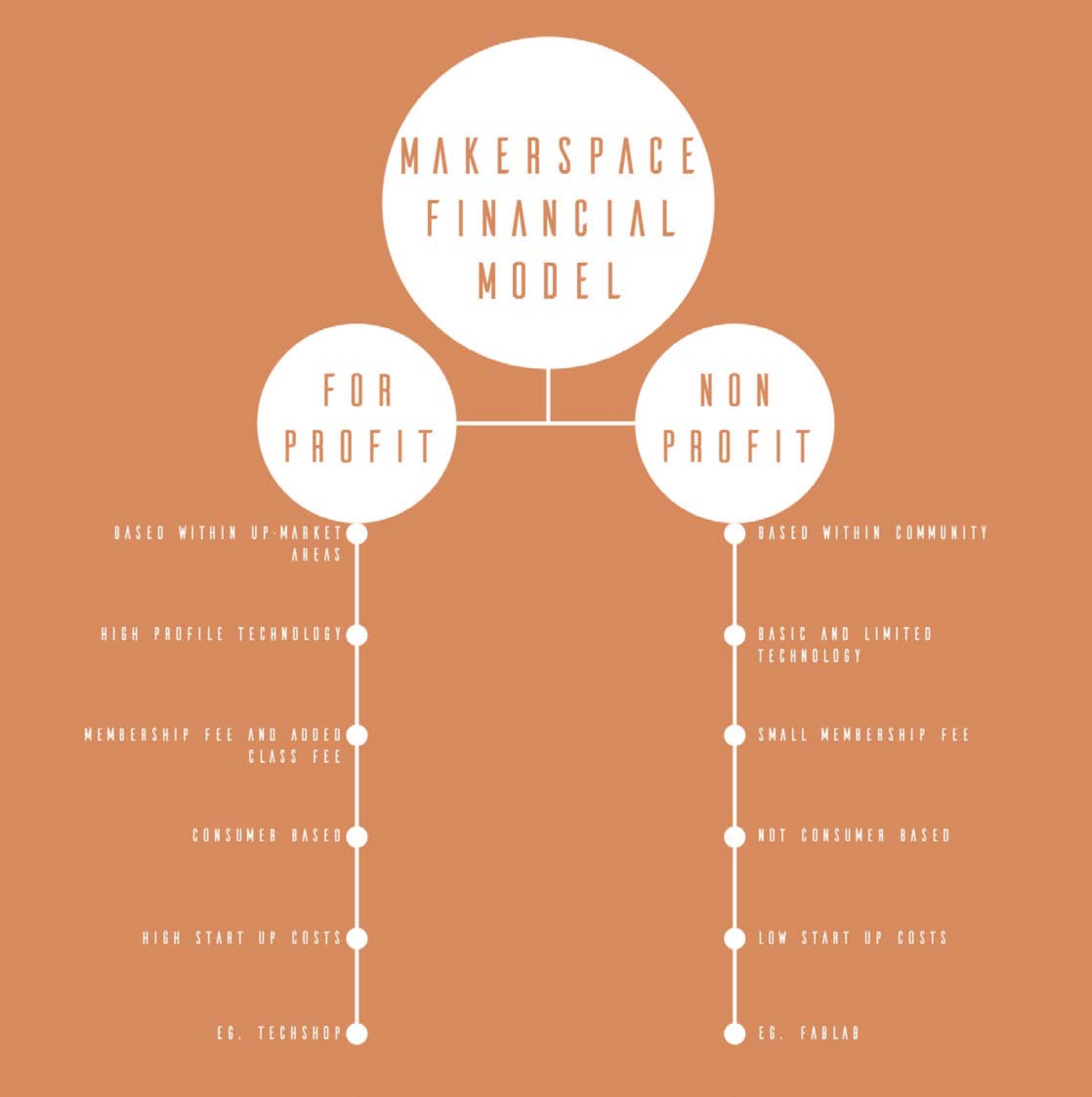
The most successful non-profit network model is FabLab according to Holman (Holman, 2015). He goes on to say the reason that it is such a successful model is because it is a non-consumer business, it consists of a loose and decentralized network, the focus is limited to only five technologies (namely CNC routing, laser cutting, vinyl cutting, circuit board fabrication and 3D printing) and because it is a community resource that has open access (Holman, 2015). The benefit of this type of makerspace is that it has low start-up costs, but it is in need of constant financial backing from sponsors to fund the facilities and maintenance of machines and necessary acquisitions. The author says that both TechShop and FabLab have “democratised access to costly equipment, expanded educational programs, and served as platforms for prototyping and invention. The next challenge is plain: to build a deeper maker economy that can sustain

makerspaces, and makers themselves, on a broader scale.” (Holman, 2015)

Therefore, for a non-profit makerspace, the upfront investment through an NGO is necessary for start-up costs for the building and the equipment. It will also be important regarding acquiring new and necessary equipment later because of the constantly evolving technical world; there is always new machinery being developed that is more accurate and efficient, and this is why it is necessary to acquire funding through grants and donations. A way to keep start-up costs low is to develop the makerspace in stages. By starting out with the essentials like a workshop with just a few pieces of equipment, the institute can be expanded as the funding becomes available. Therefore, an expansion plan would need to be put in place where the stages are mapped out as to what they will entail programmatically as well as financially.

Funding in the form of donations and grants will provide financial support for the beginning of the project and any necessary major acquisitions but what about the general expenses of running the facility? These costs include utilities, building maintenance, salaries, insurance, tool maintenance instructor fees, supplies, goods and services. The proposed makerspace will have to generate its own revenue to keep it functional. A way to create this funding is through the membership fees. I think the best way to approach this would be to apply a gym fee type of revenue model to the institution. Members of the makerspace will have to pay a membership fee to use the facilities. There should also be different kinds of fee structures based on economic standing. There is also an opportunity to rent out studios to maker groups as well as renting out lecture rooms, the dedicated market space and other large open spaces for functions. Companies could contact the proposed makerspace to be host to advertising that can be seen from the double-decker highway. Another way to create revenue would be to for the staff at the proposed makerspace to make things that can be sold at the dedicated market space to visitors, which could also serve as inspiration for people to start making.

FIG 102. Illustration of Financial Model. (Bozzonetti, 2016)





## Users of the building and their effect on the viability of it.

# USER 1

The users of the proposed makerspace are varied and not restricted to one group. The community of Newtown is encouraged to use the makerspace, being of any age or any education level, to come and learn skills to not only give the individual the opportunity to realise their potential but also to create connections within the community that possibly weren't there before. People on their way to the Bree Taxi Rank to go to work could walk past the proposed makerspace in the morning, see an exhibition or display of a certain skill and then around the time they would be going home there could be a class teaching this skill, capturing the average working individual in the community as a user. This approach is similar to the pop-up demonstrations utilised by Make Santa Fe. During working hours, the space would be where unemployed community members come to learn how to do things that could ultimately aid them in finding employment or even to start their own business by attending business classes at the space, similar to Make Santa Fe who are trying to start an entrepreneurial ecosystem in their community. Local traders and entrepreneurs could also use the makerspace during business hours to make their product or create new products. During the off-peak time, taxi drivers could take classes at the proposed makerspace whether it be learning how to make something or simply business classes that teach the basics of starting one's own business, which could inspire the taxi driver to start their own company or even to become a part-time maker. The makerspace will also serve as a host for after-school activities and holiday programs for the children in the community to attend. Children visiting the SciBono Discovery Centre could also visit the space as an extension of the SciBono visit to learn more about science and technology. When the community comes together in this type of setting, there is also an opportunity for the group to work together to make something for their community that could improve their quality of life. A community that starts to engage with one another becomes a strong network of people trying to improve their area and help each other reach certain goals. Community makers would need to pay a small membership fee to gain access to the facility and the tools.

# USER 2

University. In exchange for funding from these institutions, their students and staff would gain free membership to the proposed makerspace. Students, should they find the facilities at their university or college either lacking or entirely booked, could make use of the Newtown makerspace to complete their projects. They could also simply use the facilities to make personal items in their free time or just come to learn new skills that could stand them in better stead when looking for work once they have graduated or part-time employment while they are studying. Students from public secondary education institutions around Johannesburg should also have access to the makerspace perhaps in the form of a class at the facility once a week to prepare the students for the outside world once they matriculate. The Department of Education could, in fact, fund their membership as it would lead to better-equipped students leaving school to enter the workplace. Teachers and Professors from tertiary and secondary education institutions should, in addition to their students, have access to the facility to learn skills they can pass on to their students or use the facilities to teach classes to their students.

Makers from other makerspaces around Johannesburg should also make use of the proposed building. Some makers might be looking for a closer makerspace as their local makerspace may be very far from their homes, so the proposed facility may be the closest one to them. It is possible that a maker could be looking for particular machinery or collaborators that they cannot find at their local makerspace, prompting them to visit one in Newtown. There is also the situation where an Early Stage (See Figure 8.) makerspace made up of a few makers who want to progress to the Growth Stage and move from one of the founder's garages to a more formal location with access to various equipment. In this situation, there are studios available for rental in the proposed makerspace where these groups of makers can have their own space, use the tools and machinery and engage and collaborate with community makers. Ultimately the proposed facility could facilitate these maker groups in the Growth Stage to stabilise and formalise their identity as makers and progress to the Mature Stage, moving out of the facility to their own location. These makers would then have to pay a membership fee, possibly more expensive than the community member membership fee if they are not from the community, and maker groups renting studios would be paying membership fees and rent.

# USER 3

The final type of user of the makerspace will be companies that wish to make prototypes of a product they have designed or to conduct marketplace research. They could also use the facility to train their staff in certain machinery, programs and skills and they could also look to the makerspace as a source of potential new employees, head hunting accomplished makers. These could be companies that were started by members of the makerspace or just companies around the country.

Community members cannot typically afford high membership fees. Corporations and other makers could afford a higher membership fee making the system more viable. I think it is not realistic to charge all parties either a low membership fee, because then there will not be enough money for maintenance, or a high membership fee, because then people will not join because they cannot afford to. Perhaps members of the community should pay a nominal fee, bearing in mind that students in the area that attend institutions that have financially contributed to the makerspace will not have to pay and will have free membership. Makers who are not from the community and live more than 10km away could pay a slightly more expensive membership fee because other makerspaces are closer to them. Members will also be charged on a time basis so the more workshop time or classes they want to take the more the fee will cost. Large, established corporations wanting to use the facilities to develop a prototype could pay rental fees for the equipment used and consultation fees for any staff member that has consulted on the project. Should people be wanting to join the makerspace but cannot even afford the nominal fee, there could be a bursary system in place where they could use the facilities for free but then also teach classes. Although the movement revolves around free access to information, as Stephen Gray says, people do not value what they do not pay for (Gray, 2016) so there is a need to charge a very nominal fee for access to the equipment to encourage members to take care of the facilities.

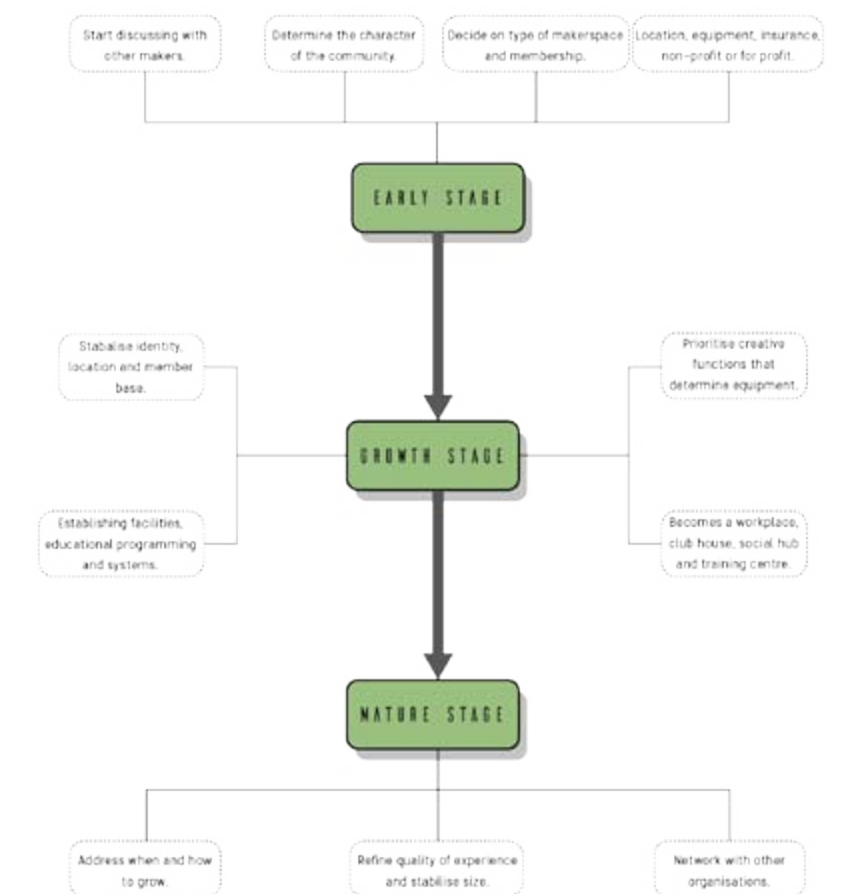


FIG 103. Illustration of Stages of Development. (Bozzonetti, 2016)



|                                                                                     |                               |                                                                                                                                                                                                                                                                      |
|-------------------------------------------------------------------------------------|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 80/166                                                                              | TYPOLGY IN CONTEXT            |                                                                                                                                                                                                                                                                      |
|    | GENERAL PEDESTRIAN            | Walk Past Display and see maker process and times of classes - Walk through public square and see makers at work - Enter Makerspace through Reception - Use provided public spaces as gathering space or just to go have lunch.                                      |
|    | GENERAL MOTORIST              | See advertising from Highway - When driving past see snippets and sparks of activity, See some part of display - If using drop-off can take slower pace around exhibition.                                                                                           |
|    | PEDESTRIAN GOING TO/FROM WORK | Walk past building on way to public transport node - See display as clue to that day's class and see class information board - On way home can see complete ion of displayed process and possibly drop into class advertised if member or go to become a member.     |
|    | UNEMPLOYED PERSON             | Walking past can see making process and classes available - Go into reception and wait there for staff member to facilitate membership initiation -From now on can go straight through to classrooms or workshops when interested in class.                          |
|    | LOCAL TRADER/ARTIST           | See what is possible through exhibition - Go to reception and become a member - Go through security and straight into classes or straight to workshop - Make uses of tool and/or Online Library - Meet people in Common Room - Use on-site storage - Sell at market. |
|   | STUDENT                       | Dropped off at Drop off point - See maker process through display - Go to classes, lectures and workshop - Go back to drop off point to get picked up.                                                                                                               |
|  | TEACHER                       | Arrive via personal car, public transport or pedestrian - Go through reception and security - attend classes, lectures and workshops                                                                                                                                 |
|  | MAKER                         | Go through reception and security checkpoint - Go to class or lecture - use workshop - Use tool/online library and common room - Use storage - Use showers and change rooms - Go through security checkpoint to leave.                                               |
|  | MAKER RENTERS                 | Go straight to Rented studio to open up - Go to classes, lectures and workshops - Use tool/online library and Common room - Uses studio storage - Use showers and change rooms - Lock up rented studio.                                                              |
|  | COMPANY                       | See advertising from highway - Go through reception and through security checkpoint - Go to Seminar/Meeting Room - Go to Offices to meet with staff - Use workshop - Leave through security checkpoint.                                                              |

FIG 104. Illustrated Table of Various Potential Users of Makerspace. (Bozzonetti, 2016)

## Suitable Procurement and Construction Methodology

Procurement for this project will extend to professional services (design consultants and specialists), contractors (main and sub-contractors) and suppliers of materials (building supplies and specialist suppliers). I am of the opinion that a traditional design led competitive procurement tender is the best option for the proposed makerspace because the project is known, costs can be managed easily, variations can be controlled, and drawings by the architect can provide a common basis for a competitive tender. A bill of quantities should also accompany the contract.

Regarding tenders, I think an open tender is most suitable, where an open invitation to tender is advertised, and someone is selected by the client, in this case, Create Africa and Isobar NowLabs. The reason I think this form of tender is appropriate is that there is no favouritism, it is an open and transparent selection process, and it is very competitive. Allowing everyone to tender is more in the spirit of makerspaces that aim to democratise information.

Contractors will be asked to submit a tender in the open tender process, and the most viable applicant will be selected as the main contractor for the entire job, not just for a particular stage as this will create inconsistency across the project. The main contractor will receive information on the entire scope of the works as well as a breakdown of each stage of construction and what that will entail. The building will then be built one stage at a time through the collaboration of the architect and the contractor.

Similar but not exact to the makerspace stages of development, I propose stage construction. In the first stage of construction, the contractor will be selected with a request to him or her that local unemployed people and builders in the community are given the opportunity to be included as part of the construction team to include the community in the construction process and to provide temporary employment for the unemployed. Involving the community in the planning and construction of the space is important, as demonstrated in the Make Santa Fe Case Study, to gain support. The first stage of construction will consist of a smaller program that will facilitate primarily the community users and the students, namely the entrance and security office, smaller versions of the labs and workshops, a few classrooms, a common room, a kitchen, digital library, a tool library with hand tools only, the display area, the offices, storage and services. These structures will not have final finishes to remain flexible for additions

Now an established makerspace, there is more opportunity to expand the skilled workforce in the construction team by asking community makers to join the contractor on the next stage of development. At this point, the level of completion will concentrate on facilitating students at the makerspace. The addition of classrooms, lecture venues and seminar rooms will be completed to accommodate students and teachers. This construction phase will also include expansions to the existing program sizes and also provides the opportunity for the makers at the facility to make certain additions to the building like testing out a new façade skin and trying out new sustainable technologies.

The final stage of construction will ultimately be a stage where the desired outcome would be the concentration on creating cash inflow for the facility. The construction of smaller studios that can be rented out and a market space will allow for this outcome. The staged approach to the construction of the proposed makerspace allows for different functions of the facility to be concentrated on at a time.



## Role and Constitution of Professional Team

### Team Breakdown

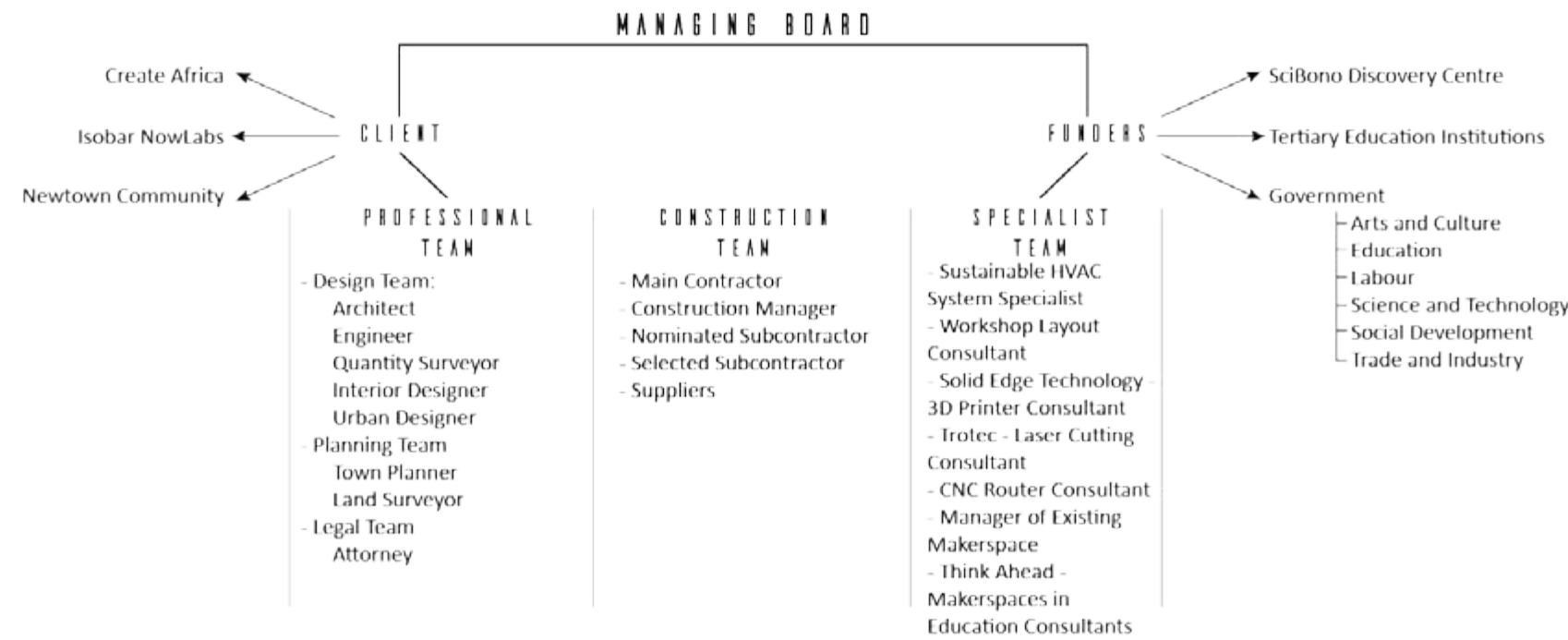


FIG 105. Diagram of Managing Board Breakdown. (Bozzonetti, 2016)

## Method of Operation



FIG 106. Diagram of Professional Team Breakdown. (Bozzonetti, 2016)

## SWOT Analysis



FIG 107. Illustration of SWOT Analysis. (Bozzonetti, 2016)

## Conclusion

In conclusion, the initiation of a public, community-driven makerspace in Newtown could strengthen the identity of the cultural precinct ultimately lead members to gain empowerment not necessarily through learning a skill, but by having the opportunity and facilities to use those skills to make something and teach others. Being that the typology is very inclusive, the space will serve to bridge the gaps between social, racial, gender and economic standings by democratising the access to tools and knowledge. A makerspace can also act as a connection between the public and private domains through visual connections as well as a gradual perforation of the building edge such that pedestrians and people in the building can start to engage and learn from one another. Ultimately a makerspace is a successful way to create interaction between members of a community and give this community, and the individual, power to shape their neighbourhood how they would want it as well as create and take advantage of this economic opportunity.



## THEORIES

My design approach has firmly revolved around two paramount theories. The theory of public and private space and the theory of exposing a soft interior from a hard exterior.

### Public and Private

Jan Gehl speaks about the different activities that occur in the space between buildings in *Life Between Buildings* (1987) as being necessary, optional and social activities. Necessary activities are those that have to be performed every day no matter what and are relatively unaffected by physical frameworks such as work, school, shopping and errands (Gehl, 1987). Optional activities are activities that people only part-take on a voluntary basis, for example: taking a walk, pausing and sitting (Gehl, 1987). Social Activities are dependent on the presence of other people in public spaces to occur. Social activity is spontaneous, and as a result of optional and necessary activities evolving because people are all in the same place, this is made possible due to the physical framework (Gehl, 1987). These activities include children playing, greetings and conversations. They occur in dwellings, private outdoor space, public buildings and the workplace (Gehl, 1987).

People on their way to performing necessary activities could find themselves walking past the makerspace and becoming intrigued by the opportunities offered by the left over spaces created in the design of the facility. These spaces give rise to the possibility of optional activities should the conditions of the space allow for it. The makerspace should then be the platform for social activities. The design of these public and private spaces should provide the physical framework to encourage these activities. There should also be spaces where community members are invited to interact with one another in

a forum like setting where open discussion and public involvement should be encouraged. Spaces, where the individual can retreat to in an effort contemplate in solitude, are also necessary. The maker sometimes needs time to map out and think over a problem that they need to fix on their own, or just simply if they need a space that is quiet and apart from all the bustling activity of a workshop.

In *A Pattern Language* (1977), Christopher et al. write about activity nodes. Activity nodes are vital spots in a community where the widely distributed public seek out other concentrations of people (Alexander et al., 1977). People are abandoning the private environment for the public in seek of socialisation. To keep these activity nodes quite concentrated, they are located in small public squares; these are called positive public spaces because they are bounded by something (Alexander et al., 1977). The small squares can be thought of as public rooms where if it becomes too large, the space can begin to feel alienating and deserted. They should accommodate public social gatherings where the face of a person at the complete opposite end of the square is still recognisable (Alexander et al., 1977). Public space can also be less formal than a square and simply comprise of the spaces left behind between buildings and the street, this is called negative space (Alexander et al., 1977). One can sit in in these negative spaces in solitude while still being and having the opportunity to seek out other people.

# -DESIGN APPROACH-



FIG 108. Design Approach. (Bozzonetti, 2016)



Public and private space can be considered in different ways according to *Lessons for Students in Architecture* by Herman Hertzberger (2009); the street, the 'in-between', private claims on public space, the public domain, public space as constructed environment and public accessibility of private space (Hertzberger, 2009).

The street is a public stage where people can socialise with one another. Hertzberger calls it the communal living room and states that nowadays streets have lost this community identity because the emphasis has now been placed on the vehicle (Hertzberger, 2009). In *Close Encounters with Buildings*, the authors say "The ground floor is where building and town meet, where we urbanites have our close encounters with buildings, where we can touch and be touched by them." (Gehl, Kaefer and Solveig, 2006. p.29) I would say that this is a good description of the street as the meeting point between the city and the building.

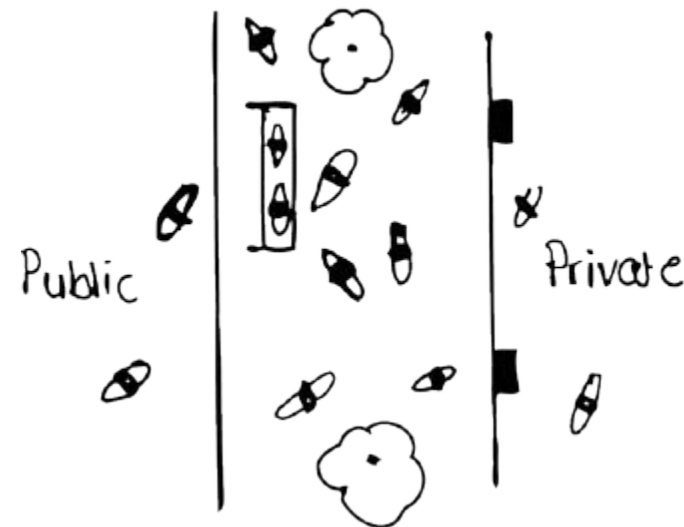


FIG 109. Illustration of the Street as a communal living room between Public and Private. (Bozzonetti, 2016)

The 'in-between' is considered to be a portion of the street, the space where public and private domains meet and dialogue starts to form. It is also a space for hospitality that can be accentuated through threshold treatment (Hertzberger, 2009).

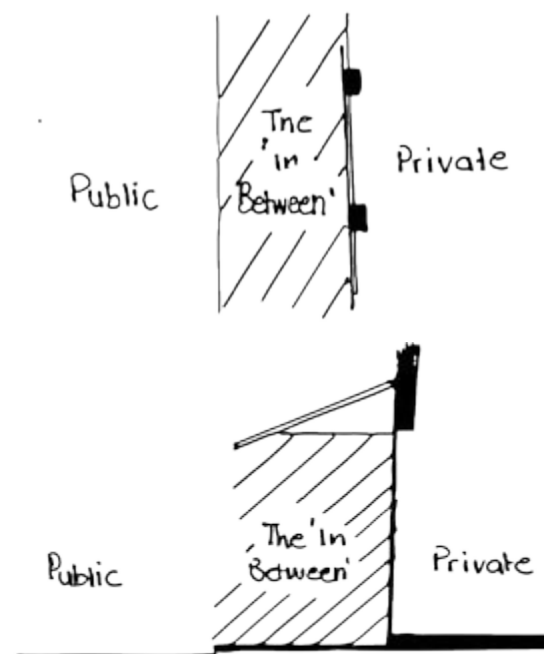
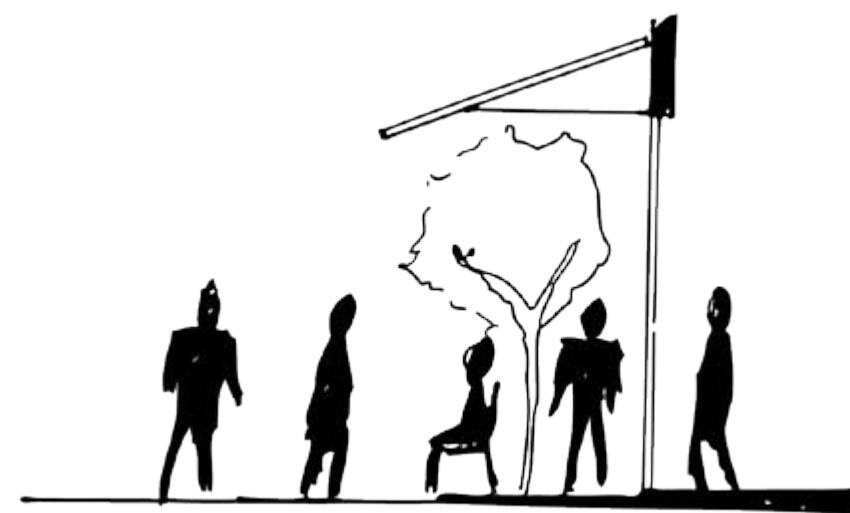


FIG 110. Illustration of the 'in-between'. (Bozzonetti, 2016)



A private claim on public space is when intermediary spaces between public and private have been created and are accessible to either domain. An example of this would be a coffee shop putting a table outside on the pavement and not reserving it only for customers but allowing any member of the public to use that table (Hertzberger, 2009).

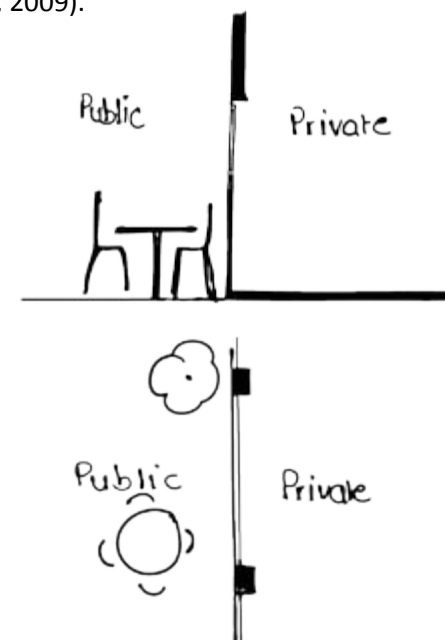


FIG 111. Illustration of private claim on public space. (Bozzonetti, 2016)

The public domain is the street, but a street in the sense of something complementary that is elevated into something more than just for traffic, not just the space between private buildings. Streets and public squares are the spaces in which community members begin to start a dialogue with one another. What was once the space for activities like revolutions and marches now needs to be stimulated once again to improve relationships in the community and nurture and reflect social interaction as Hertzberger would say (Hertzberger, 2009. p. 64).

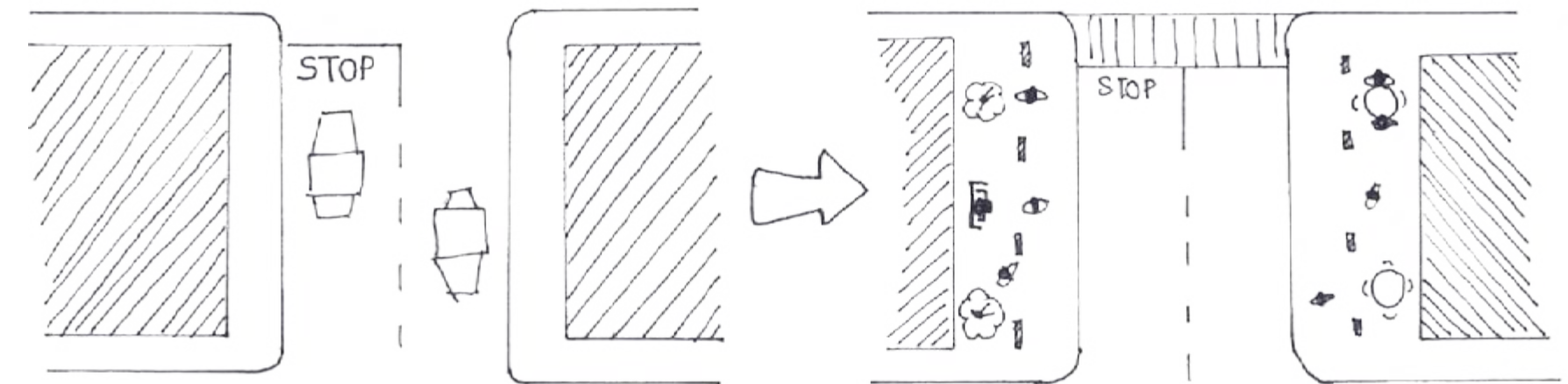


FIG 112. Illustration of the life of the public domain. (Bozzonetti, 2016)

## Exposing the Soft Interior from the Hard Exterior

The idea of exposing a soft interior from a hard exterior can relate to activity, accessibility, and form and materiality. In a research report, written by the author entitled *How Can we Make Sandton a Lighter Space?*, the author looked at many examples where material choice and the lack or presence of perforations were division barriers between public and private. In some cases, these barriers alienated the two domains from each other but in other situations created a more gradual transition between public and private.

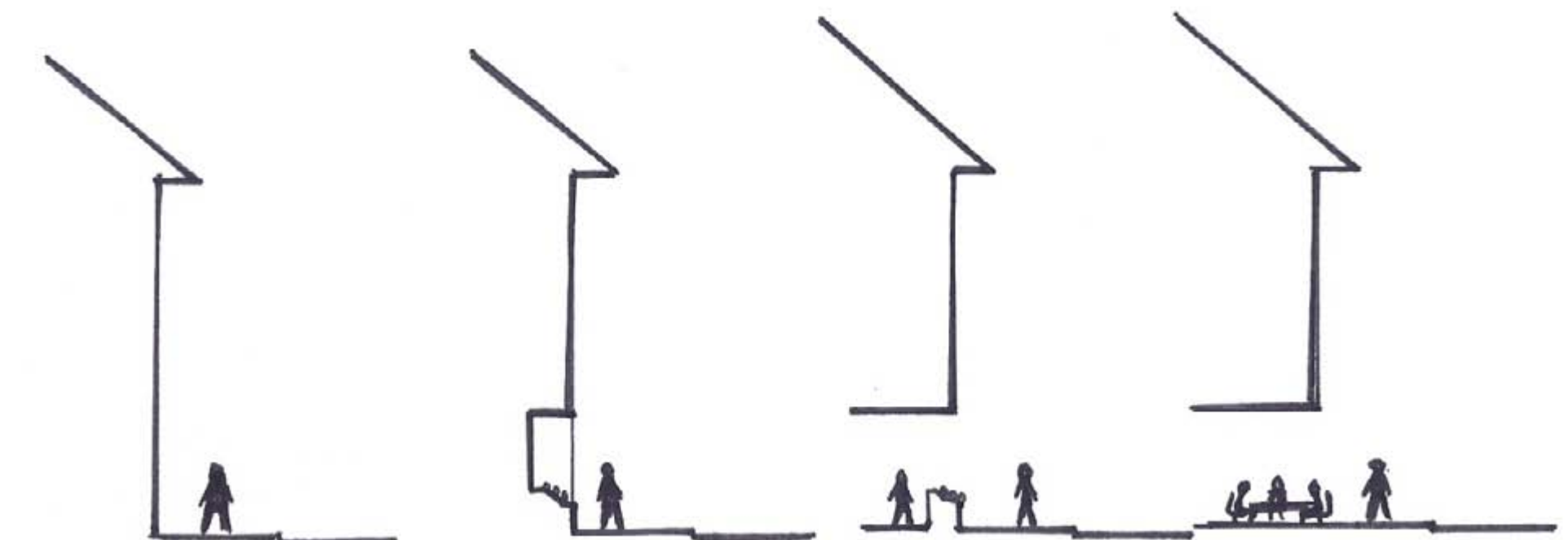


FIG 113. Sketch of Different Ground Floor Interactions. (Bozzonetti, 2015)



### Activity

When considering the exposure of the internal operations of the building to the public, transparency is key. The public and private realms, traditionally very separate, are required to coexist within the maker space. There should be areas with complete public access where a person walking past can either impart knowledge to or learn from the person performing an activity inside. In *How can we Make Sandton a Lighter Space?* The author wrote “When a pedestrian approaches a transparent façade (active façade) they are naturally invited to look into the building and they start to understand the function and activities occurring within the structure. In this same way, someone looking out of a building can start to engage with the street edge and notice the movement happening outside. Without any transparency to see out into the public realm, someone inside a building can start to feel quite trapped no matter what floor they find themselves on. These two groups of people start to form a relationship and then can begin to influence one another’s activities.” (Bozzonetti, 2015. p. 6) A successfully transparent façade or street edge can encourage a person to encounter a building such that they may end up standing, sitting or performing some activity in front of it (Bozzonetti, 2015).

### Accessibility

Public space as a constructed environment is manifested into public access. By making a building publicly accessible, one is making that building more inviting and attractive to the passer-by. The most common reason for people to socialise is for trade, trade along the streets is a form of public space as a constructed environment that encourages social engagement and exchange (Hertzberger, 2009).

Public accessibility of private space is at it’s strongest and most efficient when a building can imply an expansion of the public world into the building. By making the entrance a more gradual experience through perforations and transparency, the hard barrier between public and private that can usually be found is now blurred.

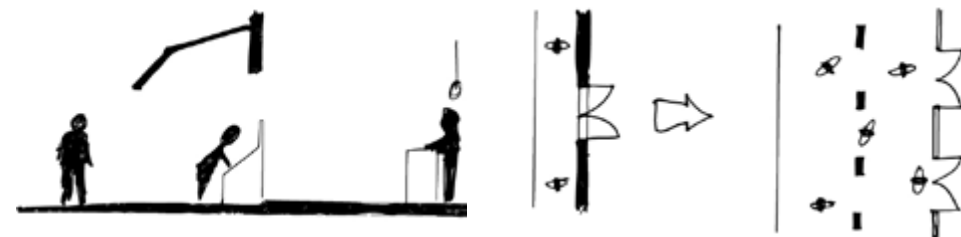


FIG 114. Illustration of public accessibility of private space. (Bozzonetti, 2016)

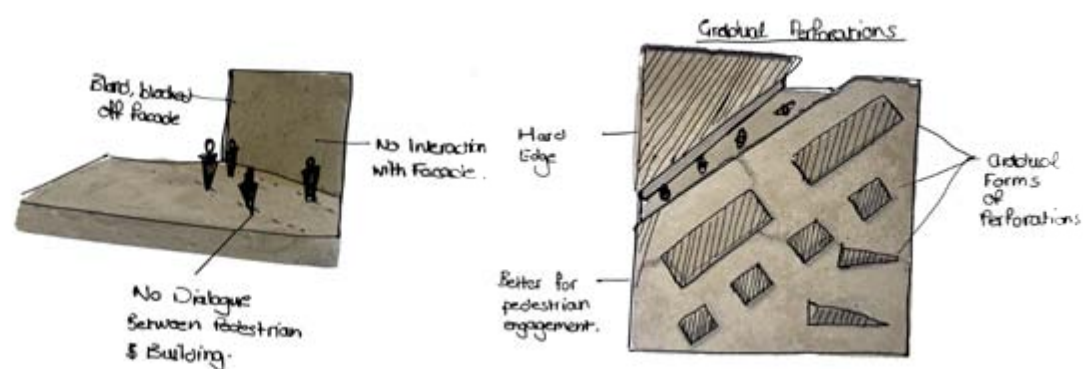


FIG 115. Illustration on photographs of Charrette models showing degrees of perforation. (Bozzonetti, 2016)

### Form and Materiality

In this case, exposing the soft interior from a hard exterior relates to exposing the structure of the building in certain areas such that the construction of the building becomes easy to understand. To achieve this, the building will need to incorporate simple construction methods and the layering of the façade so that each layer can be peeled away to reveal the inner-workings of the building.

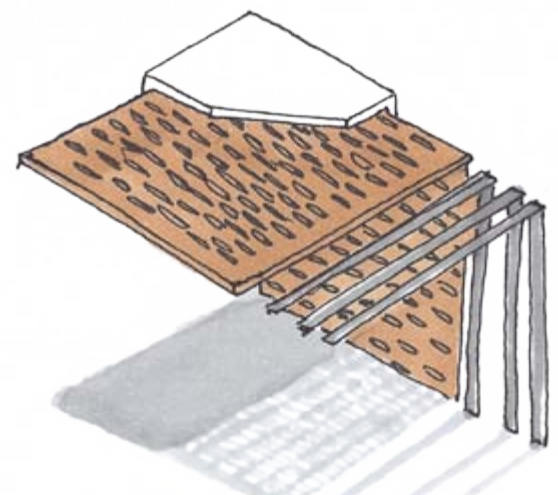
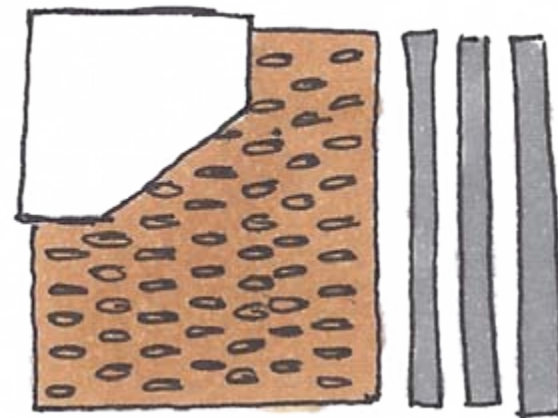


FIG 116. Illustration of concept of exposing soft interior from hard exterior. (Bozzonetti, 2016)

# CHARRETTE INVESTIGATIONS

## Network



FIG 117. Illustration on photograph showing the layering of the online network and built network. (Bozzonetti, 2016)

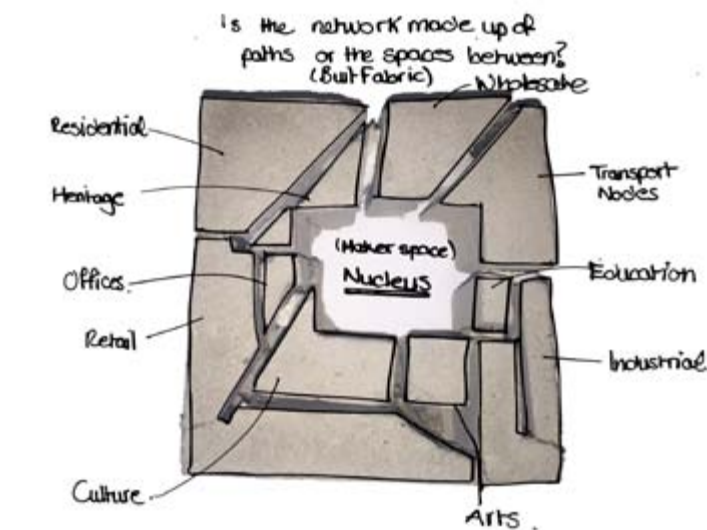


FIG 118. Illustration on photograph trying to define a network. (Bozzonetti, 2016)

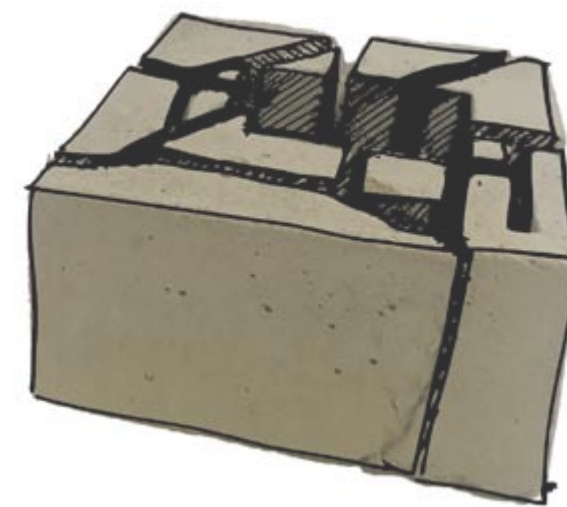
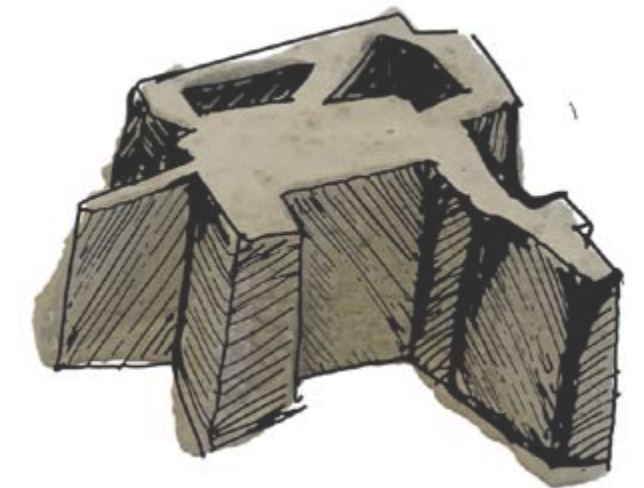


FIG 119. Illustration on photograph of concrete Charrette models massing positive and negatives space as inverses of themselves. (Bozzonetti, 2016)

V S



These are conceptual models that investigate solid and void. The process involved the making of models that are inverses of each other and taking notice of what kind of spaces and interactions are created between positive and negative. The investigation led to the asking of the question is the solid mass the network or is it the spaces and functions that occur in between the masses what makes up the network. This investigation led to the choice of using the spaces between the built fabric, or the negative spaces, as the network. These spaces will be where activity occurs, and people interact with each other both physically and visually. It is also where the makerspace activities start to connect with the pedestrian, and a dialogue starts to occur. These negative spaces must be suitable for a variety of activities, ranging from something very personal, quiet and where someone can watch a spectacle to something where lots of people are involved, and the activity becomes the spectacle.



# PROGRAMME MASSING

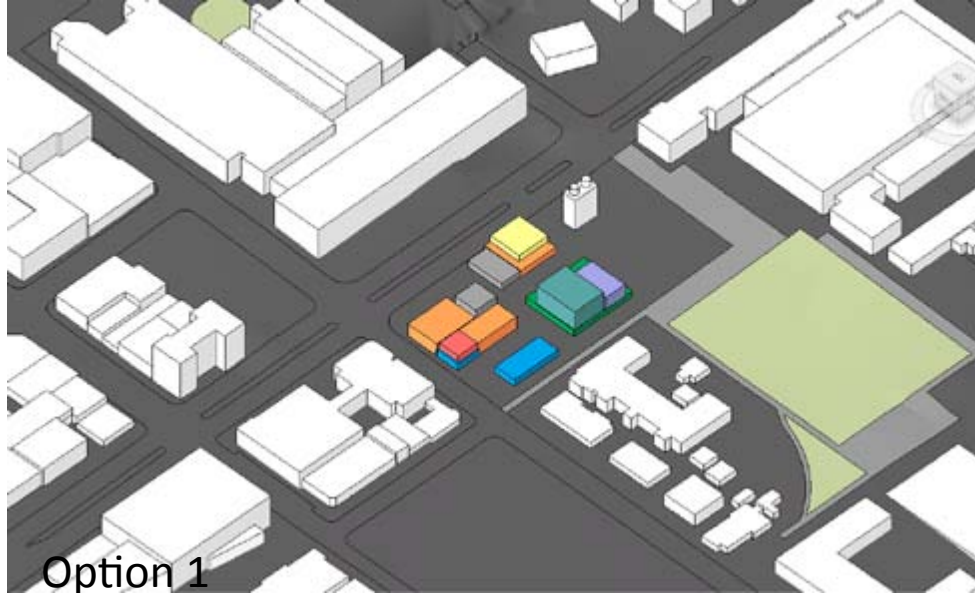
Entrance  
and  
Exhibition

Workshops,  
Labs and  
Studios

Classrooms

Offices

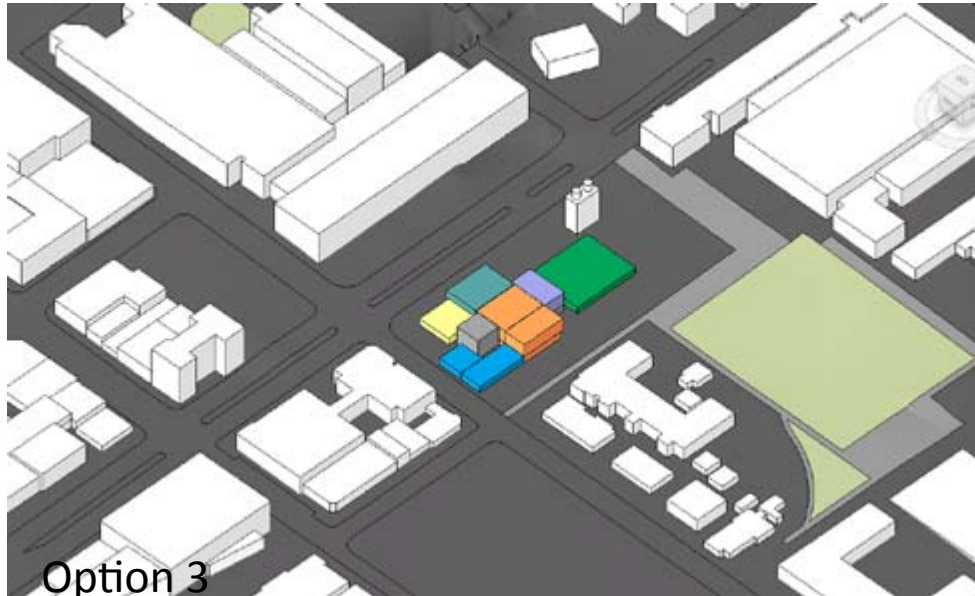
FIG 120. Model massing of Option 1. (Bozzonetti, 2016)



## Option 1

This option is permeable; one can walk through the display, labs and entrance; the workshop can be seen from the street and the market is well-positioned. The library, however, is not in the right position to serve all the makers and the access to it, and the classrooms is a problem.

FIG 122. Model massing of Option 3. (Bozzonetti, 2016)



## Option 3

The corner entrance and display/exhibition take advantage of the corner. The studios not being along the street is better regarding safety, and the office is also less accessible to the public. This configuration is very closed off with no perforation, and the library is too far from the labs. The classrooms along the street edge could have a noise problem.

Services  
and  
Storage

Market

Common  
Room

Libraries

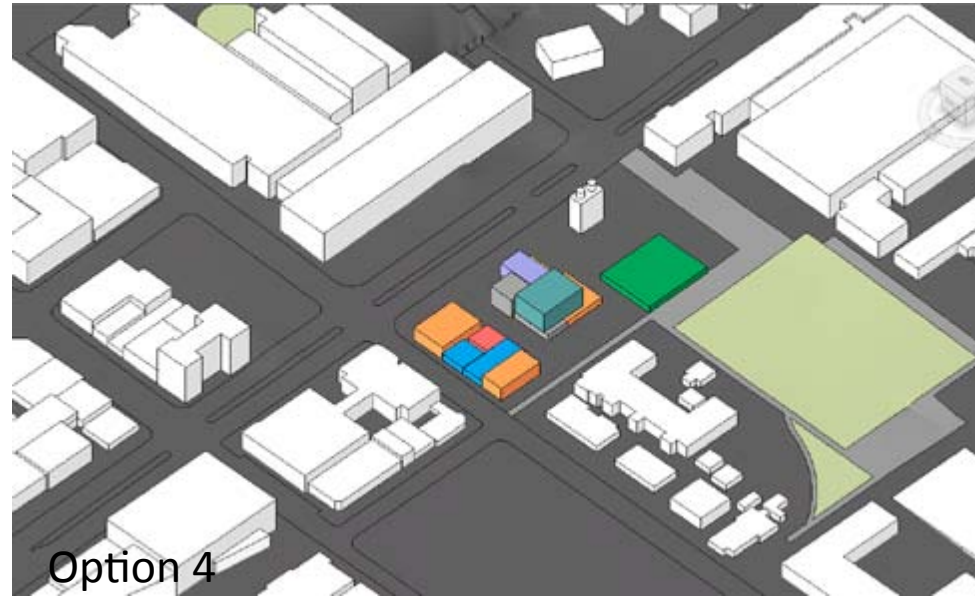
FIG 121. Model massing of Option 2. (Bozzonetti, 2016)



## Option 2

The studios being above the entrance is good to restrict access. The common room is too disconnected, and the library should be more accessible to the other workshops. The offices are too accessible.

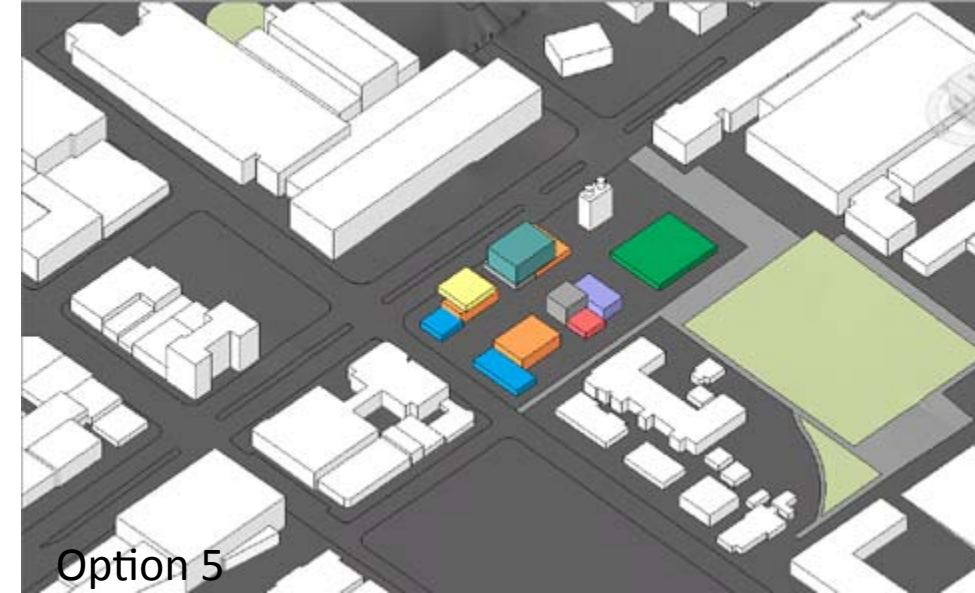
FIG 123. Model massing of Option 4. (Bozzonetti, 2016)



## Option 4

This configuration is perforated which is suitable for public access. The market can extend into the park should it need the space and school looking onto the park allows for a more appropriate learning environment. The library, however, is still too far from the labs and the studios are now too accessible to the public. The services should be internalised.

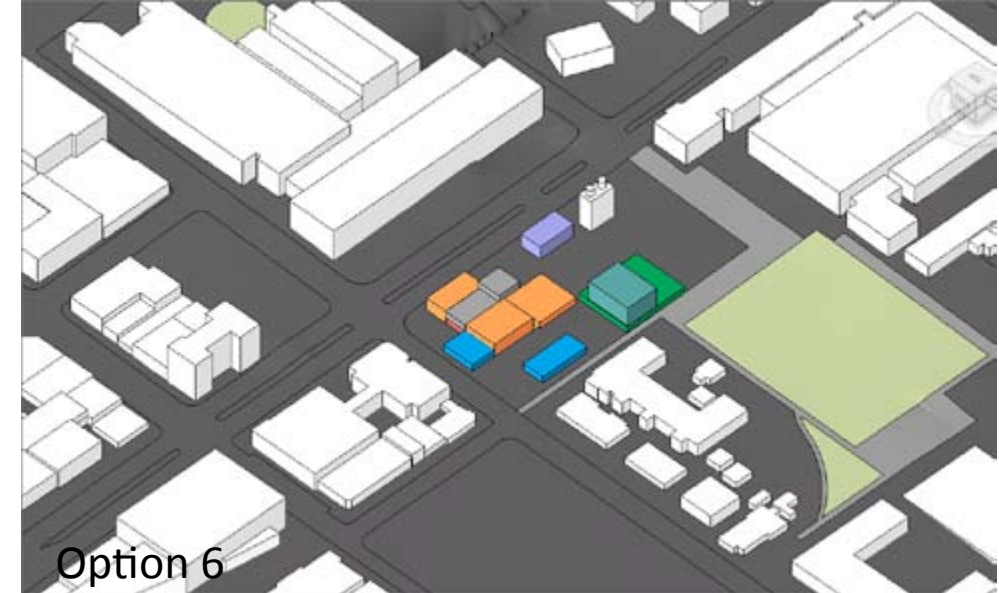
FIG 124. Model massing of Option 5. (Bozzonetti, 2016)



## Option 5

The entrance is very visible, and the lab facing the workshop allows for an interesting dynamic between the two. The library being located above the lab works well. The common room is now too far away from where the makers will be, and the services again need to be internalised. The offices and the studios are now too accessible, and the storage is too far from the lab and workshop.

FIG 125. Model massing of Option 6. (Bozzonetti, 2016)



## Option 6

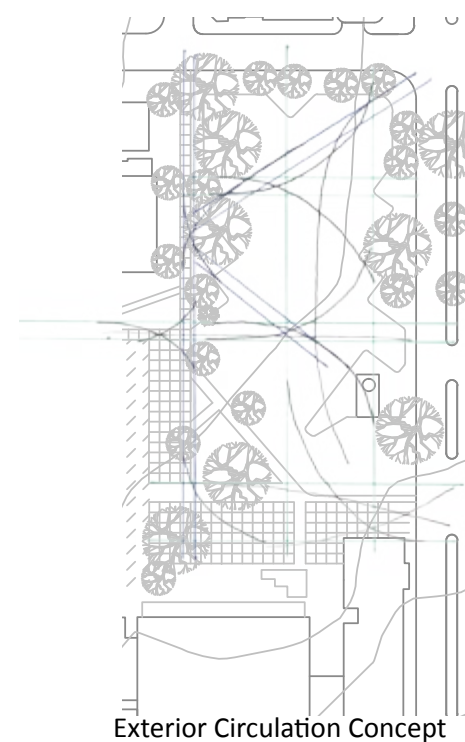
This option is permeable, and one can walk through the exhibition and display. The studios and offices are private, and the services have been internalised. The common room is now closer to the labs and workshops which can be seen from the street.

Through carrying out this investigation, the resultant information was enough to build a guideline as to the massing of the building. The design should be permeable so that the circulation runs through spaces, encouraging the public to engage with the private and the promote the transfer of information between the two realms. A corner entrance would be in keeping with the celebration of the city corner in Johannesburg and would draw in people travelling in more than one direction. The market space should face Newtown park so that if there is a need for expansion, the park can be utilised. The classrooms should be located on the South side of the site because it is quiet and because of its relation to the SciBono Discovery Centre. Making the workshop visible from the street allows for the pedestrian to connect both physically and visually with the activities inside of the building. The storage needs to be next to or inside the workshop spaces. Office spaces need to be kept separate from the workshops to ensure the space is quiet and more private. The online library would be best located near to the workshops but still kept separate such that it is more privatised. On the other hand, the tool library should be more publicly accessible so that local makers can make use of the facilities.



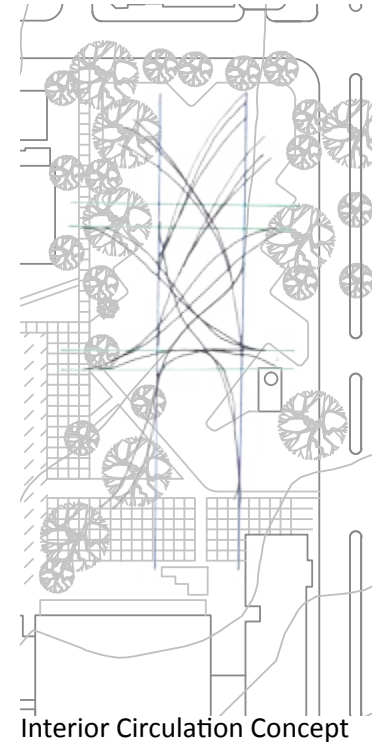
# CONCEPT DIAGRAMS

FIG 126. Illustration of Exterior Circulation Concept. (Bozzonetti, 2016)



Exterior Circulation Concept

FIG 127. Illustration of Interior Circulation Concept. (Bozzonetti, 2016)



Interior Circulation Concept

## Circulation

Through observation of the site, there was an existing circulation pattern through the site. To try and incorporate this pattern into the new design an exterior and interior circulation concept was formulated. The current circulation involved activity between North and South on the Western edge of the site and also between West and East wherever there were gaps for pedestrian movement. The exterior circulation concept sees people travelling between North and South along the Western edge of the site, and between West and East along the North edge, South edge and in the middle of the site. The interior circulation concept was designed such that two main circulation paths are running between North and South and within these paths, people cross between West and East.

## Central Social Hub

A design approach discussed previously was the idea of exposing a soft core from a hard exterior. As a concept for the central social hub of the building, investigations were conducted as to the connection between the hard outer skin and the soft interior core, whether they should be kept separate and allow for circulation between them or if they should start to attach to one another.

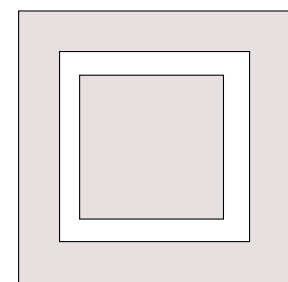
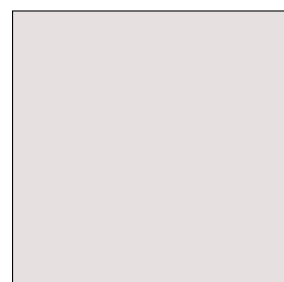
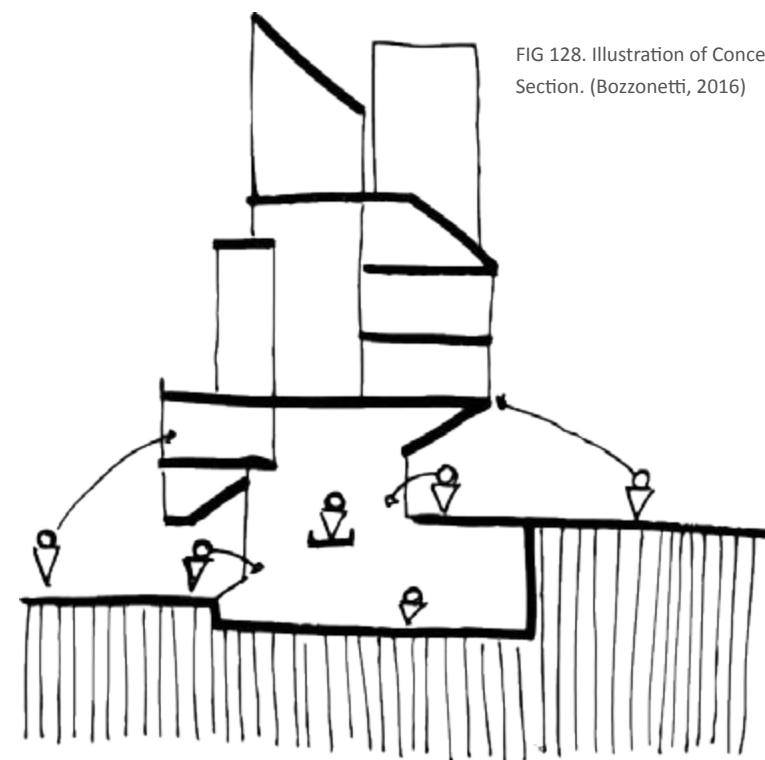
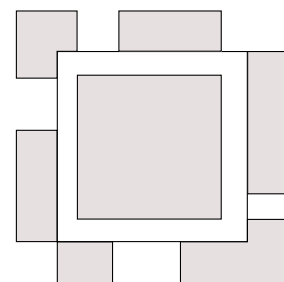
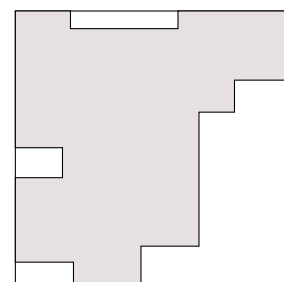


FIG 129. Illustration of Central Social Hub Investigation. (Bozzonetti, 2016)



Concept Section

## Concept Section

The concept behind the section was the idea of a central social hub of activity from which program extruded. There was also the idea that people could see into this hub from the street and could also see up to the rest of the program so that pedestrians begin to engage visually with the building and the activities happening within it.

FIG 128. Illustration of Concept Section. (Bozzonetti, 2016)

# MODEL INVESTIGATIONS

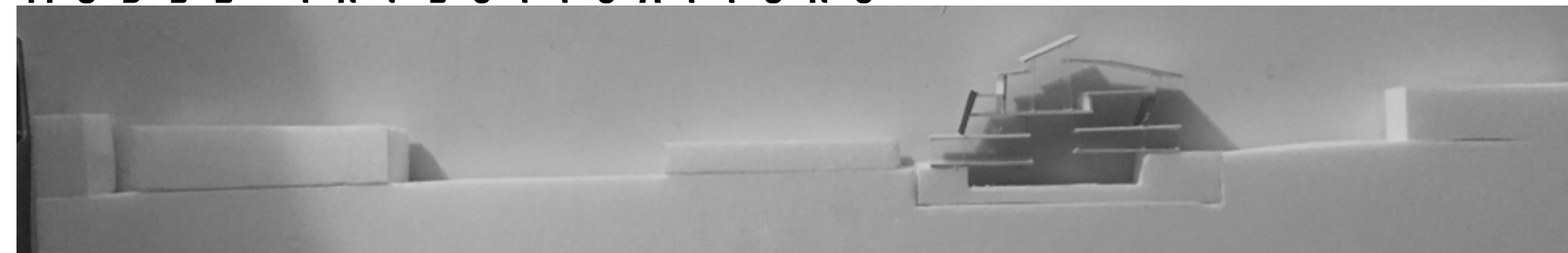


FIG 130. Photograph of Section Investigation Option 1. (Bozzonetti, 2016)

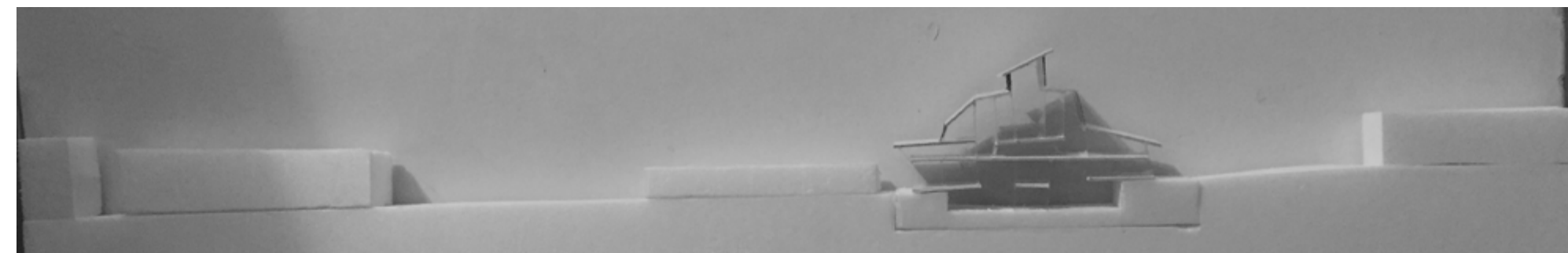


FIG 131. Photograph of Section Investigation Option 2. (Bozzonetti, 2016)



FIG 132. Photograph of Section Investigation Option 3. (Bozzonetti, 2016)



FIG 133. Photograph of Section Investigation Option 4. (Bozzonetti, 2016)



FIG 134. Photograph of Section Investigation Option 5. (Bozzonetti, 2016)



# MODEL INVESTIGATIONS

## The Section

These sectional models were carried out to define an approach to the section design of the building and see what connections were made with the site. A section through the site was built, and various sectional models were placed in this model to determine the buildings possible interactions with the surrounding buildings and the highway.

## Central Hub

A central core that connects the various programs and ties the building together. It could be solid or void.

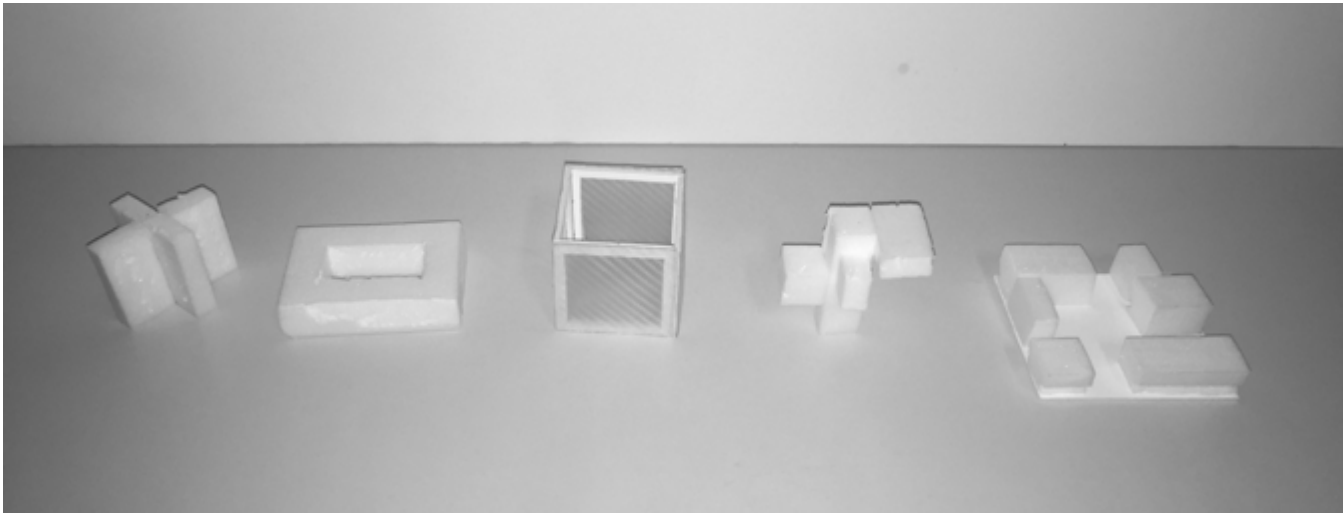


FIG 135. Photograph of Central Hub Model Investigation. (Bozzonetti, 2016)

## The Corner

The corner as an advertisement for the building and as an access point.



FIG 136. Photograph of Corner Model Investigation. (Bozzonetti, 2016)

## Hierarchy

The hierarchy of spaces and volumes maker interesting visual opportunities.

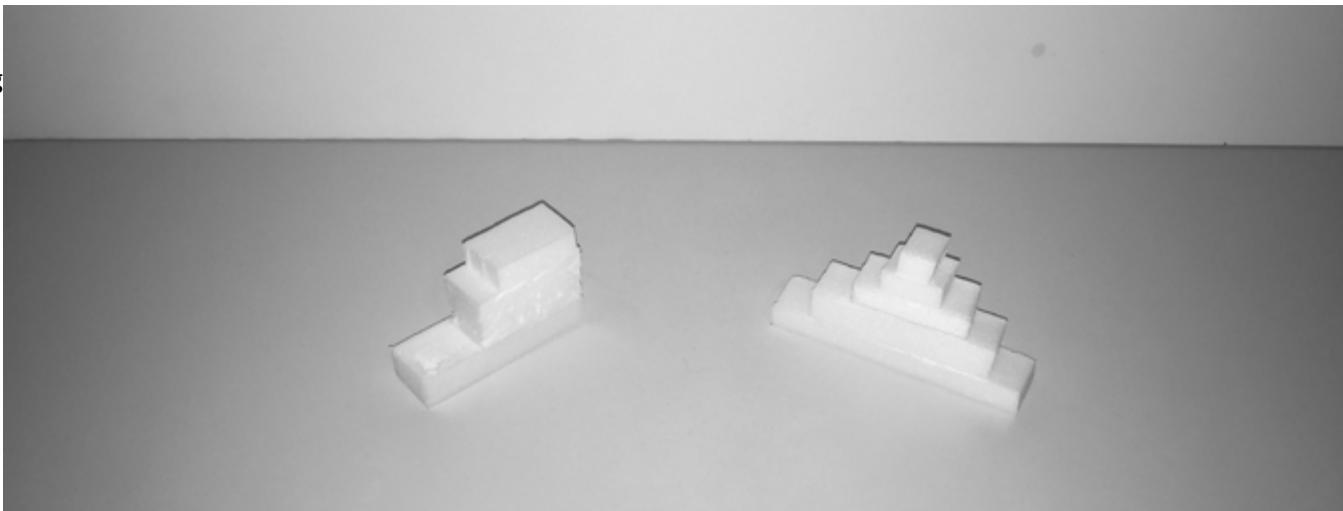


FIG 137. Photograph of Hierarchy Model Investigation. (Bozzonetti, 2016)

## Open Ground Floor

An open ground floor makes the building more perforated and more approachable to the pedestrian.

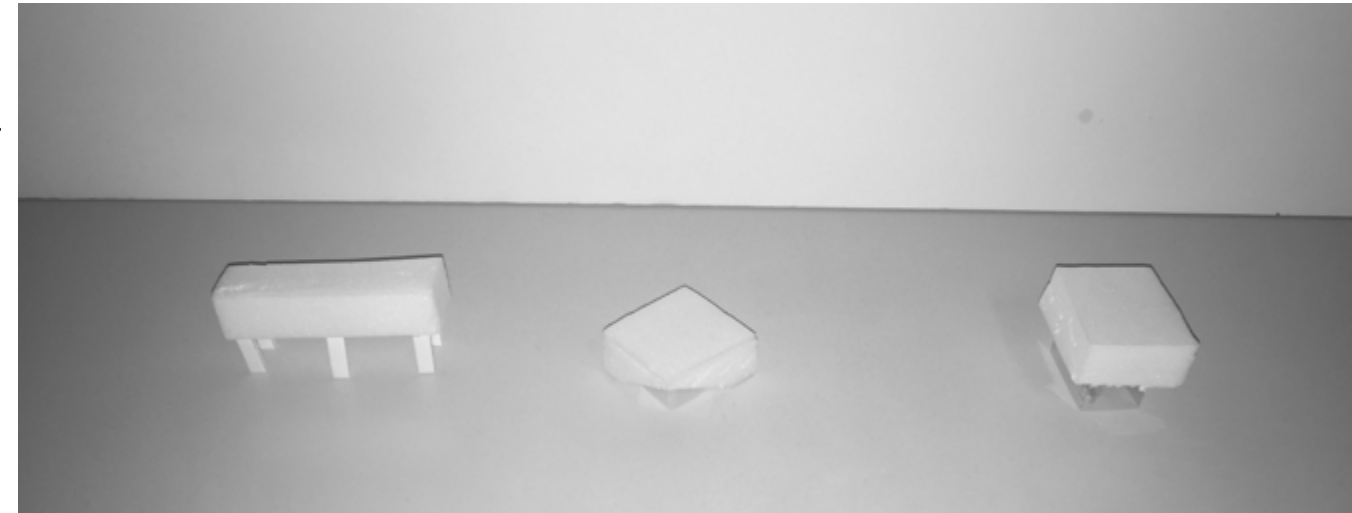


FIG 138. Photograph of Open Ground Floor Model Investigation. (Bozzonetti, 2016)

## The Circulation Spine

The circulation spine as a continuous path of movement running throughout the building considering how it announces itself as the main path of movement.

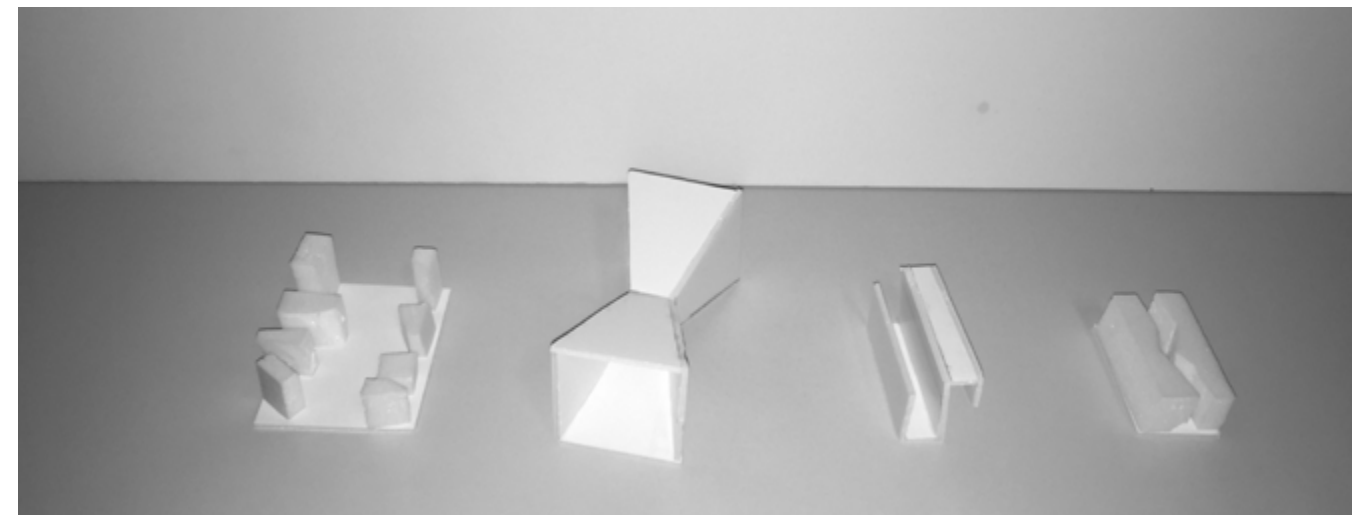


FIG 139. Photograph of Circulation Spine Model Investigation. (Bozzonetti, 2016)

## Transparency

Different degrees of transparency to make a more gradual transition from public and private.

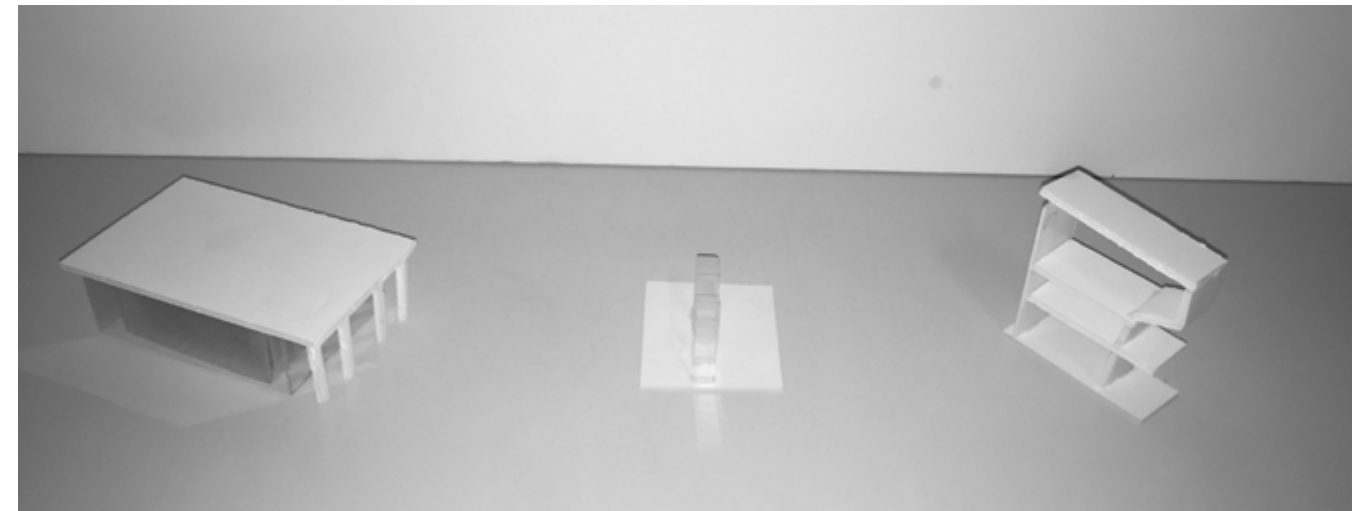


FIG 140. Photograph of Transparency Model Investigation. (Bozzonetti, 2016)



# SKETCH DESIGN

The first sketch design phase involved the massing of program, the design of connections between the program and the basic approach to volume and form.

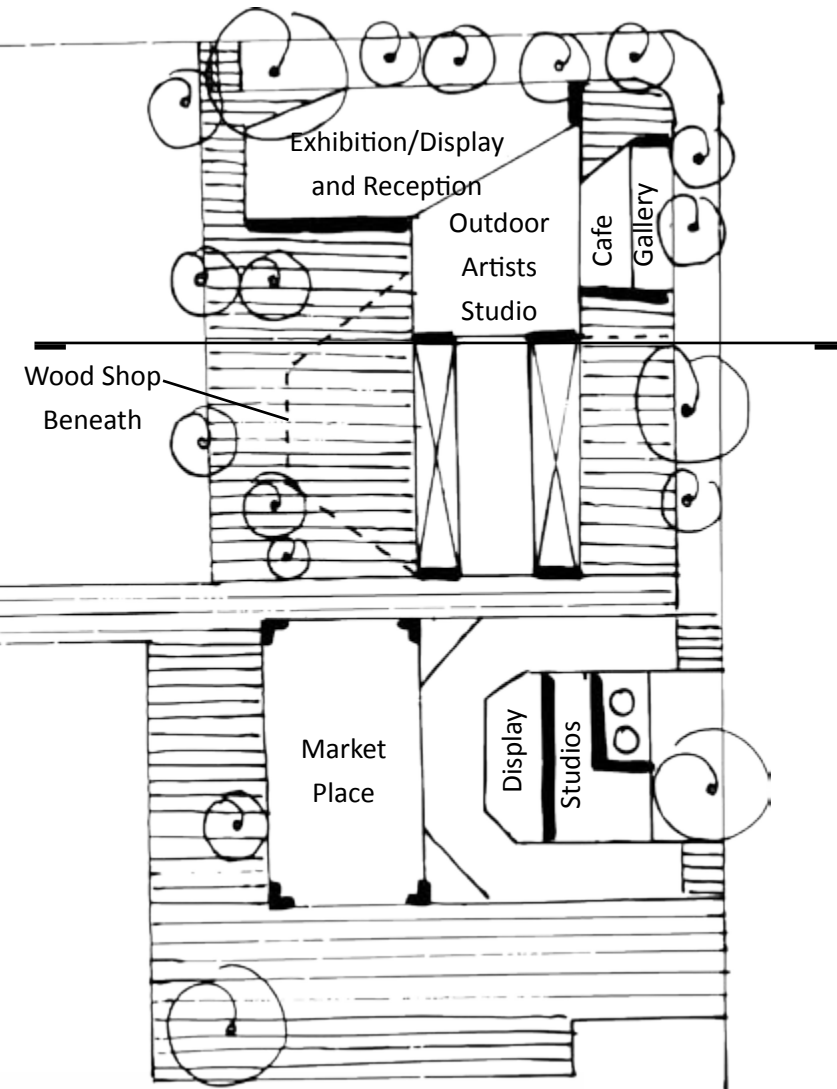


FIG 141. Sketch Design Ground Floor Plan. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

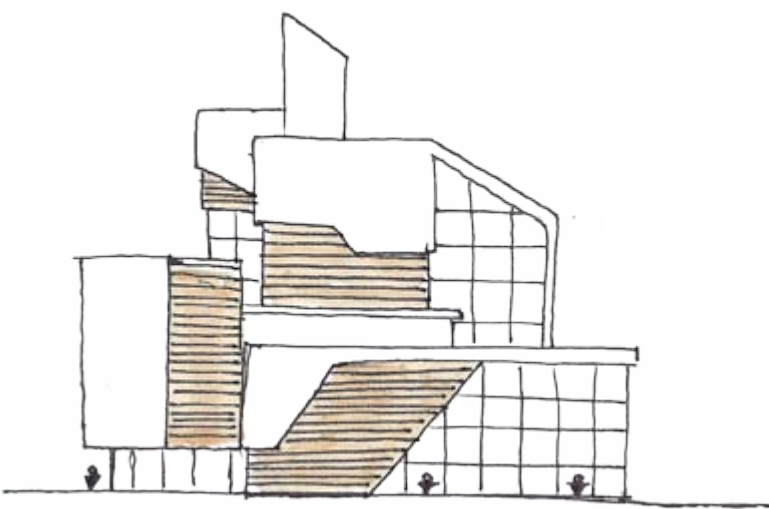


FIG 143. Sketch Design North Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

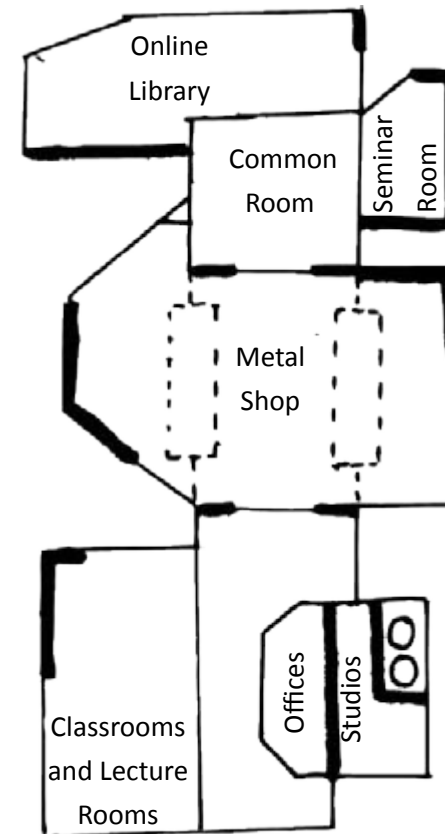


FIG 142. Sketch Design First Floor Plan. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

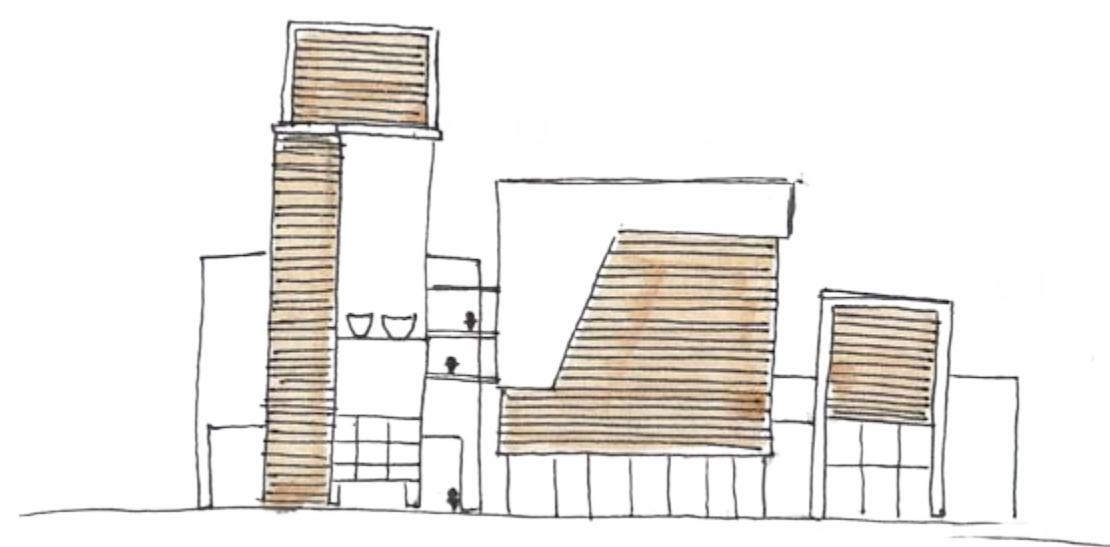


FIG 144. Sketch Design East Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

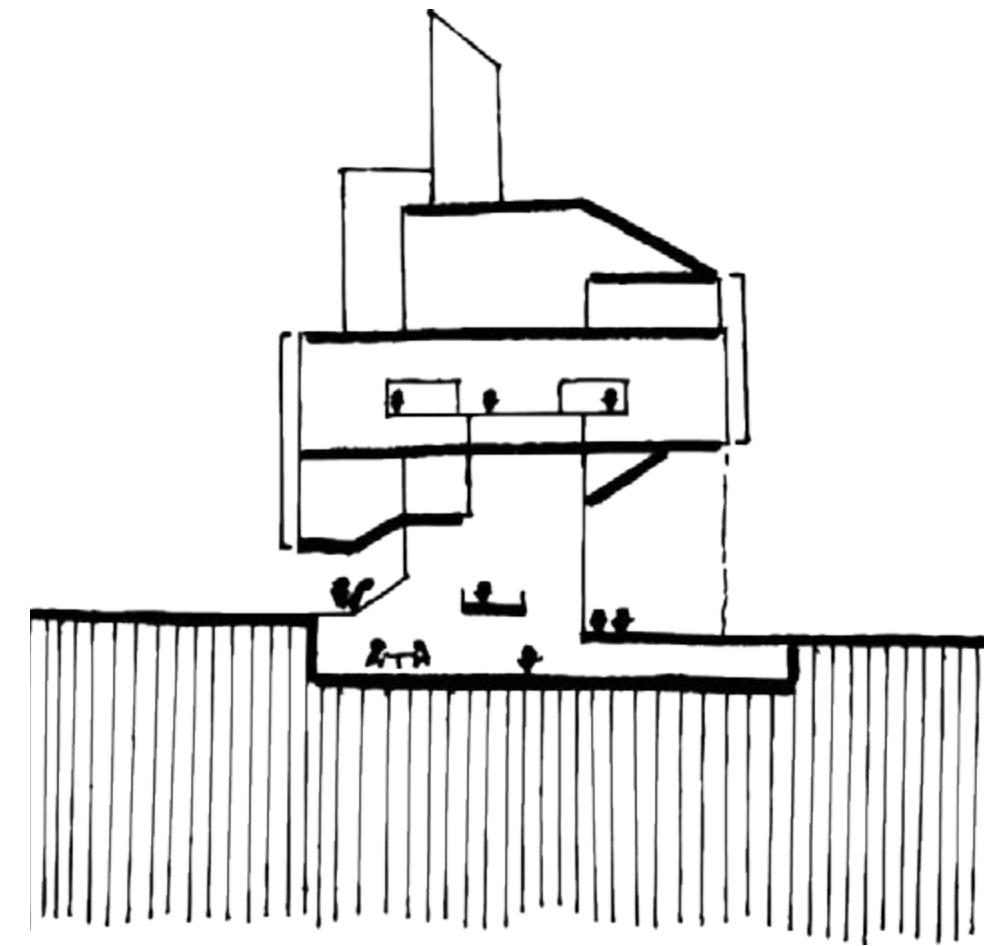


FIG 145. Sketch Design Section 1. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

The main circulation is concentrated in the middle of the building between North and South to tie all of the program together. Exhibitions, displays and a printing gallery along the street edge aim to engage with the public and draw them in. The entrance path leads into an outdoor artists studio where the public can sit amongst the artist and get coffee from the café that spills out on to it. The sunken workshop is visible from the interior circulation over the space and the exterior circulation along the street edge. A market space at the Southern End of the site spills out onto the park and can be used as an auditorium space for large functions in Newtown. There is also a drop off lane where children can be dropped off at the makerspace, facing another display to start engaging with the students. The existing Cool Factory on Site will be incorporated into the rentable studios.

The first Floor sees the inclusion of the libraries and common room. The idea is that there is another workshop at this level and various labs start popping out above it from the main circulation. Classrooms and Lecture Spaces sit on top of the market and display tower starts to incorporate offices and a radio station.

The section shows the idea of the sunken workshop and pedestrians ability to see into the makerspaces.

The elevations show the start of trying to work with the exposing what's beneath concept.

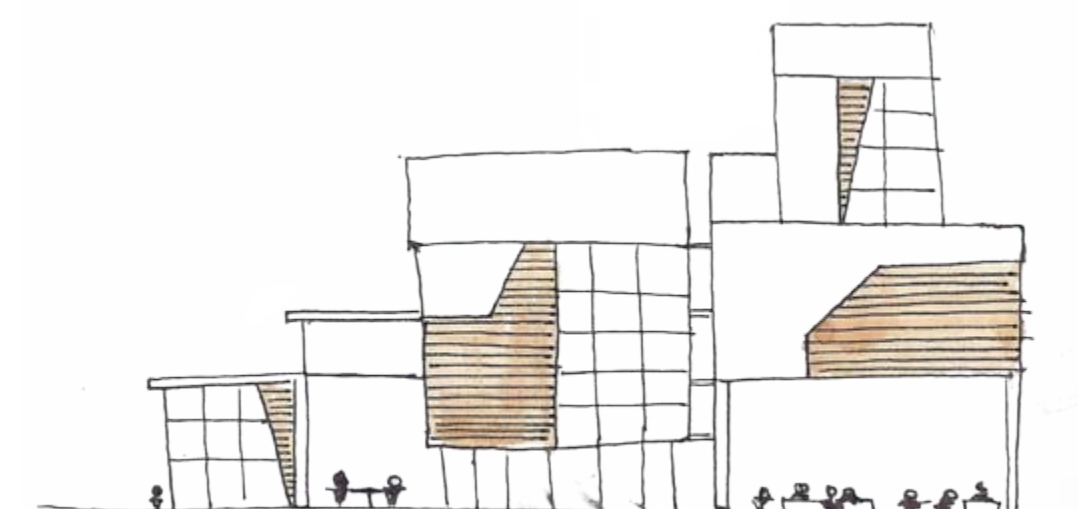


FIG 146. Sketch Design West Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

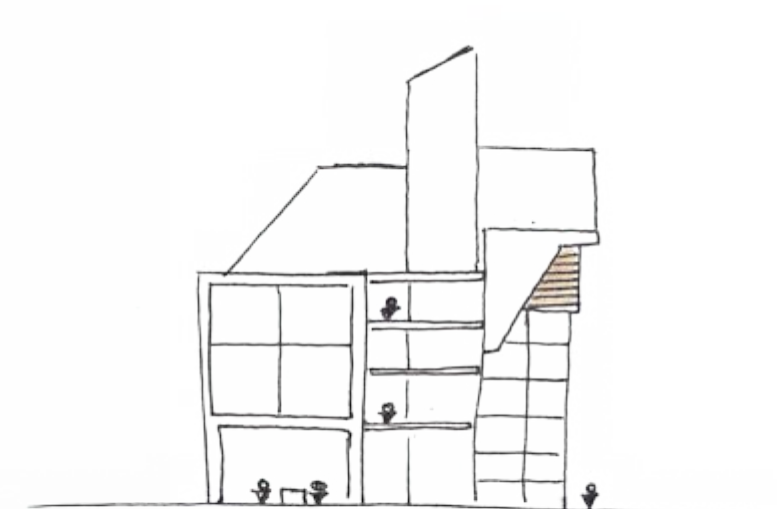


FIG 147. Sketch Design South Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m



# DESIGN APPROACH

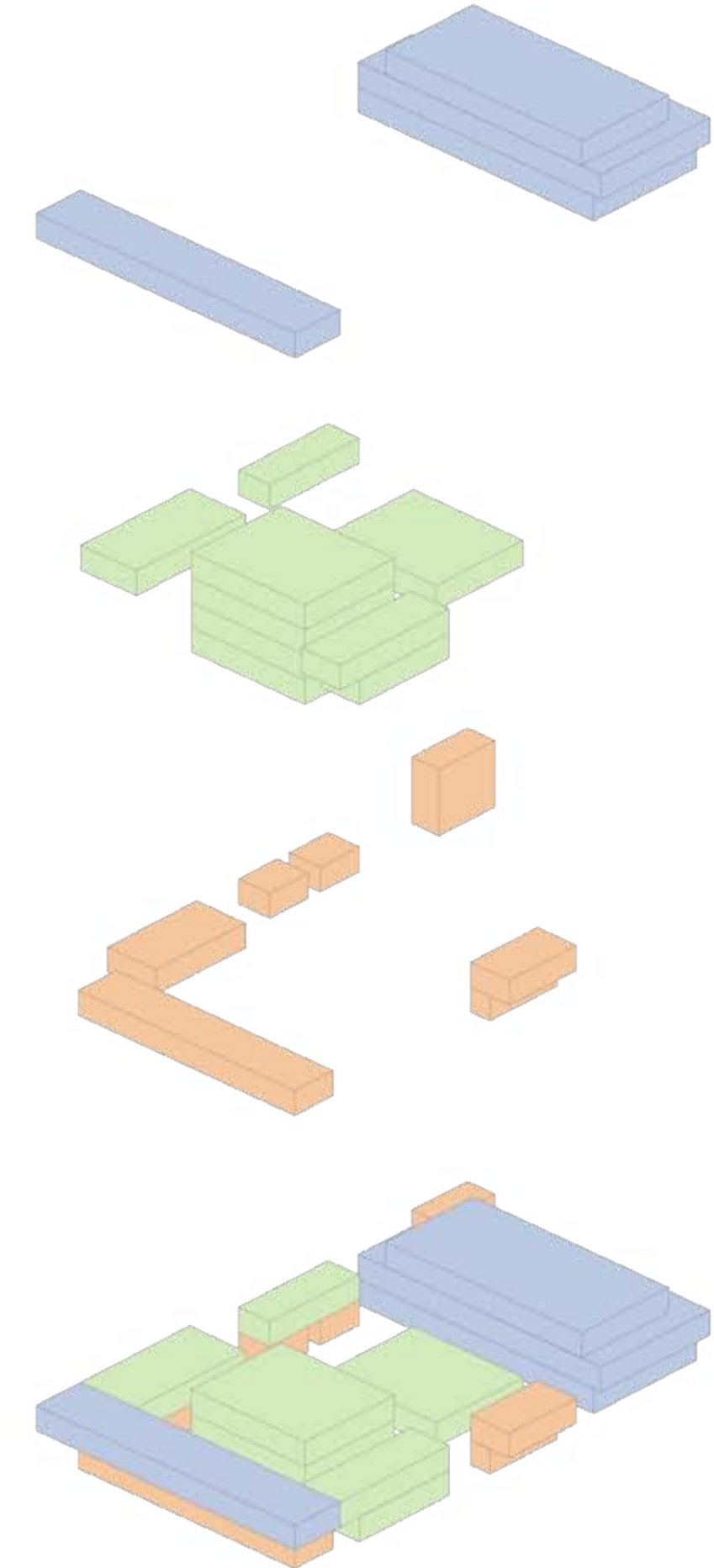


FIG 148. Programme Massing. (Bozzonetti, 2016)

## Approach to Programme Distribution

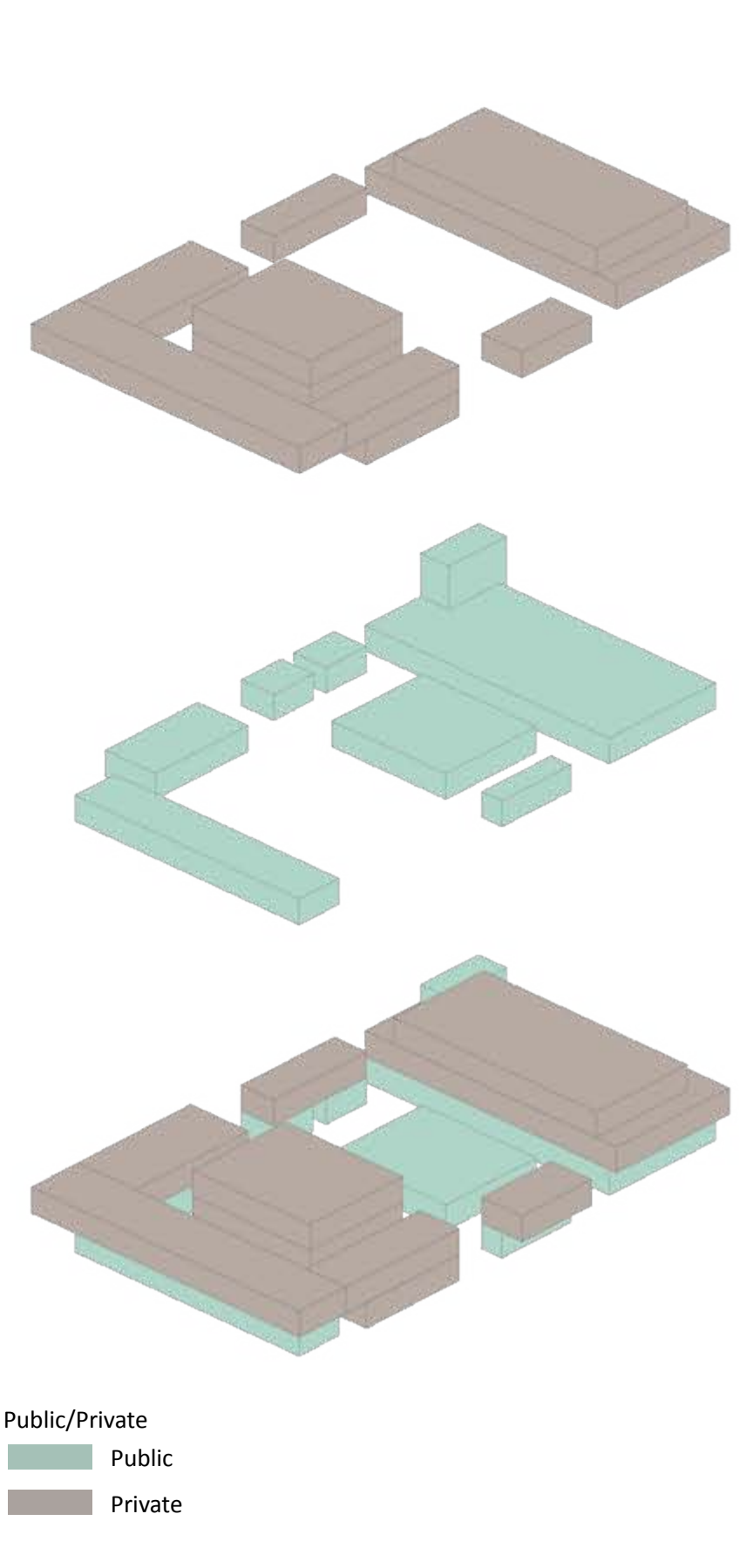
Program Breakdown

- Workshop and Labs
- Education Facilities
- Community Facilities

| Programme                                     | Total m <sup>2</sup>  |
|-----------------------------------------------|-----------------------|
| <strong>Workshop Spaces and Labs</strong>     |                       |
| Wood Shop                                     | 150                   |
| Metal Shop                                    | 150                   |
| Electronics Lab                               | 100                   |
| Digital Fabrication Lab                       | 100                   |
| 3D Fabrication Room                           | 100                   |
| Creative Arts Room                            | 100                   |
| Display/Exhibition                            | 100                   |
| Rental Studios (6 x 60m <sup>2</sup> )        | 360                   |
| <strong>Classrooms and Lecture Rooms</strong> |                       |
| Lecture Rooms (2 x 100m <sup>2</sup> )        | 200                   |
| Classroom (6 x 50m <sup>2</sup> )             | 300                   |
| Seminar Rooms (8 x 50m <sup>2</sup> )         | 400                   |
| <strong>Library Spaces</strong>               |                       |
| Digital Library                               | 150                   |
| Tool Library                                  | 75                    |
| <strong>Community Facilities</strong>         |                       |
| Entrance/Foyer                                | 75                    |
| Security Office                               | 50                    |
| Common Room                                   | 100                   |
| Market space (Including outdoor facilities)   | 750                   |
| <strong>Administration</strong>               |                       |
| Management Office                             | 50                    |
| Staff Offices (Open Plan)                     | 200                   |
| Staff Kitchen and Tea Kitchen                 | 100                   |
| <strong>Support Facilities</strong>           |                       |
| Personal Storage                              | 150                   |
| Storage                                       | 200                   |
| Service Plant Room                            | 200                   |
| Public Toilets                                | 100                   |
| Showers and Change Rooms                      | 50                    |
| <strong>Total</strong>                        | <strong>4310</strong> |

FIG 149. Table of Programme Area Breakdown. (Bozzonetti, 2016)

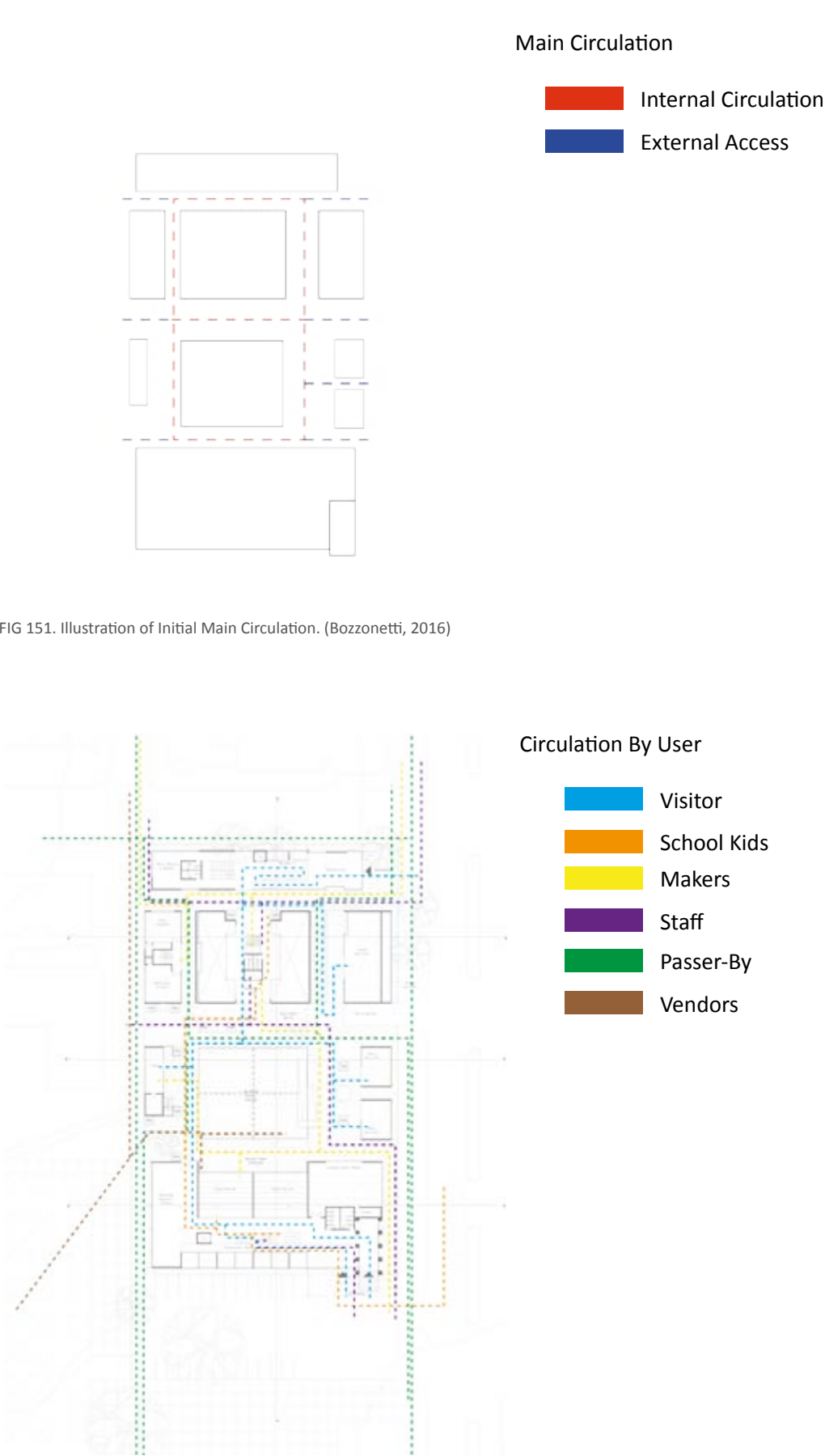
## Public and Private



- Public/Private
- Public
  - Private

FIG 150. Public and Private Massing. (Bozzonetti, 2016)

## Initial Circulation Approach



Main Circulation

- Internal Circulation
- External Access

FIG 151. Illustration of Initial Main Circulation. (Bozzonetti, 2016)

Circulation By User

- Visitor
- School Kids
- Makers
- Staff
- Passer-By
- Vendors

FIG 152. Illustration of Initial Circulation by User. (Bozzonetti, 2016)



DESIGN

DEVELOPMENT

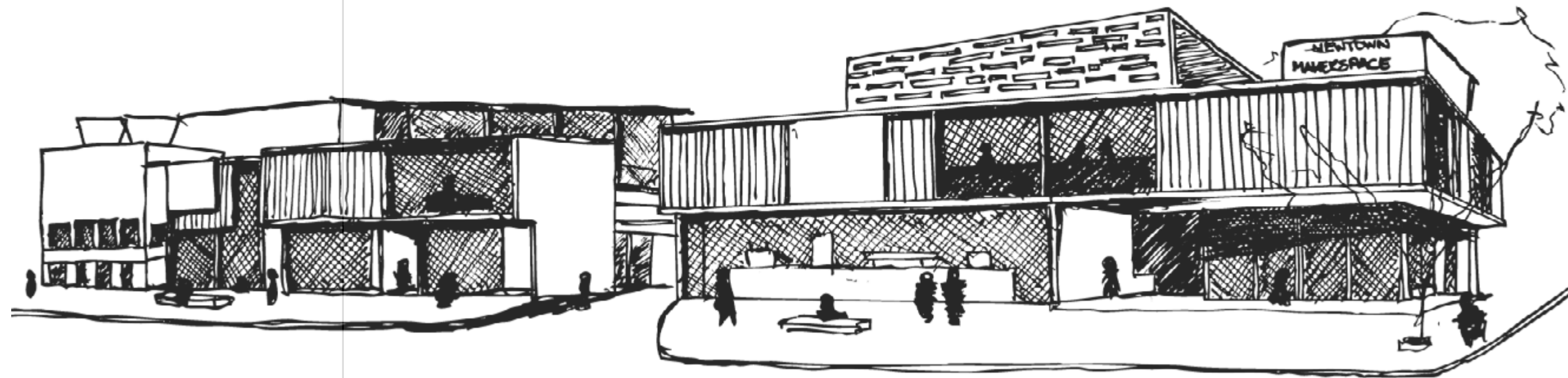


FIG 153. Sketch Perspective of Makerspace. (Bozzonetti, 2016)



# EARLY DESIGN PROPOSAL

During this phase of the design process, the building was drawn up on the computer and more detailed design was conducted. The set of drawings includes full floor plans, sections and elevations. In the feedback at this stage, questions arose about the height of the building, whether there should be more floors to take advantage of particular views, and what the building's relation was with the Cool Factory (the existing cooling tower on site). The planning of the building seemed to be on track and need to be further developed.

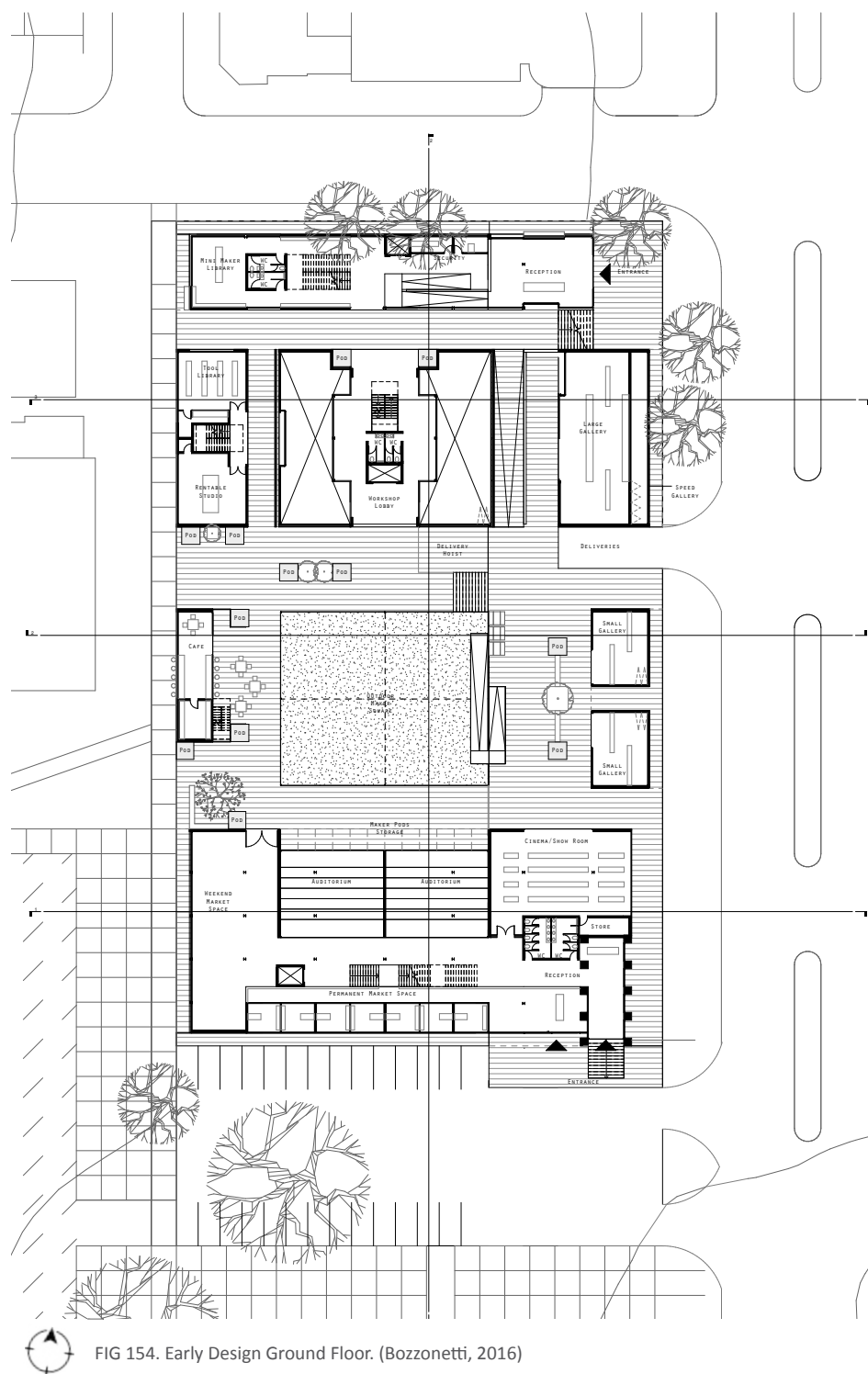


FIG 154. Early Design Ground Floor. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

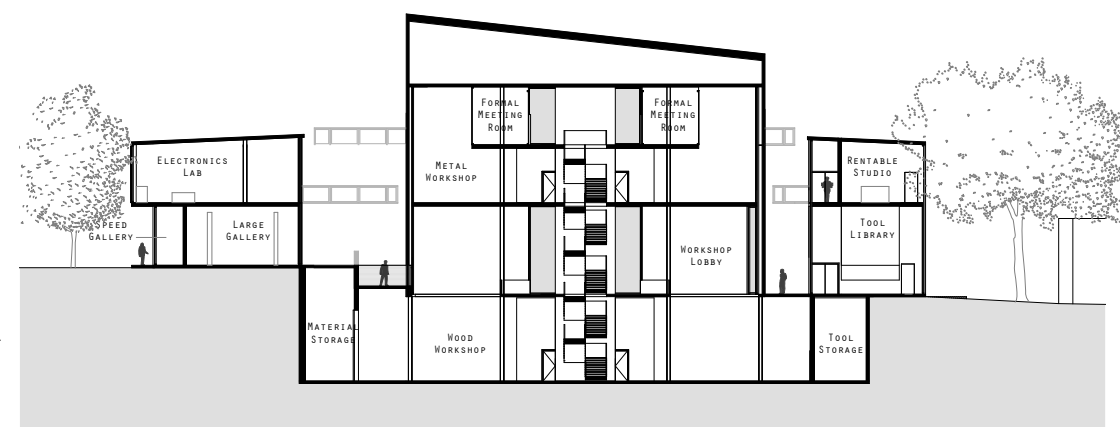


FIG 155. Early Design Section 3. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m



FIG 156. Early Design West Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m



FIG 157. Early Design North Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

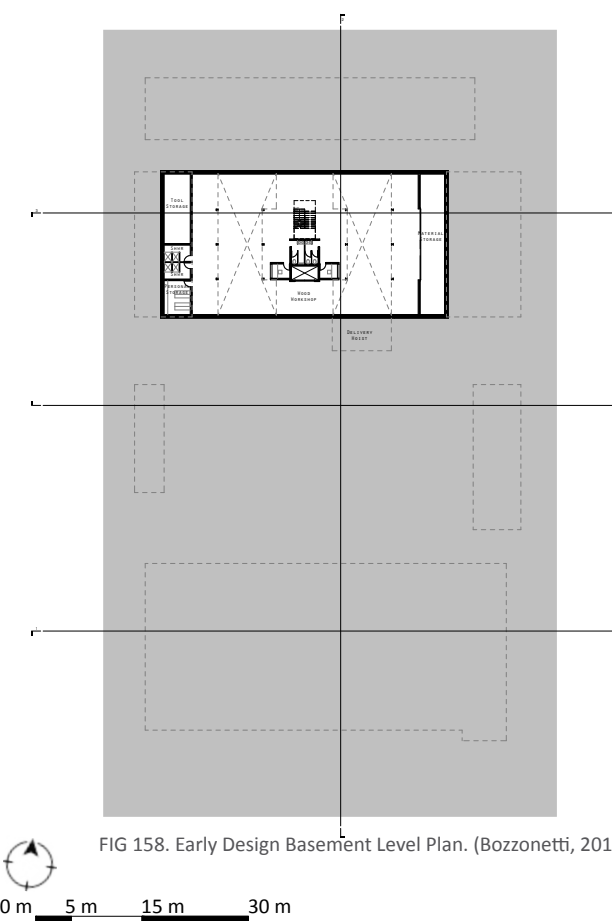


FIG 158. Early Design Basement Level Plan. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

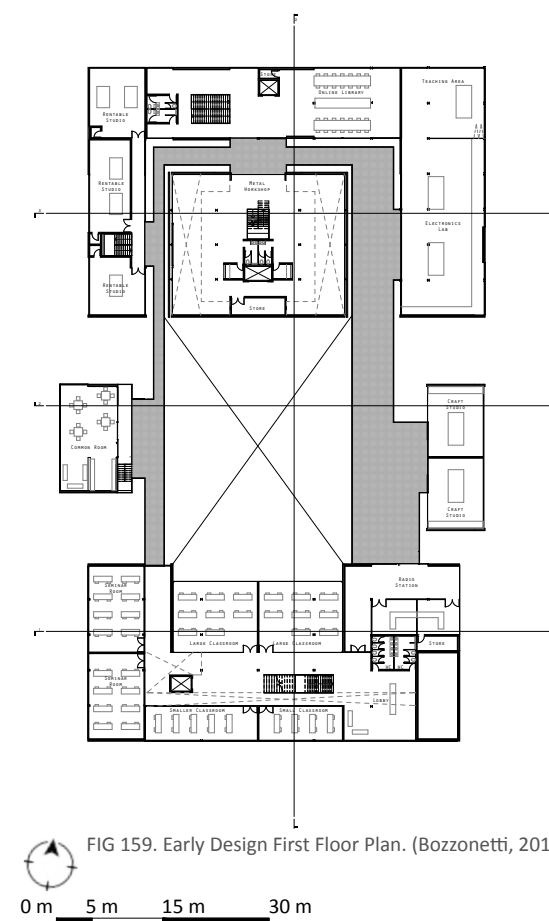


FIG 159. Early Design First Floor Plan. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

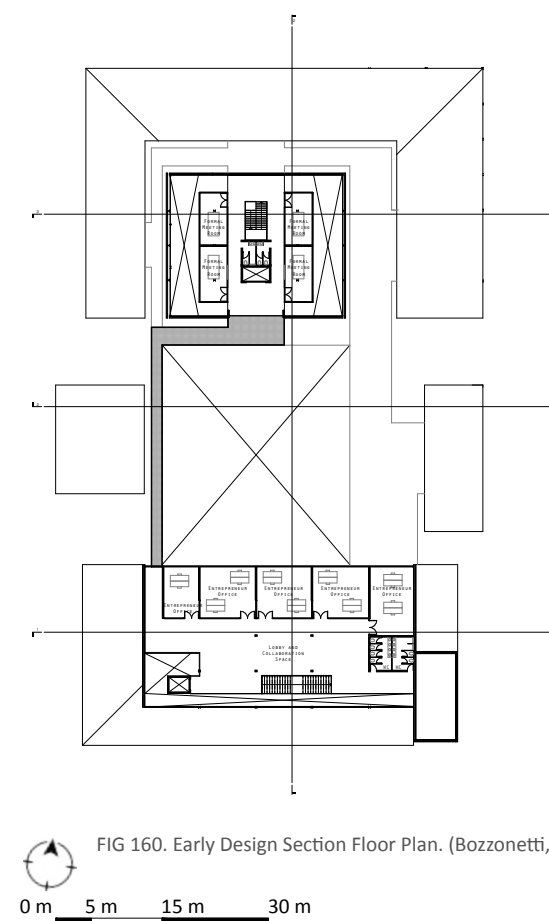


FIG 160. Early Design Section Floor Plan. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

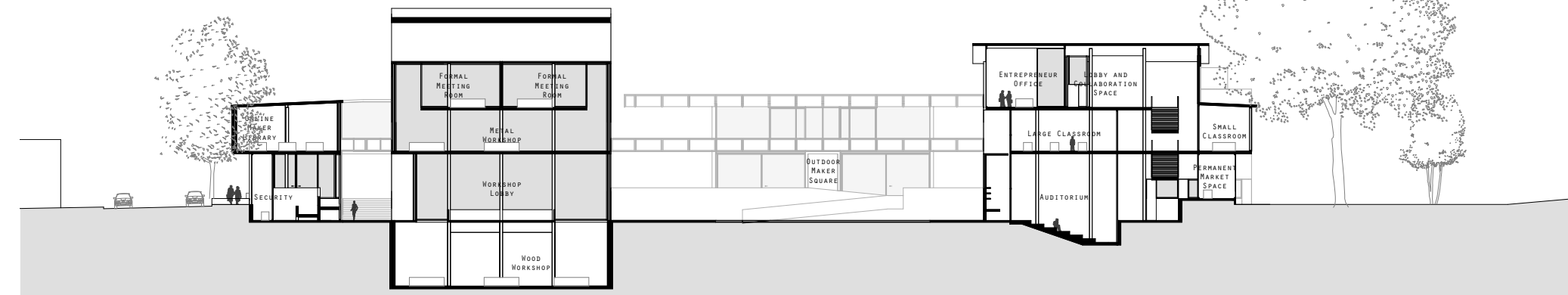


FIG 161. Early Design Section 2. (Bozzonetti, 2016)



FIG 162. Early Design Perspective Sketch of Southern Side of Building. (Bozzonetti, 2016)

Perspective Sketch of Eastern Side of Building.

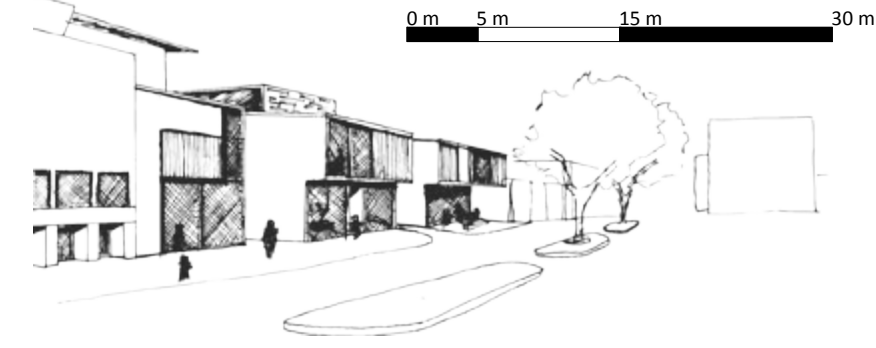


FIG 163. Early Design Perspective Sketch of South Eastern Side of Building. (Bozzonetti, 2016)

Perspective Sketch of South Eastern Side of Building.



## FINAL DESIGN

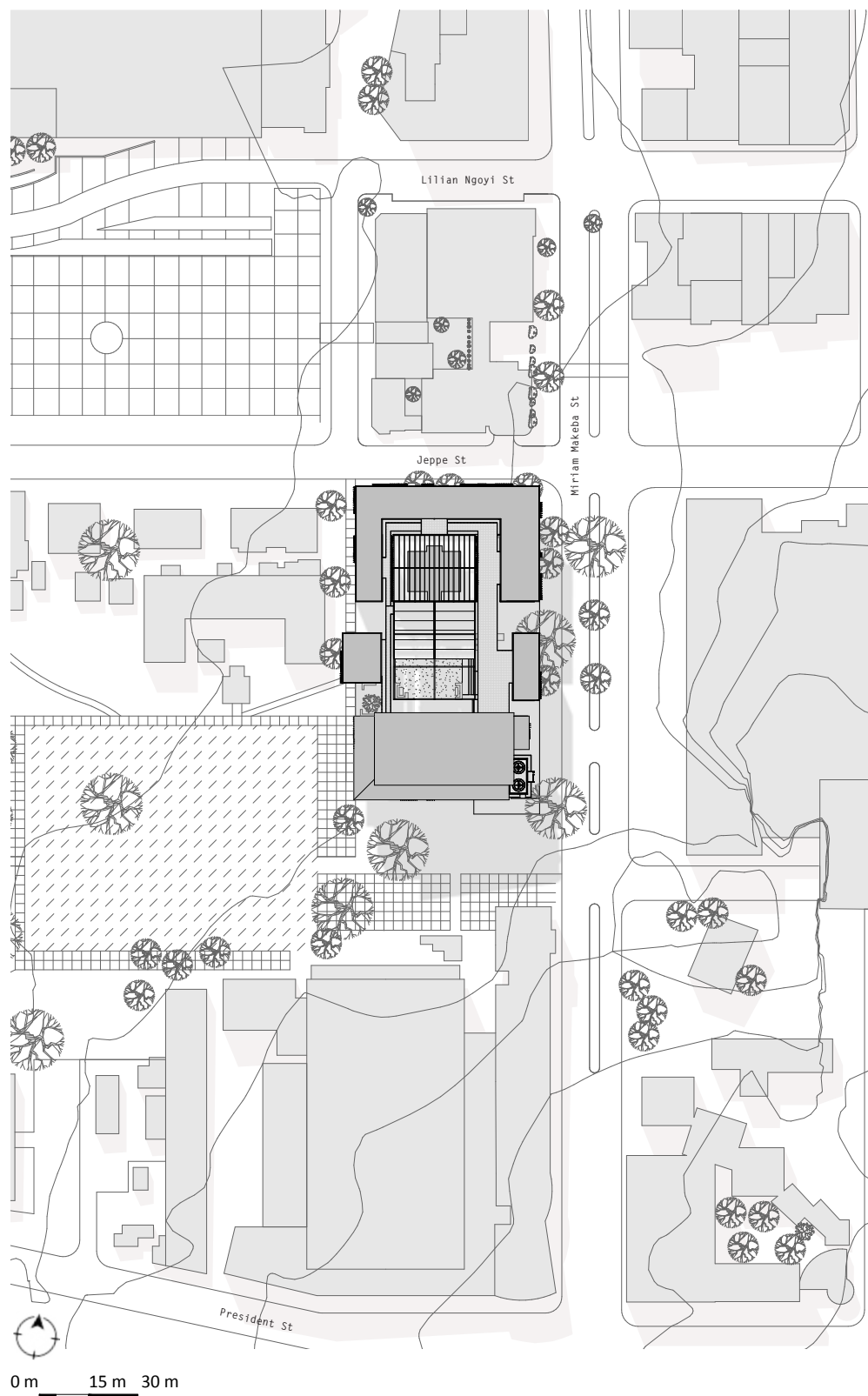


FIG 166. Site Plan. (Bozzonetti, 2016)



FIG 164. Internal Perspective Looking Shading Over Maker Square. (Bozzonetti, 2016)



FIG 165. Perspective of Maker Square. (Bozzonetti, 2016)

## PLANS

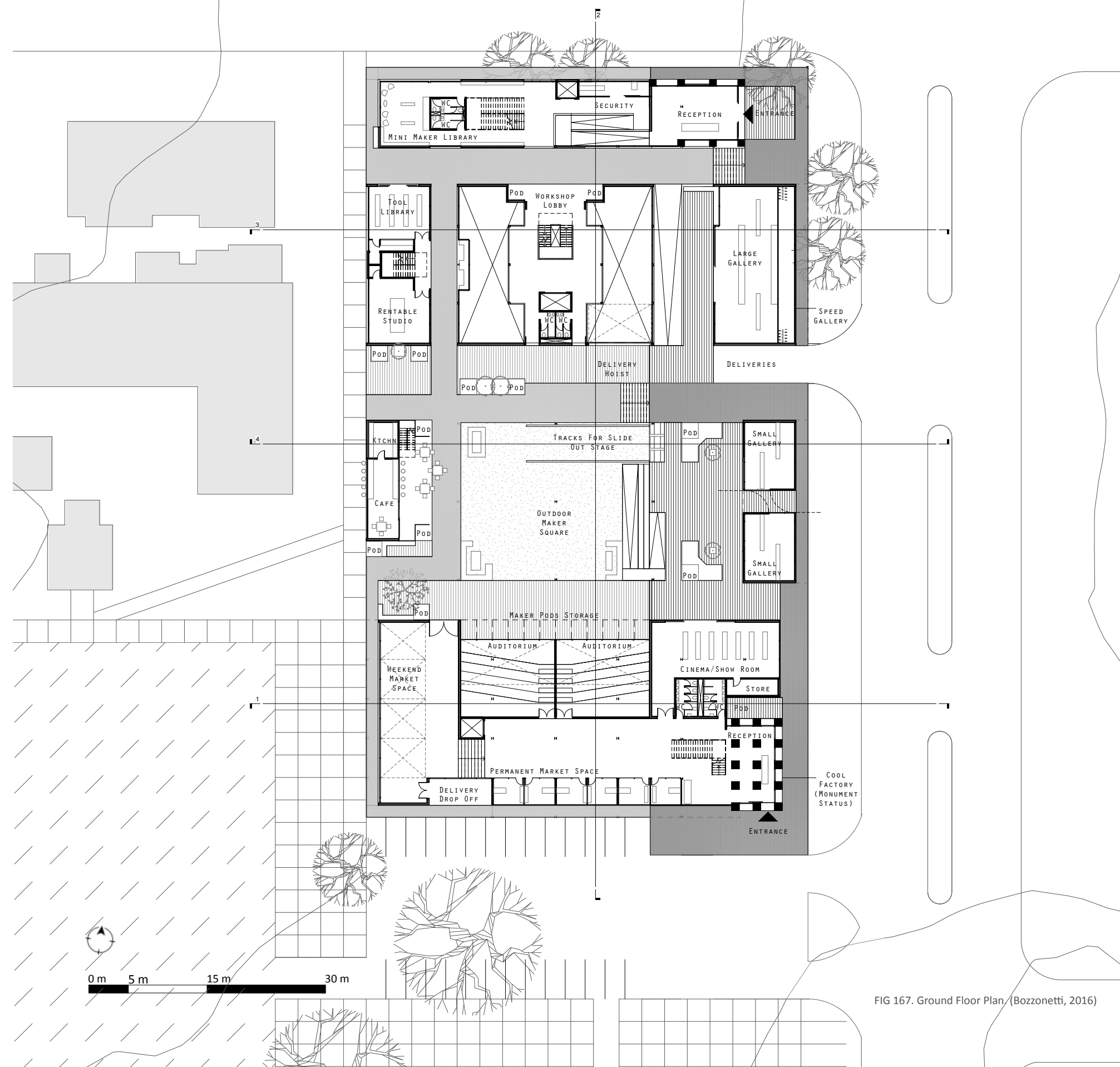


FIG 167. Ground Floor Plan. (Bozzonetti, 2016)



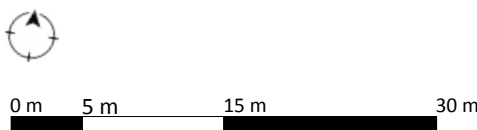
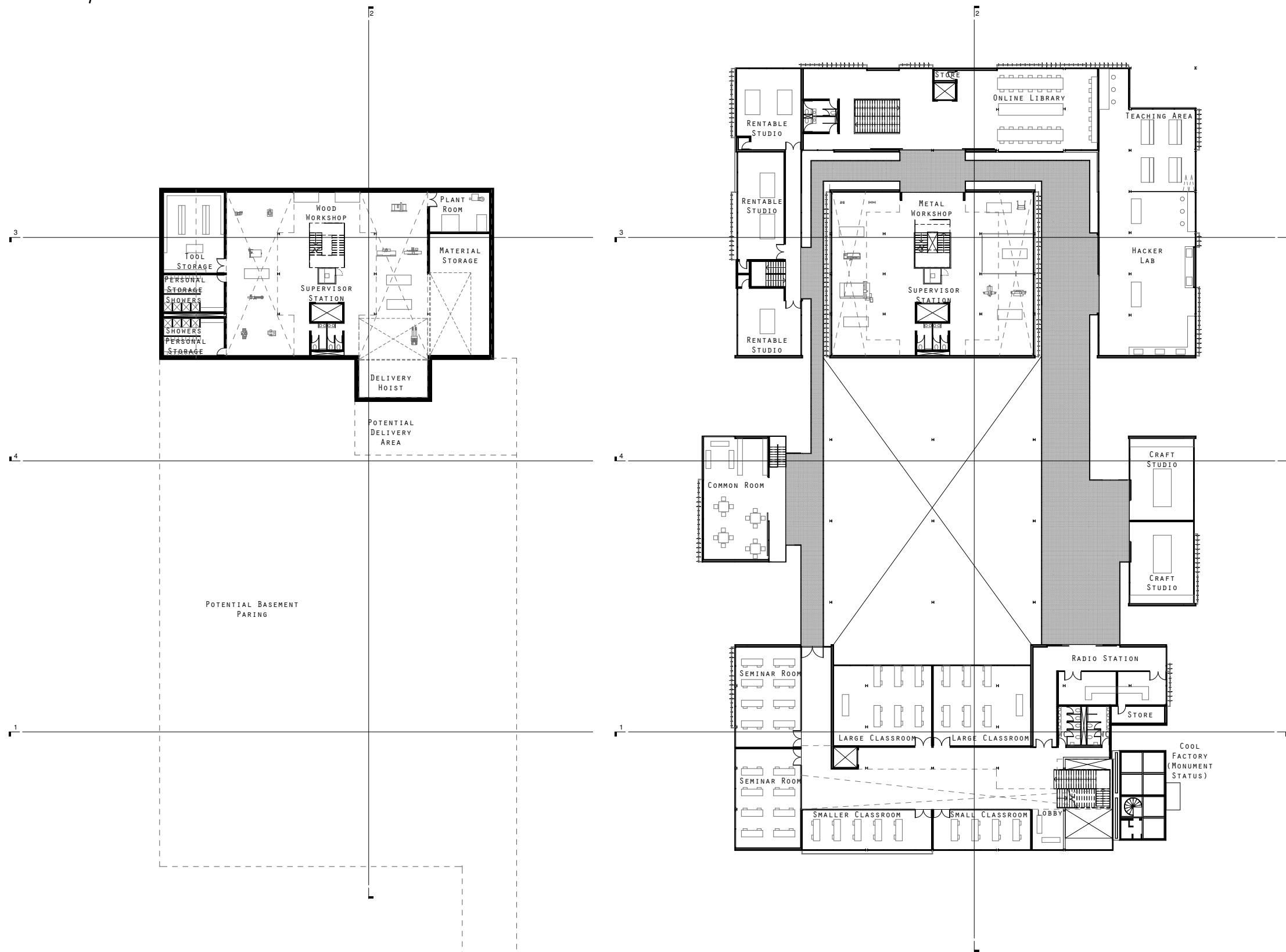


FIG 168. Basement Level Plan. (Bozzonetti, 2016)

POSSIBLE  
RAMP  
EXTENSIO  
N

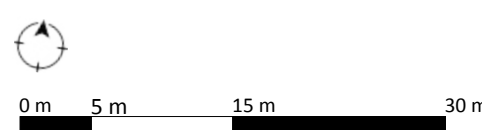
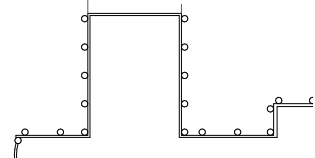


FIG 169. First Floor Plan. (Bozzonetti, 2016)

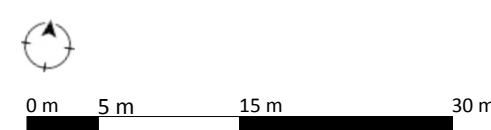
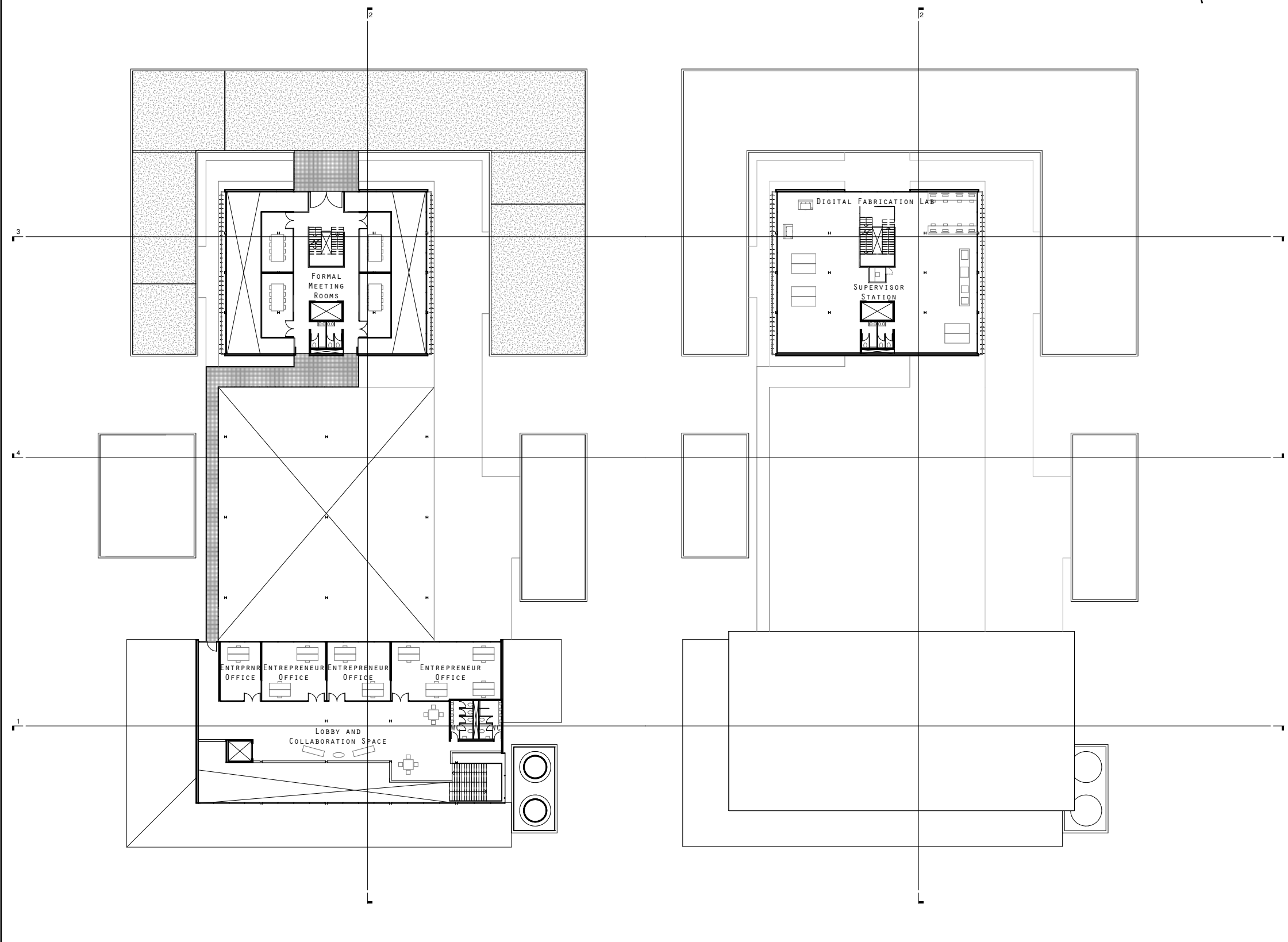
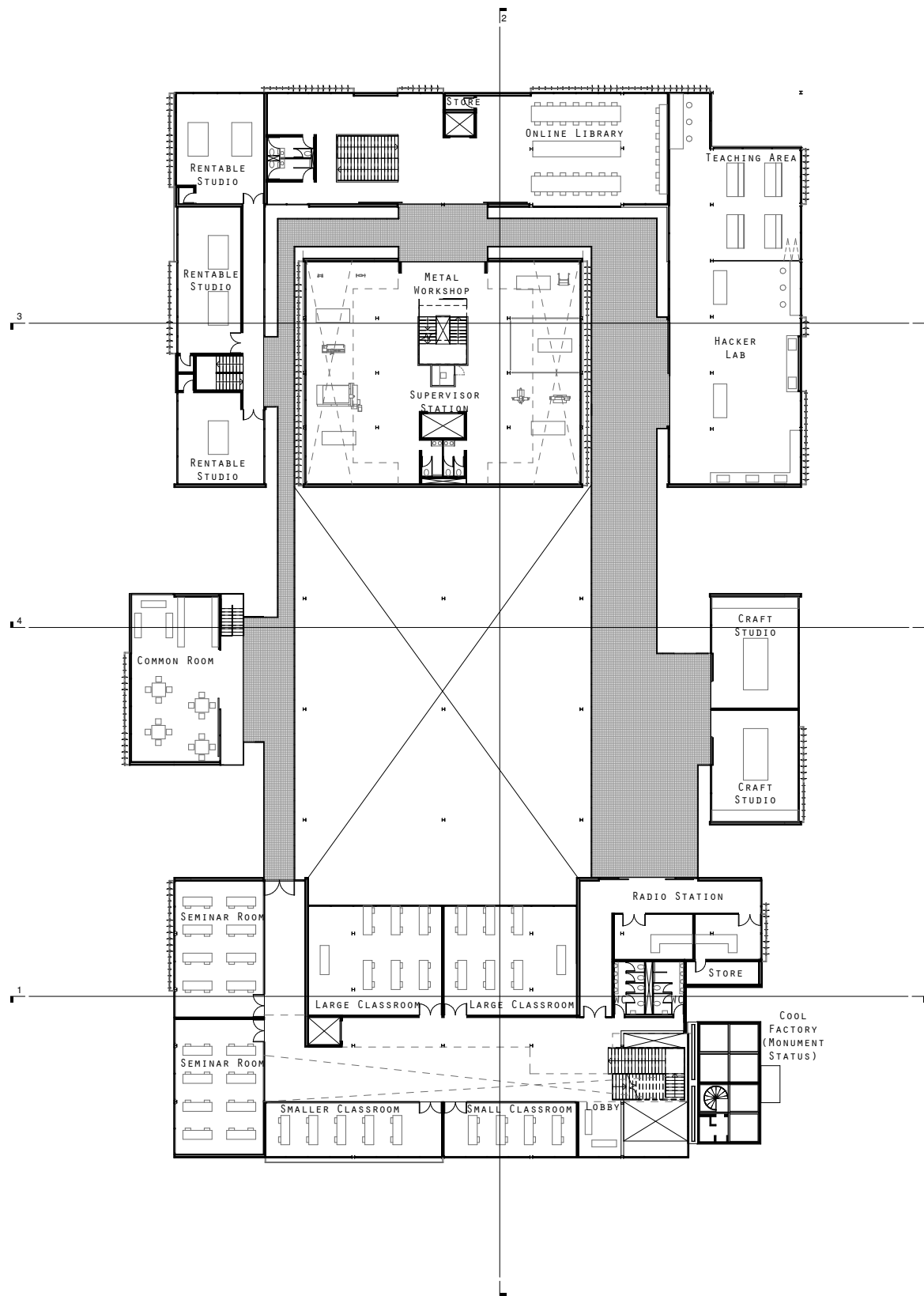


FIG 170. Second Floor Plan. (Bozzonetti, 2016)

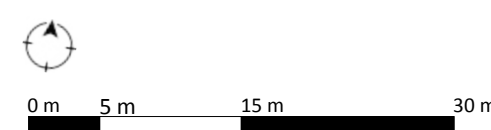


FIG 171. Third Floor Plan. (Bozzonetti, 2016)



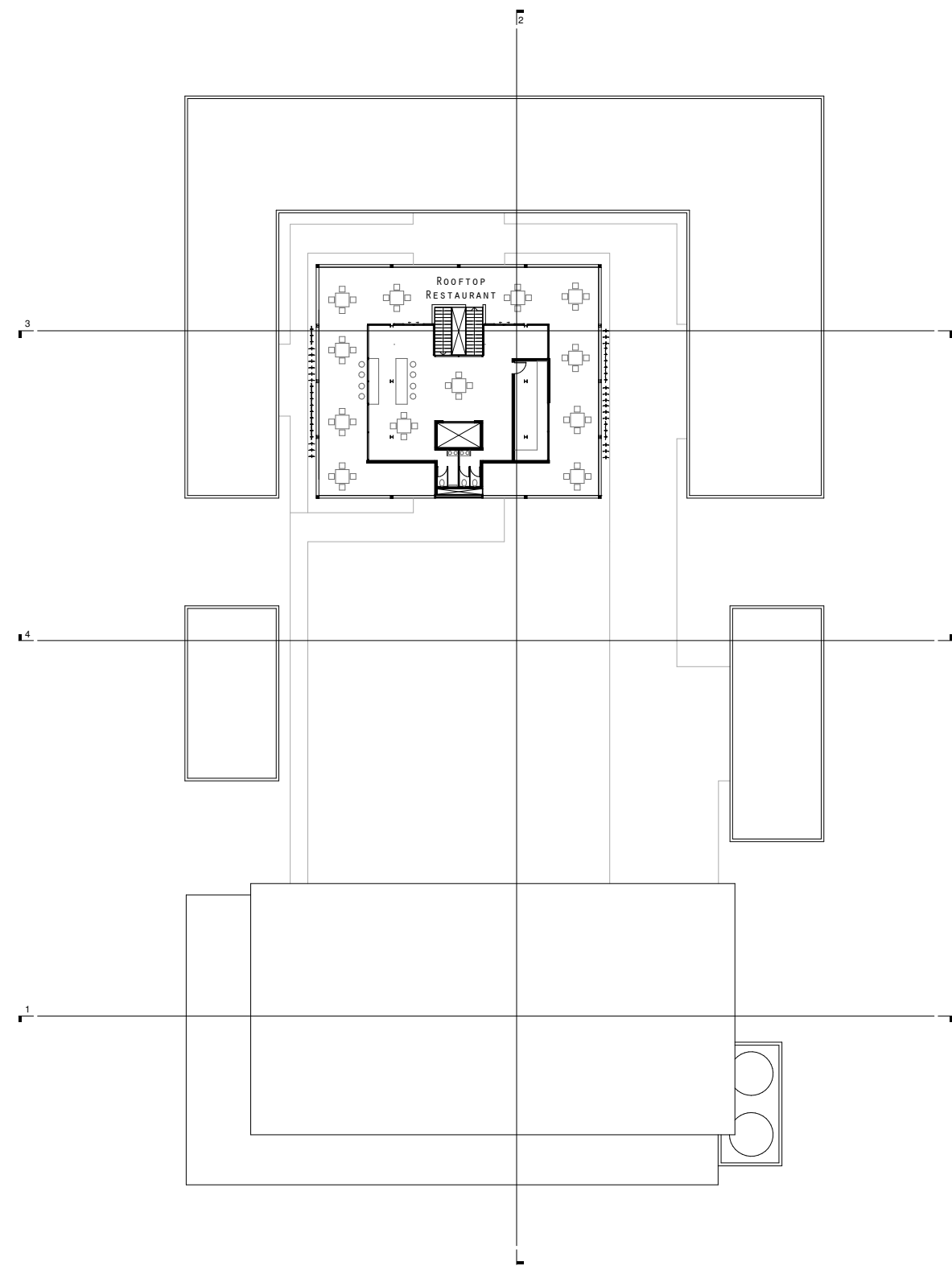


FIG 172. Fourth Floor Plan. (Bozzonetti, 2016)

# EXPLODED AXONOMETRIC

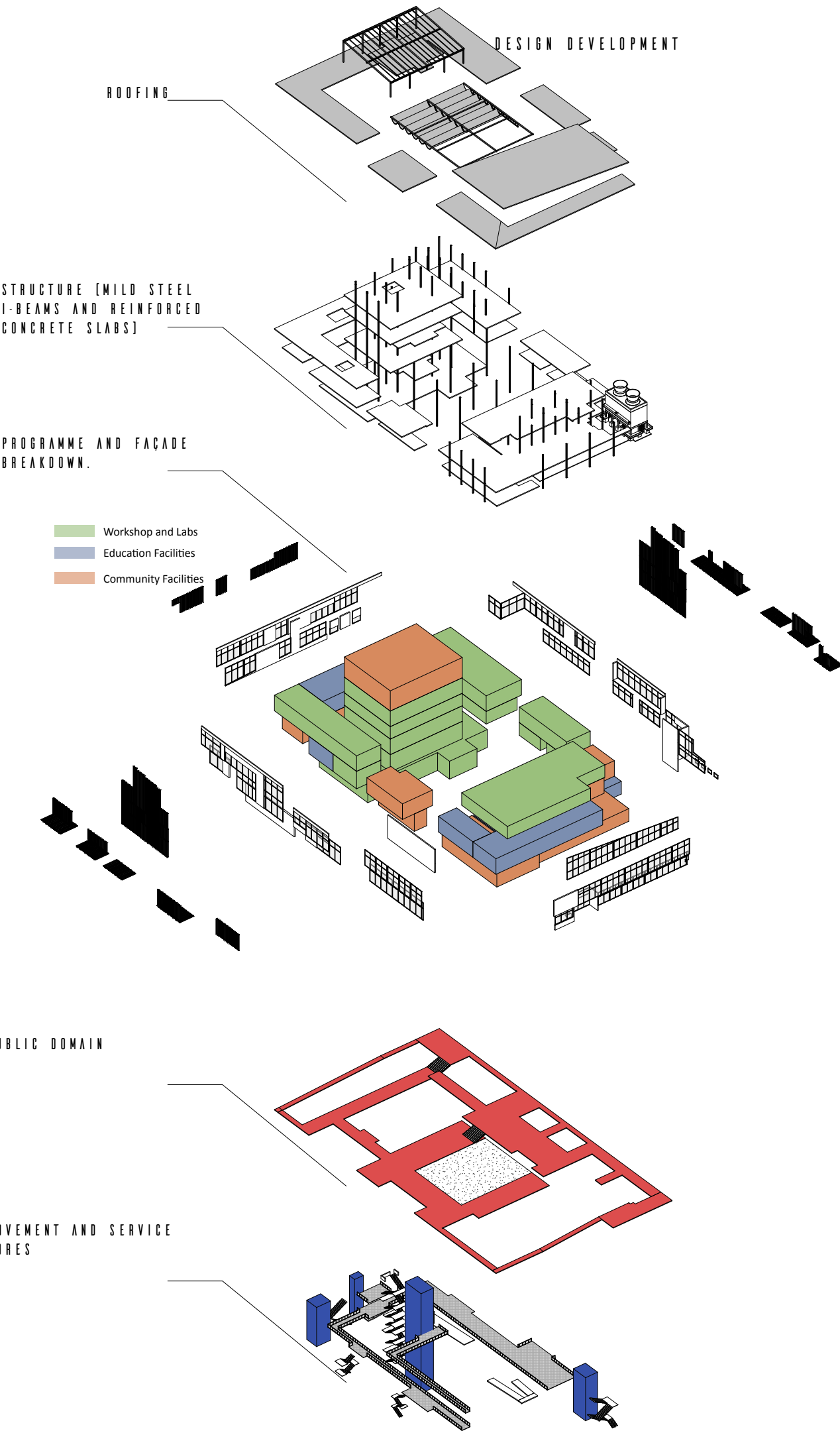


FIG 173. Exploded Axonometric. (Bozzonetti, 2016)



SECTIONS

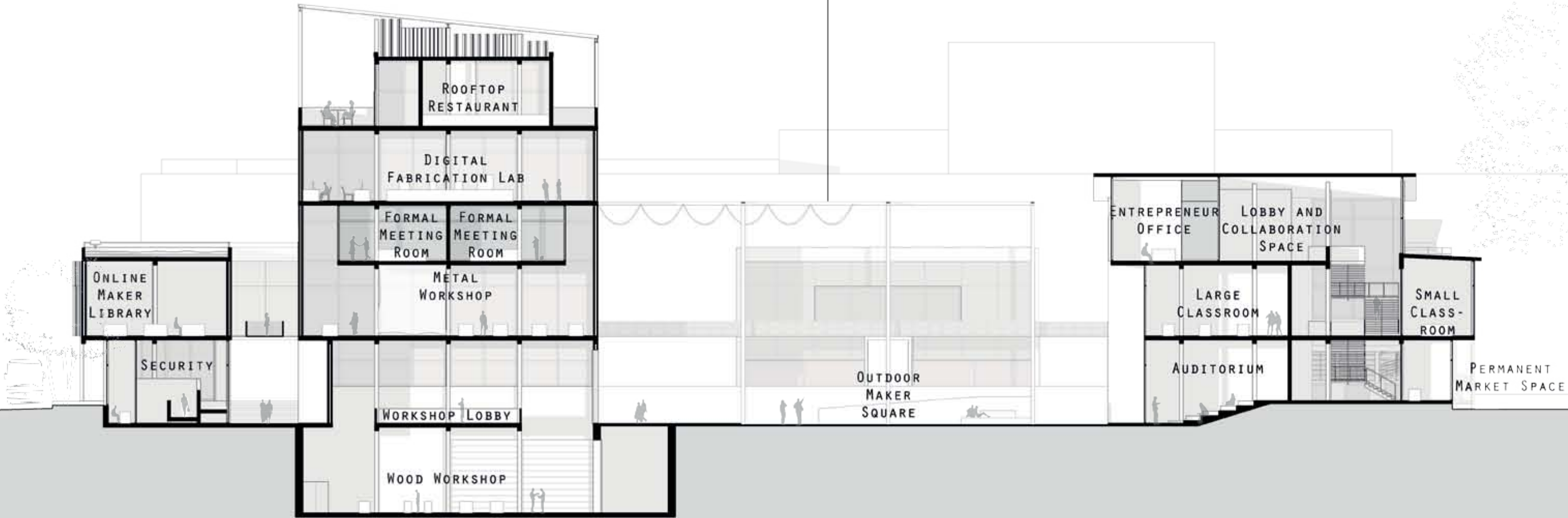
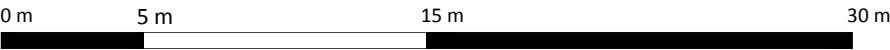


FIG 174. Section 2. (Bozzonetti, 2016)





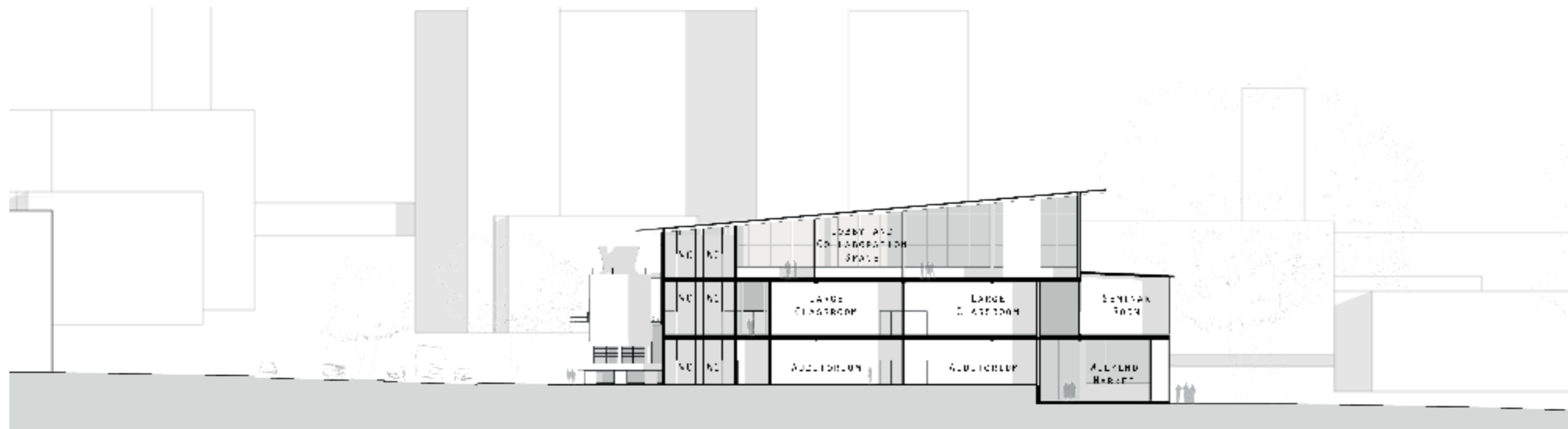


FIG 175. Section 1. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

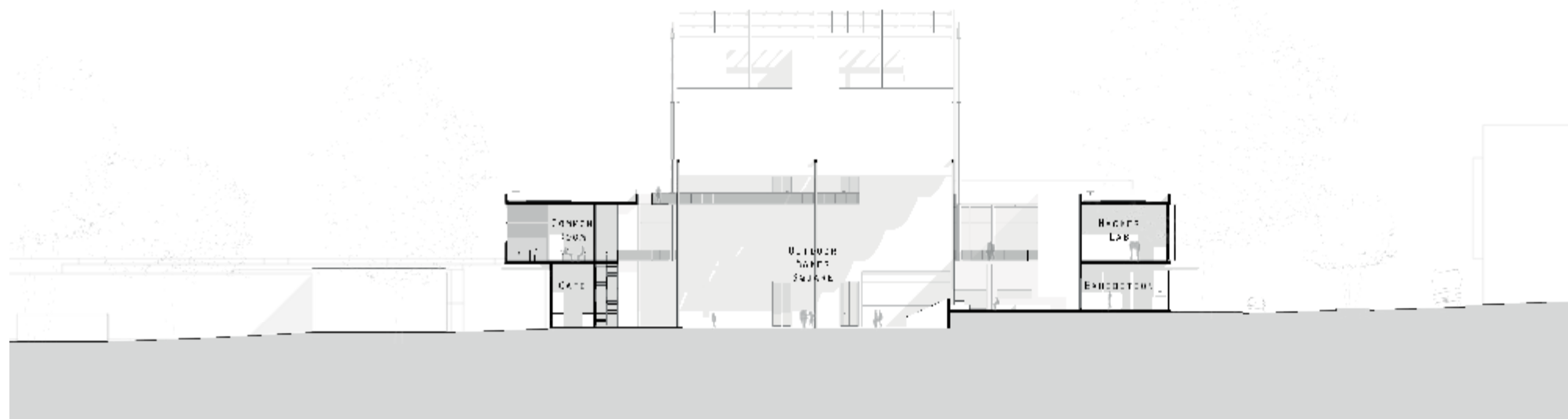


FIG 176. Section 4. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

# ELEVATIONS

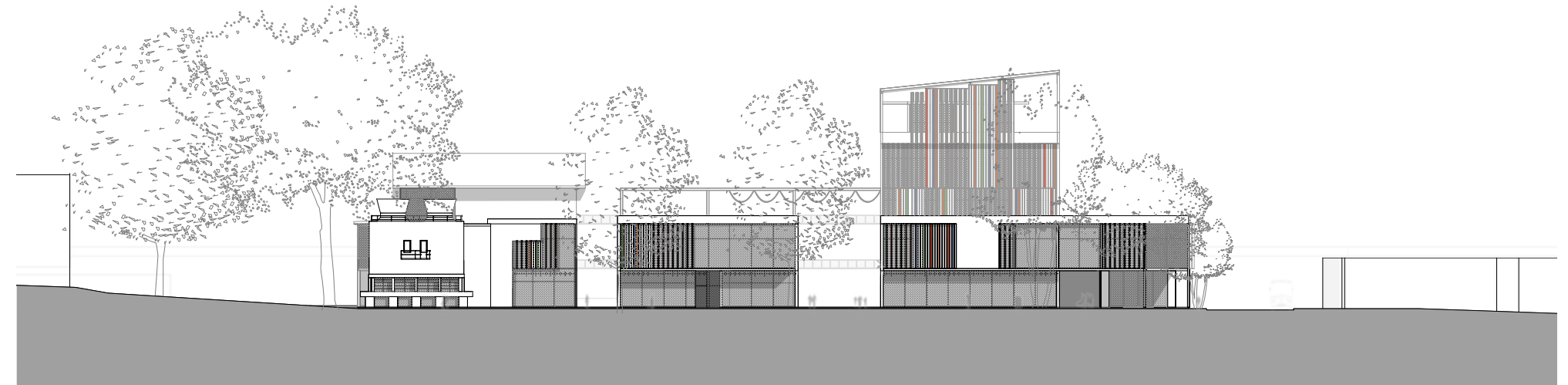


FIG 177. East Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m

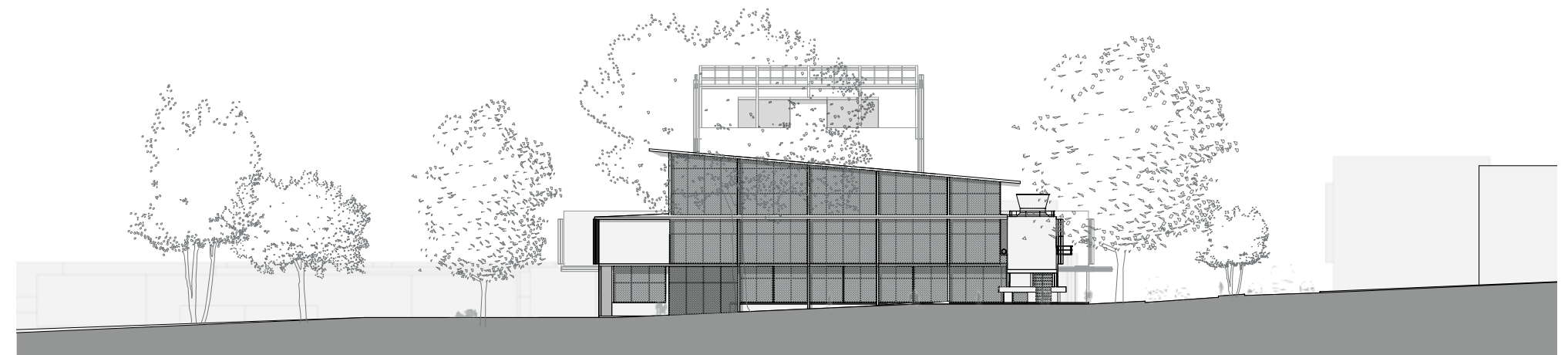


FIG 178. South Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m





FIG 179. North Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m



FIG 180. West Elevation. (Bozzonetti, 2016)

0 m 5 m 15 m 30 m



FIG 181. Section 3 Through Workshops Showing Activity. (Bozzonetti, 2016)

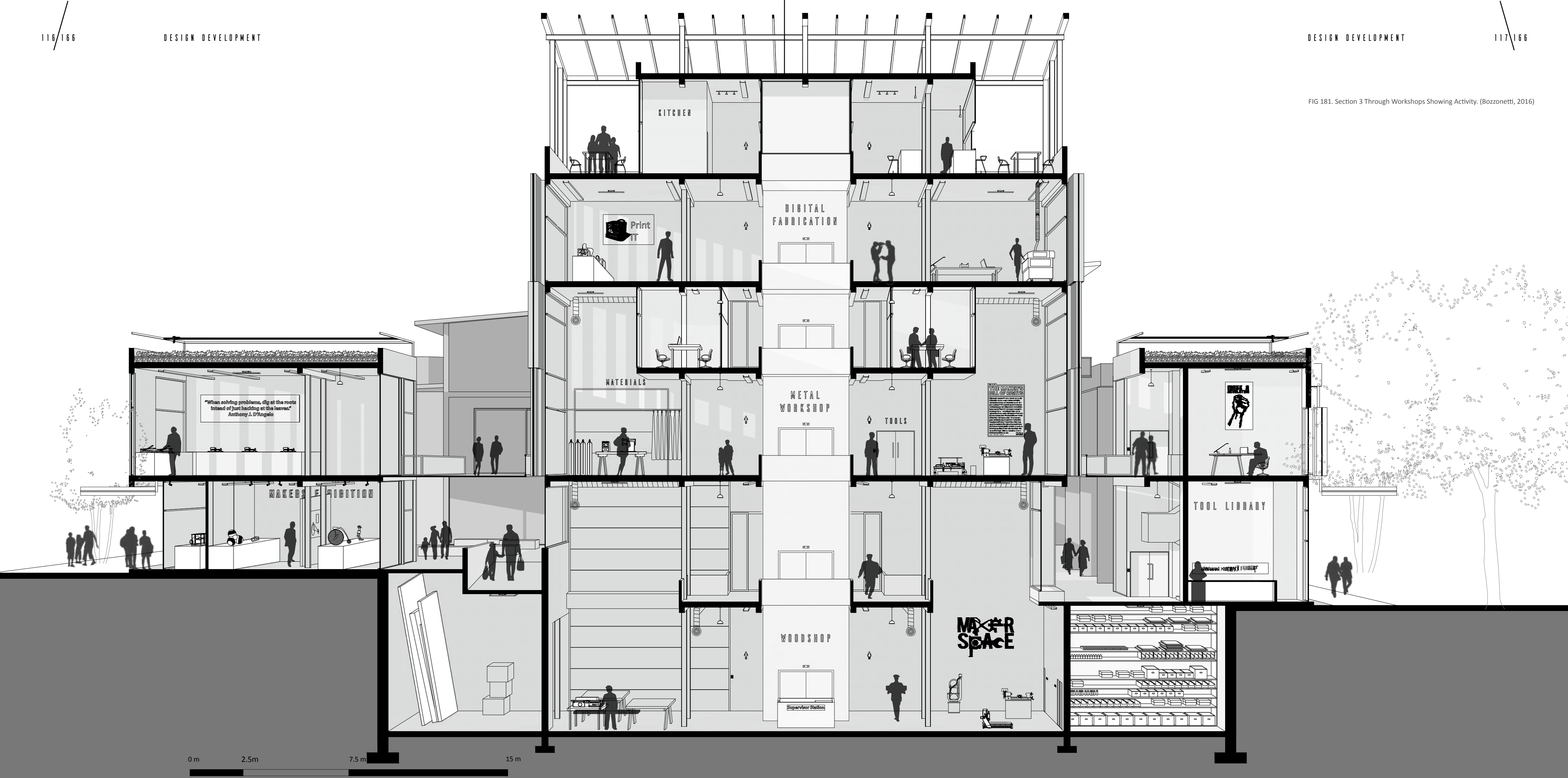






FIG 182. Perspective of Internal Pathway between Workshop and Tool Library. (Bozzonetti, 2016)



FIG 183. Perspective of North East Corner Entrance - Day. (Bozzonetti, 2016)

## CIRCULATION BY USER

The proposed makerspace aims not to be exclusionary but still maintain the necessary privacy of certain areas in the interest of security and safety. This consideration is why circulation routes have to be mapped by the type of activity a person performs in and around the building. These diagrams show these different circulation routes.

### Circulation of General Pedestrian

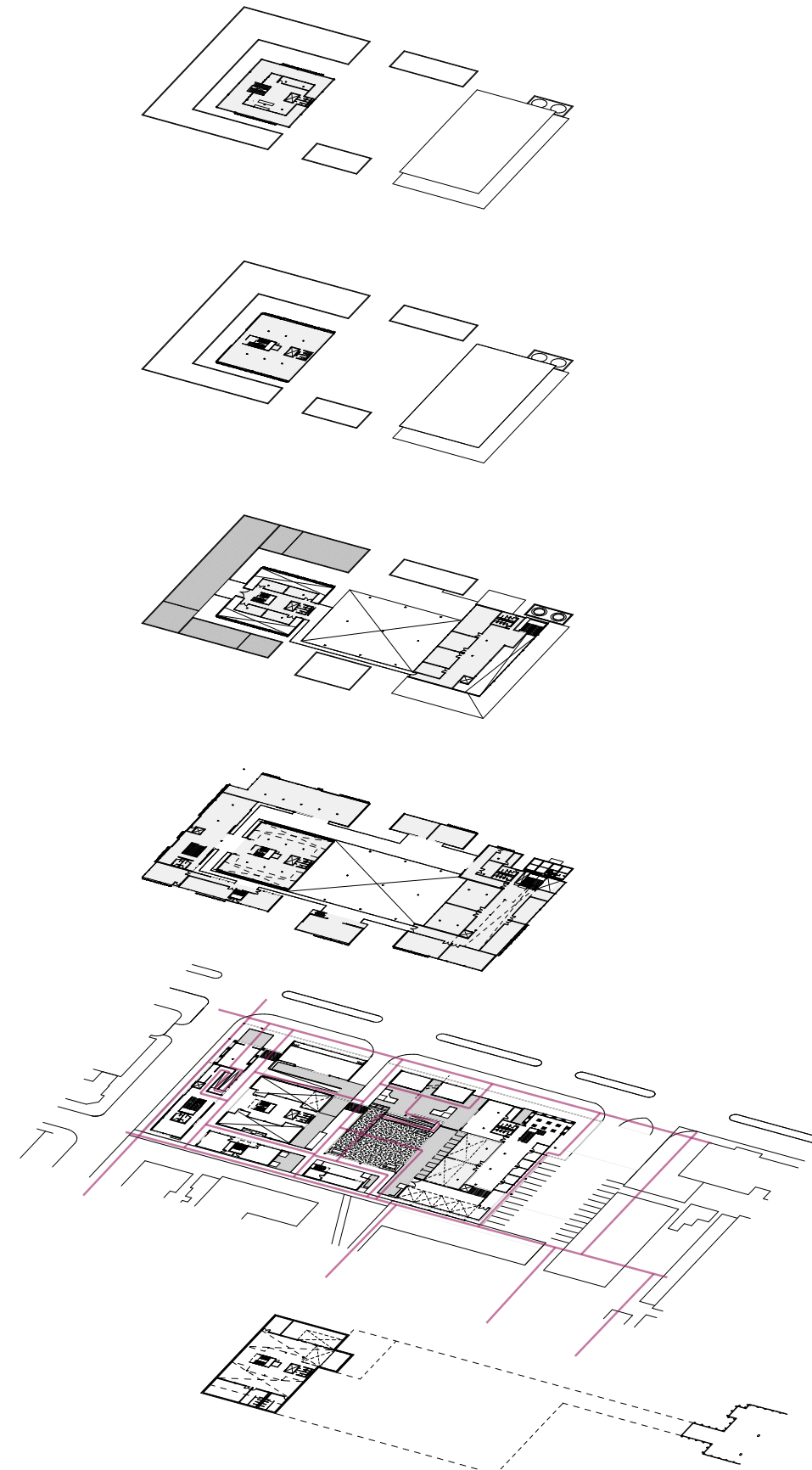


FIG 184. Illustration of Circulation of General Pedestrian. (Bozzonetti, 2016)

### Circulation of Class Attendee

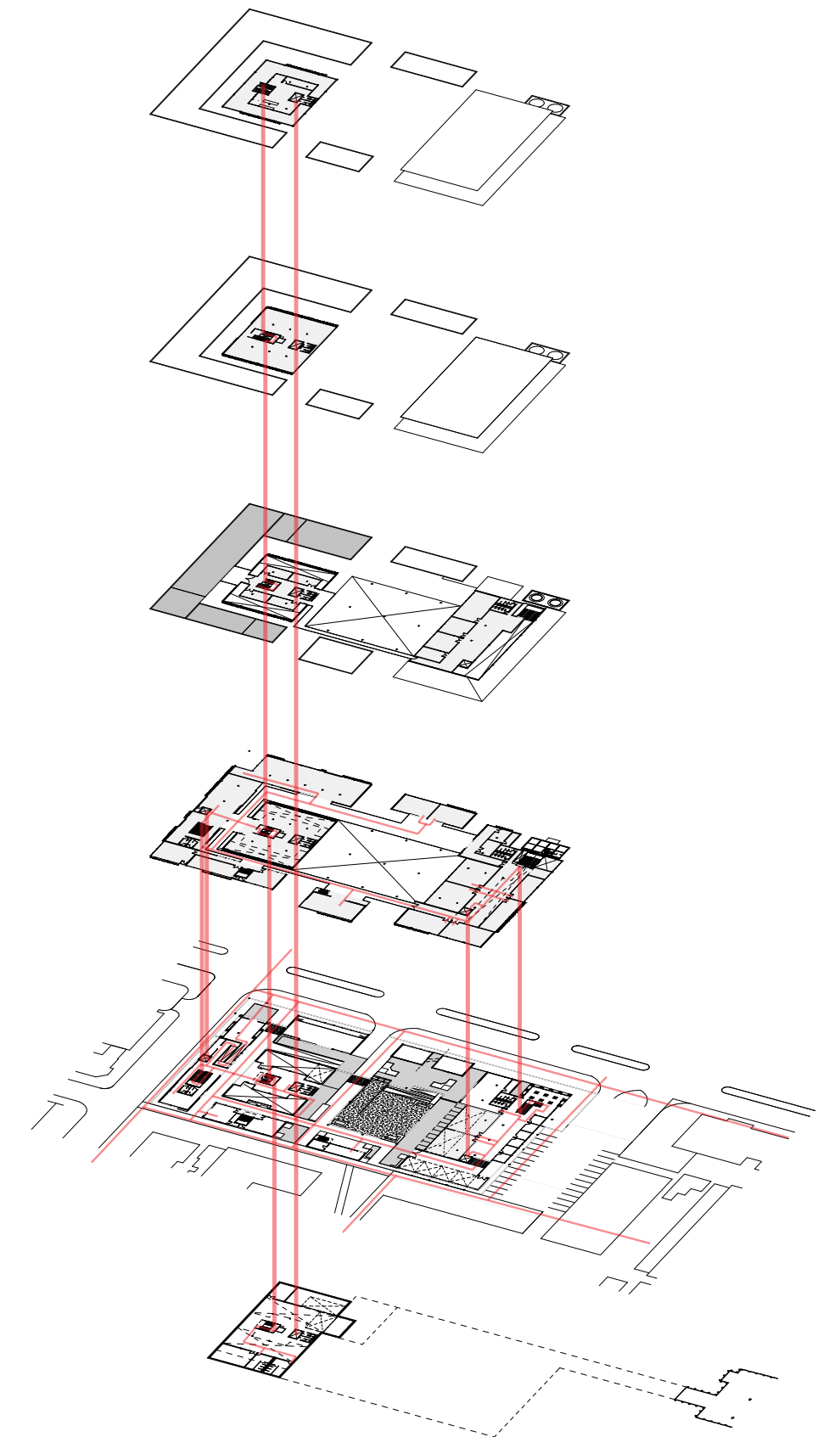


FIG 185. Illustration of Circulation of Class Attendee. (Bozzonetti, 2016)



## Circulation of General Visitors

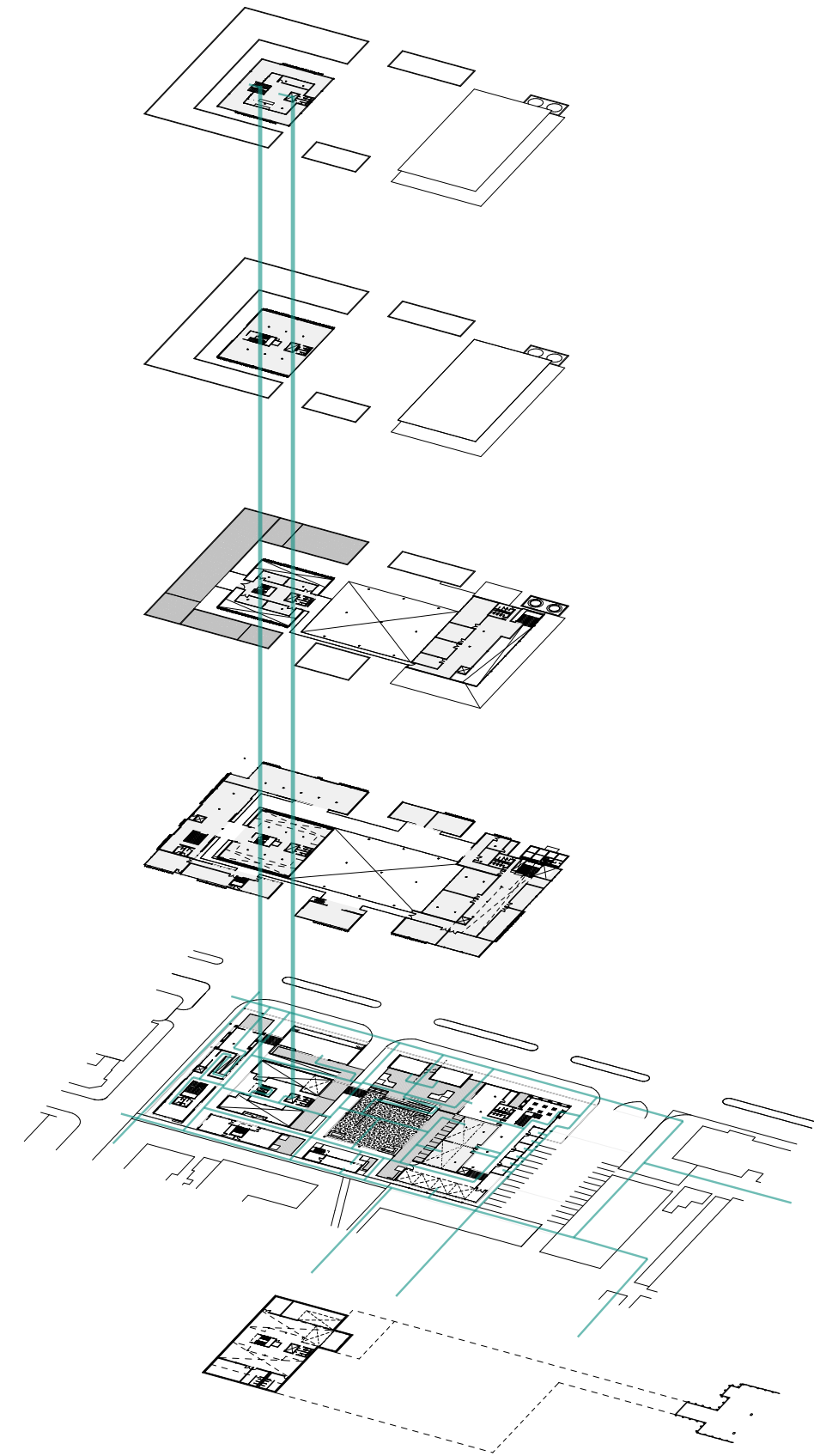


FIG 186. Illustration of Circulation of General Visitor. (Bozzonetti, 2016)

## Circulation of School Visitors

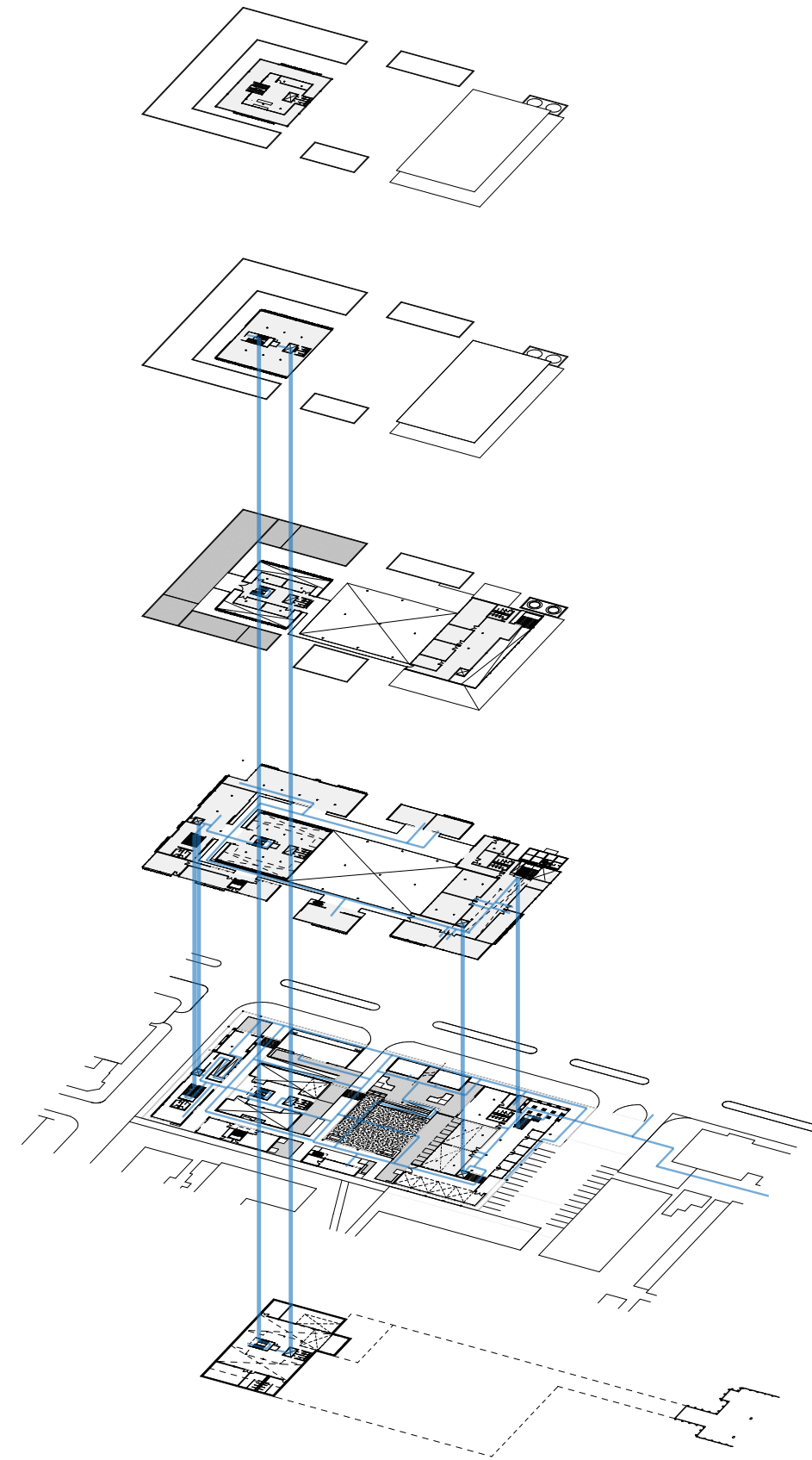


FIG 187. Illustration of Circulation of School Visitor. (Bozzonetti, 2016)

## Circulation of Local Trader or Artist

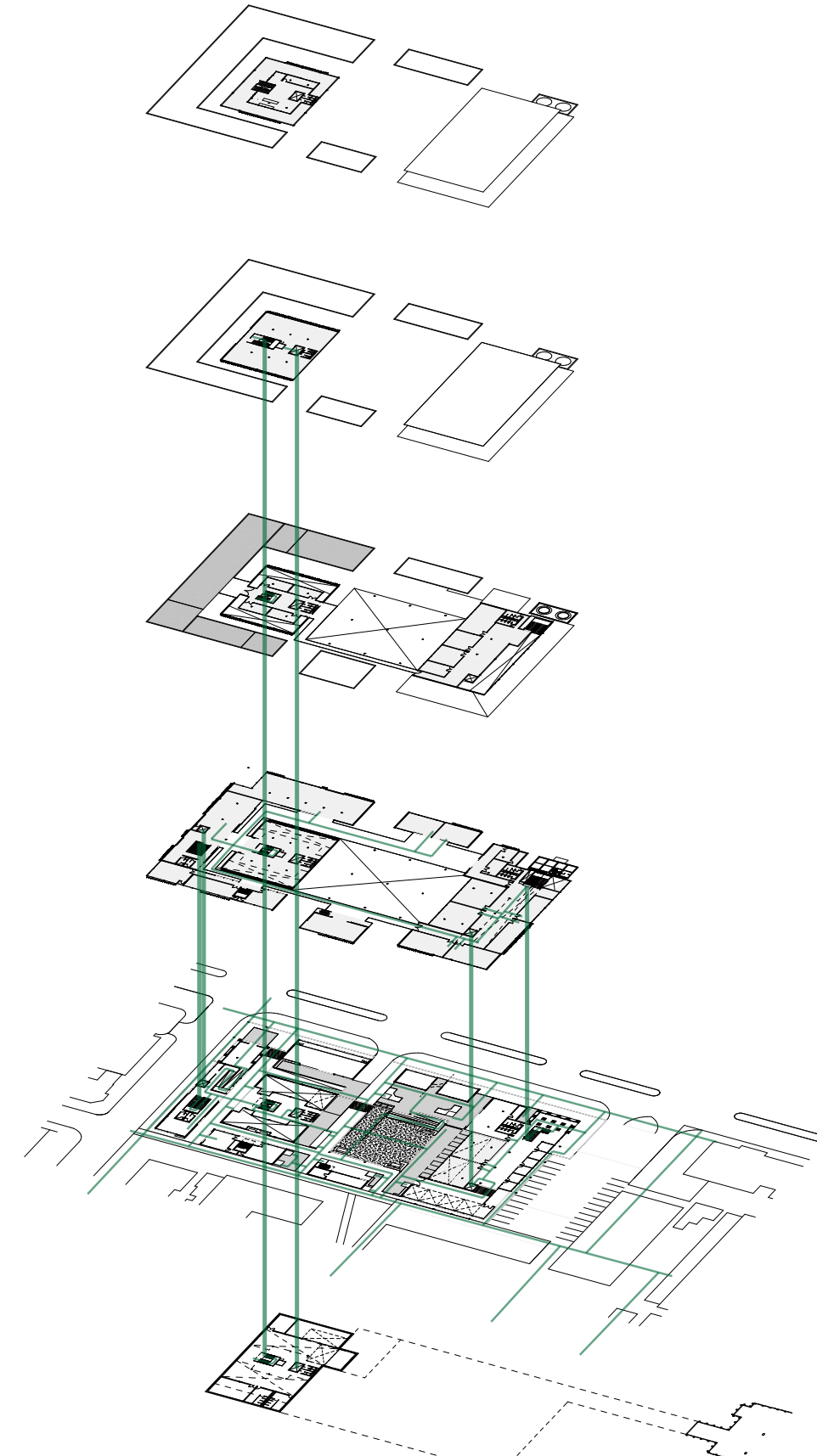


FIG 188. Illustration of Circulation of Local Trader or Artist. (Bozzonetti, 2016)

## Circulation of Maker Member

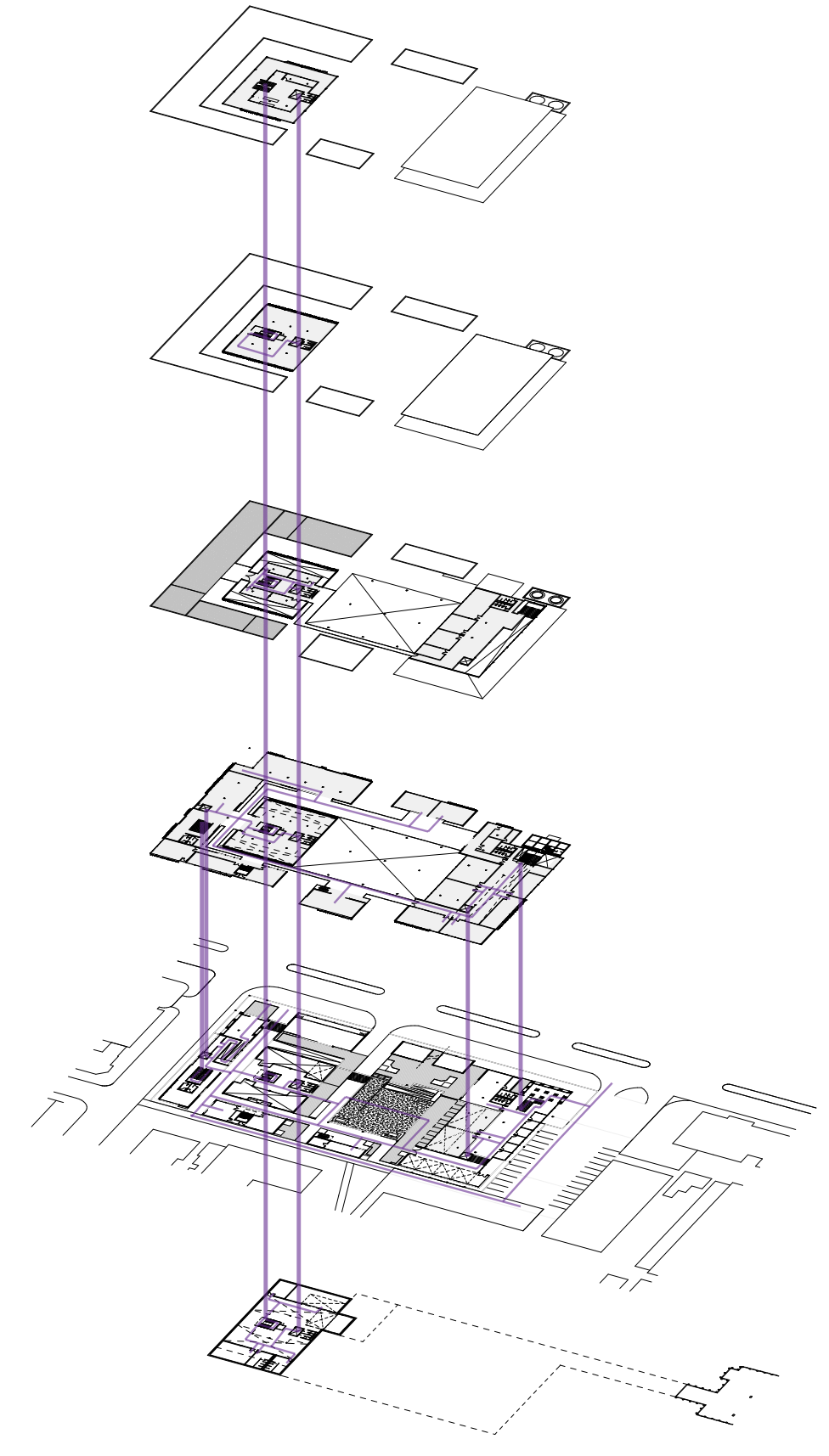


FIG 189. Illustration of Circulation of Maker Member. (Bozzonetti, 2016)



## Circulation of Employees

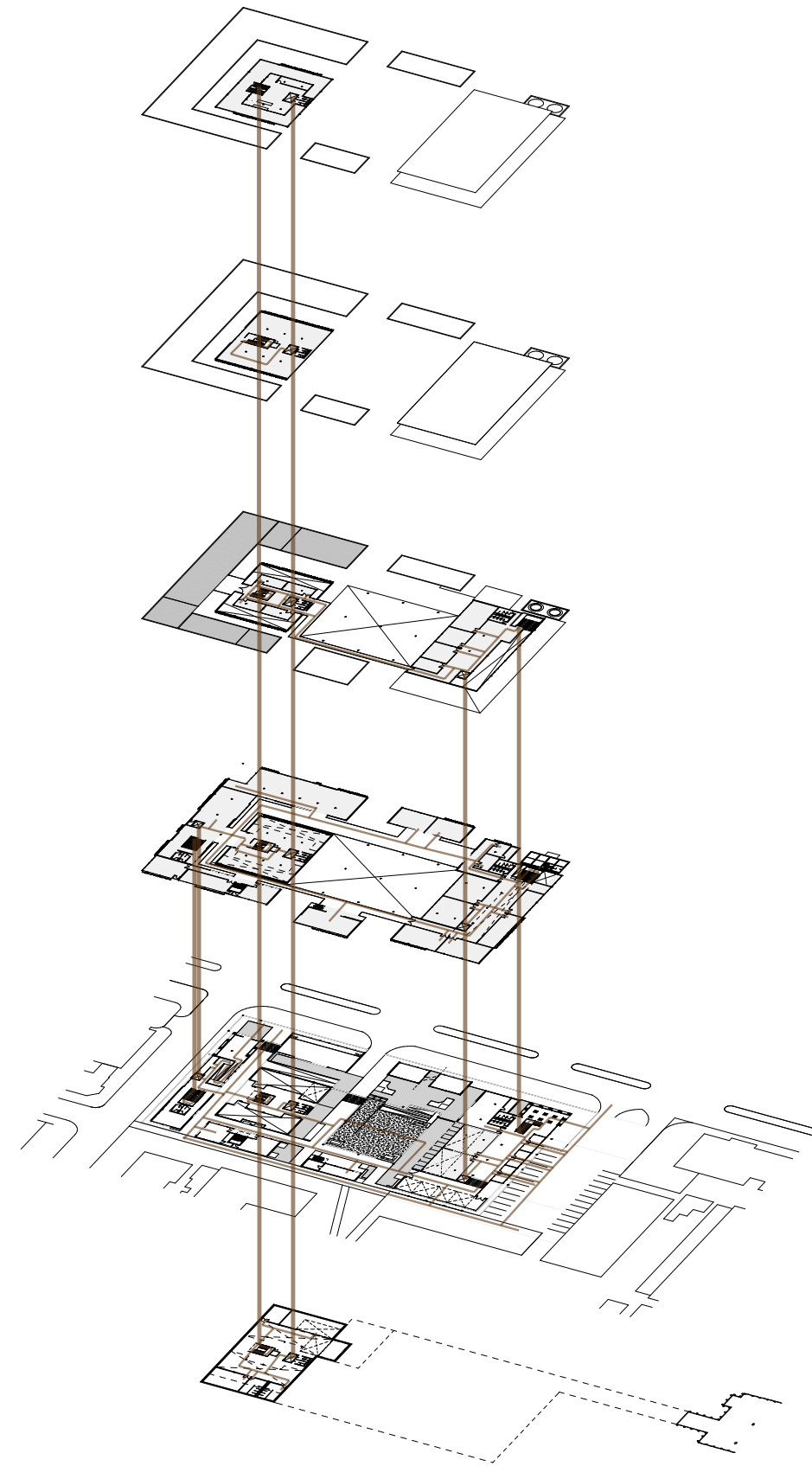


FIG 190. Illustration of Circulation of Employees. (Bozzonetti, 2016)

## Circulation of Renter

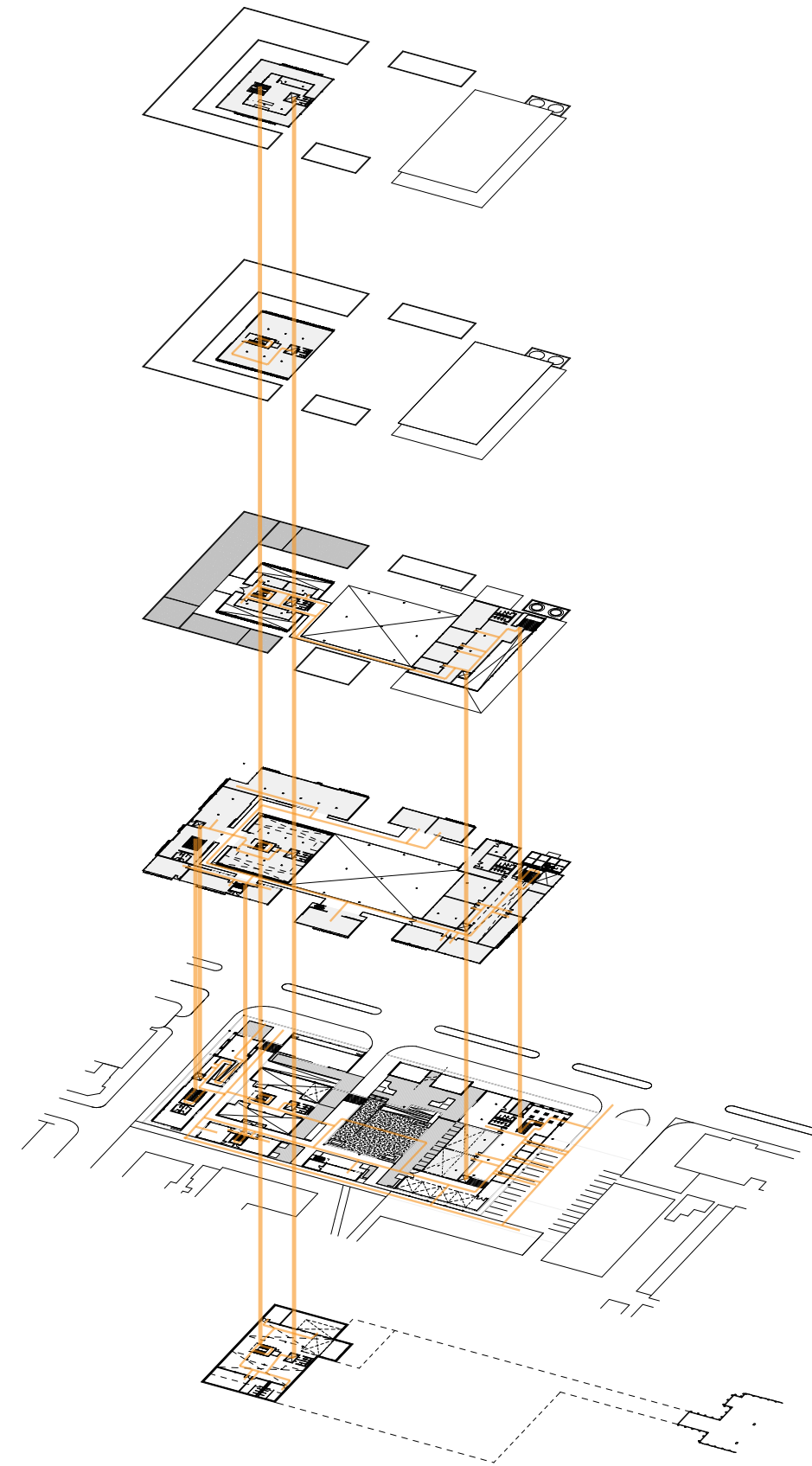
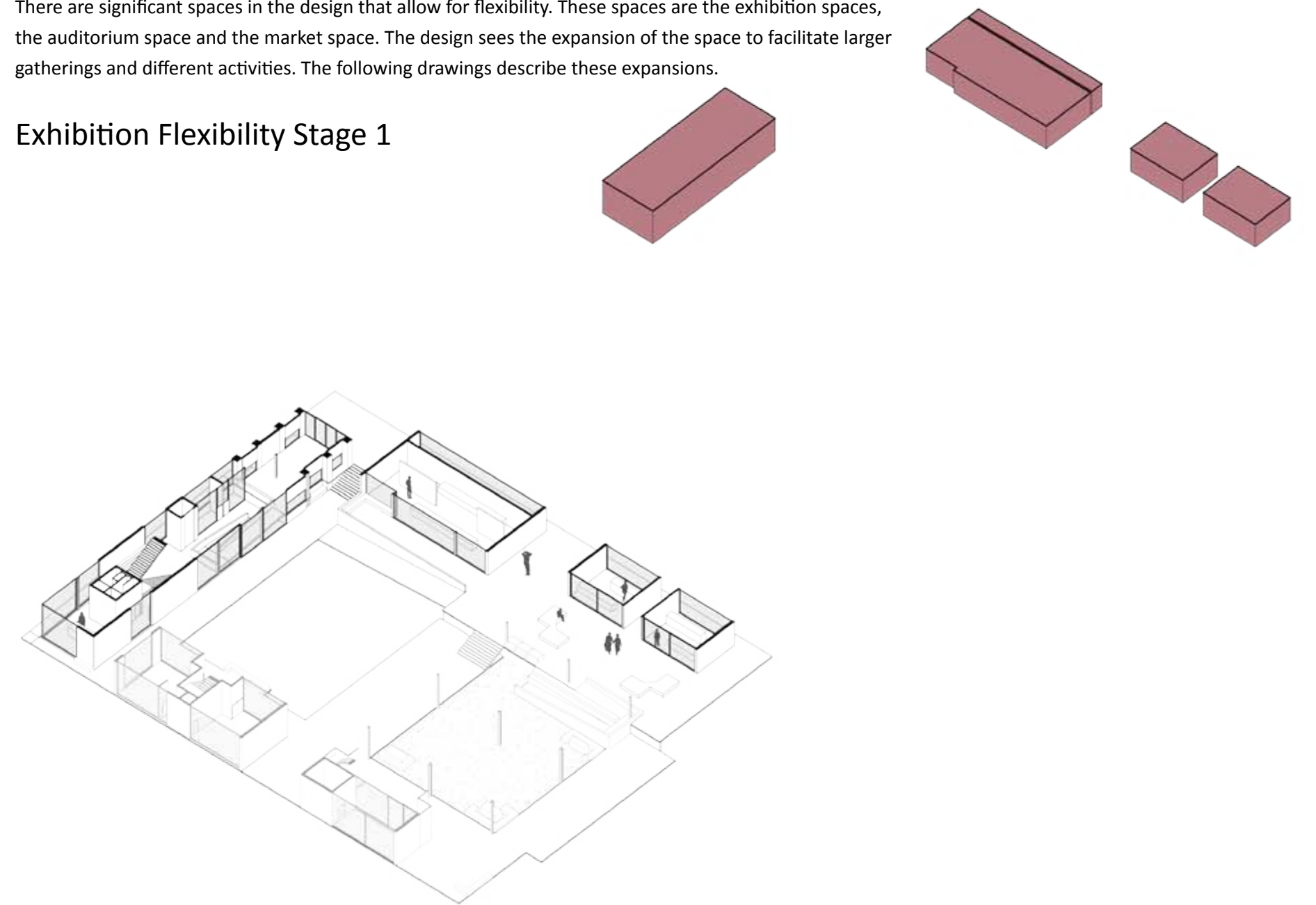


FIG 191. Illustration of Circulation of Renters. (Bozzonetti, 2016)

# FLEXIBILITY OF SPACES

There are significant spaces in the design that allow for flexibility. These spaces are the exhibition spaces, the auditorium space and the market space. The design sees the expansion of the space to facilitate larger gatherings and different activities. The following drawings describe these expansions.

## Exhibition Flexibility Stage 1



The original layout of the exhibition spaces includes two small exhibition rooms next to each other along the North Eastern side of the building. They function separately in this situation and host their own exhibitions. The larger exhibition space next to the smaller ones is for a grander exhibition and sits behind a 3D printing gallery that faces the street so that the public can watch something print. The last exhibition space is home to a maker library and sits at the Western edge of the site in line with the reception.

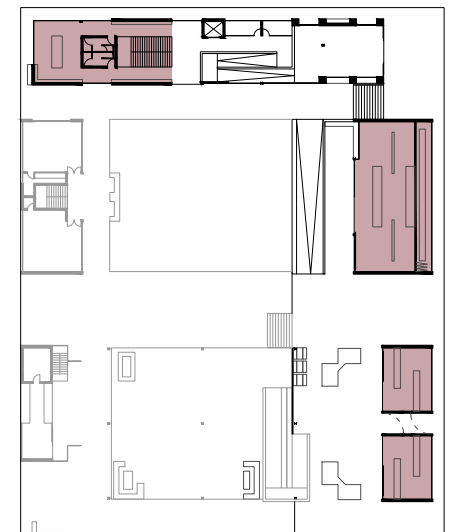
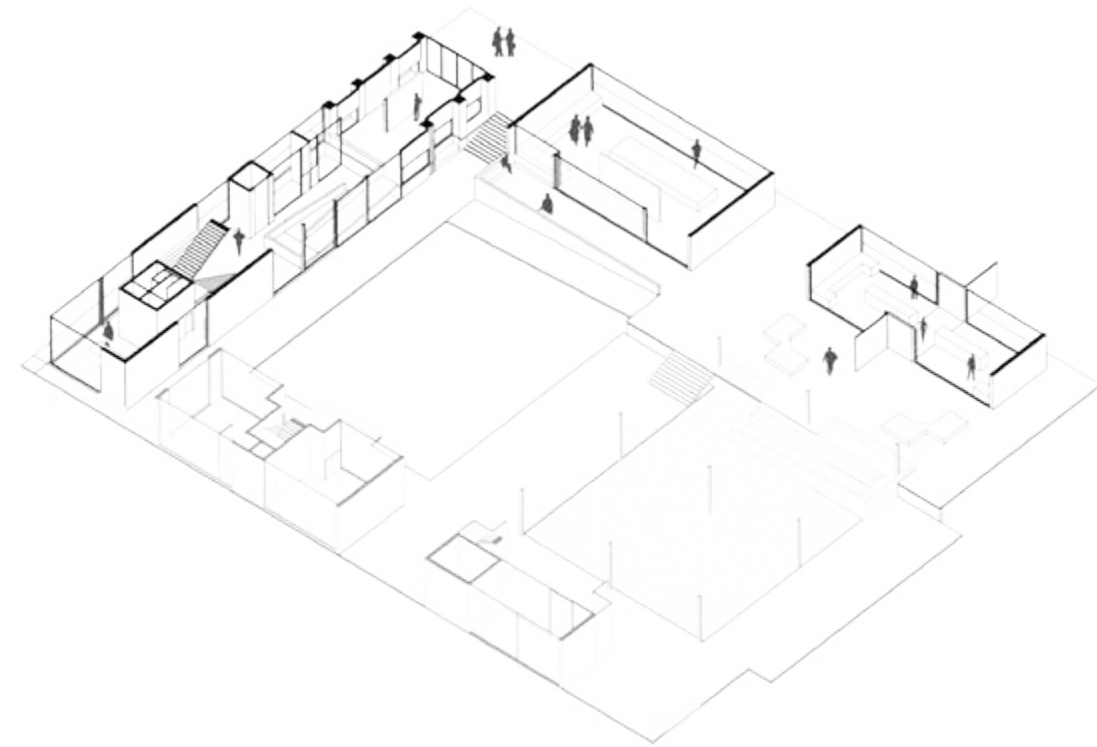
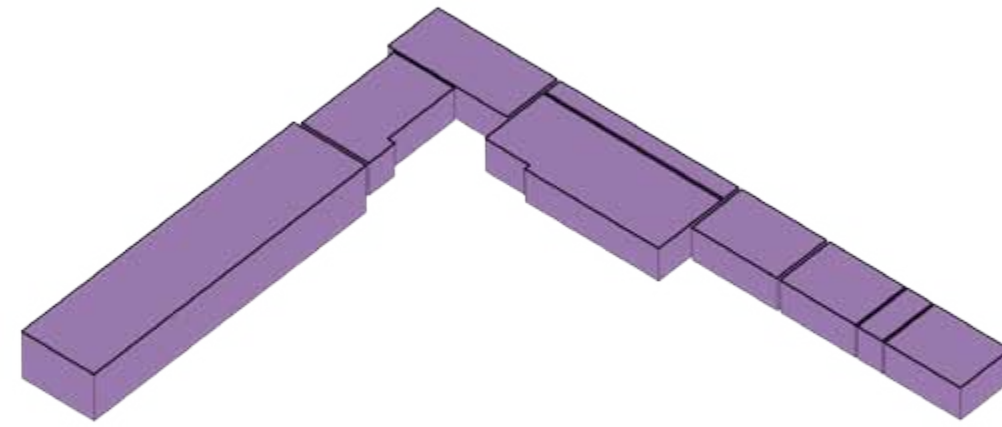


FIG 192. Illustration of Exhibition Flexibility Stage 1. (Bozzonetti, 2016)



## Exhibition Flexibility Stage 2

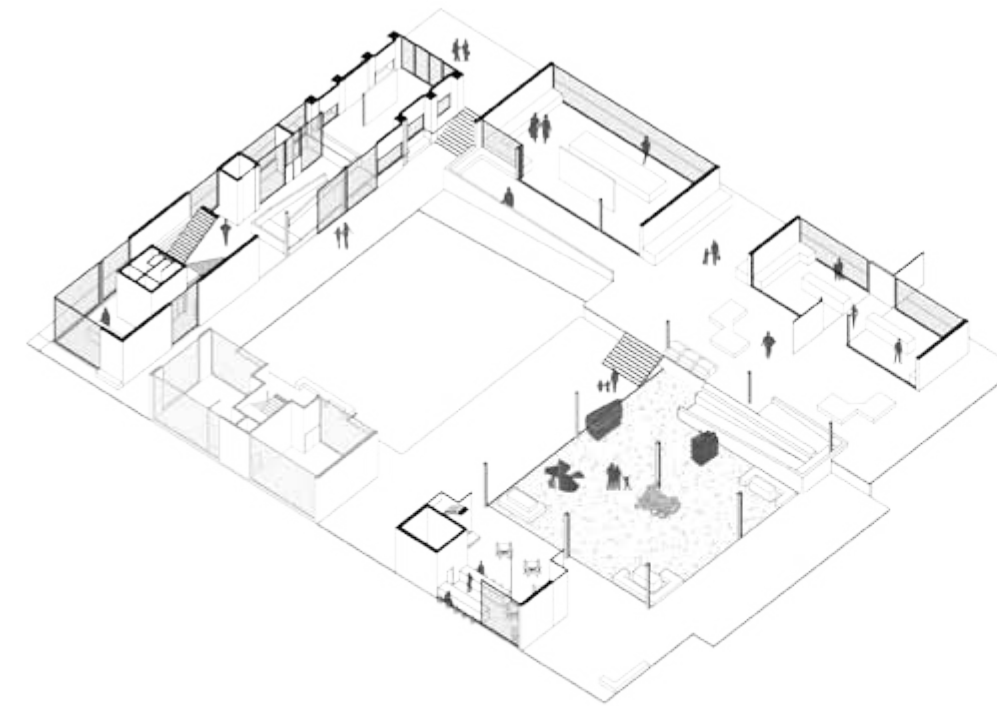
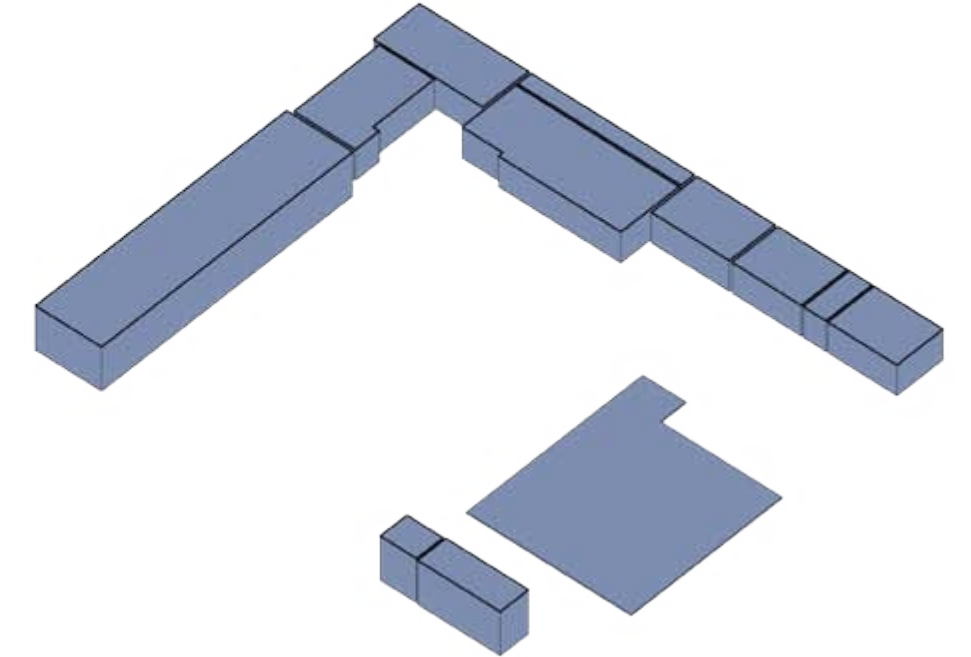


This situation allows for all of the separate exhibition spaces to function as one. Each space will exhibit a part of a larger show. The walls between the two smaller gallery spaces will slide away such that two spaces become one. The wall dividing the larger exhibition space and the printing gallery will fold away making this part of the exhibition visible to the public along the street edge. The reception will now form part of the space, including a few items from the exhibit to extend to the maker library forming a continuous viewing journey.



FIG 193. Illustration of Exhibition Flexibility Stage 2. (Bozzonetti, 2016)

## Exhibition Flexibility Stage 3



The largest expansion situation starts to incorporate the maker square into the exhibition. The square becomes an outdoor gallery space leading to the small café along the Western edge of the site. Now the exhibition can include cocktails and food along the viewing path.

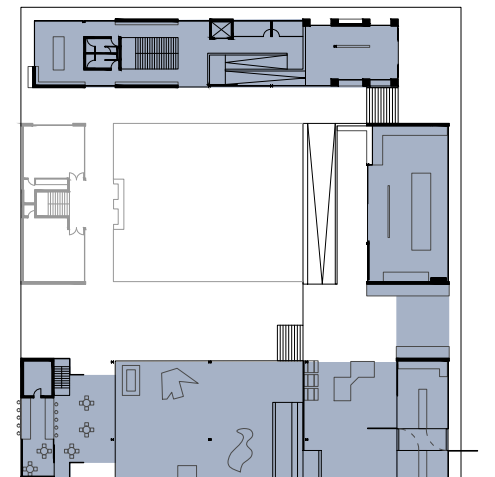
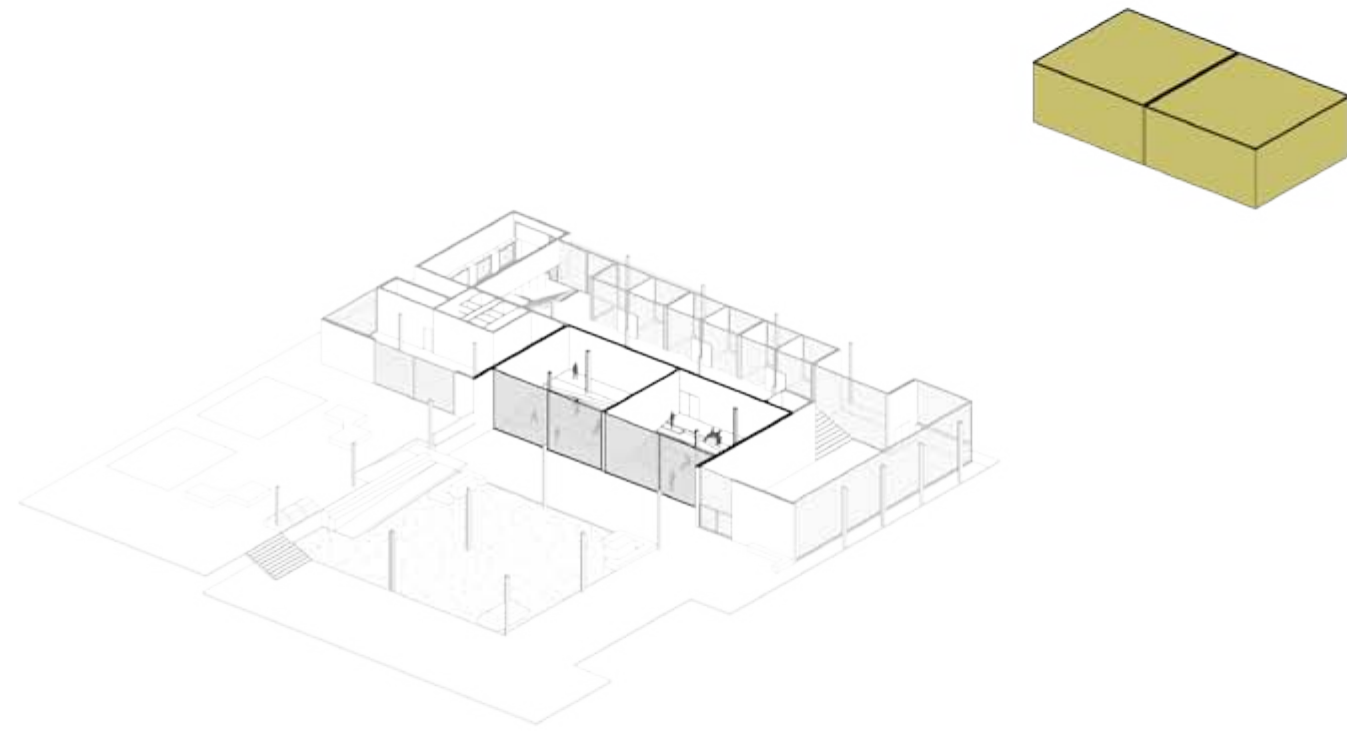


FIG 194. Illustration of Exhibition Flexibility Stage 3. (Bozzonetti, 2016)



## Auditorium Flexibility Stage 1

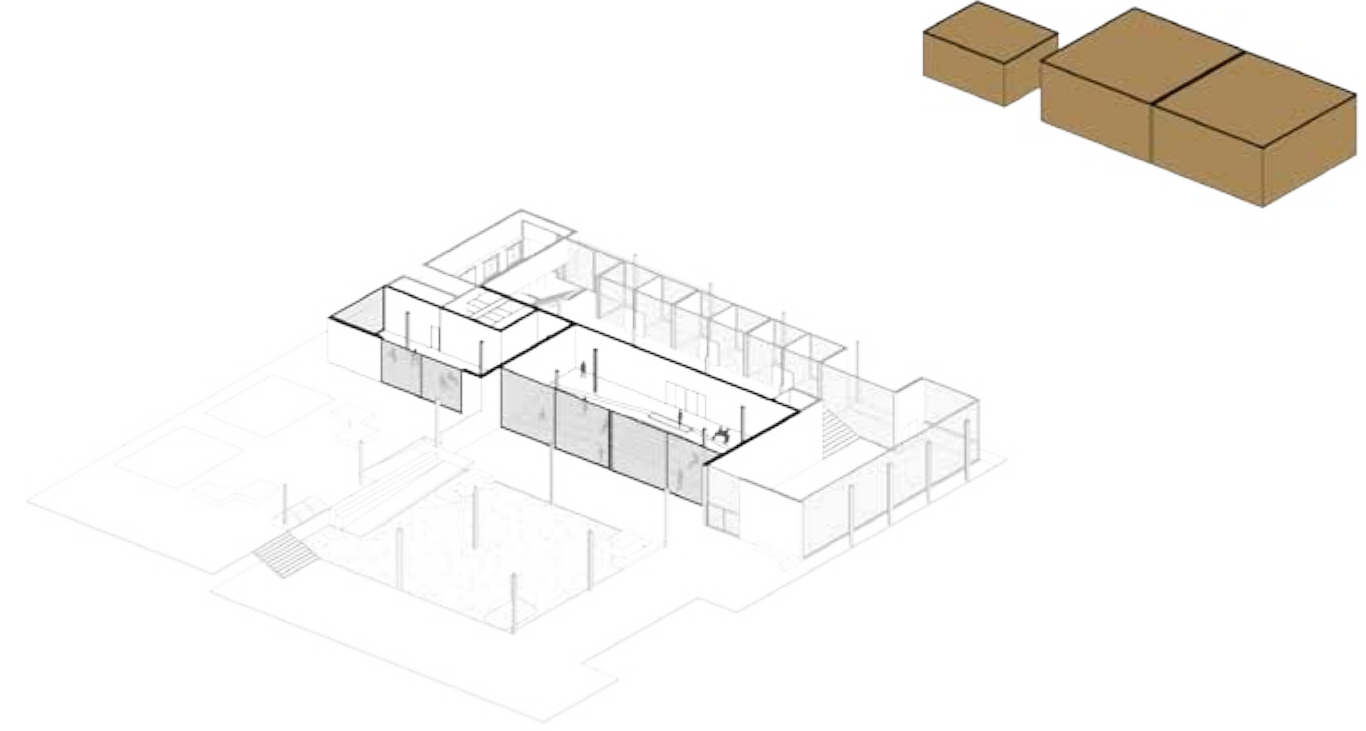


Initially, the design includes two identical auditoriums, side by side. These spaces are small venues that allow for two different small scale events or presentations to be carried out simultaneously.



FIG 195. Illustration of Auditorium Flexibility Stage 1. (Bozzonetti, 2016)

## Auditorium Flexibility Stage 2



When there is a larger scale event or presentation being given at the makerspace, it is possible to fold away the wall between the two smaller auditorium spaces to form a large auditorium. Additionally, the showroom/cinema adjacent to the large space can become a smaller auditorium, allowing for the simultaneous events.

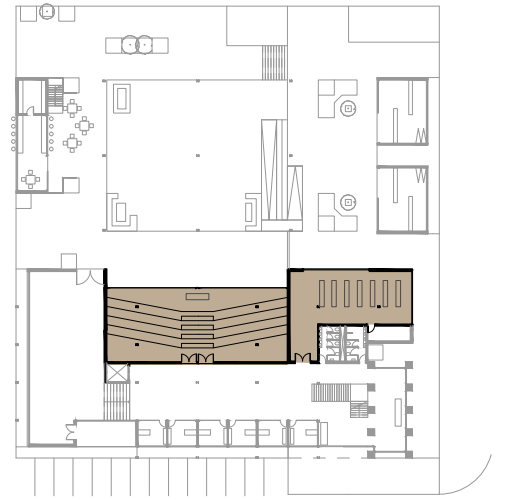
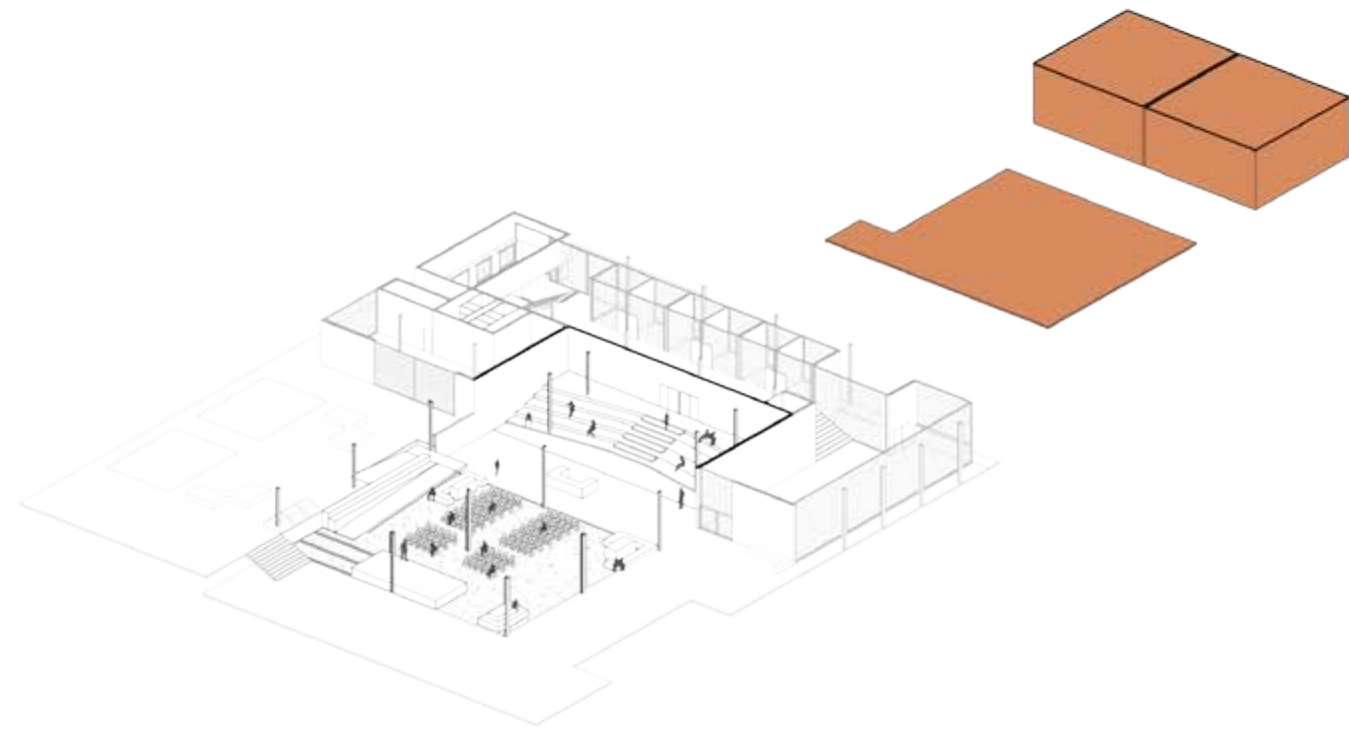


FIG 196. Illustration of Auditorium Flexibility Stage 2. (Bozzonetti, 2016)



## Auditorium Flexibility Stage 3



The final expansion layout includes the maker square. When grand events such as the maker fair or a largely attended Ted talk is to be held at the maker space, it becomes necessary to expand the auditorium into the square. The glass walls facing the square roll up to open the space out onto the square. A stage will roll out from underneath the Upper Ground Floor and provide the platform for the speaker. This expansion allows for a much larger audience extending from the square into the gallery.

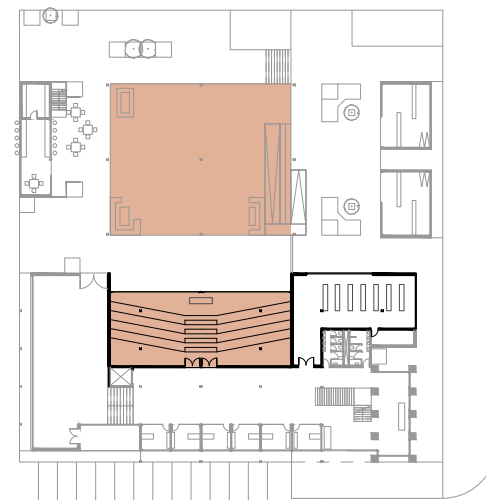
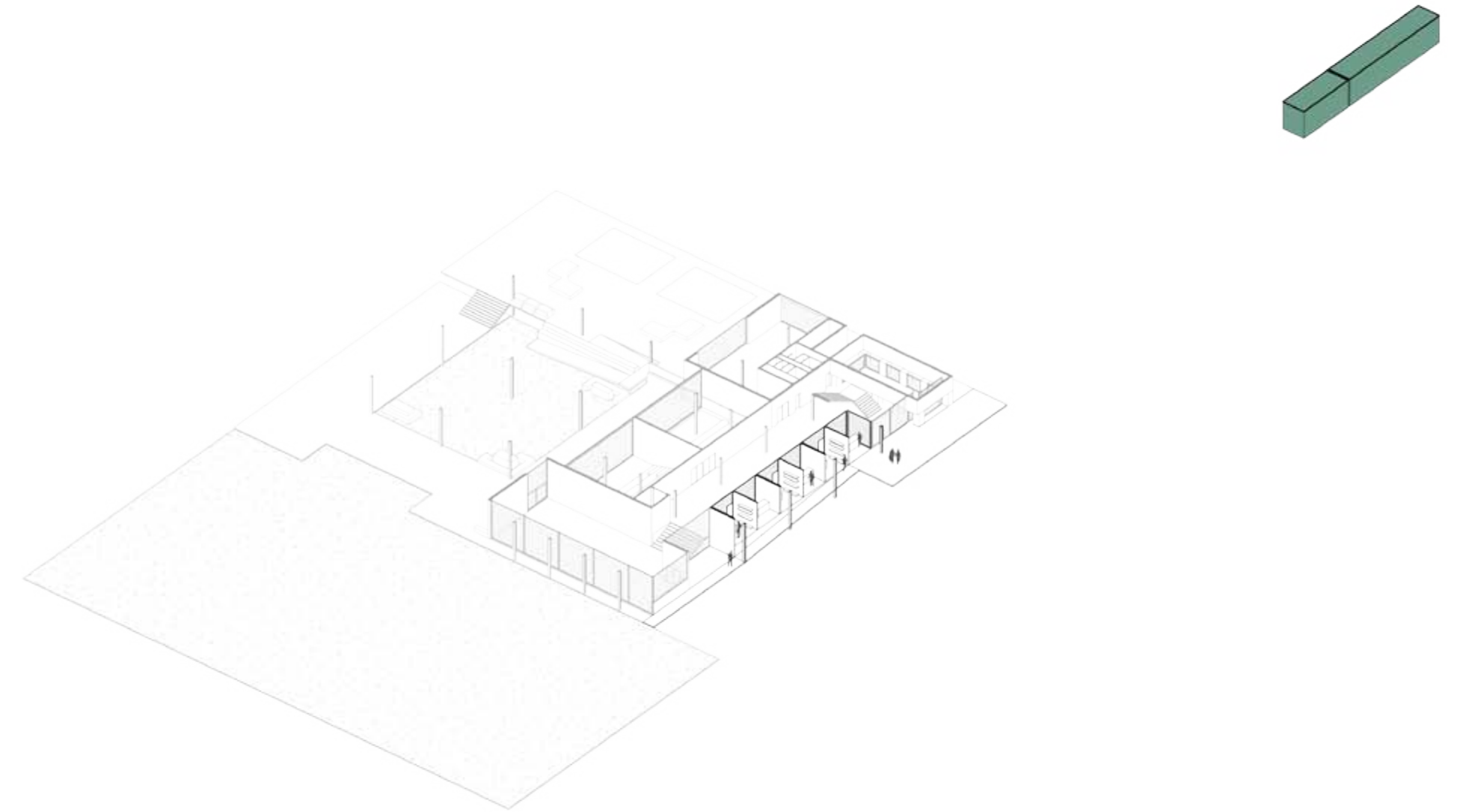


FIG 197. Illustration of Auditorium Flexibility Stage 3. (Bozzonetti, 2016)

## Market Flexibility Stage 1



During the week the market space consists of a strip of stores along the Southern edge of the building facing the parking between the makerspace and the Sci-Bono Discovery Centre. The small strip allows for permanent retail to occur during the week without using up too much space that doesn't get used because enough people do not frequent the market during weekdays.

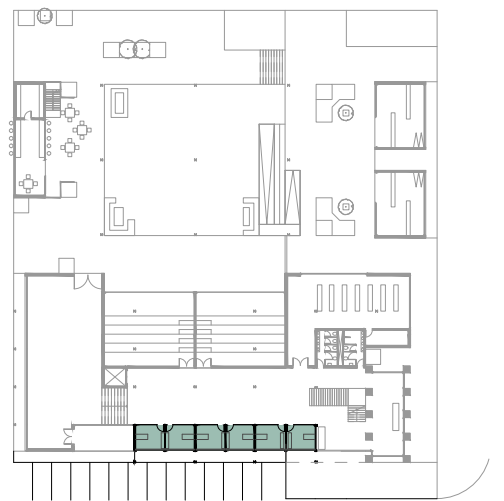
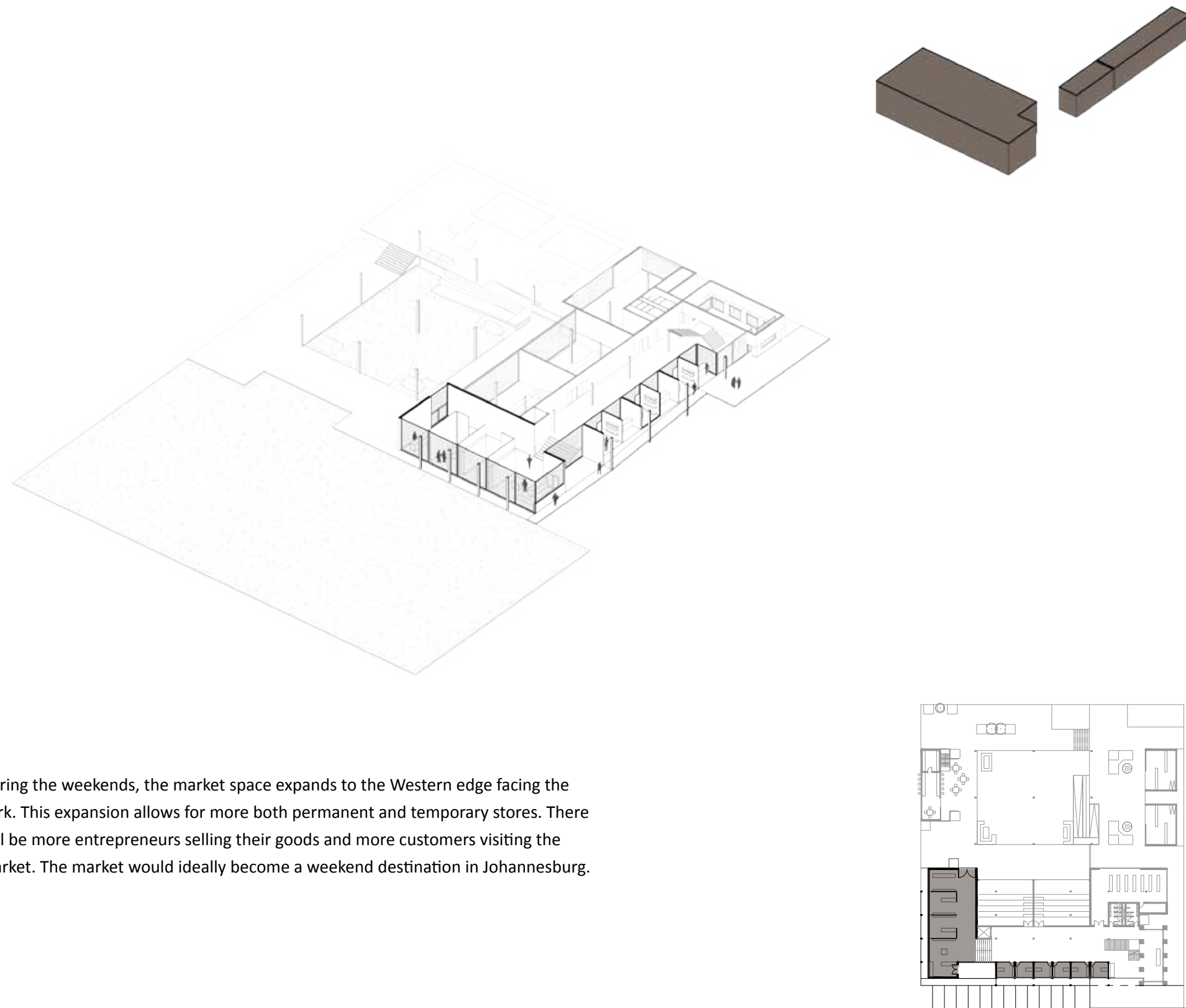


FIG 198. Illustration of Market Flexibility Stage 1. (Bozzonetti, 2016)

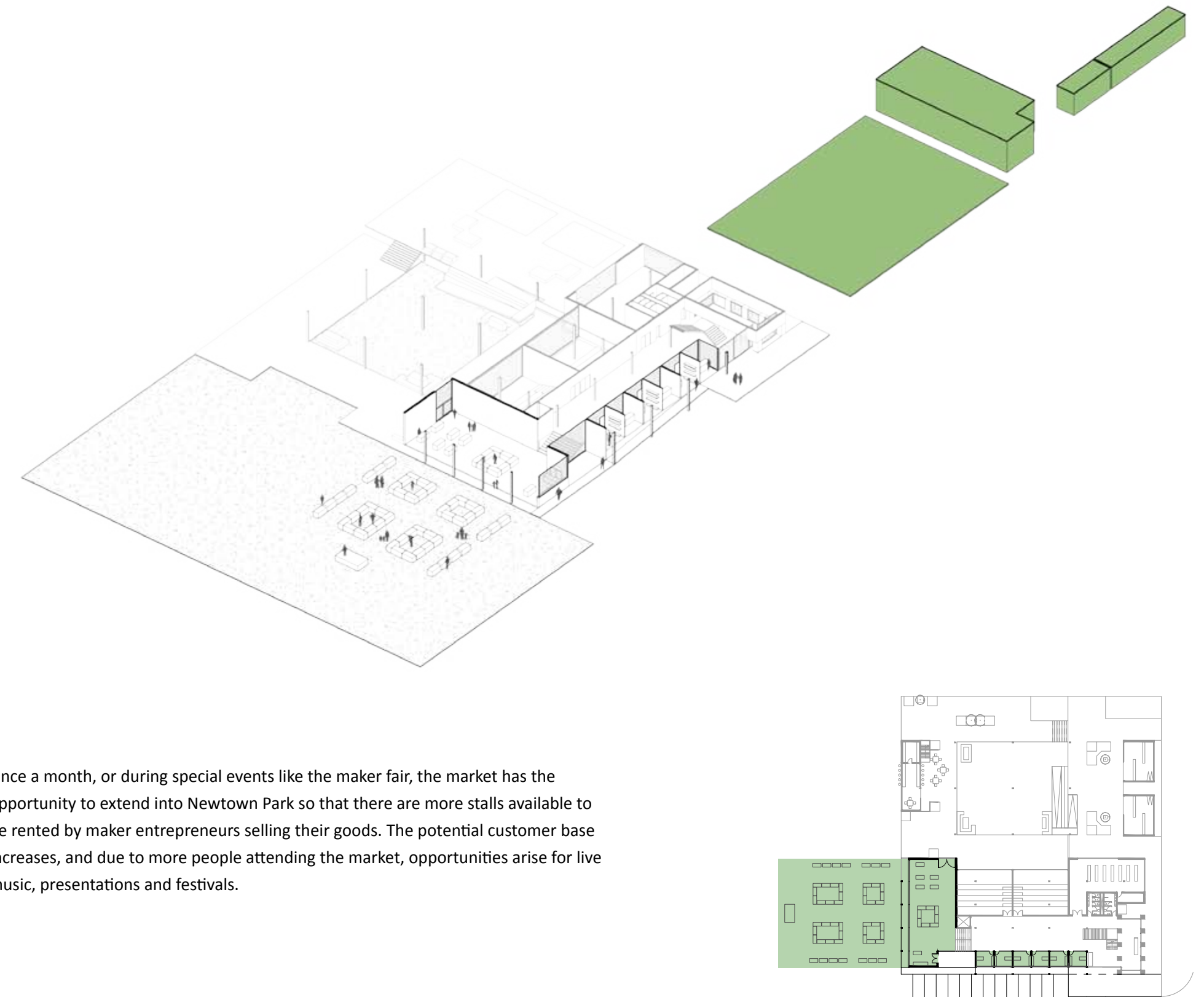
## Market Flexibility Stage 2



During the weekends, the market space expands to the Western edge facing the park. This expansion allows for more both permanent and temporary stores. There will be more entrepreneurs selling their goods and more customers visiting the market. The market would ideally become a weekend destination in Johannesburg.

FIG 199. Illustration of Market Flexibility Stage 2. (Bozzonetti, 2016)

## Market Flexibility Stage 3



Once a month, or during special events like the maker fair, the market has the opportunity to extend into Newtown Park so that there are more stalls available to be rented by maker entrepreneurs selling their goods. The potential customer base increases, and due to more people attending the market, opportunities arise for live music, presentations and festivals.

FIG 200. Illustration of Market Flexibility Stage 3. (Bozzonetti, 2016)



# THE WOODSHOP

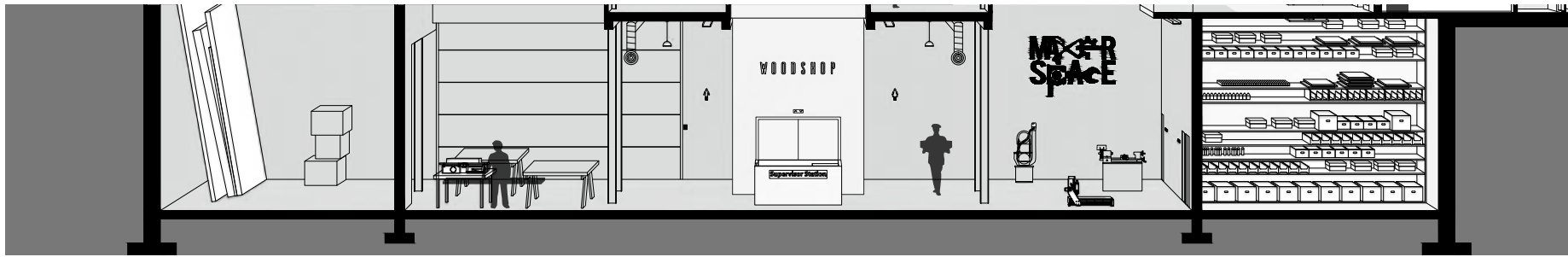


FIG 201. Section Through Woodshop Showing Activity. (Bozzonetti, 2016)

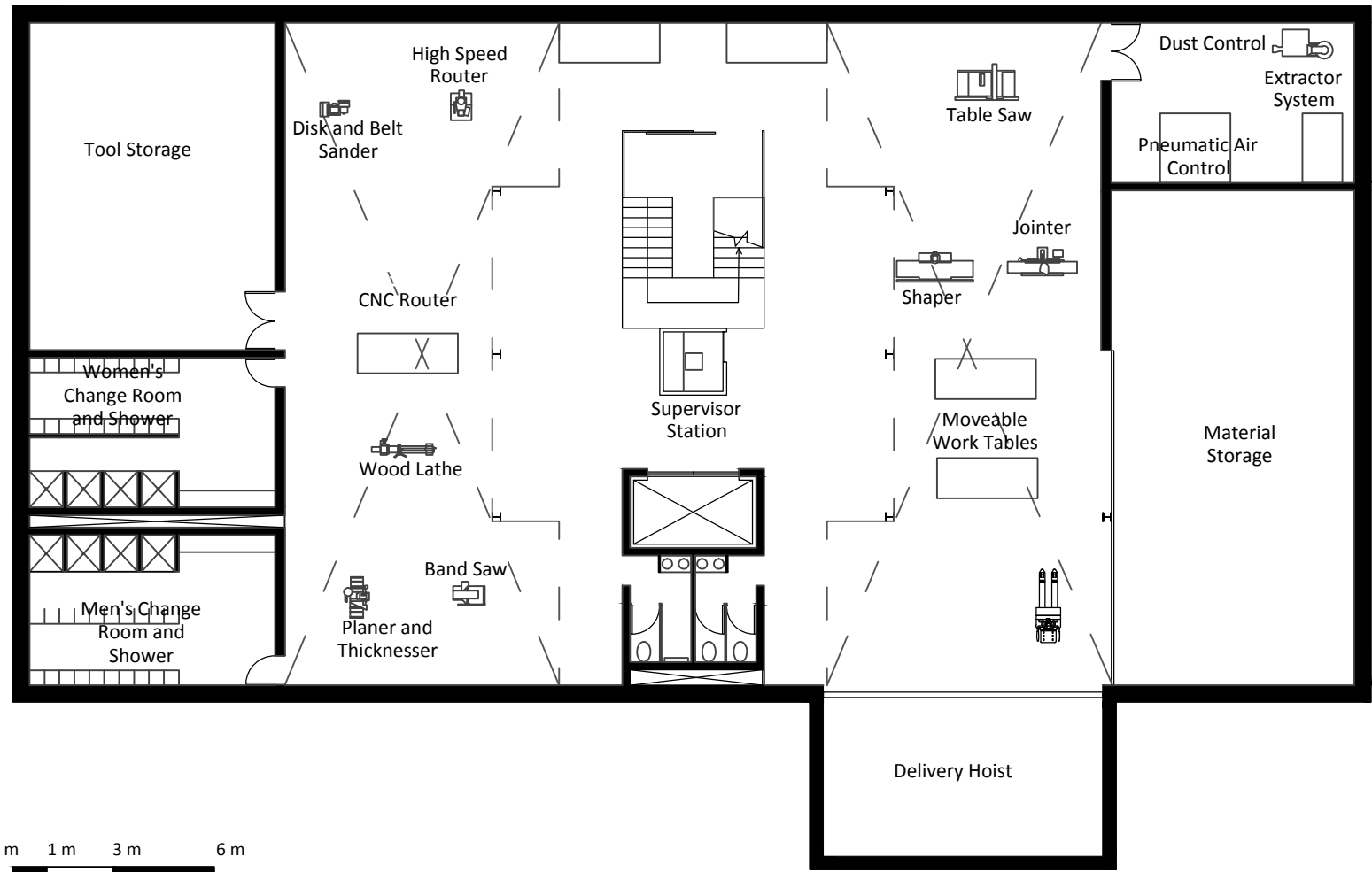


FIG 202. Plan of Woodshop Design Showing Necessary Equipment. (Bozzonetti, 2016)

# THE METAL WORKSHOP AND HACKER LAB



FIG 203. Section Through Metal Workshop and Hacker Lab Showing Activity. (Bozzonetti, 2016)

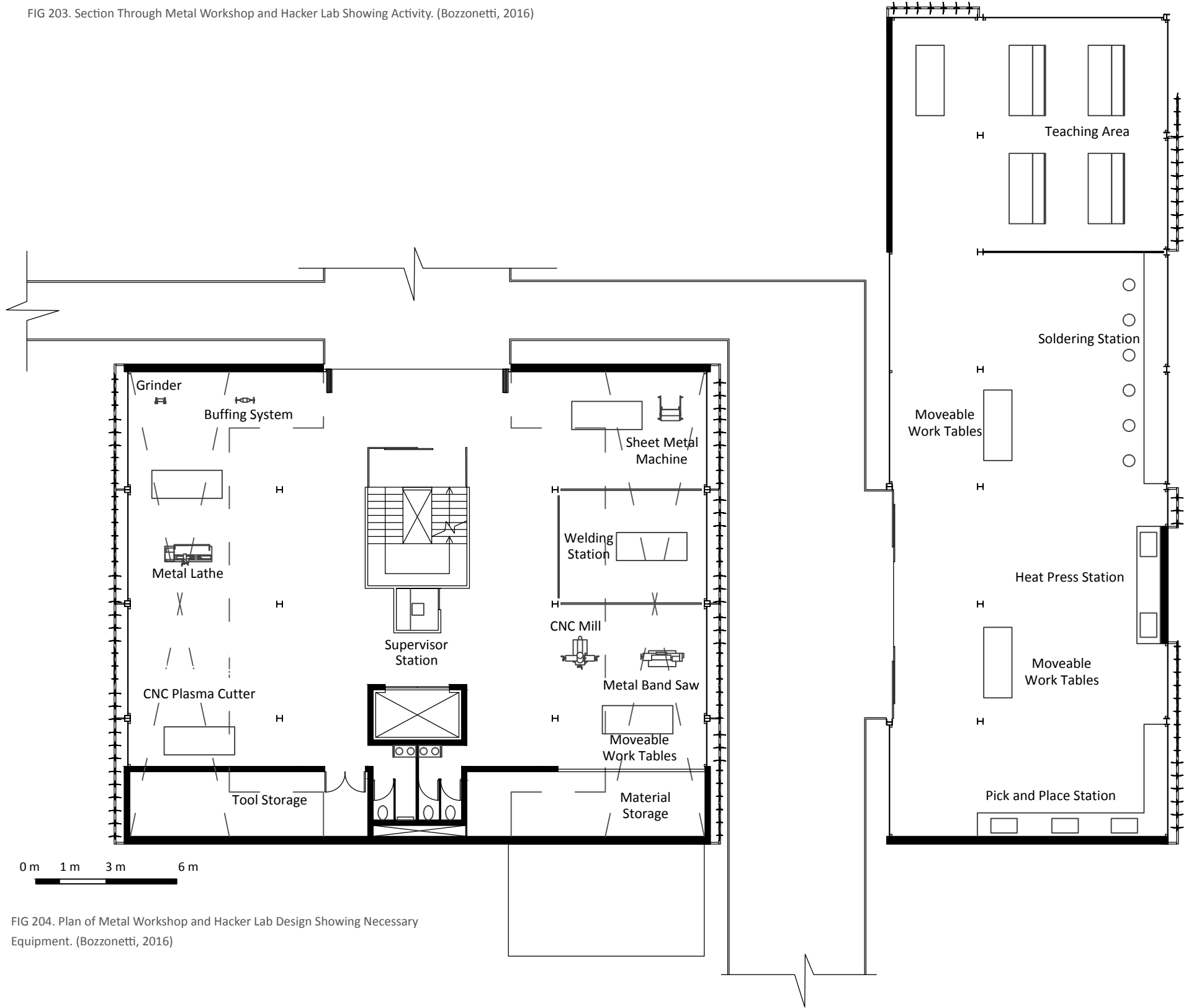


FIG 204. Plan of Metal Workshop and Hacker Lab Design Showing Necessary Equipment. (Bozzonetti, 2016)

## THE DIGITAL FABRICATION LAB

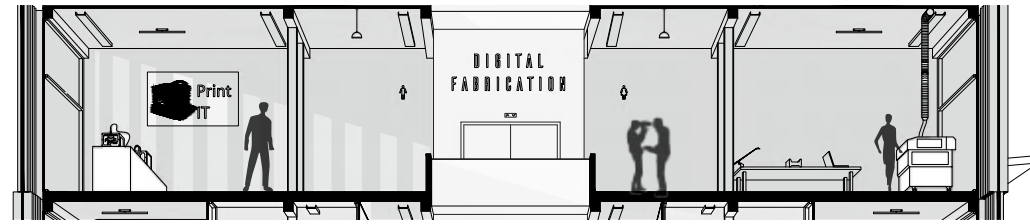
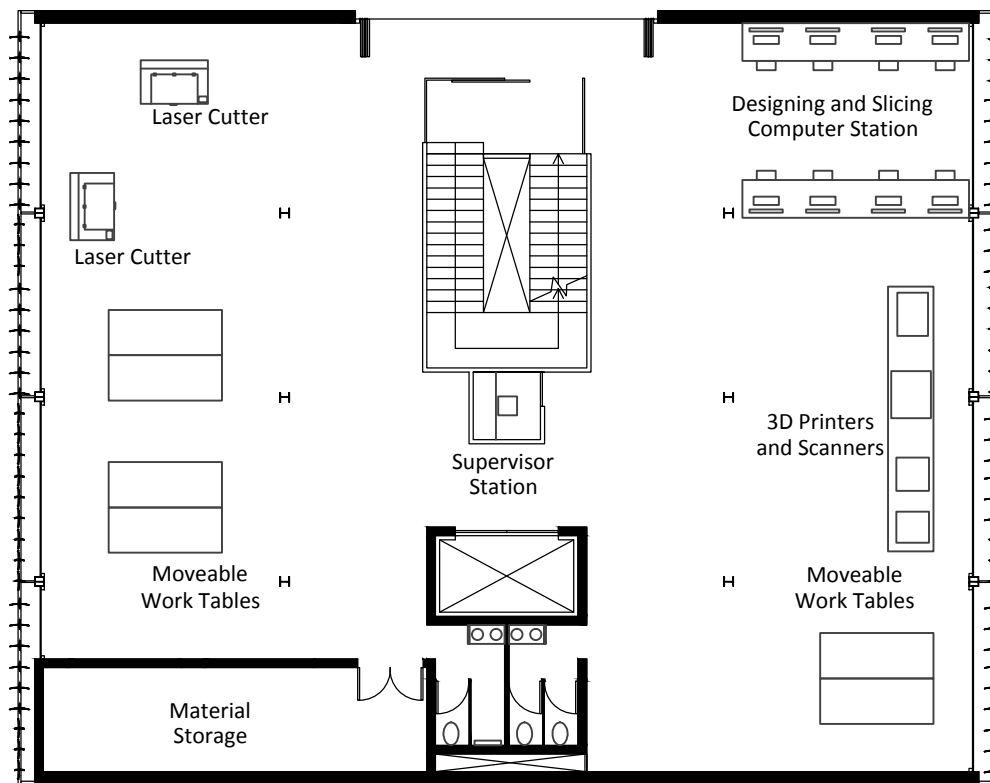


FIG 205. Section Through Digital Fabrication Lab Showing Activity. (Bozzonetti, 2016)

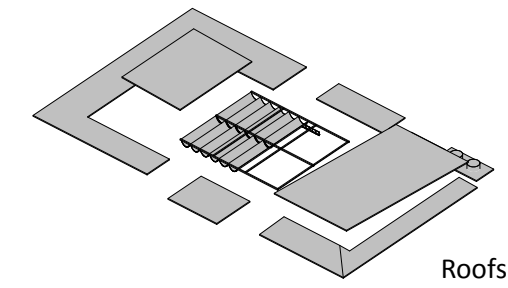


0 m 1 m 3 m 6 m

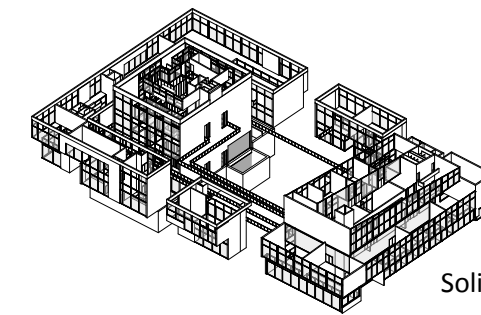
FIG 206. Plan of Digital Fabrication Lab Design Showing Necessary Equipment. (Bozzonetti, 2016)

## TECHNICAL DEVELOPMENT

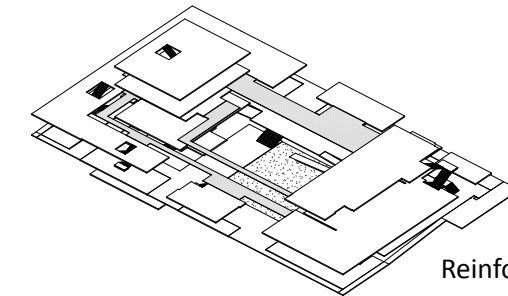
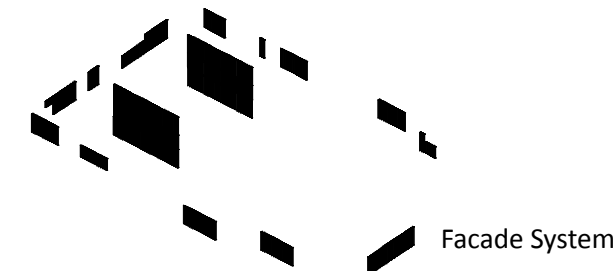
## Structural Breakdown



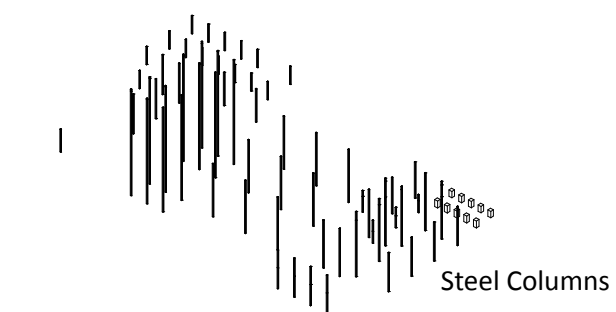
Roofs



Solid and Glass Walls

Reinforced Concrete Slabs and  
Vertical Circulation

Facade System



Steel Columns

FIG 207. Exploded Axonometric Structure Breakdown. (Bozzonetti, 2016)

## Maker Pod Structure

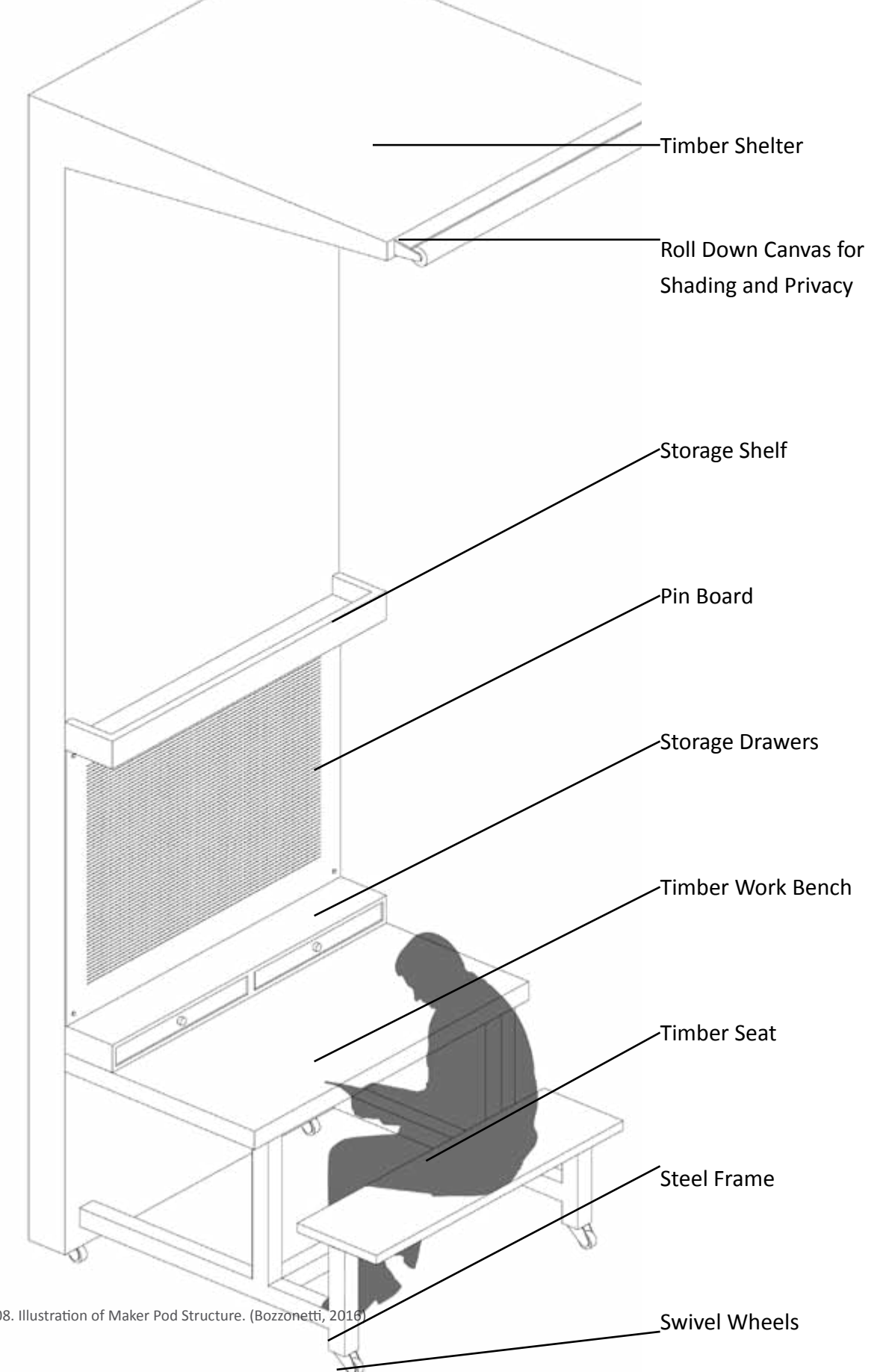
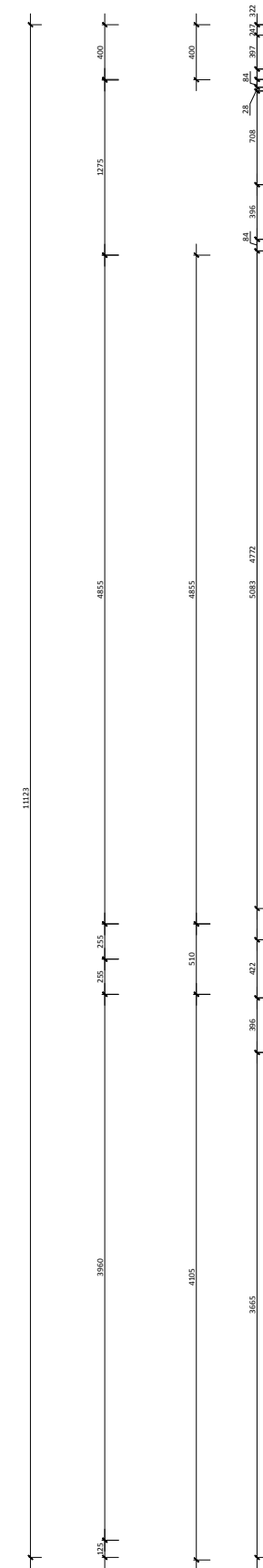


FIG 208. Illustration of Maker Pod Structure. (Bozzonetti, 2016)

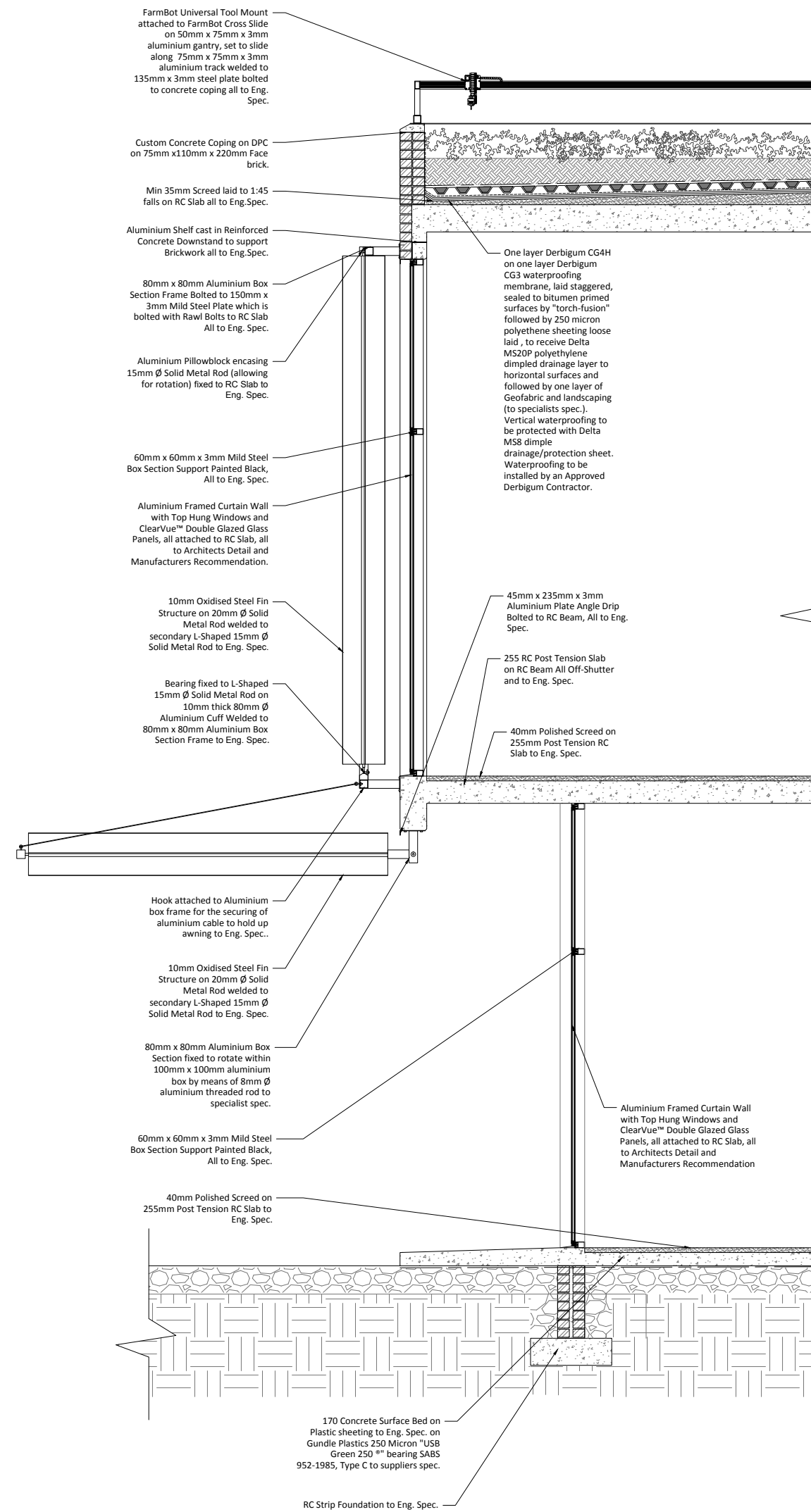


## Perimeter Section



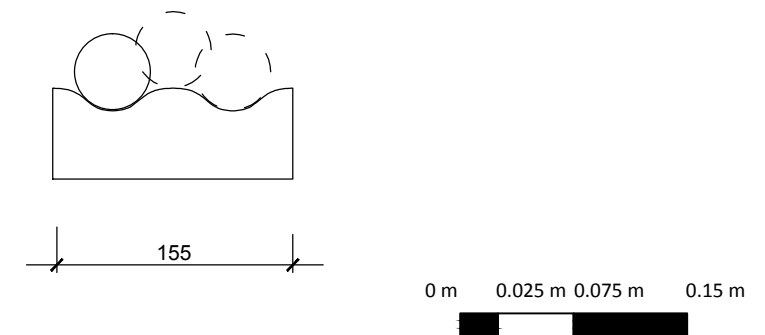
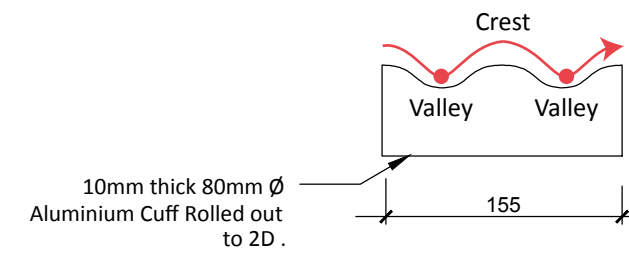
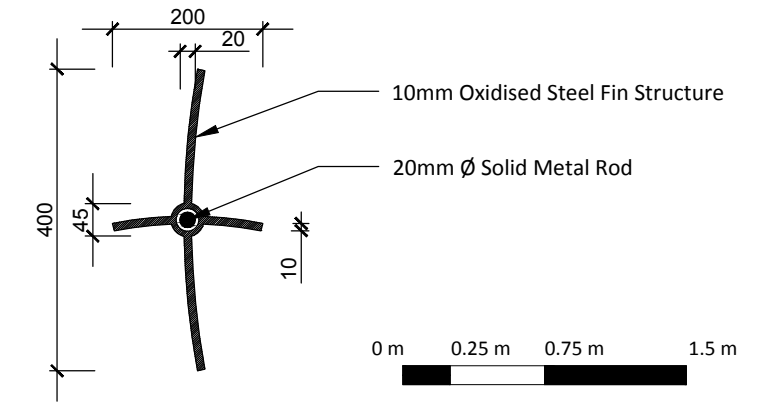
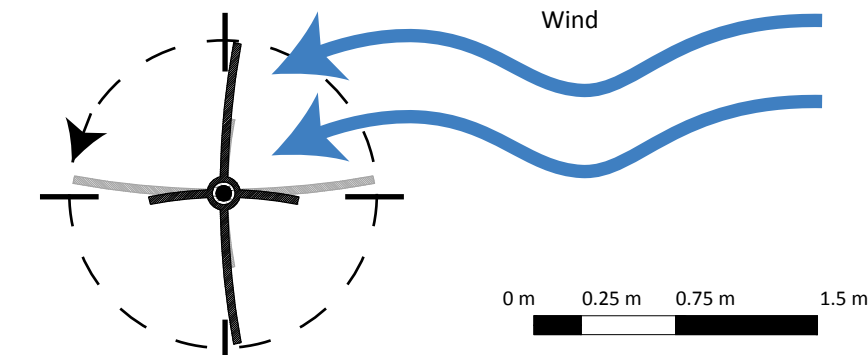
0 m 0.25 m 0.75 m 1.5 m

FIG 209. Perimeter Section. (Bozzonetti, 2016)



## Facade Detail

The idea for the façade stems from the pinwheel. The façade system consists of two, slightly curved, oxidised steel fins that intersect one another and at the point of intersection is a steel rod that acts as the point about which the fins rotate. The rods are connected to a bearing at the bottom end that travels along an aluminium cuff with a waved profile so that the rotation of the fins is limited to 90 degrees at a time. The wind will catch the fin causing the bearing to travel along the cuff, with enough wind force the bearing will travel from a valley up and over a crest down into the next valley. At the top end, the rod sits within an aluminium pillow block that allows the rod to rotate within it. Certain Section of the fins will be painted certain colours, creating a kaleidoscope of colours when the wind blows, and the 'Pinwheels' will be varying in height.



80mm x 80mm Aluminium Box Section Frame Bolted to 100mm x 3mm Mild Steel Plate which is bolted with Rawl Bolts to Concrete Slab All to Eng. Spec.

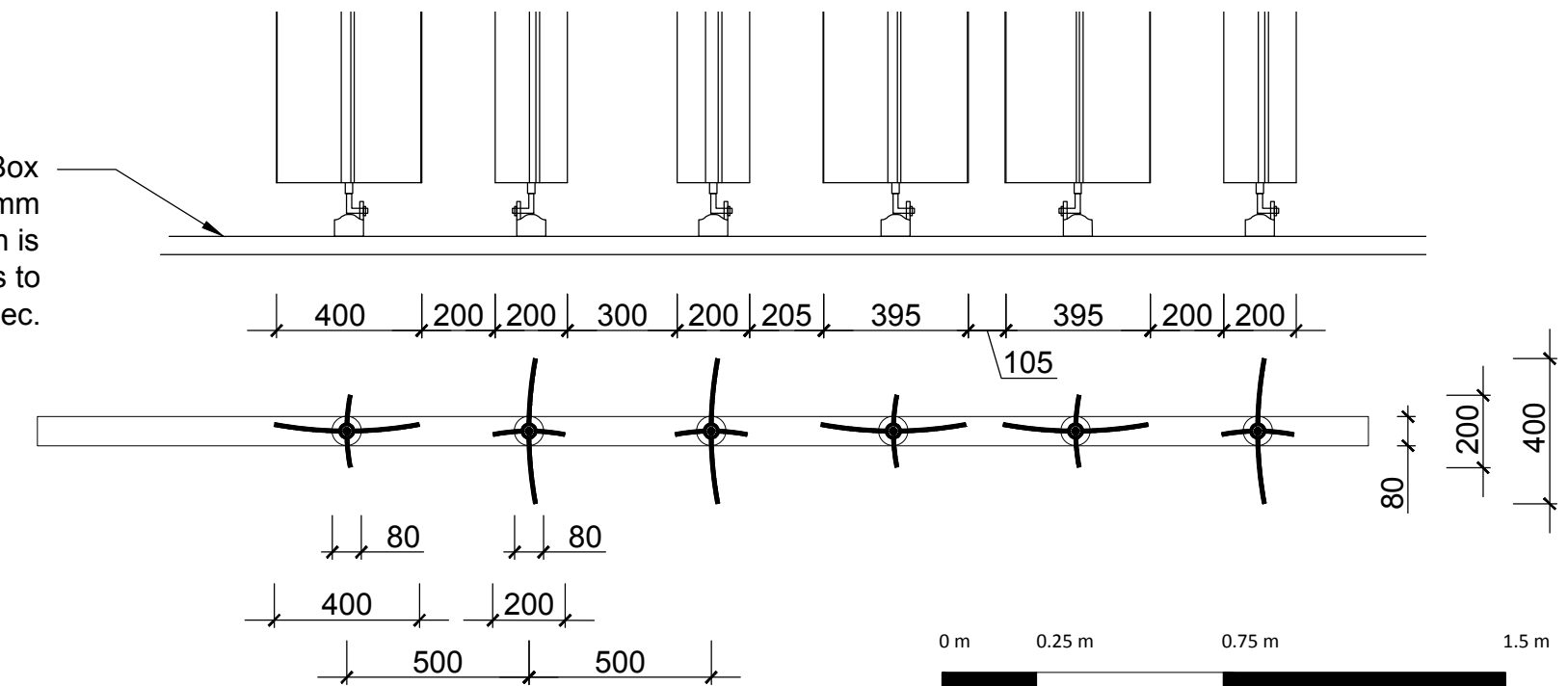


FIG 213. Plan and Elevation Drawings of Facade System. (Bozzonetti, 2016)

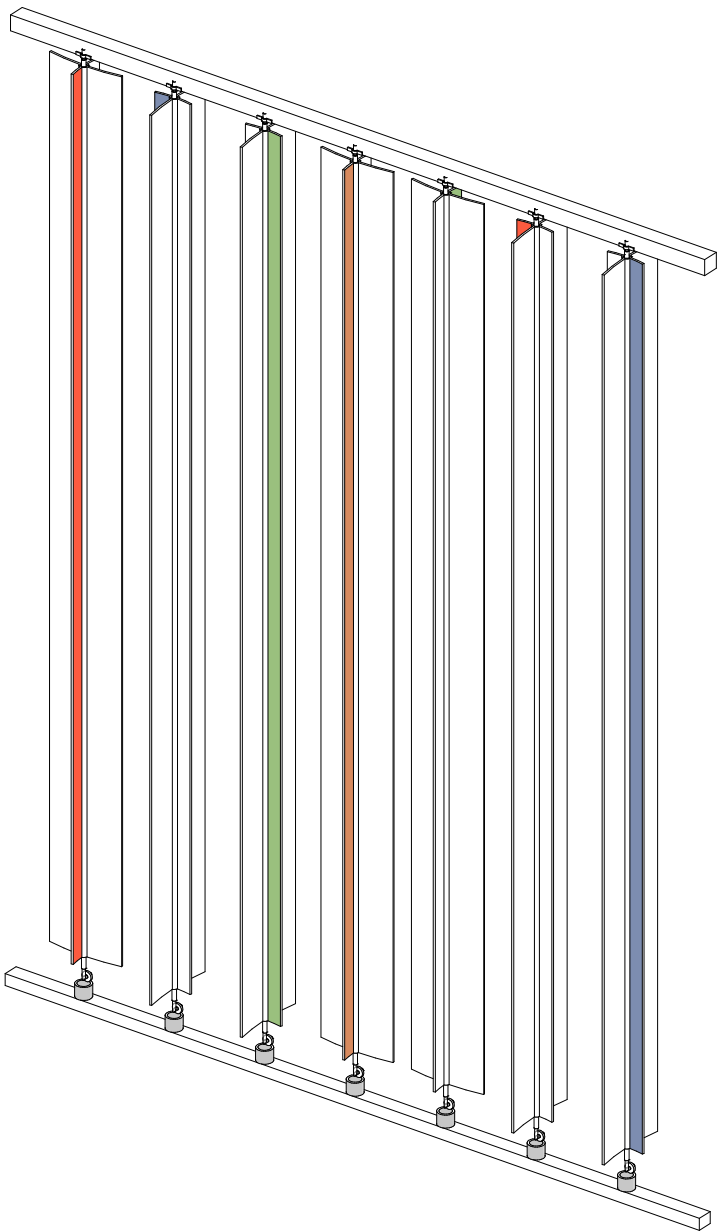
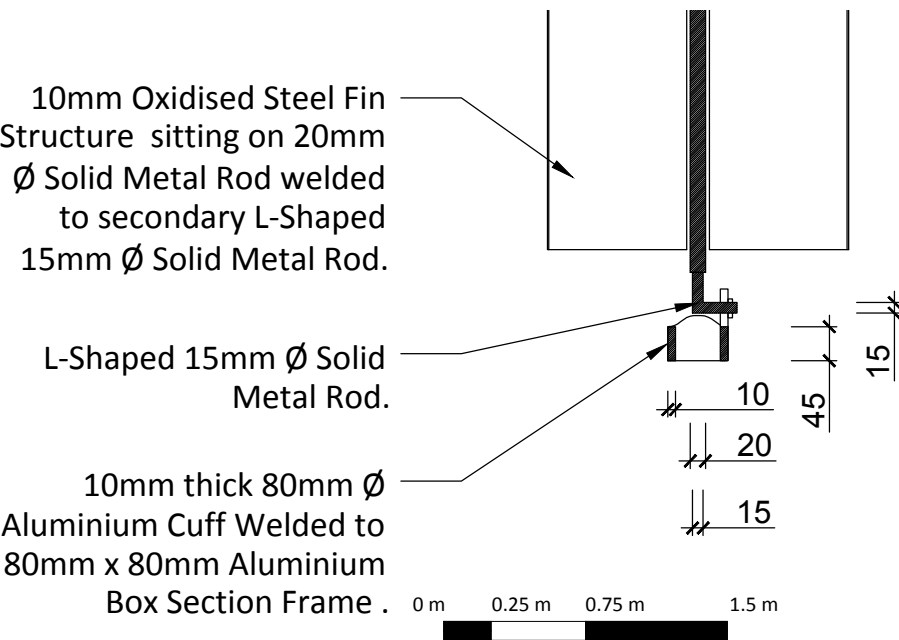
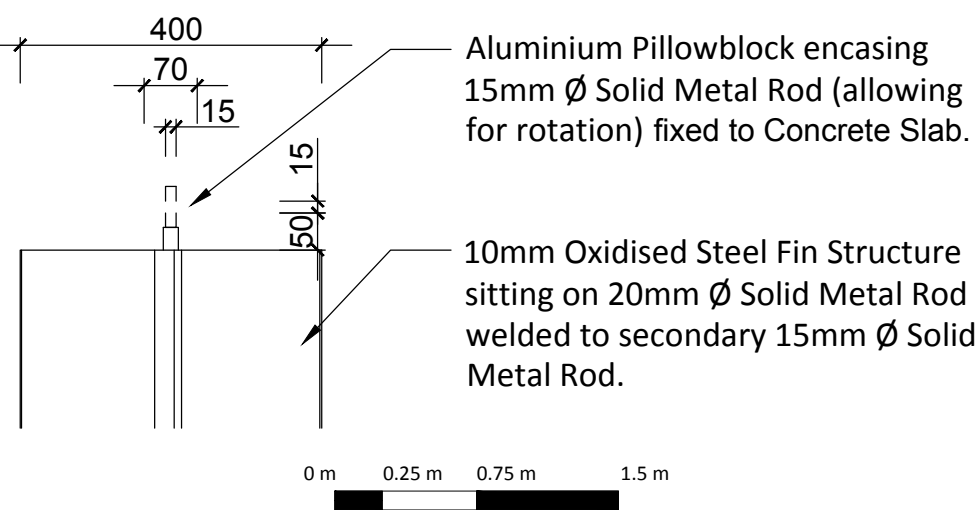
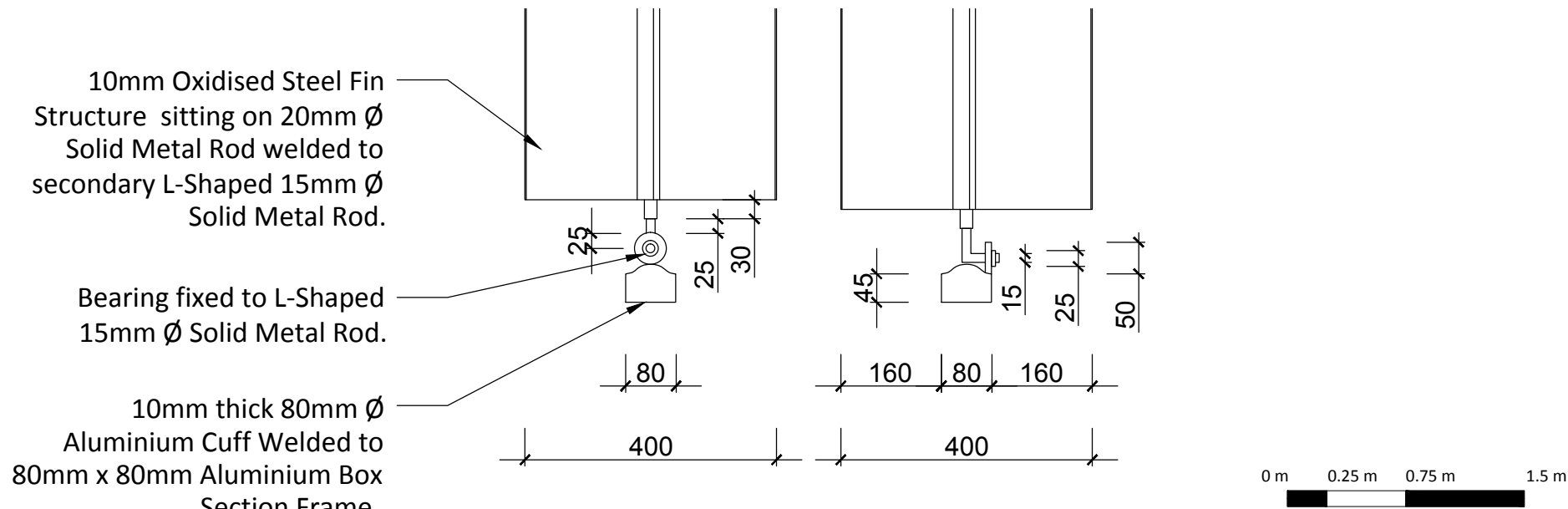


FIG 217. Illustration Showing Colour Variation in Facade System. (Bozzonetti, 2016)

## FarmBot

According to Derek Markham in his article *The open source CNC system integrates high-tech automation into backyard farming*, the FarmBot is an open source CNC system that allows for automated DIY small scale food production (Markham, 2016). The FarmBot website says that by using this system, one can design and manage a farm through a device (FarmBot, n.d.). A person can schedule a sequence of operations that is carried out by a CNC system to look after the plants. The system can plant water the plants and remove any weeds through automation. All of the design files, software source code and documentation is open source so anyone can make their own FarmBot system (FarmBot, n.d.).



FIG 218. FarmBot Grown Vegetables. (FarmBot, n.d.)

### The structure

#### Tracks

The tracks facilitate the movement of the gantry and provide high precision so that the FarmBot can return to the same position over and over again. (FarmBot, n.d.) The tracks can either be raised or low depending on the vertical clearance of the of the plants. The low tracks tend to be the better option because it is less costly, less visible and easier to maintain. (FarmBot, n.d.)

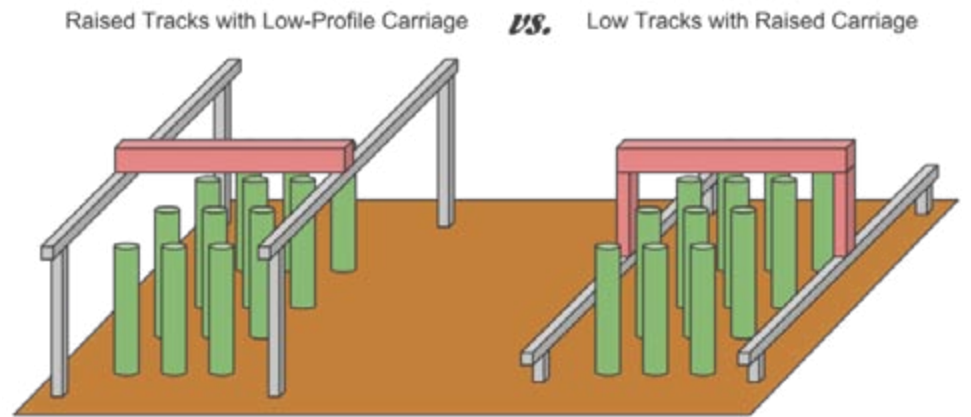


FIG 219. FarmBot Tracks and Carriage Illustration. (FarmBot, n.d.)

#### Gantry

The gantry bridges the two tracks and moves along the x-direction. It also serves as the guide along which the cross slide moves. (FarmBot, n.d.)

#### Cross Slide

The cross slide moves along the gantry in the y-direction. The universal tool mount is attached to the cross slide through a Z-axis component and is displaced in the y-direction by the slide. (FarmBot, n.d.)



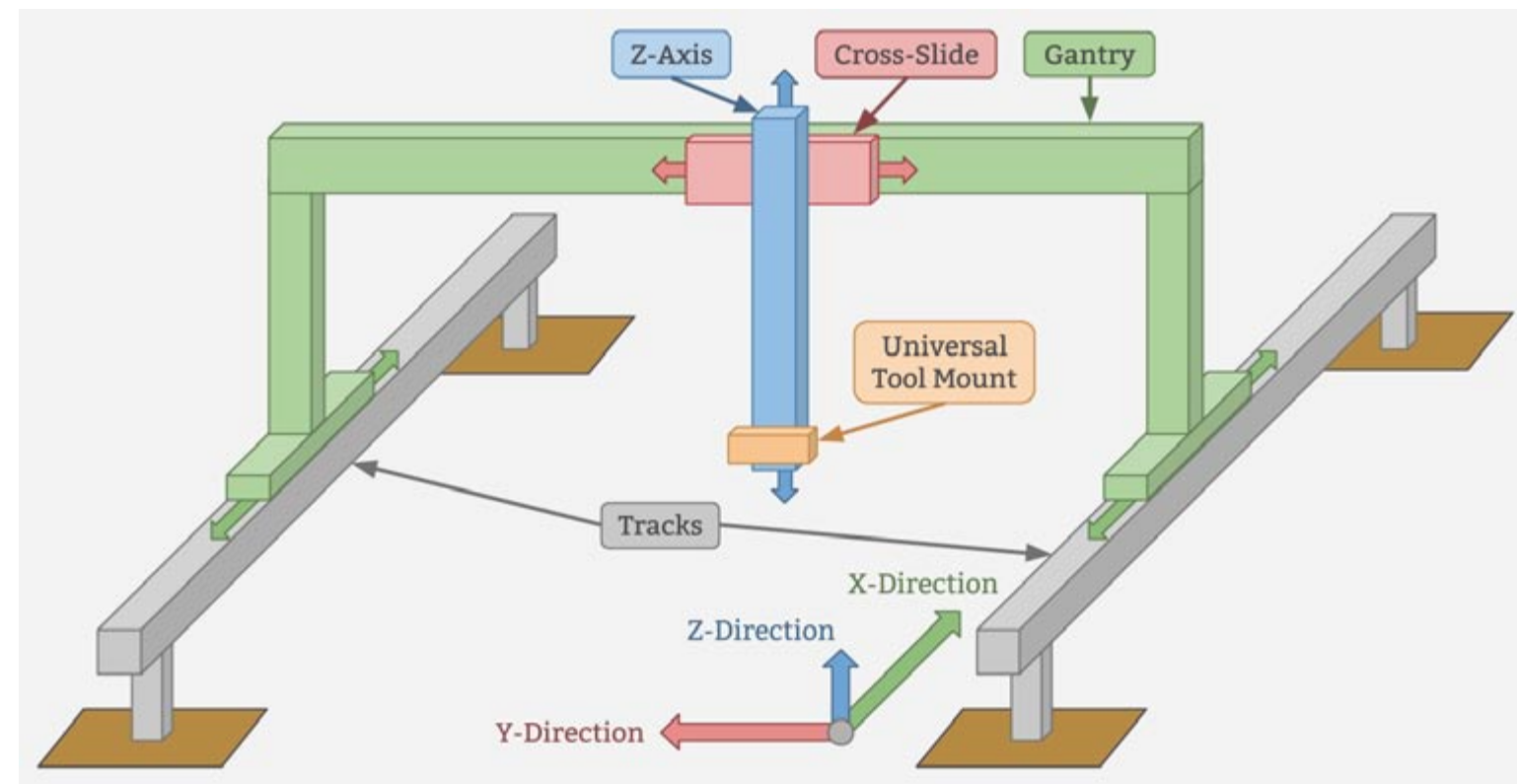


FIG 220. FarmBot Structure Illustration. (FarmBot, n.d.)

### Universal Tool Mount

The universal tool mount moves along the gantry using the cross slide, but it also moves in the z-direction, moving up and down the slide.

(FarmBot, n.d.)

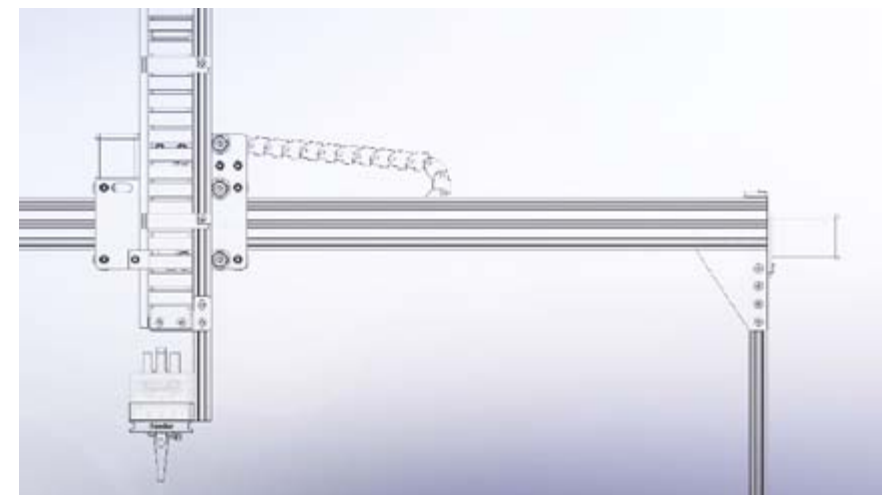


FIG 221. FarmBot Tool Mount Illustration. (FarmBot, n.d.)



FIG 222. 3D Printable Parts for seed injection and watering. (FarmBot, n.d.)

FIG 223. Other attachments available for the Farmbot. (FarmBot, n.d.)

### Use in the Design

There is an opportunity to landscape some of the roofs of the proposed design. Should those roofs be used to farm fruits and vegetables, not only could the rooftop restaurant and café use the produce in their food, but it could also be sold in the market space, forming another source of income for the makerspace.

The rooftop farm also becomes an opportunity for a collaborative project in the workshop. The members could use the open source information available on the FarmBot to make the system for the building. The parts would be able to be manufactured in-house through the utilisation of the electronics lab, 3D Printers and the metal shop. They could also use the system to experiment with how to improve it and then make that information open source. Visually the public can get involved with the CNC farming as well. Pedestrians will be able to learn a bit about what the makers do as they see the gantry sliding up and down the tracks on the roof from the pavement.

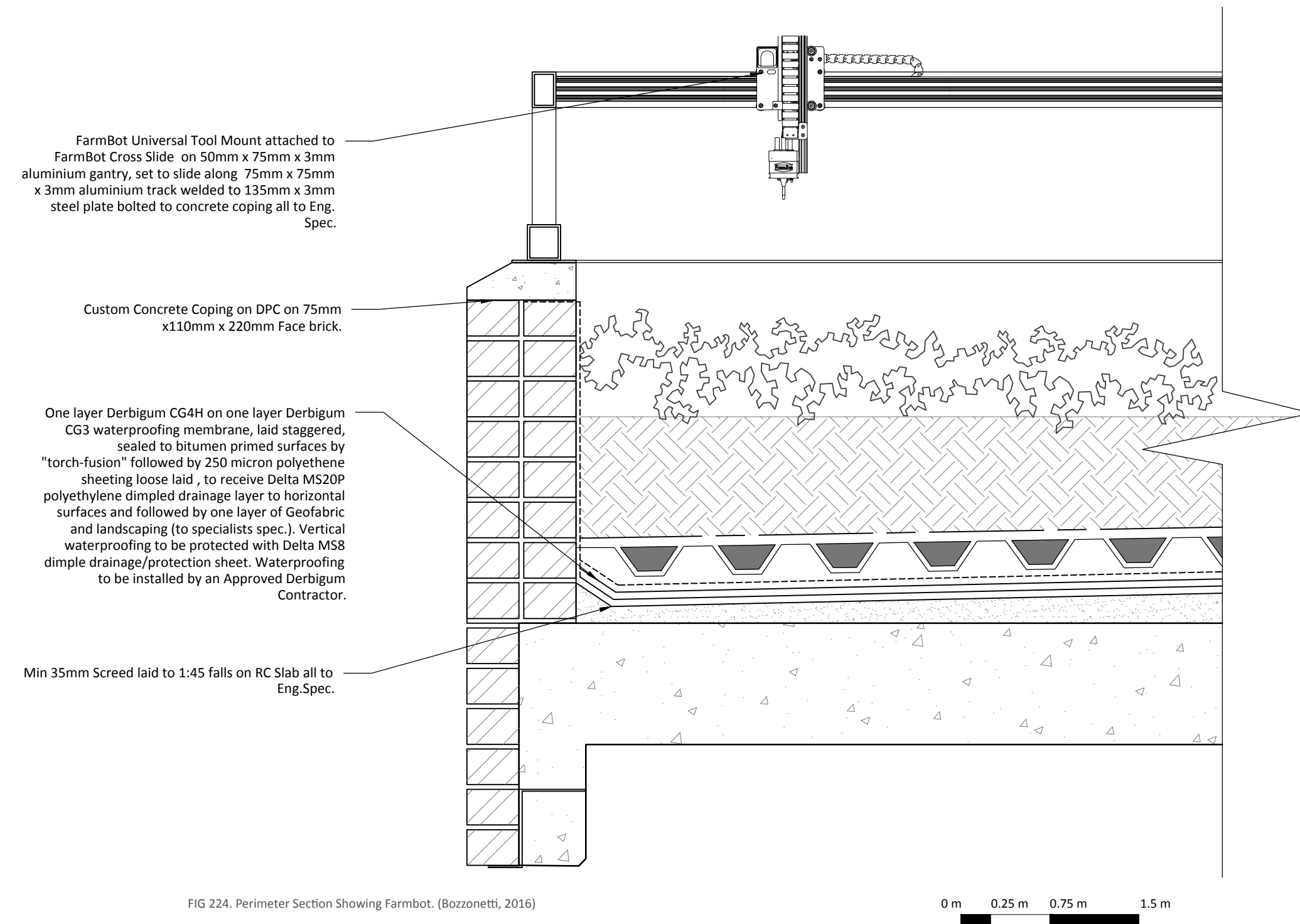


FIG 224. Perimeter Section Showing Farmbot. (Bozzonetti, 2016)

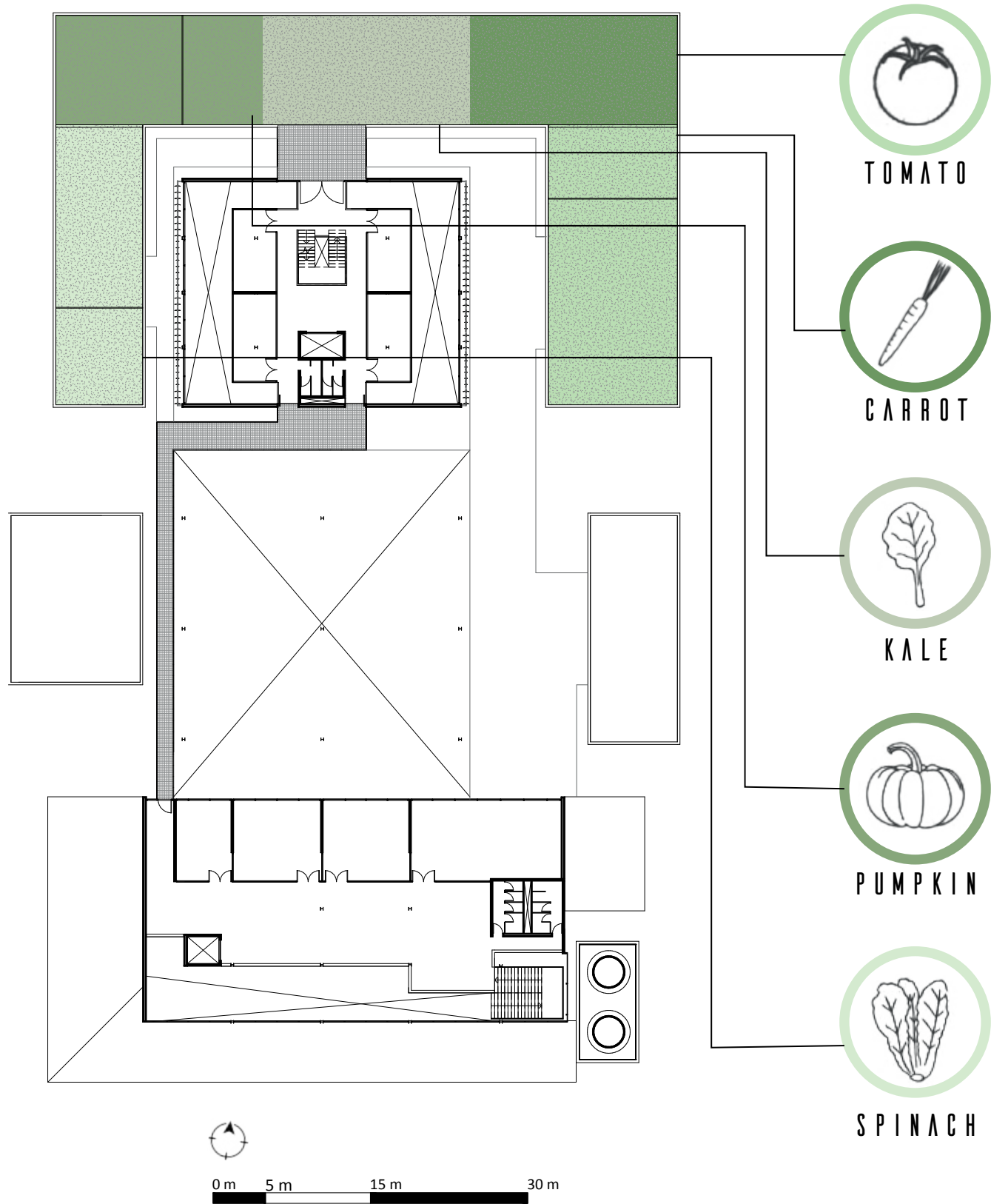


FIG 225. Farming Breakdown. (Bozzonetti, 2016)

Sustainability Approach

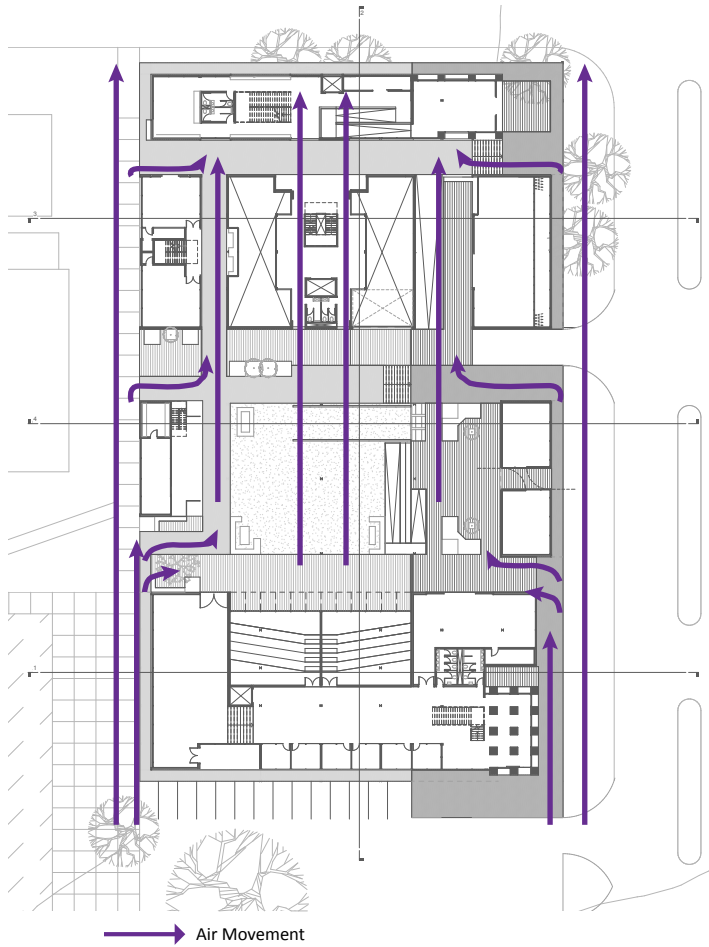


FIG 226. Passive Airflow. (Bozzonetti, 2016)

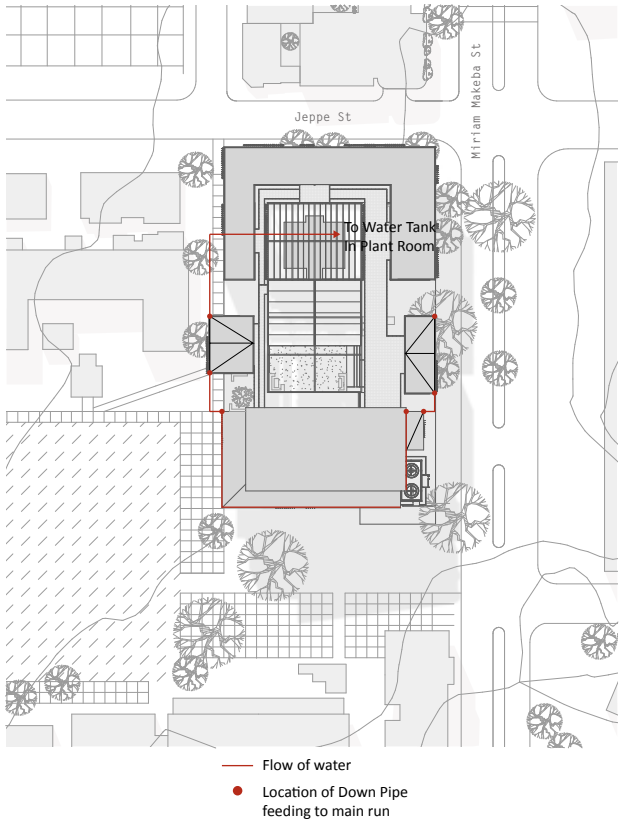


FIG 228. Rain Water Collection in Plan. (Bozzonetti, 2016)

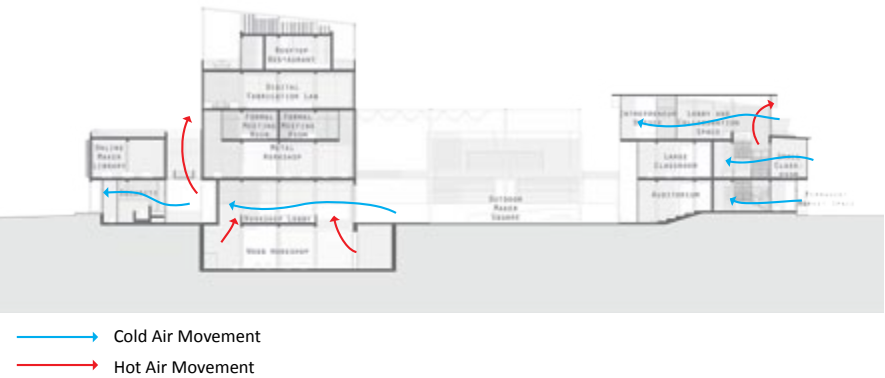


FIG 227. Hot and Cold Air Movement. (Bozzonetti, 2016)

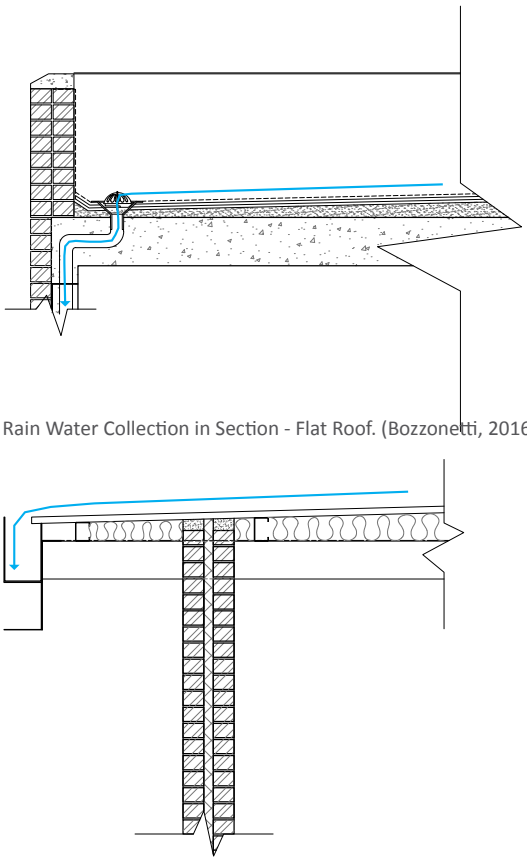


FIG 230. Rain Water Collection in Section - Flat Roof. (Bozzonetti, 2016)

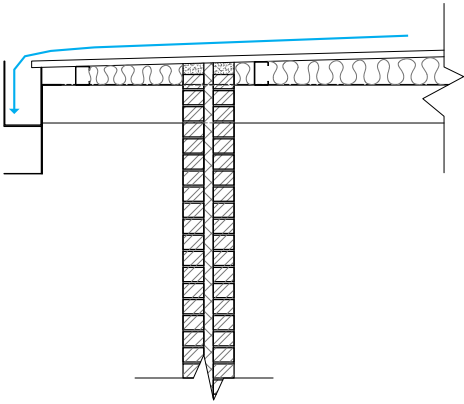


FIG 229. Rain Water Collection in Section - Mono Pitch Roof. (Bozzonetti, 2016)





FIG 231. Perspective of North East Corner Entrance - Night. (Bozzonetti, 2016)



## November Presentation and Final Models



FIG 232. Model in Context at November Presentation. (Bozzonetti, 2016)

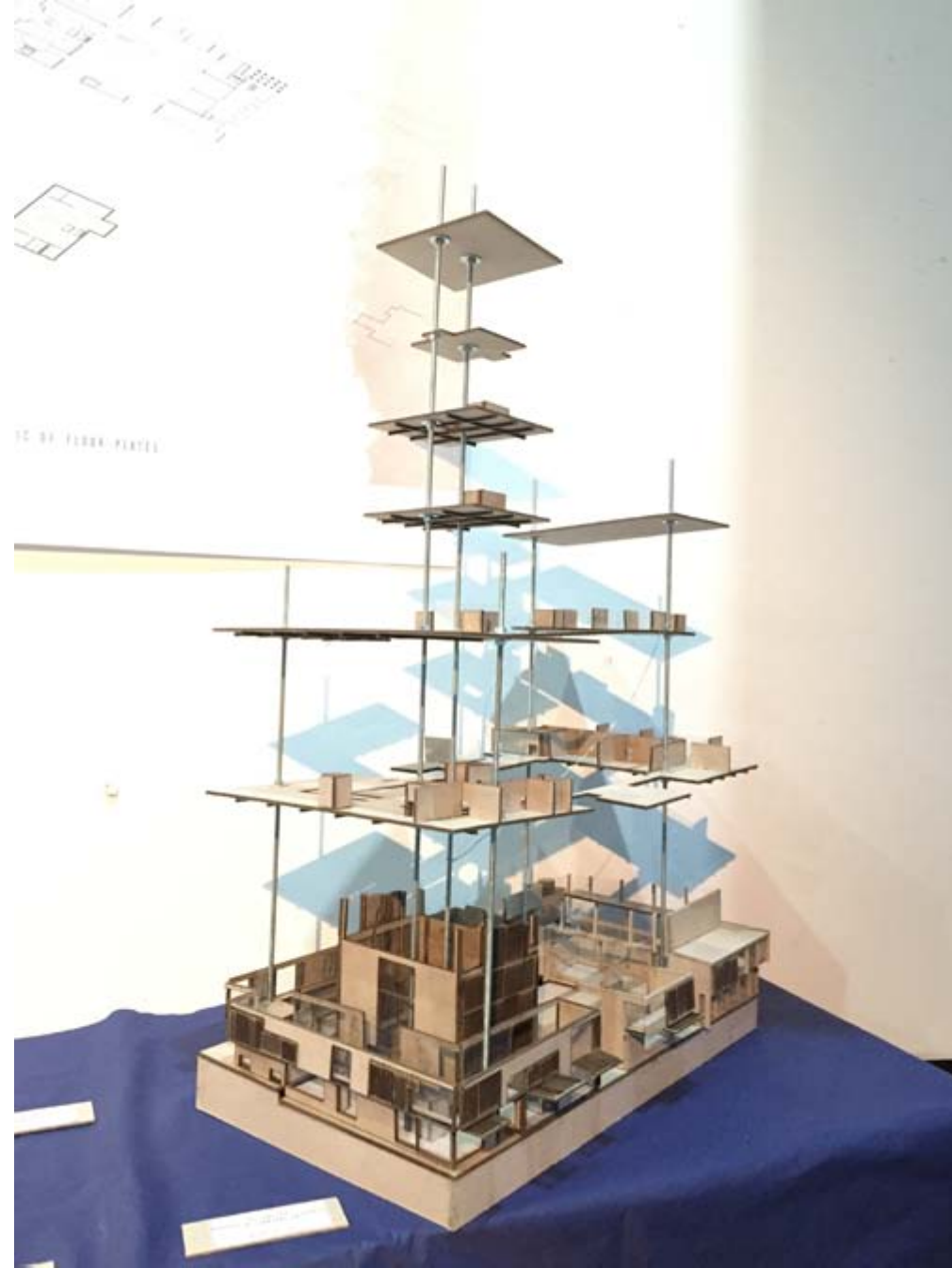


FIG 233. Exploded Floor Plate Model at November Presentation. (Bozzonetti, 2016)



FIG 234. November Presentation 1. (Bozzonetti, 2016)



FIG 235. November Presentation 2. (Bozzonetti, 2016)



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- Interview with Stephen Gray, Owner of The Makerspace on 25 August 2016. Advised on Maker Culture and Makerspaces

- Interview via email with Mia Van Zyl, Owner of Mia design & make between 5 August 2016 and 6 September 2016. Advised on Maker Culture and Makerspaces.

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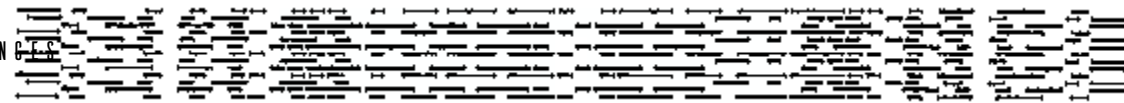
- Certificate of Retrospective Acknowledgement on behalf of School of Architecture and Planning Human Research Ethics Committee.

- Formal (Signed) Consent Form for Mia Van Zyl.

- Formal (Signed) Consent Form for Stephen Gray.

APPENDICES





**SCHOOL OF ARCHITECTURE AND PLANNING  
HUMAN RESEARCH ETHICS COMMITTEE**

**CERTIFICATE OF RETROSPECTIVE ACKNOWLEDGEMENT**  
**PROTOCOL NUMBER: SOAP15/11/05/2016**

**PROJECT TITLE:** The Culture in Fabrication

**INVESTIGATOR/S:** Claudia Bozzonetti (Student no# 534685)

**SCHOOL:** Architecture and Planning

**DEGREE PROGRAMME:** Master of Architecture Professional (MArch Prof)

**DATE CONSIDERED:** 22 August 2016

**EXPIRY DATE:** 22 August 2017

**DECISION OF THE COMMITTEE:** Retrospective Acknowledgement

**CHAIRPERSON**

(Professor Daniel Irurah)

**DATE:** 24-08-2016

cc: Supervisor/s: Dirk Bahmann

**DECLARATION OF INVESTIGATORS**

I/We fully understand the conditions under which I am/we are authorized to carry out the abovementioned research and I/we guarantee to endure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I/we undertake to resubmit the protocol to the Committee.

Signature

Date

25/08/2016

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**FORMAL (SIGNED) CONSENT FORM**

I hereby confirm that I have been informed by the student researcher of the purpose, procedures, and my rights as a participant. I have received, read and understand the written participant information sheet. I have also been informed of:

- ☒ the nature of my participation in the interview
- ☒ the place and duration of the study
- ☒ the reasons for why I was selected to participate in the study
- ☒ the voluntary nature, refusal to answer, and withdrawing from the study
- ☒ no payment or incentives
- ☒ no loss of benefits or risks
- ☒ anonymity
- ☒ confidentiality *I do not mind being named. MD*
- ☒ how the research findings will be disseminated

I therefore agree to participate in this study by speaking with the student.

~~I AGREE~~ ~~DO NOT AGREE~~ to audio-recording during interviews. *N/A*

PARTICIPANT:

*MIA VAN ZYL*  
Printed name (Optional)

Signature

Date

*2016.09.06*



FORMAL (SIGNED) CONSENT FORM

I hereby confirm that I have been informed by the student researcher of the purpose, procedures, and my rights as a participant. I have received, read and understand the written participant information sheet. I have also been informed of:

- ☒ the nature of my participation in the interview
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- ☒ confidentiality
- ☒ how the research findings will be disseminated

I therefore agree to participate in this study by speaking with the student.

I AGREE / DO NOT AGREE to audio-recording during interviews.

PARTICIPANT:

STEPHEN GRAY

Printed name (Optional)

'Steve Gray'



Signature

25 Aug 2016

Date

SCHOOL  
ARCHITECTURE  
PLANNING



MAKING IS FUNDAMENTAL TO WHAT IT MEANS TO BE HUMAN.  
WE MUST MAKE, CREATE, AND EXPRESS OURSELVES TO FEEL  
WHOLE. THERE IS SOMETHING UNIQUE ABOUT MAKING  
PHYSICAL THINGS. THINGS WE MAKE ARE LIKE LITTLE PIECES  
OF US AND SEEM TO EMBODY PORTIONS OF OUR SOUL.

[HATCH, 2014, CHAPTER 3, 0 MIN]