The Overnight City

Future Explorations of Density and Population
Growth in a Diminishing World.

by
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Author's Declaration

I hereby declare that I am the sole author of this thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

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Abstract

Land is our planet's scarcest resource. With all the combined advances in our civilizations and their respective technologies, we have yet as a society to fully understand our precarious situation within our diminishing livable planetary surface. We also live today within a world in constant stages of change. With rapid population growth on a global scale, and its resulting increases in urban density, our available usable living space is greatly becoming smaller and our lives more crowded and condensed. Following upon our urban centers, this thesis aims at exploring the effects of these global phenomena of overcrowding and overpopulation especially within the time remaining before we, as part of a developed society, witness the ground below our feet gradually disappear.

Montreal City is one developed world urban center ready to receive this next evolutionary step in urban growth and it is historically no stranger to architectural experimentation. Expanding the city's infrastructures through the third dimension will allow greater freedom in the urban sculpture of this future face of our growing urban worlds. This will be the insertion of a new population-absorbing building and urban typology. This will be the return of the megastructure and the revival of an old visionary architectural language that will advance the exploration of the impact of growth and urban concentration.

"The greater danger for most of us lies not in setting our aim too high and falling short; but in setting our aim too low, and achieving our mark."

-Michelangelo Buonarroti.

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To Chantal

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Prelude

The velvet curtain is rising on a new scene. You sit in the audience patiently awaiting the start of the show, the first act, yet the playbook and programme in your hand are blank. The show seems already underway but there is neither anyone on stage or a sign of movement amidst the crowd. A few moments pass by and you suddenly notice visible characters, but more importantly, that the stage is almost growing too small to hold them all. A glance back to your blank playbook reveals yet no new information while confusion replaces your previous feeling of anticipation. During this small lapse of attention, the stage's performers have doubled, maybe tripled. The situation rapidly forms into a chaotic mix of individuals slowly pouring off the edges and into the audience, soon you need to move away or risk being trampled. The performers eventually and inexorably reach the edge of the theatre and flow to a gentle stop blocked only by the exterior doors. You express relief for an instant until another wave of new performers emerges from the stage, this time causing the current clear space around you to disappear completely. As wave after wave accumulates, you yourself lose the luxury of movement and become stranded on equal ground with all sharing the theater. More enter from the scene. Just before the pressure overwhelms the theatre crowd, the theatre doors break open, spilling their contents into the front lobby. Unfortunately, there is barely time for a breath until this new space becomes filled, again beyond capacity. The problem is that the theatre in question was built yesterday and designed to suit its numbers then. It is now becoming evident that such intentions have been fundamentally flawed from the start. Too much focus has been given to past and, coincidently, present conditions. If our cities, like the theatre space, in the future are to grow in population overnight then we need to reconsider how we will accommodate that crowd.

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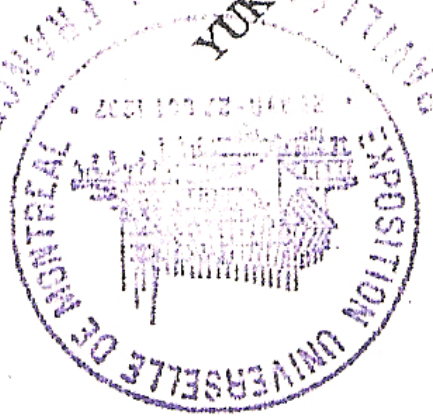


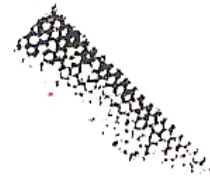
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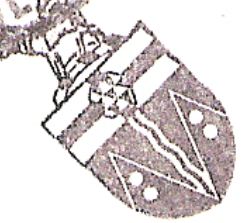












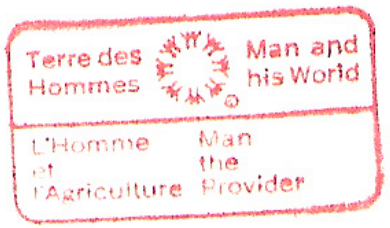
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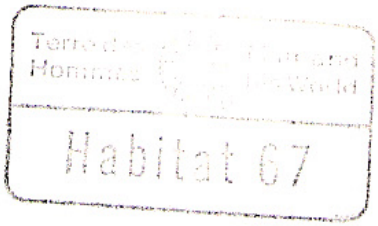

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01

The Overnight City

"These drawings are talking to people's imaginations and are meant to shock… people should think that something else is possible. Architecture does not trigger the imagination anymore. Questions should not be linear but as graphs. The different questions are linked."

-Yona Friedman [1]

1. MVRDV. *KM3, Excursions on Capacities*. (European Union: Actar, 2005), 506. Discussion between Yona Friedman & Winy Maas.

"Traditionally, architecture has always provided images in a threateningly disordered world. The stability and patterns of these images offer a sense of comfort and control. The dilemma is what constitutes one of these images."

- Mark Wigley [2]

What is a megastructure?

Yona Friedman, a visionary architect in the 1950s and 1960s, once considered the European continent to be a single city of about three-hundred-million people. With its many cities of various scales all linked together with reliable rail transportation, Europe was one large network composed only of centers and remaining vacant hinterland. As opposed to North America, Europe had then very few cities above three million people and even those were very modest in footprint. With less than two-hundred kilometres between these centers, and with high-speed rail mobility, it was very possible to imagine commuting between centers on a daily basis. Friedman proposed an expansion of this spatial organization to cover the entirety of the European continent, effectively turning the landmass into one large urban megastructure. The nodes in his proposed spatial frame were not to be individual buildings, but the pre-existing cities that dotted Europe. Friedman's new urban form would provide, in addition to continent-wide mobility, an

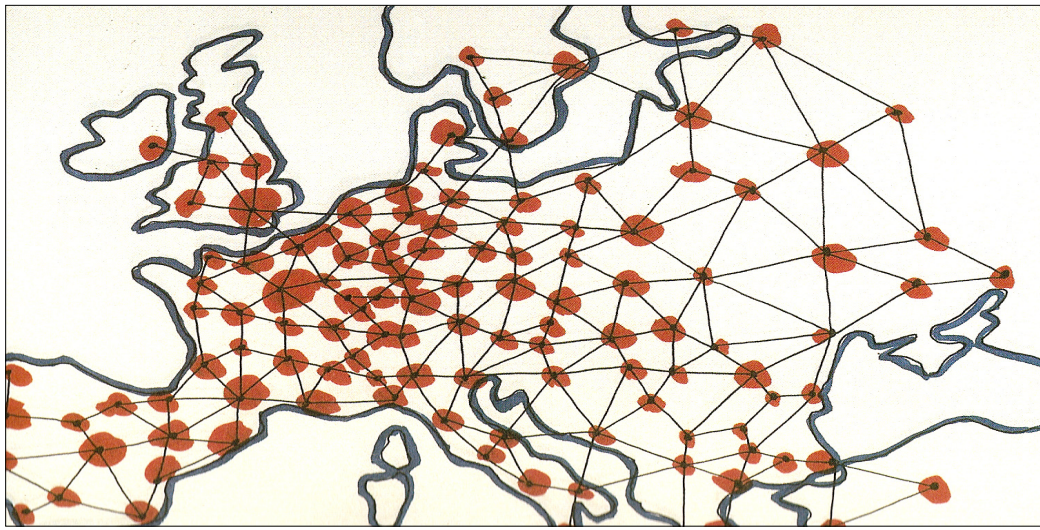
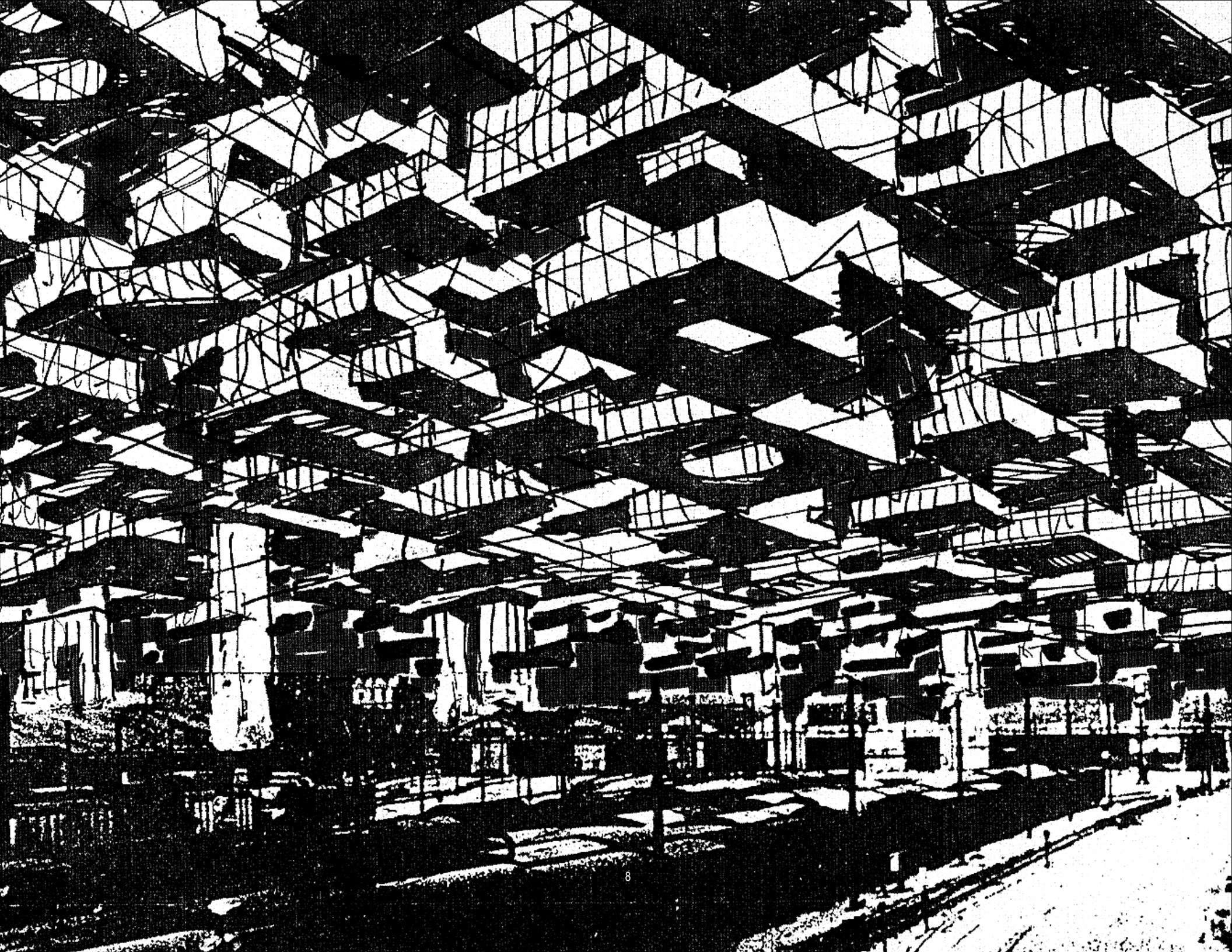


FIG. 01/01
Yona Friedman's Continent City, 1970

2. Mark Wigley and Catherine Zegher. *The Activist Drawing: Retracing Situationist Architectures from Constant's New Babylon to Beyond.* (New York: The Drawing Center, 2001), 105.

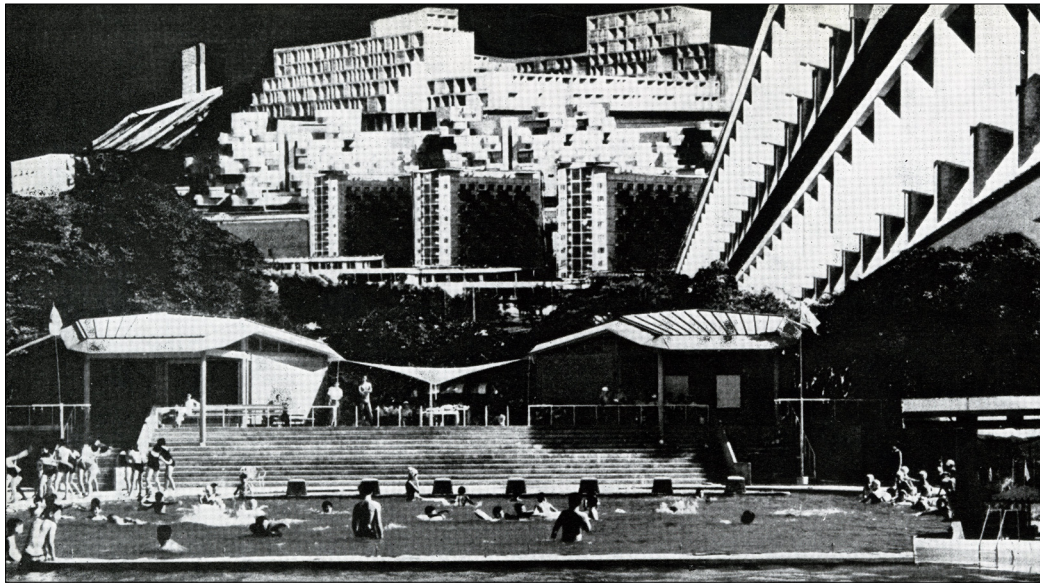


intensification of urban life by the superimposition of a modern urban-scaled construction above the existing cities. Adding three to seven layers of urbanism, Friedman could, for example, triple the density of Paris without the slightest expansion of its urbanized footprint.[3] If all existing European cities would adopt his determined ideal density of seventeen-hundred people per square kilometre, which was the density of Paris in early 1970, then in theory, the European continent would be able to hold a population of one-billion people in very comfortable modern conditions. With estimates at that time reaching a population of ten billion people globally by the year 2050, Friedman's ideal density would require about six-million square kilometres to absorb these numbers. Amounting to only sixty percent of the continent's surface, this meant that all global population growth predicted for the next eighty years could be housed on less than two-thirds of the European continent. If all this population could be housed effectively, not only would there remain one third of empty, natural land, but also every other remaining continent on Earth would in turn be one-hundred percent vacant.

Is this the definition of a true megastructure?

The answer is neither yes or no. Friedman's *Continent City* was a study extending the megastructure ideal to its limits in order to identify how we waste our most fundamental resource: the

3. Dominique Rouilard. Superarchitecture, Le future de L'architecture 1950-1970. (Paris: Editions de la Villette, 2004), 146.



Above: FIG. 03/01
An image from Civilia, a study in urban speculation from 1971 when both overpopulation and sub-urban sprawl threaten the future of the English city.

Previous Page: FIG. 02/01
Yona Friedman's Continent-City above Paris.

surface of our Earth.[4] Sprung from an emerging paranoia of urbanization and fear of high birthrates in the mid 1950s, there was further fear that any city's available expandable surfaces would be jeopardized. The birth of the megastructure idea emerged from those fears and attempted to solve, through major physical architectural and urban insertions, the needs of a fast growing society and its thirst for new surfaces.

Europe today, despite not building Friedman's megastructure, has increasingly assumed the interconnected, diverse urban network he predicted. We are nevertheless today at an important and dangerous milestone. The year 2008 marked the first time in recorded history where the balance of urban human habitation surpassed fifty percent of our global population. Along with increased population growth, large-scale urban migration now threatens the make-up and quality of many of our urban environments. If our current global population growth rates continue, numbers will become so great that the current structure of society will no longer be suitable, sustainable, or even logical. Understanding our physical world today requires a wider and more ambitious vision. This will be presented in this thesis as an architectural perspective anticipating what may lie behind our emerging urban populations.

This thesis straddles several different points of view with regards to its understanding of what lies ahead. On one side of the equation, when observing the geographical, political, and economic coincidences of modern population growth, one would be inclined to concentrate one's efforts on urban environments in the developing world as opposed to already developed cities. The latter are far superior in terms of technological progress, urban construction and availability of infrastructure. Even though the need of the developing world is both real and important today, this thesis' proposal remains one of anticipation. This thesis will anticipate that because of extreme population growth impeding our developing cities' capacity to adapt to changes fast enough, not only will their existing urban systems collapse under the pressure, but also their populations will not have any choice but to migrate elsewhere in search of more adequate living environments. In order to explore how to provide these urban environments with the means to absorb the sudden influx of population, this thesis will suggest, counter to what may be perceived as the obvious solution, that because of established investments, our developed cities are the ones that should first receive this experimentation. These experiments in absorptive architecture conducted on existing urban frameworks will have a better chance of success due to their pre-existing conditions and therefore serve as examples for others to interpret. As this work progresses, it will however become evident that not all developed cities are equipped with an adequate platform for these experiments. Montreal City will become the focus of this thesis. Not only did this city participate in a great way at the height of visionary architectural theory but it also contains a large collection of megastructure influences and artifacts still in operation. These qualities provide Montreal City with both the physical

4. Yona Friedman. Pro Domo. (Barcelona: Actar, 2006), 84.

framework for new population absorption as well as the ambition needed for further experimentation.

Can we intelligently enlarge the capacity of our existing urban domains?[5] Left alone, our urban worlds are simple collections of buildings, often unrelated, connected only by surface streets and the infrastructure they carry. As building surface demands increase, these individual buildings, in both developed and developing worlds, have typically grown on the vertical to form high-rises. Even then, however, they remain detached from one another and become anchored to the street. Can we see a stage for a new vertical zoning of urban development, and a literal stacking of the present surface based urban infrastructures and their networks?[6] If only we could imagine a way to make today's infrastructures more integrated, we could then remove the shackles imposed by our archaic patterns of roadways, bind together several large urban forms, and provide support to a new dynamic urban order.[7] This would no longer be a historical two-dimensional pattern of urban settlement. This *Overnight City*, the proposition in this thesis for a new form of megastructure re-visiting this experimentation, will imply that all layers of the city could become linked in other ways than their traditional associations. It will become necessary, in the speculative design that follows in this work, to discover the organic relationships that can merge people, infrastructures, mobility, and existing city context together.[8]

As suggested previously, in addressing this fundamental shift in the needs of human habitation, new patterns of building will remove the shrouds from our eyes and therefore reveal a more accurate reality of urban life that previously had lain hidden. Now that our populated world is revealed, there is opportunity and the necessity for experimentation in city design and the letting go of past urban histories with superfluous or obsolete traditions.[9] This thesis will make the initial assumption that our current habitation strategies in cities are in need of serious reconsideration; furthermore, that with global scaled population growth fueling the incapability of our cities to accommodate it comfortably, there is every indication that a dire urban situation is just but a decade or two away.

Our current urban world is composed of urban artifacts and forms accumulated through history that are unable to cope and adapt to today's changing demographic situations. Our constructed worlds today have unfortunately also become frozen between Modernism and opposing viewpoints in themselves nostalgic for older times. None of these provide a framework broad enough to allow for a more radical evolution of urban habitation, or grant it sufficient flexibility for the needs of the future. This thesis is placed within this projected world. Architecture

5. MVRDV, *Metacity; Datatown*, (Rotterdam: 010 Publishers), 1999. 19.

6. MVRDV. *FARMAX, Excursions on Density 3rd edition.* (Rotterdam: 010 Publishers, 2006), 312.

7. Rem Koolhaas, "Challenging Preconceptions of the High-Rise Typology." In *Council on Tall Buildings & Urban Habitats 8th World Congress 2008*. Ed. Anthony Wood (Chicago: CTBUH, 2008), 2.

8. Fumihiko Maki. *Investigations in Collective Form.* (Washington: Washington School of Architecture Publication, 1964), 75.

9. Moisei Ginzburg. Style and Epoch. (Cambridge MA: The MIT Press, 1982), 76.

is seen here as a force capable of adapting to the unavoidable problems of this undetermined future and the direction of our next urban development. Similar to Yona Friedman's plans for a pan-European city-scape in the late 1960s, the goal of this thesis will be to push hypothetically both the understanding of the limits of urbanism and the impacts of our growth on city form. The *Overnight City* will re-open this old conversation of the megastructure which never had its potential fully realized or evaluated. It is also the intention of this thesis to demonstrate that such discourse has not lost its potency and that, if viewed differently, there should be ample space available in today's discourse for a renewal of that conversation.

Doubt, enigma and insecurity lie at the heart of much of today's architecture. This thesis will unapologetically return to earlier basics.[10] It will open the vaults of the past and bring again to the front lines of discussion the notion of the megastructure and the related discussion of urban infrastructure. The *Overnight City,* like its Modernist ancestors, is an abstraction of city growth; it is an implied sudden change; it is the revival of understanding the technical nature of our urban context; it is a large-scale insertion within a familiar landscape in time of crisis; it is the questioning of our future global direction both in terms of housing and urban life. This renewed discussion will again ask if the city can be looked upon as one large continuous organism where all components are fused together into one defined architectural and urban form.[11] It will observe our new urban populations as constantly self-organizing, unstable, living systems. This unpredictability at the detailed level will thus become a new frontier for exploration beyond the original megastructures.[12] With this thesis' revival of the megastructure idea, design of architecture will become tied into a fluid counterform to historical city life. The surface of the city will become one large landscape and this thesis will claim that we should experience it as such.[13]

This will be the reopening of the megastructure story, a concept from a time when it was understood that the available architectural solutions provided by history were not suitable for containing future growth and its population densities without collapsing under the pressure. Today, we need to visualize ourselves living in the same hyperdense world and, forty-years later, we need to understand how this urban force will shape our lives. This thesis will explore recovered ambitions, drawing examples from past and contemporary megastructures while keeping in mind that there remains no un-buildable project or proposition, simply projects that have yet to be conceived and built.[14]

Is today the time to experiment and speculate through the use of radical architectural theories?

10. Mark Wigley. "Resisting the City". In *TransUrbanism*, ed. Joke Brouwer, Philip Brookman & Arjen Mulder. (Rotterdam: V2 & NAi Publishers, 2002), 107.

11. Banham. *Megastructures, Urban Futures of the Recent Past.* (London: Thames & Hudson, 1976), 8.

12. Arjen Mulder. *Transurbanism.* (Rotterdam: V2 & Nai Publishers, 2002), 7.

13. Will Alsop, McLean & Störmer. *City of Objects, Design on Berlin.* (London Press: London, 1992), 29.

14. Harbison. *The Built, the Unbuilt and the Unbuildable, the Pursuit of Architectural Meaning.* (London: Thames and Hudson, 1991), 161.

Moreover, is it time for the megastructure to return as a new option in this unpredictable world? As Frank Lloyd Wright's words which follow this paragraph suggest, architecture has such a responsibility. The megastructure is not meant as an imposing set of architectural and urban rules; rather it is an intervention that will house our population regardless of its detailed shape.[15] It is primarily about the new relationships of architecture and the layers of infrastructure that sustain us and give us the freedom to be urban citizens. Such are the next questions that we need to ask ourselves:

> "The architect must be a prophet... A prophet in the true sense of the term... If he can't see at least ten years ahead, don't call him an architect."
>
> -Frank Lloyd Wright[16]

The development of this thesis began on a few specific concepts and ideas. Even though it was Frank Lloyd Wright words which initially sparked this thesis' journey through visionary architecture, there are several other key figures and works that have greatly aided. This thesis' framework draws heavily from a few literary sources. Building upon first the concept of the megastructure, Reyner Banham's book *Megastructure, Urban Futures of the Recent Past,* published in 1976, captures the fundamental essence of the megastructure ambition and its evolution through speculative propositions but also several built examples. In addition to Banham's work, a short essay by Fumihiko Maki, *Investigations In Collective Form* from 1964, presents an early explanation of the megastructure form. The latter will be explored further in the next chapter. Together with these two works, this thesis has been shaped further by one more influence. Before Banham's and Maki's work lies Team Ten's *Primer,* initially published in 1962. Team Ten through a collaboration of several key architects of the period laid the foundation of the initial philosophies of the megastructure through this text. The importance of this piece of literature will be explored further into the thesis. Although there are more megastructure resources present in the body of this thesis, those outlined in this introduction are the most prominent.

There is more than megastructure history and theory alive in this thesis. The design work contained within is also framed between two architectural figures: Yona Friedman, already mentioned within this introductory chapter, and the contemporary Dutch firm of MVRDV led primarily by Winy Maas. Although there is a strong rapport with other architects, thinkers, or radicals such as Peter Cook and Archigram, Rem Koolhaas or even Superstudio to name a few, there is an important relationship constructed between those two figures. As suggested by the first of two quotations on the opening page of this introduction, Friedman and Maas represent two generation of thinkers not afraid of using architecture to suggest the largest scale of physical and social speculations. Both

15. Max Risselada & Dirk van den Heuvel, trans., *Team Ten, In search of a Utopia of the Present (1953-81).* (Rotterdam: NAi Publishers, 2005), 132.

16. This particular passage from Frank Lloyd Wright could not be retraced to its exact origin although it is widely accepted that it was initially uttered while in the progress of designing Fallingwater.

propose the complete re-working of urban traditions. Beyond Friedman's *Continent City*, MVRDV furthers this inquisition, amidst various other statements, where their collection of work searches for ways in which compression of programme, both horizontally and vertically, could give a population more space. Essentially, they attempt to demonstrate, in the same way Friedman did almost forty years before, the need for higher densities and other organizations in order to counter the sparse and empty expansion of our current cities. Although their projects are not directly referenced, several of their arguments influence the thesis and the scale of their ambition is therefore reflected.

Proceeding from this introduction and discussion, the second chapter, *Buried Treasure*, will explore the origins of the megastructure idea, its origins, and expand its exploration until the example of Montreal City's Exposition of 1967, the high point of this particular architectural idea. This chapter will identify particularly important figures and projects but more importantly, it will concentrate on describing the core issues and concepts behind the drive towards the creation of a megastructure and the direct use of urban infrastructures to generate architectural form. This is not intended to represent a complete historical analysis of the megastructure idea, but an overview of the period's ambitions, punctuated by projects whose relevance should be reincorporated as precedents in today's megastructure design arsenal. The third chapter, *Expo 67 Cast Away*, will continue the discussion of the second chapter but concentrate on the specific projects and ambitions present in Montreal City during the 1967 World Exhibition. This particular chapter will interpret the idea of integrating infrastructure and architecture as one large urban megastructure within an established context and contemporary architectural discourse. Supplementing both the issues raised during Expo67 and the architectural precedent in Chapter Two, the fourth chapter of this thesis, *Commandeering Infrastructure*, will explore the megastructure as a living organism complete with an equally organic and evolving population. In an attempt to remove what this thesis sees as the more static allotment of space and urban programme solutions, the megastructure concept will evolve by separating different uses for its different layers of supporting infrastructures. This chapter will introduce modern day interpretation of the megastructure and set forth the foundation for its application in our future cities of the developed world, and by extrapolation, in the cities of the developing world.

The fifth chapter, *Sailing Forth*, explains the thesis' implementation of the megastructure concept as an organic system of infrastructures. The thesis' design proposal is explored as a stand-alone thought experiment prior to its implementation in the context of Montreal City in order to understand its basic systemic organizations. Beginning with the basic layers and building them one upon the other, the design proposal takes its shape not by location but by functionality and adherence to the new megastructural principals. In addition to this general organization, it is within this chapter that the interior conditions proposed by the *Overnight City* are explored. The

sixth chapter, *Weigh Anchor*, will form the design chapter of the thesis. This design will focus on the importance of infrastructure and adaptability, not a completed final form. The former will be revisited and have its various scales manipulated to fit within the city as a useful superposition, not a destructive invasive form. Using the architectural precedence and implementing it within the city, this chapter will impose the Overnight City upon Montreal City; moreover, render a adequate portrait of life within this architectural proposition. The final and concluding chapter of this thesis, *Dry Land Ahead*, summarizes both the thesis' design strategy implementation and its relevance to our current architectural discourse, and provides speculations on future global problems and needs. This chapter will reiterate the fundamental question that sparked the initial thesis discussion: how can we reconsider our urban use of the Earth's surface?

Following the main body of the thesis, two appendices are provided as additional support to the research and arguments. The first appendix, *Our World Today* , investigates the potential impact the global human population growth and the power of exponential, albeit constant, locally concentrated growth. Extending these observations, this particular section will suggest different perspectives on our growing collection of impoverished areas. The second and final appendix is a compilation of the conceptual design work behind this thesis' final design project. Titled *Urban Exploration*, this section presents the imagery generated from the initial conception through the adventurous voyage of speculations on urban form that constitutes this thesis.

The following quotation from the Italian radical architecture group Superstudio, who filled in the gap in the theoretical discourse after the disappearance of megastructures in the early 1970s, explains the propositions made throughout this thesis:

> "It would appear that the fact that the world is round and rotates is now beyond discussion. There is still room for discussion, however, about how we are to live on it. And particularly on whether everything should be invented all over again every day or whether on the other hand it is enough to cling tightly to the appropriate gravity straps against the centrifugal force and keep on breathing."
>
> - Cristiano Toraldo Di Francia, Superstudio[17]

17. Cristiano Toraldo Di Francia, "A journey in the Realm of Reason" in *Superstudio & Radicals*: Superstudio (Tokyo: The Moriyama Editors Studio, 1982), 228.

02

Buried Treasure

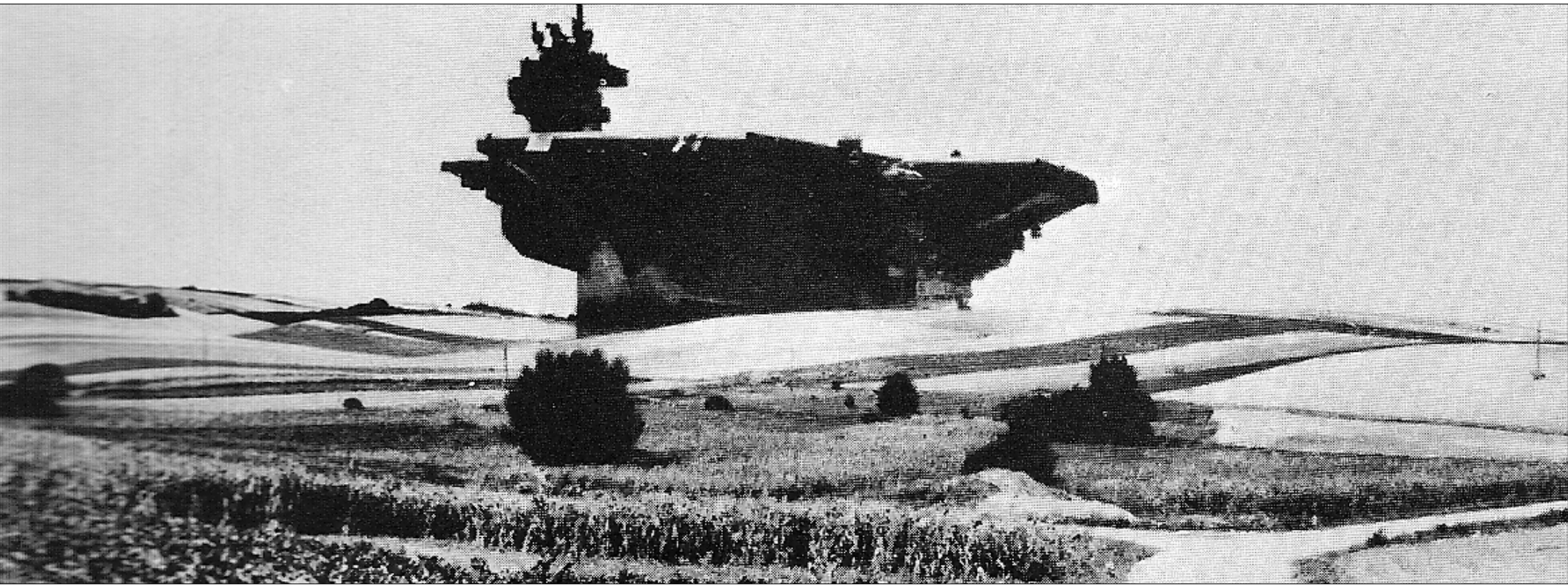


FIG. 01/02
Hans Hollein's Aircraft Carrier, 1962

The megastructure of the 1960s and early 1970s became a very different late Modernist interpretation of urban growth, and as noted, was developed as a response to our perceived diminishing global surface. It was also seen as the logical and technological evolution of the urban context in light of future exponential global population growth. Yona Friedman's version, as we have seen, becomes an endless framework of programme and experimental building, floating above and within Europe's existing cities.[18] Like Friedman's, most megastructures of the period were proposed as artificial topographies and combined with undetermined, but continuous, homogeneous networks which granted the potential for future unlimited growth and expansion. Their built shapes were the direct results of the fluctuations of the population's behavior, not merely determined by their constructed infrastructures and architectural forms.[19]

What kinds of beasts were these megastructures? The very descriptive term granting them architectural categorization would indicate some sort of grandiose and super-scaled building. This, however, was not necessarily the case. While megastructures were for the most part larger than other typical building typologies, they themselves were not buildings by any conventional understanding of architecture, be it traditional or

18. Marie-Ange Brayer, Frederic Migayrou & Fumio Nanjo. *Archilab's Urban Experiments. Radical Architecture, Art and the City.* (London: Thames & Hudson, 2005), 83.

19. (ibid, 114)

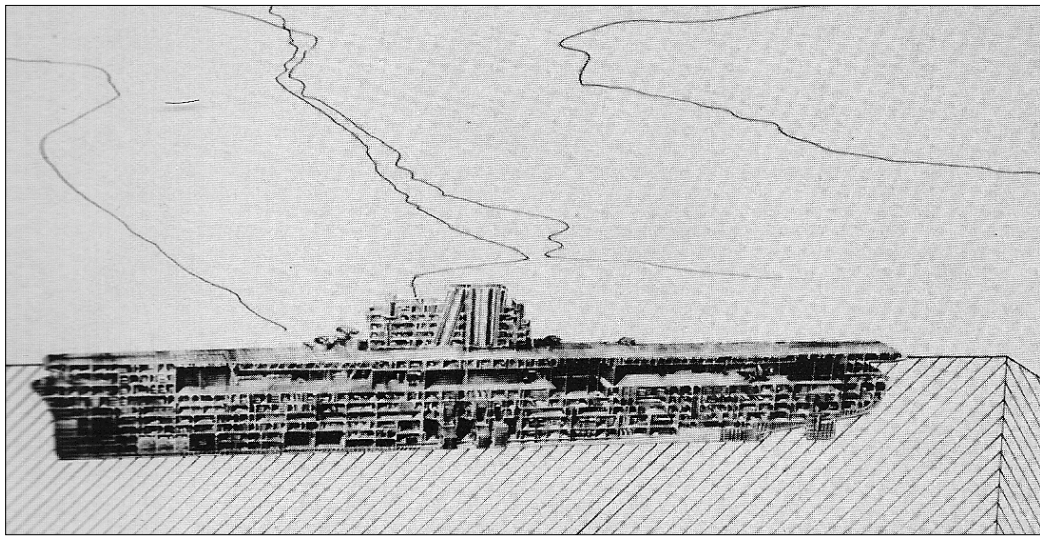


FIG. 02/02
Hans Hollein, Aircraft Carrier cross section, an underground city for 30,000 people, 1962

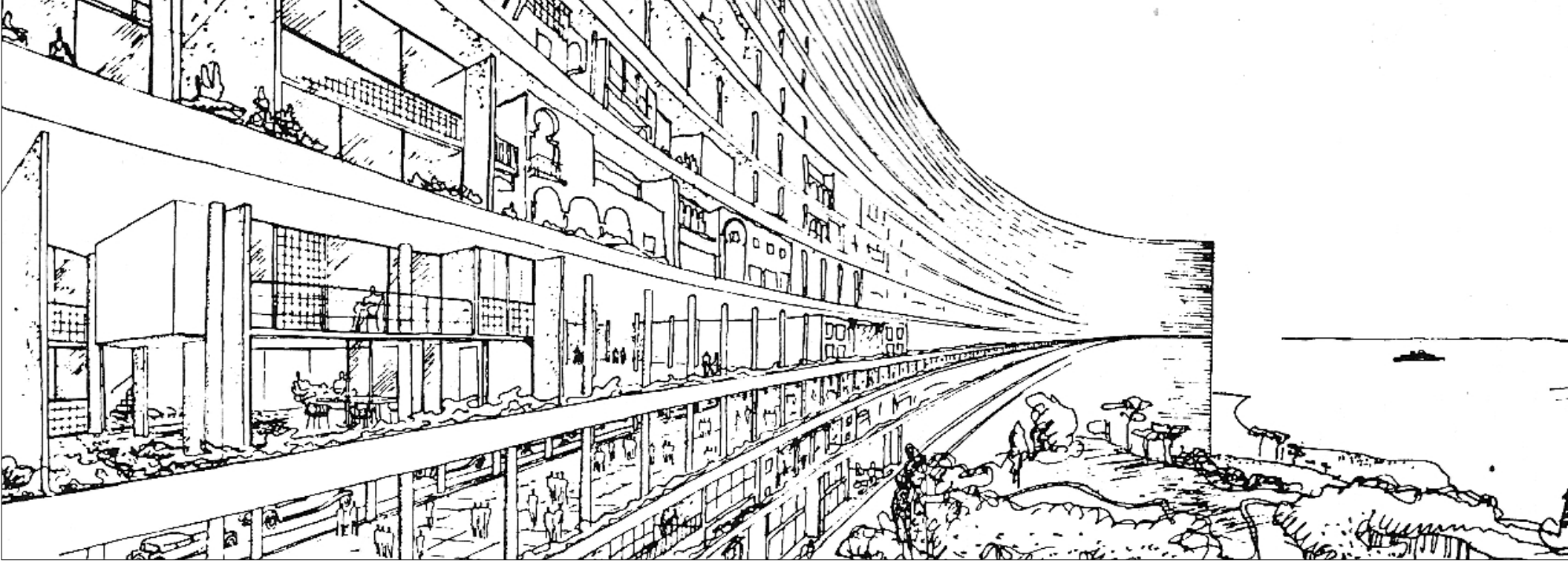


FIG. 03/02 Le Corbusier, Fort L'Empereur, Algiers 1931.

Modernist. Hans Hollein's *Aircraft Carrier* montage of 1962, the initial image of this chapter, shows the ship imposed forcefully upon the pastoral European landscape. This large engineered object, while not itself a megastructure, represented the physical and visual impact implied by its architectural appropriation and application.

There is, however, one significant Modernist precedent. *Fort l'Empereur*, Le Corbusier's solution for Algiers in 1931, was the first widely appreciated attempt at designing a megastructure. In FIG. 03/02, the linear volume of residences is stretched far into Algiers' horizon with the top level reserved as an elevated multi-lane highway. Scaled "shelves" of more detailed habitation are below this and together they show the building at the infrastructural scale..[20] The smaller inserted residences, composed in typical Corbusier *Domino House* fashion, allow the insertion of two-level units, the design of which is, according to Le Corbusier, was not determined by the overall megastructure designer. Le Corbusier never really returned to this particular urban strategy but it nevertheless influenced the emergence of the megastructure building form in later decades. It was the clear differentiation between the permanent concrete shelving , built at the scale of infrastructure, and the temporal human architectural infill that grants *Fort l'Empereur* its iconic status as a precedent.

It was Japanese architect Fumihiko Maki, however, who first coined the term "megastructure"

20. (Banham 1976, 8)

in print with his 1964 publication of *Investigations in Collective Form* from the University of Washington.[21] This book, with his speculative designs was not much more than a collection of short essays which questioned the traditional makeup of human habitation and, more importantly, their relationships, or lack thereof. Maki argued that urban society should be understood as dynamic fields of interrelated programme and independent variables. This meant that when aggregated with others, each city would establish its own temporary states of equilibrium, subject to a change of character in response to the demands of its inhabitants and society.[22] Maki pushed his critical observations further and stated that cities at that time held no spatial language for connecting individual buildings; he referred to the latter as objects.

The megastructure investigation of this thesis will begin here, after Maki's early definition of the term. As we will see, his and others's criticisms of the architecture of the period will very much resemble our conditions today. Not much has changed in forty years. The megastructure idea, as described in Maki's writings, can be understood through three forms. The first he labels as a "compositional" form; one where there is a higher hierarchical organization among several independent buildings. This would group individual buildings together not by proximity but by programmatic similarity, examples being the Rockefeller Center in New York, Brasilia City in Brazil and Chandigarh in India.[23] Second for Maki is "group" form, a more organic composition which relies on the presence of particular "guiding" elements to tie buildings to each other in a repetitive pattern. This "guiding" element could be man-made, such as a major through-road or other physical barrier, but it is more common with natural obstacles such as hillsides, ridges or shorelines.[24] Both Maki's compositional and group forms rely on collectivity and the agglomeration of independent programme either on some common network or, at the very least, with some agreement of connectivity. The third form that Maki proposes as a fundamental type is that of the "megaform". This type is most applicable to this study as it identifies an architectural composition where a large physical frame supports all functions and activities of a particular segment of a population. This frame, similar to Le Corbusier's Algiers proposal, provides an anchoring for architectures of all scales, all forms, and all functions regardless of size or temporal duration. These built diversities, in turn, are liberated from each other and free to agglomerate without great relative impact on each other and even less on the larger super-structure.[25] In Maki's description, there is the implication of lack of over-arching built discipline in response to the finer grain of the megastructure. Where there is every indication of control and design, forms are allowed an almost organic freedom of growth. "Organic"

21. Ralph Wilcoxen. *A Short Bibliography on Megastructures*. (Berkeley: University of California, College of Environmental Design), 1969, 2

22. (Maki 1964, 3)

23. (ibid, 5)

24. (ibid, 16)

25. (ibid, 11)

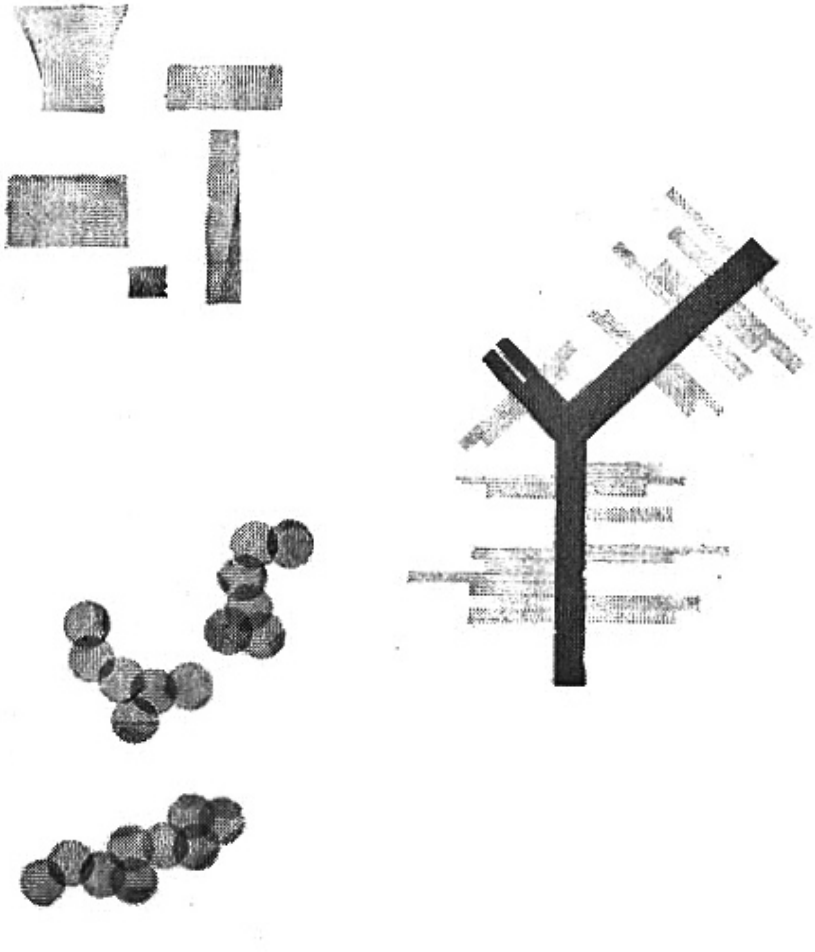


FIG. 04/02
Fumihiko Maki's approaches to collective form. Top left, compositional form; bottom left, group form; right, megaform. The latter two are seen as forms capable of serving the demands of contemporary growth and change.

in Maki's explanations represents the dynamic engagement between individual objects forming the greater whole of the megastructure.[26]

> "In the society of today, the structure of which is ever changing and becoming more complicated, it has become necessary to discover a clear and organic relationship that will link together people, transportation, goods and urban facilities."
>
> - Fumihiko Maki.[27]

Despite its systemic elaboration noted above, Fumihiko Maki's description of a megastructure remains vague and more philosophic than an objective concrete observation. It was not until 1968 that Ralph Wilcoxen, an eclectic writer and researcher at Berkley University, formulated a more accurate, physical description. In Wilcoxen's writings, a megastructure would not only be a structure of great size but one which can be constructed of modular units, and is capable of almost unlimited expansion. Also, a megastructure should provide the structural framework for smaller structural units which can be attached [plugged-in], and whose largest structural frame has a life expectancy far greater than the smaller programmatic units housed within.[28] The difference between 1964 and 1968 is evident. Maki speaks about life and interaction while Wilcoxen concentrates on the physical attributes of these beasts.

26. (ibid, 76)

27. (ibid, 75)

28. (Wilcoxen 1968, 2)

The *Overnight City* of this thesis is a contemporary megastructure that will attempt to merge the two perspectives of Maki and Wilcoxen, and bridge the gap between the futurism of the late 1960s and our world of tomorrow. Besides the two design precedents described above, there are also countless variations and interpretations of the megastructure idea that emerged in the post World War II decades. It is not my intention to categorize them all or even compose a historical analysis. It is nevertheless this thesis' goal to identify the context and arguments posed by megastructures that remain relevant for us today. Le Corbusier's Algiers project might be the first proposal to resemble the megastructure ideals of the 1960s but, in retrospect, there are far older precedents as one searches for the history of the megastructures. A possible starting point, for example, is the well-documented Ponte Vecchio in Florence. This very early precedent's relevance will become more apparent as the concept of megastructure is developed in the next pages, but for now, this Italian bridge spanning the Arno River in medieval Florence can be viewed as a sealed pedestrian tube supporting other, smaller structures.[29] Ponte Vecchio is significant because the bridge, as an engineering work, supports both the city life of shops and the bridge's infrastructural circulation. The latter combination is the most compelling attribute of this example. The physical carrying capacity of the bridge does not rely solely on pedestrian travel, but offers a framework that is composed of private and civic structures. A contemporary concept inspired by the Ponte Vecchio could be developed further and could see the initial bridge designed with an underlying network of water/sanitation/electrical services built-in, suggesting such a megaform. If one were to add secondary structure or scaffolding in proximity to these theoretical service outlets, programmatic growth would easily become possible. Hypothetical megastructure proposals, like the very brief and cursory description above inspired by Ponte Vecchio, could propose new buildable surfaces with the potential of working through a three-dimensional method of urbanism detached from the traditional ground surface.

The 1960s was also an era with an almost romantic notion, currently missing in our contemporary discourse of architecture, of the significant role of infrastructure in our cities. As a deliberate design manifestation combining visualization of both structure and infrastructure, the British group Archigram interpreted the underlying framework of the megastructure as a large trussed lattice or "diagrid". Reminiscent of Louis Kahn and Anne Tyng's *City Tower* project from 1952-58, which will be discussed later, the diagonal structure forming Archigram's *Plug-In City* of 1964 was implemented in order to grant almost unlimited freedoms of movement and organization form. *Plug-In City* was an entire urban environment that could be re-programmed and structured for continuous, never-ending change.[30] It aimed to design a city-structure that would yield to individual desires more easily than previous cities, and in turn would be shaped by the

29. (Banham 1976, 16)

30. Peter Cook, *Archigram* (NY: Princeton Architectural Press), 1999. 36.

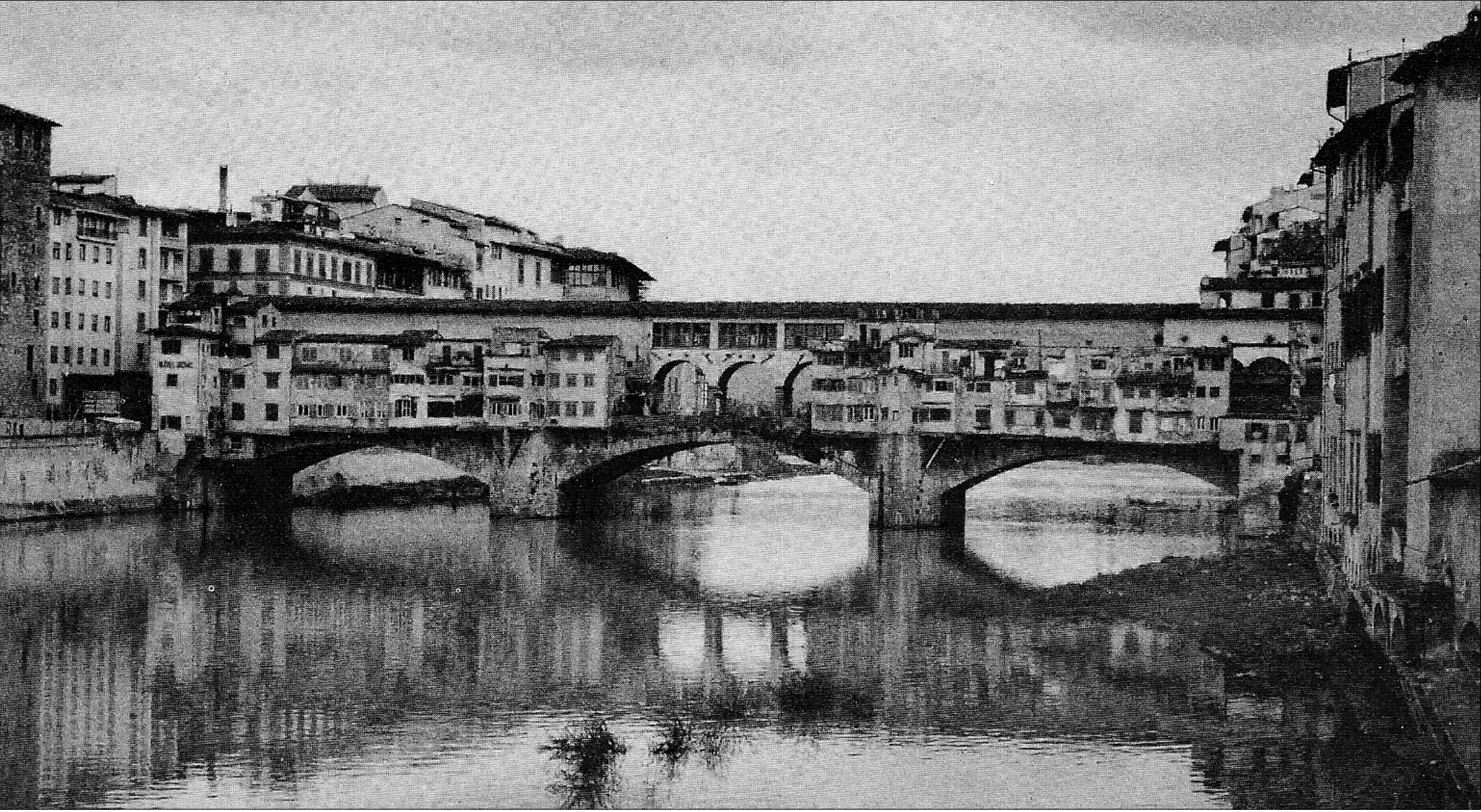


FIG. 05/02
Ponte Vecchio, Florence

complexities of combining such desires. This diagrid of transportation, services and communications was designed to hold removable roads, railways and public spaces while capsules containing homes, offices and/or shops were constantly relocated by large cranes that formed the skyline of the megastructure. *Plug-in City*, even today, is as open-ended a concept as possible. Archigram was searching mainly for a hypothetical physical environment with a sponge-like organization, whose very existence depended on ease of movement.[31] Archigram, through *Plug-In City*, further concentrated on the fluidity of their architecture. Through the several layers of transportation and services, the creation of a great matrix of possibilities could result in any constructed environment.[32]

When considering Maki's philosophy on relations between buildings, two particularly important figures of the period enter the discussion. In a memoir, Cedric Price, another British visionary architect contemporary with Yona Friedman, recounts a time when he was invited to dinner at the house of potential clients. When the evening came to an end, he felt that the best he could recommend as an architect was that the couple get a divorce, suggesting that not every architectural problem deserves a building.[33] Price's attitude towards problem solving becomes relevant when one looks at his proposal for his *Fun Palace*. Conceived

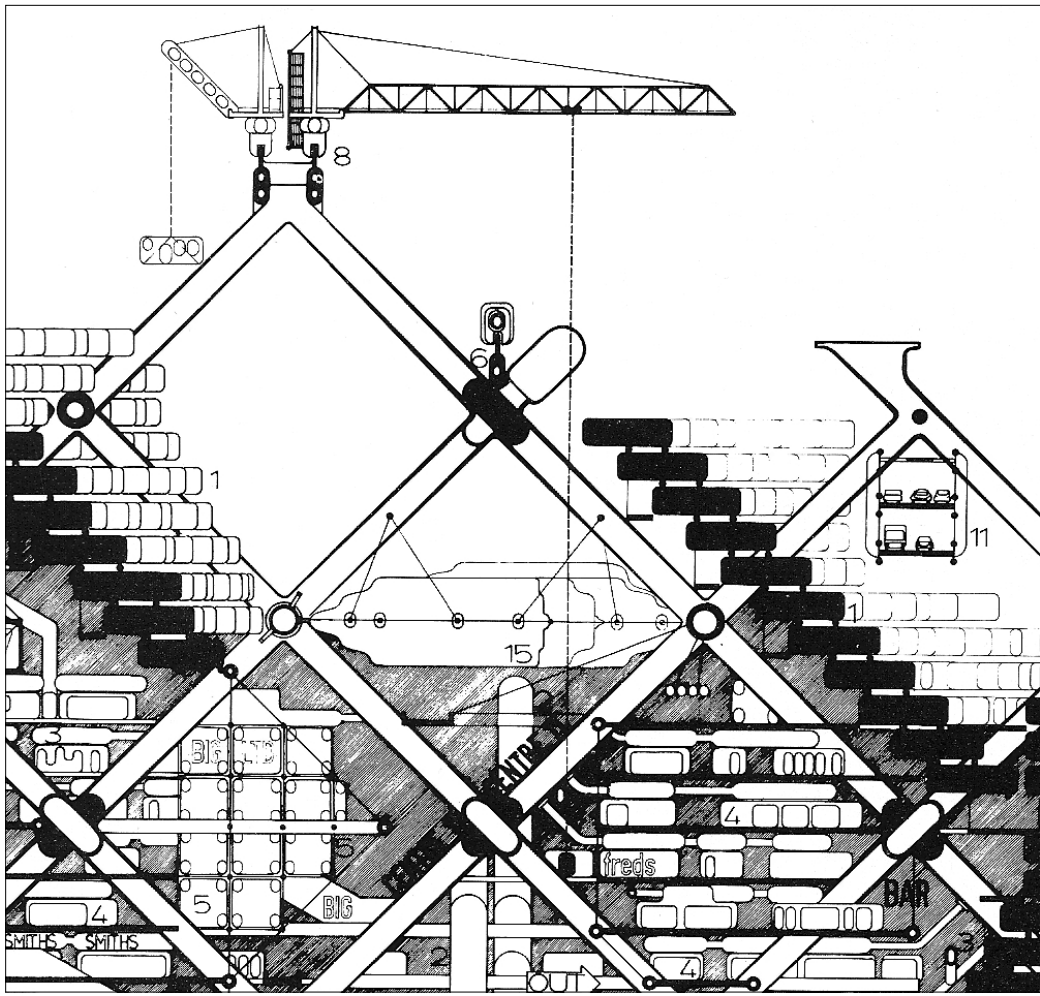


FIG. 06/02
Archigram, Plug-In City, infrastructure diagrid, 1964

31. (ibid, 17)

32. (ibid, 20)

33. (Cook 1999, 3)

in 1962, *Fun Palace* was not a building by any conventional means. First it represented adaptable volumes of space rather than typical walls and floors. Second, the *Fun Palace* was designed as a formless shape waiting to be floored, roofed, walled and serviced. None of these insertions would have been restrained within its large empty skeletal framework. This megastructure could shrink and expand as needed and therefore challenged the definition of architecture's static nature.[34] This was not a building but an interactive machine granted description only by its current and temporary population. The final form of the *Fun Palace* was never to be the invention of its creator, it was to be a reflection of its housed community, a physical "cadavre exquis", that would change on a daily, even hourly basis.[35] Price's *Fun Palace* became one of the first stepping-stones towards a new way of thinking about architecture: a composition of volumes attached together, not of individual buildings.[36]

In the same period, the architectural group of Team Ten, led by Allison and Peter Smithson, emerged in the mid-1950s as a force demanding this level of connectivity in architecture. With a continuously fluctuating roster of members, Team Ten attempted to create a new cohesion between individual buildings and collective social structure. Secondly, they sought to investigate populations not as data but as amorphous forms demanding counterforms. They professed that architecture needed to be these counterforms.[37] The counterforms would take the shape of multi-layered horizontal pedestrian networks, superimposed upon each other, where buildings became their extensions. This type of megastructure would be a weave running through the existing city allowing physical connections between buildings and new surfaces.[38] This new weave would be the Modernist equivalent of the bridge in Ponte Vecchio, without the limitation of linearity. Both Team Ten and Cedric Price formed a particularly important argument in the progression of the megastructure ideals. Unlike Archigram's prefabricated units, their propositions had no restrictions on the language and dimensions of the buildings attached or held within.

> "The counterform of the 'big form' is parasite architecture. The 'big form' creates the frame, the order and the planned space for an undeterminable, unplanned spontaneous process for parasitic architecture. Without this component every planning is rigid and lifeless."
>
> - Allison Smithson, Team Ten [39]

Team Ten's *Pedagogical Model*, seen in the large image in the next spread, helps to identify the assembly of constructed urban layers. Both the structure and its infill are treated as separate but combined into a whole. This also makes reference

34. (Banham 1976, 88)

35. Stanley Mathews. *From Agit-Prop to Free Space: The Architecture of Cedric Price.* (London: Black Dog Publishing, 2007), 76.

36. (ibid, 24)

37. Max Risselada & Dirk van den Heuvel, trans., *Team Ten, In search of a Utopia of the Present (1953-81).* (Rotterdam: NAi Publishers, 2005), 290.

38. (ibid, 132)

39. Alison & Peter Smithson. *Team 10 Primer.* Revised edition. (Cambridge MA: The MIT Press, 1968), 18.

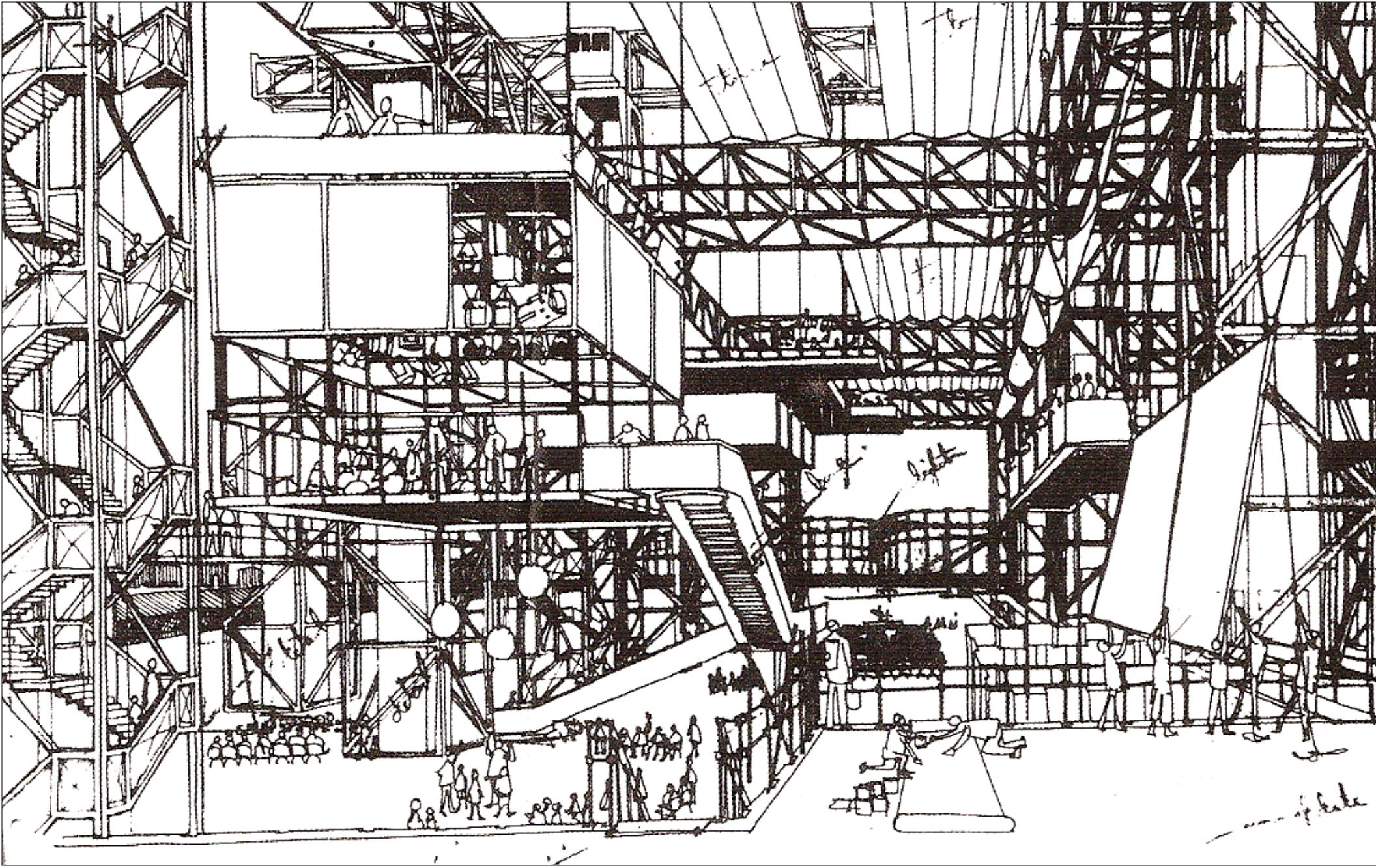


FIG. 07/02
Cedric Price, Fun Palace, conceived as a university of streets, 1964

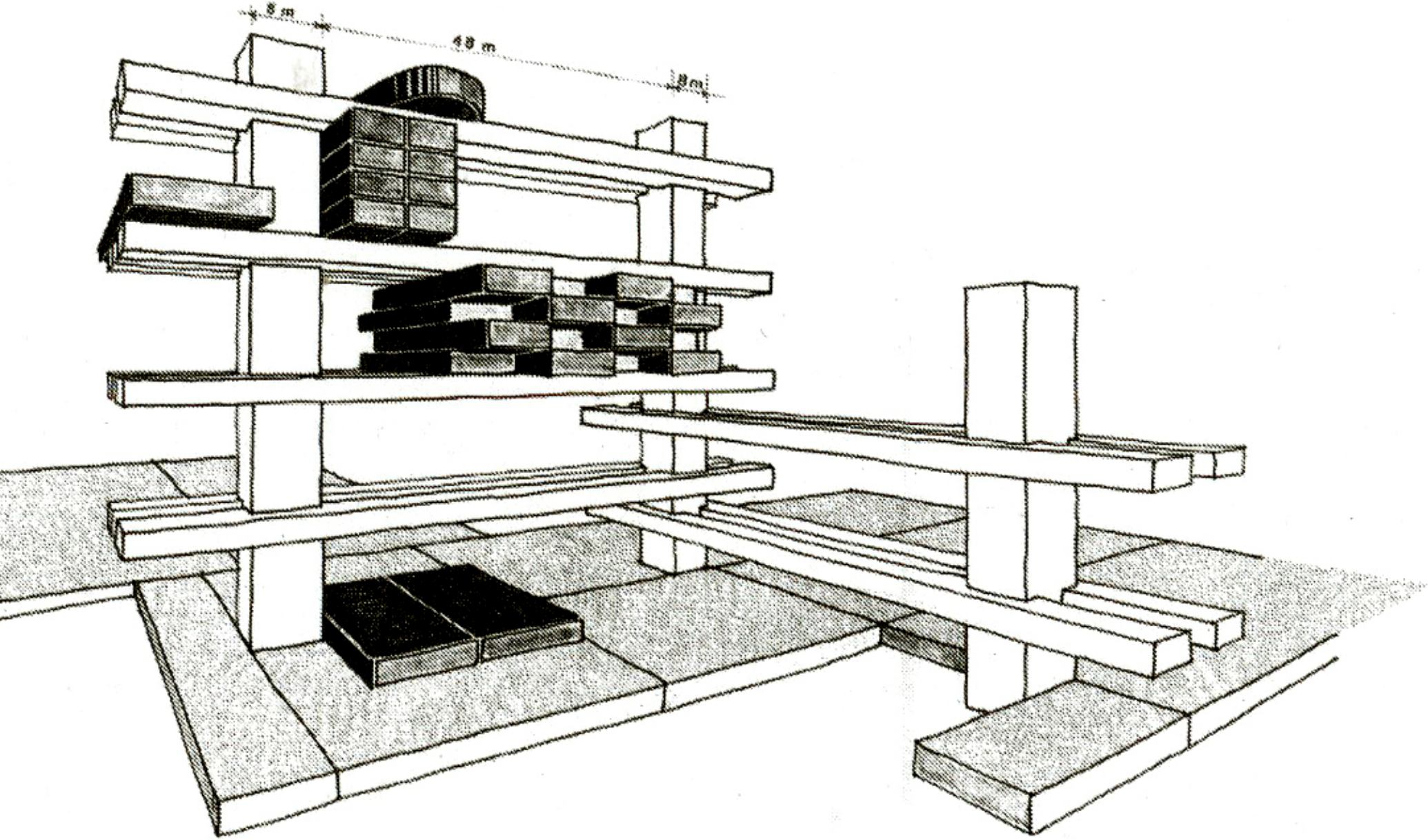


FIG. 08/02
Team Ten's pedagogical model, a simplistic breakdown of the megastructure composition.

to Yona Friedman's strategy from his *Continent City* and the understanding of three-dimensional urbanism. The megastructure example that forms the departure point of this thesis' discussion is a larger version of Friedman's *Spatial City* theory, itself a larger version of Cedric Price's *Fun Palace*. Friedman suggests that the *Spatial City* is an infinite plane of habitation, one where the inhabitant is free to chose his or her own living arrangement, and where the physical structure is second in importance and disappears under the infill. This is a multi-layered network of infrastructures strung across an urban area, able to provide a three-dimensional settlement pattern.[40] Within such a framework, one would be bound only by imagination to locate and shape his or her's particular environment.

> "The Spatial city is a transparent shelf on which shoeboxes are attached. Neither shelf nor box is the dominant feature. When one looks at a bookshelf, one does not see the individual books but the ensemble: a library."
>
> - Yona Friedman [41]

Friedman's Spatial City adheres to these basic principles. Using only minimal physical supports, the infrastructure skeleton remains the only permanent element of the city.[42] This removes the traditional value of permanence in walls, roofs and floors as all

40. Yona Friedman. *Towards a Scientific Architecture*. (Boston: MIT Press), 1975, 53.

41. (Friedman 2006, 49)

42. (ibid 117)

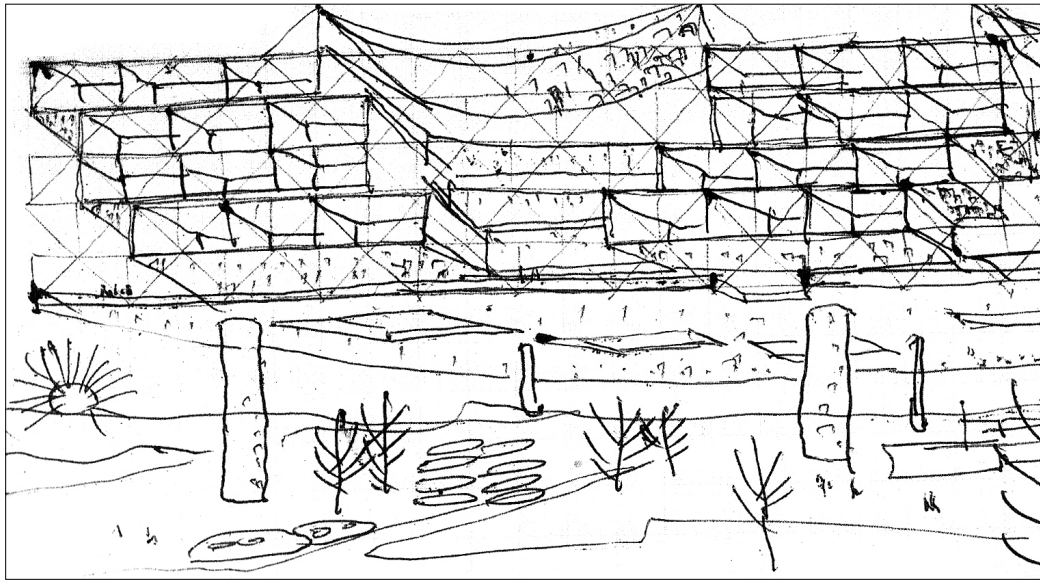


FIG. 09/02
Yona Friedman, Span-Over Blocks, 1957-58

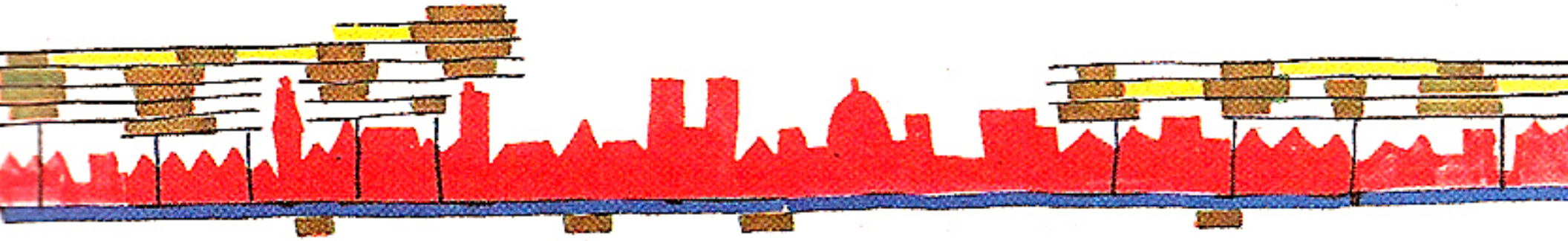


FIG. 10/02
Yona Friedman, Spatial City as intensification of an existing city.

become independent of the singular ground plane. Spanning both above the city and vacant territories, this megastructure provides a new way to densify and unite the urban fabric while allowing spontaneous and adaptable living conditions. Friedman accepts the unpredictable in lieu of detailed structure or standard building geometry, where the form of the infrastructure exists only to facilitate this freedom.[43]

Leading to this thesis' exploration of a megastructure for the core of Montreal City, it is nevertheless important to identify some of the other megastructures that punctuate this brief historical account. Proposals such as Friedman's *Spatial City* were highly speculative in their time and assumed that a great deal of structural and social change would occur. However, there is still today a great deal of similar speculations on how such a three-dimensional urban settlement could arise. As identified with the example of Ponte Vecchio, one of the most significant elements of the megastructure is the framework into which the remainder of the project fits. One default solution has consistently been to emulate a pyramidal structure. This form has often been comprised of terraced or plug-in units arranged on the sloped exterior structural frame with circulation in the interior cavity. Walter Gropius, one of the fathers of the Modernist movement, proposed in an obscure drawing what is arguably the first version of this type of megastructure, in 1928 with his *Wohnberg* [housing mountain]: a 32 story 'A' frame construction. A widely circulated version emerged

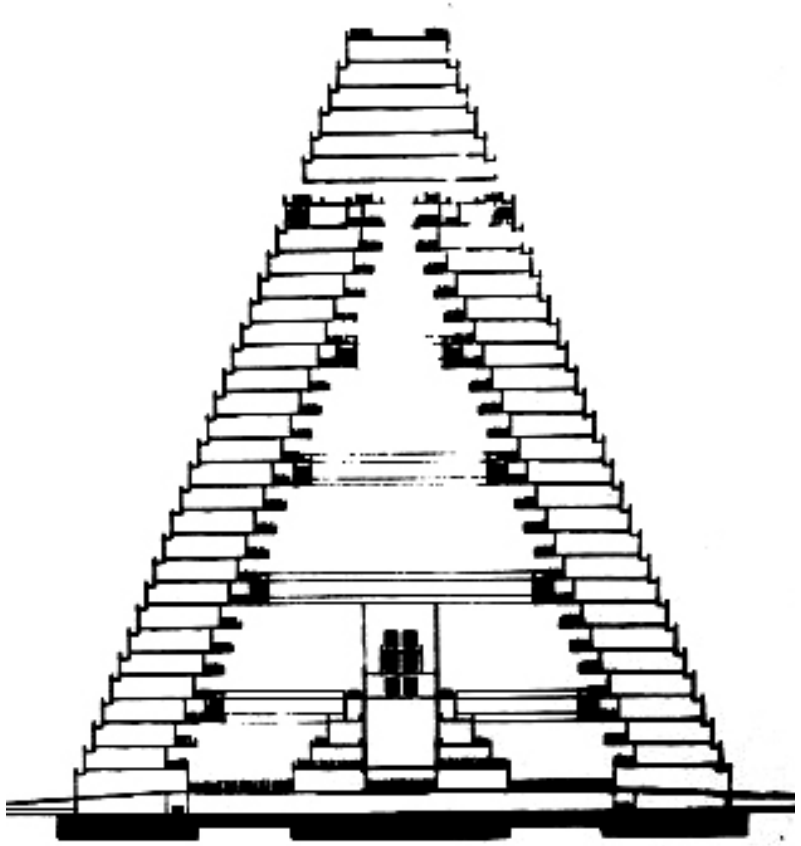
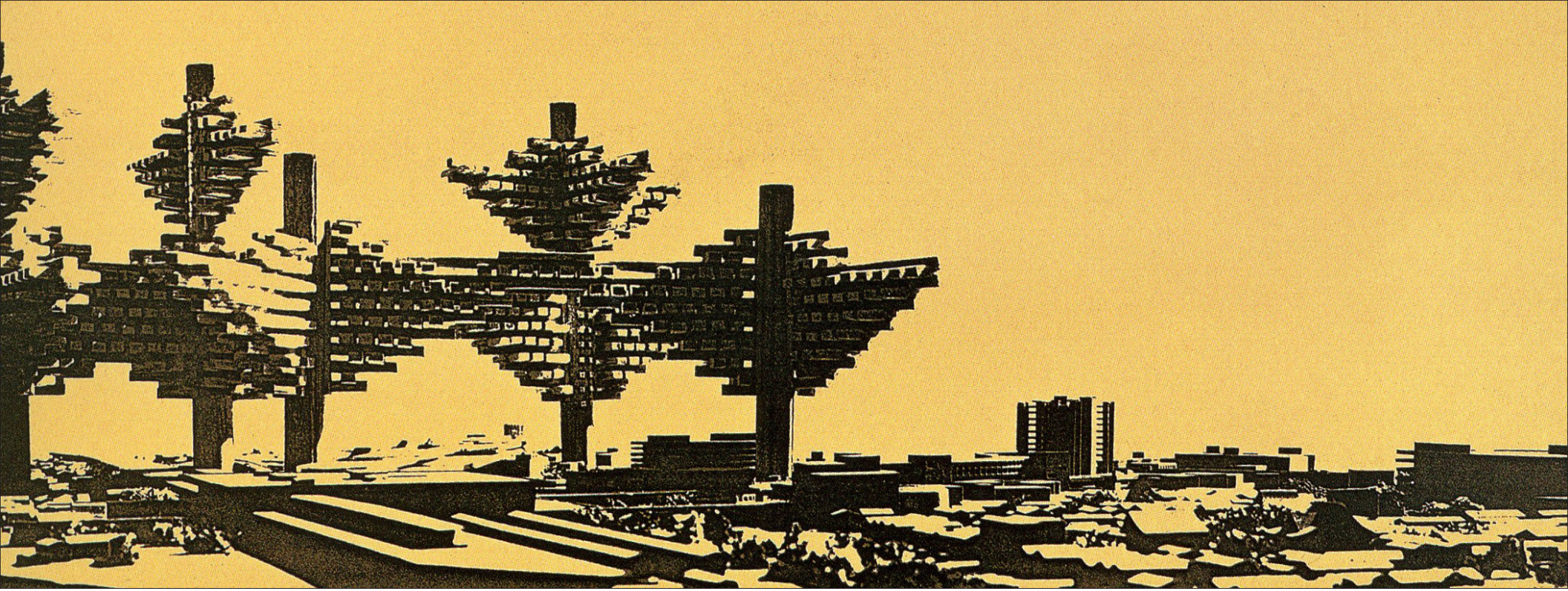


FIG. 11/02
Walter Gropius, Wohnberg, 1928

43. Sabine Lebesque. *Yona Friedman: Structures Serving the Unpredictable*. (Rotterdam: NAi Publishers), 1999. 11.

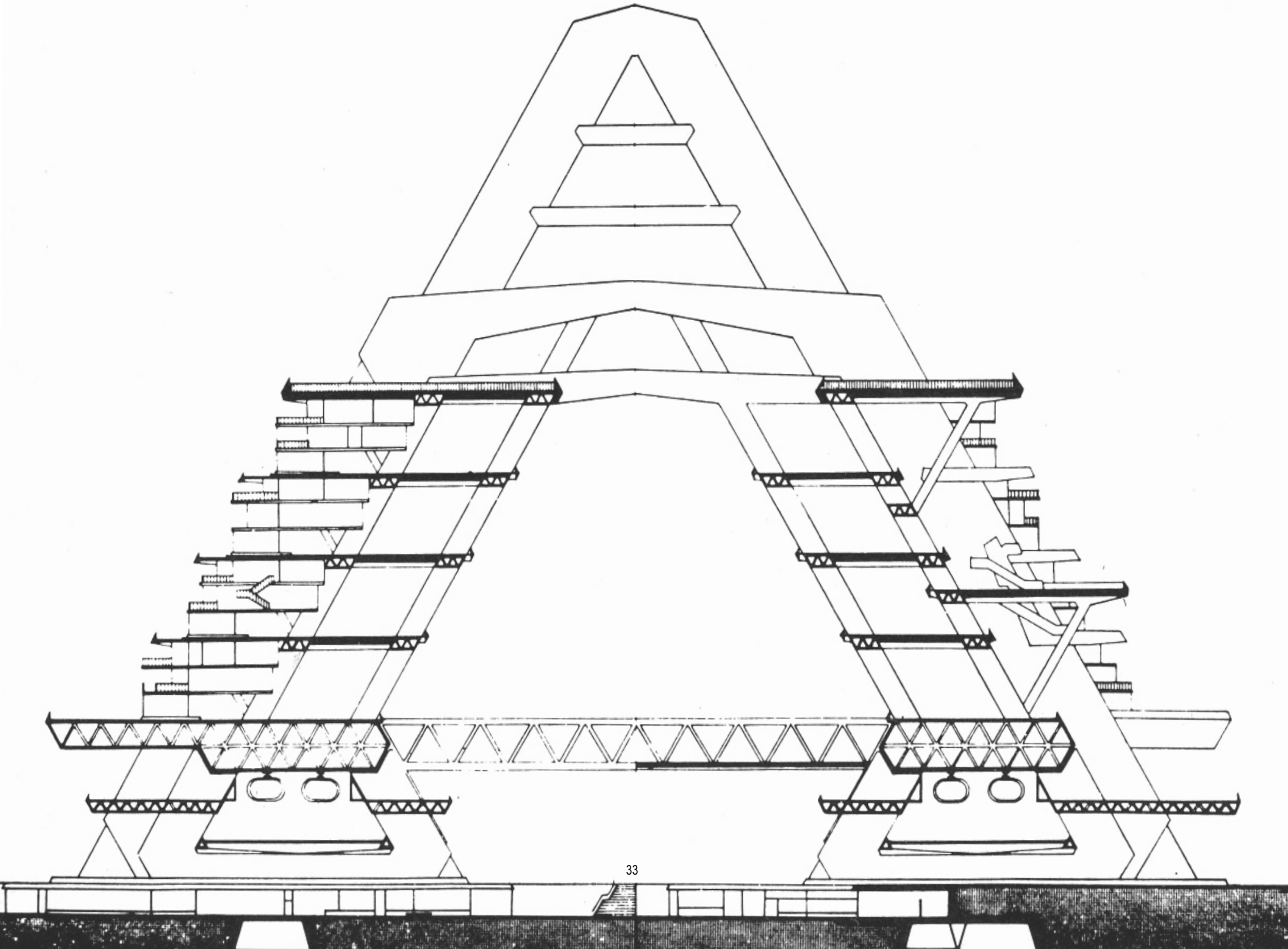


later from Japanese architect Kenzo Tange, from his M.I.T. studio in 1958, for a study of the Boston Harbour. Both of these cross-sectional strategies, and many other versions, are also necessarily linear as was Ponte Vecchio, and they require a great deal of physical structure simply to keep the form from collapsing. Tange's initiative, along with Maki's contributions, eventually form what is more commonly regarded as the Metabolist School. This predominantly Japanese school of thought revolved around implementing new urban layers in the congested city of early 1960 Tokyo. As suggested by the image on this page, the Metabolist movement observed the metropolitan city as a constantly changing organism always searching for a state of equilibrium.[44] Using the same principles of Maki's

44. (Brayer 2005, 85)

Above: FIG. 12/02
Arata Isozaki, Clusters in the Air, 1960-62 [in association with Kenzo Tange]

Next Page: FIG. 13/02
Kenzo Tange, Boston Harbour, 1958



megaform, the Metabolists would propose infinitely expanding structures that would grow from the city and bridge the sky above with modular housing components. In the context of Tokyo where land is scarce, these propositions took on the likeness of Friedman's *Spatial Cities* but retained an element of decisive intervention, maybe even one of absurd permanence especially considering the initial quest for a changing equilibrium.

Where the A-frame composition from Gropius and Tange led to large inefficiencies between structure and usable space ratios, a parallel movement grew which sought the same efficiency while trying to minimize structural requirements. As mentioned previously in the discussion of Archigram, Louis Kahn and Anne Tyng's *City Tower* project [1952-58] also became a great influence on architectural speculation. Kahn and Tyng worked closely together at the University of Pennsylvania, and this proposal combined their individual interests to give rise to this particular understanding of large-scale structure. Both architects, Kahn focused his attention on structural monumentality while Tyng pushed for the understanding of molecular structure. It is no mystery that the consideration of both the micro and the macro scales is important within the discourse of the megastructure. The resulting vertical spaceframe composed solely of diagonals is intended to support all elements necessary for a city within the voids of its structure, where the empty spaces within the structure are as important as the structural elements themselves. It is within these voids that clusters of cells are inserted in order to define use, space and scale.[45] *City Tower* is a result of this combination. The diagonal composition and importance of found space in this project will become important in the organization of this Thesis' *Overnight City* proposal but is not unique to Kahn's and Tyng's research.

> "The three-fold hexagonal plan of the structure rotates in vertical increments every 66 feet. These undulating shifts of level result from the natural completion of the triangulated space-frame in its upward helical movement. Hierarchical expression occurs in variations in floor level between the main 66-foot structural levels, in the hollow triangulated 'capitals', high enough for a person to stand in, and the three-foot-deep hollow ceilings of octahedron-tetrahedron geometry. In this project, hierarchical expression of structure is integrated with hierarchy of quantity and of shapes in triangle or hexagon."
>
> - Anne Tyng [46]

It would be difficult to mention megastructure without including Buckminster Fuller. Fuller, an eccentric American inventor, philosopher and engineer, designed and professed many innovations during his career; nevertheless, what stands above his other accomplishments is his approach to the diagonal form in structural design, specifically the tetrahedron. In geodesic geometry, if one takes six identical members, two emergent triangles are

45. Antonio Juarez,. "Organicism in the Work of Louis Kahn. Notes on the City Tower". *Perspecta*, Vol. 31, Reading Structures, 2000. 70. http://www.jstor.org/stable/1567252.

46. (ibid 77) Original source: Tyng, A. G., "Resonance Between Eye and Archetype", *Via 6*, MIT Press, 1983, pp. 61-63.

possible. If these same six members become arranged "synergetically" [as Fuller coined and referred to], one does not get simple two-dimensional triangles but a tetrahedron with three triangles in three dimensions. But this is not the most important discovery of this thesis. Even though the tetrahedron proves to be one of the strongest and most stable shapes in structural form while using the fewest members, it is the found space within the pyramid-shaped void that is more important.[47] Similar to the interior cavities provided by Kahn and Tyng, the dynamic nature of the tetrahedral structure holds the potential to create new spaces that would have not been possible with other bulky structural frameworks.

Unlike Friedman's *Spatial Cities*, this particular geometry does not place a great deal of hope in conventional rectilinear structure that traditionally require material strength, dimension and gravity to function.[48] Fuller entertained several ideas of megastructures composed primarily of tetrahedrons but one particular project falls in line with the scale of this thesis's design work on the *Overnight City*. In 1960, he suggested a geodesic dome over the island of Manhattan. This dome, with a height at center of six-hundred eighty meters and a five-kilometre diametre would be almost invisible from the ground due to its scale. This one-third geodesic sphere's surface area would only have represented

47. J. Bladwin. *BuckyWorks, Buckminster Fuller's Ideas for Today.* (New York: John Wiley & Sons inc), 1996. 68.

48. (ibid 119) Fuller, using his synergy strategy, can arguably be credited with having invented the first new type of structure in two thousand years: the geodesic dome. Although this can be disputed with Vladimir Shukhov's hyperbolid structures of the 1890s.

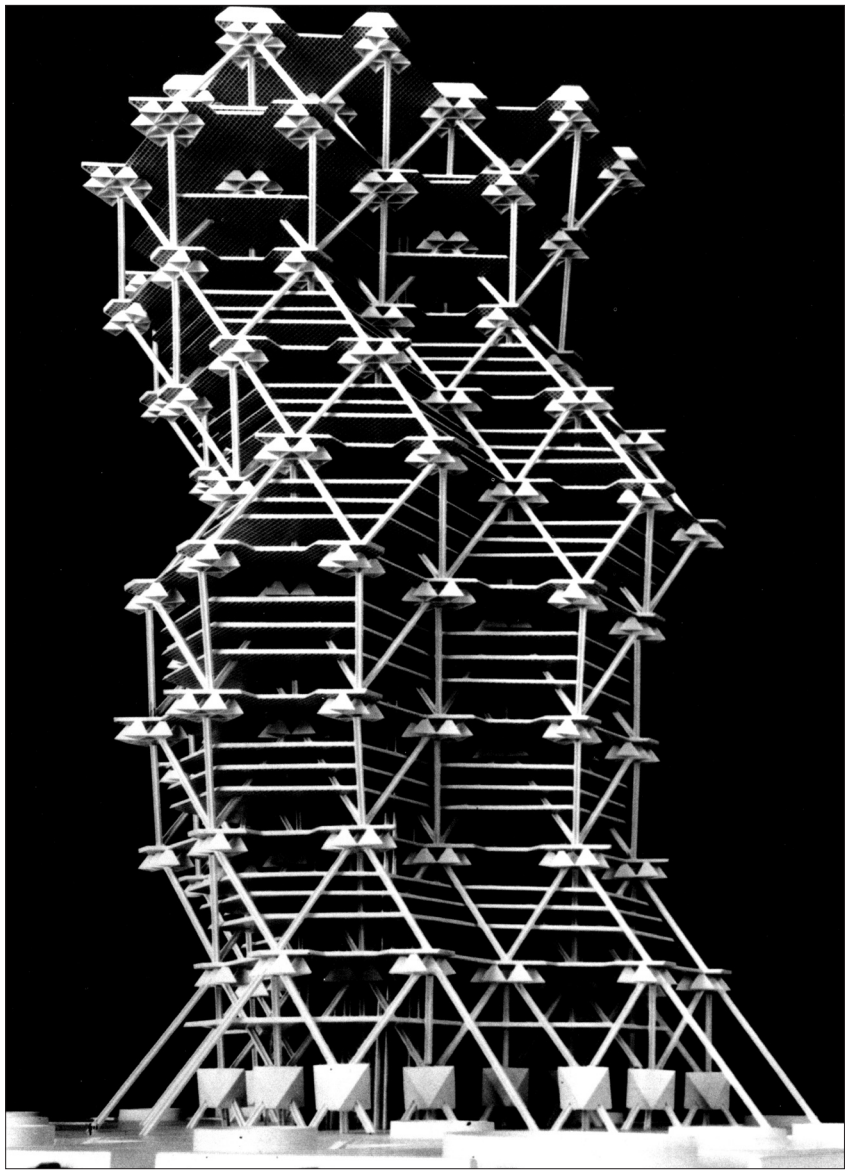


FIG. 14/02
Louis Kahn and Anne Tyng's City Tower model, 1957

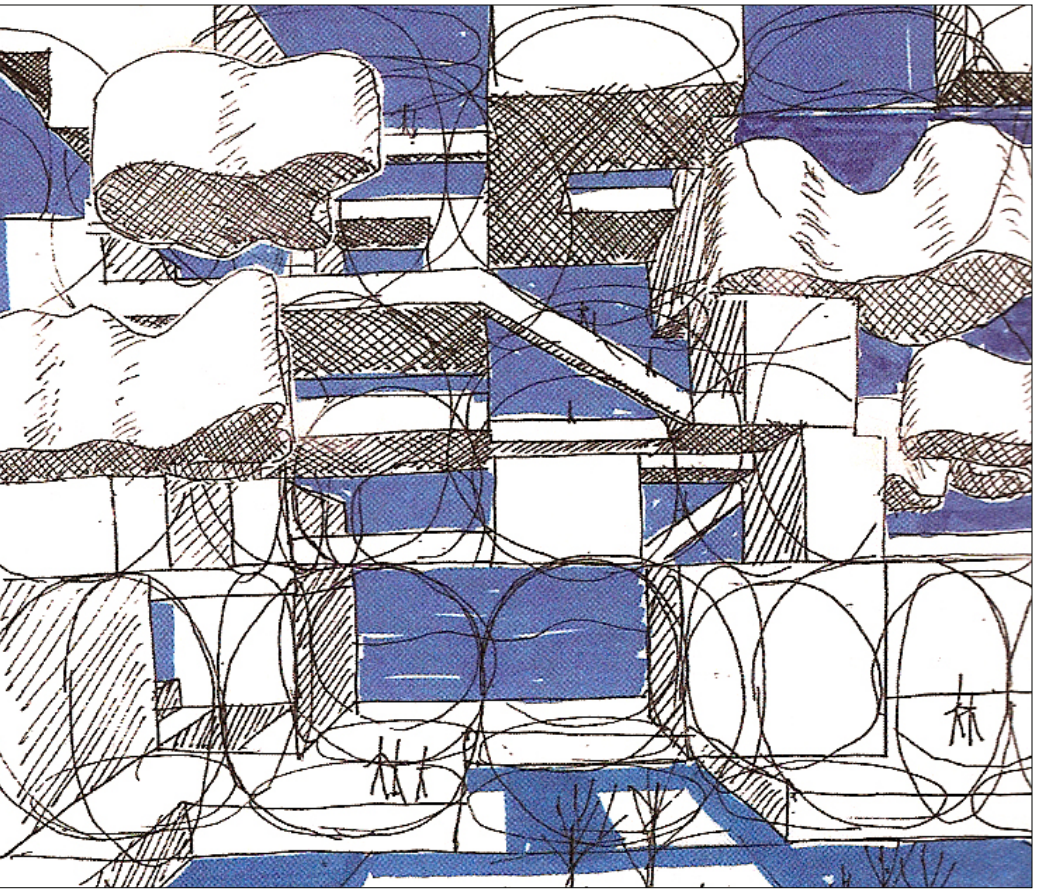


FIG. 15/02
Yona Friedman, irregular structures within the “Ville Spatiale”

five percent of the total built surface area of the city at that time.[49] Furthermore, within the cavities provided by the tetrahedron construction, there would have been more than ample space for high-speed vertical transportation and the insertion of programme within the dome’s shell’s thickness. The enclosed volume between the inner and outer surface of the dome would even have contained double the volume of the buildings within its footprint.[50] This meant that the entirety of a city could have been housed within the thickness of the structure alone. Each of the tetrahedrons would have formed valleys upon which housing could be established.

Completing this brief historical narrative for megastructure ideas and extending into Montreal City and its World Exposition of 1967, it would be unfortunate not to include Frei Otto in the same framework as Buckminster Fuller. Arguably one of the most important structural engineers in the last half century, Otto’s *Tensile Cities* may not be considered megastructures by the definitions already discussed, but nevertheless, he suggests a three-dimensional urban settlement pattern not so different from them. Where most examples of megastructures concentrated on the diversity and accessibility to an urban infrastructure matrix, Otto, just like Fuller, Kahn and Tyng, places more importance on the spaces within the larger structures and the freedoms provided. His *Sail House* project, for example, is a simple framework of tension

49. (ibid 189)

50. **Michael John Gorman.** *Buckminster Fuller: Designing for Mobility.* (Milan: Skira Editore), 2005. 184

cables, not static trusses. With only one central compressive member acting as mast, a large array of diagonal cables are anchored to the ground. It is along the outside face of this cable-net structure that walkways and housing units can be attached. Moving further, the central mast can be brought to the center, multiplied, and be supported by cables that form spatial networks bridging all into one large composition. Similar to Friedman's *Spatial Cities*, Otto suggests a settlement pattern detached from conventional methods and has great faith in the freedom granted to its population to build their own homes. Entire communities could grow in this way, consume the vacant spaces within the cables, and witness the structure eventually disappearing under the infill.[51]

Both Fuller and Otto created their own respective nation's pavilions during Montreal's 1967 World Exposition, and both attempted to dematerialize architecture while providing the freedom of mobility to visitors and programme. Fuller's seventy-metre diametre geodesic dome for the United States Pavilion enclosed an incredible volume of space. This volume was further separated by walkways, art galleries and observation levels, but all were detached from the exterior structure. Otto provided the same option in the German Pavilion but his enclosure was not through solid trusses but with the undulating shape of his tensile fabric pushed and pulled to cover the pavilion's exhibition floor. Both Fuller and Otto brought an additional layer of

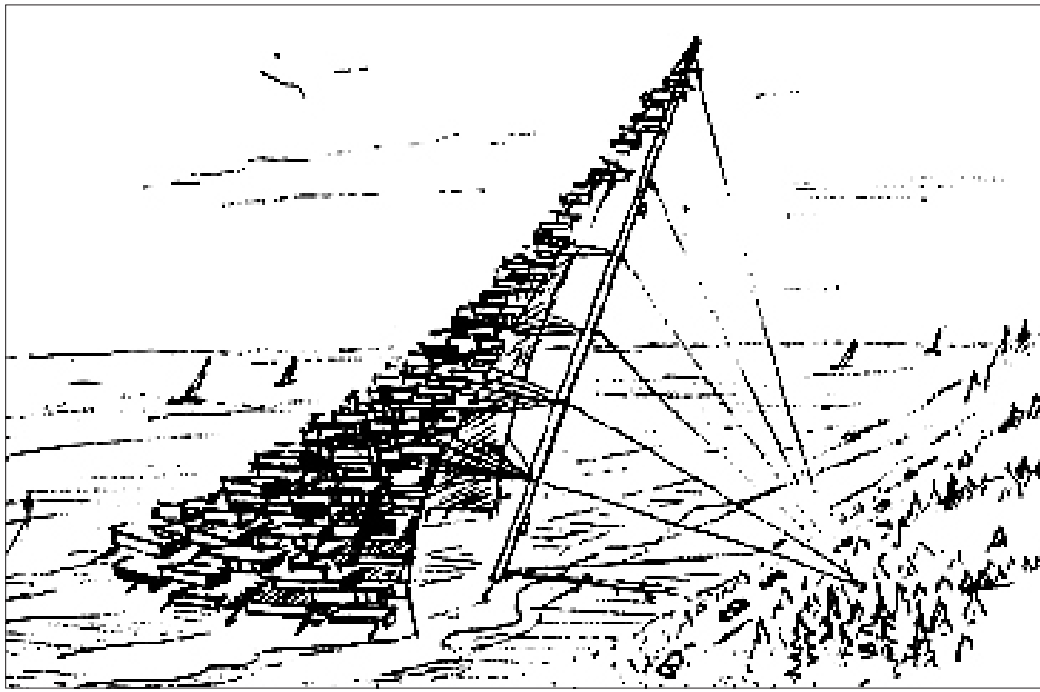


FIG. 16/02
Frei Otto, Sail House, undated study

51. Conrad Roland. *Frei Otto: Tension Structures*. (New York: Praeger Publishers), 1970.109.



FIG. 17/03
Opening day, Buckminster Fuller's American pavilion, Expo67

information to the megastructure idea. Where on one side a great deal of effort was made to expand a site's surfaces and holding capacity, these two examples demonstrated that this could be achieved without the need of excessive, redundant, and often wasteful structure.

> "For example, the whole area to be occupied by a future world exhibition or by the Olympic games might be covered with a giant envelope, thus following Paxton's Glass Palace, or Crystal Palace but with dimensions more suited to our times and our world population."
>
> – Frei Otto [52]

Throughout all the past experimentations in architectural speculations reviewed here, two constant themes have remained present. The first is the adaptability of the built environment and how it can accurately mirror its inhabitant's needs. The second, and most prominent theme, is the importance of the underlying infrastructure of our buildings and cities. The megastructure examples already identified all share these aspects and demonstrate the true needs of our growing urban worlds. The greatest and most successful built example that sought to capture the spirit of megastructural thinking is Moshe Safdie's *Habitat,* constructed for Montreal City's Exposition in 1967 along with Fuller's dome and Otto's tent. Although the actual exposition and host city will be explored in the following chapter, the particular example of *Habitat* is best explored in relation to the already mentioned megastructure precedents.

52. (ibid 151)

Safdie, both a Canadian architect and the primary planner of the Exposition, first envisioned *Habitat* as large pyramidal structures where prefabricated housing modules did not attach themselves but rested upon one another as the form grew, anchoring itself along the interior structure. This diagonal structure would feed and hold the population's needs for mobility and services by providing these through the depths of the structure itself. In total, *Habitat* would have provided the City of Montreal with nine-hundred fifty housing units complete with all modern civic and social services. Budget constraints removed the ambitious goals and reduced the final unit count to one-hundred fifty-eight dwellings.[53]

Habitat, however, was to become more than a simple theoretical argument in a time governed by very speculative theory. It searched for the concrete physical manifestation of its ideals, and provided the convenience of the individual home, location, and a three-dimensional urban pattern without the wasteful nature of conventional urban and building development.[54] Unfortunately, its organization is in itself a great paradox as most megastructure proposals inherently are: the greater the density one constructs, the more space is left unused in the center voids of the pyramidal structure. This seems like a contradiction of its fundamental ambition to create a dense urban environment.[55] Nevertheless, *Habitat*

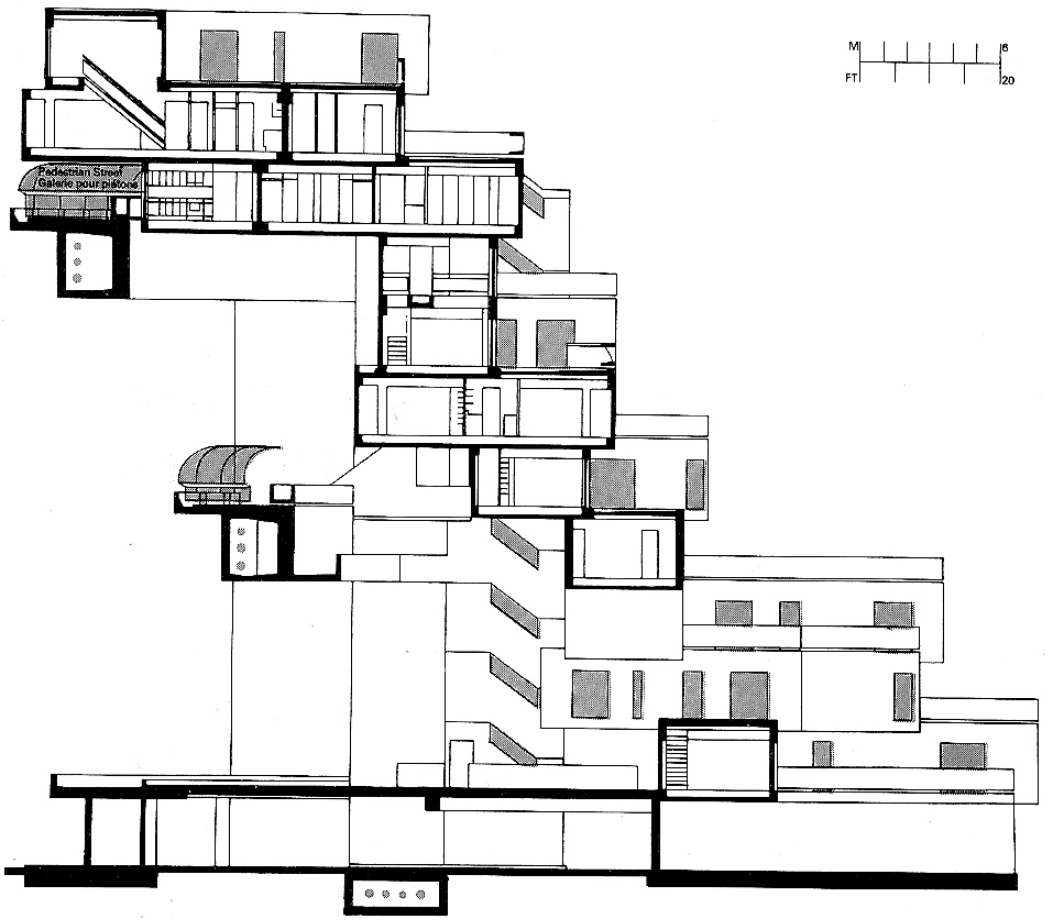


FIG. 18/02
Moshe Safdie, Habitat cross-section as completed

53. (MVRDV 2005, 494)

54. Robert **Fulford**. *This Was Expo*. (Toronto: McCelland and Stewart Limited), 1968. 112.

55. (ibid 117)

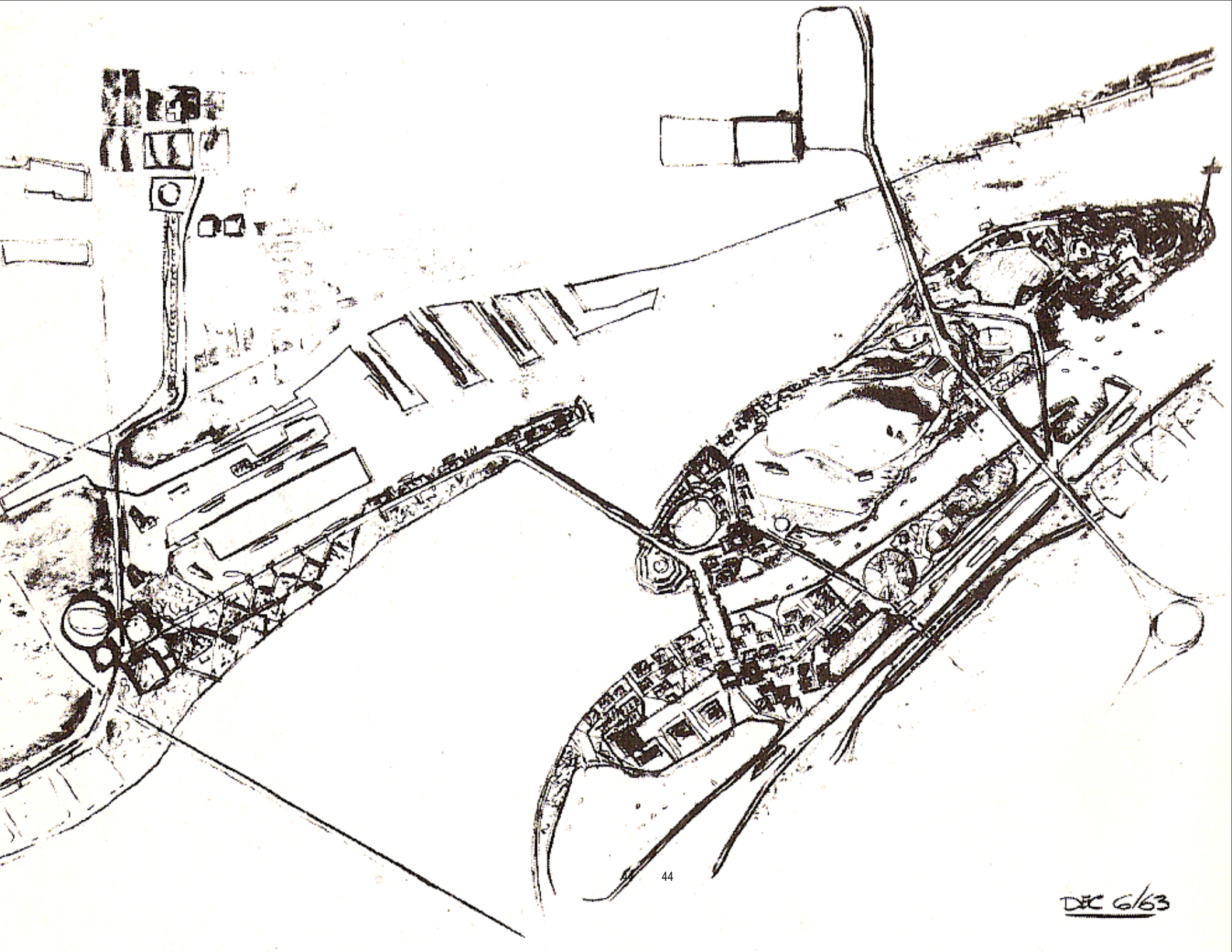

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by its very existence today remains an experiment in radical thinking and became the exposition's lasting argument for those radical alternatives to building homes and cities.

Previous Page: FIG. 19/02
Moshe Safdie, Habitat, October 2008

03

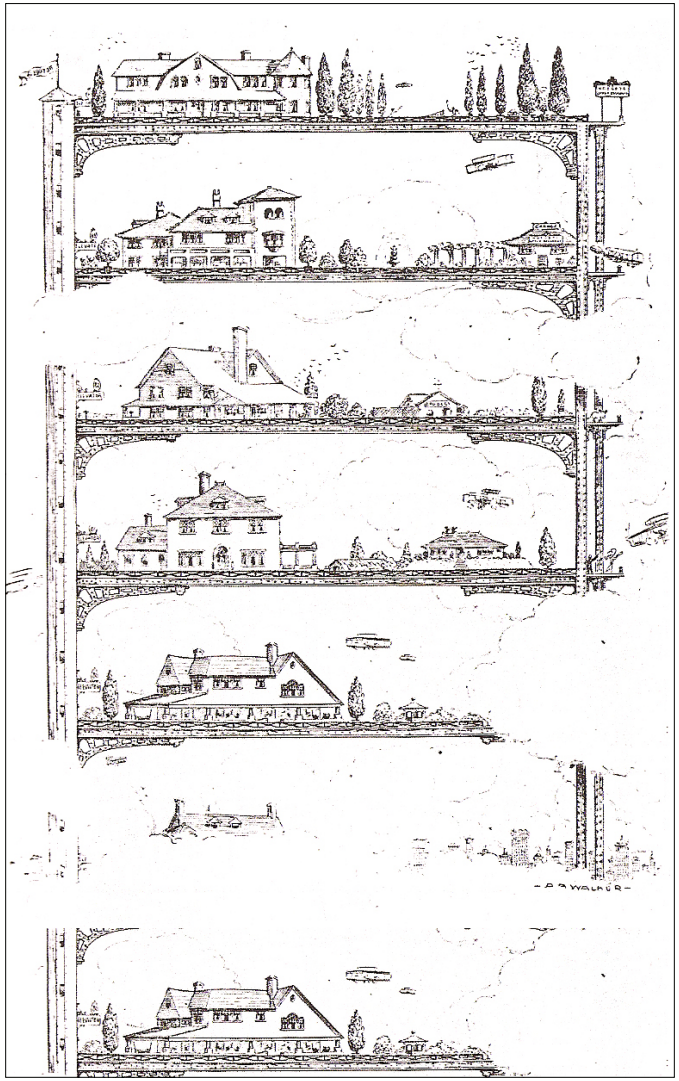
Expo67 Cast Away



44

In Rem Koolhaas' *Delirious New York,* published in the mid to late 1970s in a variety of venues, Koolhaas represents one of the earliest examples of a twentieth-century proposal for the endless multiplication of the earth's surface. In the *Walker Skyscraper* of 1909, each floor level of this vertical storage unit would hold a single villa connected to the other levels only by elevators.[56] Although this project was intended as a caricature of the anticipated high-density development at the turn of the twentieth-century, its language is nevertheless relevant to the megastructures mentioned in the previous chapters. Where the *Walker Skyscraper* demonstrated an early technological solution to society's need for replication of living surfaces, Montreal City's Exposition in 1967 crystallized this idea into a built form; moreover, since 1967, the city has in turn benefited from those experiments conducted at the height of the megastructure period. The lesson of the 1967 Exposition was simple: as an urban experiment, it asked if we could have large scale planning and complex technological processes in the environment without paying the price of stifling individual choice, variety, and identity.[57]

Montreal City itself, as will be explored in this chapter, reflected the ambition of this exposition; this city became one large urban entity, and hence one single megastructure and a new form of urban organization. Expo67 planner Moshe Safdie, the *Habitat* architect discussed in the previous chapter envisioned this Exposition as a combination of multi-



Above: FIG. 02/03
Walker Skyscraper, 1909.

Previous page: FIG. 01/03
Moshe Safdie's concept sketch for the plan of Expo67, 1963.

56. Rem Koolhaas. *Delirious New York*. (New York: The Monacelli Press), 1994. 82.

57. Moshe Safdie. *Beyond Habitat*. (Montreal: Tundra Books), 1970. 77.

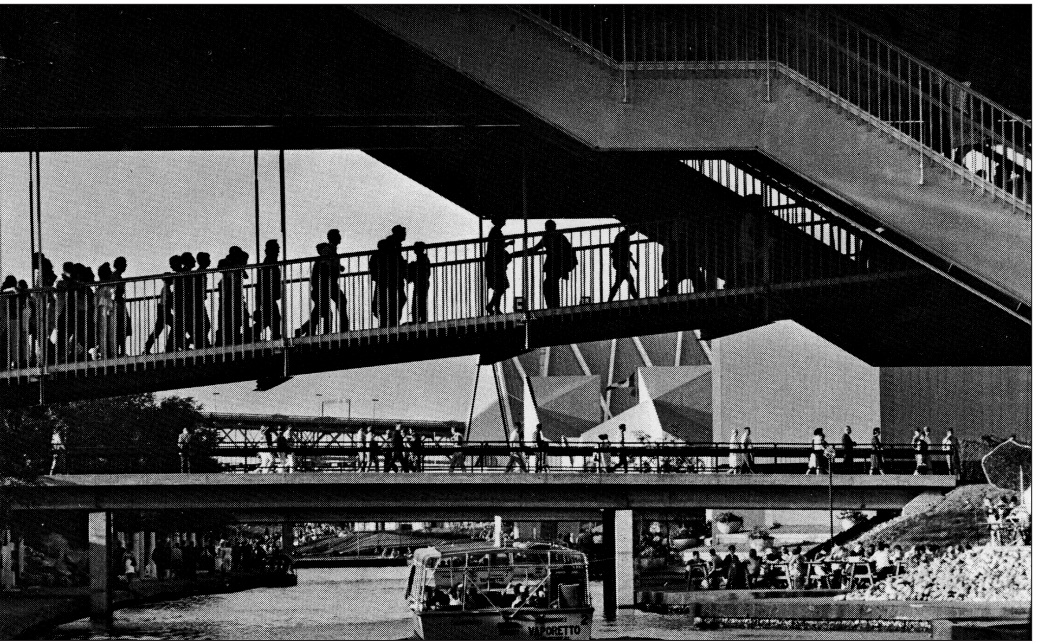


FIG. 03/03
Layers of transportation at Expo67

layered frameworks. This is represented within his concept sketch in the opening image of this chapter, and shows the extent of the Expo67 connection to the existing infrastructure of Montreal City. Emerging onto a global stage at the same time as Expo67's design, the City of Montreal was in the process of constructing an underground network that would eventually support a vast array of uses both at grade and below. The combination of pedestrian paths, metro lines and surface streets today, more than forty-years later, still contains offices, retail centers and hotels all emerging as protrusions along this urban-scaled megastructure.[58] As identified in Safdie's sketch, this new megastructure extended its infrastructure to encompass the Exposition's grounds and circulation. These systems included layered grids of monorails, subways, boats and pedestrian walkways, all providing constant options of movement.[59] The Exposition and its underlying megastructure was the transport infrastructure providing the visiting population its mobility. The architectural infill of pavilions and other programme within this infrastructural frame was unbound by the latter and was expected to evolve independently. As Expo67 demonstrated, within the whole of the city, the exposition remained tied together through this infrastructure. All these layers conceptually combined to form one large design entity providing all speeds, all means and all experiences; one could navigate the extent of the 1967 Exposition and Montreal City

58. (Banham 1976, 106)

59. (ibid 116)

without once needing to pause or wait.[60]

> "The vision, of course, can be seen as hopelessly idealistic, pointlessly utopian. Yet it has in it something of the genius of the human race, and it was this something that gave life and meaning to what we all experienced at Expo."
>
> - Robert Fulford [61]

Expo 67 attempted to explain society's position in history, more importantly, its position on the road ahead to our future.[62] Through the governing theme of Man and His World, the exposition demonstrated to each visitor the complexity, the wonders, and the dangers held in our world.[63] The Canadian government pavilions in general, and the exposition's theme pavilions in particular, demonstrated this vision. In parallel with the ideas of the megastructure period, they focused their attention on population growth and urban living. One theme pavilion, *Man the Producer,* confirmed our growing needs and our consumption of energy. It also demonstrated that the advance of technology into our everyday lives would evoke fear. This was fear that production did not equal human growth and thus the gap between the world's economical classes became very apparent.[64] A second theme pavilion, *Man in the Community*, built a reflection of the ever-changing city. From the impact of the automobile, the skyscraper and population growth, it made the argument that pre-existing urban cities were currently unfit.[65] But, the new city was also glorified as capable of evolving in response to of this fear. Another pavilion, *Man the Explorer*, concentrated its expositions on discoveries already achieved, but more importantly on those that had yet to be made. Man as a collective society was shown as the victim of illusions and ignorance. He ["man" being used as a general term representing the global society of 1967] was portrayed as barely able to scratch the surface of understanding this world.[66]

As visitors progressed through a time line of inventions, a large population counter hung from the structure indicated a global growth of one-hundred and thirty-two people every minute and the addition of two people per second. *Man the Provider*'s pavilion brought up the notion of food production and modern agricultural advancements. Continuing the previous pavilions' emphasis on growing populations, the theme of this pavilion became the effects of this explosion on the undernourished and underdeveloped nations of the world. In addition, it also reminded visitors that only three percent of the world's surface was considered cultivatable at that time.[67]

60. (Safdie 1970, 67)

61. (Fulford 1968, 156) R. Fullford was the Expo67 correspondent for the Toronto Star.

62. De Lorimier, Jean-Louis. *Expo67 Montreal Canada : the memorial album of the first category universal and international Exhibition held in Montreal from the twenty-seventh of April to the twenty-ninth of October nineteen hundred and sixty-seven.* (Toronto: Thomas Nelson & Sons Limited), 1968. 7.

63. (ibid 54)

64. (ibid 69)

65. (ibid 63)

66. (ibid 72)

67. (ibid 79)

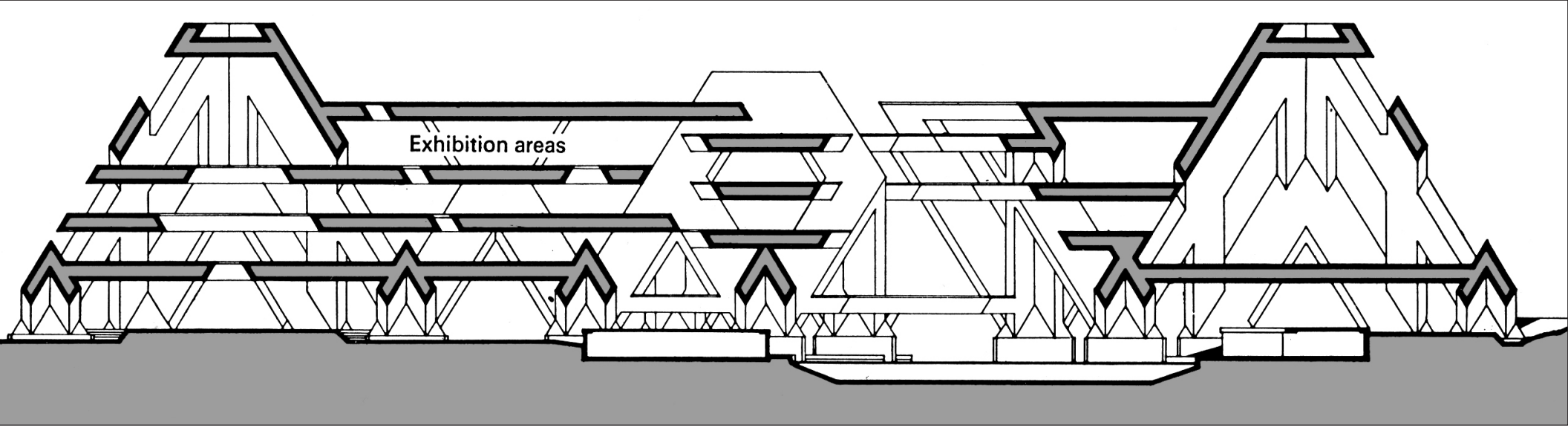


FIG. 04/03
Man the Explorer/Provider joint temporary pavilion cross-section, Expo67

The architectural ambition of Expo67 could be observed in its overall planning as well as in its independent buildings and pavilions plugged into the larger megastructure. Already mentioned in the previous chapter are the American and German pavilions of Fuller and Otto and Safdie's *Habitat*, but it is also necessary to mention a few others. Formed by a large composition of three truncated tetrahedron spaceframes, the joint theme pavilions for *Man the Explorer* and *Man the Provider* had their exhibition space inserted within the three-dimensional structural frame.[68] Flexible in all directions, this large empty framework granted a great deal of adaptability to both exhibition volumes and visitor circulation. This approach was one of the first manifestations of the architecture anticipated by Price's *Fun Palace* or Friedman's *Spatial Cities*. In essence an empty building by itself, the pavilion of *Man the Explorer/Producer* could transform its interior layout without sacrificing the integrity of the structure. It was designed first without any clear indication of its contents. This eliminated a great deal of over-specific programming since unforeseen exhibitions and objects could be inserted after design completion. The tetrahedron spaceframes remained empty until all gallery contents were finalized. After, it was simply a matter of inserting floors within the voids of the structure.[69] If it was not for Montreal City's pre-expo condition, such experimentation would not have

68. I. Kalin. *Expo '67: Survey of Building Materials, Systems and Techniques Used at the Universal and International Exhibition of 1967.* (Ottawa: The Queen's Printer), 1969. 36.

69. (ibid 43)

been so easily possible, or even conceivable. In the same fashion as the design freedoms permitted in *Man the Explorer/Producer*, there was a far larger, more permissible structure guiding the growth of the urban fabric. This, as will be demonstrated, began in the mid 1960s and is continuing today. It is the underground infrastructure forming Montreal City's basic centre city megastructure.

"Basement urbanism" is a term that was used to describe the ambition behind the assembly of the infrastructure that led Montreal City to its status identified in this thesis. This term coined by then planning consultant Vincent Ponte was key to conserving and extending this ambition of connection. Prior to Expo67, *Place Ville-Marie*, conceived by architect I.M.Pei in 1962, was the catalyst that eventually became the first of the city's various connecting layers of infrastructure. New buildings such as *Place Ville-Marie* inserted within this framework became possible by the utilization of the Canadian National Railroad air rights which previously carved deep trenches through pre-expo Montreal City's downtown.[70] Where the C.N.R. tracks dipped below street level, dual metro lines parallel to the harbour front crossed them at right angles while the city began to float above. Identified with the early city section in the next spread, this is was to be the first layer forming the foundation of the city's megastructure.

Place Bonaventure designed for Expo67 by Canadian architect Ray Affleck, another important artifact from this period, finds itself also placed at

70. (Banham 1976, 120)

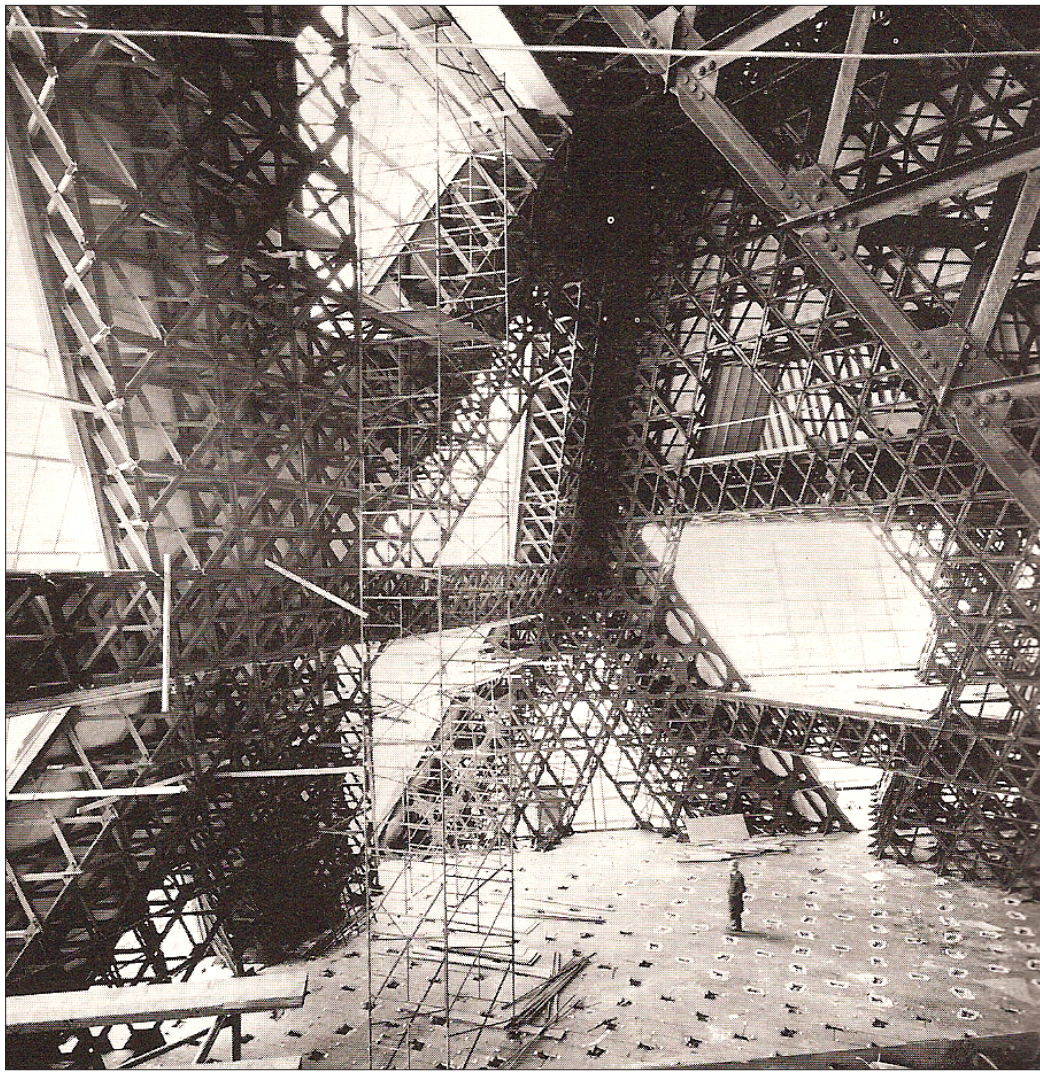


FIG. 05/03
Inside the tetrahedron space-frame of Man the Explorer/Provider pavilion during construction, Expo67.

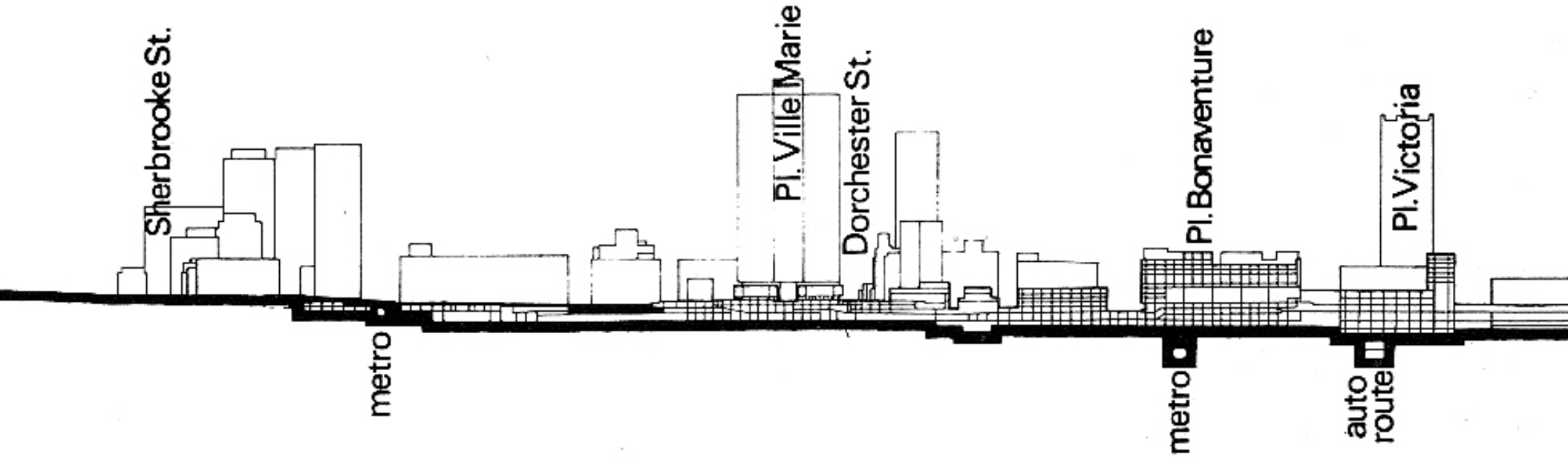


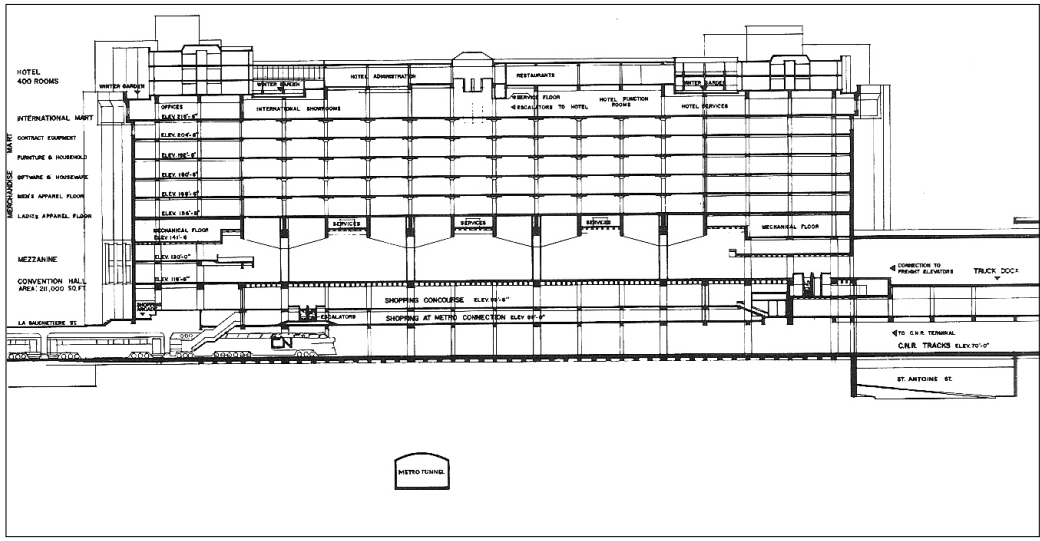
FIG. 06/03
Cross-section identifying Montreal City's underground megastructure. Identified as SEC-01/03 on FIG 09/03

an important switch between the city's rail and metro lines and the transfer from surface street to the new underground city. This large building is a perfect time capsule of the mentality of 1967. Above this rail exchange *Place Bonaventure* rises like a stacked array of urban functions, all inside a large concrete box. First, eight metres above the rails is three levels of commercial retail. Above this is inserted a convention space [Concordia Hall], then five floors of the merchandise mart, finishing with an international trade floor.[71] The latter is connected to two three-storey hotel volumes placed around exterior courtyards while office space is scattered throughout the building. Although lacking in other megastructure characters such as extensibility and varying life expectancies of components, *Place Bonaventure* and several other Expo67 pavilions are each different versions of the emerging visionary thinking of the time. They were connected to one another by both ambition and infrastructure, and each in its own unique way attempted to make predict the future of our built world.[72]

The buildings and urban strategy outlined above all signify several important ambitions. One is most certainly the need for diversity in circulation, but this does not include only population movement. This focus is directed more towards diversity and resilience of infrastructure regardless of what it carries within. Another ambition can be observed within most pavilions and city buildings. As Friedman and Price suggested more than ten years before

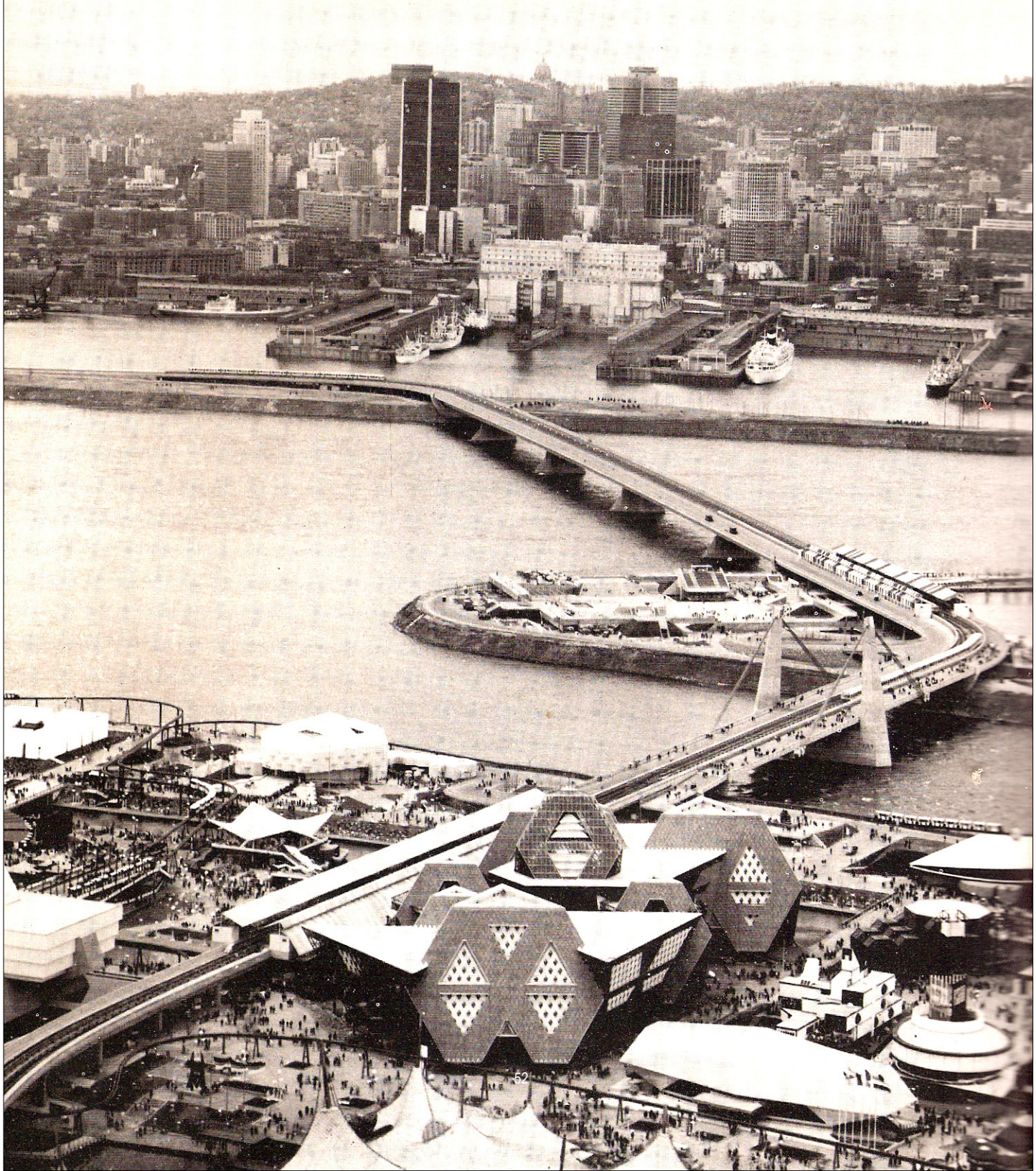
71. (ibid 121)

72. (ibid)



Above: FIG. 07/03
Place Bonaventure cross section.

Next Page: FIG. 08/03
View of Montreal City's downtown from one of Expo67's islands. Man the Explorer/ Provider Pavilion in the foreground.



Expo67, the pavilions and other city projects relied on freedoms built within their own forms, and as demonstrated, some almost allowed spontaneous and unplanned occupations. It was about the evolution of the content of these buildings, not the buildings themselves.

It is unfortunate that the buildings were connected to each other only through the underground, but nevertheless, this was a significant step forward in the discourse of architecture. Montreal City and Expo67 became modern monuments and through their experiments they attempted to create a global wake-up call to an emerging world problem. This problem was that predictions at that time called for more than half of the world's population to eventually reside within cities. This was the concern that society at that time was not yet capable of designing a proper livable city, let alone anticipating one of such scale.[73]

Reinforcing this statement, at the time of Expo67, the Canadian population was predicted to reach forty million by the century's end. Safdie's *Habitat,* among others, was a reaction to this critical situation and to the global horizontal expansion that surely would follow. *Habitat* above all else represented this goal: it sought for a better solution to urban housing.[74] Safdie's project as described earlier was not to be a solution for a few thousand, but was designed originally as an option for housing millions.[75] This particular design strategy, utilizing a form of three-dimensional urbanism, attempted to reveal the next step in the evolution of shelter in the same way that other visionary architects, many mentioned throughout this thesis, attempted in the years prior to Expo67.[76]

Since the late 1960s, several more buildings have entered Montreal City's megastructure. The city section provided earlier might have been the initial segment of the megastructure but due to the success of the exposition and its urban strategies, this underground framework has extended to almost the entire downtown footprint. Building within this megastructure skeleton, this thesis' design insertion will create an additional framework and an incredible opportunity for various programmatic volumes to evolve and adapt in parallel to our global needs. This new step will serve as anticipation of our future living situation in the same way that Expo67 and the "basement urbanism" concept of Montreal City did forty years ago. Identified in green in the urban plan on the following spread, this relationship of various independent buildings all situated on one large subterranean infrastructure datum is the proper location for future architectural experimentation. The true lasting impact is this ancient megastructure footprint. This thesis' *Overnight City* will build upon these not-so ancient ruins.

73. (Fulford 1968, 69)

74. Andrew Garn. *Exit to Tomorrow: World's Fair and Architecture, Design, Fashion 1933-2005.* (New York: Universe Publishing), 2007. 218.

75. (Fulford 1968, 111)

76. *Expo 67 Guide Book.* (Canada: Maclean-Hunter Publishing Co), 1967. 31.

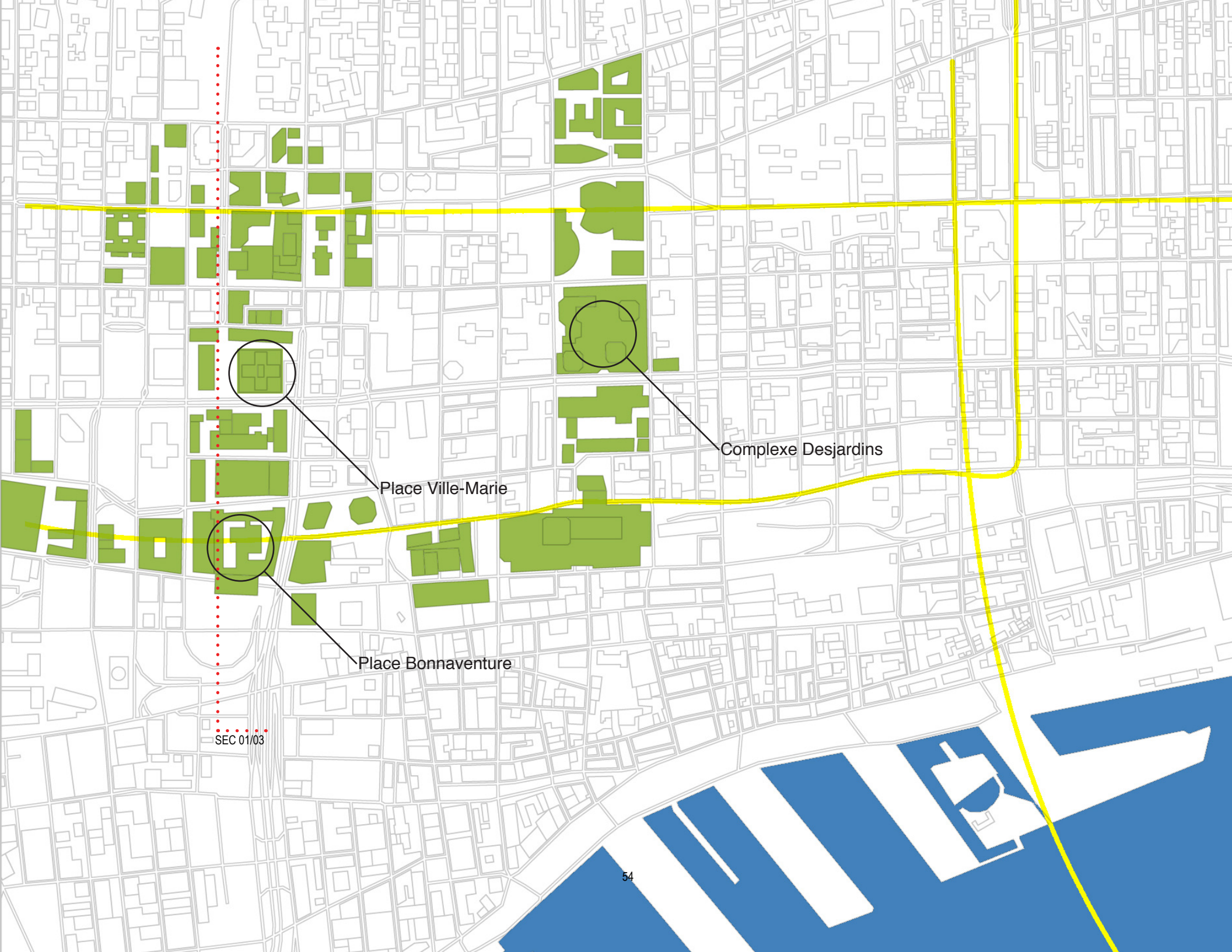
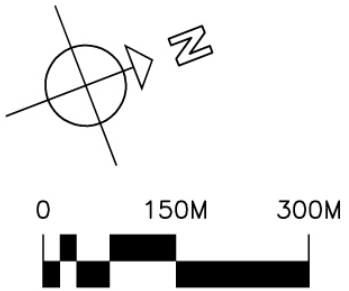

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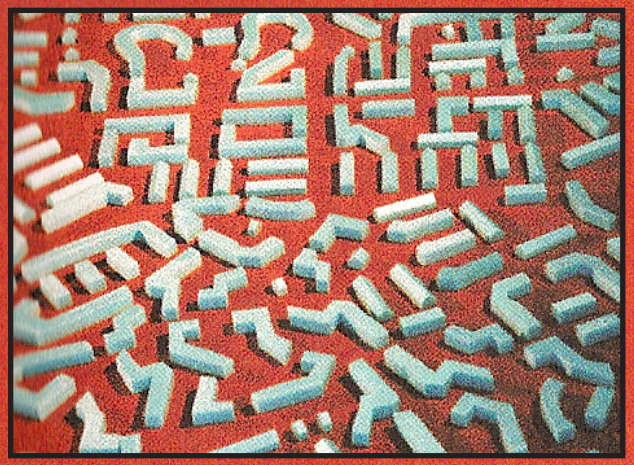


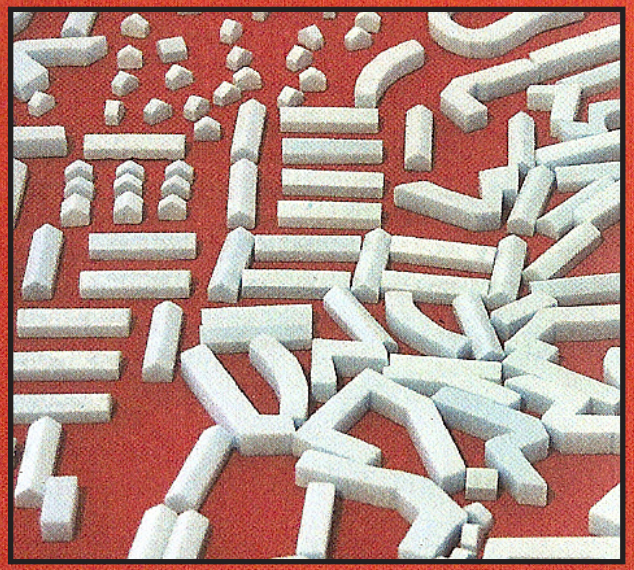
FIG. 09/03
The adjacent urban map identifies the current footprint of Montreal City's megastructure. The green buildings identify the current underground megastructure and the yellow lines identify the city's metro system. The bottom right island is one of two that hosted Expo67's many international pavilions.



04

Commandeering Infrastructure



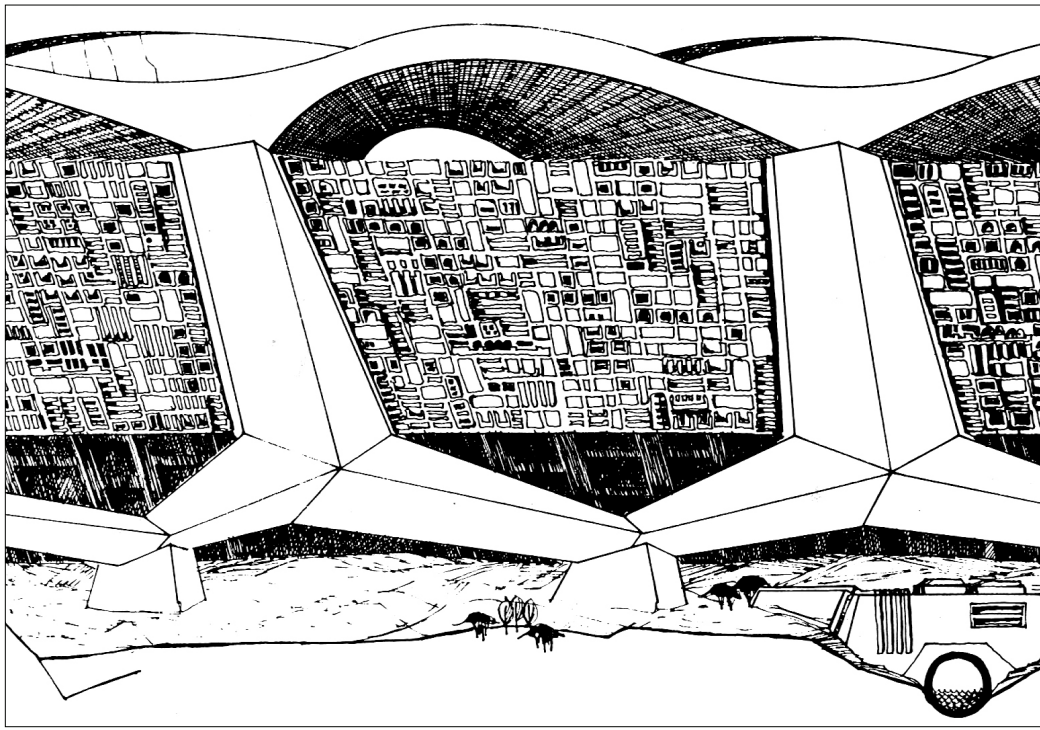




The second chapter of this thesis cast a wide net grouping together primary figures who helped define the megastructure form. Although most of those mentioned have long stopped this particular line of research, there is nevertheless one figure who has not yet been listed here who remains deeply concerned with megastructural experimentations. Since the late 1950s, Paolo Soleri has been investigating new forms and philosophies of urban environments. This prolific artist and architectural visionary, through several high density city proposals he called *Arcologies*, sought the unrestricted use of the third dimension in the design of cities. Even to this day, he remains fascinated with the idea that a single person is capable of designing an entire city.[77] While working purely through tectonic design methods, his urban proposals merge both the vertical and horizontal dimensions. This congruence of both elements results in complex and compressed stand-alone structural sculptures suggesting completely different interpretation to what the rest of the world would understand as cities. Similar to most of the architects mentioned earlier, Soleri wished to put a stop to the thin spreading of humanity. What made him stand out from the rest was his idea of "non-acreage" land where his *Arcologies* consumed no horizontal land, but were sited on the metaphorical topography lines of the landscape rather than between them like conventional development.[78] The

77. Wall, Donald. *Visionary Cities: The Arcology of Paolo Soleri*. (New York: Praeger), 1970.

78. (Banham 1976, 200)



Above: FIG. 02/04
Veladiga Arcology project, Paolo Soleri. This project utilizes a large dam structure to hold a skin of human habitation. 1964

Previous page: FIG. 01/04
MVRDV's experiment in urban sprawl and density demanding a re-thinking of urban traditions and questioning the value of conservation.



arguable downfall of Soleri's *Arcologies* came from the importance he placed on massive structural design rather than on the quality of life or even the needs to support it. Even though these proposed large scale and dense cities attempted to merged both architecture and ecology, he removed them from our existing social and urban contexts, and subsequently set them adrift alone as single entries forming an elaborate and unprecedented portfolio of similar, visionary experiments.

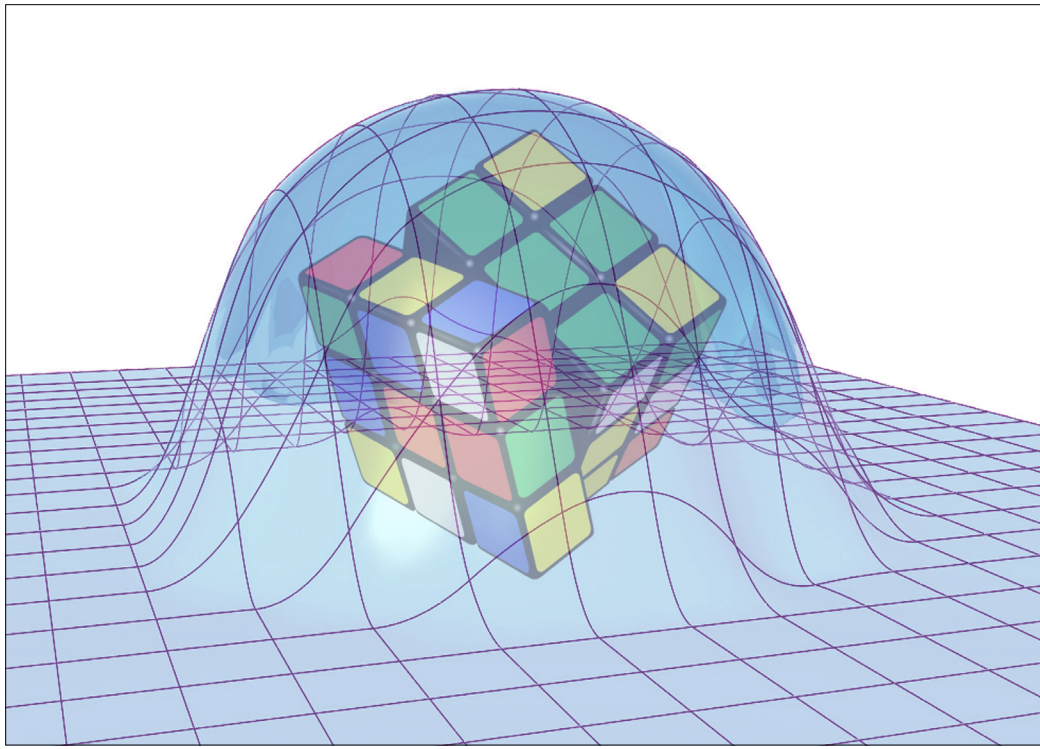
The discussion of the megastructures was not stopped due to a decrease in population growth or even technical availability. It fell out of favour because the growth predicted was absorbed in other forms, mainly through horizontal sprawl and mas. Nevertheless, the predictions of the megastructures were not rendered false, they where simply ahead of their time. This thesis alludes to a proposal not particularly exclusive of the monolithic and almost dictatorial nature implied by Soleri and the other's megastructures mentioned thus far. But, the *Overnight City* is not to be regarded as a static object separated from its background. The *Overnight City* as a contemporary megastructure will hold nothing more than the very basic systems to sustain city life while the city itself grows as an afterthought; it will be a collage of spaces or uses accumulated through time as the existing fabric of Montreal City evolves to consume this empty framework of infrastructure.

Team Ten as introduced in Chapter Two identified populations as liquid matter void of permanence, of purpose, and awaiting a flexible containment. This societal demand, through their

observations, would result in architecture providing the “counterform” as an ideal environment for these growing and unstable urban populations.[79] The contemporary visionary architecture firm of MVRDV located in the Netherlands identifies clearly with Team Ten’s metaphor. Their criticism of the adaptability quality of our current urban traditions is evident in the first image of this chapter. It suggests a very similar strategy as Team Ten proposed in the 1960s where the content of a traditional city, European in this example, is reconsidered to reduce its footprint and grant it a proper shape unique to its population’s character. The problem is that such a design strategy would surely become the equivalent of designing cities and buildings with programme descriptions more resembling the organizational behaviour of a Rubik’s Cube™ rather than a prescribed, and therefore, finite list. There is also a problem with the interpretation of the megastructure ideas. Similar to MVRDV’s criticism of mediocre sprawl, megastructure proposals span the full spectrum of futurist concepts and this thesis will argue that it is no longer their built solutions that remain relevant today but their underlying philosophy, more importantly, their understanding of the structure of urban life.

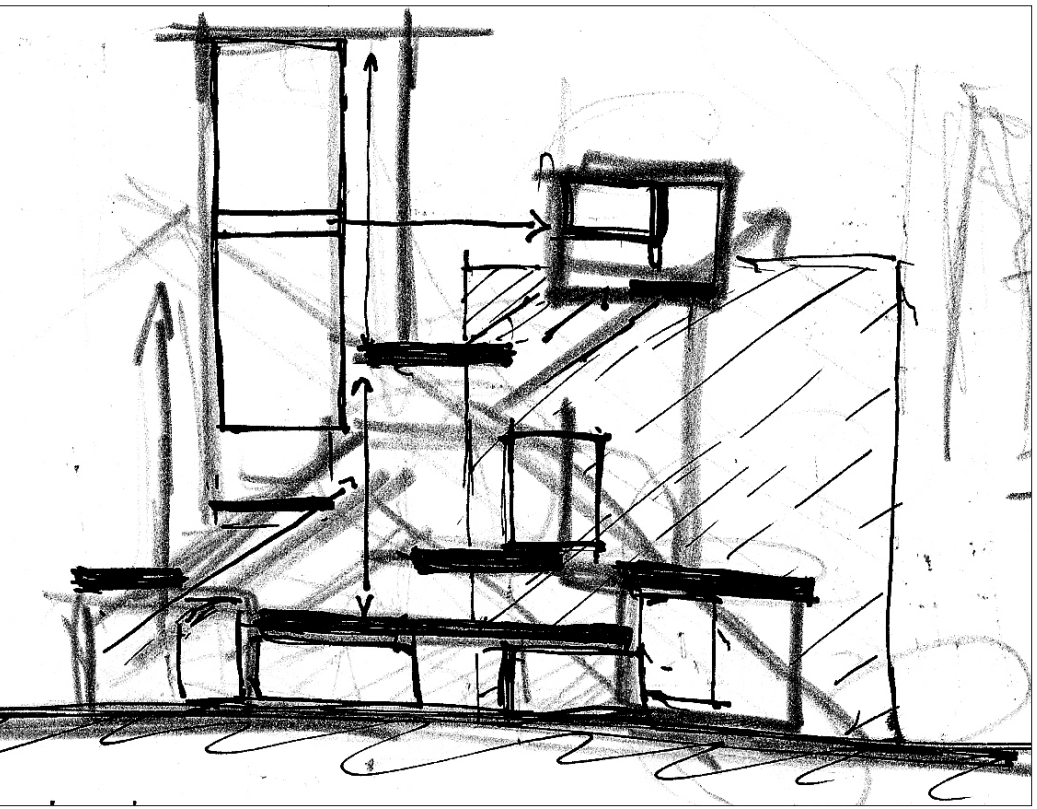
The Overnight City will be an intentional attempt at extrapolating Ponte Vecchio’s found conditions into the organic observations of population needs. This strategy will be interpreted in this chapter as an organic distribution of both city and building services; moreover, it will be interpreted as a living system where the survival of this new megastructure

79. (Smithson 1968, 4)



Above: FIG. 04/04
Architecture as counter form for an undefined program is like a solid casting of a continuously revolving Rubik’s Cube™.

Previous page: FIG. 03/04
Vertical growth concept



Above: FIG. 05/04
Programme insertion sketch within the skeleton, unbound by ground plane.

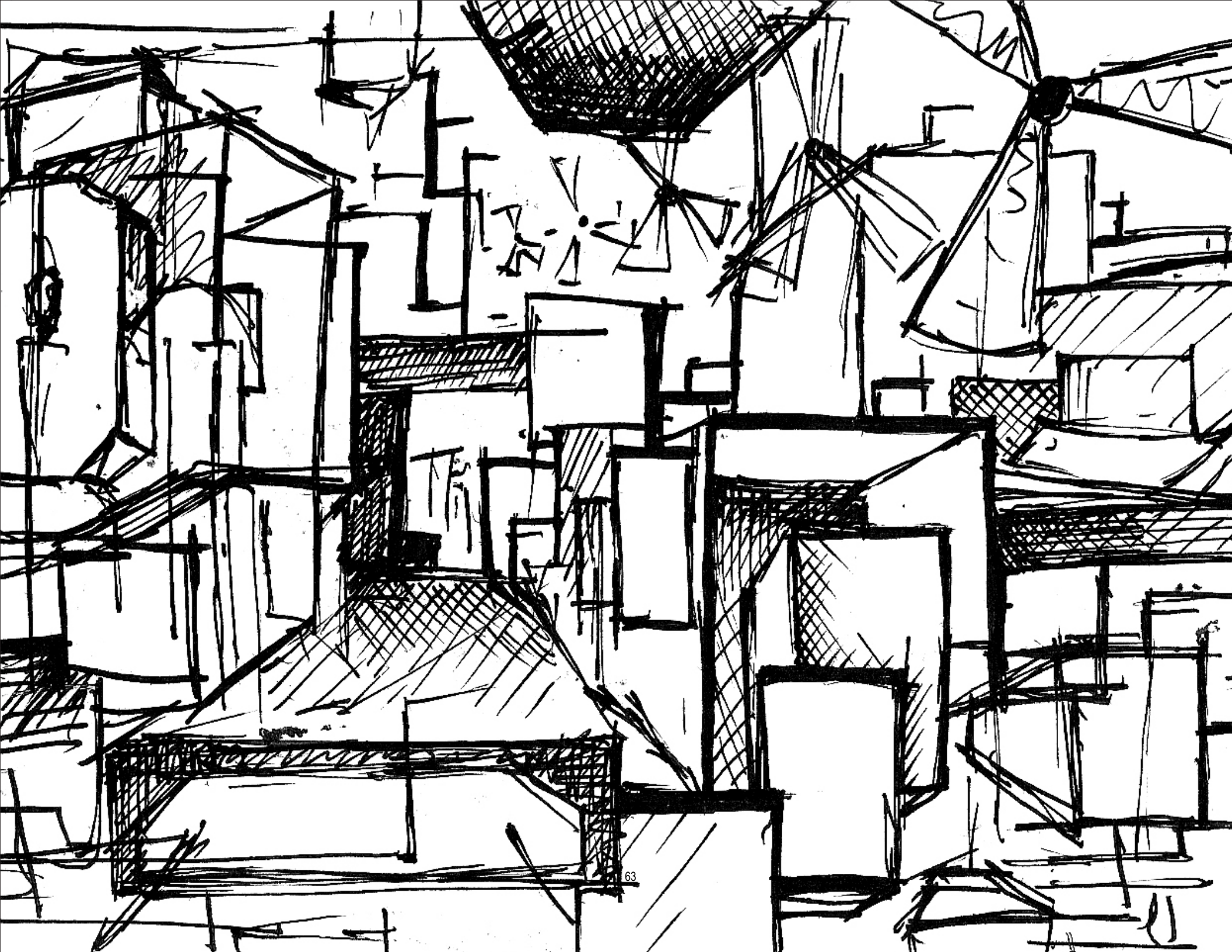
Next Page: FIG 06/04
Informal infill sketch within the infrastructure matrix and the freedom of construction within the given larger form.

is therefore understood as dependent on its porosity, nervous system, internal circulation and skeletal structure.[80]

This contemporary megastructure will first require a dynamic underlying distribution matrix of infrastructures providing access to water, sanitation, freight, transportation, etc. This forms a large three-dimensional volume and an invisible enclosure where within the combined reach of these services, programme insertion is possible. Functioning in the same way as any vascular system, these basic necessities circulate within this megastructure volume allowing other elements to grow or attach themselves to this framework. The sketches illustrating this chapter and those that follow demonstrate the freedom implied by the suggested three-dimensional system of infrastructure. In the same way as Price's *Fun Palace* and others, these imply the complete lack of control on the part of the architect when considering the "final" spatial organization within the megastructure. Within this transparent envelope, the megastructure's systems fills and defines further this volume by extending mobility to all points along the infrastructure matrix. This mobility comprised of the circulation of both population and services becomes this megastructure's "raison d'être", and implies the flexibility and elasticity required to cope with this world now understood as fluid.

> "Once we get into the third dimension, the absurd but fluid magic is open for endless concoctions. Not only have escalators created a true fluidity to people's movement, but every kind of substance can be woven

80. Michel Ragon. *La Cité de l'An 2000.* (Belgium: Casterman), 1968. 92.





and guided over space [baggage, liquids, machines, air]
and the idea of proximity starts to elasticate."

- Peter Cook, Archigram [81]

Peter Cook, a founding member of Archigram, speaks about this elasticity of space. Archigram, as identified earlier, refers to infrastructure as the solution to our urban problems. Making the leap forty-years later, the megastructure proposed by this thesis have the ability to circulate both people and services through various scaled networks. Not only will physical distances become shortened but also multiple older single-use urban layers will then become compressed, turning a once single plane into several, without needless physical expansion. These planes not only form the skeleton of the megastructure as suggested by Team Ten in their *Pedagogical Model*, but it also transform it into vibrant entities within the larger composition. This skeleton, like the bridge forming Ponte Vecchio, is both a physical supporting member as well as a metaphorical one.[82]

This particular framework has been best explained in the context of Le Corbusier's concrete shelves of his Algiers proposal. Although many versions differ from Le Corbusier's design, this skeleton is nevertheless viewed in the same way as an empty shell composed of various urban spaces

81. Peter Cook. *The City Seen as a Garden of Ideas*. (New York: The Monacelli Press), 2003. 109.

82. (Ragon 1968, 92)

FIG. 07/04 Life within the Overnight City, concept painting

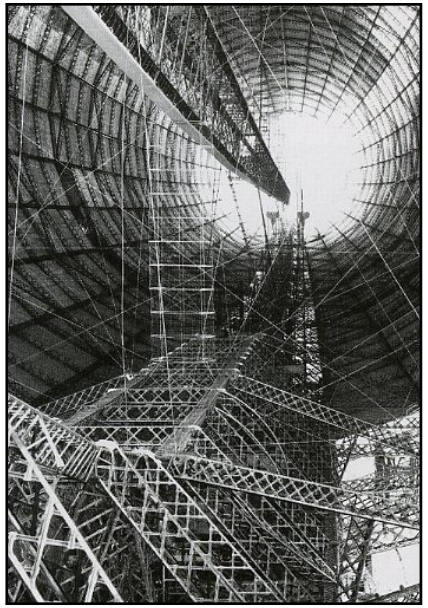
inside its voids. These voids together with the other underlying networks of infrastructure hold the theoretical shape of this new urban mass.

In the context of the *Overnight City*, this skeleton allows the freedom of insertion of parks, courtyards, streets, plazas, and other similar urban elements.[83] Team Ten in a much less technology-demanding scenario than most of their contemporaries, sought to impose similar networks within existing city centers. These as described earlier, allowed the almost spontaneous attachment of forms regardless of use or size. These, networks became several horizontal surfaces each acting as both skeletons and distribution systems. It was upon this framework that population circulation and settlement was encouraged. Extending this analogy, a contemporary megastructure will also break away from the default surface of the street and its role as the only public horizontal datum. This unfortunate tradition upheld through all urban generations has consistently remained the one piece of urban life used to measure both scale and density. More importantly, it also is the only layer to contain most if not all of the city's infrastructure. If one can project a three-dimensional framework serving an identical purpose, then there could be a greater disbursement of datums along a new dynamic matrix of infrastructures. The fourth and last crucial element to the assembly of the megastructure is the skin. Throughout the examples mentioned, change and adaptability of the megastructure has been subjected to its ability to respond to its amorphous and often temporary population of inhabitants. The skin is this receptive element guiding the continuous evolution of the megastructure. It is this skin that holds the actual life of the megastructure; it is the physical mass of the programmatic infill that completes the voids of the *Overnight City*.

A small tangent at this point in the thesis will explore the possible quality of life within the *Overnight City*. The triptych composition presented in the next spread is an attempt to provide the context within the programmatic organization of the skin of this megastructure since, as previously mentioned, this is the one element specifically ignored in the design decisions. The left and center images suggest the informal world hinted at thus far as the unpredictable counterform to overpopulated cities. Where the Piranesi etching on the left might vaguely resemble the layering of infrastructure identified through the investigation of Expo67, the center image is a direct reflection of our informal urban world conditions. Completing the composition is an interior view of the infamous Hindenburg dirigible. Essentially this last image is the desired end result to the skin, it is the organic concept the megastructure aims for: a simple skin forming exactly to the structure's shape, its complexities and supporting elements cleverly concealed. Although the relation between each of these images will become self-apparent as the second half of the thesis unfolds, in light of the population scenario generating the revival of this architectural strategy, both seem impractical if not impossible. The central and most important image of this composition is a view from the exterior

83. (Banham 1976, 17)





of Kowloon Walled City. This Chinese territory, an island within the then sovereign nation of Hong Kong, was, prior to its demolition in 1992, the densest urban settlement in the world. This informal neighbourhood which grew upon itself over several decades held at its peak a local population of fifty-thousand people. With a surface covering only two and a half hectares, this generated a population disbursement of twelve-thousand people per hectare [1.8 million people per square kilometre]. As a comparison, Manhattan Island in New York has a density of two-hundred and seventy people per hectare and one-hundred and twenty six in Montreal City. This self contained city was first organized as one large Domino House structure. It was a composition of self-supporting blocks, tenant above tenant, lifting the ground level forty-five metres up to a continuous roof datum the

Left: FIG. 08/04
Piranesi engraving, Imaginary Prison plate XIV, 1761

Center: FIG. 09/04
Kowloon Walled City

Right: FIG. 10/04
Interior view, Zeppelin LZ 129 Hindenburg.

size of the compound's footprint.[84] Kowloon, even in light of its other problems, was a livable community that indirectly and unknowingly built itself on the principles of the megastructure. Although lacking direct organization, it presented an empty skeleton of ancient buildings, corridors and service shafts to a continuously adapting community more than willing to adapt it to their individual needs. The section of Kowloon Walled City provided here demonstrates this programmatic organization. Inside, the various rooms carve and define the spatial organization of this solid organic block while other systems of infrastructure run through thin corridors and light wells.

The megastructures identified in this thesis all provide one form or another of these possibilities. This is more than a simple demands for relocation of the traditional two-dimensional ground plane. They search desperately for its extension forming concise urban volumes. These volumes, attached together though an infrastructure framework as suggested by the megastructures, are the foundation for a new concept of building envelope that can absorb programme and save the surrounding landscapes from being overrun by sprawling inefficient two-dimensional mediocrity.[85] These identified examples all bring forth the notion of a living organism that grants the possibility of life upon itself. The Overnight City, as will be demonstrated in the next chapters, will be the modern equivalent to this revisited megastructure ideal.

84. (MVRDV 2006, 152-173)

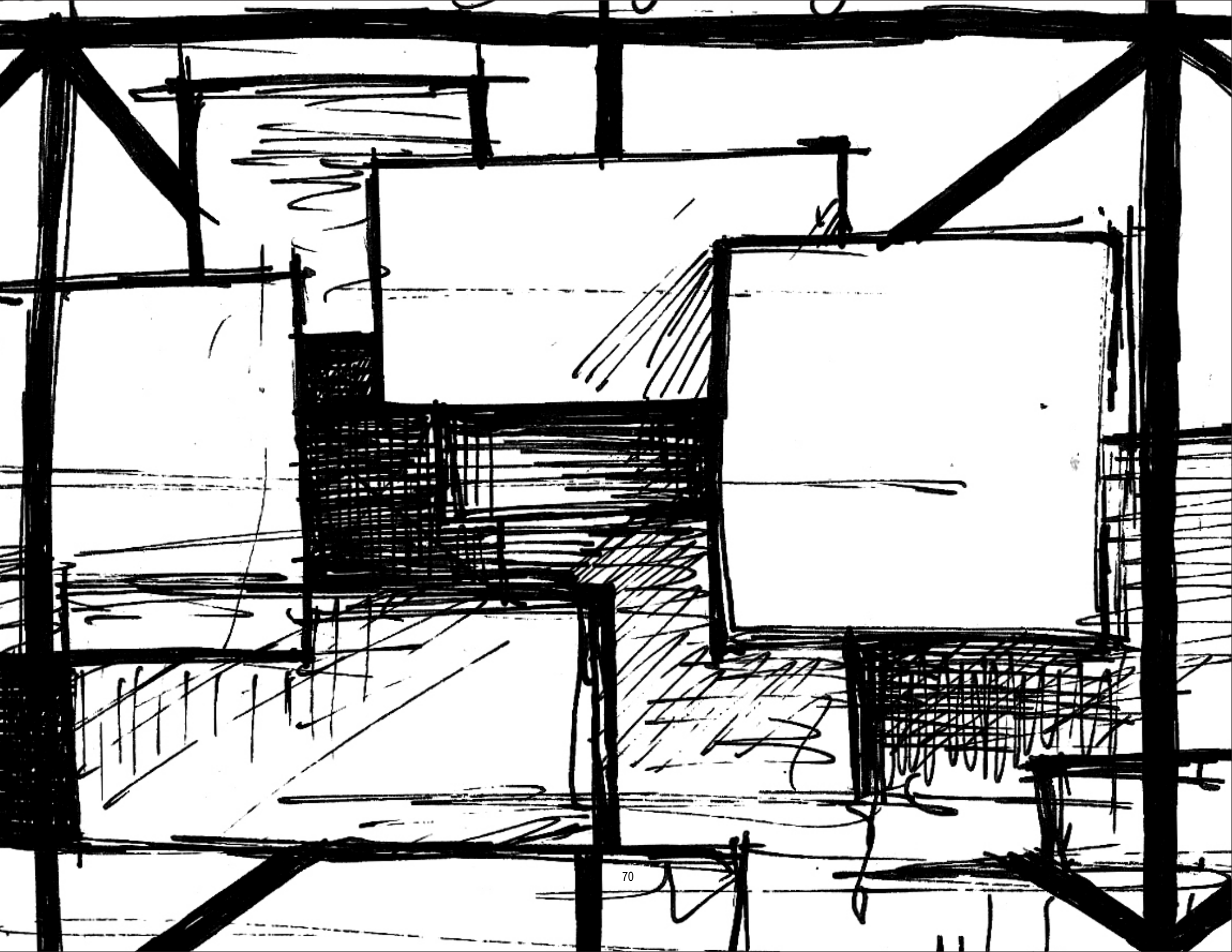
85. (MVRDV 2006, 24-28)



FIG. 11/04
Kowloon Walled City typical cross section

05

Sailing Forth



The *Overnight City* as a modern megastructure will not simply become an empty frame waiting for a predetermined maximum infill but an infill of programme suggesting unlimited possibilities for population absorption. Up until this point, this thesis has referred to infrastructure in several contexts. It is important to keep in mind as the design is further explained, that infrastructure is not simply the systems that distribute water and sanitation, nor is it unique to urban transportation networks. Infrastructure is both the source and guide of life within this thesis' new projected world. Where the availability of surfaces suitable for construction are no longer generous, a city's infrastructure needs to reach a scale previously dismissed.

The megastructures mentioned within the body of this thesis all bring forth a notion of indetermination and disorder that necessitates a double-life infrastructure. This becomes an urban system that supports independently both permanent and temporary structures.[86] Taking the form of one organism coexisting within the old city as explained previously, this beast will grow further within Montreal City's megastructure and systematically consume inefficient structures within its path. Improving on Kowloon Walled City's predicament, this large urban mass will then become pierced with additional horizontal, vertical and diagonal layers of infrastructure. The cavities carved by these insertions will then provide the locations for new urban datums. As expanded within the Rubik's Cube™ metaphor, inserted within the aforementioned networks of infrastructure are spatial volumes with consistently changing interior programmes. Only the infrastructure will remain constant as the anchor of this megastructure.

Lifting the footprints of Montreal City's underground networks rise the first stage of this new megastructure. Following suit with the organic nature of the organization, a primary artery of services and transportation is raised within the existing fabric of the city. Connecting various points of intensity along the underground and surface networks, these large foreign elements arc into the air-space of Montreal City as they draw the population at their intersection with the metro lines and subterranean city. These lightly curved trussed arches, reminiscent of Buckminster Fuller's geodesic dome still present on the old Expo island, cradle in their cavities both the extension of the metro system and all needed infrastructures. Anchoring the curved frames and marching along them are vertical members serving as intermediate supports for the major spine of this urban scaled skeleton. Where these vertical members meet this spine, not only are physical loads transferred through the diagonal structural composition but landings are also carved in order to enable infrastructural and programmatic connection with the remainder of the megastructure. Furthermore, in order to provide lateral stability to this portion of the skeleton, additional structural frames are rotated perpendicular to the vertical members. This ninety-degree corner creates uninterrupted vertical

86. (Rouilard 2004, 71)

Previous Page: FIG. 01/05
Freedom of construction within the infrastructure grid concept sketch

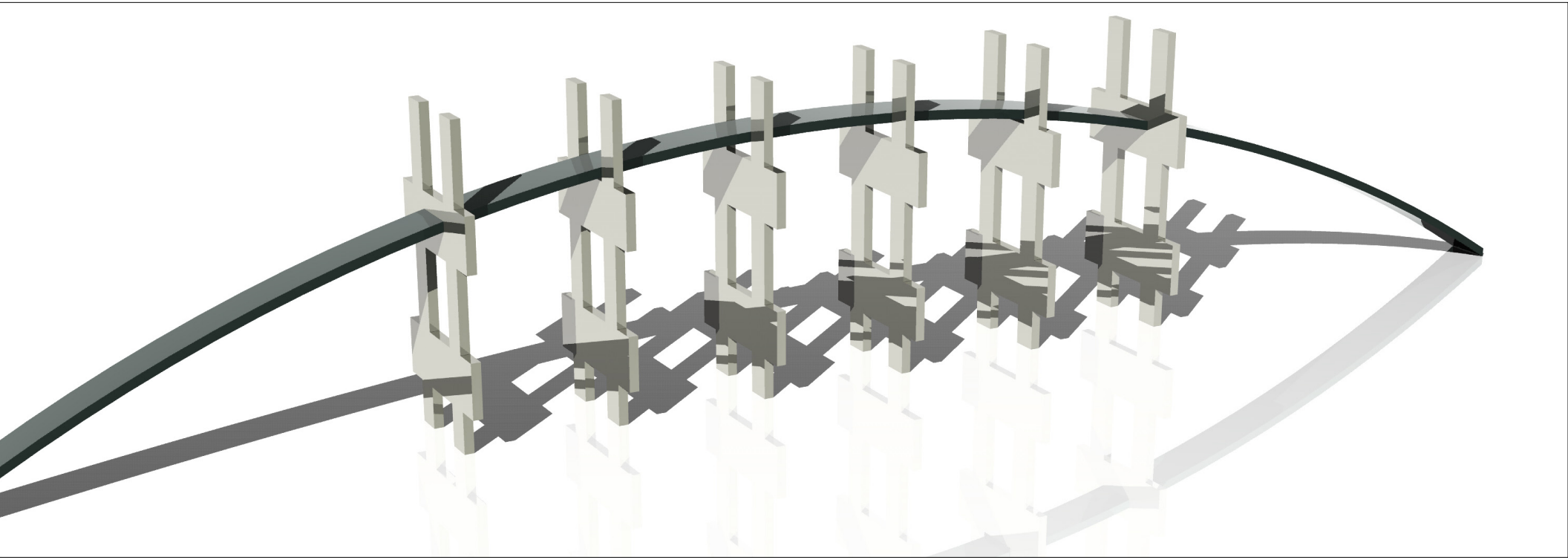


FIG. 02/05
The first stage of the Megastructure is the infrastructure skeleton. Although generalized for the sake of the example, these elements merge together and create the basic system of infrastructure that will anticipate the eventual attachment of unpredictable urban programme layers. The population movements currently contained at grade level is encouraged to flow upwards and across the entirety of the volume of the construction as if unrestricted by existing street grids and urban traditions; even gravity itself seems no longer to apply in the experience of the Overnight City.

corridors running adjacent to the frame and spine to allow the continuation of this infrastructural matrix without conflict with the horizontal levels or eventual programme additions. As all the infrastructures run through the megastructure's spine, their contents are distributed naturally to their respective vertical frames and then funneled downwards into their respective volumes. Contained within this elaborate distribution spine and subsequent smaller networks, not only is there the casual transportation of citizens, but also the possibility of high-speed rail lines, large scale water, sanitation and electrical supply and the insertion of all required egress paths and other life-safety systems. These vertical frames reach the city's street and underground levels with enough force to displace both terrain, roadways and even buildings. As these extensions of new infrastructure carve their way, the space between them is altered and becomes an almost sublime otherworld; it becomes transformed into an architectural oasis amidst the eventual chaos that is surely taking shape overhead. Circulation within this system is intended to be indirect and should be achieved through the progression of smaller layers of infrastructure. The fluidity within this megastructure will follow the path of least resistance amidst countless options within each frame and independent programme volume. Such movement through this large urban mass is by no means linear and should be approached in the same way as a meandering river spreads across the landscape.

Extending the megastructure's infrastructural reach within this urban mass, the air-space framed

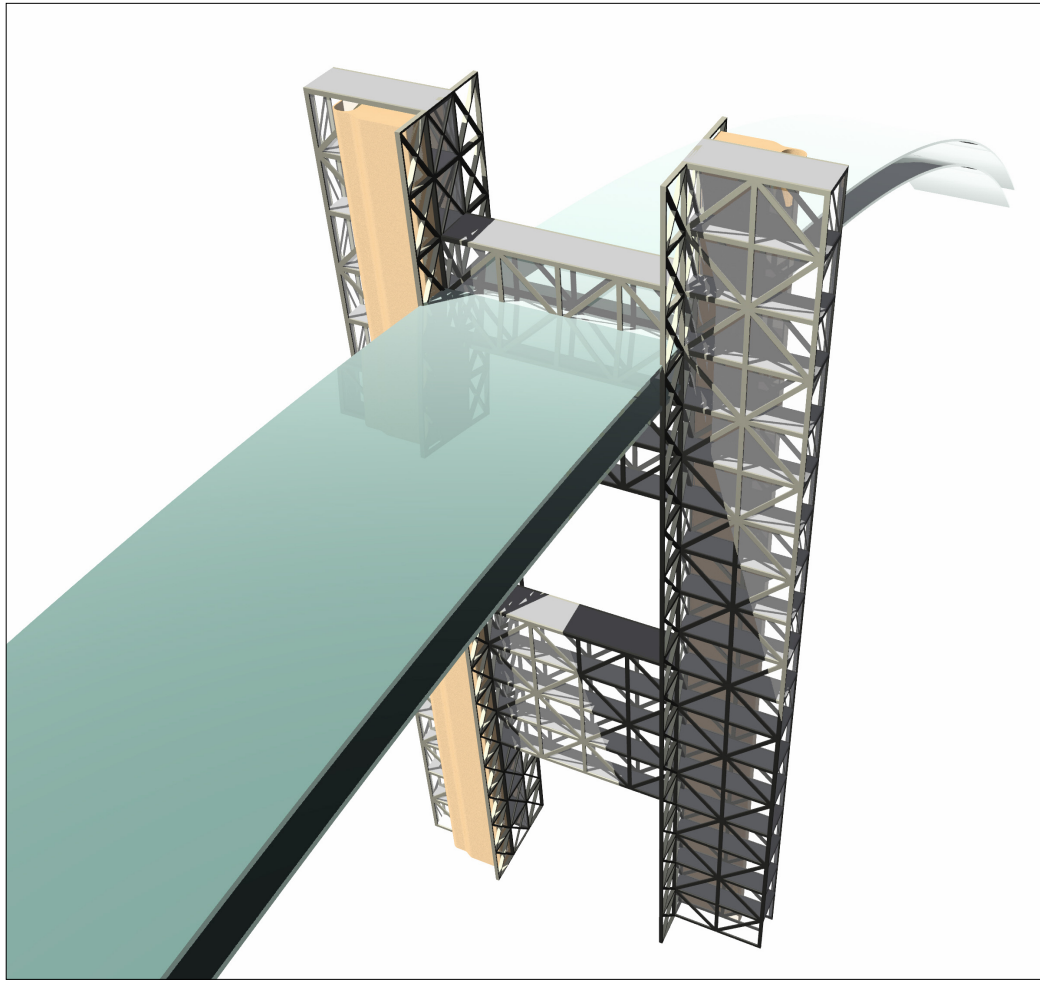


FIG. 03/05
Represented by the light coloured vertical prisms, egress and other services are attached as single volumes along the structure of the vertical frames. These combined with the horizontal spanning structure and the lateral bracing receive the infrastructural spine. Landings are inserted at this junction and both infrastructure and programme is dispersed throughout the reach of the megastructure.

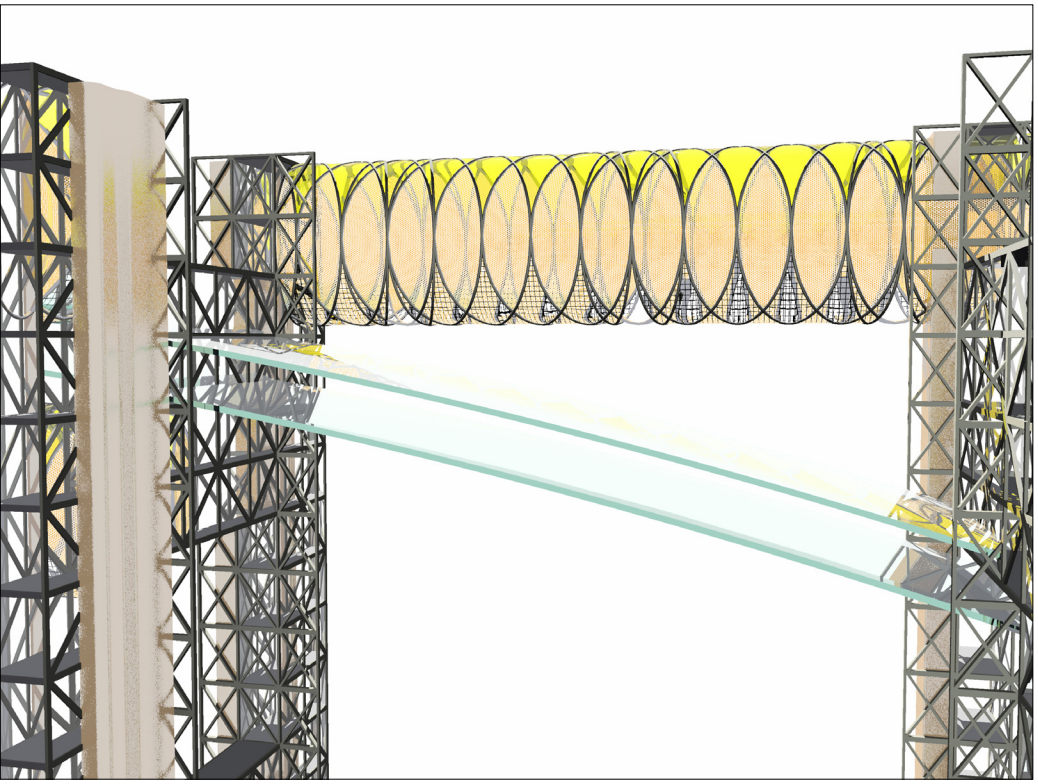


FIG. 04/05
Although lacking a great deal of additional information, the drawing above identifies the top horizontal datum spanning between the vertical frames. It also identifies where the infrastructure spine connects with the vertical frames in order to disperse its contents throughout the rest of the megastructure. The space below the horizontal datum would eventually hold an additional system of infrastructure anchorage points that will be explored in the drawings that follow in this chapter.

by the vertical members mentioned earlier is further defined by large paired horizontal elements. This addition to the megastructure's skeleton forms the skeleton of this urban organism. This new element is anchored to the truss work of the structural assembly already described and thus becomes a natural extension of the infrastructural distribution system already in place. These combined with the remainder of the megastructure divide the air-space into workable volumes. Emerging also from the vertical frames, large platforms run the length of these horizontal axis and become new public datums. These new horizontal datums also serve as large public spaces and are extensions of the dynamic diversity of programme allocation that is to be found throughout all other cavities of the megastructure. The interior of these horizontal sections is left to the demise of the inhabitants of that particular volume and will be explored in greater detail in the closing section of this chapter. The surface of these horizontal elements receive an application of varying tensile surfaces on the exterior of their meshed framework. These acting as both skin and structure are allocated as necessary to provide the needed strengths and translucencies within this public realm of the megastructure. The oval shaped cross-section of these datums, as the following drawings will indicate, is composed of two primary horizontal levels serving as large public datums. The curved latticework of these horizontal elements and the diagonal bracing of the vertical frames provide the anchoring for additional floors and any other conceivable programme. It is through this

framework that the systems of this megastructure are extended.

As identified with FIG. 06/05 in the next spread, the organic breakdown of the megastructure is formed by the superimposition of several different layers of infrastructure. Following the already mentioned vertical frame and spine assembly, within the air-space contained by two horizontal frames, smaller vertical systems provide another layer of anchorage for the next and final stage of the skin of this urban organism. This matrix of connection points giving shape to the skin is first formed by both large stairways and high-speed elevators combined with their landings. Second, a smaller grid fills the extent of the slightly contained volume above the city. This is the final layer of possible departure points for the insertion of programme elements, this is the full extension of the infrastructure's reach.

As FIG. 07/05 demonstrates, the curved space-frames that form the last layer of the megastructure assembly divide the air-space into smaller contained volumes. These are scaled and subdivided into three-dimensional property grids intended to mimic our more contemporary concept of neighbourhoods. Within these pockets, the variety of anchorage points for new construction and constant connection to the underlying infrastructure provides unrestrained buildable urban and public space. In addition to the space contained within these neighbourhoods, the surfaces between the undulating frames also become smaller scaled public datums and platforms for vegetation, recreational areas, and even space to entertain the idea of local

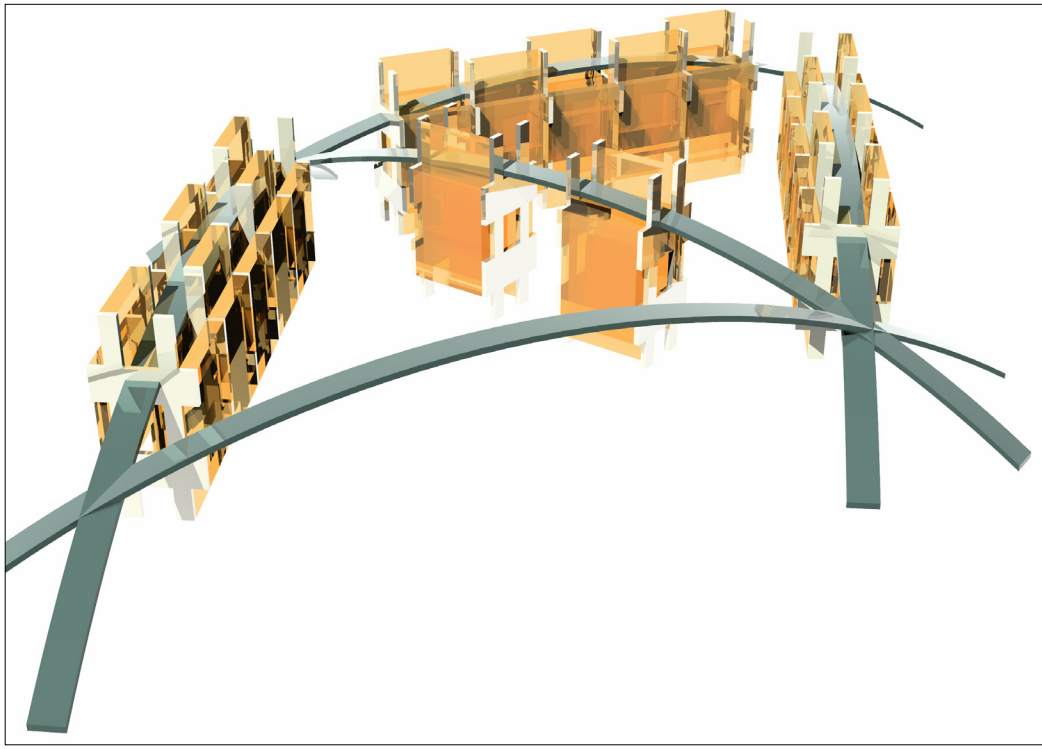
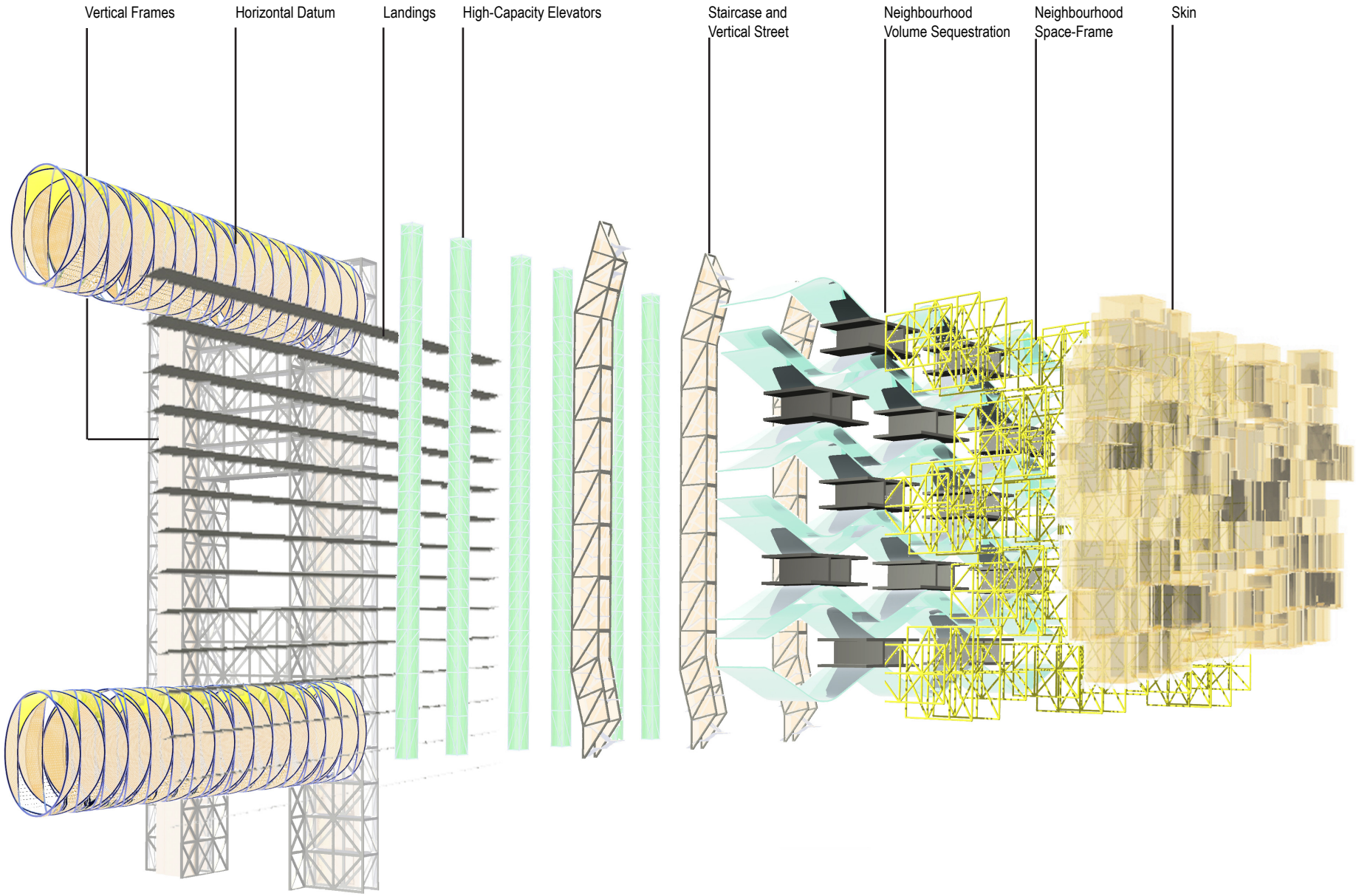


FIG. 05/05
The above demonstrate the Overnight City megastructure's general massing without any influence from the context it would eventually become inserted into. The two triangle formation is self-supporting while the space held within its frames is filled by nondescript programme.

Next Page: FIG. 06/05

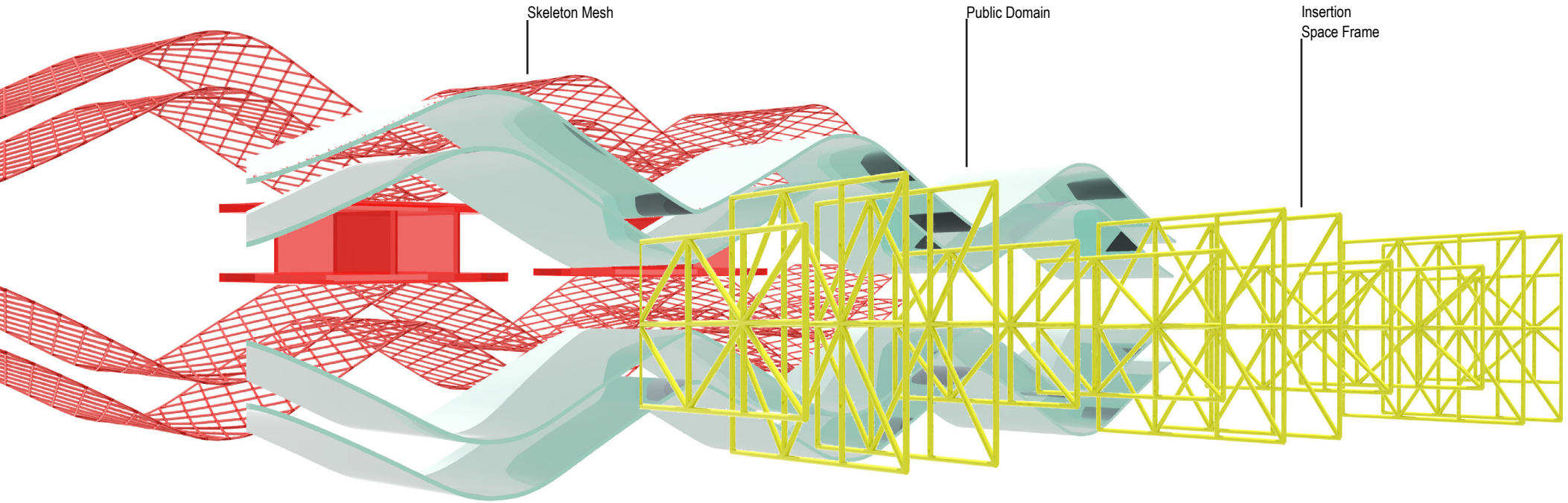
The assembly of the megastructure follows this breakdown. First, with respect to the organic description provided earlier, the vertical frames draw the population both from grade and from the infrastructure spine [not pictured here]. As these members pierce the existing city, the volume they frame is further isolated by the position of the paired horizontal datums. This represents the first stage of air-space sequestration. This volume is then pierced by the needed circulation and egress elements and divided into appropriate neighbourhood scales. These last few elements are woven together to form a large infrastructure latticework of anchorage points. The volume contained within each individual neighbourhood zone is then provided with its own distribution tree of services and becomes the final layer granting freedom for the attachment of the skin. The important aspect of this organization is the diversity of scales of infrastructure combined to grant this freedom of programme insertion. As one traces back from the initial spine cradled between the vertical frames, the availability of services and circulation methods grows out to consume the greater whole of the defined body of the megastructure.


Vertical Frames
Horizontal Datum
Landings
High-Capacity Elevators
Staircase and
Vertical Street
Neighbourhood
Volume Sequestration
Neighbourhood
Space-Frame
Skin

Next Page: FIG. 07/05

The assembly of the final layer of the megastructure, the skin, is also observed in a similar way as the previous systems. First, the curving parallel frames separate the overall volume into smaller volumes. These are the sequestered neighbourhoods. They are separated from each other by the structure of parallel frames and their interior space is filled with the end of the infrastructural distribution tree. The red frame in the adjacent image connects to the latticework of infrastructure while allowing the distribution of its contained services to flow within the cavities of its structure. The yellow coloured infill spatial matrix is the final layer of anchorage that will receive the bulk of the undefined programme elements. Furthermore, the gap formed between these volumes enables a zone free of anchorage points that guarantees a certain open public domain tuned to the housed capacity of each neighbourhood.

Here lies a small tangent to the organization discipline explained thus far. Although all portions of the megastructure assembly have been described as organic, even free, they remain relatively well constrained within the guidelines. The freedom of construction is expected to be present through the skin of the megastructure as it grows within the cavities between this infrastructure matrix. Even the neighbourhood volumes are not intended as absolute or finite entities suspended within this matrix. The gaps between neighbourhoods and between the larger volumes themselves allow the bridging of programme. One could easily imagine several dozen Ponte Vecchio structures spanning informally between the more formal spaces. This is the intention of this megastructure.


Skeleton Mesh
Public Domain
Insertion
Space Frame

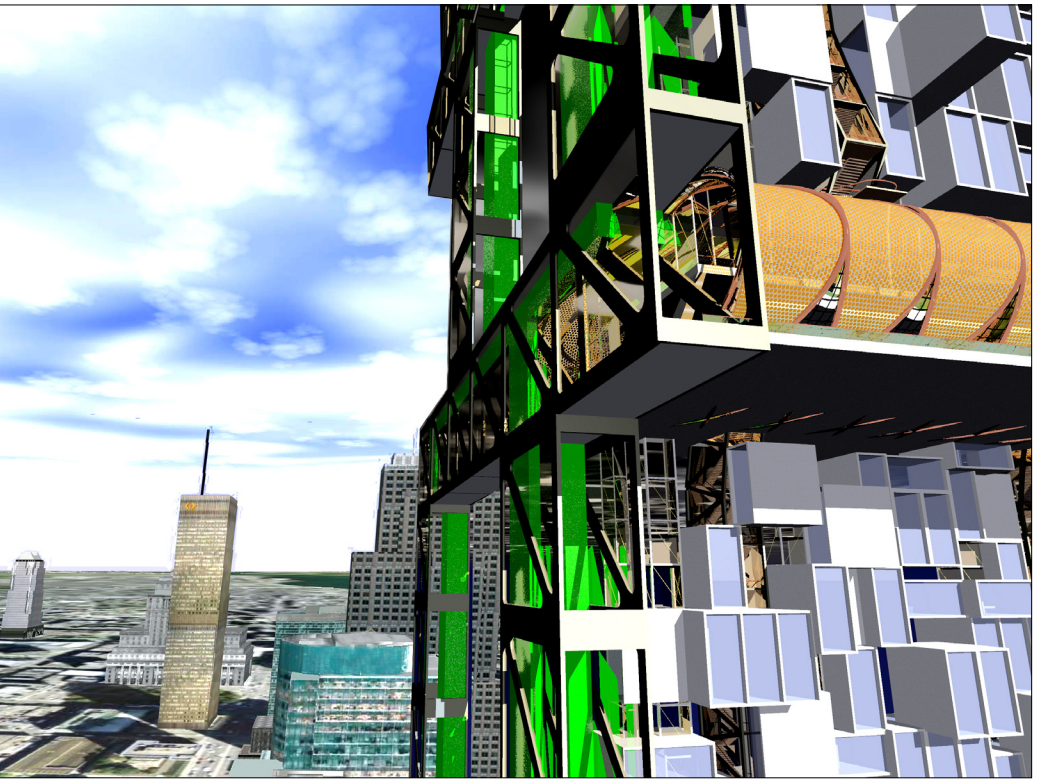


FIG. 08/05
Above is an early attempt at the organic assembly of the megastructure. All the layers are present here superimposed on one another. The skin in this example is composed of nondescript housing blocks while the vertical frames alter their geometry in order to make forms better suited for their individual context and carrying capacity/need.

energy production or agriculture.

Although the distances between the footings are set apart at equal distances, the vertical dimension of the airspace contained between the horizontal datums is subject to its location within the city. This will be demonstrated in the drawings to follow but particularly in FIG. 10/05, not only is the existing context at grade a factor, but also the position of the other portions of the infrastructure matrix. Elements such as the spine for example would further influence how this airspace is to be used. These additional openings and gaps between the independent growths of programme will lead themselves to more informal uses. The same can also said for the top of the spine, the vertical frames, or any other found-space temporarily left-over from programme infill. Also in this drawing is identified the internal high-speed transportation contained in the spine and its landings at the connection to the horizontal cross members of the footings. When all these elements become fused together, regardless of the programme infill, into these series of frameworks, the entire assembly becomes one large lateral bracing structure for the entire megastructure.

Since life within the fluid skin of the *Overnight City* is intended to be free from top-down design sources, this thesis will not attempt to impose a particular default programme allocation. Nevertheless, this remains a work of anticipation, therefore, the images and drawings that will conclude this chapter will only attempt to freeze a moment within the ongoing evolution of this urban organism. Between the life contained in the more private

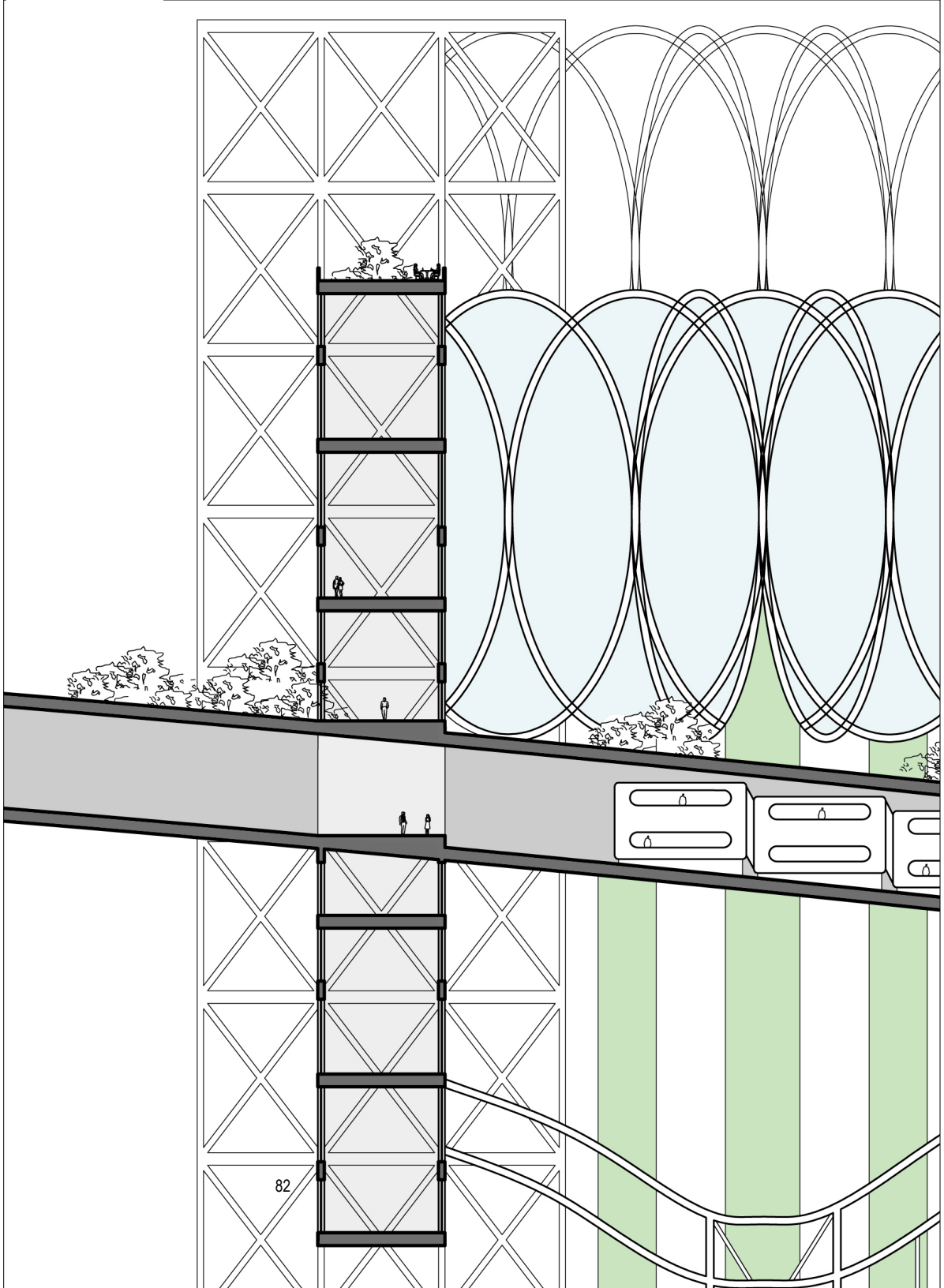
and more public sectors of this megastructure, the latter takes a greater sense of importance. First, the horizontal datums, vertical frames, and neighbourhood spaceframes, as explained earlier, all provide a form of scaffolding that allows the bulk of the skin of the megastructure to support itself. As it will be hinted through the imagery that follows, these horizontal elements also hold a great deal of concentration of uses and circulation. Upon this scaffolding, the contained airspace is pushed and pulled depending on the placement of programme and resulting open space. Whether it is at the intersection of the horizontal and vertical datums or simply the connection of the access corridors to recreational spaces, these openings within the fabric of the megastructure allow construction that otherwise would not easily arise if it was not for the flexibility implied by the ease of the infrastructure carrying this discussion. Following the drawings, this chapter also presents four interior views suggesting this particular three-dimensional urban strategy.

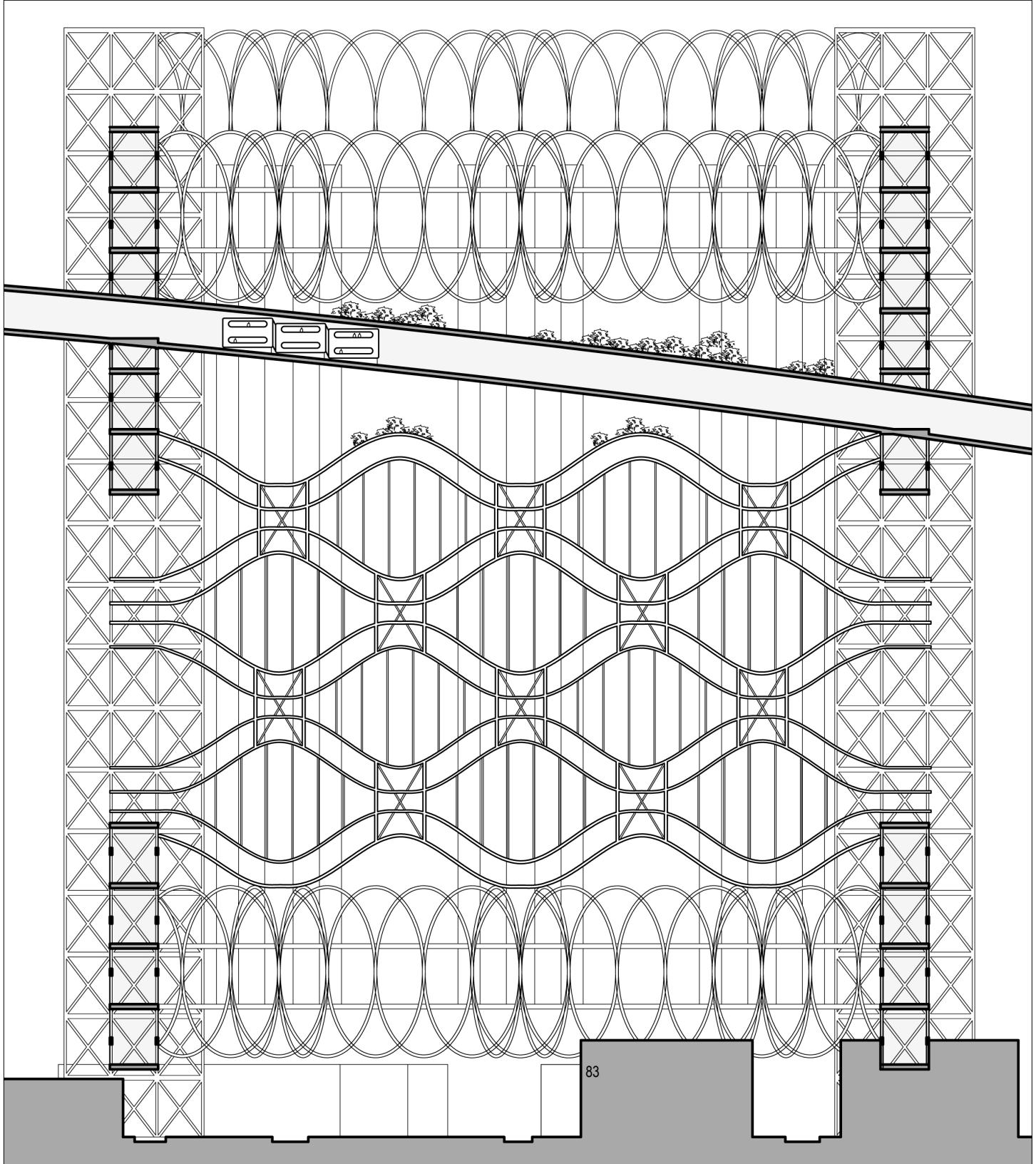
These perspectives will attempt to convey an environment capable of adapting its shape, and also, in the same way as Fuller's domes or Otto's tents from decades past gave freedom while providing shelter, these public realms will equally echo those ambitions. The quality of these urban environments will be due to the informal infill within the infrastructure shell of the *Overnight City*. This found space within the cavities carved out of the organic mass will allow this freedom and create a new form of urban living and a vertical landscape. The following set of images and drawings will attempt to punctuate a narrative through the larger public realms of this megastructure. The ample anchorage points provided by countless overlapping structural members will become new surfaces for the content of this architectural mass to build upon. This concentration of inserted programme and open civic space will represent a mirrored version of the population, and hence, an appropriate counterform.

FIG. 09/05
This cross-section of the spanning member of the vertical frames demonstrates the intersection with the infrastructure spine. This drawing represents the cavity carved by the high-speed transportation rail system within the arcs and these horizontal sections. The green zones are the vertical circulation corridors within each volume leading between the larger horizontal datums in blue.

Next Page: FIG. 10/05
This is a longitudinal section of a typical volume spanning the distance between two vertical frames. Where the infrastructure spine separates the volume of sequestered air-space, a large empty space is carved on the inside of the assembly. The horizontal cross-pieces of the vertical frames [as shown in both FIG. 09/05 and FIG. 12/05] are lowered or raised depending on the position of this spine and any existing ground cover worthy of integration. The top levels of these are allowed to be utilized as needed by the local population of that volume. The curvilinear structure that separates the housing neighbourhoods behaves as one large diagonal bracing system further anchoring the skeleton of the megastructure.

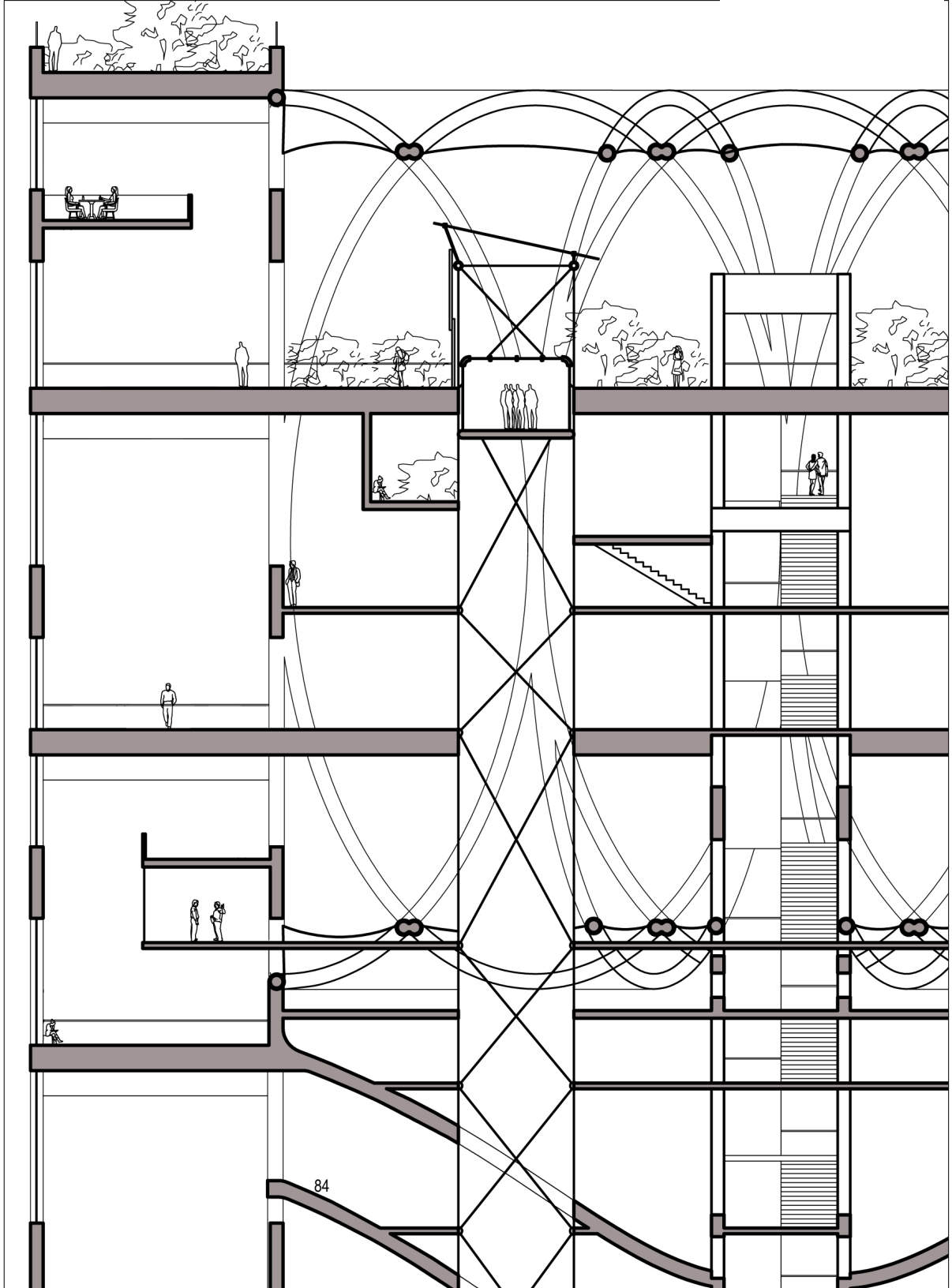





83


0
10M
20M

FIG. 11/05
This is a longitudinal section of the intersection of the horizontal datums with the vertical frames. The vertical frames' structural floors are extended to become the primary public domain. Programme is attached afterwards to these layers of infrastructures.





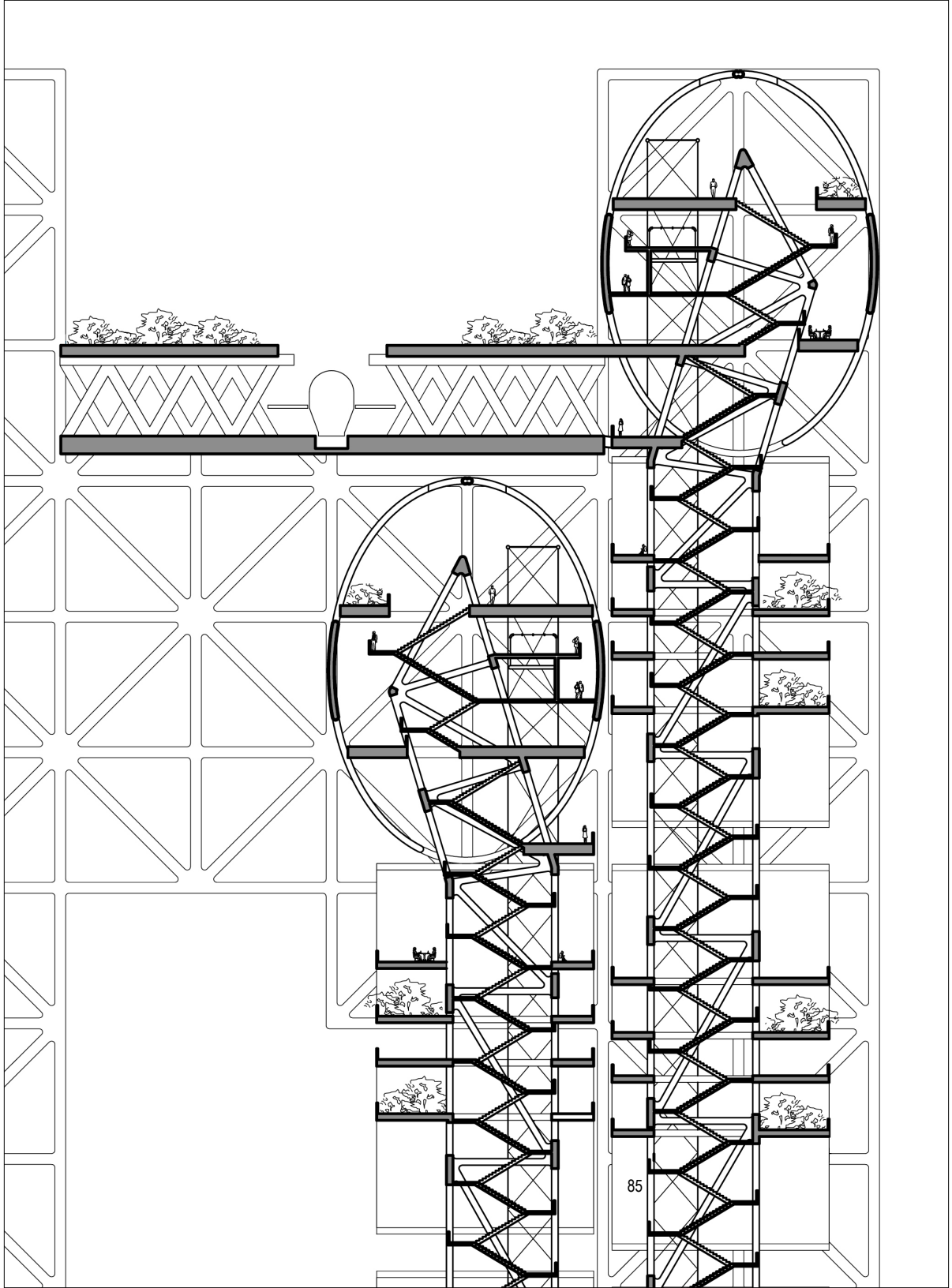
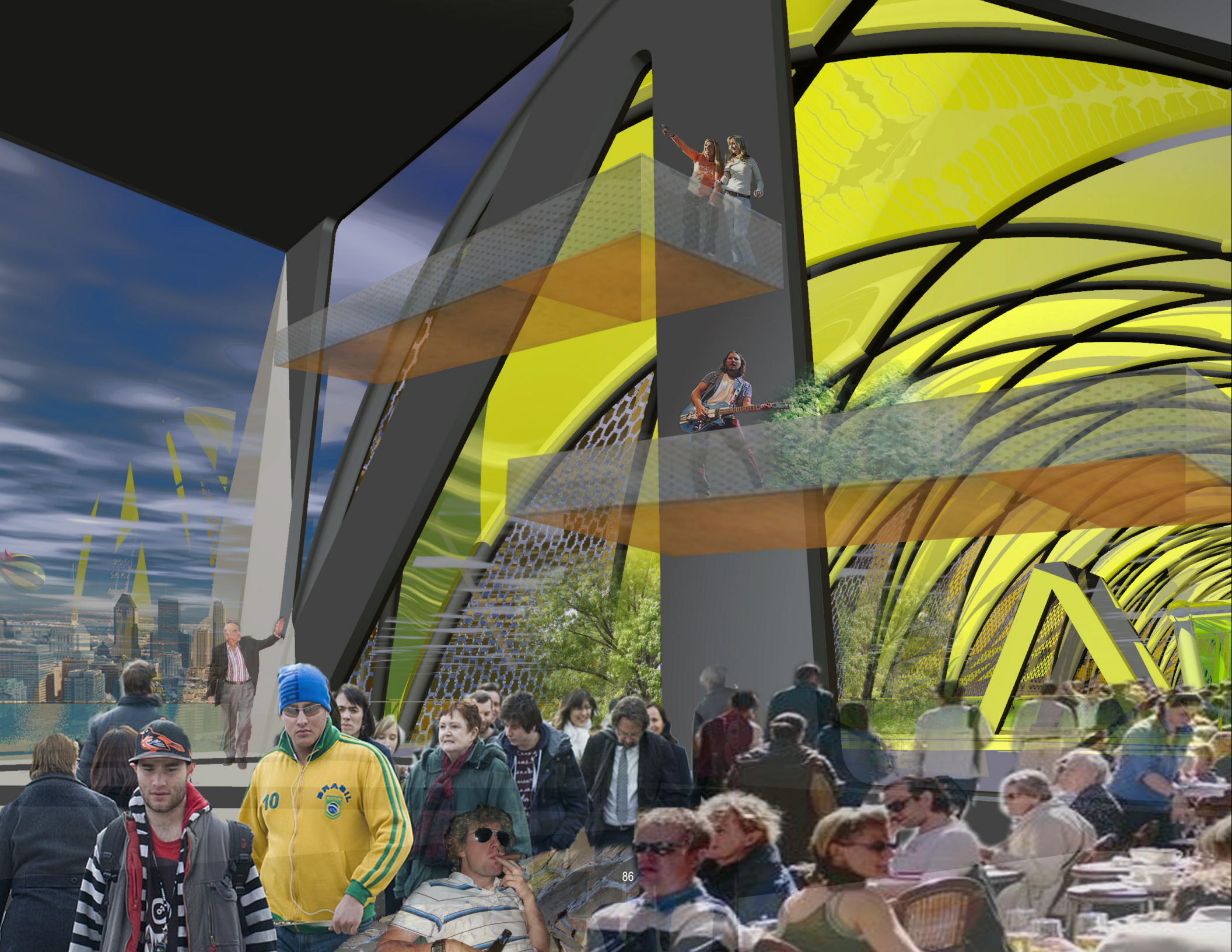
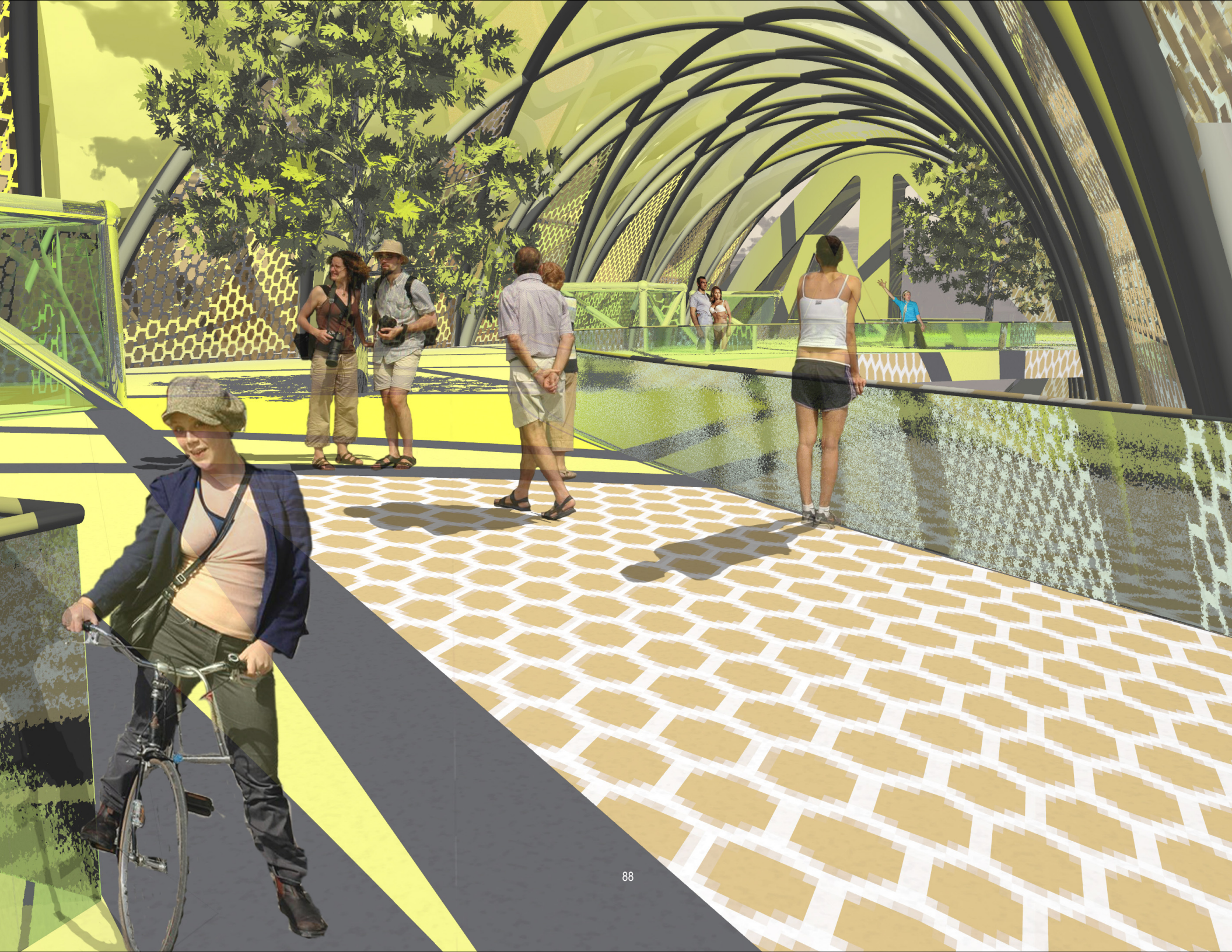


FIG. 12/05
This is a cross-section of volumes intersecting with the infrastructure spine at the highest point of the megastructure assembly. The neighbourhood volumes are shown empty of their space frames for the sake of demonstration of the scale of their interior.


BRASIL
10

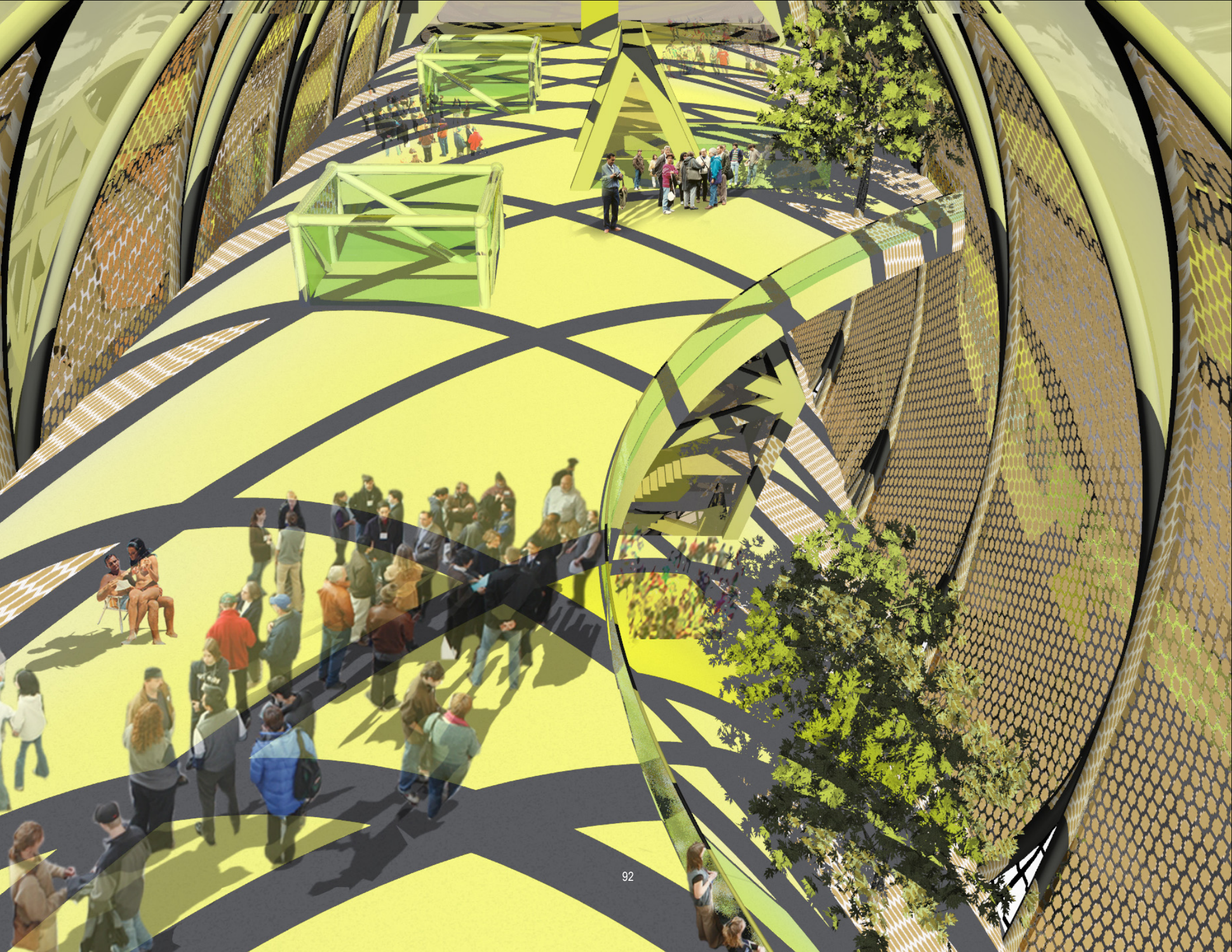
Previous page: FIG. 13/05
The first interior view of this public domain identifies the space within the vertical frames at their connection to the top horizontal datum. Where the major horizontal floor plates are extended through this framework, there is continuity formed between the second stage of the megastructure. The small protrusions of the various vertical circulation systems in the background allow this connection to the smaller scaled, more personal regions. In addition to the dense population movement captured within this space, the layers of anchorage points and the volume enclosed by them grant the possibility of additional programme. Demonstrated by two simple platforms, similar elements would aggregate upon one another as they grow along this infrastructure scaffolding.



Previous Page: FIG. 14/05
The second interior view is positioned slightly before the intersection with the vertical frames shown in the previous image. It is here on the top level of these horizontal datums that the second level of the megastructure's assembly manifests itself. As hinted at previously, this large horizontal expanse of space is naked save for the presence of the elevator and stair systems. This with the designed lack of anchorage points compared to its lower level allows for a lower density infill and the provision of open space and daylight infiltration through the layers of translucent skins cladding the structure. This zone is envisioned as an elevated promenade bridging both systems of transportation; a calm section linking the high-speed world of the infrastructure spine and the meandering scale of the smaller programme volumes.



Previous Page: FIG. 15/05
Below the top level of the horizontal datum shown in the previous image, this denser public space has a greater programmatic infill due to its greater anchorage points. As the circulation systems pierce this datum, the addition of landings and structure allow this loosely defined volume to be consumed while remaining connected to the greater whole of the megastructure. Also, the section of the datum closest to the exterior of this horizontal datum, due to its fewer anchorage points, continues the same strategy as the top level and allows a certain volume of open space to pass from the topmost level down to the lowest.



Previous Page: FIG. 16/05
Concluding the last of the datum images, this interior view demonstrates the total volume enclosed by the horizontal structure. From a slightly different point of view than the perspective in FIG. 14/05, here is shown the complete public domains which frame both top and bottom of the contained housing volumes as defined by the drafted section earlier in this chapter.

The last few stages that give anchorage to this megastructure's skin allow an almost parasitic urban composition. Even though the preceding images concentrate on the public realm, the infill content of the neighbourhood volumes should also be approached in the same way. Piece by piece, the air-space in these spaceframes created by the lattice of infrastructure becomes consumed depending on population size and need. No longer floating in the air, these now-defined neighbourhoods are provided a final framework on which to build. It is evident that the variety of structures and service outlets provided give an unlimited diversity of living and spatial connections. These ensure that each and everyone of the independent neighbourhoods are capable of creating their own unique world in the same way as Expo67's infrastructure allowed its pavilions. Each neighbourhood could be regarded as an individual pavilion.

As the primary wave of programme is inserted, there is a process of urban evolution where there is a continuously changing fabric, never a final product. This skin of the megastructure is unbound by either ground plane or relics of the existing city. The quality of the organization of space found within this skin will be in line with the life proposed in Yona Friedman's *Spatial City*. Like Montreal City's Expo67 demonstrated, it is the freedom of construction within the defined envelope that is most important. The skin of the megastructure as described above is to be understood in the same way as Archigram predicted the voluntary attachment of housing modules in 1964 within their *Plug-In City*. The smallest scaled three-dimensional grid of infrastructure present within these neighbourhoods now becomes the new foundation of urban settlement. Here, one utilizes not surface coverage but volume consumption. Therefore, within these sequestered neighbourhoods, this spaceframe and the extent of the infrastructure distribution tree will allow its air-space to be consumed by programme. Furthermore, with the lattice assembly of infrastructure cutting through these frames, full connectivity with the remainder of the megastructure is ensured. For the sake of simplicity, this thesis presents one example of a potential cell of this skin. The example provided in the next few pages will demonstrate the intended organization of the skin of the *Overnight City*. If we take a single dwelling unit and array its contents as if the unit itself is nothing more than floating in a matrix of infrastructure, the result will be the following:

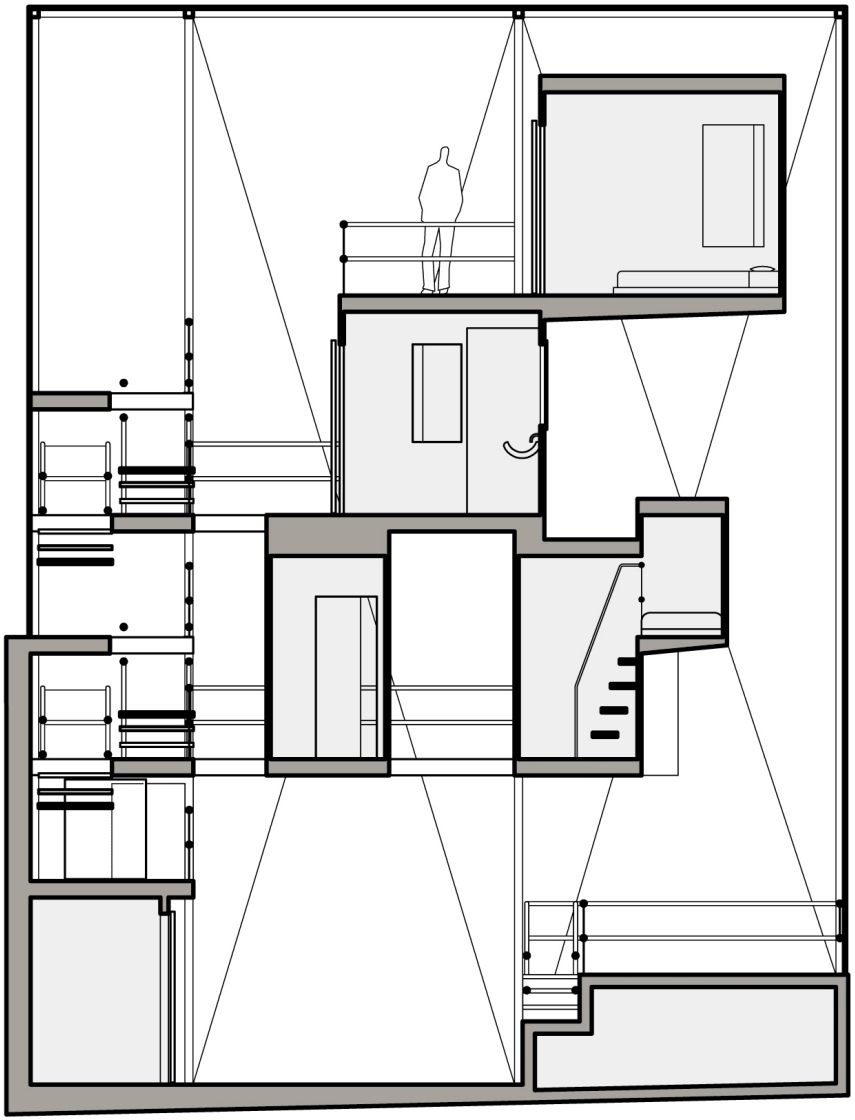
First, separating the elements of a typical household between those that are public [living room, kitchen, stairway, etc] and those that are private [bedrooms and washrooms] we can examine each individual programme piece's unique spatial implication within the unit's organization. Second, turning the private elements into volumes, these can be suspended within the spatial matrix. As these blocks of programme become inserted within the air-rights of their respective volume, they anchor themselves to this matrix obviously for structural reasons but also for access to the water, the sanitation, the electricity and any other service granted by this infrastructure. Identical to the overall organization of the *Overnight City* discussed in

Chapter Four, the negative or leftover spaces then become the public realm of the housing unit. This approach is not intended to describe the final form of the skin of the megastructure, and because of the almost infinite amount of locations, combinations and dimensions one can insert within the neighbourhood spaceframes, an infinite amount of other genres of typologies could as easily be inserted; nevertheless, this example will remain as a generous guide for visualizing and understanding the conditions within the megastructure.

The example above for a single housing unit is no more than four hundred cubic metres in volume. With each neighbourhood holding approximately fourteen thousand cubic metres of empty volume, full capacity using solely this example would amount to roughly thirty-five units. Granted that the example could comfortably hold three to four individuals, each neighbourhood volume could contain a local population between one hundred five to one hundred forty people. Although these numbers suggest that infill is primarily done through compactness, in reality, the total amount of built volume would be subject to the need for natural daylight and ventilation, among others. It should also be noted that infill would most likely follow along the lines of multi-unit compositions as opposed to singles. In addition, since the total framework granting anchorage to the skin is not restricted to these neighbourhood volumes, and anchorage points are plentiful outside their jurisdictions, additional air-rights are available almost anywhere within the full extent of this infrastructure matrix. Programme insertion then is not limited by the fourteen thousand cubic metre volumes but by the entire urban mass.

This vision is not to be understood as growth only through verticality but more respective of vines creeping along a stone wall in search of sunlight, forcing themselves through the cracks between the layers of the megastructure. This megastructure is to be a physical framework on which individuals can settle using a three-dimensional property grid generated by the rotating availability of volume. Attaching to this infrastructure, urban settlement will expand in all directions, each form of habitation latching itself to these supply lines. Such a system would rely on the forces of gravity in order to control city expansion, and the preservation of daylight and air quality. While this concept remains fueled by the increase in local population and the need of buildable surfaces, the *Overnight City* has the potential to extend to a virtual infinity compared to our current two-dimensional urban world. This new form of the megastructure argument and its flexible systems of infrastructure will provide to our shrinking world the additional surfaces it will require. The two sections and the model diagrams provided at the end of this chapter demonstrate the assembly within one potential building block of the megastructure's skin.

FIG. 17/05 and FIG. 18/05
Both longitudinal and cross-sections on this spread identify within the typical housing unit example the separation of personal volumes [positive volumes] and public space [negative volumes]. The positive volumes are inserted as needed within the confines of the infrastructure matrix in order to provide a typical housing unit. The public domain is the resulting amorphous counterform, the negative volume, to these suspended shapes. The enclosure is undefined in this example as such an element would need to respond to both the shape of the infrastructure and its location within the megastructure framework.



0 2M

FIG. 17/05
Typical housing unit longitudinal section

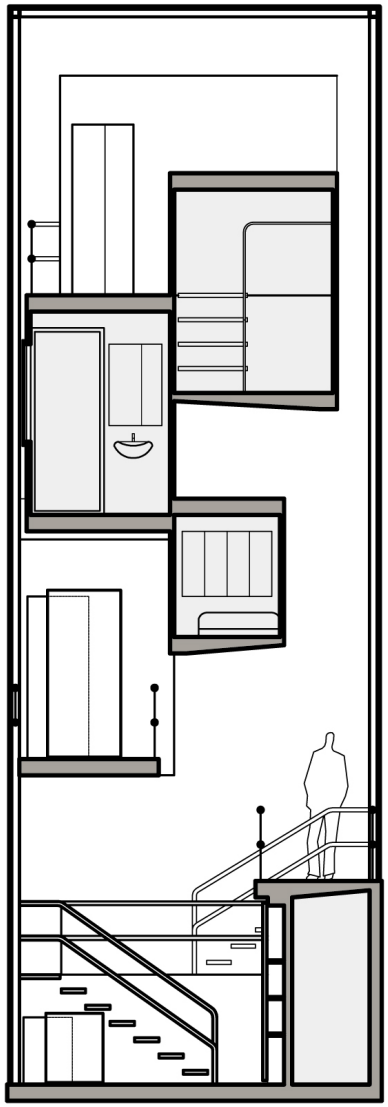
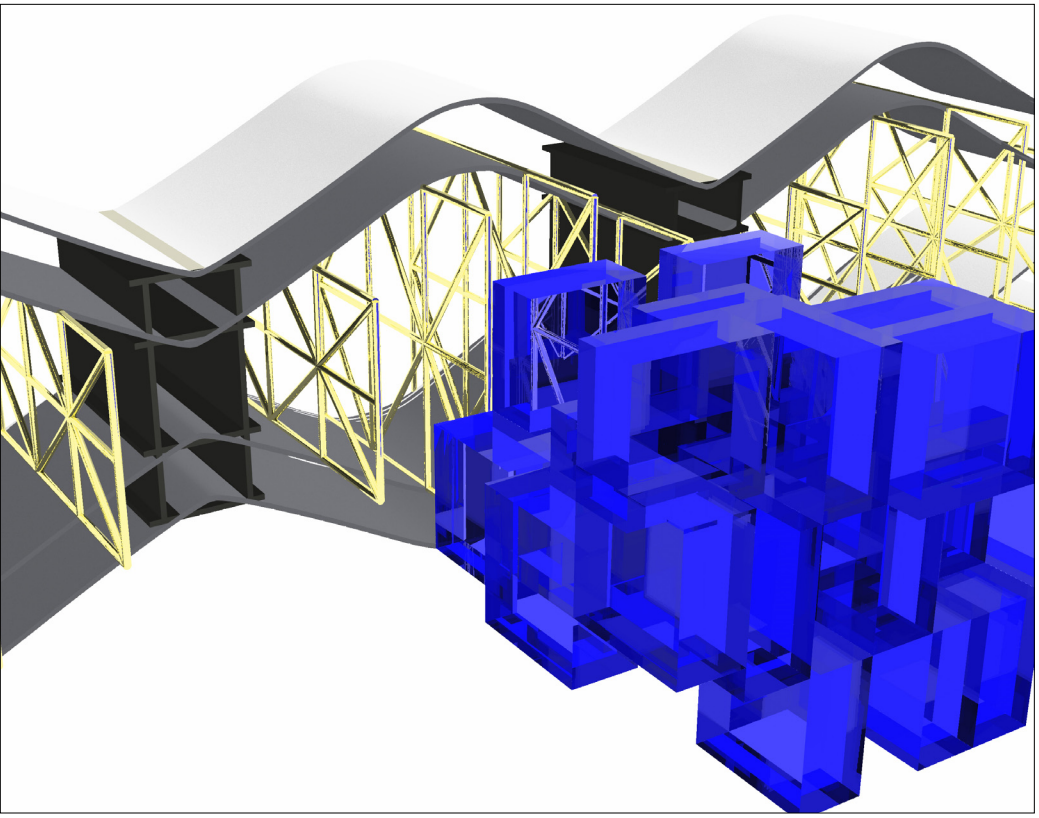


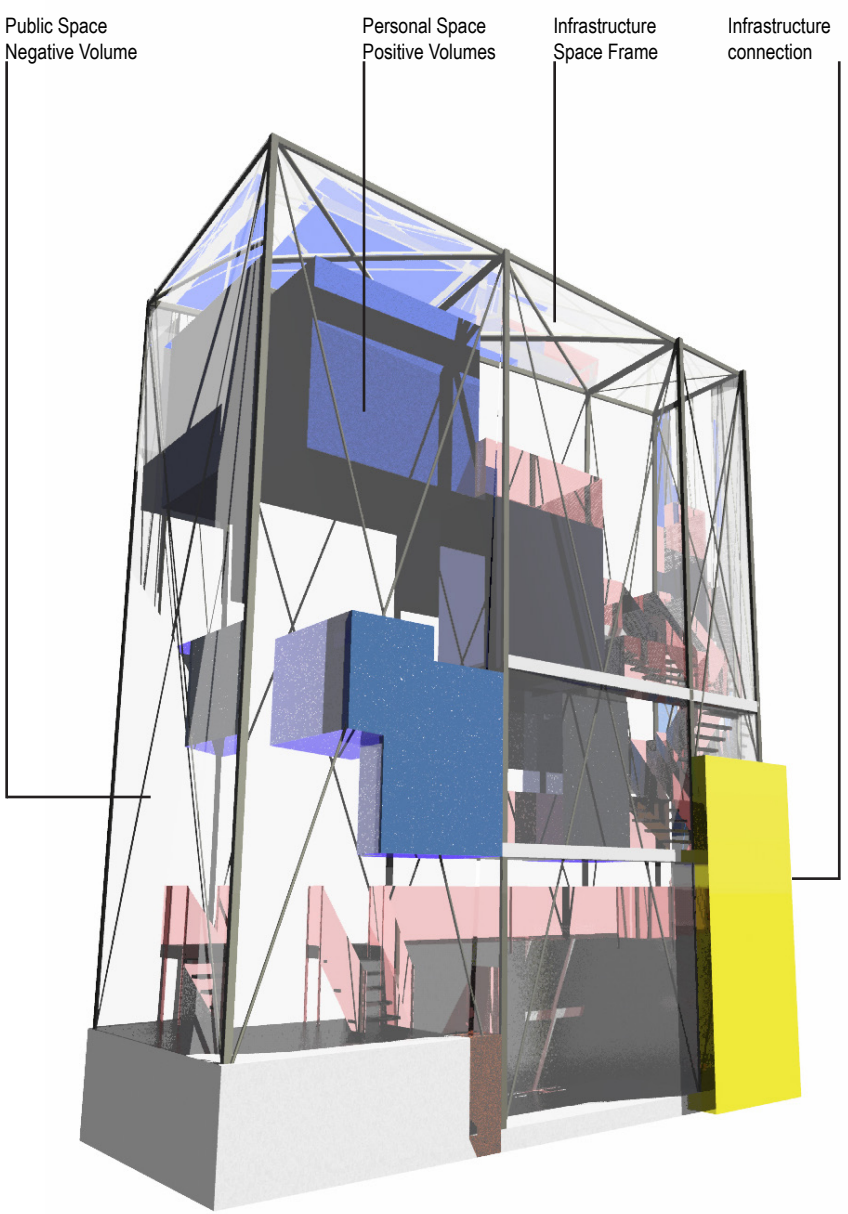
FIG. 18/05
Typical housing unit cross-section





On the Left: FIG. 19/05
This neighbourhood organizational model demonstrates the way in which the skin of the megastructure would insert itself within the larger array of systems already in place. Each mass of programme represented on the left with the blue prism fits within its respective volume and expands outwards pending its need for daylight and open space or simply due to individual ambitions.

Next Page: FIG. 20/05
The adjacent image describes a programme massing as explained in the previous typical housing unit example. This particular housing module constructed during the first stages of the thesis' research contains all necessary elements one would expect in a contemporary private environment. What is purposely lacking in this example is the grounding or context usually attributed. The reason for this omission is that the latter is not important in order to understand the organization of the programme in the greater megastructure. The context that would normally allow these units to be inserted has been extended from the traditional ground plane to the sequestered volumes. This analogy is further explored within the interior organization of the spaces where these, like the unit itself, are not restricted by traditional expectations. Within the contained prism, programme is freely allocated, and only afterwards connected to the infrastructure matrix and to the remainder of the megastructure.


Public Space
Negative Volume
Personal Space
Positive Volumes
Infrastructure
Space Frame
Infrastructure
connection

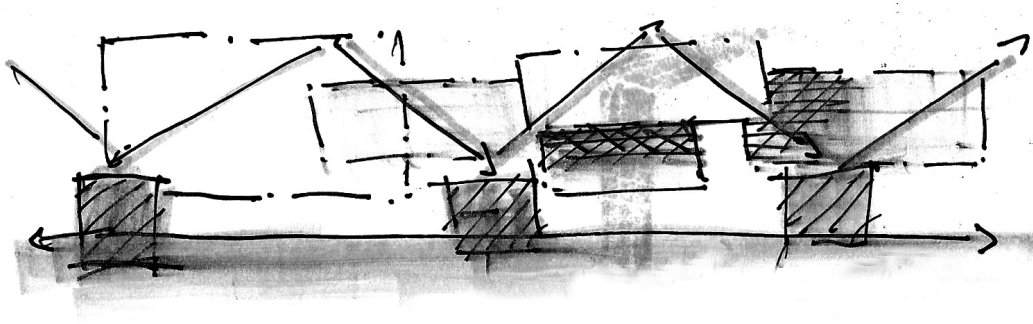
06

Weigh Anchor



There is one element missing from the description of the *Overnight City* in the previous chapter. Although hinted at throughout the text, the exact points of connection within Montreal City have thus far not been defined. The adaptability of this megastructure within the urban context needs to be understood as the force that will shape its infrastructure and resulting volumes, otherwise a great portion of both city and megastructure could remain vacant and static.[87] It is this framework, the larger and loosely defined organization of the *Overnight City*, that will determine the appropriate counterform to the impending population injection within Montreal City. If not, then the resulting megastructure will not coexist comfortably within its host city but overshadow it. This might be one of the largest problems facing the megastructure ideal that, in order to fulfill its vision, too often there is a disregard for the urban life that the proposal relies on for sustenance. Can the *Overnight City* if proposed as a solution be less apocalyptic than it appears? This megastructure proposal as an undefined structure within Montreal City could eventually hold the equivalent of a modern metropolis on only a fraction of the expected footprint, and there is obviously a danger when such scales become suggested. While respecting the organic composition and assembly identified earlier, simply extending the underground network of Montreal City does very little to connect the remainder of the city together. One could very much argue that by doing so, the proposition has distanced itself from its initial goal of creating additional buildable surfaces within

87. (Cook 1999, 21)



Above: FIG. 02/06
Sketch section of the Overnight City only periodically touching the ground to allow access into the megastructure, early concept drawing.

Previous Page: FIG. 01/06
Is the idea of a modern revision to the megastructure ideal such a frightful suggestion? Simply mentioning the concept of a megastructure has for several years taken on an apocalyptic flavour. This thesis attempts, among other things, to refute this presumption.



FIG. 03/06
Le Corbusier's Plan Voisin, a re-development plan for Paris, 1925

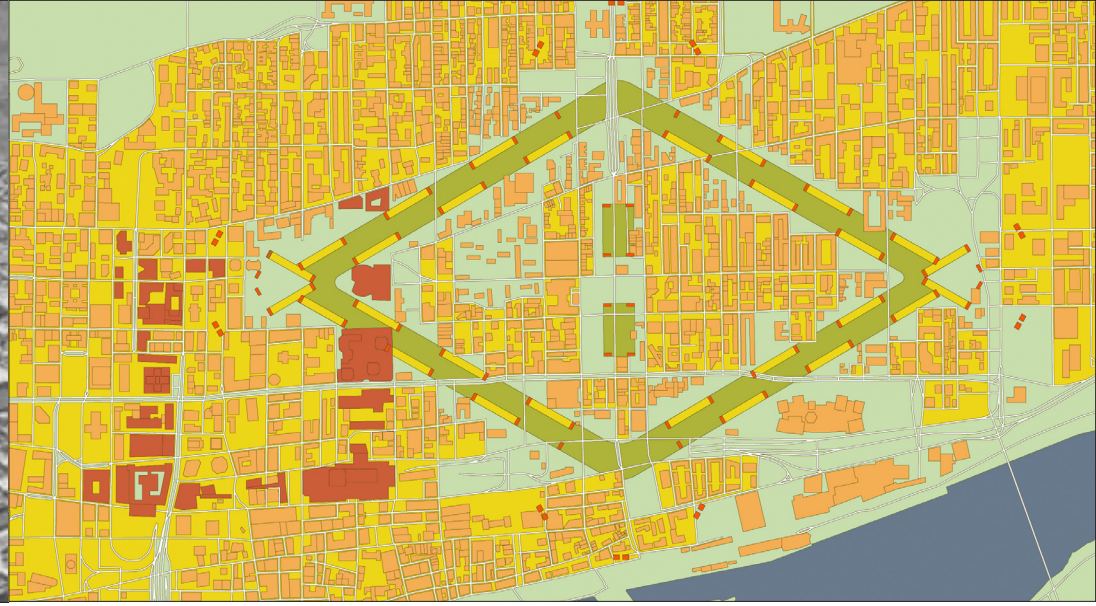


FIG. 04/06
The organization of the Overnight City taken literally as a pure addition to Montreal City

the city proper.

This fundamental shift in approaching urban settlement is no different than was Le Corbusier's infamous *Plan Voisin* of 1925. It was to be a re-design of Paris where a significant part of the city would be striped bare to allow an ordered and separated organization of towers and motorways. In Le Corbusier's proposal, there was an underlying idea of erasure throughout the design that inexplicably assumed success. Even though the previous description of the *Overnight City* might come dangerously close to suggesting such a strategy, that is not its intention. The narrative of images above demonstrate this default visual interpretation of the megastructure theory. Identified in these images, the arches as simple extensions of the old megastructure do not appear to grow naturally and continue the existing life of this underground city. The nature of the *Overnight City's* form and footprint is to be taken lightly as a final decision. If this thesis' design proposal is to become solely an extension of the underground city, then this addition within the context of Montreal City would appear alien; a creature coexisting by coincidence of proximity, even one of direct confrontation. Just like Le Corbusier's proposed Paris high-density towers, its presence alone would only further reinforce the feared dictatorship of habitation and landscape this thesis wishes to avoid. The relationship of both new and existing megastructure within Montreal City needs to be an organic relationship.

First, as this megastructure expands to absorb population growth, the ground cover is removed of its burden of defunct buildings. Second,

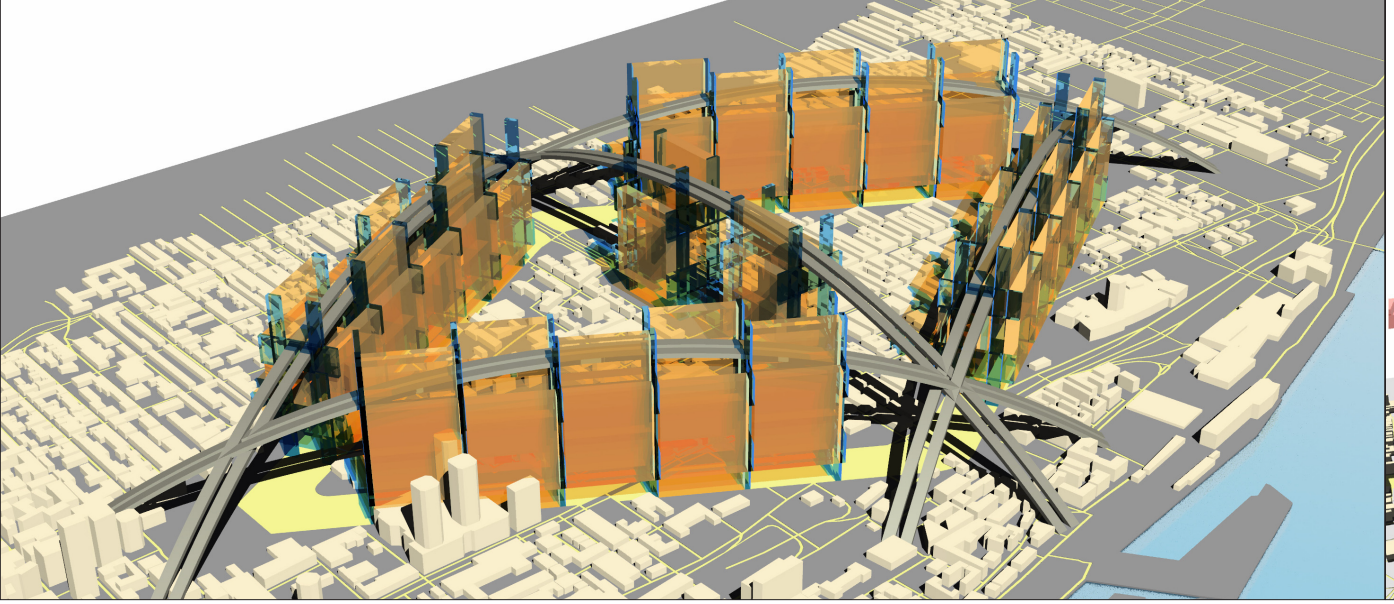


FIG. 05/06
Megastructure massing as organized in FIG. 04/06

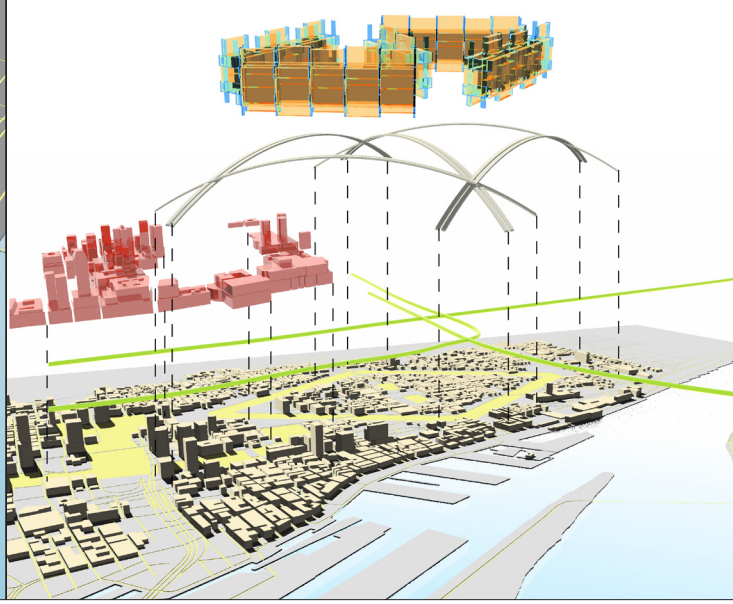


FIG. 06/06
Breakdown of the default organization

this new urban world should remain merely a container of infrastructure, and the medium through which population and urban life are supported and encouraged.[88] Unlike its suspiciously suggested "tabula-rasa" strategy, within the Overnight City megastructure, most existing systems and buildings of Montreal City would remain present to allow continuity and greater access into this new urban layer. Drawing upon visions from Hugh Ferris' charcoal drawings and Piranesi's etchings, this new world within the foundations of the megastructure exists as the leftover space partially consumed both by the new infrastructure and the preserved artifacts. All of these become layered into one large entity drawing people within its distribution matrix from various points of the city at various speeds. Living within this megastructure would then become a merger of experiences ranging between Price's Fun Palace with nuances of an English picturesque garden or even New York City's Central Park.

The *Overnight City* as a new form of urbanism will take the following shape within Montreal City. Since this megastructure is not assumed to be linear or even predictable in its organization, the arched infrastructure spines, fill the air-space above the city and intersect each other as they cover several points along the existing Montreal City megastructure. The latter is identified in the following city plan as the green assembly of building footprint. This agglomeration of relics from past urban ambitions serves as fertile ground for this new megastructure growth. In this scenario, three separate spines cross this area while

88. Harvard Project on the City. "How To Build a City". In *Mutations*. Ulrich Obrist, Hans,Ed. (Barcelona: Actar), 2001. 12

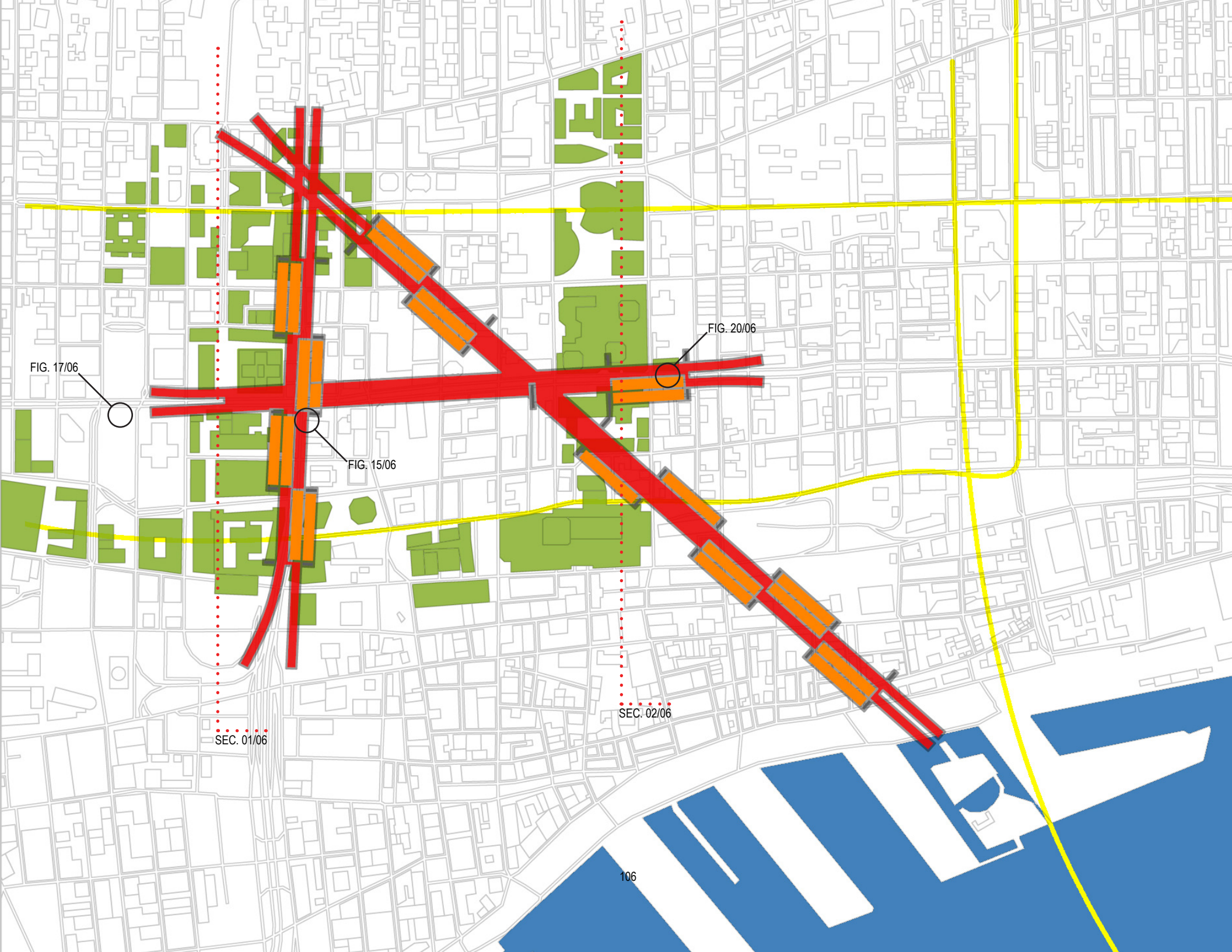
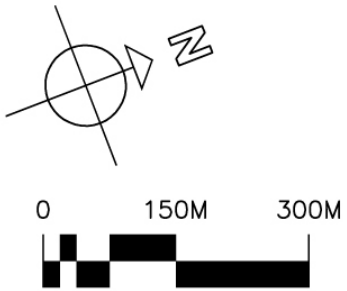

FIG. 17/06
FIG. 15/06
FIG. 20/06
SEC. 01/06
SEC. 02/06



FIG. 07/06
On the left is the Overnight City's urban plan as inserted within the Montreal City megastructure. The existing megastructure remains identified in green and the metro lines in yellow. The images and sections that follow in this chapter are also labeled on this plan.



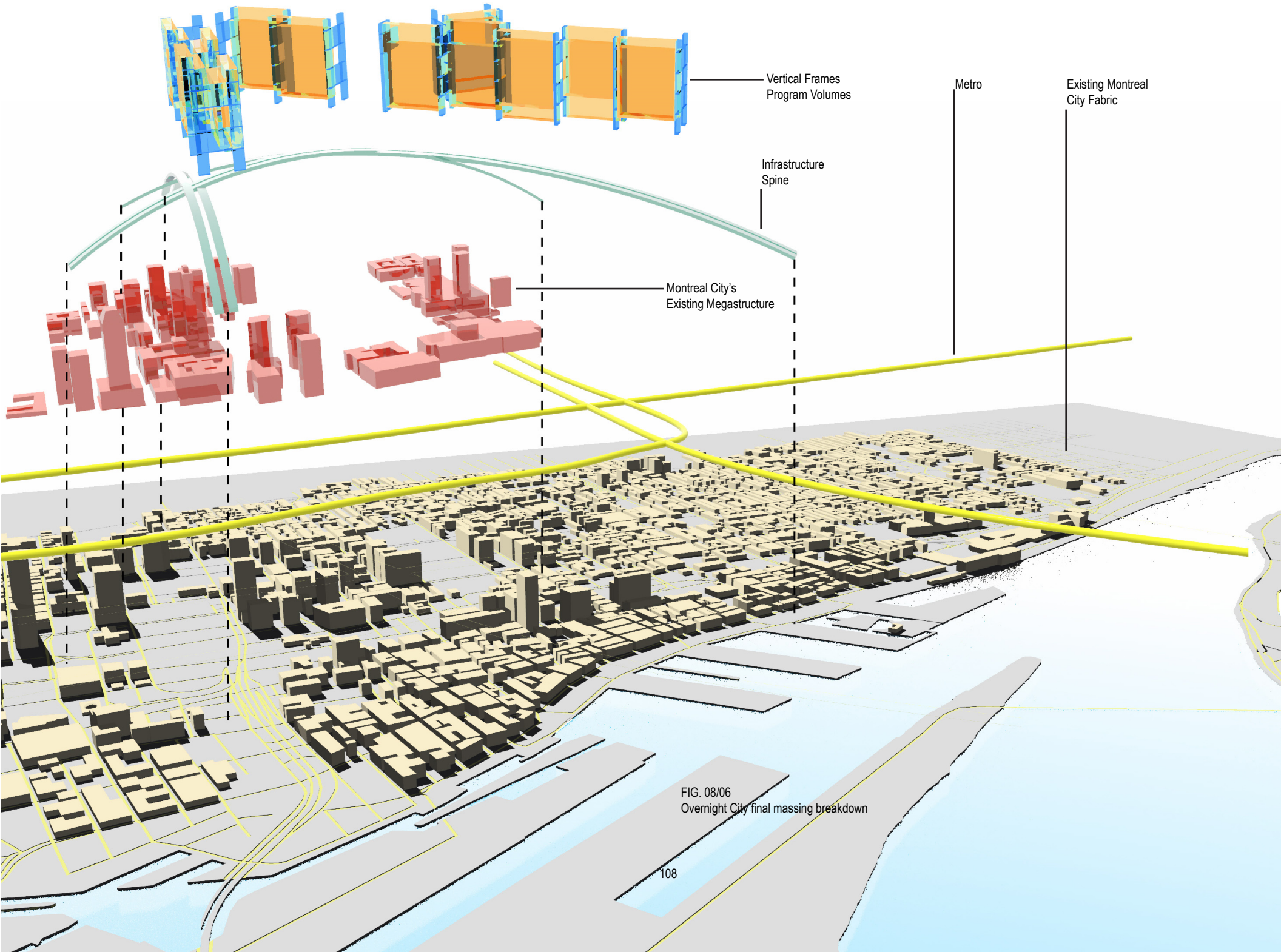
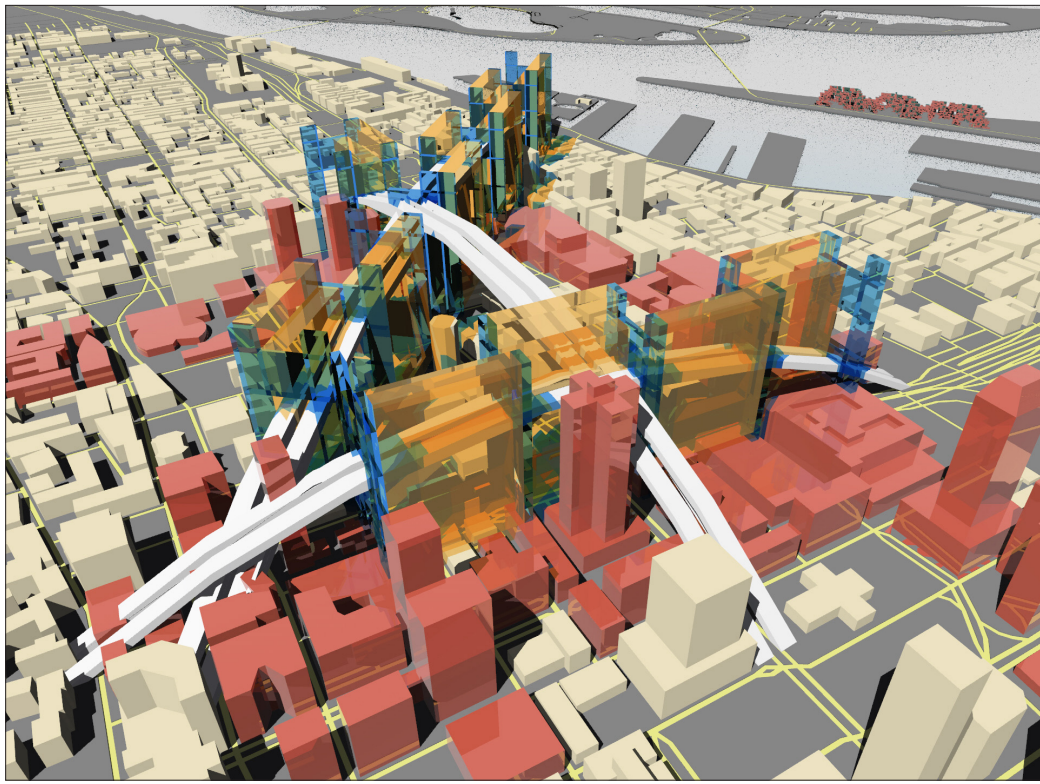


FIG. 08/06
Overnight City final massing breakdown

making zero effort to avoid each other or extrusions from the ground below. Where these spines meet another building or system of infrastructure, they in turn become adopted as supports for the entire composition. This arc formation becomes one large triangulated self-supporting structure, and its footings are distributed as needed along its paths. As identified earlier, the cavities within these structural members also carry the extension of the metro lines and underground city. The adjacent diagram on the left demonstrates this insertion within the layers of Montreal City.

After the megastructure, underground networks and the infrastructural skeleton, the volumes of programme coloured in orange are appropriately defined depending on their locations within the existing city. Drawing back to the Rubik's Cube™ image from the previous chapters, this geometric pattern implied by the arc formation adapts to the individual nature of the city. As demonstrated in both images here, the megastructure now lives within Montreal City as a positive parasite rather than a totalitarian governing body. The silver arcs snake through this urban mass and its airspace and carry along their lengths the larger programme volumes. These arches and their vertical frames bind together both existing and old megastructures to sculpt this amorphous insertion within the city. The presence of the *Overnight City* within the downtown of Montreal City will close the void between the existing high-rises and ground level. Forming connections through the intersection of these layers to the existing city, there will no longer be any circulation which relies solely



Above: FIG. 09/06
The Overnight City is inserted within Montreal City. The existing megastructure is identified by the red buildings and the entire formation of the proposals is directed towards the old islands of Expo67 and Moshe Safdie's Habitat present in the top portion of the image. The volumes and infrastructure spines sit within the cavities of the existing megastructure which in return provides new surfaces for its urban evolution. It also important to mention in the context of the above massing the rotation of sequestered airspaces running along the infrastructure arches. This strategy allows greater preservation of open volume, daylight and natural ventilation.

Previous Page: FIG. 08/06
Moving away from the destructive force implied by the initial assumption of the megastructure, the adjacent diagram demonstrates the insertion of the various layers of the Overnight City. Represented above in its completed massing, this organism snakes its way through Montreal City making reference to the existing megastructure and underground networks while effectively dividing the air-space above in order to spread its three-dimensional settlement strategy.

on the verticality of the towers or the horizontality of the pedestrian network. This will be movement undisturbed by these basic pragmatic directions. As both the skyline and aerial photo montages on the right and following spread suggest, the imposing nature of the megastructure, once feared, is removed as this project grows to adapt to the city instead of replacing it in its entirety.

Already covered in the previous chapter was the local carrying capacity of one typical neighbourhood. Using the same housing unit example and an average density of thirty-five units per neighbourhood, the *Overnight City*, as assembled in the presented organization, will provide the adequate volume to support roughly twelve thousand of these units. More importantly, this proposal will absorb a local population between thirty-eight and fifty thousand people without a single expansion of Montreal City's urban footprint and hardly any destruction of existing fabric. While the density of Montreal City's urban center is currently hovering at nine hundred people per square kilometre, within the *Overnight City*, the density will be four-hundred fifty thousand people per square kilometre. Furthermore, as previously mentioned in the context of Kowloon Walled City, Montreal City holds a unit density of one hundred twenty-six units per hectare. The *Overnight City* will provide a density of thirteen hundred units per hectare. Although these numbers are staggeringly large in comparison to their context, the organization of this megastructure does not suggest undesirable living conditions. In total, this megastructure will provide a private building volume of five-million

Next Page: FIG. 10/06
Updating the massing within Montreal City, the Overnight City straddles various points of the city while carrying upon itself new buildable surfaces. It is a literal positioning of large scaled Ponte Vecchios bridging not two parts of one city over water, but linking together all layers of Montreal City into one cohesive urban volume.

Next Spread: FIG. 11/06
Following in the footsteps of the previous images, the Overnight City no longer remains a dangerous beast overshadowing the city but an adapted organism loosely contained [not to say temporary] within its grasp.





FIG. 11/06
Overnight City inserted into the Montreal City skyline





FIG. 12/06
The confrontation with the existing fabric of Montreal City does not need to be brutal. Although some modification at grade is needed to ease the transition between the old and new megastructures, the latter is merely an extension that continues above while the remainder flows freely into its organization.

cubic metres within the neighbourhoods forming the skin alone. It is also important to mention that these calculations do not take into consideration the volume between the neighbourhoods, inside the horizontal datums and the vertical frames as well as any other air-rights created outside the primary skeleton within reach of the infrastructure matrix. When all is summarized, these last few points can easily add a doubling or tripling to the total buildable surfaces of the megastructure.

Historically, the megastructures concentrated their efforts on providing infrastructure first, programme second. The Overnight City provides an answer to these issues but it also transforms the city into a volume containing both. Bridging this gap, the city is no longer composed of elevated buildings and protrusions but becomes a true matrix of connectivity. As demonstrated throughout, it is this thesis' fundamental argument that it is much more beneficial to grow out and improve the existing networks rather than replace them and start anew if one is to search for additional urban surfaces.

Life within each section of the megastructure will be independent from each other. The ending of this chapter will explore the possibilities granted by this freedom within the empty frame of the *Overnight City's* infrastructure. This will be a general walkthrough complementing the previously provided imagery and suggesting that in fact, this counterform may be even more elastic than one might have imagined. Although the interior conditions within the horizontal datums and vertical frames have been explored in the previous chapter, the actual



FIG. 13/06
The freedom of programme allocation is present both within and outside the megastructure. Due to the density created by the organization of the Overnight City, more buildable volume can be attributed to other, more public uses. The above image demonstrates only one possibility of this juxtaposition between hyperdense urban settlement and vast open space within the same city context.

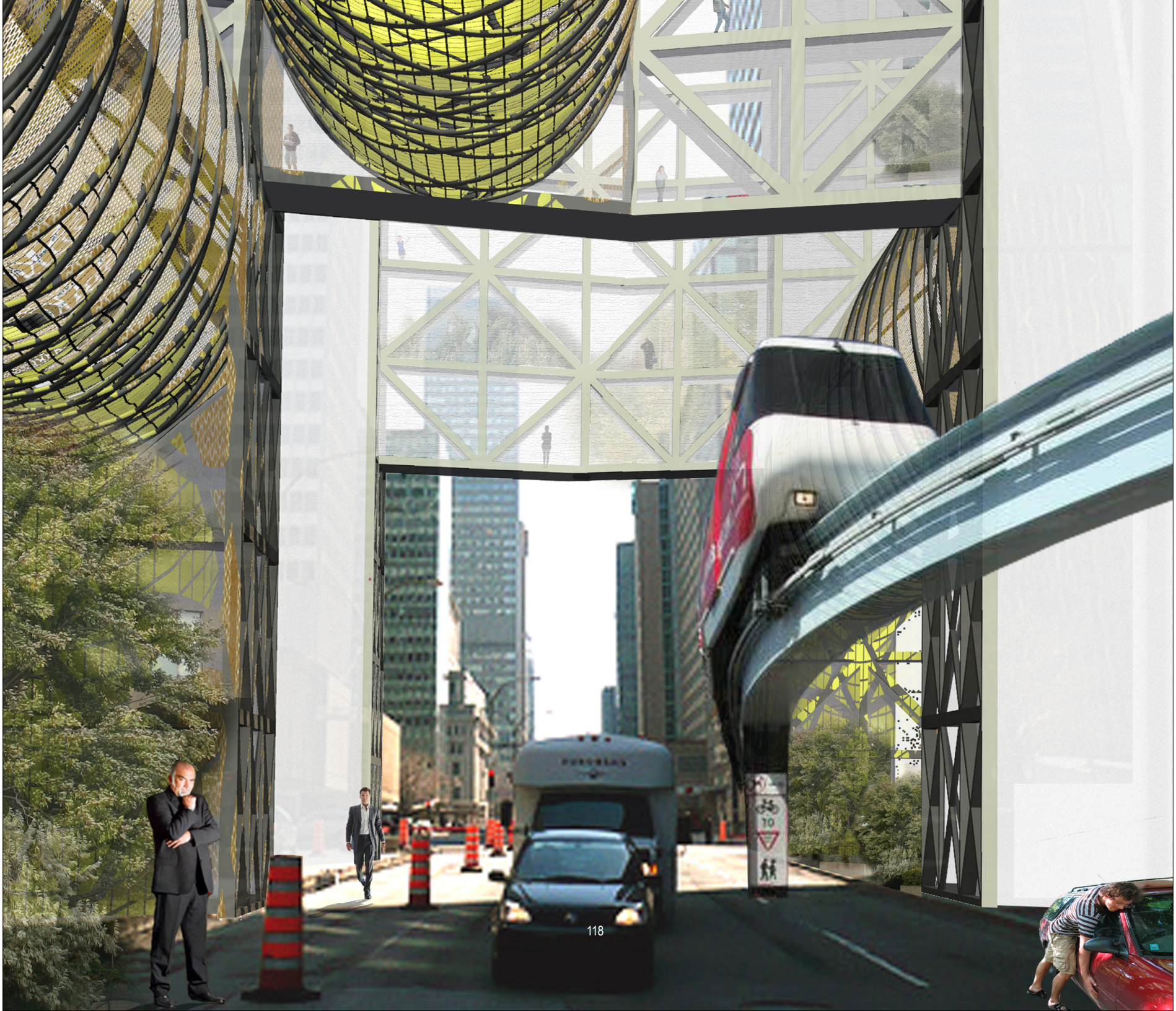


appearance of the megastructure as a whole has only been viewed from afar. We now enter closer to this confrontation with Montreal City. The following images will demonstrate further that this encounter with a new form of urbanism should no longer be feared.

Appearing in both FIG. 12/06 and 13/06 from the previous spread, the ground presence of this construction can take on several different scales. In the first example, the existing buildings easily pass below the volumes of programme while in the second image, they are removed and replaced with open space. In this last one, only a single road remains as it passes above the lowered ground plane. FIG. 14/06 and 15/06 demonstrate another level of street connection. FIG. 14/06 on the left identifies the cavernous void that can be created within the belly of the megastructure, if one were so compelled to build one. On the opposite spectrum, FIG. 15/06 has almost no modification to the existing buildings and the infrastructure at grade. Although the first three images are not specifically sited within the city and megastructure since they are general representations, the fourth image in the series is sited. FIG. 15/06 on the next page and identified in the urban plan provided earlier, straddles Place Ville-Marie within the gap of its footings. The street passes above the underground network and instead of breaking its continuity, the footings dip below grade to access the underground flow of population and draw it upwards.

As we move to where the arches of this megastructure connect with the ground, the

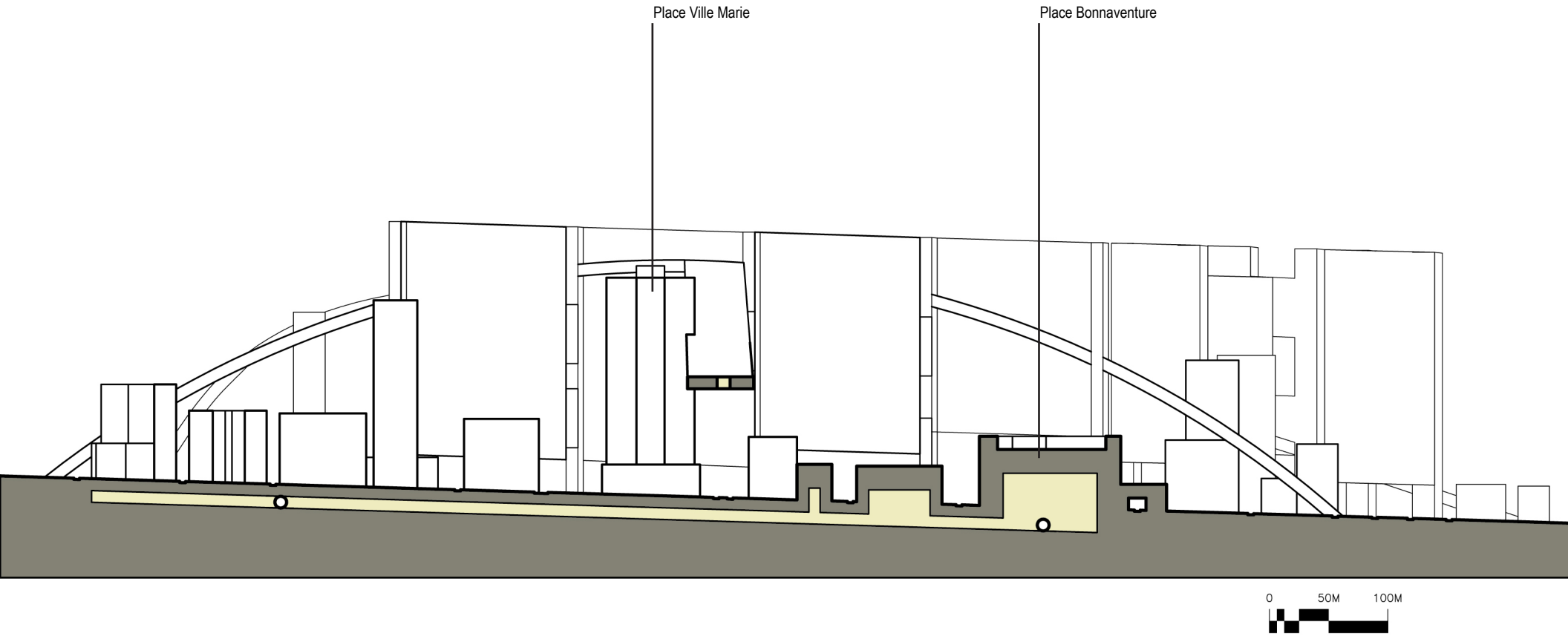
Previous page: FIG. 14/06
The adjacent image is appropriately titled “Inside the Beast”. Similar to the previous two images, it illustrates the interior conditions of the megastructure and its relationship to the primary horizontal datum of Montreal City. In this iteration, the existing fabric runs in the background while when descending between the vertical frames one finds a alternate reality detached from the traditional life at grade in an urban setting. Although gratuitously pictured as both temperature extremes, this image explores the relationship between the layers of the megastructure and the possible forms of usage that could be held within the system.



contained services and transportation elements are spilled over this landing as a way to absorb greater accessibility. FIG. 18/06 demonstrates just one of these interventions within the city fabric. As the curvature of the arches meets the ground, the Earth's vegetated covering is extended upwards. Where the slope is too steep for human occupation, this space is not wasted as this space becomes usable for other necessary civil uses. In this particular image, Place Ville-Marie is clearly visible between the two frames and identified in the urban section in FIG. 16/06 in the next page. This section in particular not only shows the Overnight City's presence within the Montreal City but also its underground network. This drawing is an updated section of the one provided in Chapter Three within the context of Expo67. This section and the one that follows demonstrate the dimensions of the larger volumes hung between the megastructure's frames. Although represented as solid prisms, they are in reality nothing of the sort but composed of countless smaller volumes, openings and neighbourhoods.

The two images that follow after the urban sections are to be read as options for furnishing the top of these infrastructure spines. FIG. 19/06 identifies the conditions where the horizontal cross-members of the vertical frame intersect the spine. There is here the provision of public spaces within the structure of the frames for both exterior and interior uses. In addition, as both images demonstrate, certain portions of these arches can be used for other, more imaginative activities. The final image demonstrates another entrance point

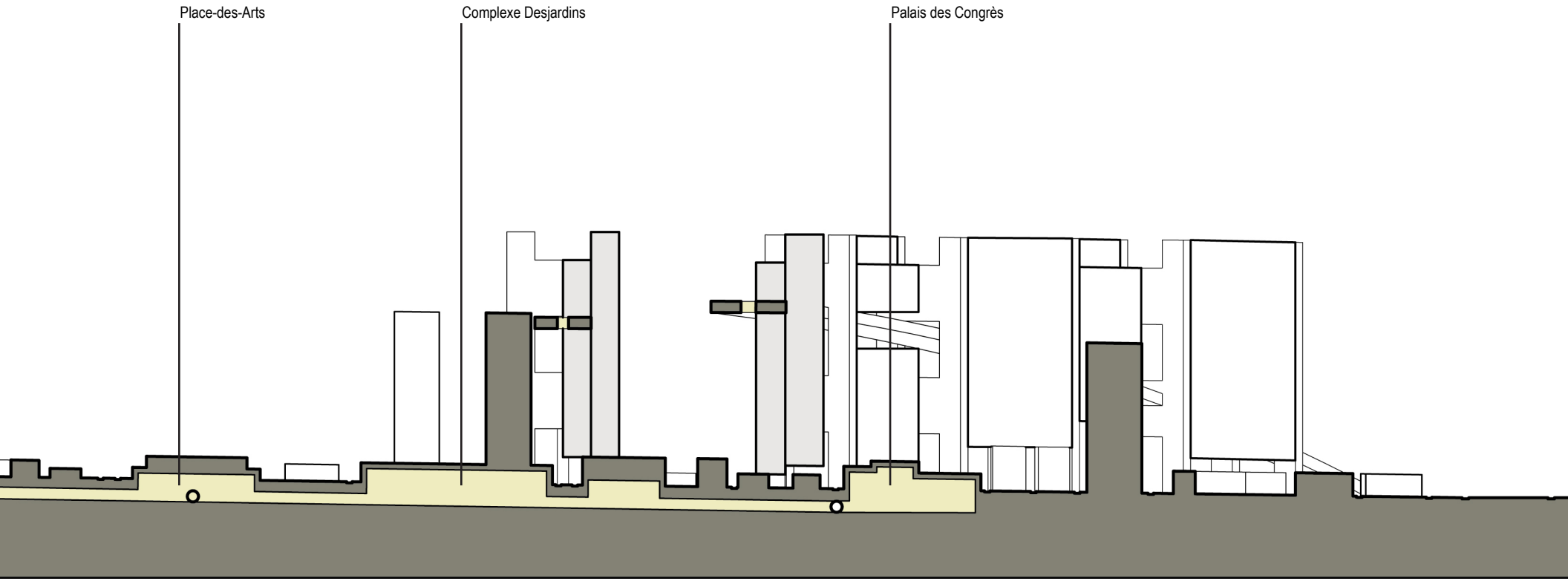
Previous Page: FIG. 15/06
Similar in concept to the images describing the inside of the Overnight City, not every interaction between grade and megastructure results in a removal of ground coverings. In this example taken at the base of Place Ville-Marie, the existing surface networks are allowed to remain intact. As the frames straddle above, their footings dig deeper below and connect to the underground. The infrastructure contained within this existing condition is extended through the vertical frames and dispersed through the volumes above.


Place Ville Marie
Place Bonnaventure
0
50M
100M

between both the new and existing megastructures. Each image is better served by the description in its caption and should thus be read in conjunction with this narrative.

In the end, these images serve not to convince one of the need for the *Overnight City*. They are set in a way to help demonstrate the fluidity, flexibility and unpredictability inherent within a megastructure proposition. It is important to remind the reader that this thesis promotes not a final product but a set of varying layers of infrastructures that allude to a physical form within the city. The examples provided throughout are only moments frozen in time as these insertions within the greater whole of the *Overnight City* are almost instant in comparison to the underlying matrix granting it this freedom.

Previous Page: FIG. 16/06
The adjacent section is a refreshed version of the previously presented urban section in the third chapter of this thesis. Where the initial megastructure rose above as the rail buried itself below, the Overnight City repeats this process once again but substituting the initial C.N.R. tracks with Montreal City's underground network. The latter is identified through section with its interior volume coloured and with the metro line's positions. This section is represented as SEC. 01/06 on the previous urban plan of FIG. 07/06 and is taken at the same location as the urban section in Chapter Three.


Place-des-Arts
Complexe Desjardins
Palais des Congrès


0
50M
100M

Previous Page: FIG. 17/06
This second urban section demonstrates another and more recent addition to Montreal City' underground network. Represented as SEC. 02/06 in the urban plan FIG. 07/06 this section identifies the arrangement of programme volumes and the infill possibilities within the sequestered air spaces of the new megastructure. Represented in the same fashion as the previous urban section, the underground network is connected to the new layers via the vertical frames and spread throughout the city once reaching the infrastructure spines.


VERNIGHT CITY
TRANSIT

Previous page: FIG 18/06

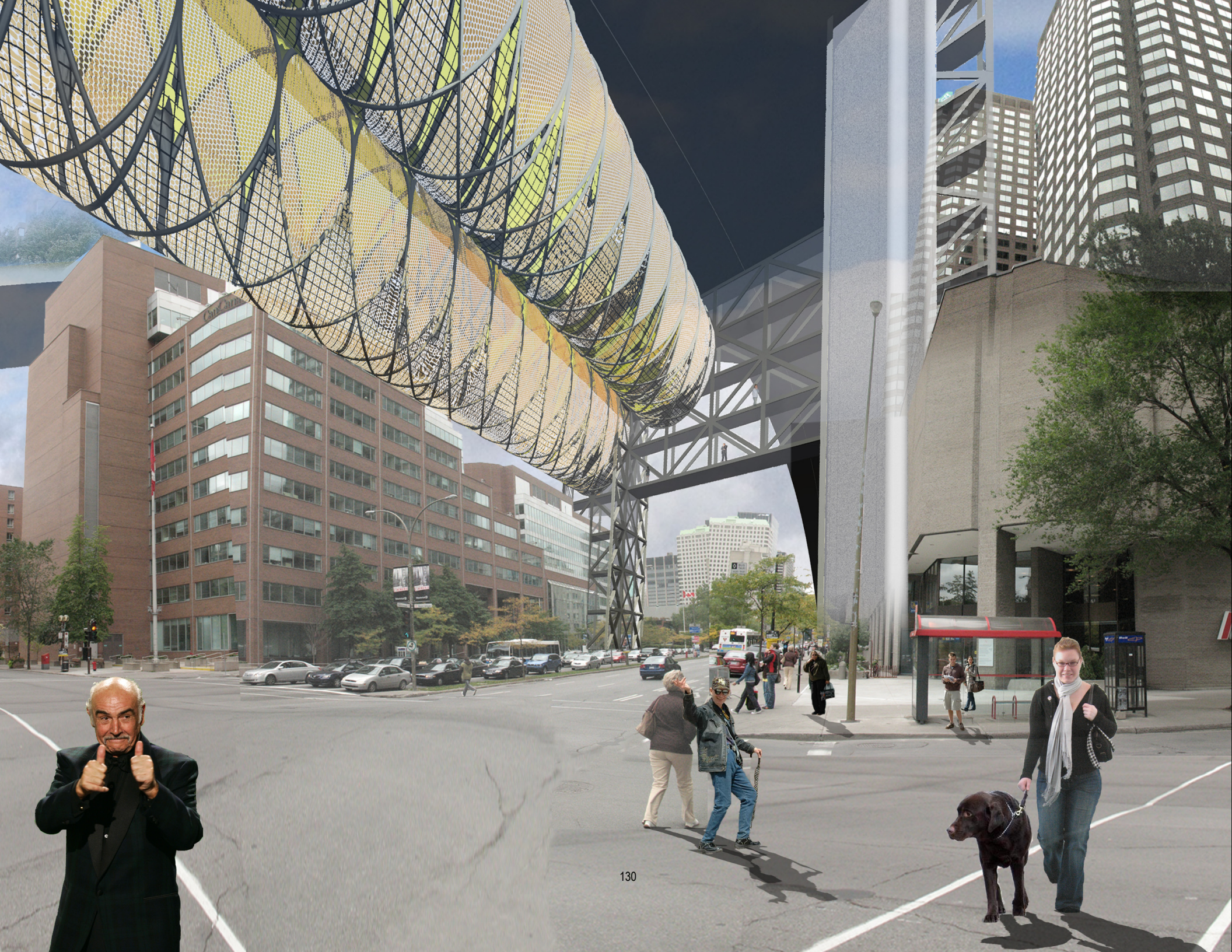
There is another point of merger between the old and the new megastructures. Whereas the previous images concentrated on the interior relationships, where the infrastructural spines meet the ground is also an area of great interest. As the arcs curve downwards and blend with the existing fabric, their internal systems spread out from their central containment within this guiding element. Included among these, the internal high-speed transportation services become accessible from the existing Montreal City public datum. As expressed in the adjacent image, this merging carves an opening within the fabric of the city and therefore a moment of pause prior to entering the inside of the megastructure. In addition to this impact, the surface of the arc also becomes an extension of this newly created public domain. Although varying in steepness depending on the context, this new surface can become the site for additional programme, agriculture, or as explored in this image, power generation. It is also important to mention the presence of Place Ville-Marie in the background and the merging of the spine to one of the vertical protrusions of the old megastructure as suggested by the urban section of FIG. 16/06.



Previous pages: FIG. 19/06
Moving up the infrastructure spines, one eventually would attain a particular point where the arc connects to the vertical frames. Although dependant on the degree of curvature of that section of the megastructure, a great deal of this spine's exterior surface can be turned into a habitable zone for the residents of the megastructure. This surface would be accessible through the vertical frames since these serve as locations for the transition between the high-speed transportation contained within the spine and the vertical frames' more casual circulation systems. In this example, the top horizontal datums are visible in the background. Their circulation and other systems of infrastructure would eventually connect to the surface of the spine, further encouraging the expansion of the megastructure's skin outside the contained neighbourhood volumes.



Previous Page: FIG. 20/06
Standing tall above the old city, the provision of new habitable surfaces within the confines of the Overnight City, in the same way as below, allows a new form of urban programme allocation. No longer needing to abide by the rules enforced by traditional adherence to the ground plane, the city life along with its new construction arcs into the skyline, connecting itself to the surrounding fabric as its evolution sees fit. A sectional cut in the foreground of the image demonstrates the paired tetrahedron frame forming one of the spines of the megastructure. It is within the found space of the structure that the necessary infrastructure and resulting spaces are inserted.



Previous Page: FIG. 21/06

Present in the second urban section, there is another significant portion of the underground network within Montreal City. Although constructed after the success of the first piece during Expo67, there is again the creation of connectivity between several key parts. The Overnight City extends to cover this portion of the city. The adjacent image represents the moment where the old megastructure crosses at a right-angle to this new insertion. Present on the right side of the image and in the second urban section, one key building within this composition is the Complexe Desjardins. This combination of hotel and office towers with retail podium are but one extension of the existing megastructure that the Overnight City is more than willing to integrate into its form. Here, the structure will adapt to the buildings it comes into contact with. As the juxtaposition of old and new arises, the Overnight City grabs ahold of the old fabric and allows its own circulation and datums to connect. This invasion of infrastructure encourages the growth of the city to follow along the multitude of surfaces and anchorage points.

07

Dry Land Ahead

"If there is to be a 'new urbanism' it will not be based on the twin fantasies of order and omnipotence; it will be the staging of uncertainty; it will no longer be concerned with the arrangement of more or less permanent objects but with the irrigation of territories with potential; it will no longer aim for stable configurations but for the creation of enabling fields that accommodate processes that refuse to be crystallized into definitive form; it will no longer be about meticulous definition, the imposition of limits, but about expanding notions, denying boundaries, not about separating and identifying entities, but about discovering unnameable [too sacred to be uttered] hybrids; it will no longer be obsessed with the city but with the manipulation of infrastructure for endless intensifications and diversifications, shortcuts and redistributions."

- Rem Koolhaas.[89]

89. **Rem Koolhaas & Bruce Mau.** *S, M, L, XL.* (Rotterdam: The Monacelli Press), 1995. 968.

The problem with predictions is that common sense often turns out false.[90] What Rem Koolhaas predicts in the adjacent quotation is very much the opposite of common sense since he speaks not about creating guides but more importantly about their elimination in our current understanding of the direction of our built futures. The megastructure theories lifted throughout this thesis have for the most part rubbed against the grain of our established notion of architectural common sense. While some past architects consciously proposed the latter, it is not the intention of the *Overnight City* to speculate along those lines. Making a reference to Frank Lloyd Wright's words from the beginning of the thesis as well as Koolhaas', the *Overnight City* will insert itself as an additional infrastructural layer within the existing context and provide the additional space needed for a growing metropolitan population.

At the height of the megastructure era of 1967, the best estimate was that we only had half of the required buildings that would be needed to house the population predicted for the year 2000.[91] This meant that with all the acquired built fabric which had survived through centuries of urban living, there remained a need of doubling just to meet a thirty-year prediction. Furthermore, this also implied that we would require the doubling of our urban footprint and infrastructure unless we wished to witness a significant portion of our cities become consumed by overpopulation.

As population and density increase, so will the scales of the architecture. Past terms such as street, block, neighbourhoods, etc., will now see a return to the core of their idea, not necessarily what tradition has labeled them. The megastructure justifies them a new and more appropriate meaning.[92] We require this form of alternative if we wish to sustain a way of life in this emerging crowded urban world. Le Corbusier's ideal city was to hold three basic necessities: Sun, Air and Greenery.[93] Even with our growing populations, this goal remains the same today, although a critical fourth element will now be added to the mix. This as identified earlier will be the element of space or, now more appropriately defined buildable surfaces. Within the organization of the Overnight City, and as densities and programme are inserted, a great deal of observable space is kept present by its composition and the freedom of construction allowed within the reach of the infrastructure matrix. These revisions to the megastructure ideal reverse the paradox which plagued Safdie's *Habitat* and all its contemporaries.

This thesis began by projecting growth on a global scale and since this is an exploration based on future speculations, these projections will now take on a hyperbolic scale. The need to revisit the lost discussion of the megastructure as an adequate building typology is real. As identified throughout the thesis, we find ourselves today at several serious crisis points. Besides the shift in urban versus rural population ratios, if we are to trust our current climate

90. George Friedman, *The Next 100 Years*: (New York: Doubleday), 2009. 249.

91. (Ragon 1968, 53)

92. (Smithson 1968, 76)

93. (Maki 1964, 21)

models and their speculations, local population growth by birth alone will hardly become an issue in comparison. The geographical areas of our world today which currently boast the highest local growth percentages are also the ones at greater risk of environmental catastrophes. The range of potential problems are too numerous to mention in great depth, but with the increase in global temperature, the rising ocean levels, the loss of glacier fed rivers and several levels of desertification, even more land is scheduled to disappear, to become unusable, or both. Adding insult to injury, it would be foolish to attempt to keep these populations stable and salvage their sinking ships when the odds of failure severely outweight success. It is also an unfortunate coincidence that the areas today that suffer both from population growth and potential severe climatic problems are also those affected with poverty, crumbling economies and insignificant infrastructure investments. Although not a particular heart-warming thought for the millions [even billions] of people living within this danger zone, they will have no choice but to relocate.

The world of the megastructure and the *Overnight City* is one of anticipation. In addition to loss of physical land, other circumstances will also cause these large groups of people to migrate. With such environmental problems, warfare and resource scarcity will undoubtedly follow and increase this shifting of populations. This will cause a direct migration to the remaining geographical areas with less problems but more importantly, areas already holding established networks of infrastructure. This nomadic undefined mass of people estimated to number in the hundreds of millions will have to insert themselves within an existing milieu if they wish to survive. Although we may like to assume that such effects will be mild or at the very least that our established urban centers will be capable of adapting to these insurgences, but due to contemporary mediocrity, greyness and low density of our urban traditions, there has not been the creation of suitable absorbing conditions. Without the revival of this lost discussion, we are marching blindly into this future.

Montreal City can be expected to become one of these places that will attract part of this immense migrant mass. For geographical reasons as well as economic ones, it is to be well suited to continue as an important world urban center. Although the remains of the megastructure legacy of Montreal City formed a logical departure point, the city's evolution remains bound by decisions made forty years prior. With unprecedented densities and unpredictable environmental changes resulting in urban migration, there will be the emergence of another world underneath our own and the Overnight City's population absorption characteristics will then be crucial. This will further require a change in the way we use the surface of the earth. The proposition raised through this thesis should be accepted as new challenges with enthusiasm.[94]

As an example, in 1956 the United States saw themselves disadvantaged when it came to mobilizing their military across their large country's

94. Will Alsop & Kenneth Powell. *Will Alsop 1990 : 2000.* (New York: Laurence King Publishing), 2002. 73.

surface. President Dwight Eisenhower choose in response to this problem to build the vast interstate highway network currently in place today in order to facilitate mobility of large groups of people and objects.[95] In the same scale as the American highways, Montreal City will become carved and linked by this new infrastructure matrix, but instead of transporting soldiers, it will be the city itself and its malleable fabric that will be set in motion. In order to cause this shift in our urban world, there needs to be an approach of similar scale, ambition and impact without the horizontal expansion by-product left by the American highways as their most widely regarded contribution. In addition to bridging Montreal City's various points of intensity, there will also be a need of energy production, agriculture, industry and other elements all needing to reorganize themselves in a world restricted by the removal of horizontal expansion as the default option.

> "Architecture is probably a hoax, a fantasy world brought about through a desire to locate, absorb and integrate into an overall obsession a self-interpretation of the every-day world around us; an impossible attempt to rationalize the irrational."
>
> - W. Chalk, Archigram [96]

As we embrace this future, not only will it become important that different residential buildings become stacked, but also offices, industry, farmland, parks and recreational spaces as well.[97] Elements and strategies inherited over the last few centuries will no longer be in the best interest of developing an architecture of anticipation; moreover, an architecture of responsibility. The age where the single building coagulates both form and process into a static final box while an imperial grid imposes order at grade [which inexplicably remains constant in the vertical] is over. The *Overnight City* proposes a departure from this norm, this megastructure will become a city with a continuous layering of undefined volumes of space. It will leap, twist and jump in complete disagreement with the grid, the unquestioned given, and the traditional.[98] It will be constructed as one large theoretical sponge and emerge as a three-dimensional form of urbanism in opposition to our permanent and dated urban conditions.[99]

If areas targeted today are signs of our global future, then our established cities outside of harm's way will need to adapt to this situation. The difference now is that with foresight and some adjustments we can provide the framework to absorb this change without turning the entire globe into one large informal settlement. By displacing traditional infrastructure from grade into a different framework, habitation will grow without impinging on available lands. With global scaled growths and urban migration to occur only in a few but large concentrations within our existing cities, this

95. (Friedman 2009, 217)

96. (Cook 1999, 85) Warren Chalk in a letter to David Green

97. (MVRDV 2006, 396)

98. (Cook 2003, 116)

99. (Rouilard 2004, 83)

compounding effect of both living and infrastructural needs will be of the utmost importance.

The megastructures that first emerged fifty years ago merged the city and its architecture and therefore inherited the infamous connotation of colossal, multi-unit architectural masses.[100] It was understood that they proposed nothing more than a dream world where the inhabitant was referenced only in a schematic way. Most fought more for social acceptance than their physical realization [although some proposals such as the Fun Palace were arguably buildable].[101] These megastructures, for the most part, did not particularly attempt to predict the future of the city but proposed a perspective they felt needed serious consideration. Today, we do not have the same luxury of time as architects profited from in the mid 1960s. The crisis is at our doorstep and we need to work both social acceptance and feasibility into one convincing alternative if we wish to adapt to this changing urban world. As unchecked urban growth worsens, a city like Montreal could expect to see a large instant influx of population. This demands a different vision where the passage of time and its implications on population totals will not destroy living conditions for everyone.

The chaos within our developing nations' informal settlements is but a mirror into the future of urban housing if we are unwilling to think in terms of anticipation. These areas represent human habitation where scarcity of land causes populations to build upon themselves out of desperation. Without the proper framework, this urban condition will spread as these communities migrate elsewhere searching for better suited environments. The Overnight City will provide, in the same way as the bridge behind Ponte Vecchio, the framework of infrastructure suggesting such an environment encouraging absorption. It is now time to look into the disregarded megastructure ideals for these solutions. Possibilities brought forth from this departure from the two-dimensional world and traditional urban structure will be reflected as examples upon the remaining world cities, since each will eventually experience their own similar problems. This will lead towards not simply density or intensification but towards a new form of urban life, a new landscape, and more importantly, a different way to look at what constitutes a buildable surface.

Without being afraid of speculation, architecture will bridge this gap between the real and the [apparently] surreal.[102] During the 18th century, a simple city beyond seven-hundred thousand people would never have crossed into the realm of the possible.[103] Can the architect today anticipate a city larger than three-hundred million tomorrow? This is the perspective that the overnight city will embrace. It will be one step, one philosophy, one city, and therefore, one megastructure.

100. (Banham 1976, 196)

101. (ibid 90)

102. (MVRDV 2005, 5)

103. (Ragon 1968, 15) in reference to Alexandria's peak population

“Inside every cynical person, there is a disappointed idealist.”
- George Carlin

Fin

Appendix 1

Our World Today

Building upon the problems anticipated in the context of population growth and urban migration, this essay aims to identify the social implication of living in an overpopulated world. Furthermore, it also questions the readiness of our developed cities in anticipation of the soon to begin waves of urban migration. This appendix provides anchorage to the speculations mentioned throughout the thesis and, more importantly, outlines compelling questions which were unfortunately outside of the scope of this thesis' research.

Our future is an unsteady one. In light of overcrowded and congested cities, our urban worlds are fast becoming modern necropolises.[104] Never before in history has such a great percentage of our world's population resided within the urban context. To illustrate, in our last 50 years we have seen city populations increase 4.3 times over.[105] Projecting our current 2% per year urban growth rate, we can expect the doubling of our global urban population by 2042. In other words, within 35-years we will witness urban populations go from 3.2 billion to roughly 6.5 billion. More importantly, keeping the same growth rate, we should expect a tripling of our current urban population by 2062, a quadrupling by 2074, and a 500% increase [5 times 2007's numbers] by 2087. This would create an exponential growth sequence of 3.2, 6.5, 9.6, 12.8 and 16 billion urban people respectfully before the end of this century.[106] Coincidently, rural populations are only increasing at a rate of 0.3% per year and are even expected to reach negative or zero growth rates within the next 5 years. The latter is statistically insignificant in comparison to the urban sector since rural population doubling time is currently 230 years. Is it logical then to assume that our existing cities today will be able to absorb an additional 3 billion people within the span of 35 years? Unless drastic change occurs, our cities remain finite containers waiting to spill over.

It is this condition which poses the greatest danger. Dr. Albert Bartlett, professor emeritus of physics from the University of Colorado, has been repeating this message for the greater part of the last 40 years. I provide one crucial piece from his analogies in regards to the effects of compounding growth:

> "Suppose we had bacteria that doubled in number [1, 2, 4, 8, 16 etc] this way every minute. Suppose we put one of these bacteria into an empty bottle at 11:00 in the morning, and then observe that the bottle is full at 12:00 noon. There's our case of just ordinary steady growth: it has a doubling time of one minute; it's in the finite environment of one bottle. I want to ask you three questions. Number one: at what time was the bottle half full? Well, would you believe 11:59, one minute before 12:00? Because they double in number every minute. And the second question: if you were an average bacterium in that bottle, at what time would you first realize you were running of space? Well, let's just look at the last minutes in the bottle. At 12:00 noon, it's full; one minute before, it's half full; 2 minutes before, it's a quarter full; then a 1/8th; then a 1/16th. Let me ask you, at 5 minutes before 12:00, when the bottle is only 3% full and is 97% open space just yearning for development, how many of you would realize there's a problem?"
>
> - Dr. Albert Bartlett [107]

104. (Rouilard 2004, 86)

105. The United Nations. "World Urbanization Prospects: The 2007 Revision Population Database", The United Nations, http://esa.un.org/unup/

106. (ibid)

107. Albert Bartlett, "Dr. Albert Bartlett: Arithmetic, Population and Energy (transcript)". Global Public Media, Denis Morel, ed., http://globalpublicmedia.com/transcripts/645

When does growth become dangerous? Following with the previous analysis, we cannot yet accurately predict our world's habitable capacity. Remembering our 35-year urban doubling rate, one needs to consider where within our bottle we stand today. Can we honestly believe that we have only used less than 3% of our available space? If current growth trends are to continue for the next century, the global population situation is certain to become very different. When this thesis began in the Fall of 2007, the global population was slightly above 6.6 billion and current predictions place it at roughly 9.7 billion by 2050, a 47% increase.[108] Pushing one step further, with an anticipated compounding growth of 1.17% per year [both urban and rural], we should expect the doubling of the earth's total population by the turn of our next century. This is the world that will lead to the *Overnight City*. Are we ready to receive this long-term increase; moreover, any short term increase?

This will be a world where 2 billion people live in India, double that of China; a world where the largest desert is home to almost a quarter of the world's total population; a world where some of the smallest African nations will each have to house larger populations than that of the entire North American continent; a world where the United States, holding nearly half a billion people, represents the only developed nation in these projections. Growth apparently goes against logic since areas unfit even for their current numbers today are most at risk. Just the combined numbers for both Nigeria and the Congolese countries alone will pass the one-billion mark before the end of this century.[109] If trends illustrated through these projections continue, even India's growth and dire living conditions today will look like paradise when considering the projections of some African countries tomorrow.[110] Speculating on the unimaginable impact of growth among these countries, one must ask: how long until they reach the limit of their containers?

These places, with only a few exceptions, lack basic necessities and urban infrastructure. Their densities are rising by the hour and soon they will see themselves suffocating under the pressure of unmanageable population sizes. We are at a place in our history where the dominating culture, religion and language can fast become poverty and soon, the only common universal medium. As the world's leading population centers change places for less developed seats, attention to these new areas hold great importance in understanding the future of our young metropolises. With this distinction between developed and developing countries, it is clear that urban growth is neither universally spread throughout the world, nor is it, concentrated in the most suitable areas. Granted the conditions generally found in the crowded cities of our developing nations, it is no surprise that such rapid growth generates a great deal of stress on both local services and remaining available space. It is also

108. The United Nations, *World Population to 2300*. (New York: United Nations, 2004), 4.

109. (World Urbanization Prospects: The 2007 Revision Population Database)

110. Klaus Segbers. *The Making of Global City Regions*. (Baltimore: The John Hopkins University Press, 2007), 78.

easy to imagine the incapability of the existing urban fabric to compensate and absorb this growth. Both fabric and basic services will have to bear the weight of several hundred million more people through this relatively short period.

> "Thus the cities of the future, rather than being made out of glass and steel, are instead constructed out of crude brick, straw, recycled plastic, cement blocks and scrap wood… Instead of soaring towards the heavens, new twenty-first century urban worlds squat in squalors, surrounded by pollution, excrements and decay. They might one day look back with awe at the ruins of ancient mud huts from the very dawn of city life."
>
> - Mike Davis [111]

Chasing this thought further, influxes in population render the quality of life subject to misery, deprivation, starvation and ultimately death. Mike Davis makes this position clear when demonstrating the absorbing quality of these future seats of population. This is our reality, overpopulation and extreme densities combined with marginal conditions. Can there be a new perspective that would grant itself adaptable to the reality of such growth? What is the social impact if one city goes from 3 million today to 9 million within 20 years? The *Overnight City* proposed in this thesis is conceived in a future of extreme metropolises, a future where a city can easily surpasses the size of today's continents. Within this scenario, these places would fast become incapable of sustaining life.[112] As these situations become compounded, suddenly the potential for catastrophic human disaster is real. It is evident that the preceding projections are idealistic in their assumption of long-term, continuous global growth, but growth will need to occur somewhere. These projections reinforce the notion that, if these growth continue, that our world is shrinking, but also, that we might run dry on space faster than expected. They demonstrate a reality many might not be ready to accept. How long can populations increase until we no longer as a global community can live?

> "We are thus sitting in a spaceship whose steering does not function anymore, heading for a crash. The best we can do is make this crash softer"
>
> - Yona Friedman [113]

Expansion on the perimeter has for the last few decades relieved the pressure of mass migration. It is highly irrational to assume that such a strategy that solely relies on the availability of vacant horizontal land will suffice. Yona Friedman sees this as the clear indication that global communication is impossible. As this reinforces the differences between the "haves" and "have nots", it is clear that through his argument, the impossibility of global communication will make the shift towards global poverty one step closer. As a population surpasses its critical group size, it becomes too large to remain manageable in any conventional sense. This mass

111. Mike Davis. *Planet of Slums*. (New York: Verso, 2006), 19.

112. (Smithson 1968, 30)

113. (Friedman 1975, 125) Speaking about population growth.

will fast disintegrate into smaller entities, each to become more self-reliant, no longer accessible by any top-down organization. Currency will fast lose its value and funding will cease, as the little capital left would be best invested elsewhere than in the progression of the urban cohesion. There will be less need of official commerce, of institutions and of traditional housing as single use spaces. These spaces will take on a time-share schedule as the availability of space for separate use infrastructures becomes compromised. Following this, personal dependence takes over. This is the start of the "one-man" technologies where there remains very little reliance on social organization. As this last stage is achieved, it is now a poor world. Those of the non-industrialized countries will find themselves much more suited for adaptation as there is already little organized structure to collapse. The Western developed society will follow the same course and will need to find a new organization outside of current ideologies or suffer this impeding collapse.[114]

There was once a time when the average available space per person in the Chinese city of Shanghai was no more than 6 square metres. 15 years later, this available space has doubled while the population has grown some 34%. [from 7.3 million to 11.1 million urban population][115] This was achieved by building tall. Although with so much density on such a relatively small city footprint, these vertical housing blocks only feed the fire that is on-going in the street network at grade. Each high-rise is cast out as an island surrounded not by water, but by the roads and onramps needed to serve them.[116] On the opposite side of the equation, while Shanghai condenses vertically, Mexico City appears to be an endless horizontal city. In a country where the cost of petroleum is lower than that of mineral water, it is no surprise that the need for infrastructure linked to personal transportation has spread the 20 million plus population thinly over the landscape of which, more than 60% reside in informal settlements. Capital investment in the latter surpasses that of public transit or of the urban quality of the city.[117] This misplaced attention to capital allocation has only helped in stretching this vast population across the city, pushing the poorest to the fringes and contributing to the ever increasing congestion that plagues all developing city centers. Lagos, the capital city of Nigeria, is currently one of the world's fastest growing cities with an official population of 17.5 million. Considering its growth rate is above 4% per year, it will experience a doubling of its population in less than 17 years pending continuous growth. This is a growth rate 10 times that of New York or even Los Angeles.[118] Furthermore, it is a complex network of marginal, even illegal, frameworks that keep its 80% informal population functioning.[119]

Our urban future is that of the informal

114. (Lebesque 1999, 61)

115. (World Urbanization Prospects: The 2007 Revision Population Database)

116. Ricky Burdett & Philipp Rode. "The Urban Age Project". In *The Endless City.* Ricky Burdett & Deyan Sudjic. (London: Phaidon), 2007. 19.

117. (ibid 11)

118. City of Lagos official home page. "Largos State-Population." Lagos State. http://www.lagosstate.gov.ng/c/portal/layout?p_l_id=PUB.1095.7. 2006 Data.

119. (World Urbanization Prospects: The 2007 Revision Population Database)

settlements of what we often deem the third world. Housing here relies on current forces and is a constantly changing living organism. It is not bound by decisive roads or zoning regulations but is, more often than not, a self-regulating social system. What remains important is that even through our developed eyes, Lagos might appear as a large chaotic mess, in practice, it remains a functioning city. It demonstrates a complete inversion of our tradition-based sense of urbanism and city life; it is the critical turning point which demands the redefinition or our understanding of "housed capacity".[120] Lagos is successful at managing its immense population growth by a clear removal of any spatial boundaries or land ownership. These are in constant fluctuations and redefinitions. They allow the city fabric to evolve in parallel with its current society, and no set urban settelment strategy exists as special property arrangements becomes at best, only temporarily settled by the juxtaposition of joint interests and agreements.[121] It might not look like it right now, but the city of Lagos is several years, maybe even decades, ahead of the developed western world. It is the true visionary example of a future urban world.

> "Lagos has none of the infrastructures, systems, or even environmental resources far approaching what we would consider adequate to support population levels. Yet, it represents an image of our future urban world some 20, 50 or even 100 years from today."
>
> – Rem Koolhaas [122]

120. Rem Koolhaas. "Lagos". In *Mutations*. HansUlrich Obrist, ed. (Barcelona: Actar), 2001. 652.

121. (ibid 661)

122. (ibid 719)

Why is this not a desirable solution for our global problem? As a developed society, we peer into these worlds and treat them as a novelty and as exclusions to the "real" world we live in. In the end, it is the developed world cities which are delusional. These observations taken from Lagos, Shanghai, Mexico City and others are images of a reality too common to a great deal of our world's population.[123] There is very little urban litter left in these situations as the fabric which forms these megacities remain in constant fluctuation; there is hardly the opportunity for bad habits to form. In the environment we are about to enter, the ability to change will be fundamental to survival. Unlike the informal settlements mentioned, our developed cities have built themselves around a scenario where they remain frozen in time and thus, are prevented from changing as society needs them to. They become nothing more than litter in the greater picture of the transformation of our urban realm. Unguided by top-down structure, informal habitation takes on its own self-organization. This becomes an urban architecture of necessity and not necessarily representative of traditional city life. The spontaneous order of the informal forms the organic relationship between buildings and site. This allows the flexibility of diverse spaces to the changing needs of its users.[124]

> "A flower grows in the field because it cannot help but grow; thus it cannot contemplate whether or not it is

123. Deyan Sudjic. "Theory, Policy and Practice" In *The Endless City*. Ricky Burdett & Deyan Sudjic. (London: Phaidon), 2007. 48.

124. (Davis 2006, 71)

appropriate to the field that existed before it. On the contrary, by its very appearance, the flower transforms the general image of the field."

- Moisei Ginzburg [125]

What shape would a modern favela take within the context of our developed cities? Spontaneous, informal growth does not have a particular shape of its own. It is within its very nature shaped only by the landscape it occupies. Just like the flower metaphor above, populations increase whether or not their locations permit them. We must provide an appropriate absorbing context or else run the risk of them transforming it, and to the peril of us all. The image of the future city is nothing more than a stone's throw from the favelas of today.[126] This confusion exists and one must be able to allow the natural evolution of the urban life, not impose upon it uniquely through top-down strategies. As human settlements become more numerous and our urban population totals rise, the creation of this overnight city will no doubt by default take similar shape to these informal settlements more common to the developing sectors of the world today. Will higher densities allow more space floating in the greater collective city? What are then the frameworks, the means of transportation, and the resulting structure of urban life? What becomes of the typical urban building blocks? How small can we collapse the unnecessary in order to create more space?

125. (Guinzburg 1982, 47)

126. (Friedman 2006, 103)

The ripple cast earlier by Yona Friedman is not far from a reflection of our current urban situation. He identifies two types of circumstances easily categorized as developed and developing cities. What he stress above everything else, is the need for the developed cities to consider new forms of organization, to cope with the growths in both population and, more importantly, the increase in poverty. In an increasingly crowded world, how do we accommodate this increase without degrading the quality of our urban cities, not to mention their energy and livability? How do we then provide an architecture within these circumstances?

"Can you think of any problem in any area of human endeavor on any scale, from microscopic to global, whose long-term solution is in any demonstrable way aided, assisted, or advanced by further increases in population, locally, nationally, or globally?"

- Dr. Albert Bartlett, 1998 [127]

127. Albert Bartlett. "Professor Emeritus Al Bartlett - Physics at Colorado University - Articles on Exponential Growth, Peak Oil and Population Growth, Sustainability, renewable resources and the Environment", http://www.albartlett.org.

Note: This section brings forth a short passage from Dr. Albert Bartlett's traveling lecture on Arithmetic, Population and Energy. Dr. Bartlett has spent the greater part of his academic and scientific career examining how to understand steady growth over time using simple mathematical arithmetic but more importantly, always within the context of finite environments. Generally his approach relies on the exploration of the effect of steady growth when applied to population size or energy use. In his opinion, population growth is our civilization's greatest challenge. Also, the statistics provided throughout are taken from several United Nations publications. These are identified separately in the bibliography.

Appendix 2

Urban Explorations

"Apparently, formlessness can be a sign of hidden order."

- Mark Wigley [128]

"Architecture equals the imposition on the world of structures it never asked for or that existed previously only as clouds of conjectures in the minds of their creators."

- Rem Koolhaas [129]

"When one says 'city', one implies the 'people' in it, not just 'population'. This is the first problem concerning the architect. If society has no form, how are architects to build the counterform?"

- Aldo Van Eyck, Team Ten [130]

128. (Wigley "Resisting the City", 107)

129. (Koolhaas 1994, 246)

130. (Risselada 2005, 290)

The Final appendix of this thesis is quite straight forward. Throughout the design explorations, several paintings were composed as visual arguments when the writing itself had yet to be assembled. Some have found their way into the thesis' body, but several pieces remain on the outside unable to insert themselves appropriately. The design of the *Overnight City's* megastructure generated a great deal of imagery and this appendix summarizes the author's most prized and relevant examples. The three quotations lifted on the previous page formed an appropriate platform that launched this investigation. The following paintings are visualizations on the speculations of both population growth and the resulting increase in urban density that was suggested throughout this thesis' development.

Working in chronological order from earliest to most recent, the first set of images represents a triptych composition on the nature of density and the quest for new housing environments. Working within the confines of the living conditions of the developing city's informal urban fabric, both the left and right panels speak to the need to claim the leftover spaces within existing city fabrics. Where the left panel approaches a selective, strategic parasitic growth within the urban environment, the right panel ignores the latter and builds above. The center panel, bridging the two criticisms, implies a merger of strategies as a protest upon an undefined city form. This triptych composition marks the first attempt at constructing an argument in favor of searching for new buildable surfaces within existing cities. This vision is to enable programme to be erected between and/or above existing buildings. In addition, as the urban centers redevelop their current buildings, these particular insertions would be strung across the skies above the existing city. Connected through pathways, they reach the ground only when necessary, minimizing the need for a larger footprint. Although the concept of the megastructure in these paintings was undeveloped to say the least, they suggest an organic freedom of spatial consumption through a living fabric. This attitude has remained consistent through to the conclusion of the thesis.

Following the previous triptych, a diptych composition represented a "before and after" concept based on the thesis' population projections. These images are the only ones rotated to fit the thesis book layout and need to be viewed with the right page on top [counter-clockwise rotation]. The important panel is the left one. Where the right panel identifies open space, the other speaks of congestion due to spatial arrangement in hyperdense urban worlds. This last one has served as the basis for the *Overnight City's* several design iterations.



FIG. 01/X2 Parasitic Architecture
House as Thesis as House, left triptych panel



FIG. 02/X2 Opportunistic Architecture
House as Thesis as House, center triptych panel





FIG. 03/X2 Suspended Architecture
House as Thesis as House, right triptych panel





Top of Page:
FIG. 04/X2 Hyperdense-World Section
Population Projection, left diptych panel

Bottom of Page:
FIG. 05/X2 Open-Space Section
Population Projection, right diptych panel

Moving along with the design speculations, the next set of paintings represents various takes on the concept of vertical extrusion. The first is simply the direct application where a vertical piece of infrastructure is stretched, and the undefined city following along its spine. Intended as a revision to the previously mentioned composition this applies a more direct massing strategy. This painting is also a predecessor to the one that appears in the Fourth Chapter identified as FIG. 03/04. The painting on the right page follows a similar logic but where the previous used a vertical method of extrusion, this painting suggests an organization built along the notion of a medieval wall. Inspired by dense informal settlements such as Kowloon Walled City, this panel proposes a return to compactness and, more importantly, a return to limitations. This represents the notion of construction within a finite enclosed volume.

Following this last example, the large painting on the next spread represents the first conscious insertion of a megastructure within Montreal City. Although an abstract representation, the painting depicts roughly the downtown of the city and the proposed matrix of infrastructure to fill the voids between the urban fabric. This painting remains one of the first departure points following the diptych composition mentioned earlier and its influence should be evident granted the final megastructure proposal.

This Page: FIG. 06/X2
Vertical Extrusion

Next Page: FIG. 07/X2
Walled City









The composition of panels on the right, the second triptych in this appendix, are various takes on the relationship of infrastructure, ground plane, and flexibility of buildings. Since a large focus throughout the investigation of the megastructure relies on the freedoms provided by undefined volumes, these panels each show one facade of this idea. From left to right, the left panel explores the possibility of floating blocks of programme removed from their anchorage to a common ground plane, the right panel explores the freedom of construction within the loosely defined containment of space, and the center panel implies the wrapping of existing fabric in new layers of infrastructures. The last two images in this appendix, placed on the next spread, are informal attempts at giving a shape to the thesis' argument while keeping in mind the previously mentioned paintings. The image on the left page calls for the further investigation of air rights within an existing urban center and the one on the right page is a return to the visualization of life within this proposed continuously alternating world.

Painting in combination with other visual media is used as a method to flush out concepts. The paintings provided are not as a black and white in their interpretation as identified but are a great deal more organic in their influences. The short descriptions were not intended to be explanations but more of a window into the author's process during the conception of the thesis's early design proposals. These are moments of insight frozen by the often arbitrary decision of completeness; their interpretation is intended to reflect this quality.







Above:

FIG. 09/X2 Floating Programme
Infrastructure and the Ground Plane, left triptych panel

FIG. 10/X2 Infrastructure
Infrastructure and the Ground Plane, center triptych panel

FIG. 11/X2 Freedom of Construction
Infrastructure and the Ground Plane, right triptych panel

Previous Spread:

FIG. 08/X2 Montreal Megastructure Concept

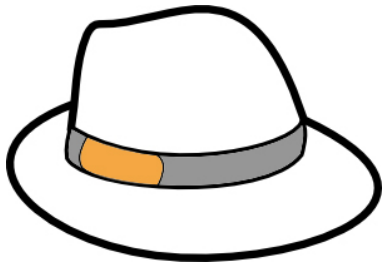
Next Spread:

FIG. 12/X2 Revision of Air-Rights

FIG. 13/X2 Life Within, second version







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