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EXILED PERIPHERY

Bound by Desire and Production.

Theory Project

Submitted in partial fulfilment of the degree Master of Architecture (Professional).

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PROLOGUE

THE CENTRIFUGE

The Beginning

It was a city of unimaginable beauty, where diverse ecological landscapes and people converged to live in harmony. The spatial scenarios were diverse; the lines separating one ecology from the next, one population group from the next, and urban from vast openness, was universal and apparent. It was a metropolis of extreme contrasts, its inhabitants desired to experience and live within this beauty in an uncontaminated manner, away from the dirt, crime and perversion that was so typical of the city they worked and laboured in. Their homes became spaces of solitude and calm, hermetic retreats where natural beauty could be appreciated.

Any attempts from individuals or groups, wanting to introduce aspects from the city into their peripheral neighbourhoods, were purged with quick effect, to preserve this ideal lifestyle that had been cultivated and not yet become contaminated. The community upheld their duty to protect themselves; collectively they were the guardians of their environments.

Life in the suburbs was comfortable. People equipped their homes to minimize the frequency by which they had to travel by car into the city. Typically the houses had large gardens with swimming pools which simulated the outdoors, and inside there was enough entertainment and electronic devices to keep its inhabitants happy for hours on end.

Trips to the local shopping malls happened infrequently, about once a week, but when they did go shopping it was done in large volumes. The home was equipped to accommodate for stock piling, much like an emergency bunker during wartime. The home and

the car collectively became devices which allowed for those living on the periphery to distance themselves form the world out there.

But all was not perfect in this beautiful environment, where much violence was submerged behind it's seemingly flawless facade. Crime and aggression against random people was common. There was an omnipresent state of fear in the air, fear of the unknown and fear of the city which concealed these people. Most felt that the less interaction with the city, the better and every attempt was made to keep the rogue elements of the city away from their homes. Large perimeter walls, with electric wired fencing mounted on top, was standard. Private security roamed the streets 24 hours a day, backed up by guard dogs and alarm systems.

Their homes were fortresses of their ideologies. When the inhabitants had to venture out of their suburbs and into the city, it happened quickly and seamlessly by car, without coming into contact with much of its obscenities. Visits were as brief as possible. As the population swelled and increased in riches, so did the ideology of each having their own piece of paradise. The citizens continued on a path of vast expansion, living ever further away, which meant that the city as a whole operated like a lung, expanding and contracting with people moving between their homes and work. This daily pattern occurred until weekends, when a quasi-stasis was reached, with most staying at home entertaining family and friends, while at times some ventured into the city seeking more. The separation of the city into two parts was desirable for most. It afforded the opportunity to have separate lives; one for living and solitude and the other for indulgence, production and sometimes excess.

Rapid Deterioration

The world was beginning to change. For the first time since the world wars, a collective, global awareness of impending catastrophe was imbedding itself into people. People were confronted with daily propaganda about the world being close to collapse, because of exponential population growth and the unrelenting consumption of natural resources required to sustain it. There was a sense of immanence in the air.

That day arrived far more abruptly than most had expected. The world's oil reserves had effectively run out, with only a year's reserve stored by government. No-one saw it coming, or at least it was always in the form of a rumour or backyard gossip, that was never taken seriously. There was no mention made of it previously by government, as they feared a massive upheaval within society if they did so, for it was they who did not invest in alternative modes of transport and alternative methods of delivering supplies and products. Government had to ration the little remaining fuel to a select few to delay the inevitable for as long as possible. In the beginning it was given to its top officials, the public bus service, refuge collection trucks and emergency vehicles. It was an enormous mistake; the sight of government officials driving around in private vehicles agitated the general population. People began to revolt. These vehicles became symbols of ineffectiveness and deception. Within weeks the killing of officials began, as citizens took aim at the soft, moving targets deemed the source of their problems.

There was no alternative but to allow only busses, refuge collection and emergency vehicles as motorized transportation. The citizens were on edge. Their freedom depended on a few busses. For many this reality had never existed before. Within weeks their lives had been altered irreconcilably; before they were predominantly nuclear families, moving in and out of the city for work or study and back to the confines of their comfortable homes. Now that mostly consisted of long journeys into the city. As time passed, frustration became endemic, especially for those that lived on the periphery and needed to commute into the city, which was nearly everyone. The waiting times for busses became unbearable. There were simply not enough of them, especially on the periphery where the city was so haphazardly occupied. For some it took up to two hours to walk to the nearest bus stop. Their commute consumed most of their day. Their lives as they knew it were impossible to sustain.

The suburban ideologies people fought so hard to sustain had swelled the city beyond its means. It became like a monstrous obese person, consuming until it was unable to move, its excessive consumption now blocking all its arteries. The metropolis was so out of proportion that it was unable to service itself.

The city was on the verge of total collapse, purging its dead weight. Policing became impossible as citizens were constantly venting against malfunctioning municipal infrastructure. For many, the scenes of violence were only ever a reality seen on television, of how the poor living in the ghettos attacked police and city property. To them those images had never made much sense, but now, suddenly and forever, they understood.

Hand Over

Without fuel there was no way of delivering basics like food or medical equipment. The government had to recommission its old freight trains to take on delivery of these essential items to the urban centres. It soon turned into a military exercise as gangs quickly ceased the opportunity of exploiting the points of delivery. The gangs were fighting each other and the police on all fronts to get control of basic services and supplies. The gangs grew rapidly as they gained control of most it. This ensured them a constant capital flow as well as membership.

As the only mode of transport, buses were rapidly overtaken by these gangs seeking to control movement. They realised that if they could control movement, they controlled people's freedom and essentially the way people lived. They eventually extended their reach to refuge collection while the city managed to hang onto its emergency vehicles.

The gangs filtered the reach of busses and refuge collection by stopping them reaching the suburbs. The suburbs were problematic, not because there were not enough people as most of them lived there, but because they were so spread out. They could simply not to justify the fuel resources. As rubbish piled up in the streets, citizens on the periphery stopped paying utilities. The city had no option but to cut electricity and to confine water collection to designated points. Since water did not flow into the private home anymore and collection had to be made in public, it became easy to control by gangs.

The city reached breaking point. All the services that had once held the city together gave in. Previously passive, hard working, family people joined the fray, attacking the city's infrastructure and each other. The swell of destruction became unstoppable.

Hanging On

Families had to confront their circumstances. The ability to travel was non-existent, as there was a complete infrastructural meltdown. The suburbs had no inherent infrastructure that could be used to generate an income with. The metropolis had effectively been built in two parts; one for living, the other for working. For those living at the periphery, which was most, there remained no alternative but to split the family into two parts; one parent had to move into the city to remain employed and generate income for the family, at least until the situation cleared itself up. Schooling was the other determining factor that kept families in two locations. It was the one institution that could not be moved to the city, be it due to attachment, nostalgia or fear of their children being victims of city violence. The unanimous response was to keep one parent at home in the suburbs to fend for their children and to ensure that they get a complete education. Students lived on campus and scholars had to relocate to the nearest school so they could be close to home with parental guidance. The family unit was stretched beyond comfortable levels. Those parents that moved into the city effectively became urban nomads, migrating between the centre and periphery during the week and weekends to be between work and family.

A typical day for those left behind consisted largely of parents and children walking to and from school. For some that took up to an hour and a half. They could not even go to the shopping mall anymore, which had provided them with most of their out of house entertainment, because they had all been shut down. Food security was a problem; delivery was only focussed on the city which left people from the suburbs with no option but to join communal farming enclaves that had sprung up near the schools where parents spent their days. There was no currency exchange which ensured a labour base. Those

that did not work had no access to the food, which meant everyone was involved in one way or another. The children joined after school, the young ones playing in the fields while the older ones tended to the crops. Life in the suburbs became medieval; it had become purely about survival.

Adaptation

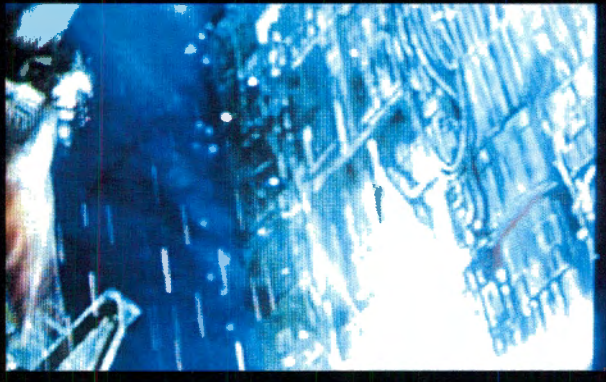
The first migrants from the suburbs moved into deserted buildings which quickly filled to capacity. Before long, temporary housing had to be erected to accommodate for the influx of people. There was no space left though. Previously the lifelines of the city, but now rendered useless, highways, parking lots and streets turned into accommodation corridors. At first it was a ramshackle of adobe shelters hugging the ground, but it rapidly transformed into an industrial process of well co-ordinated, multi-level dormitory living cells, growing out of the ground and surpassing in height most of what had already existed.

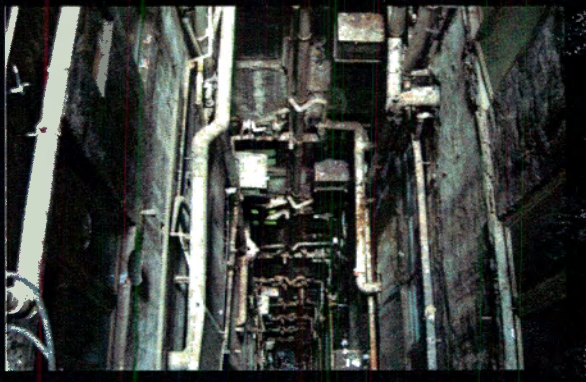
These new nomads saw it as a temporary situation. Their new living environment resembled nothing they had previously known. It was a far cry from the life of luxury and comforts that they had built around them. Their new living environments now became the most basic denomination of their lives and the ideology, which they had fought so hard to protect, was now with their families to uphold.

The city was under immense pressure to deal with the influx of temporary workers. It became the part-time home for nearly a million people desperately adapting to an environment they had never known before. Confrontations were frequent and at times violent. Previously hard working, family people found themselves on edge and quite often the instigators of aggression. Aggressive behaviour was endemic and the policing of outbursts became impossible to contain- at least through the structures of the law. The nomadic community began taking on the responsibility of conflict resolution, in an attempt to avoid a state of total anarchy. It worked for the most part…

Life, for most of the new city dwellers, was tough. The confinement to a cell was too much to tolerate. There were no basic facilities in the cells; nowhere to cook, no living room and no washing or toilet facilities. Every aspect of the home was outsourced to the city; the home had become a dismembered artefact, a relic of the past. The city contained more basic living facilities than the home, which meant that for the first time these nomads were spending significantly more time in the city than at home. Their lives were effectively inverted, stretched into obscure spaces of the city.

There were basic facilities localised within the cellular living pile, like toilets, small restaurants and tiny cinemas, but the monotony of visiting the same places, especially the restaurants for dinner, was too cyclical for most. Restaurants, movie houses, bars and parks were filled with singles going about their daily lives, as many had stretched their daily routines at random throughout the city. They were exploring and discovering new qualities the city had everyday. It was not unusual to see a single person arriving for dinner at a restaurant, straight from the bathhouse, dressed in sleeping gear, as the extension of living

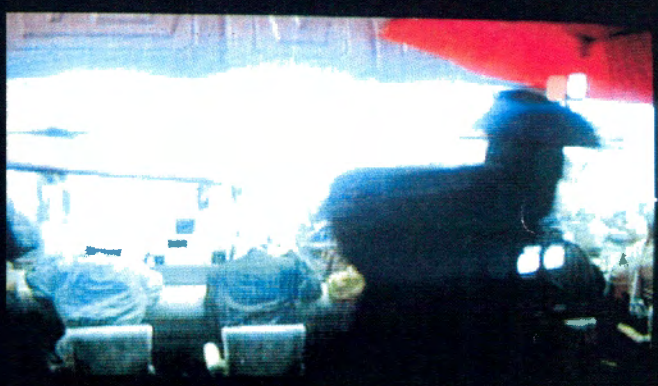




beyond the home began blurring people's judgement of how they had to appear and behave in the city.

There was a sense of liberation beginning to imbed itself within the individuals living in the city. They were beginning to enjoy the complexity of their days which they experienced trying to survive. It was no longer the place they had only visited in groups. Their exiled homes became devices which involuntarily empowered the individual to use the city as they pleased. With all this crossover layering, attributed to basic living needs, new forms of interaction developed amongst people. There was a sense of impermanence shared by everyone, partly because their families were not with them, but also because of the vast amount of interaction they shared with others, with varying degrees of intimacy. Like never before, strangers shared new found proximities and experiences. Of all the new things they had to adapt to, the most unfamiliar were visits to the bathhouses. Going to restaurants, cinemas and bars were not uncommon, even in the suburbs, though it was far less frequently done. The bathhouses, however, were anomalies. These were unisex spaces which tested the very morality of the incoming, family orientated people. It became the space which most openly tested people's desires and their commitment to their families. The city allowed them to indulge in activities that family life in inert suburbia simply did not tolerate. It unlocked the repressed desire that many had never accessed or thought of.

Nic Bornman 05/2009

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Family Partitioning

A devastating trend emerged which began to destroy the very core of the family unit, as partners began to visit less over weekends. At first, the visits had been frequent, every weekend without fail, but within a year this typically became less and less. Weekly visits turned into fortnights, which turned into months. Returning city workers felt estranged by the emptiness in this place they had once found so desirable; it had become increasingly impotent to them. They missed life back in the city and they came to realise that the city had given them a new sense of being filled with desirability. Even with all its imperfections and chaos, the city had actually become appealing to them.

It was no surprise that those left behind on the periphery became restless, their lives having been turned into banal daily routines. They sensed the new found pleasure in the lives of their partners and this frustrated them. The farms became the only social stimulus for those left behind and as time passed, work became less physical and more of an emotional engagement. Everyone shared a common bond in the hardship of the times, which was felt both physically and emotionally. They consoled each other, especially about their discontent towards the lives their partners were living in the city, while they were stuck in this dreadful environment. Just like in the city, everyone had instantaneously become single. They had received no emotional or physical stimulation and this had predictable effects. There was a complete remapping of emotional engagement, stemmed from society simultaneously experiencing the same emotional issues in large groups, compared to previously when everyone had scattered emotional experiences in relation to each other. There was initially emotional indulgence, which eventually extended into satisfying the urges of sexual abstinence.

Architectural Graveyard

Large patches of the city periphery turned rural as people continued emigrating into the city, while for those remaining in their massive homes the place only became lonelier. On an annual basis the periphery was emptying out, as parents fulfilled their roles of getting their children through school. Schools turned into skeletal versions of themselves, as those scholars who graduated annually were not replaced by any incoming students. As schools emptied, so did the suburbs. The final bastion, which congealed the suburban periphery, was beginning to dissolve and so with it it's population. Thousands of people were evacuating the metropolitan periphery at the same time of the year, turning the suburban landscape into an architectural graveyard. Overgrown mansions dominated the landscape, while roads became indistinguishable; nature began to consume what was once part of the city.

The Afterlife

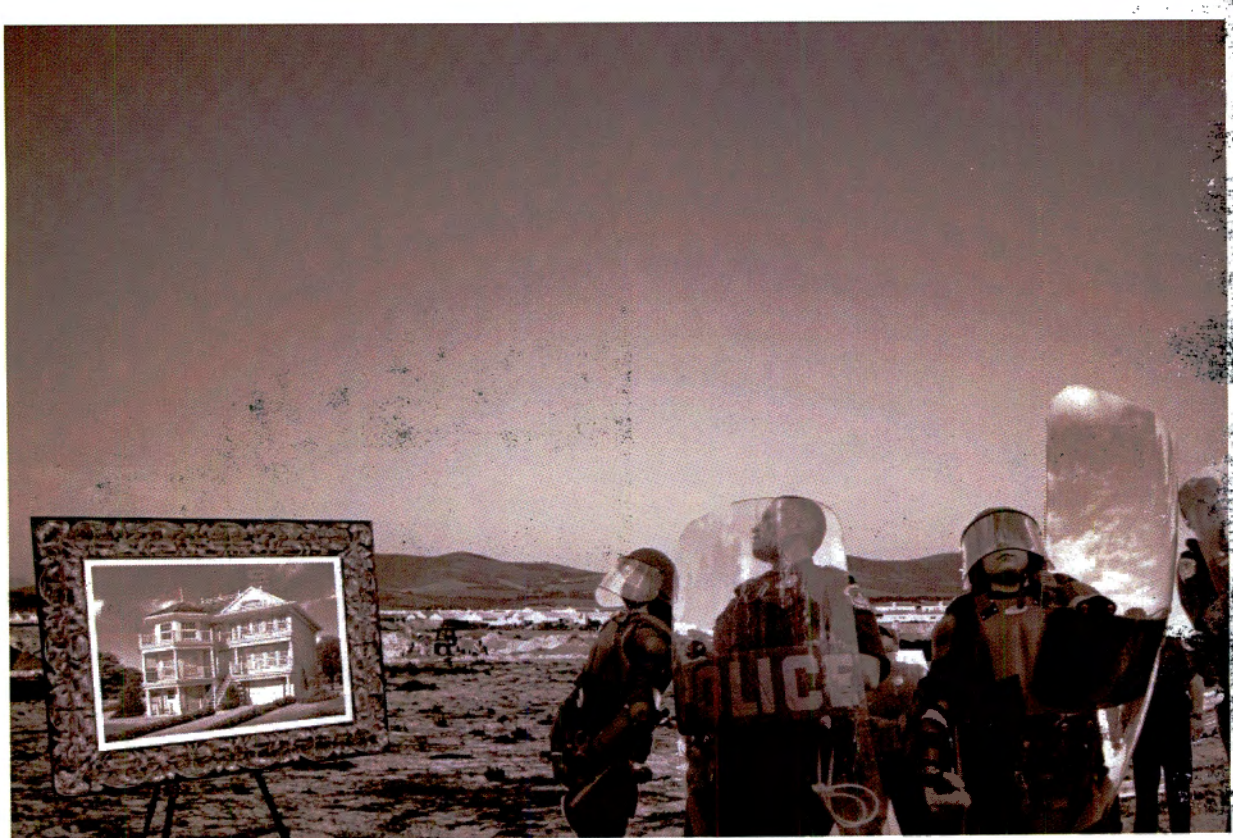
It took the city twelve years to completely contract in on itself, as graduating scholars and their parents left the suburbs en mass for the city. Their environment was simply too harsh and their longing for family life too strong. The city's population swelled exponentially with these new arrivals. They were easy to spot, usually disorientated by the intense visual overload and droning sounds of human activity. They were also dressed very well all the time and walked around with large bags containing all sorts of paraphernalia for all eventualities in a place they were still

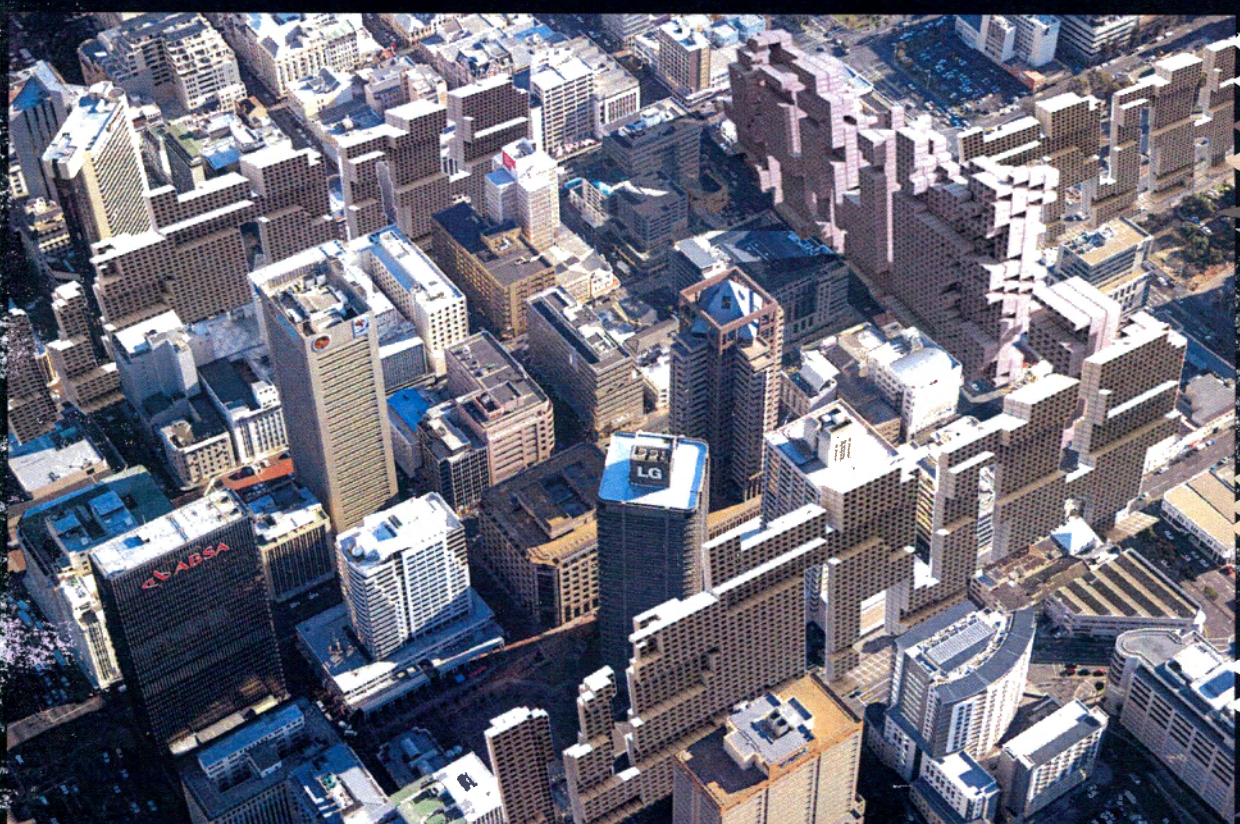
trying to comprehend. They would eventually learn that the city provided everything they would need for the day before returning home.

Most families were reunited, but their lives would be forever altered. There was a uniform acknowledgement of, and amnesty granted to partners for the adultery committed while apart. For the first time children became prevalent on the streets again, as new ones were born in the city and filled the void of youth which were previously exclusively schooled in the suburbs. The city was also beginning to diversify again; it was no longer only a place occupied by single working people.

Living environments adapted accordingly with the formation and reunification of families, but fundamentally it remained compressed by the limitations of available space. Family homes were typically not a series of connected rooms, as it had previously been; it was common to find families dispersed throughout an accommodation block, in a variety of configurations, often only to meet up in a park or restaurant. The luxuries of before were now seen as limiting, outdated and socially hermetic. A new order had been established.

The end.

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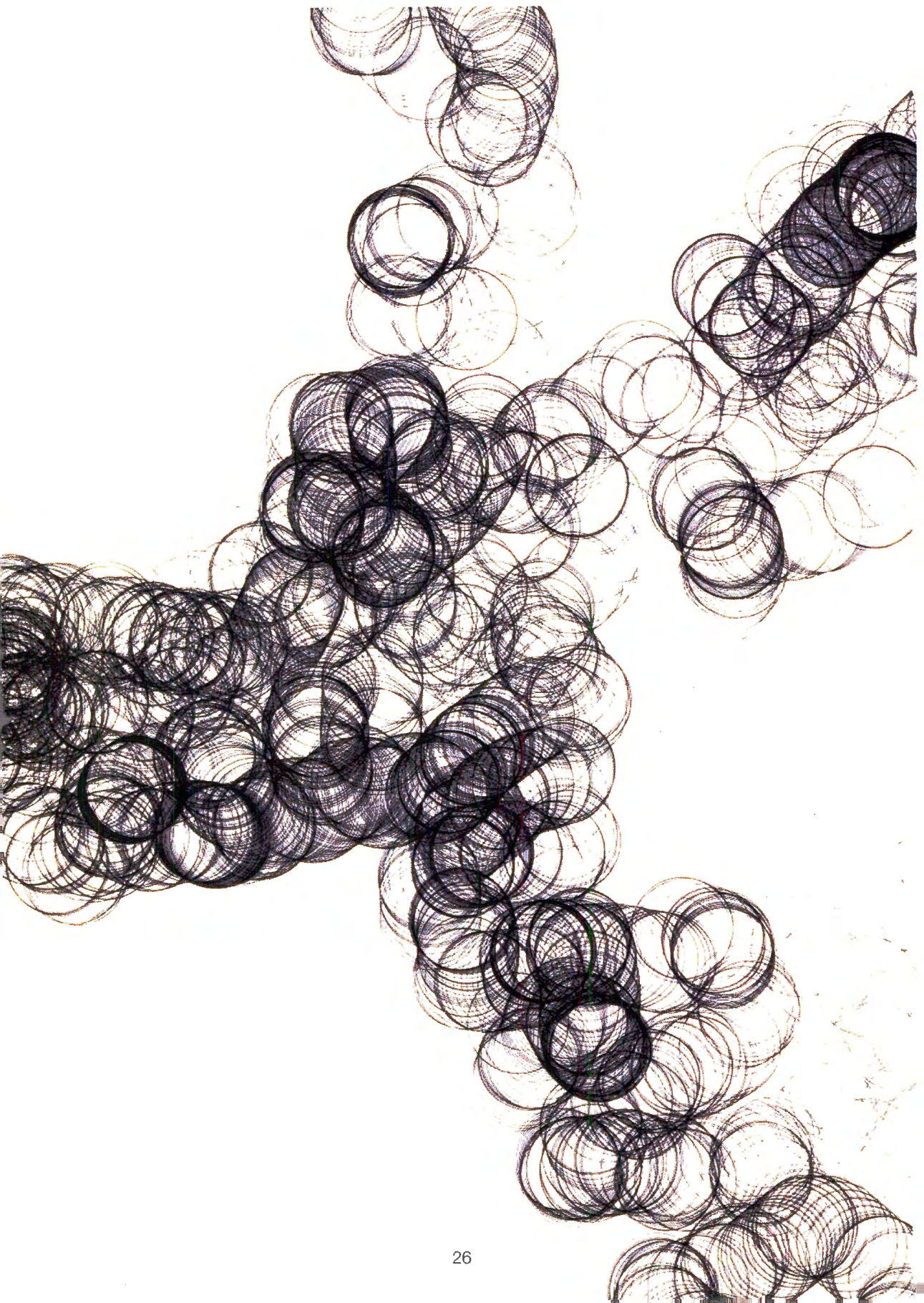

THE EXILED PERIPHERY

Bound by Desire and Production

Project Outline

This project is an evaluation of the city as a holistic entity- in this case Cape Town. It is about exaggerating, merging and at times contradicting different components of the city and combining it into an intense, dynamic condition which is embodied by architectural potential. The primary underpinning concept is to unearth and melt the pervasive separation between living and production so that their relationships can become liquid in relation to another. The thesis is to address this dichotomy by inextricably linking to both narratives through their parted locations and programs to be a fundamentally integrated and complex condition. The focus thus falls on society both privately and publicly and the complexities that result between them.

There will be a focus on the space of (re)production as being significantly driven by the continuous and redefined arrival of consumer traffic and the corresponding subsidiaries necessary to sustain their massive infrastructural networks. Production has developed into a continuum of renewed representations of consumption which has lead to a surge in urban spectacles. The project will thus be balanced in the perpetual and obsessive desire of pathological consumption while trying to maintain some kind of privacy for the individual.

Cognitive awareness of social depth and behavioural complexity needs to be unearthed and at times be revealed. It implies that space not be arranged as a series of compositional elements but rather defined by human activity. The reading of social activity is essential; it aims to transform the existing hermetic architecture dominating life in Cape Town to a stage set hosting visually complex user patterns that confront the issues at hand; namely crime and social inequality at large.

BUILDING TYPOLOGY

Statistics and figures show that the city needs to build housing for 700, 000 or 19% of the population who currently live in shacks or backyard dwellings. Current density in Cape Town ranges between 2100 and 6500 persons per square kilometre with an average density of 4000 persons per square kilometre [1]. The city will effectively accumulate an additional 180-300 square kilometres of horizontal mass depending on the housing typology used. All this amounts to additional roads, piping, transport, electricity to name but a few basic infrastructural requirements. However if we were to adopt other global city density models for example: Paris the city would need 28.7 square kilometres or Hong Kong 14 square kilometres.

The current housing solution when building homes for the poor has been to drop it down in the least intricate and geographically complex parts of the city. Evidence suggests that this model is not about to change. We can therefore assume that the city will continue to further exaggerate and stretch the relationship between living and production for an additional 700, 000 people who will be conveniently plugged onto the periphery.

It goes without saying that to plan future housing delivery as attachments to the urban periphery would for ever lock in poverty and social segregation endemic in South African society. Dignity cannot be quantified through bricks and mortar; it operates at a far deeper social level.

At its most basic level the city will have to accommodate 700, 000 people and counting within the productive city. Large land parcels which can accommodate low-rise high density housing typologies within the productive zone are few meaning much of the informally housed population will remain peripheral. However the city has scattered across its surface thousands of small land parcels of which many are City owned within the productive zone. The only building typology capable of confining itself into these parcels at the densities required are tall buildings. It becomes a matter of using architecture as a device which can critically engage and invert the city as we know it into a much more fluid programmatic condition.

The hypothesis is a high density vertically occupied mix of living; production and spectacle. It will be unpacked and woven into the fabric of the architecture and the city through social location and applied technology. The universal tower as an object of financial speculation and horizontal social stratification with a skin cloaking structure will be the antithesis. The typology of the tower will turn the angle of infrastructural investment of the City and Government 90 vertical degrees by omitting wasted infrastructural capital currently spent to push the city horizontally beyond its means.

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[1] www.demographia.com 05/2009

USE: **LIVING, WORKING, CONSUMI**

HEIGHT **150M**

AVERAGE GFA PER FLOOR: **900SQM**

OTAL FLOOR AREA **50 000 SQM**

GFA: NRA RATIO: **70-80%**

FLOOR HEIGHTS: **3m (75%) - 4.5m (25%)**

AVERAGE PERSONS PER LEVEL: **78 PAX**

WORKING: **600- 1000 PAX**

Note to the reader: The project, at the time of print is theoretically based with the design heading into pre-conceptual formal design enquiry. It is however important to state the typology and intended scale of the building to grasp the technological issues the building will inherit and at times challenge. The preconceived numbers and resolutions assumed are aimed only as a guide.

BUILDING TYPE: **TOWER**

IG, SPECTATING, PRODUCTION

TOTAL VOIDS: **15 000 SQM**

TOTAL FLOORS: **40 LEVELS**

TOTAL PERSONS: **2700- 3200 PAX**

LIVING: **1700- 2200 PAX**

ELEVATORS: **10-13***

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1010
大快活
fairwood
PEPSI
大家樂
IXUS
EOS 5D

THE UNFILTERED CITY

The city is seen as an artificial accumulation of human activity and organisation, which is an unpredictable, unfolding forum of complexity, contradiction and encounter. It cannot always be understood.

The city constitutes the most civilized and desirable form of human occupation; it is like an addictive magnetic device which naturally compresses in on itself the more it has to accumulate; based on a society of self constraint ensuring continuous intensification of the urban condition. Proximity of program and activity is not predetermined or governable but instinctively self locating and evolutionary; a brothel may share an entrance with a church through the lobby of a hotel or be individual entities spread apart. Tolerance is not tailored but endemic. The ordinary is as significant as that which is special.

The city is a slow moving grinding machine; its congestion not a depiction of inefficiency but the result of accumulated of activity. Congestion is only superficially chaotic; when layers of activity are extracted individually it becomes clear that the congestion is in fact instinctively organized and streamlined. The need for a vehicle to drive at high speed down a freeway is seen as the result of inefficient programmatic proximity; while being able to buy extruded mild steel H-beams in the basement of Gucci or McDonalds is seen as efficient.

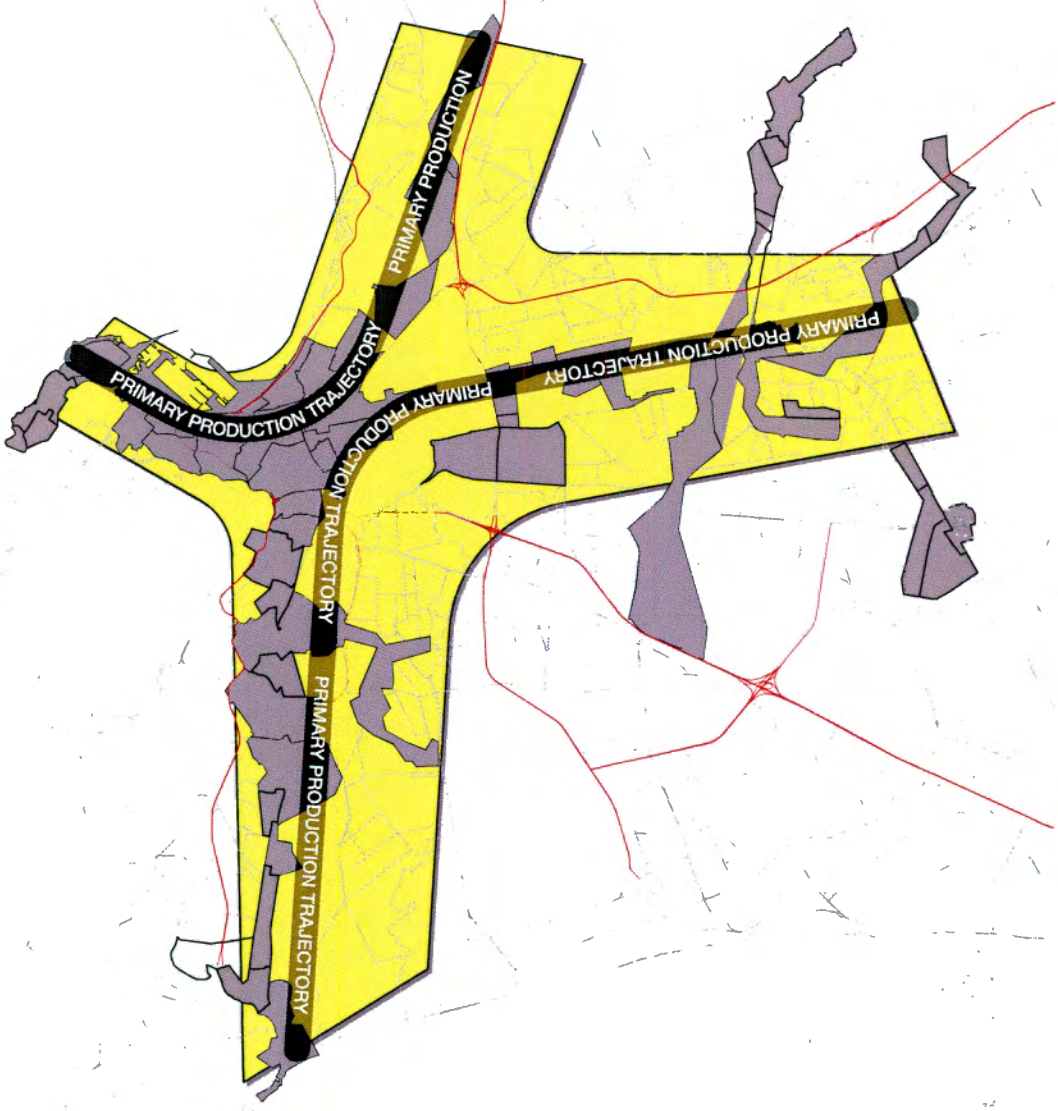
The renewal of the city, by multiple agents, on that which has become redundant or inefficient when juxtaposed to the old and historical will ensure the integrity and complexity of the urban condition. The city is a stage set which conducts the complex dynamics of social relations organised around the infrastructural webs of production (knowledge, labour, power and technology). [2] Living and production can be clearly defined from another in that they are essentially contradictory in nature. The spatial systems that integrate them are heterogeneous with variable gradients of intensity and outcomes. It is here where the complexity of the city lies.

The infrastructural web binding society and production should not be seen as a system which connects detached entities but rather as an integrative and non-linear interplay of continued renewal between what is public and private. It is therefore the proximity between production and living which determines the space between. The clearer the spatial definition in-between the less spontaneity and generative outcomes will be present. It is therefore essential to push the tolerances ever more between living and production to obtain a dynamic urban condition.

2 Lefebvre, Henri. The Production of Space. Wiley-Blackwell. New York. 1992

X-LOPE Urban Model

Cape Town has designated its production along two primary trajectories. These trajectories have to act as development magnets that contract the city and avoid more homogeneous sprawl.
The **X** is a superficial envelope that demarcates and contains the city into a intensified environment based on complexity, contradiction and encounter.



BLIND APARTHEID

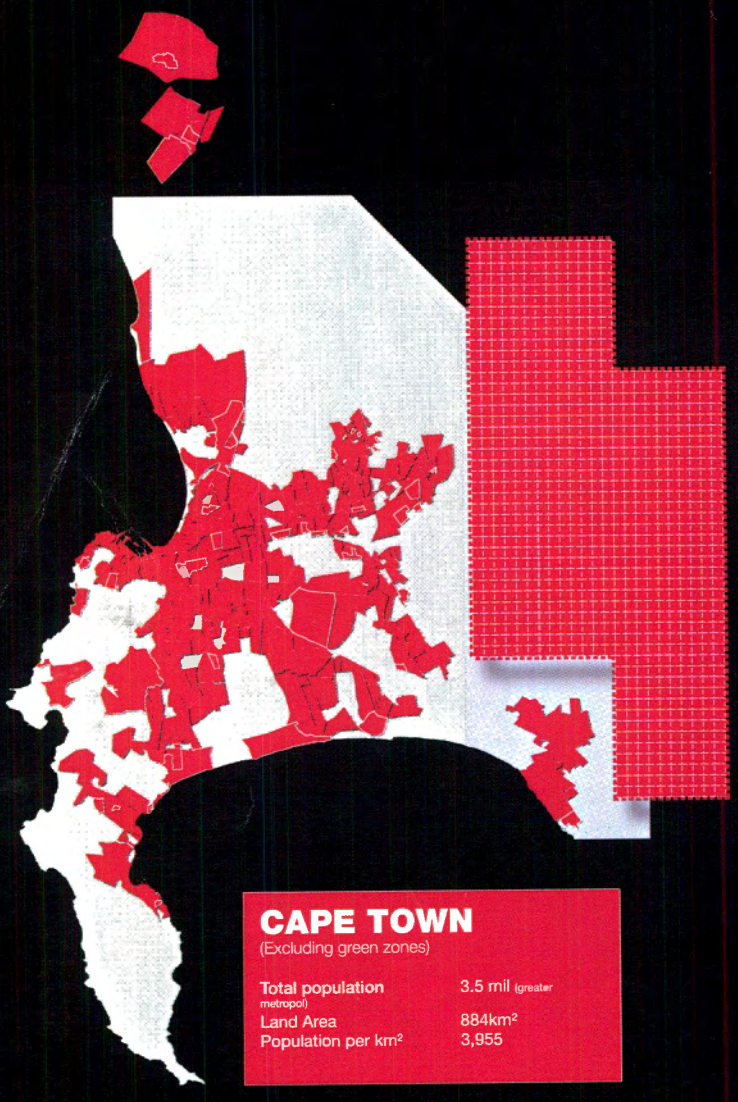
South Africa is a country of extreme contrast and diversity. Cape Town is bipolar; at the one end it has extremely complex racial, economic, political and social compositions. Yet the lines separating rich from poor, urban from suburban, production from living and public from private has it arguably being among one of the most clearly defined and arranged cities anywhere in the world. There is no spatial correlation between to what is essentially a very complex city.

The dominant departure point remains the legacy of Apartheid of the urban condition. It needs to be noted in addition that the city has a much broader apartheid that is not only racially based but urban too. The city at present is an urban dichotomy, that has partitioned in one form or another nearly every citizen from it productive zones. It's partly due to zoning laws and a perception by people that living should be treasured and absolutely private at every opportunity.

The city has therefore quite simply not had enough pressure exerted on the urban condition. It seems to be content and protective of its inert character by pasting desperately dull and redundant urban fabric without any restraint.

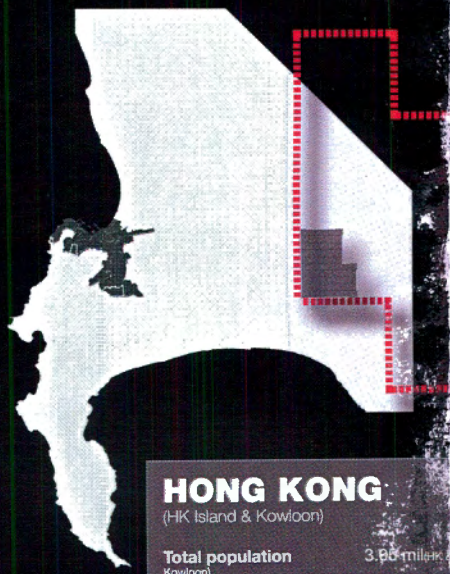
Obsessed by ownership and protection the city is composed of intensely inclusive and introverted environments; fuelled by a lethal combination of a society gripped by extreme fear and the disconnect between the 'lived-in city' and the 'productive city'. The city is currently withdrawing into ever deeper introverted realities via the home.

ADT security alone has 200 000 security posters on homes in Cape Town which amounts to 42 km² of surface area boundary walls



CAPE TOWN
(Excluding green zones)

Total population (greater metropol)	3.5 mil
Land Area	884km²
Population per km²	3,955



HONG KONG
(HK Island & Kowloon)

Total population (Kowloon)	3.90 mil
Land Area	61.1 km²
Population per km²	49, 919

KOWLOON
(WALLED CITY)

Total population	50. 000
Land Area	0.03 km²
Population per km²	1.924,563

Comparative density studies of **Cape Town** in relation to other world cities.
The diagrams superimpose population densities per square kilometer from **Hong Kong, New York, Mumbai, Kowloon, Paris and Los Angeles** and is mapped out as a footprint on the Cape Peninsula.

ALL FOOTPRINTS CONTAIN 3.5 MILLION PEOPLE RESPECTIVELY- THE EQUIVALENT POPULATION OF THE GREATER CAPE TOWN METROPOL

NEW YORK
(Manhattan)

Total population (MANHATTAN)	1,55 mil
Land Area	72.5 km²
Population per km²	21, 382

MUMBAI
(Marine Lines Ward)

Total population	197,228
Land Area	1.77km²
Population per km²	111,428

PARIS
(VILLE DE PARIS)

Total population	2.12 MIL
Land Area	87 km²
Population per km²	24, 439

LOS ANGELES

Total population	3.7 MIL
Land Area	1289 km²
Population per km²	2,850

THE ENTIRE POPULATION OF SOUTH AFRICA (44.2 MILLION) AT HONG KONG DENSITY WOULD FIT INTO THE 886sq KILOMETER BUILT FOOTPRINT OF CAPE TOWN.

CAPE TOWN IS THE WORLDS 552th DENSEST CITY

AT THE DENSITY OF THE KOWLOON WALLED CITY CAPE TOWN'S ENTIRE POPULATION OF 3.5 MILLION PEOPLE WOULD BE ABLE TO FIT INTO THE GREEN POINT COMMON AND STILL HAVE SPACE TO KEEP THE GOLF COURSE

At the density of Mumbai's Marine Ward
Cape Town could fit all its residents into the neighborhoods stretching from Sea Point to Woodstock

If Cape Town adopted the density of Paris it would be able to fit 6.3 times into itself and have a population of 22 million residents.

ADT security alone has 200 000 security boards up on homes in Cape Town which amounts to 42 km^2 of surface area stuck on boundary walls... this is half the foot print of Manhattan which accomodates 900, 000 residents.

* http://www.demographia.com 05.2009

Perceptions

'Almost without exception South Africans have anti-urban values' and a fixation on owning a lot of space[3]. As a country with extreme variations in wealth the problem is further compounded by low-density suburban models which can be afforded by the wealthy who have disproportionately large homes in low intensity environments. The ambitions of the poor are to simulate this lifestyle. Rapid urbanisation has seen the rural way of life being imported into the city which is both an interpretation of past environment and a means of economic survival. 'The tradition of urban living in South Africa is relatively short and nostalgic feelings toward rural or farm lifestyles remain'[4].

'Projects carried out with a variety of students from different backgrounds in the University of Pretoria revealed that they view the ideal city as made up of discreet mono-functional low-density areas, separated by green belts.[5]' This idea of what cities are and should be is based on their experience of their surrounds be it urban or rural. Based on their experiences or for that matter inexperience there is a resistance toward alternative ways of living. 'In recent studies of incremental housing in developing countries, it has also become clear that residents recreate, or reform, their environment until it resembles the rest of the city[6]'. This can be seen in a study of housing projects where research points to residents consistently choosing larger lots or homes with inferior services over smaller lots with a higher quality home that is better serviced. [7]

In a survey of squatters on the outskirts of Pretoria, 95% chose detached houses and 5% high-rise flats as the preferred type while no-one chose an alternative typology[8]. This negative and naïve attitude towards urban living means the urban population either do not need, understand or appreciate urban environment[9]. 'These views and aspirations will not change spontaneously. Examples are needed of what compact living could be like... where government (should become) involved in pilot projects to develop alternative typologies, which could educate people on the possibilities of compact living...[10]'

---

3 Schoonraad, M. 2000. **Some Reasons Why We Build Unsustainable Cities in South Africa.** Pretoria: Department of Town and Regional Planning, University of Pretoria

4 Barbir, J. 1998. **Urban Design within Local Government.** Paper presented at A Short Course on Urban Design. Spatium, Clarens. p.9

5 Schoonraad, op cit

6 Tipple A.G. 1996. **Housing Extensions as Sustainable Development**. Habitat International. 20(3):

7 Napier, M. 1999. **Consolidation Pathways of Households in Core Housing Settlements in South Africa.** Paper presented at CSIR Workshop on Consolidation of Housing through Self-Help Extensions.

8 Schoonraad, op cit

9 Barbir, J. Op cit. p 9

10 Schoonraad, op cit


The city has quite simply not had enough pressure exerted on the urban
condition. It seems to be content and protective of its inert character by
pasting desperately dull and redundant urban fabric without any restraint.

The South African Home

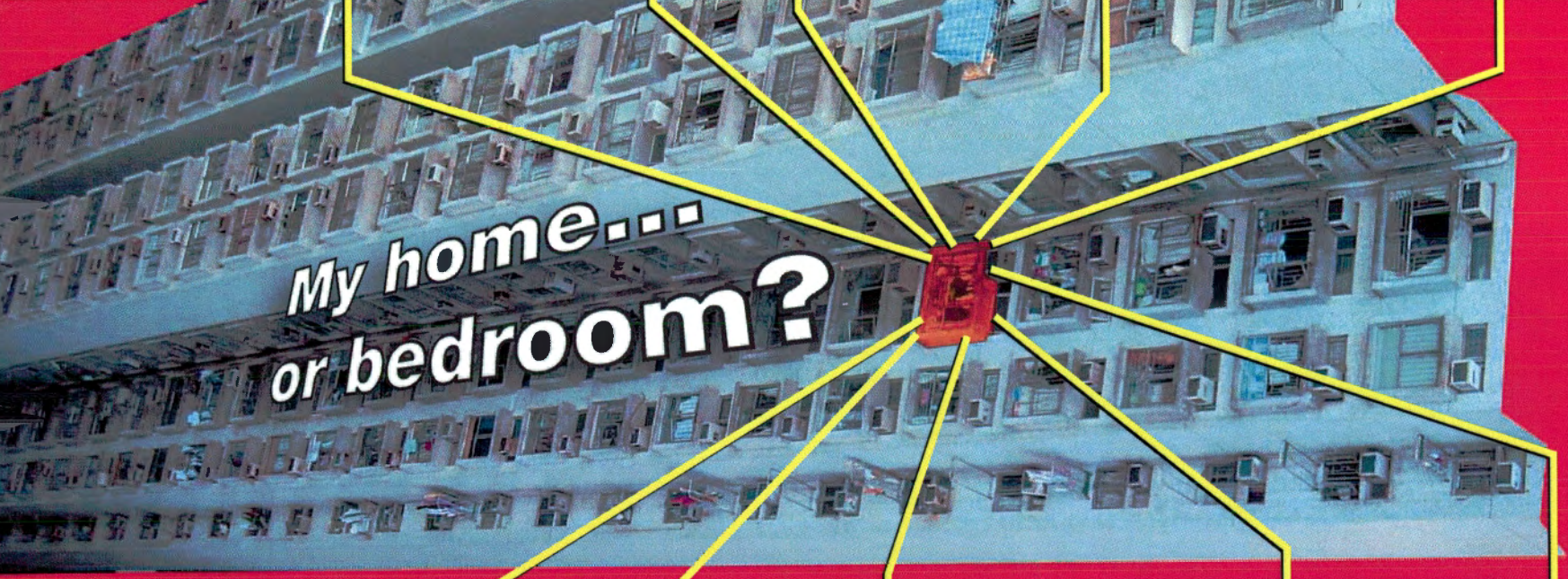
South African suburban homes are in one way or another defensive and resist the urban condition; both by an obsession for security and how well it simulates the city. Homes are packed with elements to endure hermetic social activity- like bunkers in war time the home in South Africa is equipped to provide and shelter against the city while engaging with the city is reduced to a minimum via private transport.

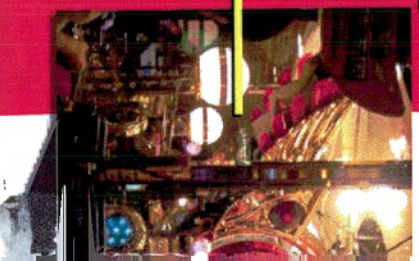
The homes of the poor; by enlarge however, are models of absolute minimal existence. However they share a common relationship with the rich toward the city, underpinned by flimsy connectivity, -integration and -infrastructure. The predominant building type (the RDP home) which will be constructed for future generations is currently so void of anything meaningful qualitatively and quantitatively that it could actually contain great promise as an urban device. Current RDP homes are mono-functional free-standing squares on disconnected parcels of land at low densities. 'From a survey[11] in Mamelodi it appeared that between 30 and 60% of residential properties are used for non-residential purposes varying from day-care, selling of a variety of daily goods, restaurants to repair of electrical goods. This is not always visible to an outsider as no special structures are necessarily erected and some of these activities take place on an ad hoc basis as the need arises. Although areas are planned as mono-functional, they soon become mixed in terms of use[12]'

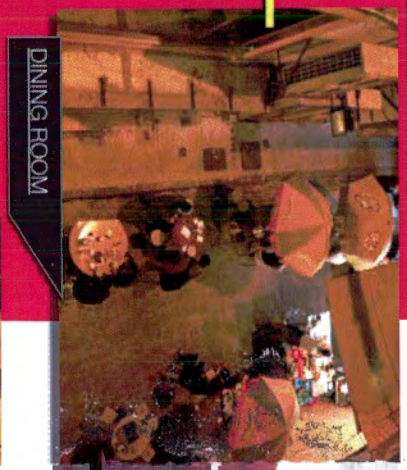
11 City Council of Pretoria (CCP) (1998a) **Mamelodi Integrated Development Plan**, Drafted by University of Pretoria, Pretoria.

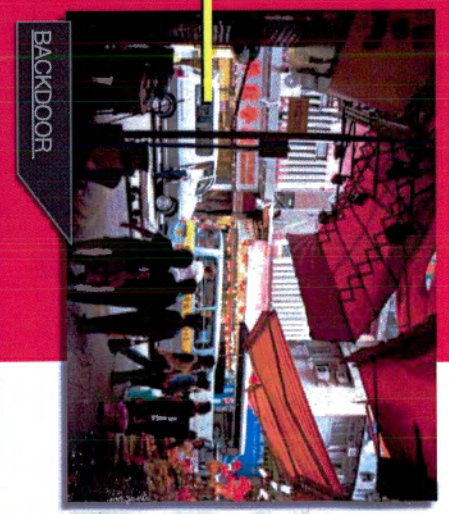
12 Schoonraad, M. 2000. **Some Reasons Why We Build Unsustainable Cities in South Africa**. Pretoria: Department of Town and Regional Planning, University of Pretoria

My home... or bedroom?









GARDEN

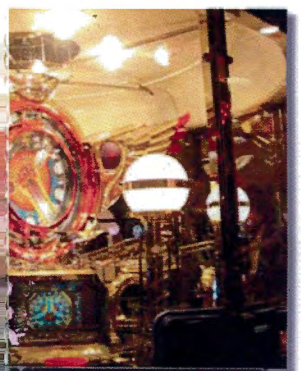
FRIDGE

BREAKFAST ROOM

KITCHEN

STORE ROOM

LAUNDRY ROOM



ERTAINMENT ROOM

The Outsourced Home

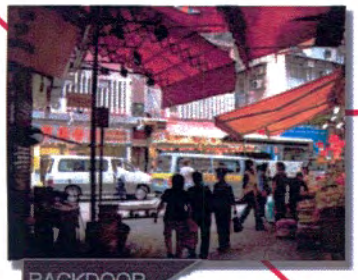
In major global cities the majority of its population live in the most minimal of circumstances. Be it in New York, Hong Kong or Tokyo, the reality for most in these cities are life in a shoebox. The comforts of home are substituted by extreme and near-omnipresent urban intensity. The consumer economy and relating infrastructure is fractal and located throughout the urban terrain. In South Africa the economic landscape is far more concise and extremely selective. Going anywhere becomes a destination in itself.

By contrast in Asia commercial and production infrastructure is fundamentally integrated into the living domain. Multiple layers and the proximity of programmed activity ensure that by default everyone is integrated into and can source from the city regardless of circumstance. It is essential that the project inverts the current housing model of the city. The model home will have to essentially be fractured and redistributed into the city in order to remap the way the city is used and engaged with. Fractal programming that will dismember and liberate the home from excessive programmatic baggage. It will effectively and inadvertently make the home into a device which is useful to the city by merging the tolerances of private and public life. The proximity of human density in relation to production is a critical component.
The overlapping of social practice has a long way to go in South Africa; by outsourcing the home as an extension of the city more vigorously along communal principals it could go a long way to transgress these issues South Africans face. The communal therefore in this case refers to the extension of experiences and finds less fulfillment in personal possessions. The redistribution of the home could have a profound effect on how the city is perceived and used. It has the potential to dissolve the partitioning of race, economy, age, class and gender distinctions that has so meticulously embedded itself in South African society. The project will thus focus on providing accommodation for multiple user groups or essentially different economic and racial groups. The logic is that if the project is exclusively aimed at the poor or rich it would simply contradict itself by exaggerating existing social segregation. Technologically there would have to be a realistic separation of both cost and product assigned to these different housing groups.

MY HOME MAP


GARDEN

FRIDGE


BACKDOOR


BREAKFAST ROOM

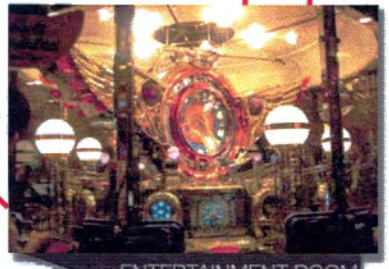
TV ROOM


STORAGE

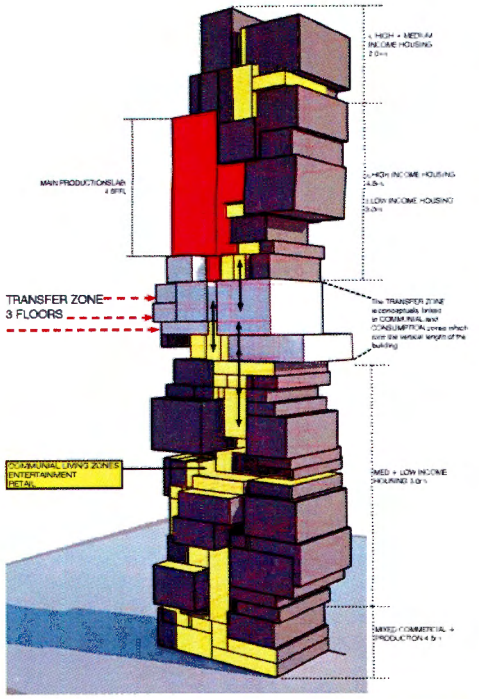

KITCHEN


DINING ROOM


LAUNDRY ROOM


ENTERTAINMENT ROOM

COMMUNAL PROGRAMMING



Communal Kitchens

In principal are communal spaces dedicated to shared cooking facilities. It will provide flexibility for example where different teams can cook on alternating days for large groups within the building. These kitchens will also serve the canteens and can expand potentially as businesses for catering.

Families occupying more than 1 housing unit

South African families are often very large. The aim is to redefine what a family living arrangement is. For example: Does it necessarily have to be a series of connected rooms to be called a family home or can it be fractured throughout a building whereby a family occupies 3 apartments based on their circumstances? It is in principal a more formal variation of the dormitory scenario.

Washing Facilities

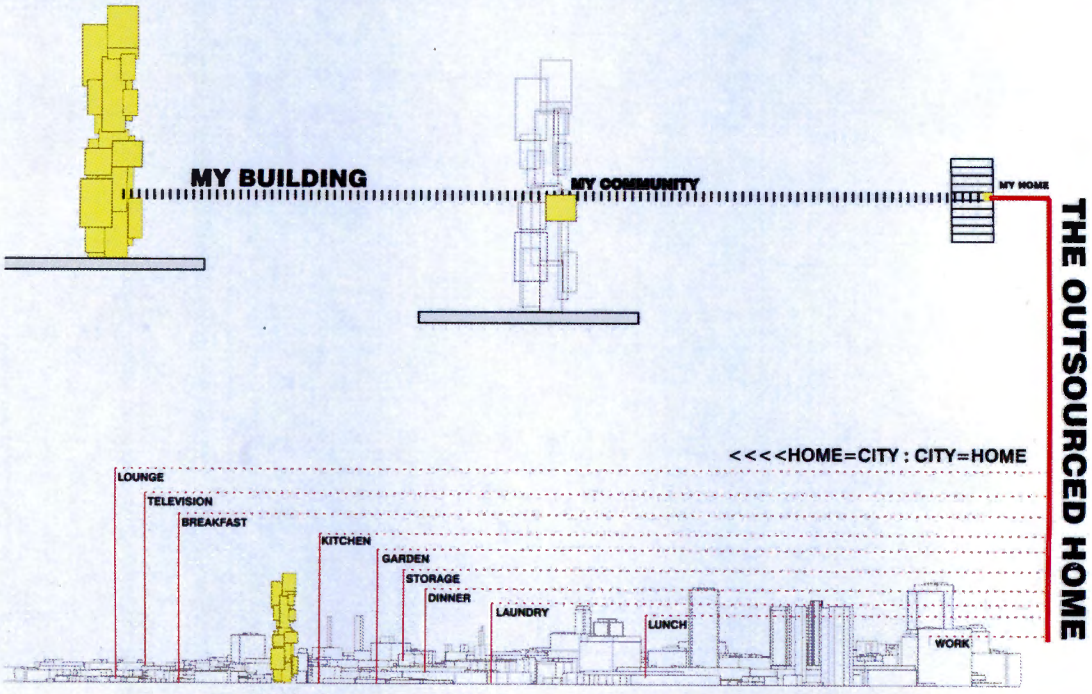
Communal washing up (non-machine laundry) spaces will be integrated into the building fabric. It is conceived to be a communal space for cleansing; which is fundamentally different to disposing of dirty laundry discharge from the washing machine in your kitchen down a PVC pipe into service shafts.

Day Care

Crèches and after school care for children.

Entertainment spaces

An offshoot from the common living rooms but more activity based. E.g. pool tables, stage performances



Dormitories

Migrant workers are a hidden reality that exists in Cape Town of which there are both local and foreigners citizens who require flexible rental arrangements. Additionally dormitories will act as supplements for families who have outgrown their living units due to increased family size and are unable to afford larger accommodation. Careful attention will have to be given to the demographic arrangement of these spaces.

Bathhouse

Shared changing room type facilities with showers and bathes. There will be washing and toilet facilities in each apartment but it is foreseen that the population density of the building in sectors will be too concentrated both for people queuing up in the apartment and for the plumbing capacity. The bathhouses will be an attractive alternative to the in-house facilities which will lighten and simplify the plumbing strategy of the building reducing the piping maze and shaft sizes.

External spaces

A fundamental component; with many of the communal facilities being coupled to accessible exterior spaces. There will be a range of voids spread throughout the tower both horizontally and vertically with a various levels of intimacy.

Eating Canteens

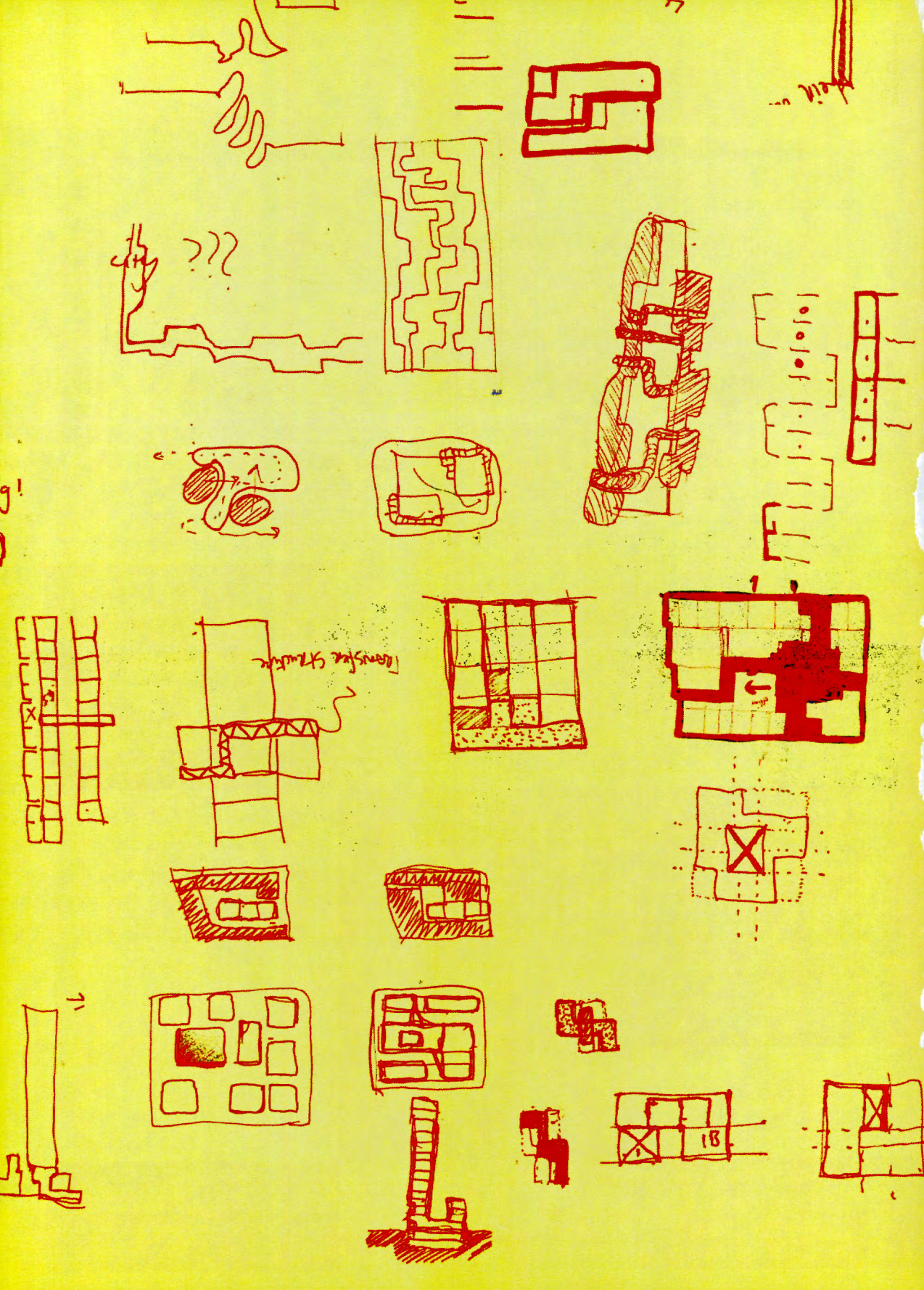
Eating canteens are seen as transitory zones for a quick non franchised meal. Meals will be significantly cheaper and supplement for home cooking.

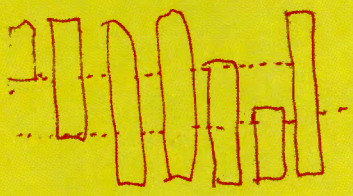
Laundry rooms

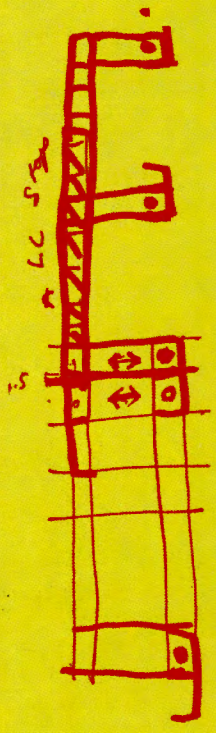
Coin operated machines

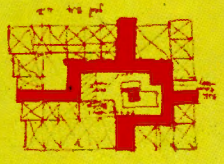
Common Livingrooms

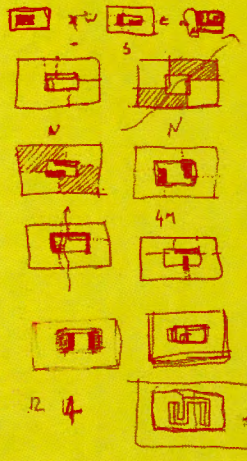
A common South African example would be the boarding house model; a large media room typically used to watch television in. Computer facilities will also be available.

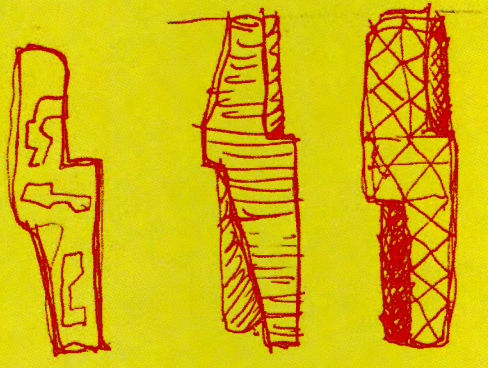




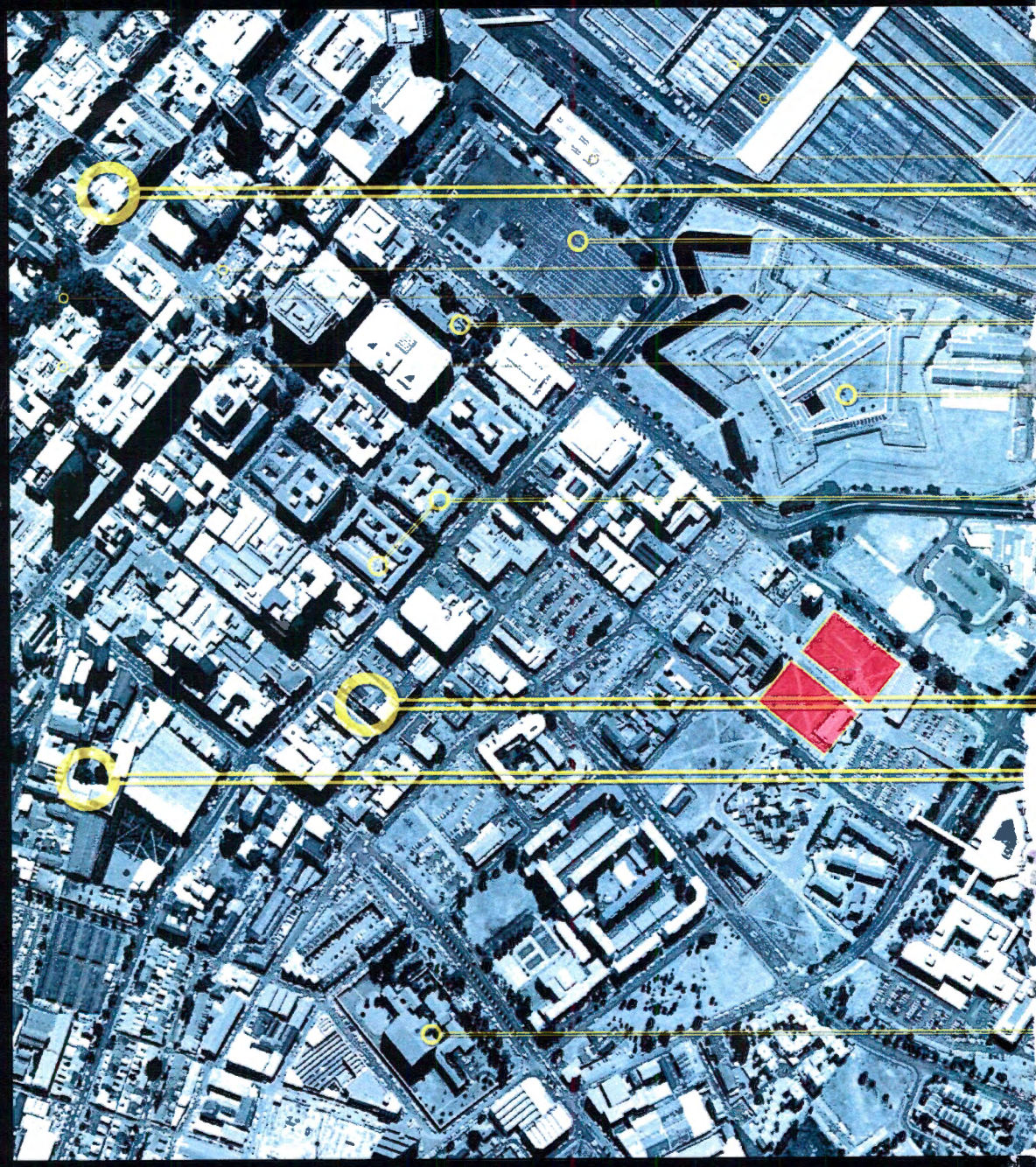


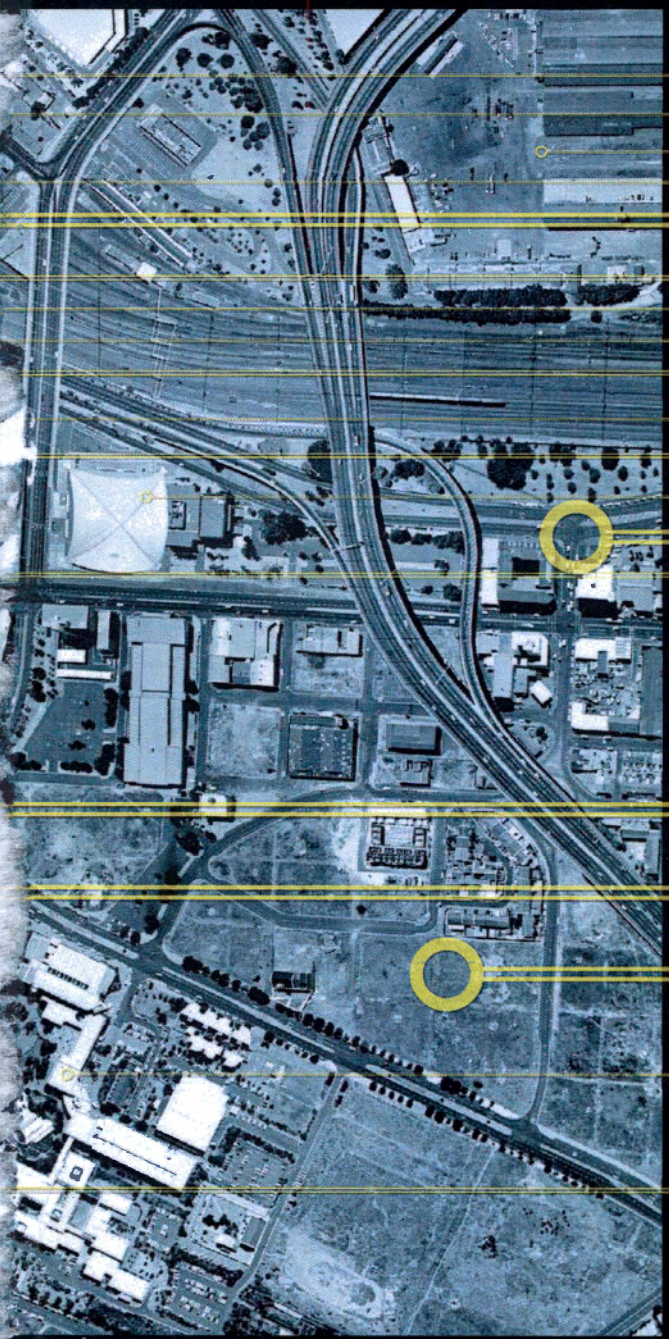






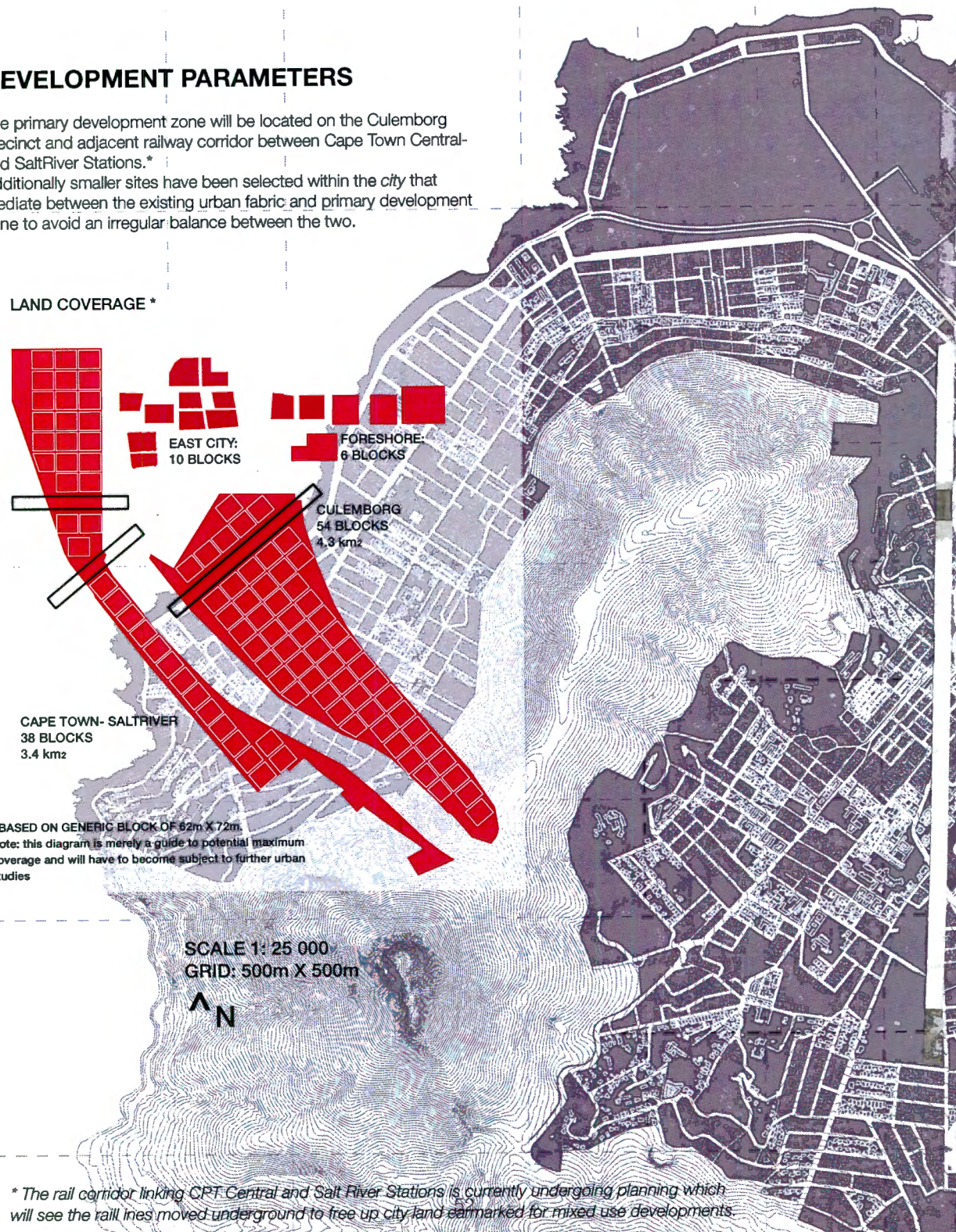
SITE
EAST CITY, CAPE TOWN



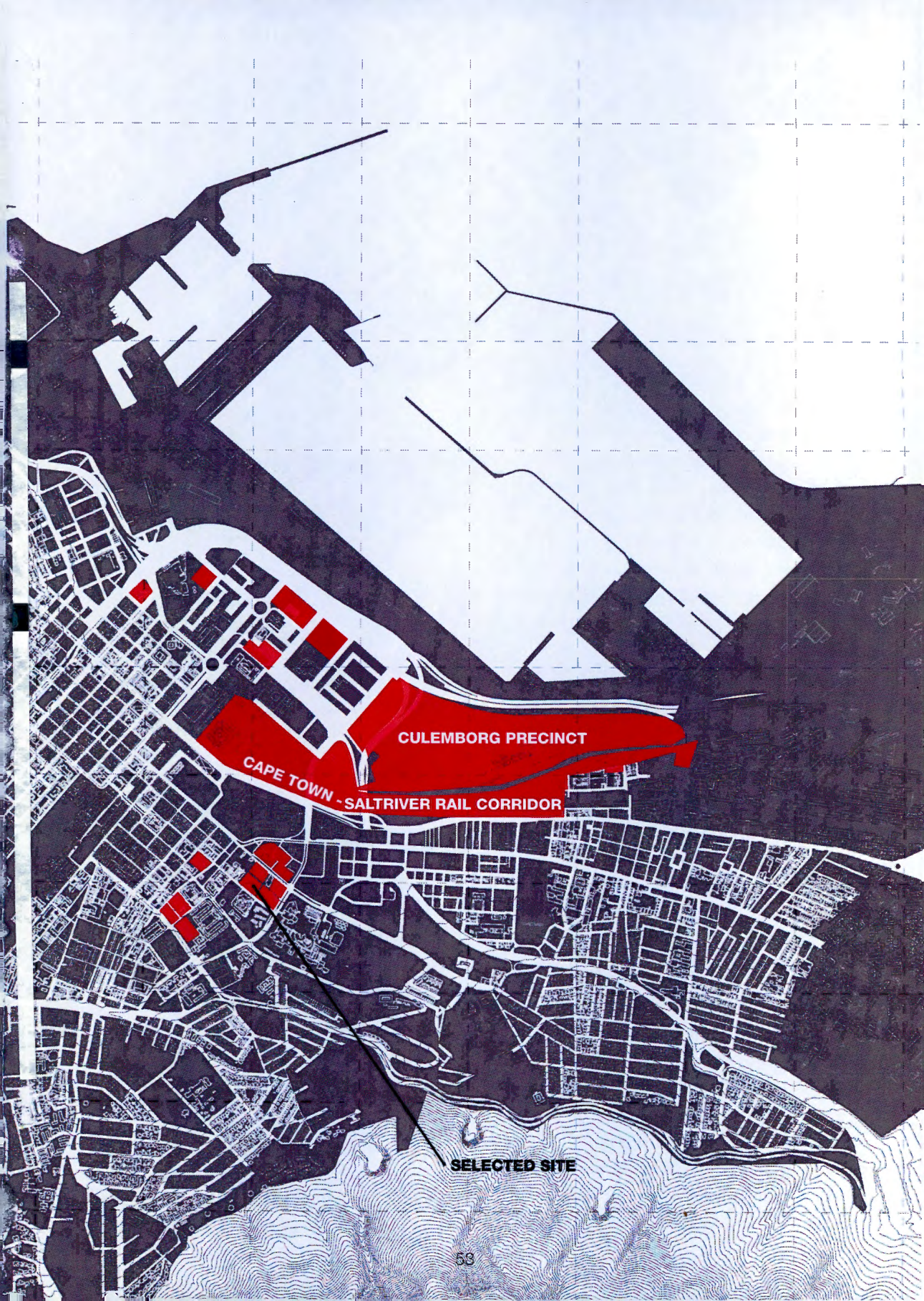

CPT CENTRAL TRAIN STATION
CENTRAL TAXI STATION
CULEMBORG
CENTRAL BUS STATION
CITY CENTRE
THE PARADE
CHURCH SQUARE
COMPANY GARDENS
CITY HALL / CENTRAL LIBRARY
PARLIAMENT
CASTLE
GOOD HOPE CENTRE
WOODSTOCK
MAG. COURT
CPT CENTRAL POLICE STATION
EAST CITY
GARDENS
DISTRICT 6
CAPE PENINSULA
UNIVERSITY OF TECHNOLOGY
ARCHIVES

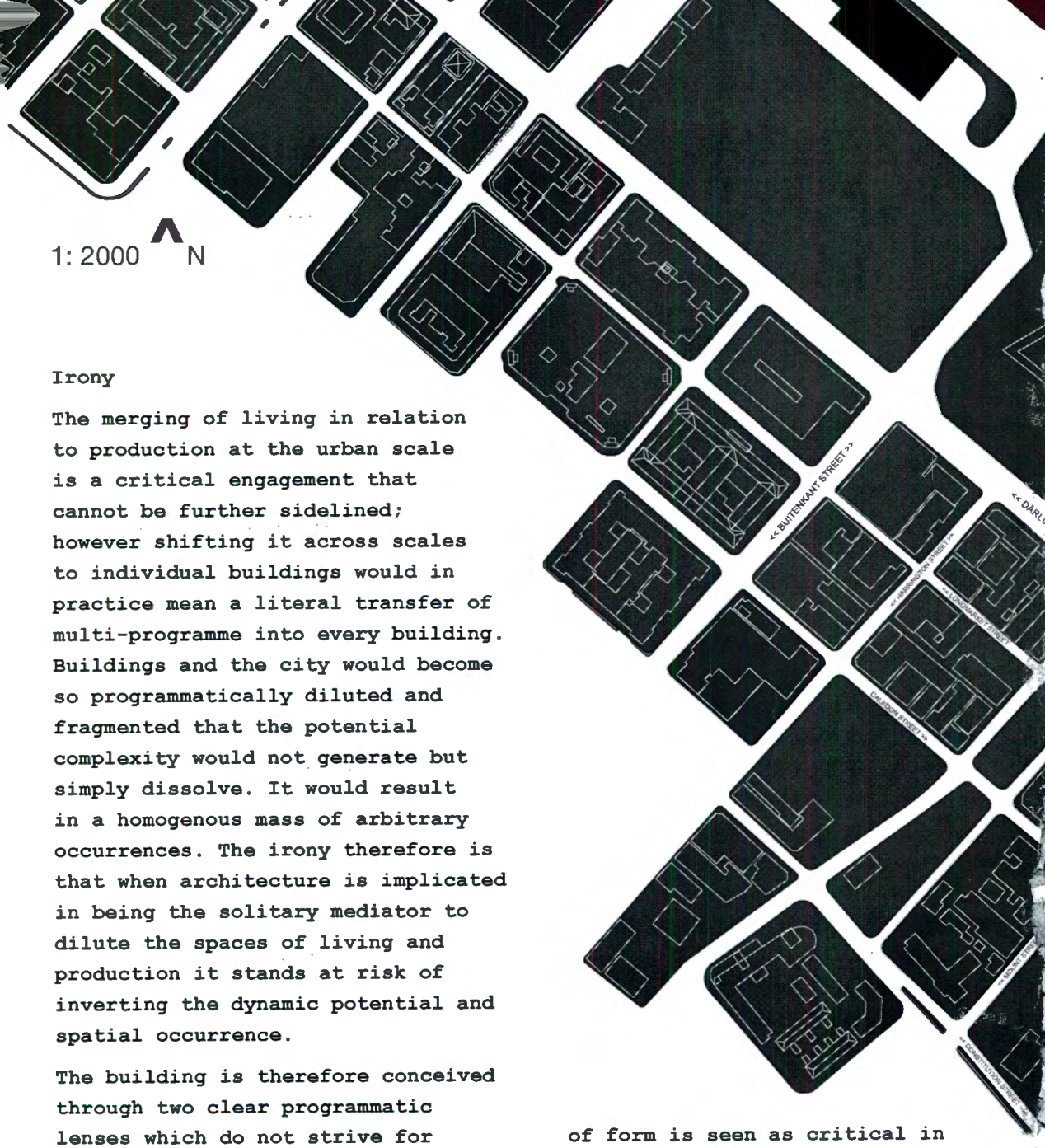
DEVELOPMENT PARAMETERS

The primary development zone will be located on the Culemborg precinct and adjacent railway corridor between Cape Town Central- and SaltRiver Stations.*
Additionally smaller sites have been selected within the *city* that mediate between the existing urban fabric and primary development zone to avoid an irregular balance between the two.



** The rail corridor linking CPT Central and Salt River Stations is currently undergoing planning which will see the raill lines moved underground to free up city land earmarked for mixed use developments.*


CULEMBORG PRECINCT
CAPE TOWN - SALTRIVER RAIL CORRIDOR
SELECTED SITE



Irony

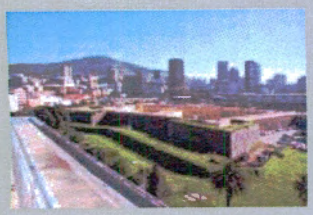
The merging of living in relation to production at the urban scale is a critical engagement that cannot be further sidelined; however shifting it across scales to individual buildings would in practice mean a literal transfer of multi-programme into every building. Buildings and the city would become so programmatically diluted and fragmented that the potential complexity would not generate but simply dissolve. It would result in a homogenous mass of arbitrary occurrences. The irony therefore is that when architecture is implicated in being the solitary mediator to dilute the spaces of living and production it stands at risk of inverting the dynamic potential and spatial occurrence.

The building is therefore conceived through two clear programmatic lenses which do not strive for a total anarchy of programmed dissolve but rather to focus on the definition between them to generate a subtle, but shared, occupancy which links them. The approach is to exaggerate the differences between public and private to generate tension between parts. The reading of form is seen as critical in establishing difference rather than similarity.

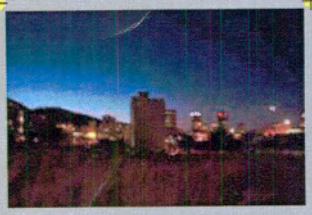
That which is privatised, the home, is architecturally inherently introverted and enclosed and will be treated that way while that which is communal and public becomes an extension

of the home. The housing is seen as the datum; with the building therefore being resolved through a programmatic balancing which superimposes it with public communal program.

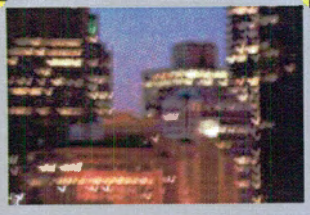
The housing mass of the tower becomes the primary formal driver with it pushing out toward the city which gives the building it formal but fractured outline.
The fragmentation of the housing block is both programmatically determined and by having to allow for communal program to operate between it. The communal program is squeezed between the housing mass in a parasitic manner and is recessed deeper into the floor plate to have a relationship between the core and the city simultaneously.
The housing mass is tectonically designed to be impermeable from the outside while the communal program is conceptually linked to the production of the city and is therefore distinguished both in its recessed massing and transparency to the city. The reading of the tower is both conservative through living and revealing through production.



E1.



E2.



E7.

E3.

EAST: VIEWING WEST

TENAN STREET

E4.

District 6 edge.
Edge with least connection to towers.
Sloped gradient
Pavement terracing will be needed.

E5.

E6.

E9.

E11.

E10.

Sloped ground.
Visible entrance.
Mostly a blank edge condition.
Closed edge to city.
Pavement terracing will be needed.

E12.

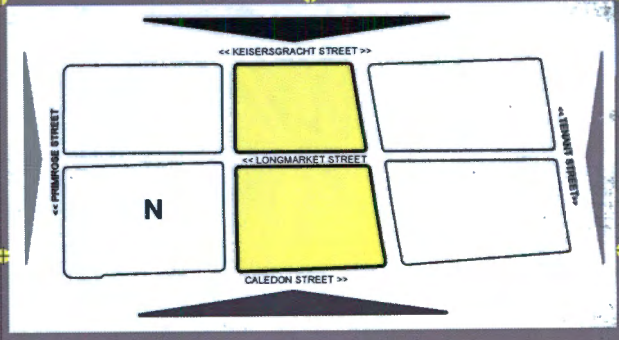
E13.

WEST: VIEWING EAST

PRINCE STREET

E14.

E15.



E16.

E17.

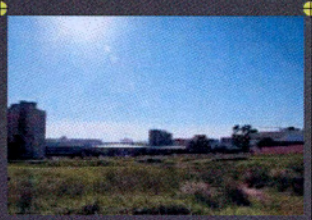
E18.

E19.

East city link.
Highest point on site gradient. Best location in terms of pedestrian comfort to appropriate site from. Would be best suited for high intensive public program. Primary access point for residents.

SOUTH: VIEWING NORTH

CALEDON STREET



E20.

E21.

NORTH: VIEWING SOUTH

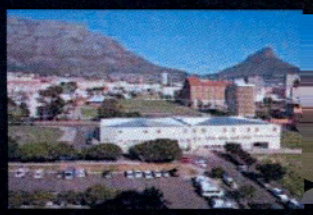
KAISERSGRACHT STREET

E22.

E23.

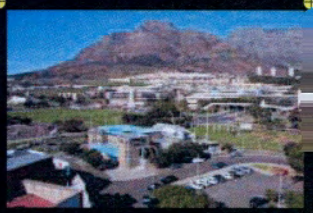
E24.

E25.

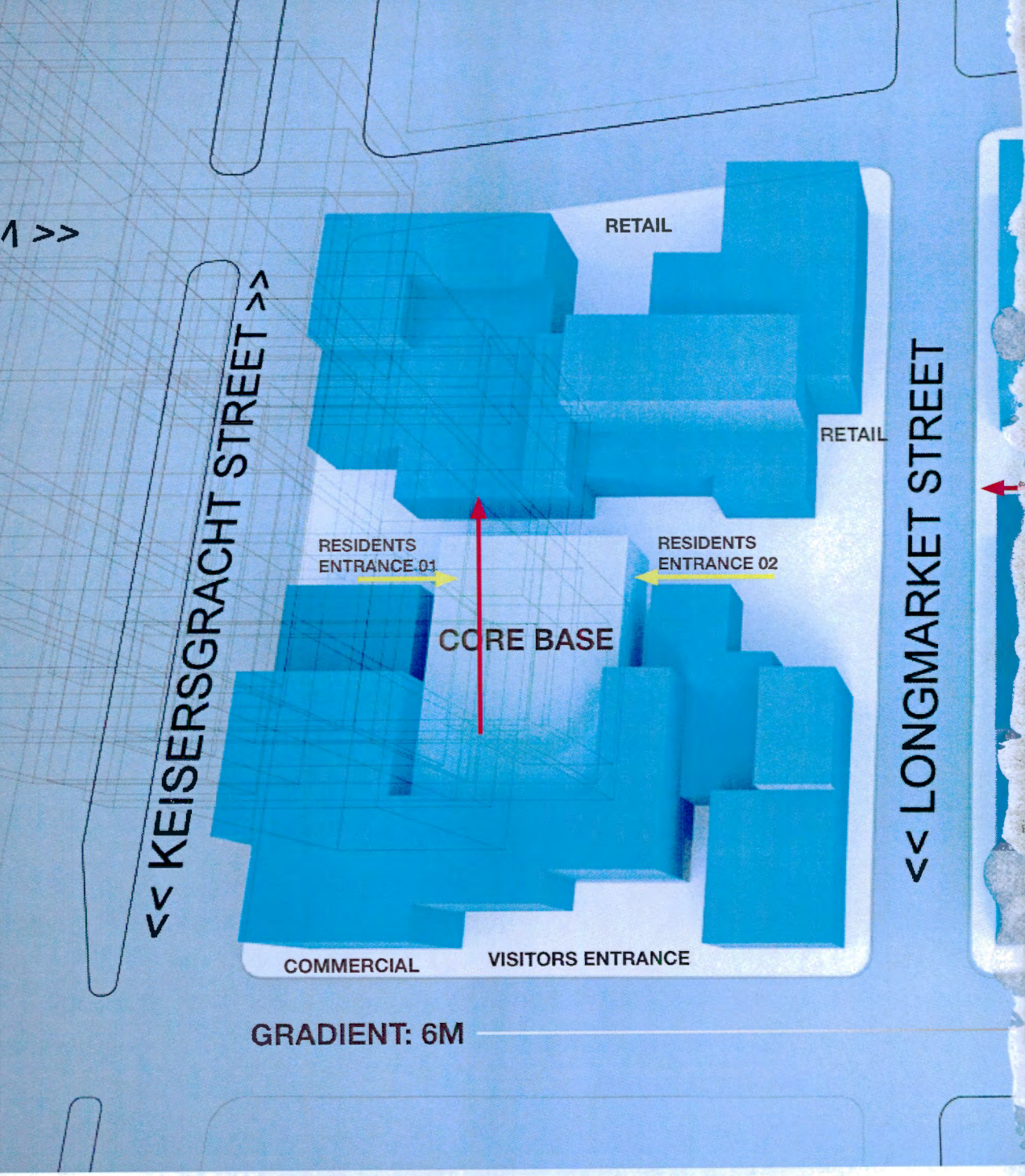


E26.

Primary public transport access point to site. Main link from station and city. Lowest point on site gradient - 8M vertical incline to Caledon Street, site cycling will be needed to overcome gradient. Primary commerce edge.

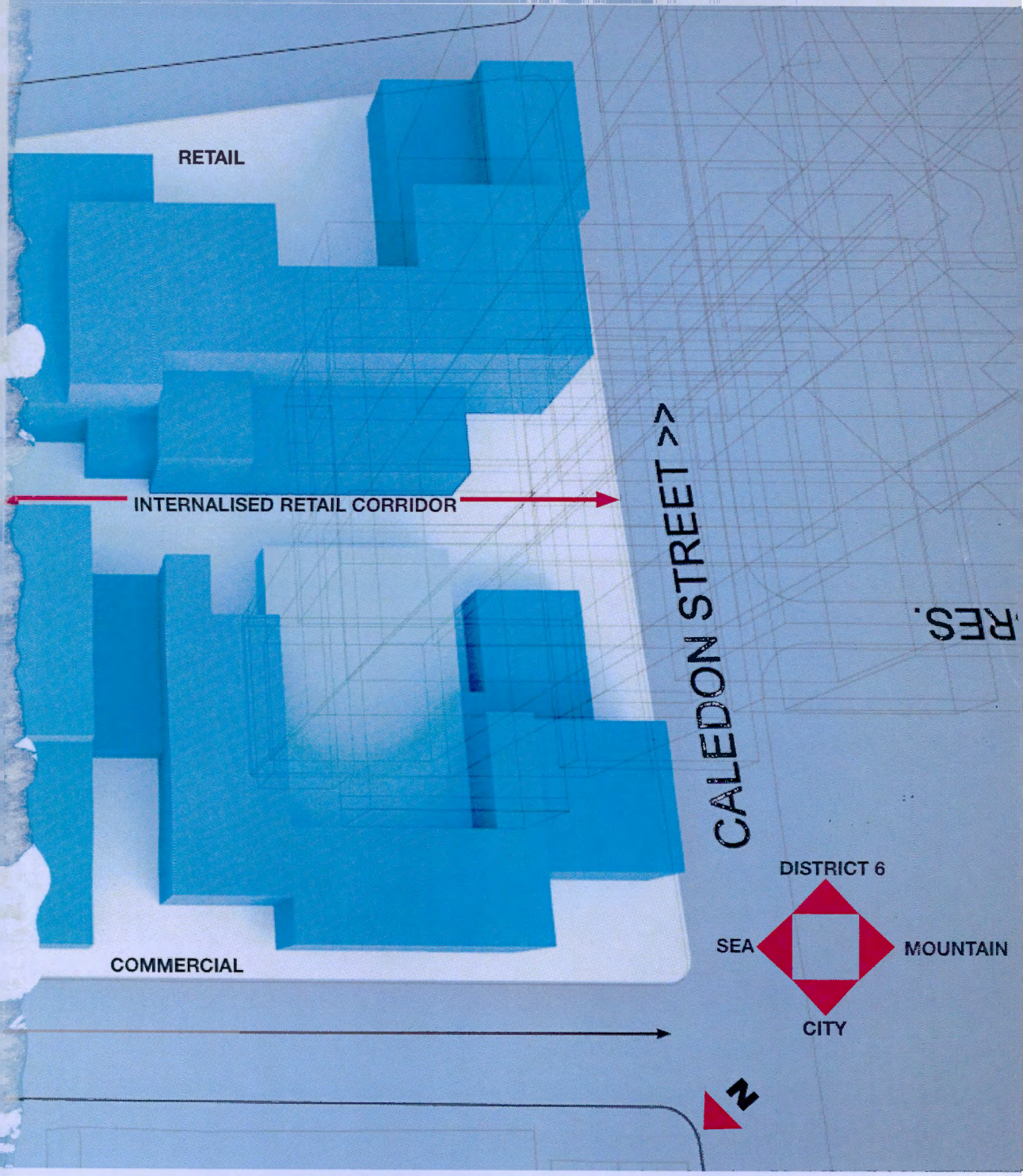


E27.



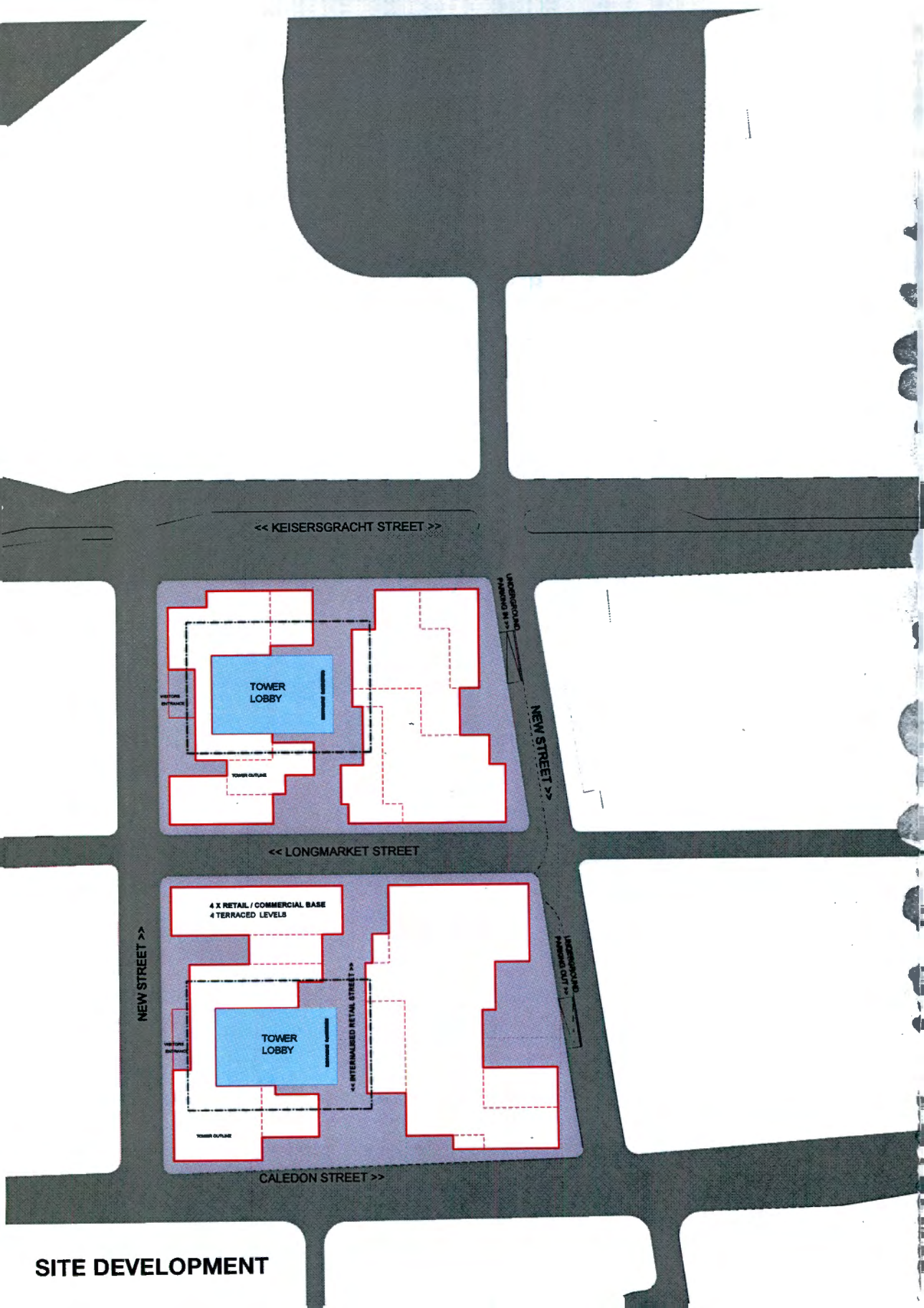
GROUNDING

Cape Town by way of its zoning laws suffers from massive parking podiums that consume entire city blocks so that floor area ratios can be reached to build tall buildings. The city when viewed from afar is therefore impressive with its massive infrastructure, but on the ground it predominantly comes without architectural or



social consequence. The city has more space on the ground dedicated to its cars than the people who use the city. The grounding of the towers will therefore become essential in establishing diverse spatial continuity and to stimulate social urbanism, cultural life and consumer flows.

While the tower will in part bring together mixed programming the ground plane still remains the space most able to host urban pressure and cross pollination of human activity because of its neutrality and proximity to the city. The response was to open up the city block and to merge the high vertical density above with



SITE DEVELOPMENT

the horizontal fluidity from the city to generate a layered exchange between users and their activities.
Both hard urban frontages are provided to the city and internalised passages connecting the tower to the street is provided by opening up the city block. The internal pedestrian streets give an intimate introverted aspect to the city block which is typically reserved for servicing and other private activities. This way it is possible to have spatial continuities by generating a high degree of permeability at the ground level, with the centre of the block being accessible visually from the pavement and vice versa. The scale of the base buildings vary in elevation (1-4 stories) and plan depending on the slope of the site and street frontage and typically steps back from the street edge (both internally and externally) in a traditional zoning manner.

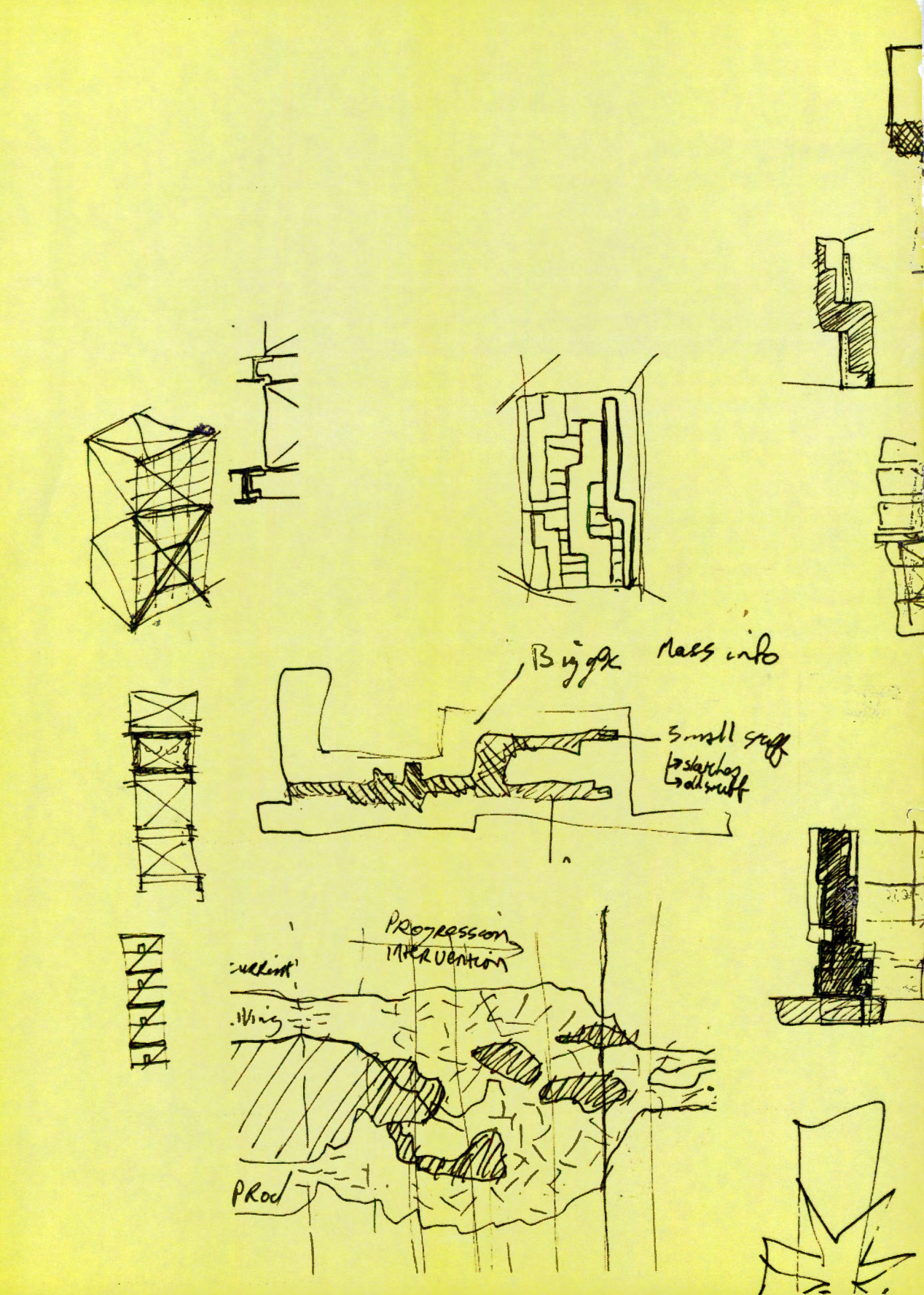
The tower docks to the ground on the street side but stops short of its base on the internal streets. Parking is exclusively located underground and access to and from runs parallel to the street edge to avoid vehicles having to penetrate the block.
The access lobby is both private and public but does segregate these users for security reasons. Public access to the building is controlled by the lifting strategy which shuttles the public and private users to different points on the floor plate which allows for security control of the building.

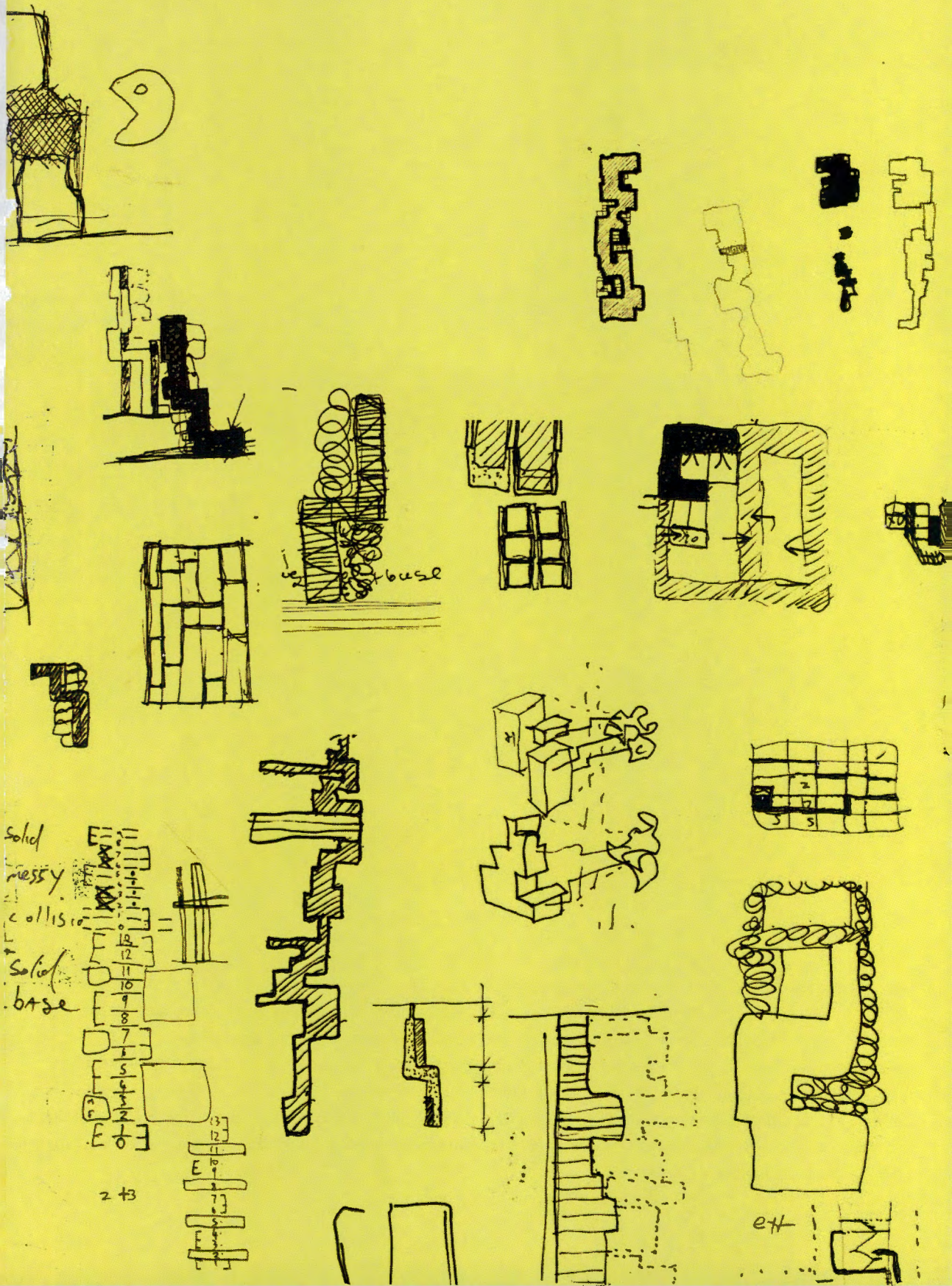
LEVEL 1

LEVEL 2

LEVEL 3

LEVEL 4


Bijgk
mass info
small stuff
PROGRESSION
INTERVENTION
PROD


base
solid
messy
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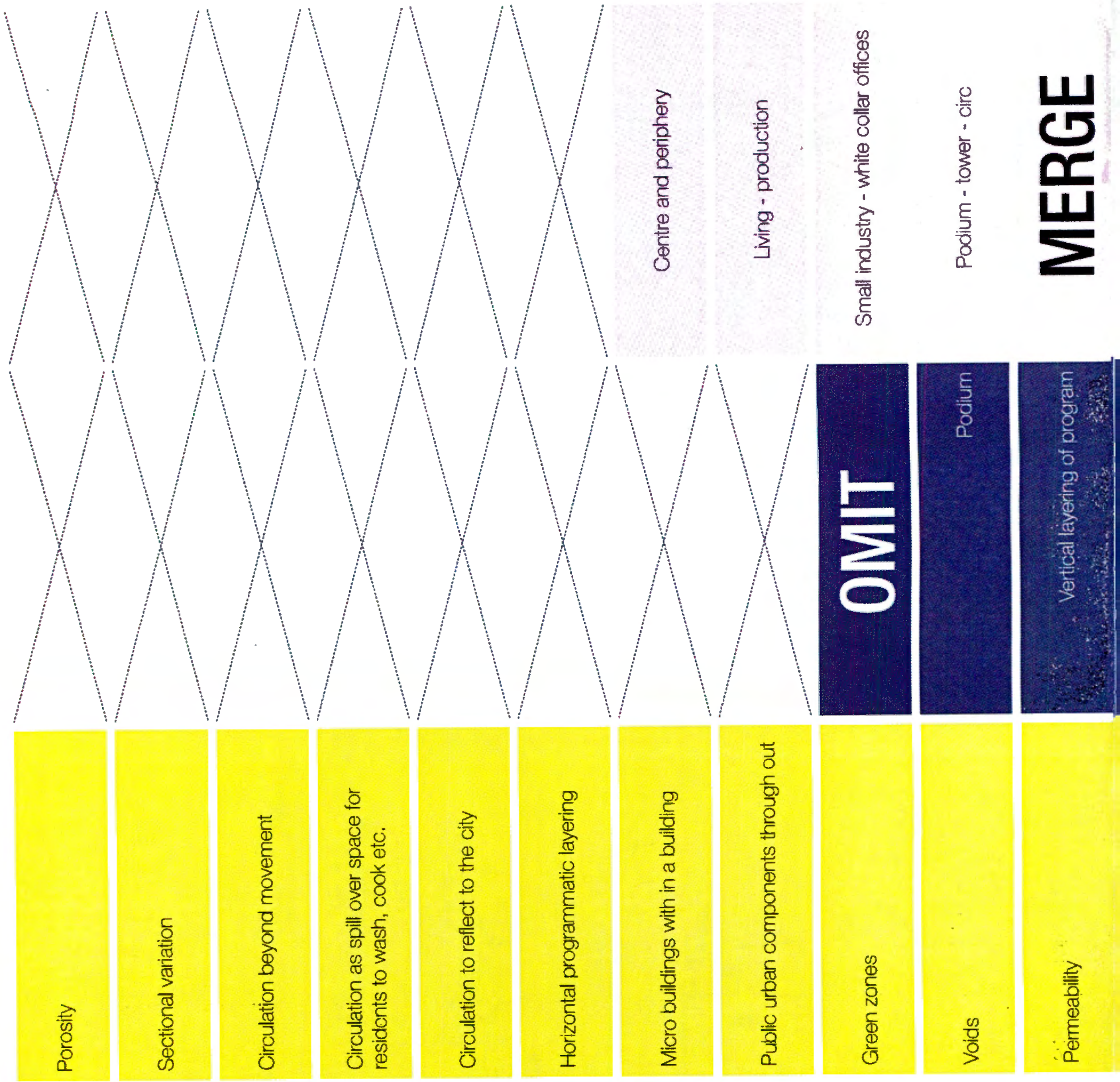
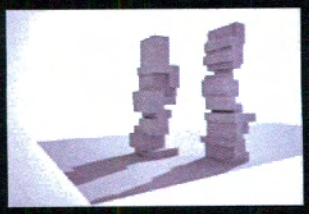


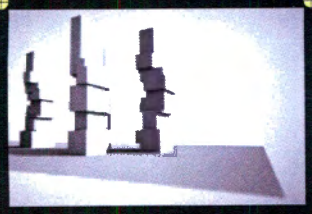
One of the primary spatial arguments, is the articulation of buildings within a building or a building, with a broken identity. It is therefore important to spatially collapse the methodology of developer-driven towers by dissolving the HOMOMASS typology. The building will re-engage spatially with the potential plurality that tall buildings are inherently composed of. Which means no assumptions or given's can be accepted without rigorous design interrogation. For example that void be acknowledged as much as volume will be. The use of void becomes strategic in that strictly speaking it does not belong to anyone and this in itself opens up a rhizome of open-ended or complex connective opportunity. This does not however mean floor area is sacrificed for the presence of void- it can be made up for 'above'.

Spatial diversity	Sectional repetition	Public - private
Varied transparencies	Tower mass	Work - living
Varied internal public environment	Encapsulated circulation	Living - production
Buildings within buildings	Typical core puncturing through floors- looking at introducing voids	Classes - race - economic brackets
ADD	Absolute prescriptive programming, functionality and spatial scenarios	
	Generic passages	
	Only interior changes	
	Typical 'full floor' plate	
	Massive programmatic chunks	
	Introverted tower typology	

TOWER TYPOLOGY ASSESSMENT

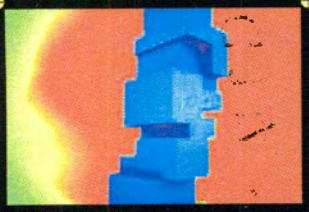


01. AUG. MASSING STUDY



02. AUG. MASSING STUDY

03. AUG. MASSING STUDY



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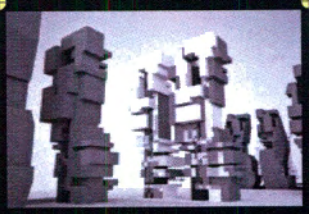
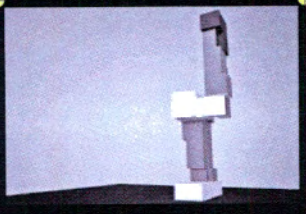
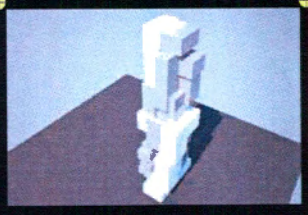


05. SEPT. MASSING STUDY

06. SEPT. MASSING STUDY



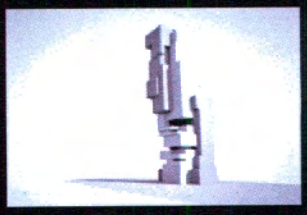
07. SEPT. CIRCULATION



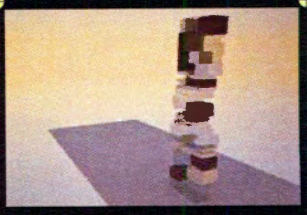
08. SEPT. PROGRAM STUDY

09. JUNE STUDY MODELS

10. SEPT. MASSING STUDY

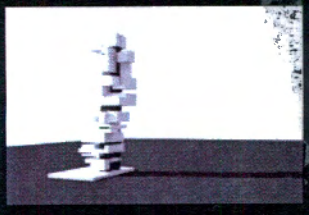


11. SEPT. MASSING STUDY

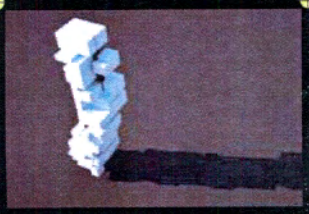


12. TRANSPARANCY VS MASS

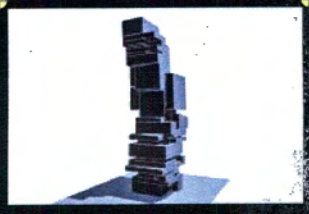
13. THE DOOM



14. EXPOSED CORE



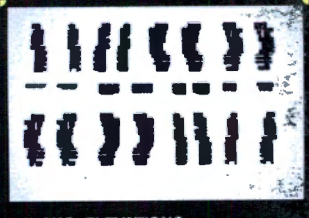
15. EXPOSED CORE



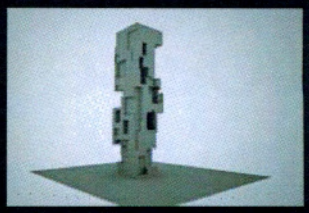
16. AUG.

17. TRANSFER STRUCTURE

18. FACADE RECESSING STUDY

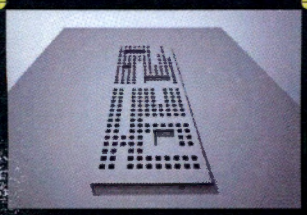


19. AUG. ELEVATIONS



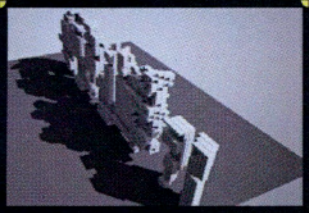
25. JULY MASSING STUDY

28. LEANING STACK

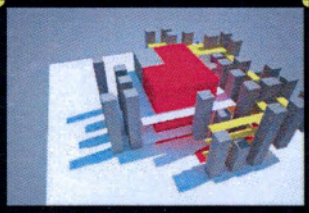


20. EXILED PERIPHARY BATHOUSE

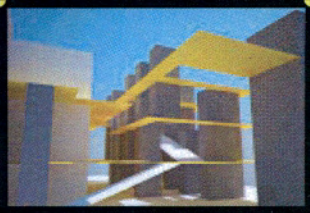
21. EXILED PERIPHARY BATHOUSE



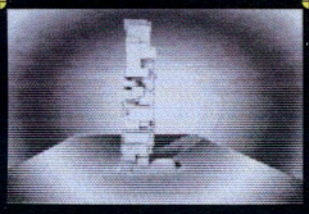
22. EXILED PERIPHARY HOUSING



25. TRANSFER LEVEL

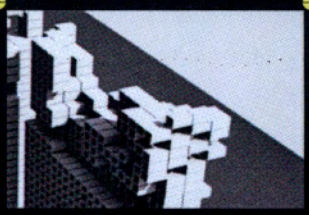


29. TRANSFER LEVEL

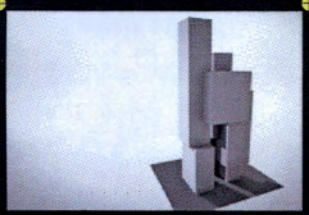


23. ELEVATION

26. NIGHT LIGHTS



27. EXILED PERIPHARY HOUSING



24. JUNE STUDY

27. SEPT. TRANSFER STRUCTURE

TECHNOLOGY OUTLINE

One of the primary spatial arguments, is the articulation of buildings within a building or a building, with a broken identity. It is therefore important to spatially collapse the methodology of developer-driven towers by dissolving the HOMOMASS typology. The building will re-engage spatially with the potential plurality that tall buildings are inherently composed of. Which means no assumptions or given's can be accepted without rigorous design interrogation. For example that void be acknowledged as much as volume will be. The use of void becomes strategic in that strictly speaking it does not belong to anyone and this in itself opens up a rhizome of open-ended or complex connective opportunity. This does not however mean floor area is sacrificed for the presence of void- it can be made up for 'above'.

The building is conceived to have two basic components; the cores- containing vertical circulation and services, which cantilevers out the ground and provides primary resistance to bending moments, deflection and lateral loads. The second are components that are hung from the cores, which will be in the form of a steel frame. It will contain a combination of prefabricated living units that will slot into the frame. The frame as a whole will tie the cores together to form a singular rigid structure. It is foreseen that the steel frames will be craned and welded into position onto the core.

The technology focus will therefore be on the relationship between fixed in-situ components (core) and prefabricated components (steel diagrid frames and prefabricated units. The intermediate spaces that host the spillover living program like washing, cooking etc., will consist of a balance which mediates between these two technologies in order for it to capture both aspects of the home and public domains.

There is the potential to build the building in phased developments i.e. the whole building need not necessarily be constructed at the same time. The Standard Bank of South Africa Building in Johannesburg in principal was built similarly from the top down after the whole core had been constructed. The building is essentially modular and can conceivably be built in stages i.e. first the cores followed by the steel diagrid framing and prefabricated components, which will act independently and can be hung effectively at any stage. This means investment could be phased or even divided in a much more flexible manner (e.g. public private partnerships) considering the massive investment needed to build tall buildings.

THE PREDICAMENT OF TALL BUILDINGS

High rise buildings are essentially devices of economic speculation and just about exclusively made to maximise floor area by repeating itself as many times horizontally as possible, only to stop when by law it has to or becomes 'inefficient economically'. Inefficiency is generally measured by the core expanding to such an extent that it swallows its own floor plates, as too many elevators are needed to service the required number of floors. The building is shrunk and stretched until a ratio of efficiency is reached followed by horizontal slicing- its fate forever sealed hermetically.

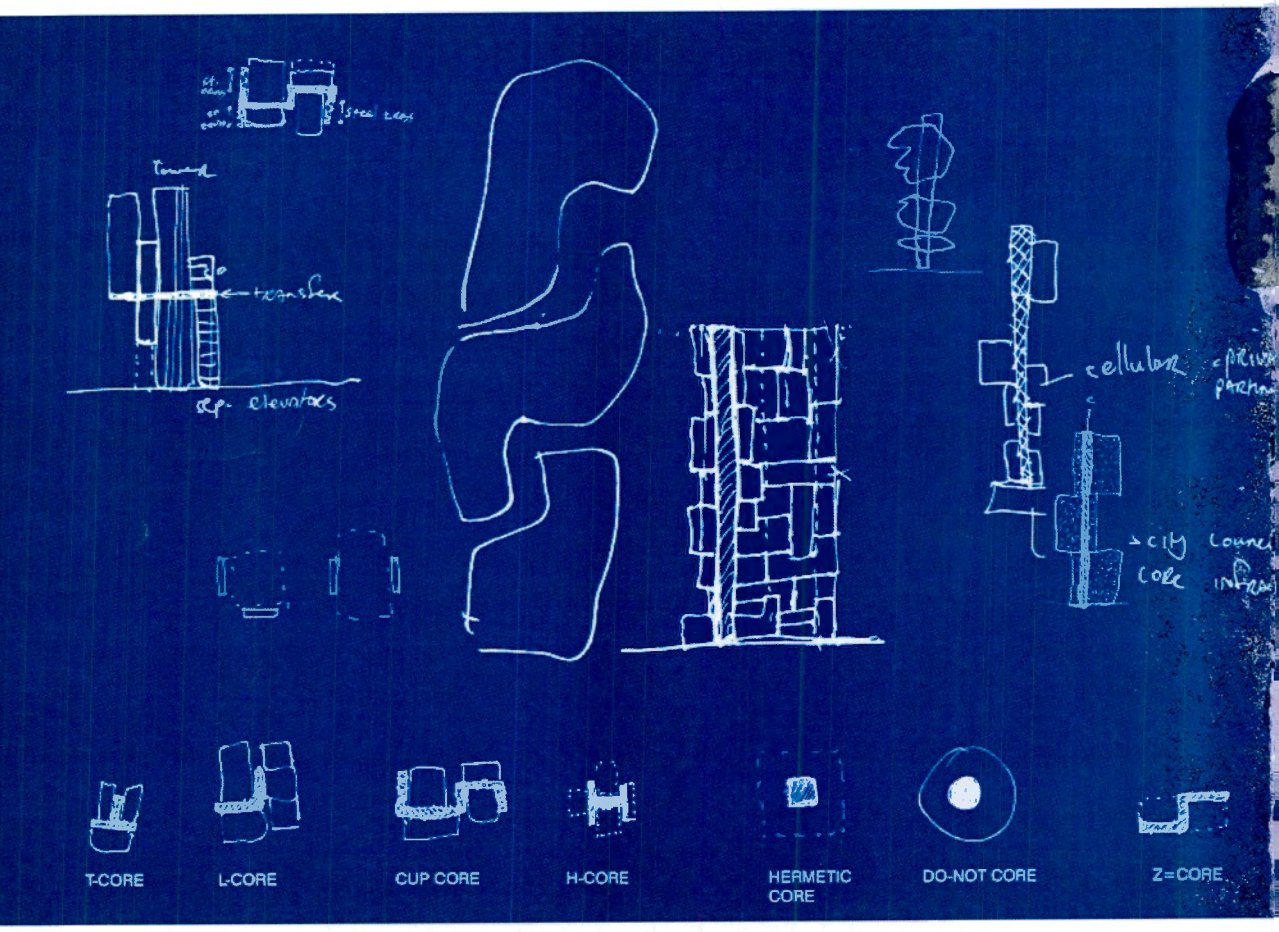
When the building is a commercial tower, floor to floor height is at 3,8 meters- enough to fit the floor slab, beam depth and a maze of piping, conduiting and air conditioning ducts, neatly covered by a suspended ceiling to hide it. This should all be achieved within the parameters of between 800-1000mm so that there is at least 2.8 meter ceiling heights, to prevent occupants working far away from the façade from getting depressed due to a lack of natural light. For residential towers the section gains an additional 600mm per floor potentially as less 'junk' needs to be crammed into the ceiling. Building codes allow for lower floor to ceiling depths starting at 2.4 meters.

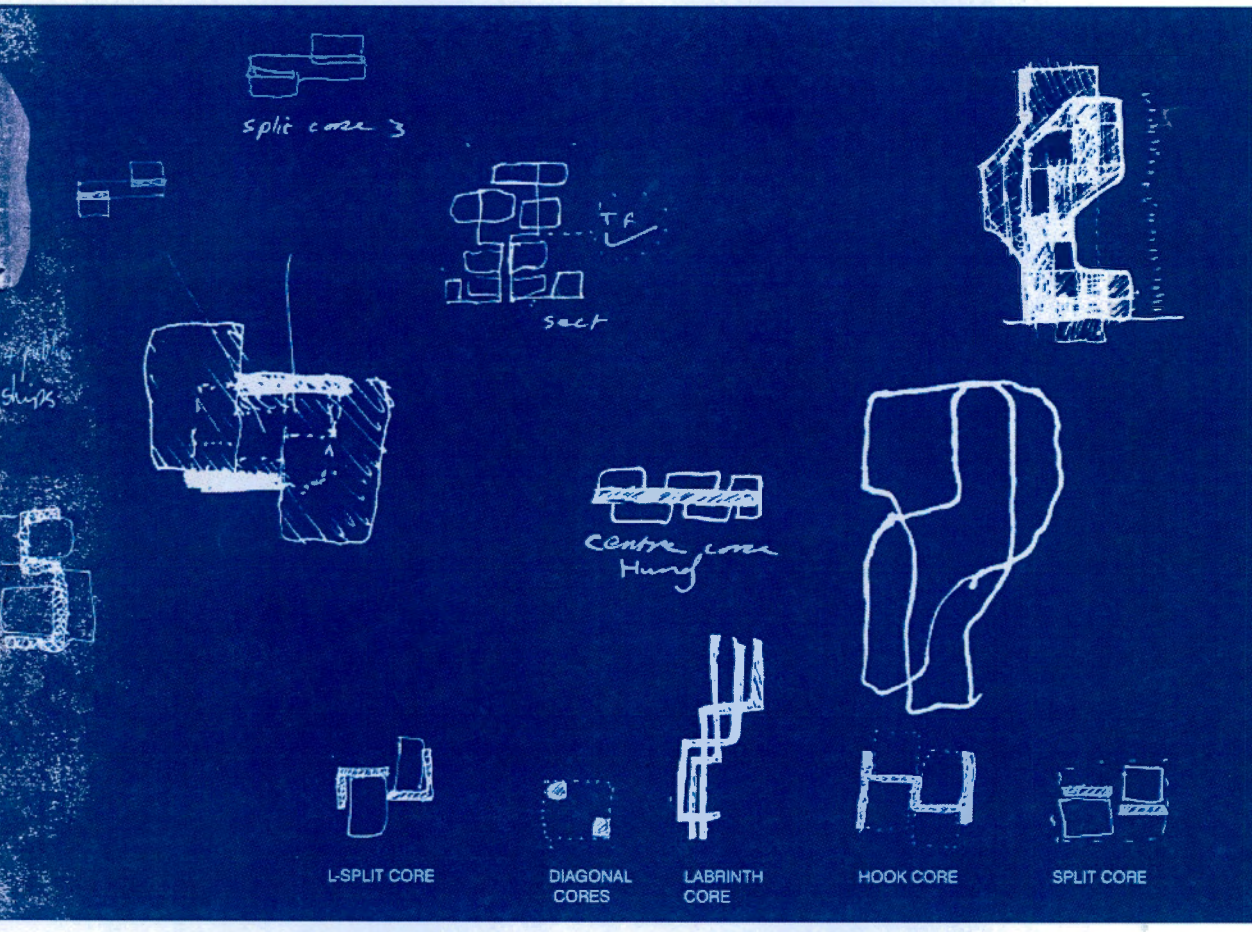
As a silhouette towers are vertically perceived, however without highly efficient horizontal layered packaging towers would not be built because of the expense. The horizontal therefore dominates the epitome of verticality in architecture. The consequence is that any interconnectivity between the horizontal reduces efficiency and places any architectural potential in a straight jacket. Negotiation on this matter is typically uncompromising from a client who is about to spend more money on a building that will not pay for itself in their life time. To further compound the problem, for the architect, is the minefield of technical professions who are only quantitatively enriched but are vital to make such an undertaking happen.

Structure is determined in the basement: 8.4 meter column grids are good because 3 vehicles can be parked between them, two apartment units at 4.2meter centres and/or office furniture modules divide within the structural grid and facade mullions. Ceiling partitioning grids coincide at 600mm centres. "The taller the building, the more the structural inheritance from the upper regions dictates the decisions below. Each high-rise represents the systematic reduction of freedom toward where it matters most: on the ground"[1]

*** Source: Yeang, Ken. The Skyscraper Bioclimatically Considered. Academy Editions. London.

1 Koolhaas, R. **SMLXL**. Monacelli Press. New York. 1995


transfer
sep. elevators
cellular
T-CORE
L-CORE
CUP CORE
H-CORE
HERMETIC CORE
DO-NOT CORE
Z=CORE

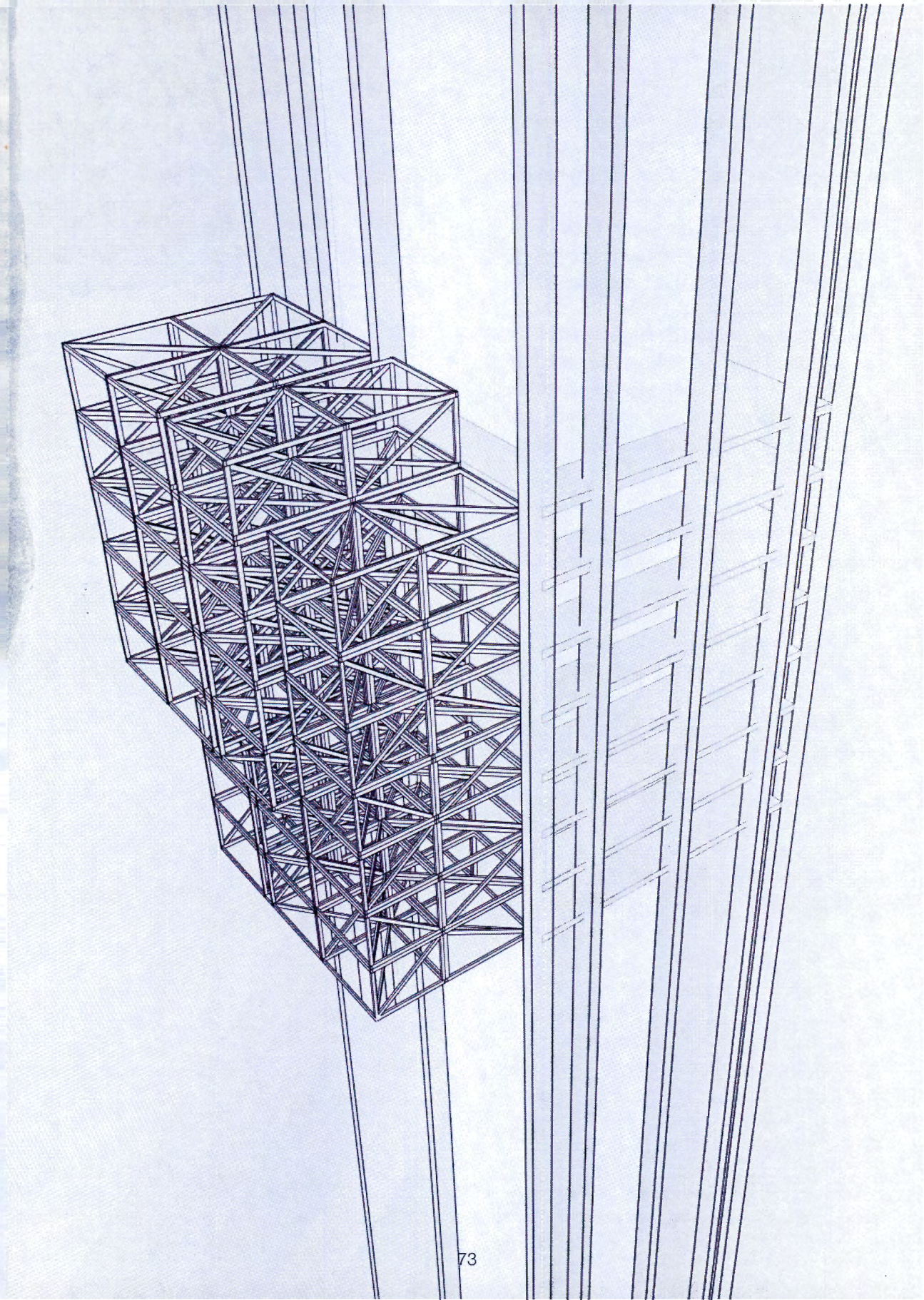

split core 3
TF
sect
centre core
Hung
L-SPLIT CORE
DIAGONAL CORES
LABRINTH CORE
HOOK CORE
SPLIT CORE

Structure

01 CORE

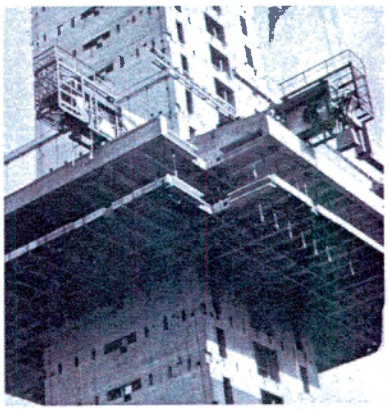
02 CANTILEVERS

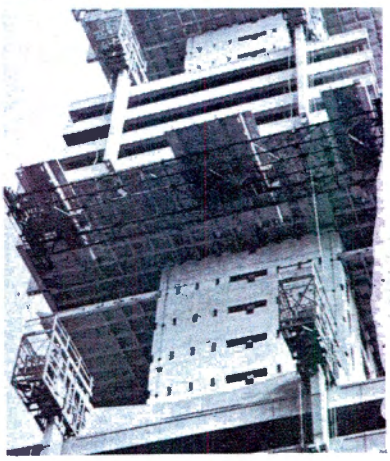
03 STEEL FRAMING (PREFABRICATED)



CORE

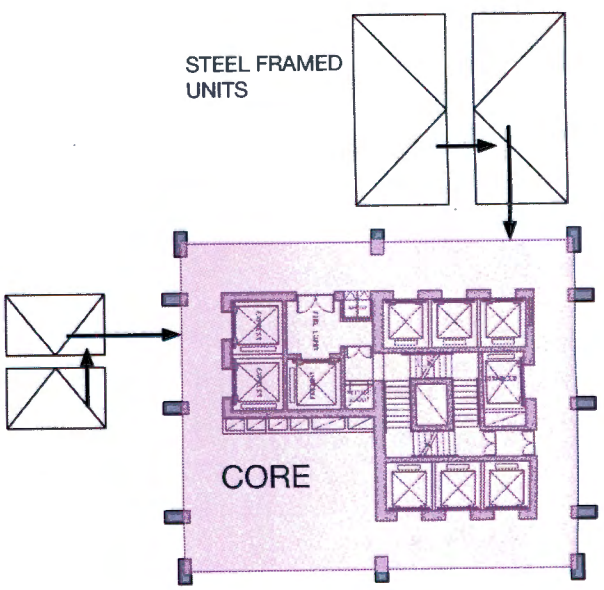
The design intent is for the core to extend itself beyond the typical model that is a hunk of concrete floors attached it, and to become a softer more socially considered element. The cores will host some of the dismembered housing programs like washing-up facilities, laundry rooms, canteens, kitchens etc. and connect via the voids to the building mass. This space everyone is accessible to any user and therefore it is the most democratic space. The cores will need to communicate both locally, and to the city, by revealing more than just being a facility that distributes people and services.





Right above
Hoisting in position of a perimeter beam
Right below
Hoisting in position of floor units by means of the tray

Cores are significant components in any high rise building. It typically takes about 28% of the total structural cost and takes up about 25% of the floor space. The implementation will be the most critical in the project since its completion is required before the remainder of the building can be started with. The core will be the primary element which resists deflection, bending moments and over-turning, so it will arguably be the most critical of the structural components. Studies show that bending moments play a bigger role than shear moments as a building becomes taller. One of the most important stiffness design parameters to consider in any tall building design, is its maximum deflection, which is usually in the neighbourhood of a five hundredth of the building height. Two modes of deformation, bending and shear deformation, primarily contribute to the total deformation. In this case the cores will not be severely affected by shear as this is passed onto the unit frames. In general, as a building becomes taller, and its aspect ratio becomes larger, the contribution of the bending deformation becomes larger, and that of the shear deformation becomes smaller. [1]



1 MOON, K. **Dynamic Interrelationship between Technology and Architecture in Tall Buildings**. Ph.D.

October 1968

November 1968

December 1968

January 1969

February 1969

March 1969

April 1969

May 1969

June 1969

Standard Bank of South Africa Building, Johannesburg.
Example of a building that built the core first followed by floor construction

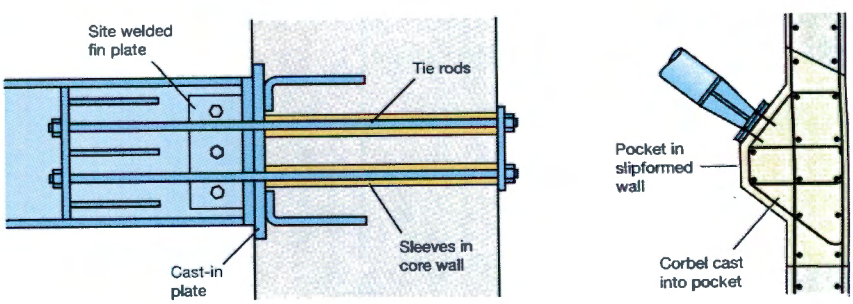
CANTILEVERS

In principal the structural design can be based on the methodology of the Aspire Tower in Doha which uses an in-situ reinforced concrete core with structure cantilevered from it. The Arup engineering team decided that the best way to connect the radially spanned beams from the core to the perimeter, would be for steel plates to be cast into the core's walls at floor beam locations, and anchored back into the body of the core. These embedded plates were surveyed and connections for the floor and transfer beams were welded on site. The steel beams were connected by slipforming to the core throughout its height, with a corbel section at lower level.

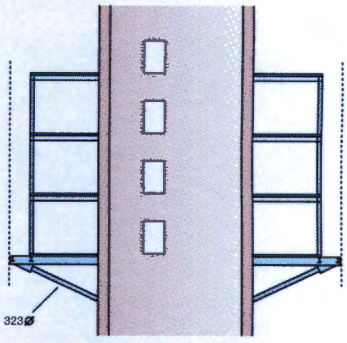
The floors that cantilever out from the central core comprise steel beams supporting concrete slabs acting compositely with metal decking. The general arrangement has the primary beams spanning radially between steel columns and the core, with circumferential secondary beams. Steel columns in each module are supported by transfer arrangements cantilevering from the core. The presidential apartments, museum, and restaurant floors are supported off the core by steel cantilever brackets at the base of each accommodation block. The hotel, by contrast, is supported off the core by a system of vertical trusses located within the partition walls between the hotel rooms. The inner lines of the vertical trusses are in turn supported at their bases by a reinforced concrete corbel ring to the core located below level 4 in the hotel lobby area. The vertical trusses are typically between levels 5 and 10. [1]

The vertical trusses embedded within the partitioned walls can be incorporated with the diagrid framing, which will house the prefabricated apartment units.

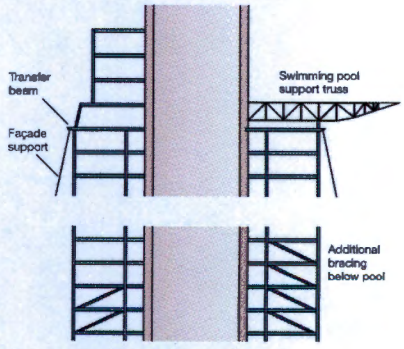
1 Chikaher, Gregoir and Hirst, John. **Aspire Tower,Doha, Qatar.** The Arup Journal. 2/2007



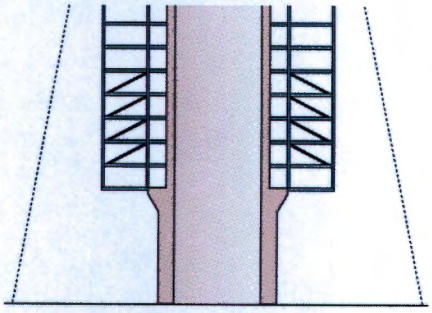
Initial concepts for a) core connection detail (with tension capacity) and b) strut support corbel detail.



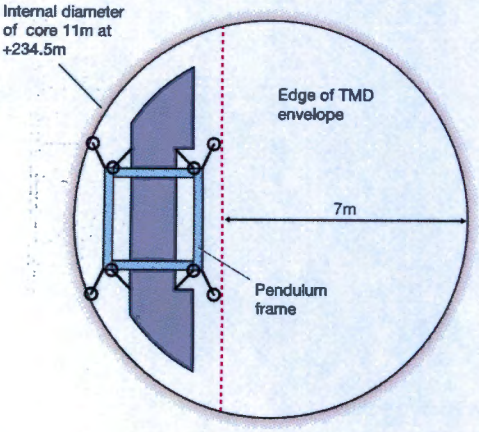
Floor support bracket.



Upper hotel/office and health club.



Hotel floor support.



Victoria Hall Student residences

Jniversity of Wolverhampton, UK

Architects Gary East

Is a mixed-used apartment complex for stuoents at the University of Wolverhampton. Victoria Hall consists of four buildings, the tallest of which is 25 stories, it now holds the recoro for overall height and number of stories in a builoing constructeo principally off-site. The grouno floor is site-built, but the other 24 stories are assembleo from 333 individual modules.

The Vision factory in Cork, Irelano, starting mooular proouction just as initial site work was beginning back in England in July 2008. Site piles were driven ano capped, and above those a ground floor with long spans for street level uses ano student common areas was built of poured-in-place concrete. The ground floor acts as an architectural plinth as well as a structural transfer beam for the smaller span mooular structures above.

The builoing's cores, which house the central circulation, centralizeo utilities, fire stairs, ano elevators, are site built from slip-formed concrete

As for the mooules, each has its own structural steel frame oesigneo to carry the loads of the modules above it. The mooules also incluoe concrete floors, orywall walls ano ceilings, and a fire-rated envelope.

Prior to shipping, all mooules are pre-fitted with plumbing, fixtures, finishes, cabinets, and even furnishings (multiple mooules are used to complete each student suite). Once completeo, the individual modules made their way from Cork by boat and truck to Wolverhampton

The mooules weigh 21 to 29 tons and are lifteo into place by crane. Individual modules are stackeo on top of the prior story and attacheo to the core. Once a mooule has been set in its final location the trames are spot weloed to create a unified structural mosaic.

On the inside, a module's preinstalled electrical and plumbing components are simply joined to the main runs. The modules are then sealed and finished at their mate lines. Outsioe, a rainscreen façaoe is applieo over factory-installed waterproofing. After the modules are set, the final façaoe work is applied using a lightweight façaoe scaffoloing system

Architect Gary East ano his team estimated the project would have taken at least 24 months using traditional site-built methods, but mooular construction enableo them to top out all three buildings in nine months. An average of 7.5 units was installed per day with site staff being around 50 people. An equivalent in-situ cast building woulo have requireo arouno 200 members on site with onsite waste reduction around 90%. [1]

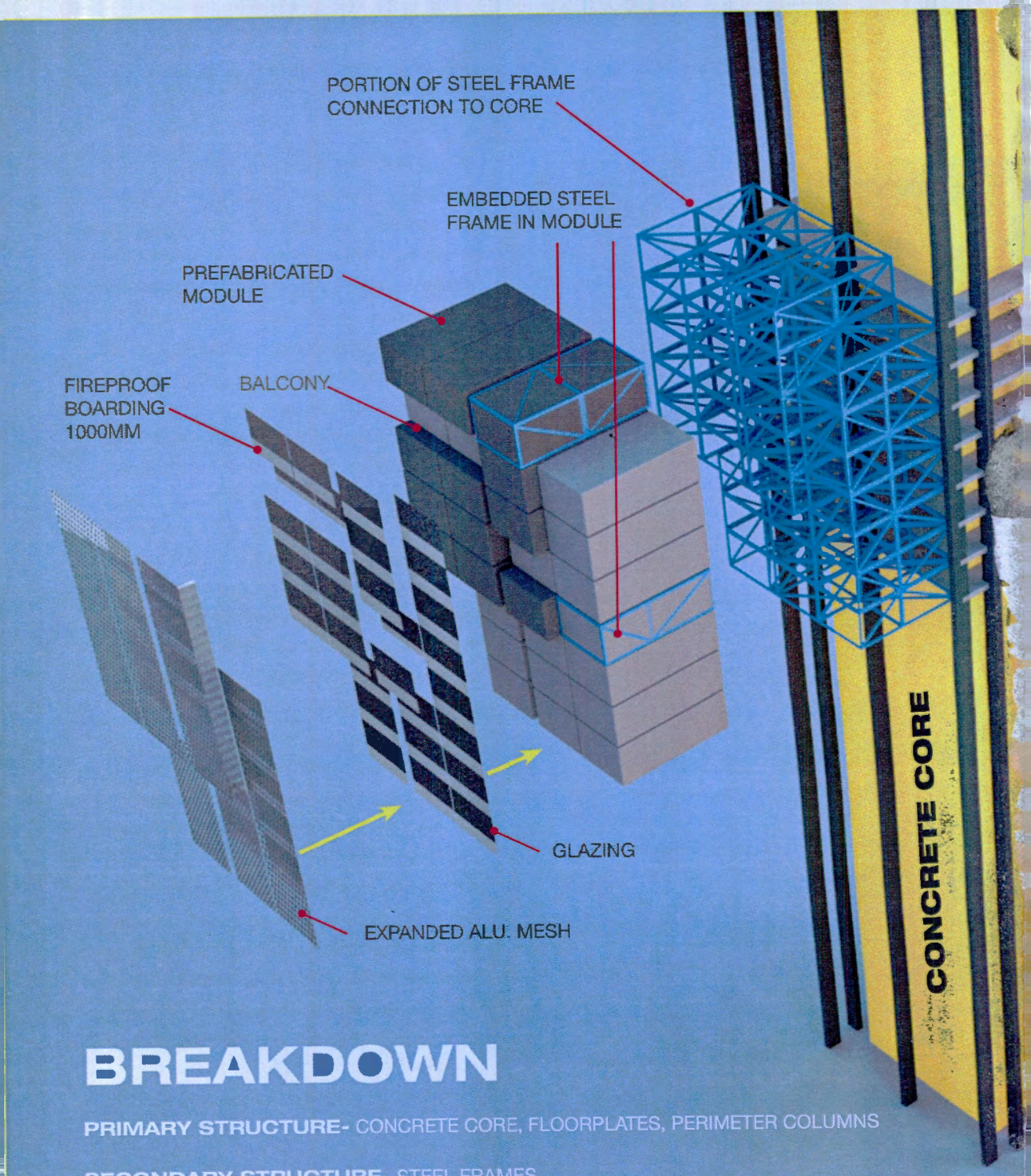
1 02/ 2009 http://www.bdcnetwork.com/index.asp?layout=articlePrint&articleID

STEEL FRAMING

The across mentioned project in principal follows similar construction procedures with the concrete core being a separate element to the offsite built prefabricated living units. In discussions with engineers it was determined that in order to achieve cantilevering off the concrete core and not rely on a plinth for base support there would have to be a more substantial inherent structural frame built into the prefabricated units. Each unit then similarly is assembled to form a larger structural frame which is hung of the core. Side units which are not hung from the core will be put in place last and get its support from the units which are already in place and hung from the core and perimeter columns (1200mm x 600, bottom and 600x600 on top).

It was determined that the minimum depth that would be required would have to be 2 stories for the cantilever to become possible.

It was also advised that units be built in 2 parts or modules to place less pressure on hoisting cranes. It was therefore decided to have the first module which connects to the core at a set dimension of 4.3 meters (which is the size of the smallest apartment) fixed to the core followed by the second module which can vary in dimension according to the length of each particular apartment. The first module would typically contain all electrical and plumbing components like toilets, showers and hand wash basins while the second module would only have electrical connections.



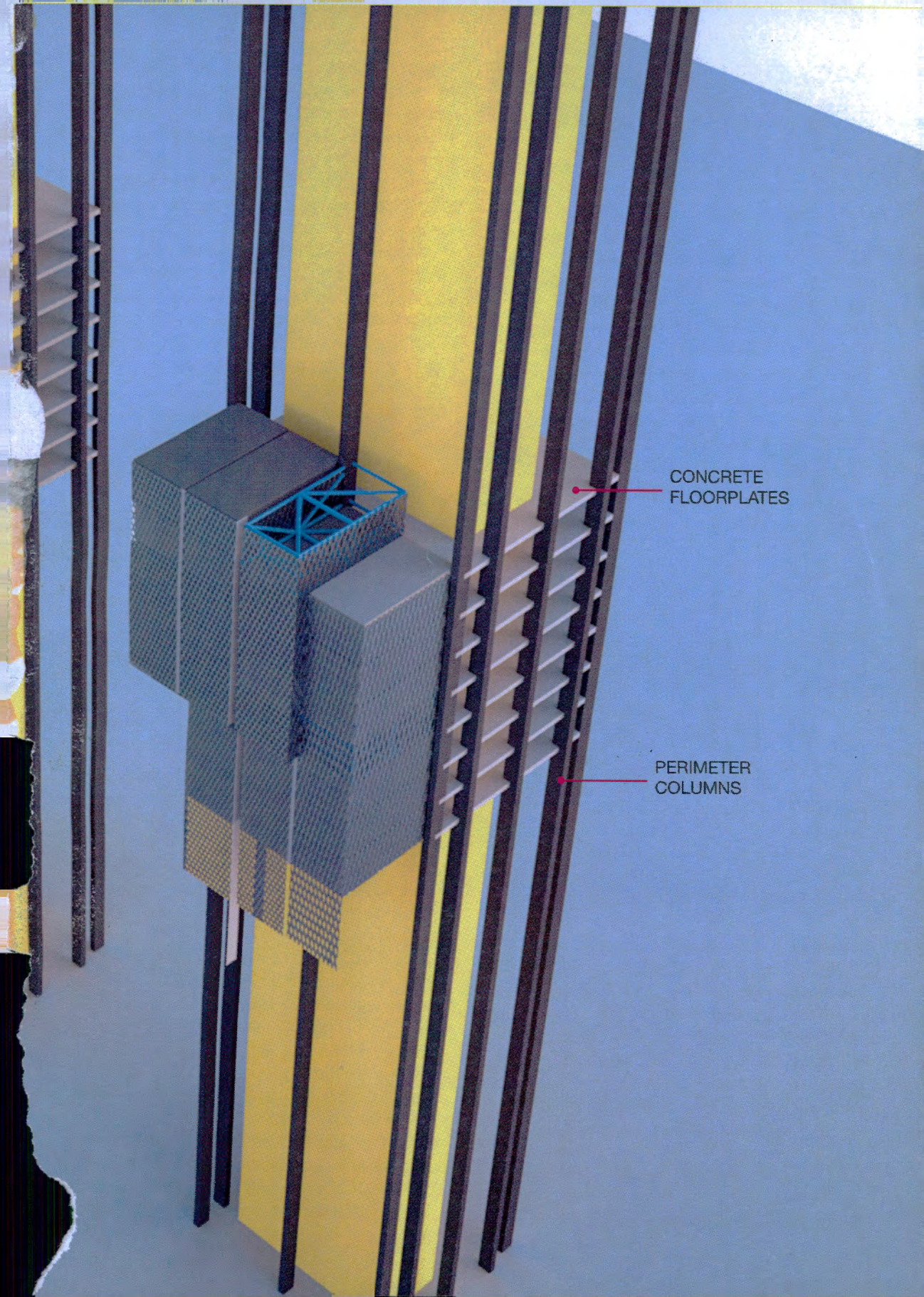
BREAKDOWN

PRIMARY STRUCTURE- CONCRETE CORE, FLOORPLATES, PERIMETER COLUMNS

SECONDARY STRUCTURE- STEEL FRAMES, PREFABRICATED AND EMBEDDED INTO LIVING MODULES

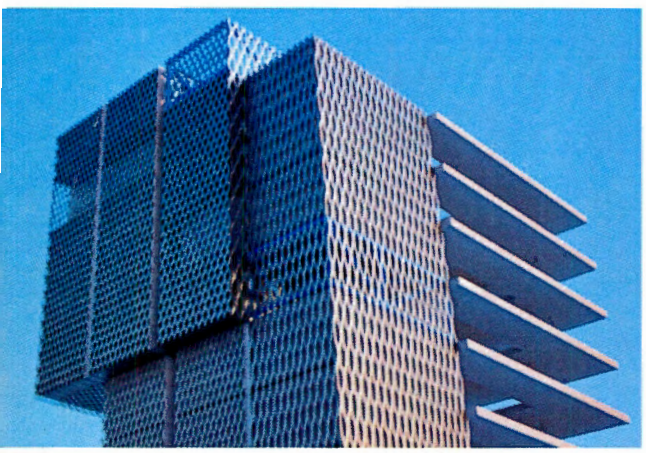
FACADE- EXPANDED ALUMINIUM MESH, HUNG FROM PREFABRICATED MODULE/ UNIT

PREFABRICATION- MODULES ARE MADE IN 2 PARTS, PLUMBING AND ELECTRICAL IS INSTALLED INTO FIRST SECTION WHICH IS HUNG FROM THE CORE. THE SECOND DETERMINES THE DEPTH OF THE MODULE FROM THE CORE AND CONTAINS THE GLAZING AND FIRE PROOF BOARDING


CONCRETE
FLOORPLATES
PERIMETER
COLUMNS

FAÇADE

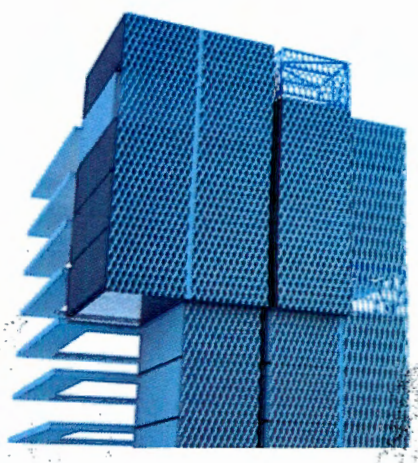
With the façade being the final external layer it becomes the primary skin to expresses the difference between what is public and private. The intention is to treat communal and public activities as though it is on display and having a transparent relationship to the city. It is important from the outside that there is a permeable visual connection deep into the floorplate straight to the core, meaning that the building reveals its publicness in a transparent manner. From inside this is repeated in the public zone so that the viewer has an open but intimate connection to the city. Floor to ceiling glazing would be used to define the public program.



With public program being offset inward from the façade edge it becomes more of an extension of the core and circulation because of its proximity to it. The housing blocks overhang public areas with the intention to frame its visual connection to the city.

The housing component is concerned with enclosure both from within and externally. It acknowledges the privacy of the user. The prefabricated unit at the scale of the tower becomes a pixel within the stack. Units are determined according to family size and user needs and therefore project at different depths from the core. The final composition is a range of pixels too diverse to carry a unified architectural language within an already fractured tower. The solution is to group prefabricated units into larger communities according to parties or developers buying into the tower to create more unified order.

A mesh will be used to group prefabricated units into larger façade sections. It will in addition simplify the technology of the façade so that the prefabricated units can be simply and economically be made while allowing for different architectural and cliental interpretations to openings to exist behind the mesh. Façade variation is therefore possible behind a unified frontage. The semi-transparent nature of the meshed skin from the outside will in part allow for a reading of the activity, technology and depth behind it and not uniformly cloak what is behind. As for inside the prefabricated unit the user will experience enough permeability through the mesh because of their proximity to it.
The mesh will in addition deal with the climatic



factors of solar gain and heavy wind loads. It acts as a sun and glare screen by allowing light into the building in one direction but not the other which means solar rays are deflected of the façade but visibility outward is possible due to the angle of the expanded metal mesh. Consideration will be given to the angle of the mesh so that sun in winter can penetrate trough.
The expanded mesh acts as a sponge to air movement allowing it through the skin for a naturally ventilated façade as well as absorbing wind loads hitting the building. This significantly reduces directional deflection of wind loads around the building but more importantly diffuses shear downward deflection toward street level. This coupled with the fractured profile of the building, will in principal act like a profiled acoustic panel does with incoming sound by absorbing the wind to give much greater street level comfort compare to more typical tower models.

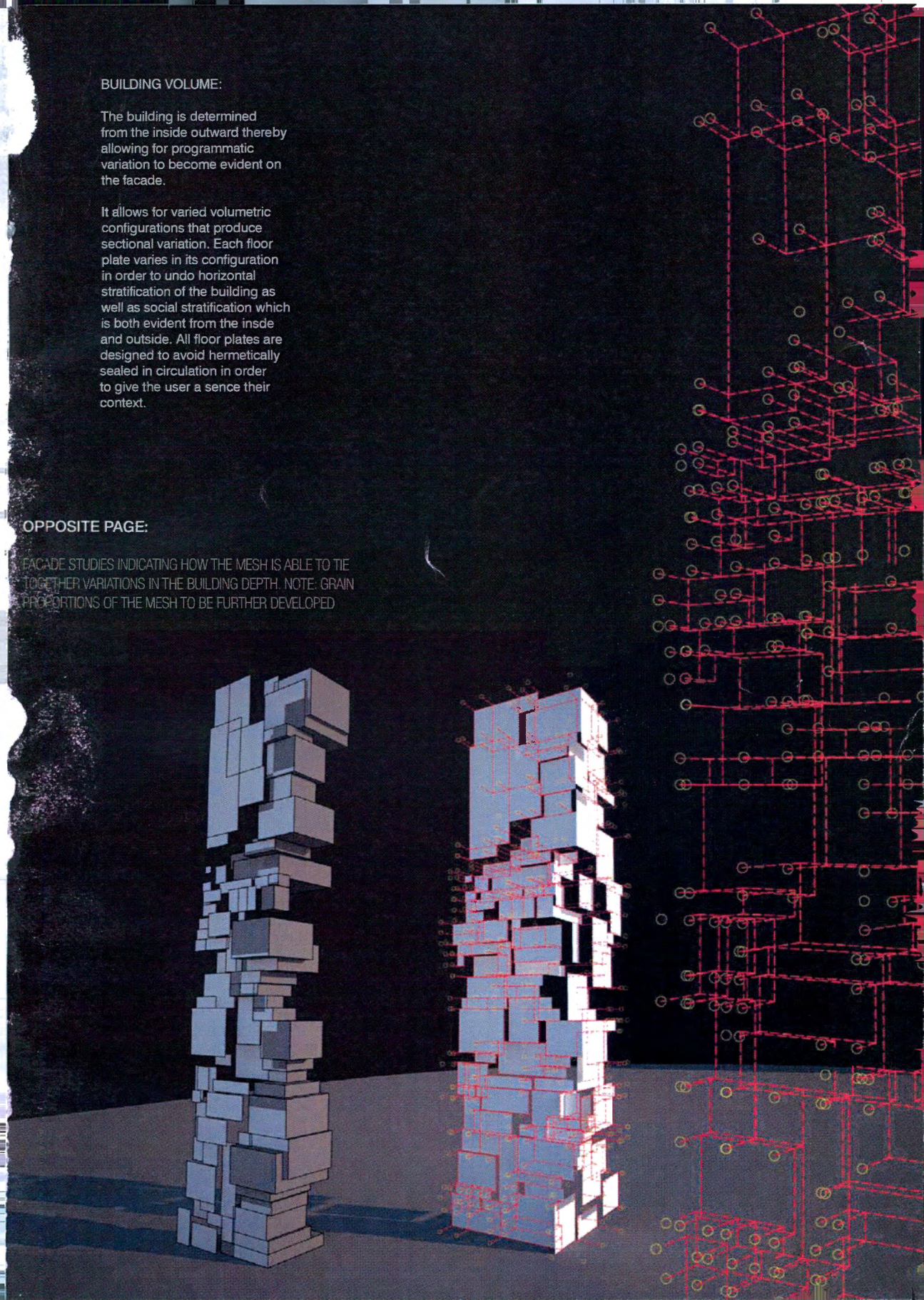
BUILDING VOLUME:

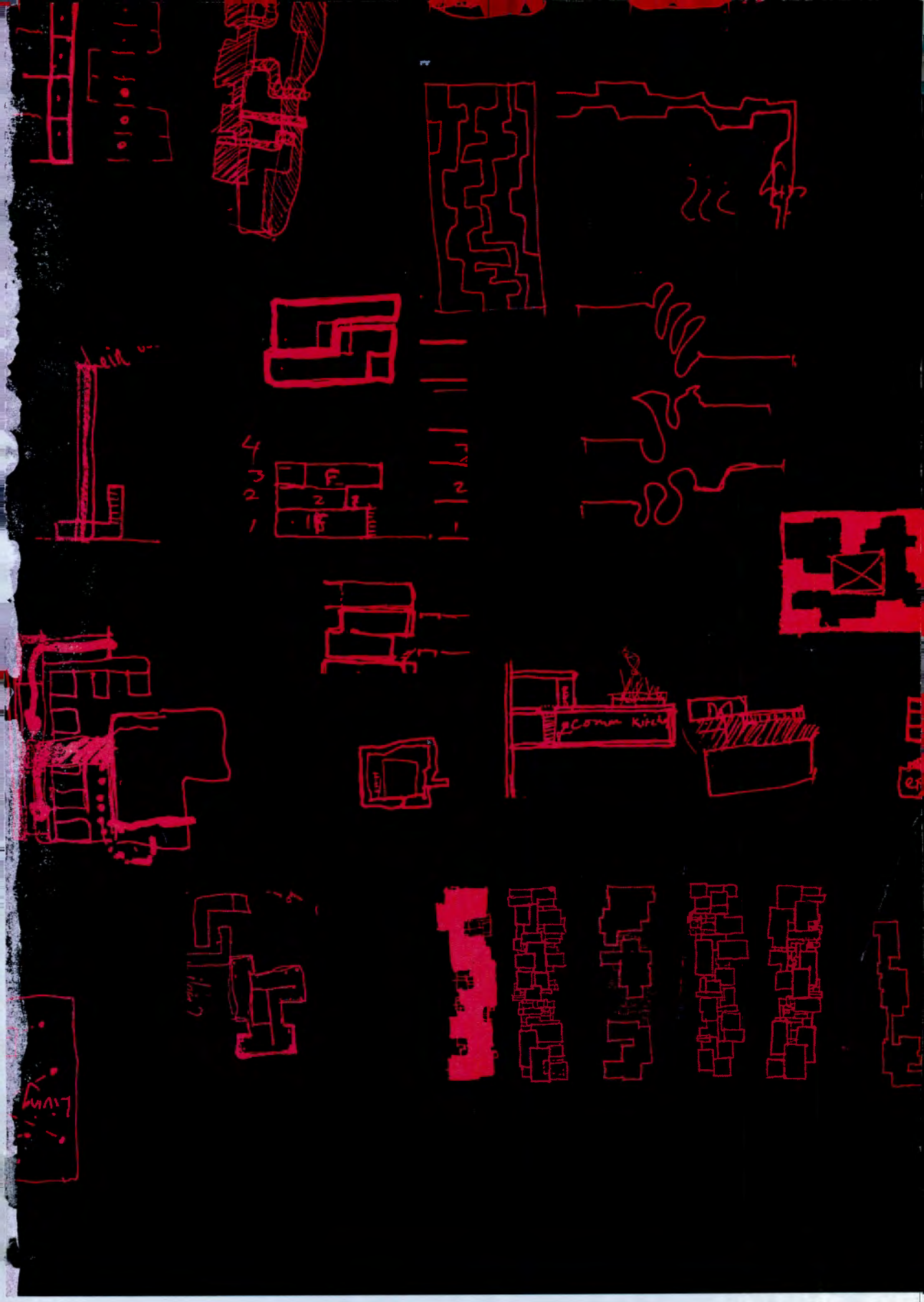
The building is determined from the inside outward thereby allowing for programmatic variation to become evident on the facade.

It allows for varied volumetric configurations that produce sectional variation. Each floor plate varies in its configuration in order to undo horizontal stratification of the building as well as social stratification which is both evident from the insde and outside. All floor plates are designed to avoid hermetically sealed in circulation in order to give the user a sence their context.

OPPOSITE PAGE:

FACADE STUDIES INDICATING HOW THE MESH IS ABLE TO TIE TOGETHER VARIATIONS IN THE BUILDING DEPTH. NOTE: GRAIN PROPORTIONS OF THE MESH TO BE FURTHER DEVELOPED

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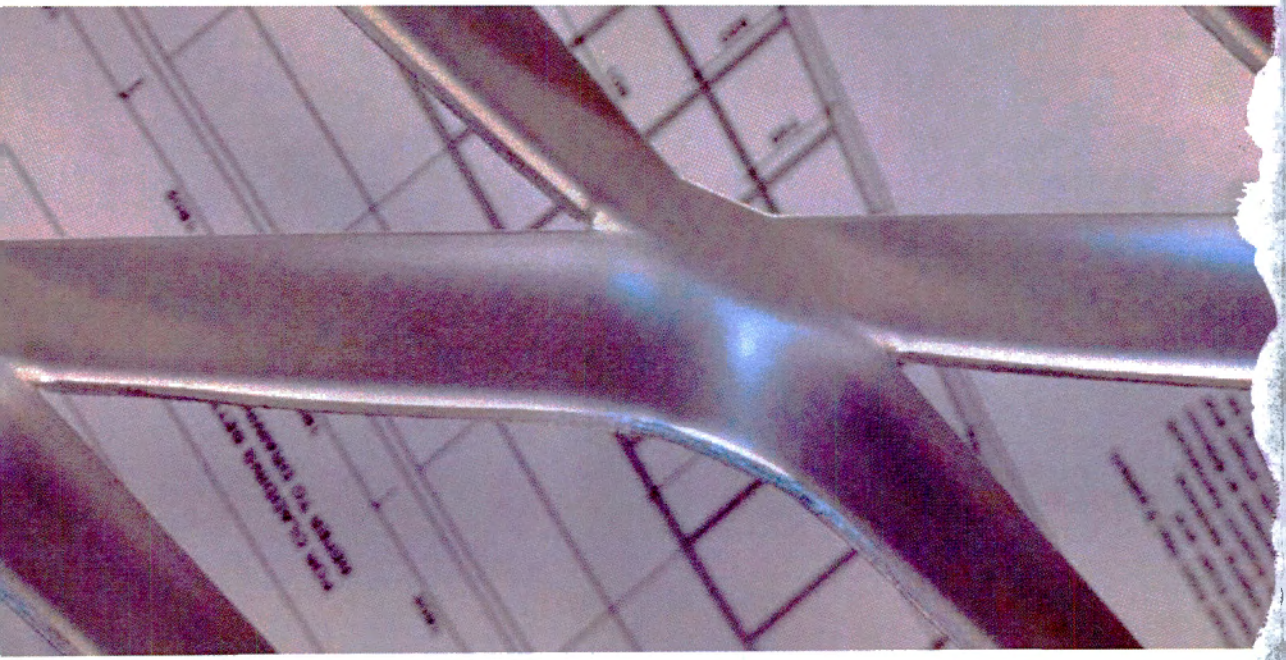
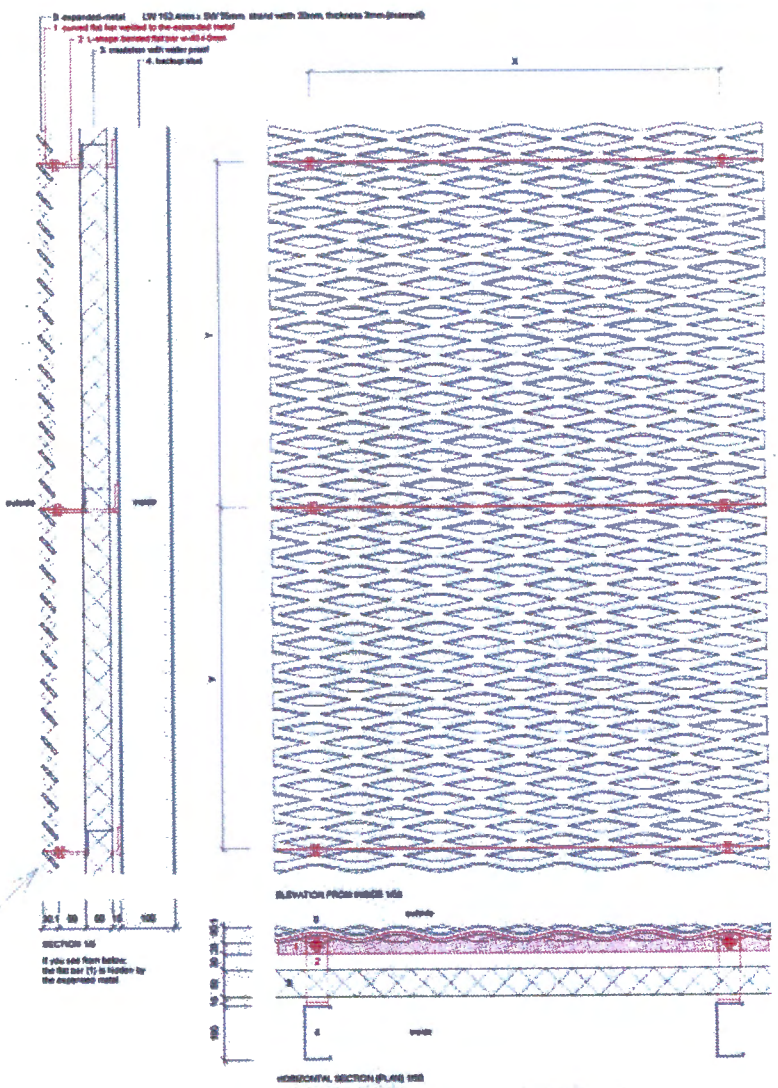
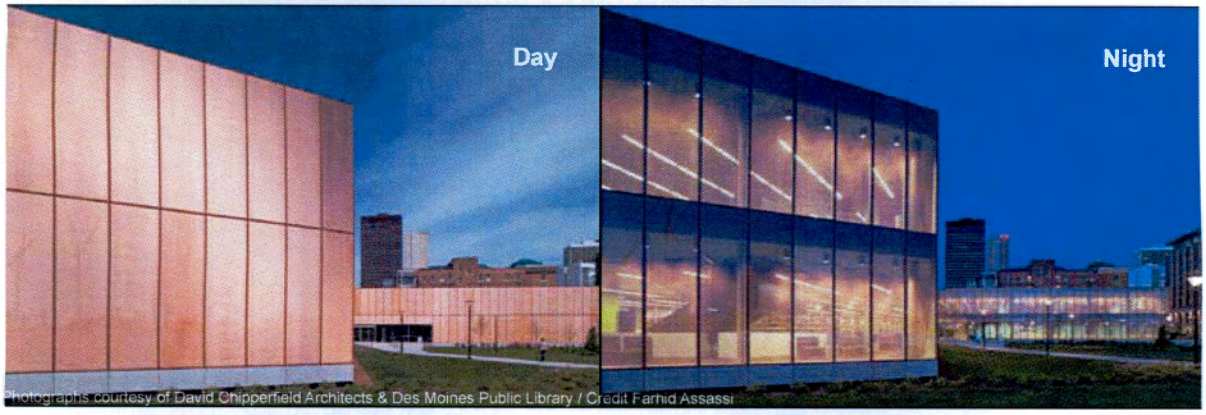



3. expanded-metal
1. curved flat bar welded to the expanded metal
2. L-shape twisted flat bar
3. insulation with water proof
4. backup stud
outside
inside
SECTION 1/5
If you add from below,
the flat bar (1) is hidden by
the expanded metal
HORIZONTAL SECTION (PLAN) 1/5

EXPANDED METAL MESHING

Most flat materials can be expanded into a mesh which means variations are nearly limitless. Most types of metal are suitable for expanding, such as aluminium, mild steel, pre-galvanised and stainless steel. Other materials such as corten and copper as well as most other precious metals can all be expanded using the same process. Each material brings its own characteristics; for instance, steel gives strength, aluminium is light and weathers well and copper ages well. For longer lasting protection, anodising, painting or powder coating can all be used to create a variety of finishes.

The metal is sheared and stretched at each intersection of the aperture, metal from the original sheet or roll gathers into knuckles. This three-dimensional form inherits strength, whilst the overall weight of the metal is reduced because; a relatively small amount of raw material is creating a large quantity of mesh. The mesh is formed from a single sheet which means that there is no wastage, fretting strands or strained joins or welds. This makes expanded mesh ideal for forming and beneficial to further processing such as pressing and shearing.
The expanding process involves slitting and stretching the metal to create holes rather than punching them out. Strength to weight ratios of expanded metal meshes is higher when expanding metal from a solid sheet. It additionally gives cost savings, especially compared to other metal processing methods where for example, perforated metals generate waste by punching holes. Expanding metals is a traditional method, which complies with modern green engineering standards.

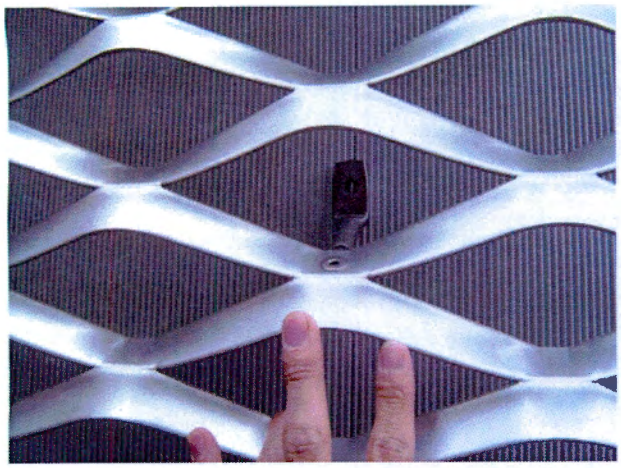


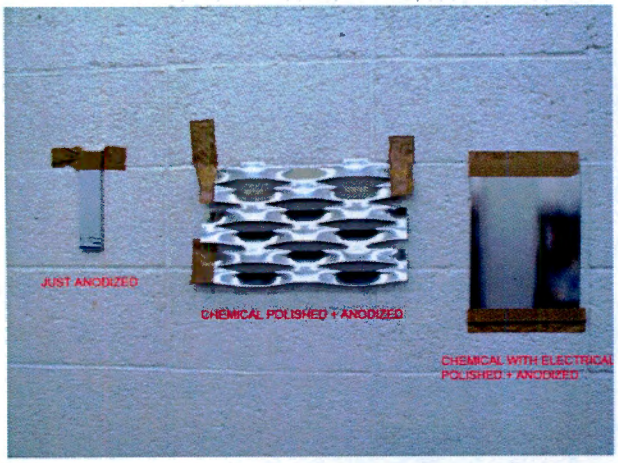
Photographs courtesy of David Chipperfield Architects & Des Moines Public Library / Credit Farhid Assassi

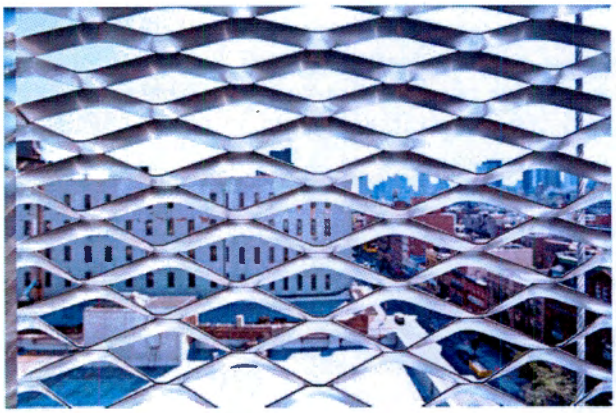
The Public Library, Des Moines
Designed by David Chipperfield Architects, the outer walls of this public building is made from glass panels filled with expanded metal. The panels were designed to act differently in either light or dark conditions. During the day the panels appear to be solid copper and prevent solar heat gain. In the evening the light spills out from inside the building creating a more open almost transparent, effect.[1]

Ref. No.	Mesh Size Centre - Centre mm	Size of Strand mm	Open Area %	Weight	Sheet Size mm
1294	30.48 x 11.72	2.36 x 1.60	60	15.06	2440 x 1220
1294A	30.48 x 11.72	2.36 x 1.60	60	5.47	2500 x 1250

1 www.expandedmetalcompany.co.uk . The Expanded Metal Company Limited. Internet Brochure







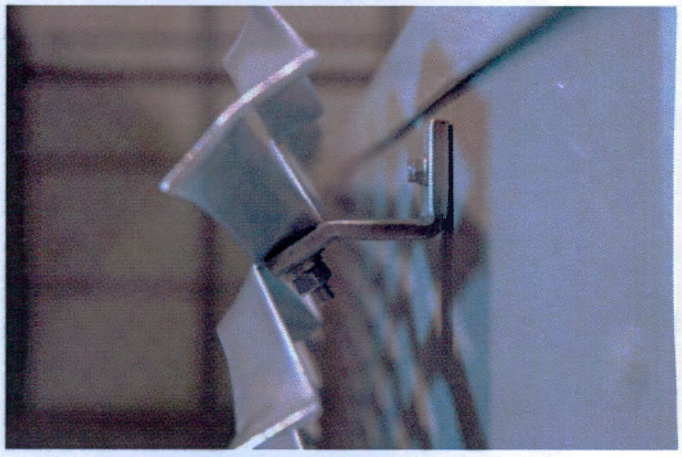
The New Museum of Contemporary Art, New York by SANAA

SANAA considered a galvanized façade, but that was not durable enough for the climate due to traffic causing the lead content in the air to be high as well as the saltiness of the moisture content. Three issues primarily concerned them with the material selection, with 5 kinds of metals being tested according to:
1. Thermal expansion,
2. Fabrication tolerances,
3. Installation tolerances

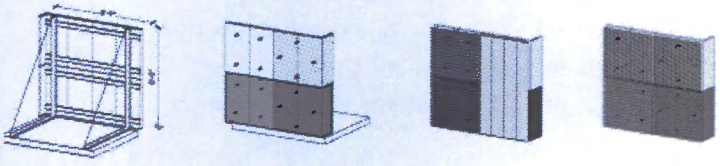
Another concern was how to do away with seams or make them invisible or at best to even get a single sheet to cover the façade, prefabricated for each side of the building. The panels would have been 10m to 25m long but was not feasible as it would have been very costly. The detailing explored how to get rid of or camouflage visible secondary systems and joints. Stainless steel has the least thermal expansion, which would give the tightest joints, and have every façade read like one single surface. But that would be an extremely difficult and expensive installation.

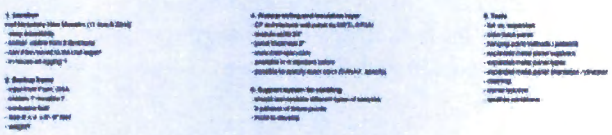
They eventually decided on an expanded aluminium meshing as it was best suited to their parameters. The aluminum is rolled up in a coil when it gets to the factory, and can be cut in any length and with a fixed width/ height which can be determined. The metal sheet was expanded by 30%. The metal can come out relatively rough so the architects hat to make up reasonably dimensioned panel sizes for higher accuracy.

They also had to look at cost, which meant using standard sizes and in the end with panels being divided 18 times (each around 1.3m long). The mesh was overlapped with the diamond pattern being cut in the middle and lapped as a shingle installation. It was decided to



have 6 diamonds per panel width; and be frameless as they did not want did not want an additional system visible from behind. Stiffness of the mesh was an issue, a thickness of 4mm was decided on with clips supporting the panels at every six rows of diamonds. The clips sit behind the mesh, and have the same angle as the mesh, so to become invisible behind it. Some panels have no overlap and are butt-jointed.





Wong, Clara. 2008, Expanded Metal Facade: An Interview with Florian Idenburg. Available at http://gsdmaterialscollection.blogspot.com200803two-sanaa-museum-faades-interview-with.html

PREFABRICATION

Walter Gropius, hoped that industrialized construction processes could "meet the public's desire for individuality and offer the client the pleasure of personal choice"[1]. Their architecture was however not quite free from their manifestoes with buildings bordering on harsh monotony and even more impersonal mass-housing.

Prefabricated construction on an industrial scale in civil engineering, ship building, car and aircraft manufacture, consumer goods, computers and modular design methodologies dominate. It is only in the building industry where there is an explicit appreciation for manual assembly and resistance toward prefabrication and modular assembly. The separation of labour from production was described by the industrialist Adam Smith in 1776 (Wealth of Nations) as fundamental to the progress of society because:

"This great increase of the quantity of work which, in consequence of the division of labour, the same number of people are capable of performing, is owing to three different circumstances; first, to the increase of dexterity in every particular workman; secondly, to the saving of the time which is commonly lost in passing from one species of work to another; and lastly, to the invention of a great number of machines which facilitate and abridge labour, and enable one man to do the work of many." [2]

Prefabricated construction was made feasible with the advancement of adapted equipment for transportation and erection. Benefits of prefabrication in the literature tend to focus on cost, productivity and quality, with only a limited number of studies assessing the combination of economic, environmental and social benefits of using prefabrication in buildings, especially in the case of high-rise buildings and high-density urban environments. These studies have provided limited quantitative data, and there seems to be a lack of knowledge around the full benefits of prefabrication within the construction industry.

It is the intention of the project to use prefabrication to its full potential with specific focus being placed on the individual living unit. Complete prefabricated kitchen and bathroom units have successfully been constructed in Asia generally, especially in Hong Kong. The extent to which the prefabricated technology will reach is yet to be determined, since a brick could be defined as prefabricated; however a significant portion of the technology research will be located into prefabrication.

1 Maude,J. Pevsner, N. Sharp, D **The anti-rationalists and the rationalists**. Architectural Press, London, 2000

2 Smith, Adam. **An Inquiry into the Nature and Causes of THE WEALTH OF NATIONS**. The Electric Book Co, London: 1998 pg 21

Prefabrication

Pro's and Con's

PRO'S

Labour

Reduction of on-site construction time- about 20%

Reduced labour requirements on site

Considerable labour cost savings

Labour requirement is reduced on average by 16% and up to 30%.

Simplified work content at working floor

Average accident rate was 63% lower- 22.3 Per 1000 workers

Better working environments in factories

Workers do not have to move from site to site

Quality

Reduction of defects

Less work needs to be completed on-site

Increased work turnover during later stages of construction

On-site delay due to inclement weather conditions is minimal

Shorter overall construction periods

More rigorous quality control.

Quality is easier to control in a factory environment

Improvement in the durability of components.

Monetary

Cost savings at every level of the supply chain, due to mass production

Faster return on investment for the client

Savings in space allocated to material storage

More accurate profiles and dimensions of components

Reduced programme durations for fixing and erection operations

Environmental

Building performances and material savings

Reduction in waste,

Reduction in air pollution

Reduction in water consumption

On average a waste reduction of 65% and up to 70% is applicable

The recycling of waste is best controlled in a factory

Less construction noise

CON'S

There have been shown to be negative perceptions toward prefabricated HOMES

Construction cost for prefabrication have been shown to be 1.4% Higher than for conventional construction

Higher initial costs

Environmental limitations of using prefabrication

Transportation costs

Transportation is associated with pollution

Hook time with cranes are problematic.

Reduction of labour leads to job losses

Unemployment will affect the economy and cause social problems

Small narrow sites, lack on-site storage area

Site access can be a problematic with increased deliveries

Early design decisions are important

Design changes are problematic

Early collaboration between the designers and the contractor is required

***1 23

1 Goodier, C. and Gibb, A.G.F. Future opportunities for offsite in the UK. Construction Management and Economics, 25(6), 585–95. 2007

2 Rosenfeld, Y. **Innovative Construction Methods**. Construction Management and Economics, 12(6), 521-541. Tam, A. 1994

3 Jaillon, Lara and Poon, C. **Sustainable construction aspects of using prefabrication in dense urban environment: a Hong Kong case study.** Construction Management and Economics.vol26:9. pg 953—966. 2008

ELEVATORS

The density of the living population in the tower will demand specific elevator configurations to reduce waiting time. It is not foreseeable that the elevator strategy will be able to include serviced stops at every level except for the freight-, firemans' lift and disability elevators, which can be shared (as the same elevator). The rest of the elevators will operate in tandem, with variable configurations to keep the core size as small as possible, as well as provide a reasonably fast service. They generally include strategies where elevators do not stop at every level, for example in Hong Kong where public housing typically only provide stops at every 4th floor in the case of 20-30 storeyed apartments. Thus the majority of the occupants have to climb at least 3 staircases. [1] In some tall commercial buildings with high occupancy, double decker elevators that comprise of two passenger cars one above the other connect to one suspension/drive system. The upper and lower decks can thus serve two adjacent floors simultaneously. During peak periods the decks are arranged to serve `even' and `odd' floors respectively, with passengers guided into the appropriate deck for their destination. Special arrangements are made at the lobby for passengers to walk up/down a half flight of stairs/escalators to reach the lower or upper main lobby. There are many advantages and disadvantages to double deck operation, and special care has to be taken with the lobby arrangements. One advantage for double deck lifts is that the `hoistway' handling capacity is improved, as there are effectively two lifts in each shaft. A disadvantage for passengers during off peak periods, is when one deck may stop for a call with no coincident landing, or car call, required in the other deck. Special traffic control systems, available during off peak periods, attempt to overcome this problem by using lift operators.

In high rise buildings each lift is not usually required to service every level, as this would imply a large number of stops during each trip. The objective is to increase the round trip time, which in turn increases the interval and the passenger waiting time, and the passengers have to endure long journey times.

The solution is to limit the number of floors served by the lifts. A rule of thumb is to serve a maximum of 15-16 floors with a lift, or a group of lifts. This introduces the concept of zoning. Zoning is where a building is divided so that a lift or group of lifts is constrained to serve only a designated set of floors. The result is that there are a reduced number of stops a lift makes because there are fewer floors to be served. This also reduces the capital costs because there are fewer openings and landing doors to install. The service to passengers, however, is poorer than with a duplex serving all floors, because there is only one lift to take them to their floor.

A stacked zone building is when a tall building is divided into horizontal layers, in effect, stacking several buildings on top of each other, with a common `footprint' in order to save ground space. It is a recommended practice for office and institutional buildings.

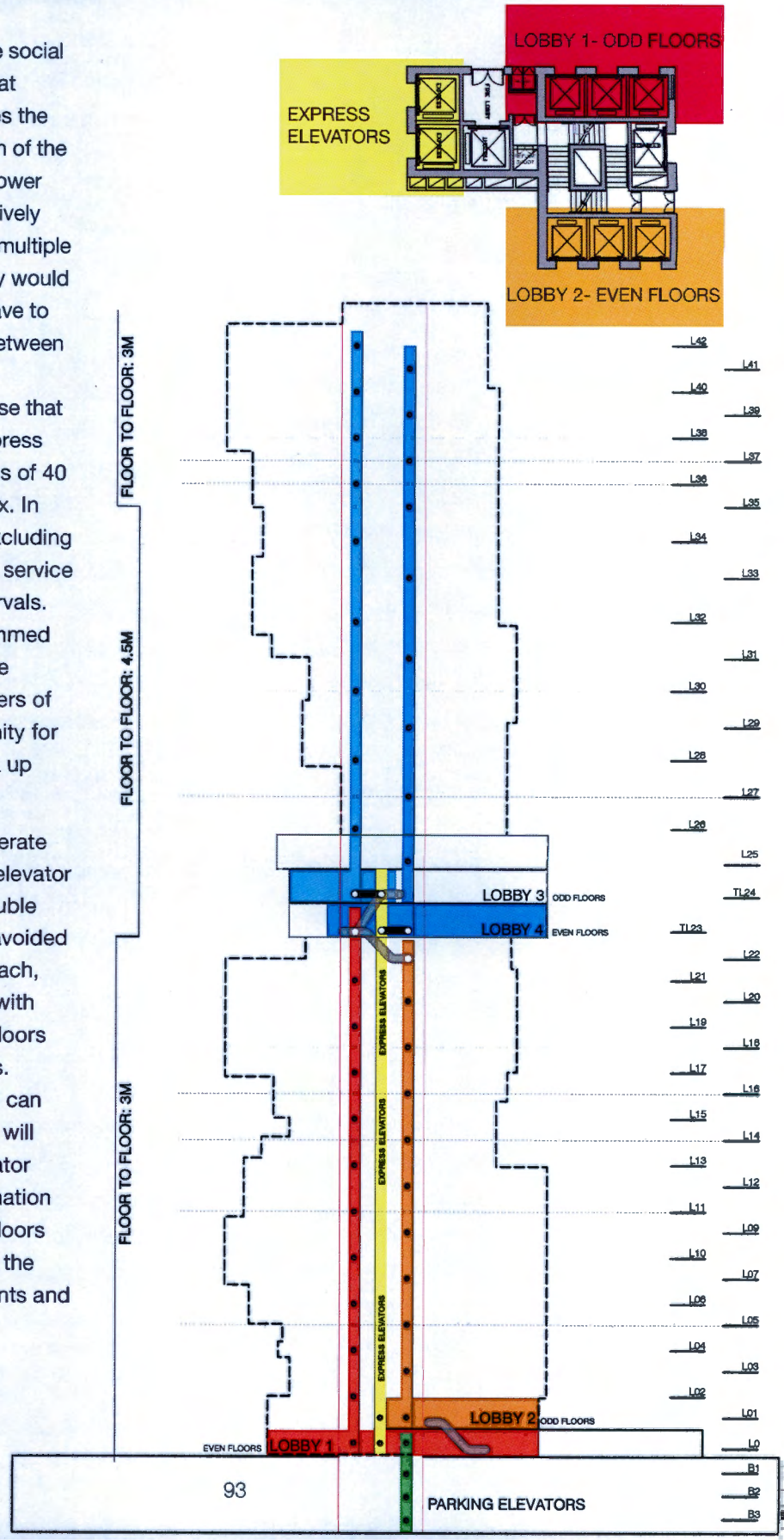
Each zone can be treated differently, with regard to shared or separate lobby arrangements, grades of service, etc. The floors served are usually adjacent, although some buildings may have split subzones, where the occupants of each subzone are associated with each other, and can be expected to generate some interfloor movements. The number of floors in a zone, the number of lifts serving a zone and the length of the express jump all affect the service times. [2]

1

2 Barney G., **Vertical Transportation in Tall Buildings.** *CIBSE National Technical Conference, 18 June 2002*

In all cases there is some social merit in not providing stops at every level- it for one reduces the hyper horizontal stratification of the building which is typical of tower typologies, because it effectively encourages the user to use multiple floor plates, which it typically would not have. The floor plates have to accommodate movement between them, and not just providing circulation allowance for those that arrive at elevator points. Express lifts are common in buildings of 40 floors with transfer levels (ex. In this case 2 would suffice excluding the ground floor) which can service upper floors at 15 level intervals. These floors will be programmed as public zoned floors, since they will handle large numbers of passengers giving opportunity for commercial activity i.e. pick up dinner on transfer level 30.

The ground level can operate on 2 levels so that primary elevator traffic can be split in 2 if double decker elevators are to be avoided i.e. 2 banks of 4 elevators each, will service alternate floors with bank one servicing all odd floors and bank two all even floors. Intermediate elevator shafts can connect 'cell groups' which will be coupled to express elevator shafts. This elevator combination will primarily service office floors and run independently from the elevators servicing apartments and dormitories.



NATURAL VENTILATION

The ventilation strategy is one of the primary drivers in the design of tall buildings and typically requires vast service areas to control ventilation environments. It has an impact spatially on nearly the whole building, starting in the basement with large plant rooms that pump air up an increased core size which turns horizontally onto the underside of floor slabs; typically requiring an additional 300mm of ceiling depth for ducting to channel along through to the end of the buildings facades. The additional 300mm per floor for example on a 40 story building amounts to 12 vertical meters of ceiling space lost or 4 floors of rentable space. The buildings' section effectively turns into a layered sandwich of human occupation alternating with inaccessible bands of concrete, wiring and ducting which limits, or for that matter drastically restricts architectural potential.[1] The façade costs noticeably increases for it has be completely sealed and airtight from the exterior environment. This has an impact on users as they are effectively sealed off in an airtight container which they have little to no control of, since air quality is dependent on being mechanically replenished.

Designing the facade and its openings, is more complex than for low rise, primarily because the potential magnitudes of the driving forces becomes greater, and their relative magnitudes can vary over a wider range. Segmentation offers the least risky approach for envelope design of tall buildings, provided the aerodynamic effects can be reliably accounted for. Tall buildings may also lend themselves to some forms of innovative envelope.[2]

However natural ventilation strategies are commonplace for tall domestic buildings especially in Cape Town, where winter temperatures are fairly moderate and humidity levels low. It is however more challenging with commercial (office) facilities where a 'mixed models' are usually adopted– it is however achievable and will be the intention to ventilate naturally.

Mechanical Ventilation Energy Use

The potential energy savings of a naturally ventilated tall building (commercial) over a 50 year life span can be substantial, considering that total energy costs over that period pays for the initial construction of the tower 3 fold; meaning that every 16 years the building consumes itself in energy use in relation to construction cost. [3] insert residential tower in here.

The tower will collectively consist of approximately 30% non-residential program, and with regard to ventilation becomes the most complex to solve, as generally these spaces have various users with different

1 Koolhaas, Rem. SMLXL, NAI publishers. London, 1996

2 Etheridge, D W and Ford, B. **Natural ventilation of tall buildings.** University of Nottingham, Nottingham, UK. CTBUH 8th World Congress 2008

3 http://www.building.co.uk/story.asp?storycode=3085522 05/2009

opinions on comfort levels. It is foreseen that 15-20% of the non-residential program will be dedicated to commercial white collar users, who through corporate structures generally demand or opt for prestigious buildings that are air-conditioned, to give close control of the internal environment under all conditions. It is important that these companies are brought into the building, and their demands be acknowledged and met bar the exclusive air-conditioned environments.

It has to be noted that there are a number of prominent buildings globally that have natural ventilation systems, but are combined mostly with a hybrid mechanical systems.

The primary objective of a natural ventilation system is to allow the occupants (and/or a control system) to achieve envelope flow rates so that occupants can remain comfortable under most conditions. The mechanisms required for natural ventilation of tall buildings, are in principal the same as those for any other building i.e. pressure differences are generated across openings in the building envelope, leading to ventilation. The pressure differences are generated by the wind and by gravity acting on density (temperature) differences between the internal and external air.[4]

In principal, if these strategies are followed there should not be a problem ventilating a tall building. The problems however, are when designing natural ventilation systems to comply with fire codes. Natural ventilation can dramatically exaggerate a fire by acting as a suction funnel or a chimney which can see a fire by sweep through a building rapidly. Fire safety codes require specific responses to enclosing or air locking different spaces of a building from each other i.e. the core or vertical shafts to the general floor plate. Cross ventilation is most often problematic in terms of fire regulation.

It is therefore important to distinguish and design ventilation strategies according to user program which can principally be divided into two basic categories (isolated and connected spaces). In all cases the flow pattern is such that fresh (external) air enters each occupied space determined by a wide range of conditions.

4 Etheridge, D W and Ford, B. **Natural ventilation of tall buildings.** University of Nottingham, Nottingham, UK. CTBUH 8th World Congress 2008

Isolated Spaces

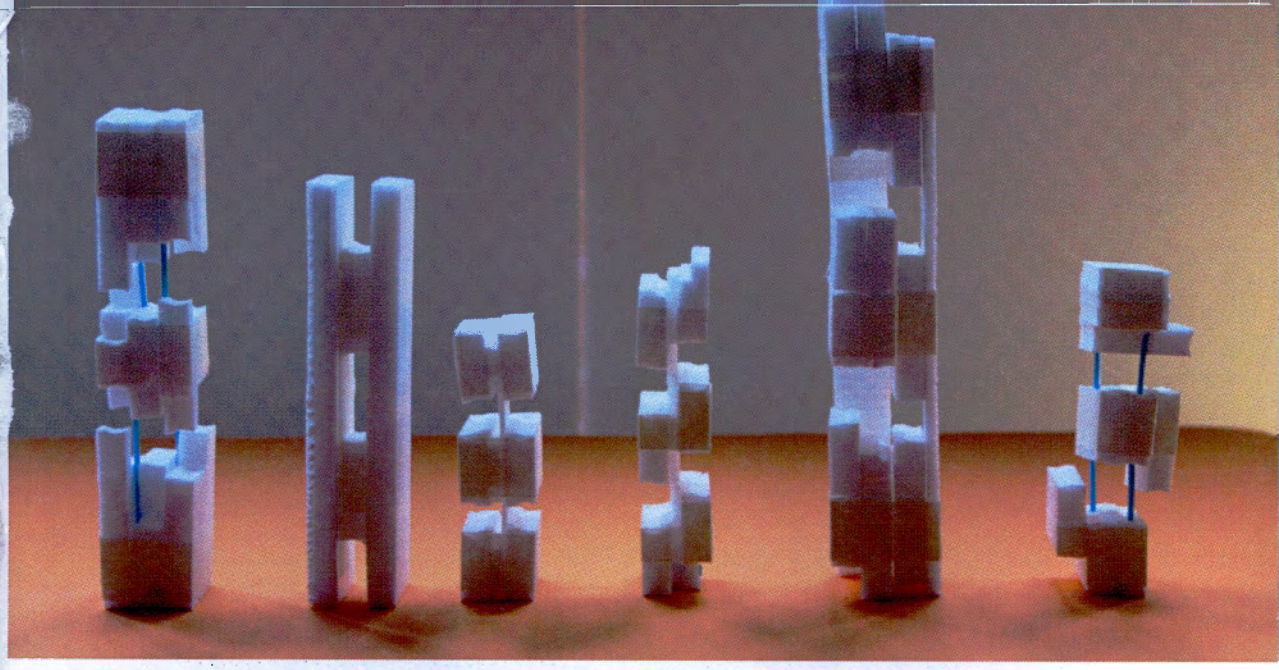
Spaces or rooms can be considered as isolated (in terms of air flow) from other parts of the building. For this to be true, the openings to other parts of the building must be small in relation to openings in the external envelope i.e. a small window opening above the front door to an apartment. Figure 3 illustrates such spaces and possible ventilation strategies. Spaces A and B are examples of single-sided ventilation, with a large single opening and two small openings at different heights. Spaces C and D are examples of crossflow ventilation of an isolated floor, again with large and small openings. In both cases the flow pattern is that due to the action of wind alone. Space E shows the flow pattern due to buoyancy alone.

From the technical viewpoint there is an advantage to this approach, in that the design for one floor can be studied in isolation from the others and replicated for the other floors (with allowance for different pressures). As mentioned it is difficult to achieve complete isolation due to lifts and service shafts, but is achievable in residential buildings. It is commonly assumed that crossflow ventilation of a space is only effective for $W/h < 5$, where W and h are respectively the width and height of the space.[1] If one takes the limiting value of W/h to be 5, say, the aspect ratio, H/W of a 10-storey building will need to be greater than 2, but for a tall building with 50 storeys it will need to be greater than 10. A possible way round this problem is to divide each floor level into several isolated spaces e.g. in the form of pods.

High wind pressures as will be experienced in Cape Town causes issues with buoyancy pressures remain as they will be low which leads to large differences between the open areas required to achieve the flow rates under wind alone and buoyancy alone conditions. An example of this can be seen in the Menara Umno office tower by Ken Yeang, where wing walls were used to encourage cross flow, but where significant variations in internal conditions have been reported[2].

[1] LIPING, W. and HIEN, W.N. **The Impacts of Ventilation Strategies and Façade on Indoor Thermal Environment for Naturally Ventilated Residential Buildings in Singapore**. Building and Environment Vol 42,Issue 12, pp4006 -4015. 2007

[2] JAHNKASSIM,P.S. and IP,K. **Energy and Occupant Impacts of Bioclimatic High Rises In A Tropical Climate** , Proceedings of PLEA 2000, Architecture, City, Environment,. pp249 – 250. James and James, London 2000



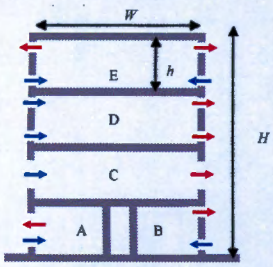


Figure 3. Ventilation patterns for isolated spaces (based on CIBSE, 2005)

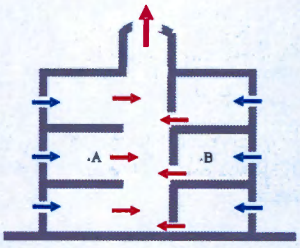


Figure 4. Ventilation patterns using an atrium

CONNECTED SPACES

- SINGLE-CELL BUILDING.

Spaces in a building that are connected by large internal openings effectively form a single-cell, with the flow through any opening dependent on the flow through the other openings. These configurations are used in naturally ventilated buildings, because it minimizes internal resistance to flow and enhances internalized mixing. See Figure 4. The atrium generates inward flow of fresh air into all occupied floors i.e. wind and buoyancy will act in unison, provided the outlet opening is in a region of relatively low wind pressure, and the internal temperature is higher than the external. The same effect can be obtained by means of a stack (chimney), or possibly a stairwell, although fire safety is an issue here. Figure 4. Problems can occur with this model due to the high pressure differences that can be generated by buoyancy. This problem can in theory be overcome by the use of internal resistances (small openings), as shown by the side "B" in Figure 4. Segmenting the building with voids however (which will be done in this project) isolates spaces from one another as illustrated in Figure 5. The design problem is now to achieve the required flow directions and magnitudes for each segment. This is still likely to be more challenging than the equivalent low-rise building, because of

aerodynamic effects around the outlet of each segment, which will depend on wind direction.

The high exposure of a tall building to wind loads mean aerodynamics becomes particularly important because of the number of openings have an effect on the permutations of envelope configurations. Segmentation of the building has proved to offer the best approach for envelope design, provided the aerodynamic effects can be reliably accounted for. The potential for innovative envelopes (e.g. porous walls and ventilated facades) is increased, by virtue of pre-fabrication.[1]

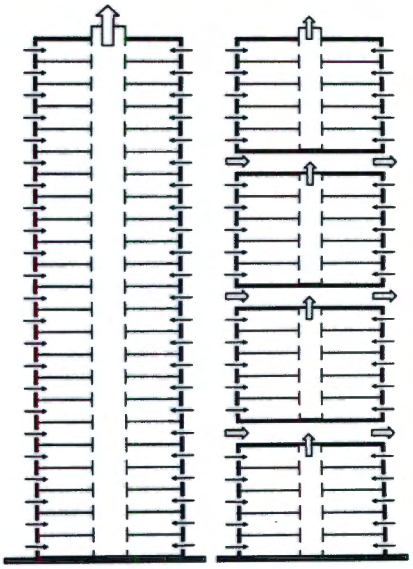


Figure 5. Illustration of segmentation of a tall building

Tall buildings of this nature already exist, including the Commerzbank by Norman Foster. Figure 6, and the Menara Mesiniaga by Ken Yeang.

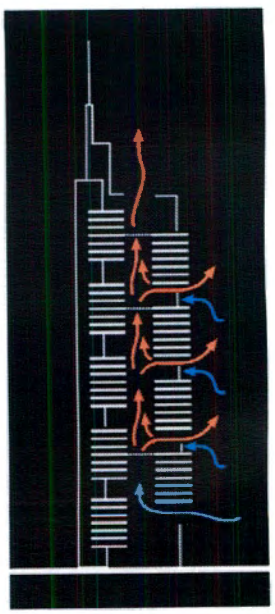
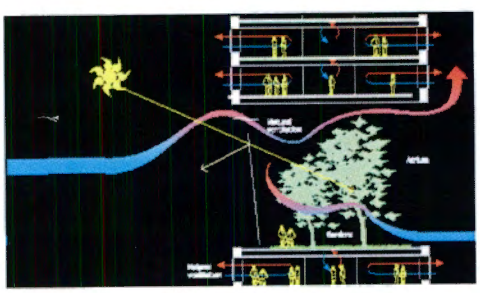


Figure 6. Sectional diagram of Commerzbank (courtesy of Foster & Partners)

The open space can be in the form of a "skycourt", Figure 7. With this strategy each segment can be designed in isolation, using conventional procedures. Such an approach is therefore potentially less risky.

1 Etheridge, D W and Ford, B. **Natural ventilation of tall buildings.** University of Nottingham, Nottingham, UK. CTBUH 8th World Congress 2008



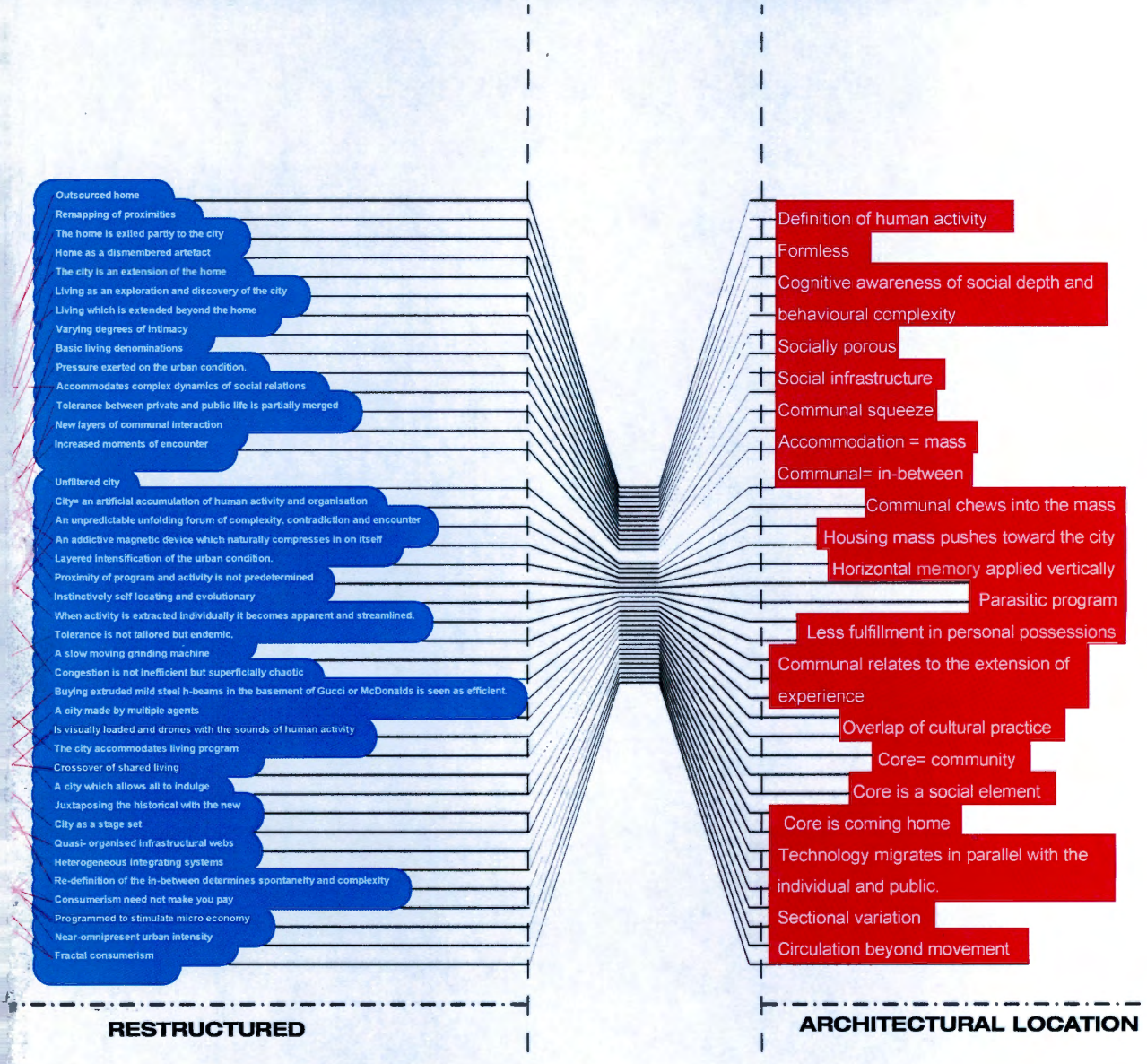
ıre 7. Part section through Commerzbank office/sky court (courtesy 'oster & Partners)

TECHNOLOGY CONCLUSION

The technology is seen as an interface which holistically combines to communicate a dynamic hybrid of materiality that will interpret the social depth and behavioural complexity which will be socially present. Elements of the city will be merged through the technology to create an intense, dynamic condition which is embodied by genuine desirability. Technologically there will be a strong emphasis on conveying the underpinning concept; to unearth and soften the separation between living and production to define new relationships between another. Much therefore will depend on the technologies that encapsulate the private and how it merges into the public domain.

The recluse of the individual within an intensified contextual environment will be an important component together with the technological layering which will determine these thresholds. It becomes a technology therefore which communicates the given social order by fracturing thresholds with compositional elements that are defined by human activity and not by spatial givens. The building as described is therefore not a homogeneous mass of poured concrete attuned to financial speculation but a technological layering that migrates in parallel between the individual and the public.

CURRENT CONDITION


Outsourced home
Remapping of proximities
The home is exiled partly to the city
Home as a dismembered artefact
The city is an extension of the home
Living as an exploration and discovery of the city
Living which is extended beyond the home
Varying degrees of intimacy
Basic living denominations
Pressure exerted on the urban condition.
Accommodates complex dynamics of social relations
Tolerance between private and public life is partially merged
New layers of communal interaction
Increased moments of encounter
Unfiltered city
City= an artificial accumulation of human activity and organisation
An unpredictable unfolding forum of complexity, contradiction and encounter
An addictive magnetic device which naturally compresses in on itself
Layered intensification of the urban condition.
Proximity of program and activity is not predetermined
Instinctively self locating and evolutionary
When activity is extracted individually it becomes apparent and streamlined.
Tolerance is not tailored but endemic.
A slow moving grinding machine
Congestion is not inefficient but superficially chaotic
Buying extruded mild steel h-beams in the basement of Gucci or McDonalds is seen as efficient.
A city made by multiple agents
Is visually loaded and drones with the sounds of human activity
The city accommodates living program
Crossover of shared living
A city which allows all to indulge
Juxtaposing the historical with the new
City as a stage set
Quasi- organised infrastructural webs
Heterogeneous integrating systems
Re-definition of the in-between determines spontaneity and complexity
Consumerism need not make you pay
Programmed to stimulate micro economy
Near-omnipresent urban intensity
Fractal consumerism
Definition of human activity
Formless
Cognitive awareness of social depth and behavioural complexity
Socially porous
Social infrastructure
Communal squeeze
Accommodation = mass
Communal= in-between
Communal chews into the mass
Housing mass pushes toward the city
Horizontal memory applied vertically
Parasitic program
Less fulfillment in personal possessions
Communal relates to the extension of experience
Overlap of cultural practice
Core= community
Core is a social element
Core is coming home
Technology migrates in parallel with the individual and public.
Sectional variation
Circulation beyond movement
RESTRUCTURED
ARCHITECTURAL LOCATION

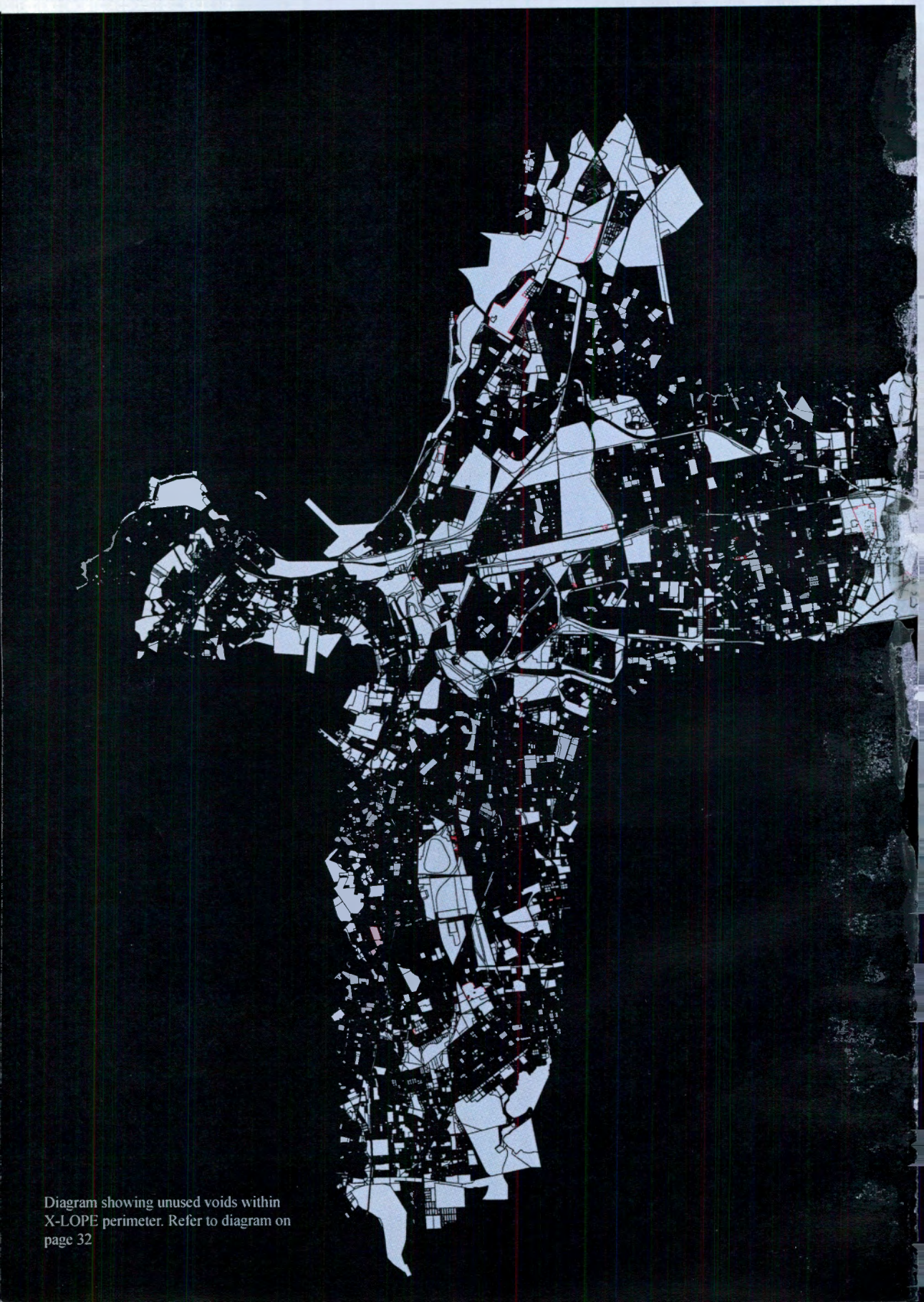


Diagram showing unused voids within X-LOPE perimeter. Refer to diagram on page 32

PROJECT CONCLUSION

Cities are getting bigger fast. As of May 2009, the Earth's population is estimated to be about 6.77 billion and is expected to reach about 9 billion by the year 2040. According to the UN-HABITAT 2008 Annual Report, sometime in the middle of 2007, the majority of people worldwide will be living in towns or cities (3.4billion) for the first time in history and is referred to as the arrival of the "Urban Millennium". In regard to future trends, it is estimated 93% of urban growth will occur in Asia and Africa. By 2050 over 6 billion people 65% of humanity, will be living in towns and cities. What this means for the urban condition is that it is most likely to double in size over the next 30-40 years. The City of Cape Town, is estimated to double in size by 2030,[1] which is obviously of serious concern if we intend to adopt housing models which will place the most vulnerable portion of the population as addendums to the city fabric. The quantity of well integrated properly located urban developments being built in relation to typical suburbia and RDP housing is trivial, which has turned the city into a massive Pseudo-urbanized monster.[2]

Almost without fail the world's greatest cities have been able to accommodate the population Cape Town in a fifth of the space required that it has been done in, with many only needing a tenth of the space. It seems inconceivable that conversation around planning is still about locating new housing for the poor on virgin windswept lands when there is more than enough space to contain them within the existing fabric.

Cape Town could become a great city but it certainly is not that at present. We currently stand at the threshold; some argue that we have already crossed it, where our continued actions on the city will forever and irreversibly immerse the city into a state of homogeneous banality and that shunned its most vulnerable.

Pseudo-urbanization: is the condition in which a large city has formed in an area without a functional infrastructure to support it. As the population of an urbanized area grows, the city's infrastructure must grow with it, or else shortages will develop, typically in housing, education, transportation, clean water and waste removal services, or other services such as law enforcement.

ADDENDUM 1

Developer Driven

Contrary to what many believe pre 1996 emphasis was placed on ad-hoc participation consisting of community building. Post 1996 has seen a more bureaucratic approach with limited community participation with emphasis placed on decentralisation and partnerships effectively narrowing involvement on grass roots level[1].

As a typical capitalist economy the urban fabric is dictated by the input of developers; economy shapes cities which means cities are privatised- urban planners often have little or no impact on shaping the city[2].

During Apartheid, 'developers and the government agreed what the ideal city should look like, and were very effective in creating it because their goals overlapped, albeit for different reasons.[3]' The Architecture of Apartheid and the Group Areas Act is today seen as government driven; however much of the intricate detailing was implemented by private developers who's influence has not been acknowledged or analyzed in the dismantling of Apartheids policies.

'Since the introduction of the democratic government, the goals of government and developers do not overlap: the one aiming for justice and redistribution and the other for short-term gain.[4]' The paradox is that government through lack of capital have had no alternative but to fall back onto private developers to fund projects and thereby has had to shift its stance from being the sole provider to that of an enabling partner, otherwise referred to as 'enablement'[5].

Developer-driven mass projects ultimately give beneficiaries limited choice with regards to location, house type and have no influence on the outcome or the quality of what they receive; a direct result of not being able to directly access or engage the state at official or political levels[6].

---

1 Khan, F. & Thring, P.(ed) 2003. **Housing Policy and Practice in Post-Apartheid South Africa,** Johannesburg: Heinemann Publishers, p28

2 Pickvance in Taylor N. **Urban Planning Theory since 1945**, Sage Publications, London 1998.

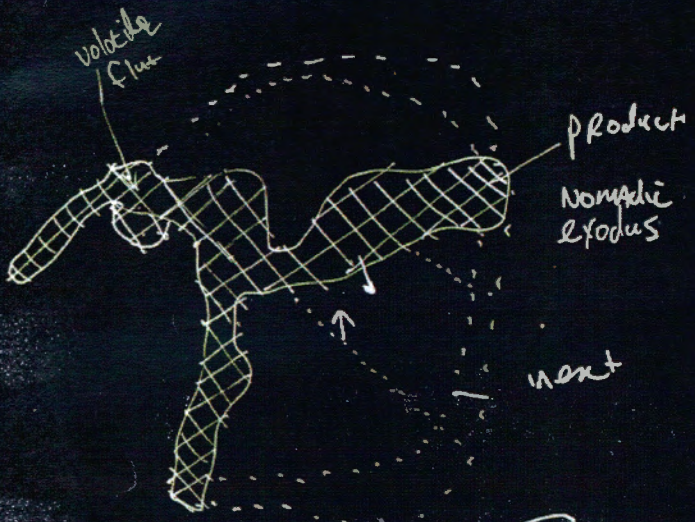
3 Schoonraad, M. 2000. **Some Reasons Why We Build Unsustainable Cities in South Africa**. Pretoria: Department of Town and Regional Planning, University of Pretoria

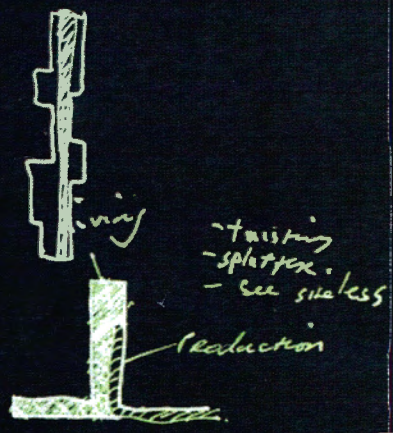
4 Schoonraad, M. op cit

5 Department of Housing, 1994. **White Paper on Housing. A new housing policy and strategy for South Africa.** Government Gazette, 345(16178) notice 1376 of 1994, 23 December.

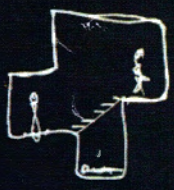
6 Khan, F. & Thring, P.(ed) op cit. p28

Rep: Productive + inert city





How many towers?
Are they merely repeated?
Can it be generic?
OR specific
280m?
45 stories
153.6 m @ 3.2 m = 48 flrs



need greater links btw floors
hence vertical massing
break down
* circulation alleys become
Big allowing for cooking +
washing

ADDENDUM 2

Sprawling Politics

South African policy makers in 1994 in both green and white papers and in numerous other documents explicitly take an 'outright rejection of the low density, sprawling, fragmented and largely mono-functional forms of development' that has characterized the apartheid city and intern to promote and insist on the development of sustainable integrated settlements with higher densities and mixed use are to be pursued as some of the most unsustainable, inconvenient and inefficient cities in the world.[1] If anything we have embarked on a path where the Apartheid city is simply being embellished by succession.

It has found itself continuously playing catch-up to a demand that simply always would outnumber the capacity to deliver. Demands to achieve figures due to the housing backlog have meant government became, and continue to this day to be under immense pressure to account for delivery figures. This issue now fundamentally occupies government's approach on how it evaluates results of housing policy. The existing measurement system, based on the HUIS database, is quantitative in focus[2] and does not presently provide acceptable analysis on qualitative indicators. 'In addition, government discourse on housing delivery (such as the Minister's budget speeches, MEC's reports, etc.) is overly quantitative[3]'.

It's prevalent within the white paper and widely criticised in a variety of literature that the current quantitative stance on housing delivery, economic classification and social partitioning are primary contributing factors dictating South Africa's housing and urban structuring. Quantitative results dominate current housing discourse=

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1 Dewar D. 1992. **Urbanisation and the South African City: a Manifesto for Change**. Cape Town: University of Cape Town, Urban Problems Research Unit

2 Baumann, T. 2000. **Comments on the State of Human Settlements in South Africa Report**, Johannesburg: Isandla/PDM seminar

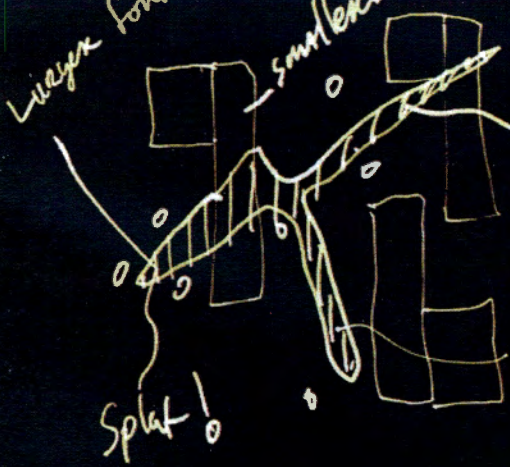
3 CSIR, **The State of Human Settlements in South Africa**, 1995-1998, (Draft 3), Department of Housing, September 1999.

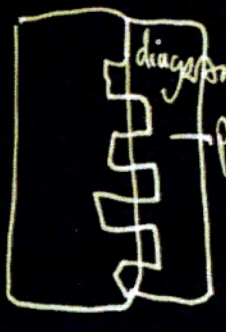
Peri - Centric
↳ SA Condition

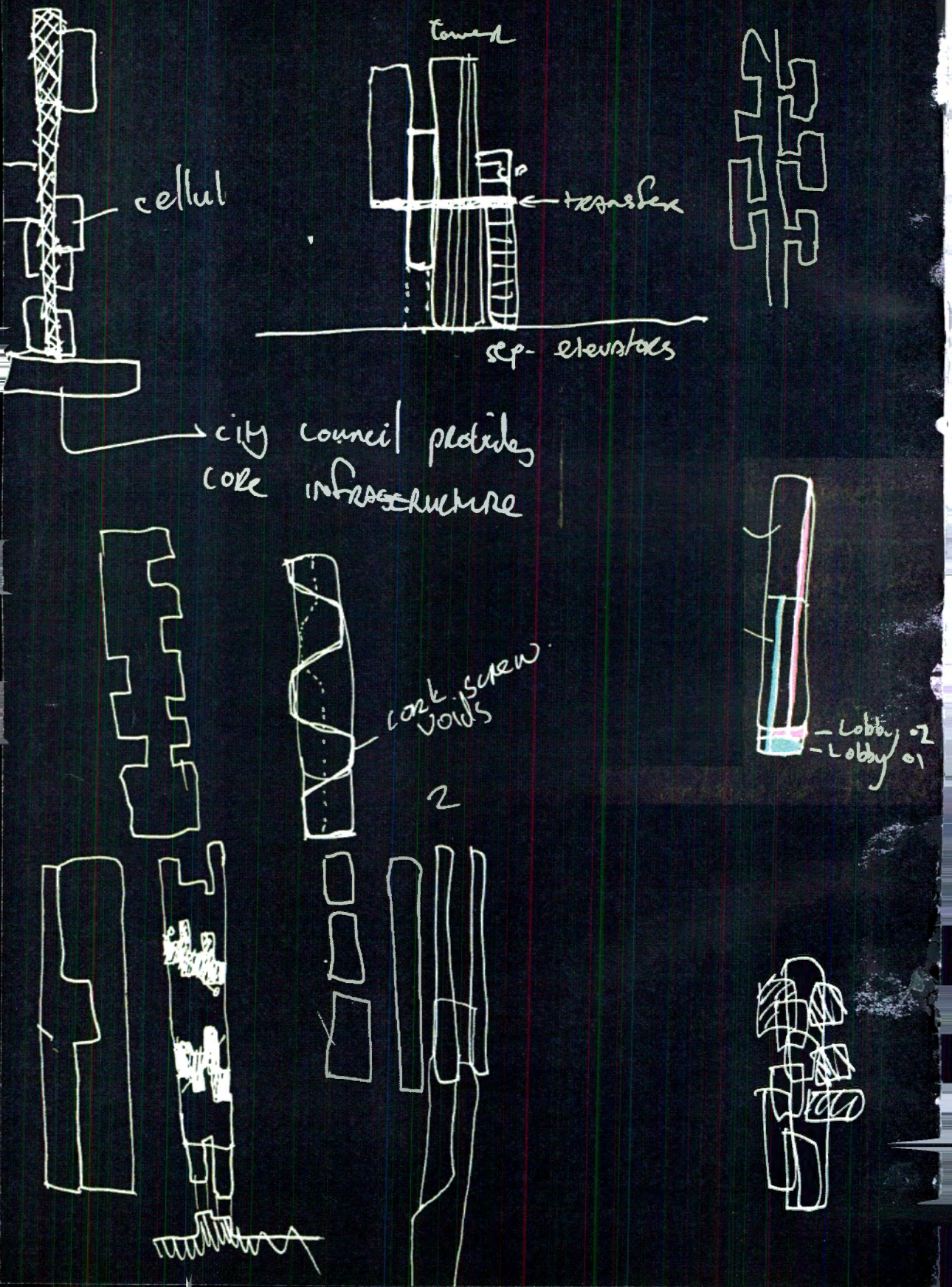
Dichotomy

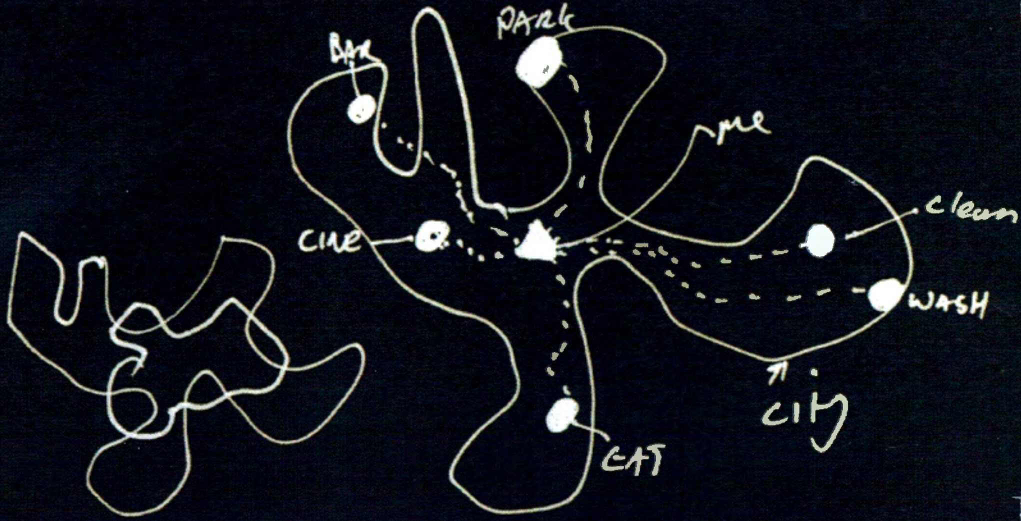
Living + Production - peri-centric

Out Lived Ept - Lasociety of spect

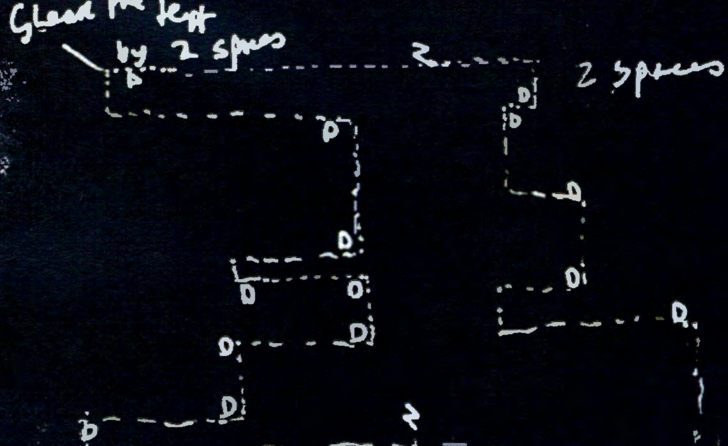





Tower
cellul
transfer
sep- elevators
city council provides
core infrastructure
cork screw
voids
2
Lobby 02
Lobby 01

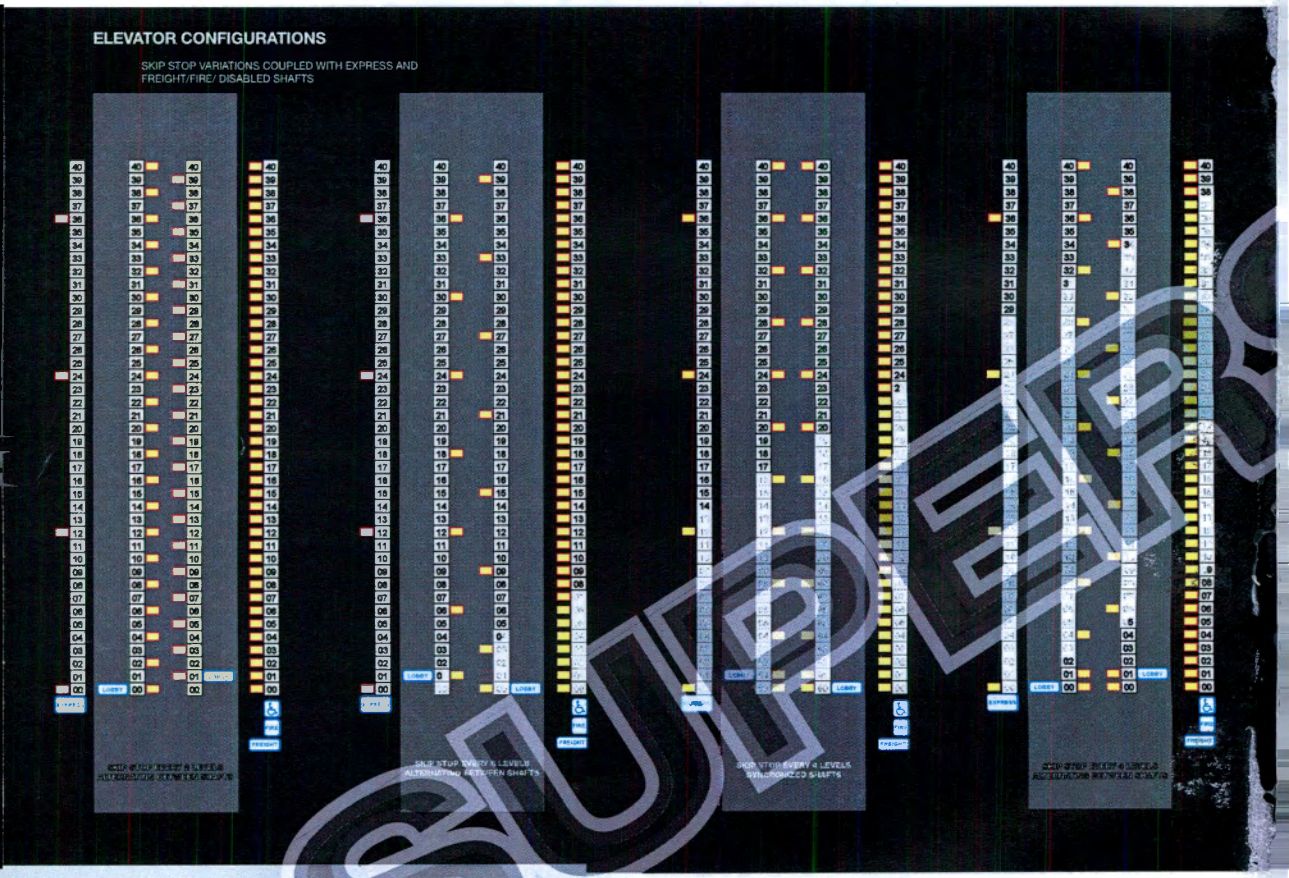


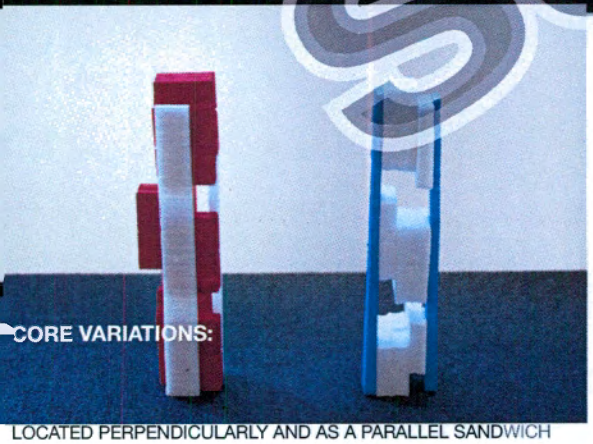
2 cities : 1x peri
1x central > ppl were fearful of of this
only daring to go down on
in the day [illegible] [illegible] temporarily
stays at night

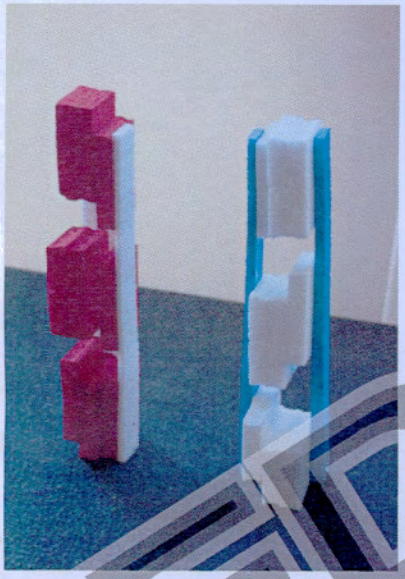


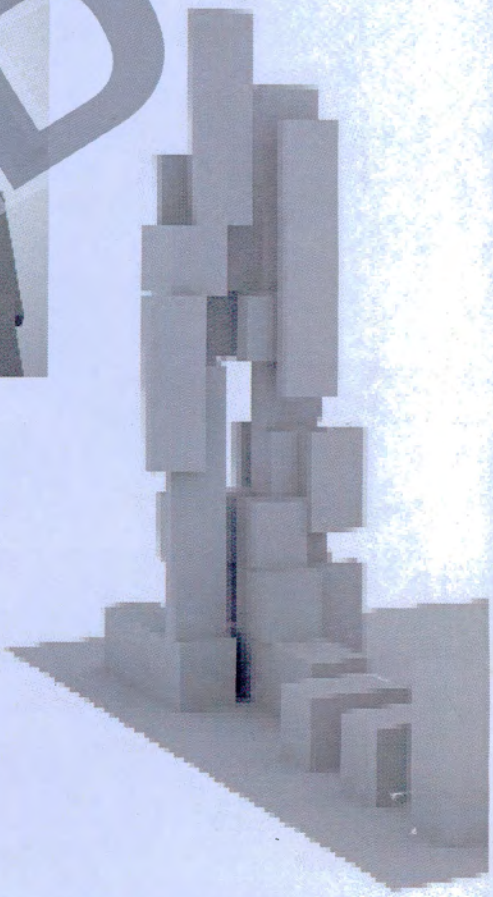
SUPERSEDED CONTENT

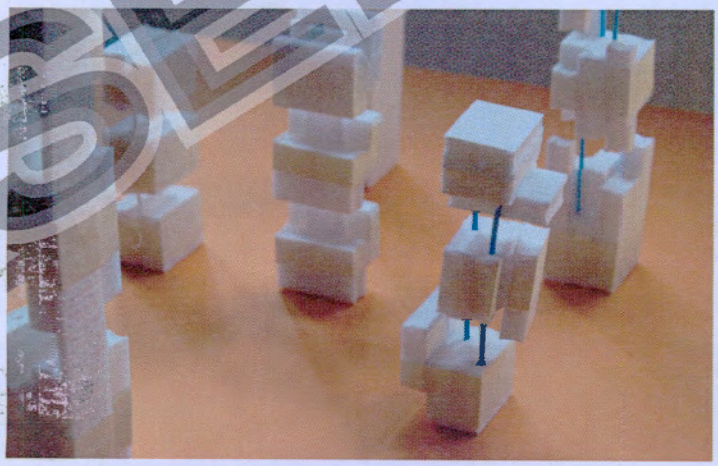
Includes outdated material that fell away during design development since June 2009 submission. The content that follows mostly concerns the technology position. Also included are dated models.

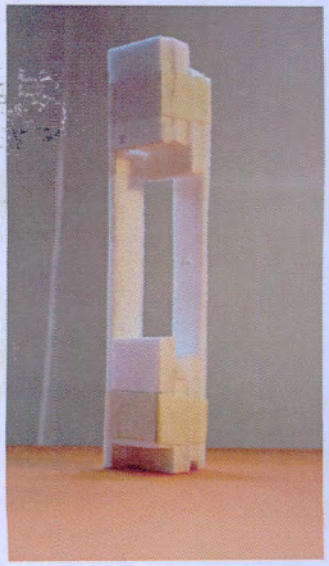


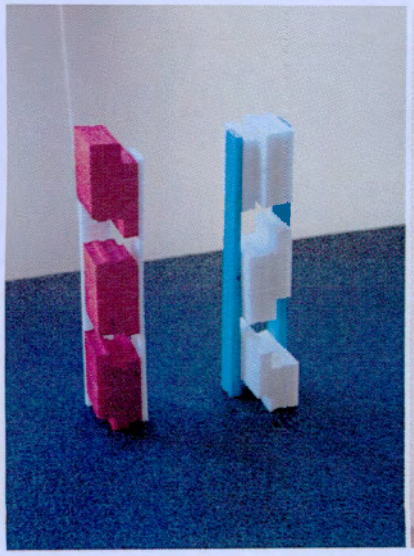


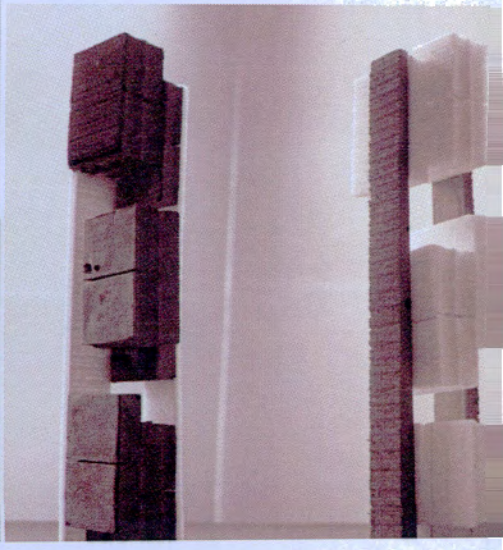


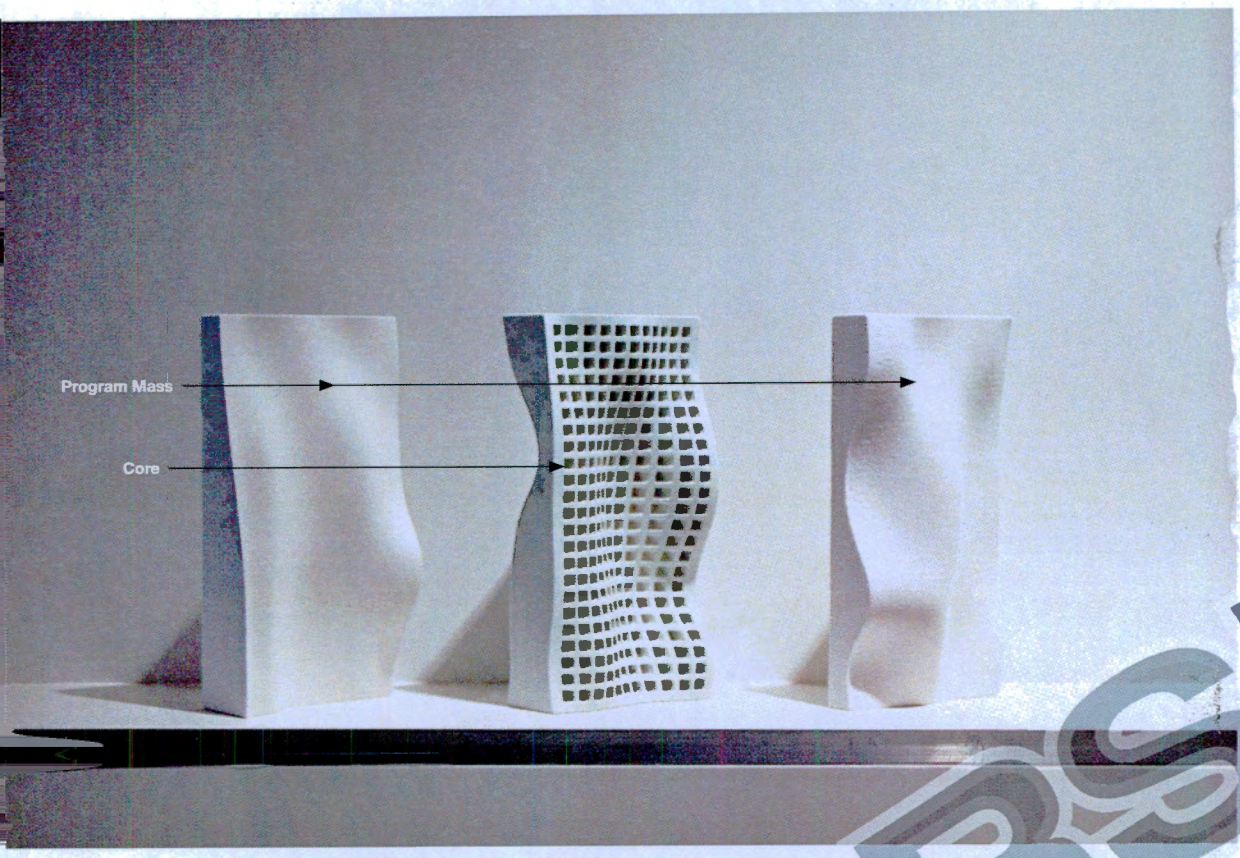


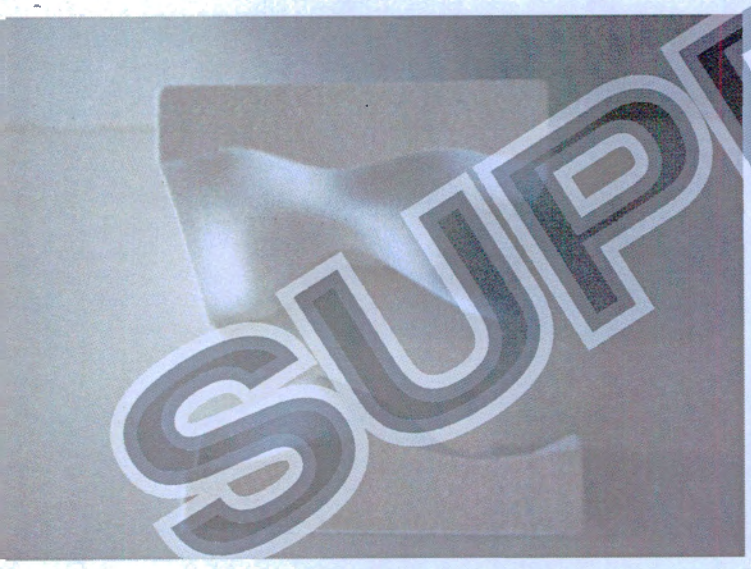






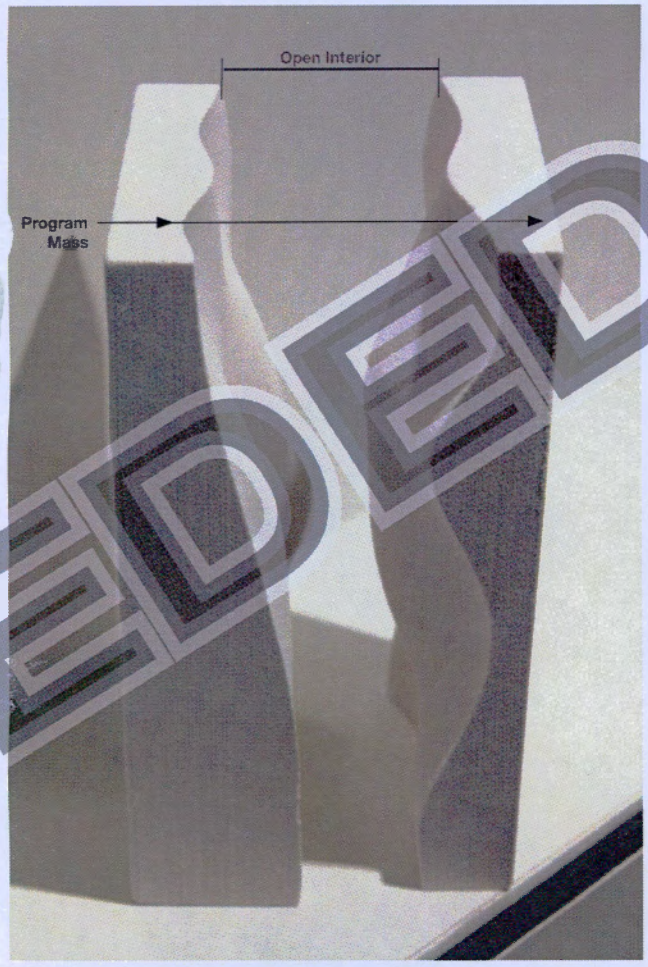


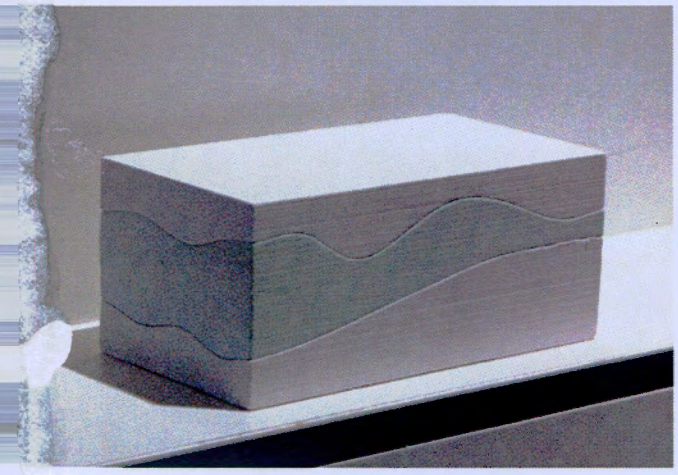


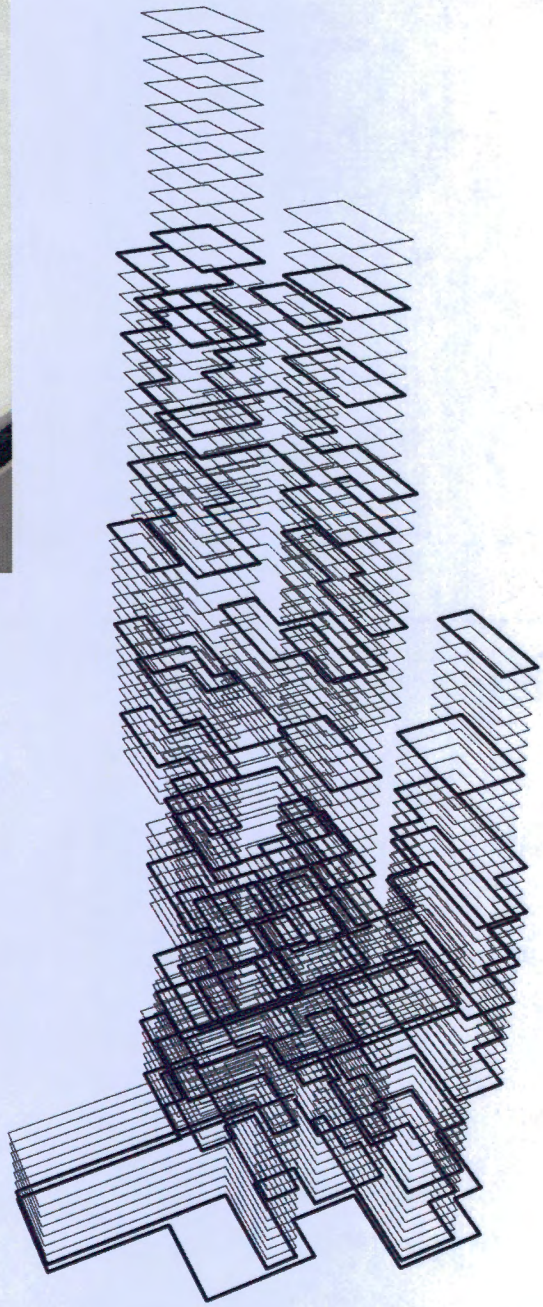


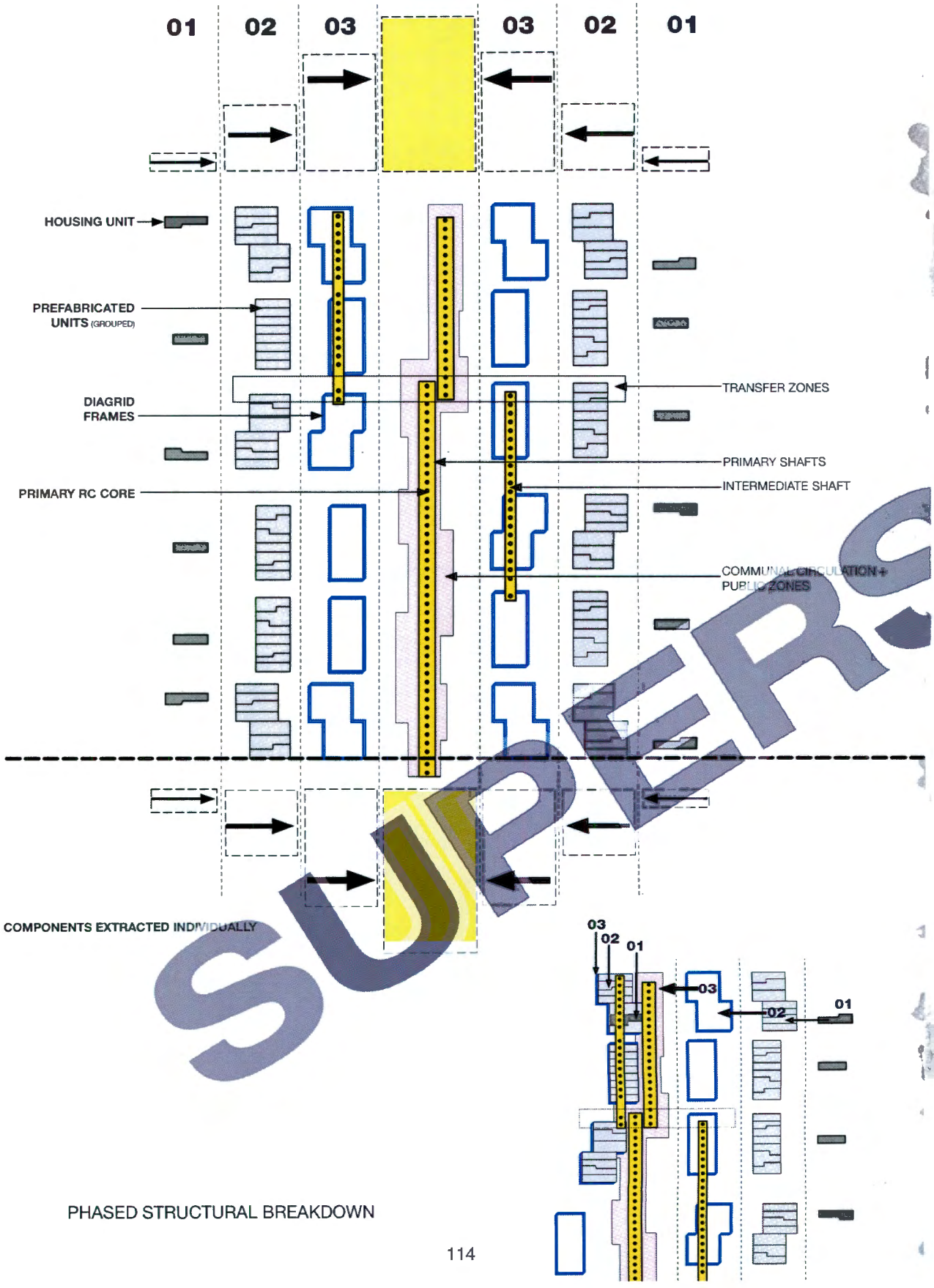
Fluid Core

Study model showing relationship between exterior mass and the core.
The core is seen as a space that goes beyond servicing the building as a hermetically confined space that will host communal programs.


Open Interior
Program
Mass







PHASED STRUCTURAL BREAKDOWN


PREFABRICATED
HOUSING UNITS TO FIT INTO
DIAGRID FRAMED BOX
DIAGRID FRAMES
TO INCASE
PREFABRICATED
HOUSING UNITS
PRIMARY RC CORES
(POSITIONED PARALLEL)
(POSITIONED PERPENDICULARLY)

Diagrid Framing

Constructing voids in the building will become the most challenging in structural terms, as any cantilevering at this scale is complex. Most of the building's composition will come from the relationship between volumetric and voided space- the technology and construction of separation will therefore be of particular importance. To avoid mass being visibly skewered through the voids it is important that built mass be contained; contemporary structural solutions point toward diagrid framing which is able to uniformly distribute stress and loads by way of its structural properties.

The difference between conventional exterior-braced tube structures and diagrid structures is that the conventional vertical columns on the perimeter (or most of them) are done away with, because diagrid frames are able to displace gravity loads and lateral forces (wind in Cape Town) via its triangulated composition. In a typical true diagrid structure the incremental rate of forces and bending moments at the base and the top of the building will be different.

Shear forces are experienced linearly while at the base bending moments are experienced. Thus a diagrid structural system will typically account in its design for shear forces at the top and bending moments at the bottom. [1]

It has to be noted in this case that voids alternate horizontally with mass in the building. It will create horizontal divisions, meaning the diagrid will act in cellular units to shape the voids and not as a continuous tube which spans from top to bottom. The diagrid as a structural system, therefore will primarily deal with shear forces and not bending moments which the cores will have to account for primarily. Connections of the diagrid frame to the core it is foreseen will tie and brace the cores and combined will create more stiffness to counter act bending moments. Lateral loading stiffness will therefore come from the cores and their location in relation to each other. The diagrid frame will essentially act as a modular frame that hangs between the cores, which is structurally sound enough to contain the prefabricated modules and act as bracing support between cores. In addition, the diagrid is structurally appropriate, in that it is able to best deal with cantilevering to the extent that it is capable of liberating the prefabricated components from its structural responsibilities. This can be seen as framed units contained in a cage and hung from a wall.* Note that embedded within the partition walls of the units, there is the opportunity to add structural strength to the frame, by attaching vertical trusses from the core and sandwiching them between the partitioned walls.

Moon, Kyousung S. **Optimal Grid Geometry of Diagrid Structures for Tall Buildings**, Architectural Science Review, Vol 51, September 2008

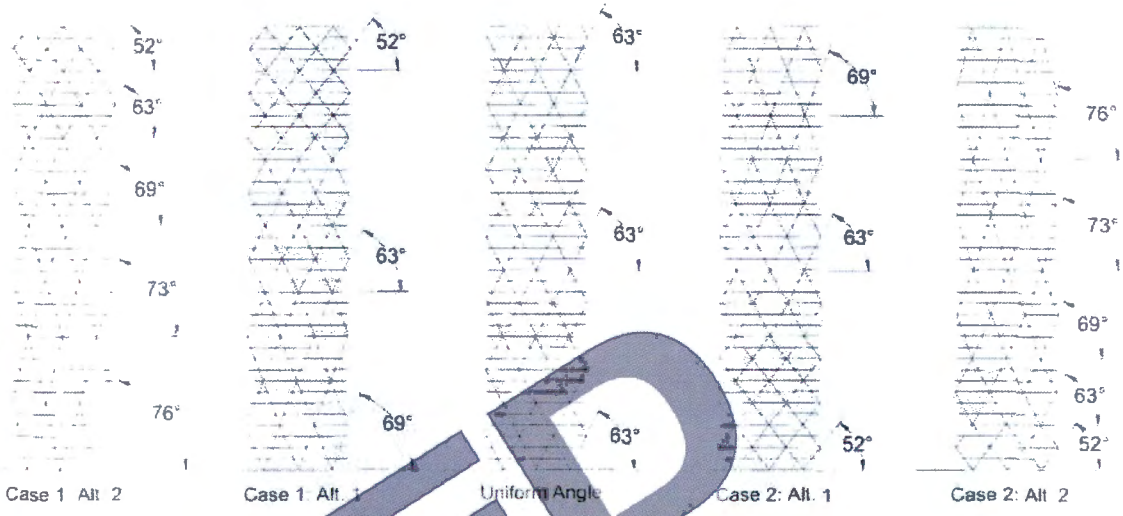
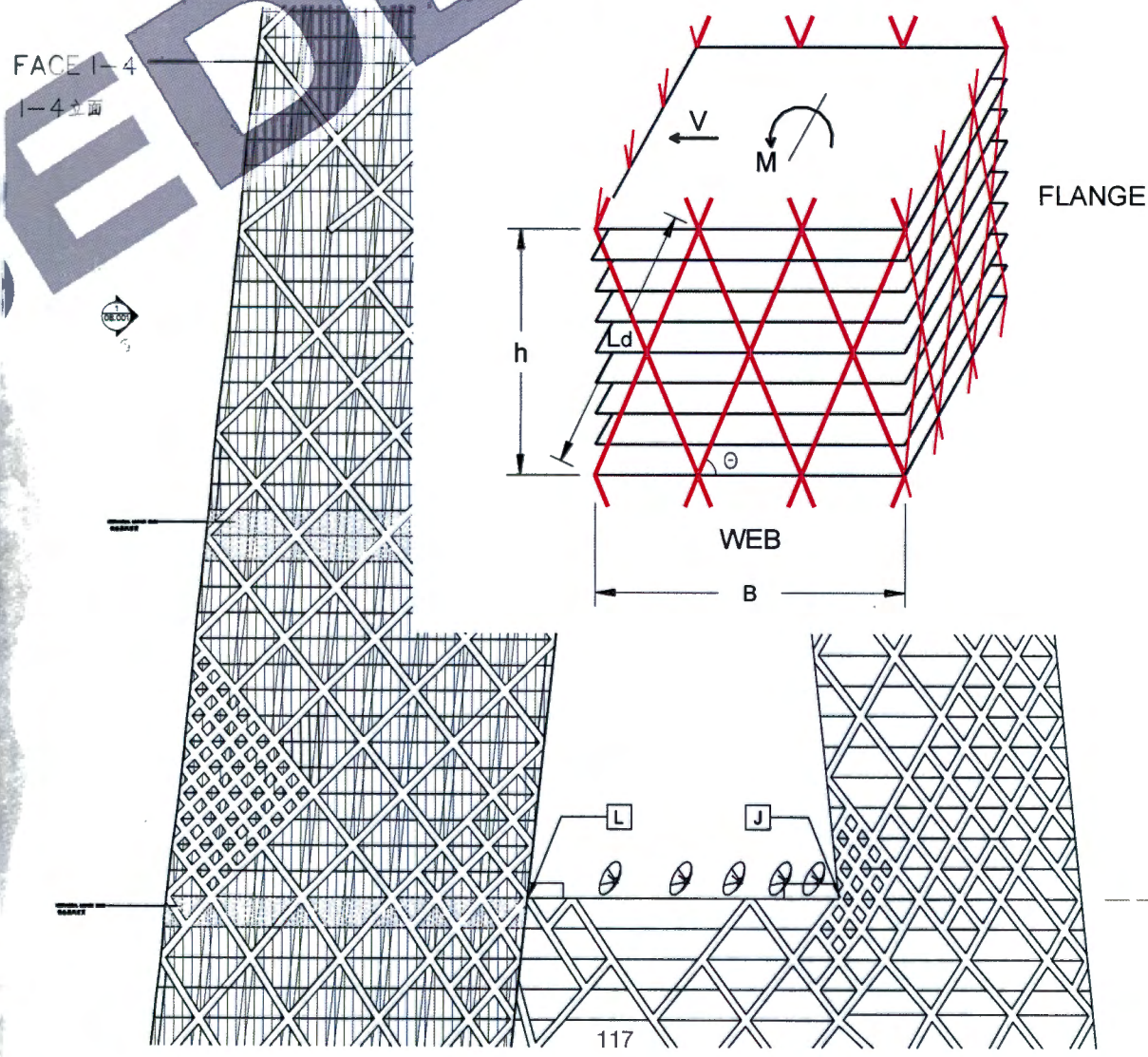
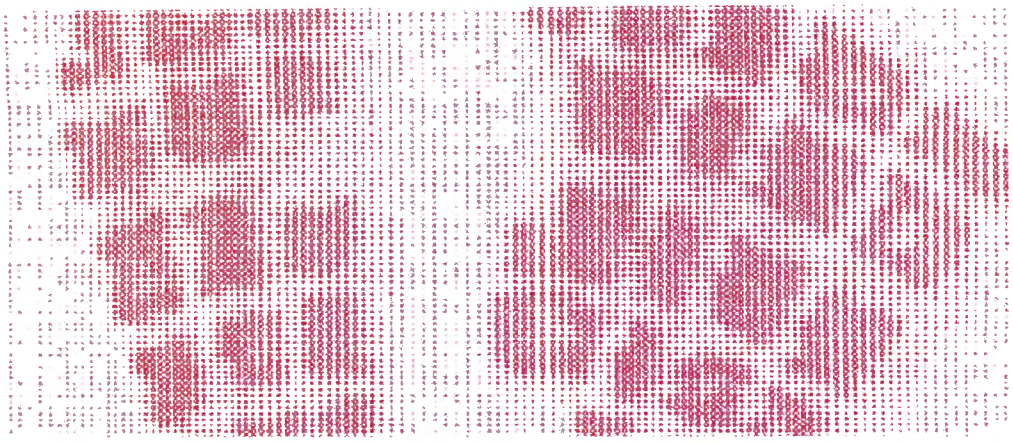


Figure 9: Variously configured 40-storey diagrids (H/B = 4.3).





In general diagrid structures use much less structural material than in more conventional tall buildings composed of orthogonal members. Compared to iterative methodology in tall building structure, diagrid structures are more efficient for today's relatively light and tall buildings because structural design becomes governed by stiffness rather than strength. [1]

Diagrid Diagonals

The optimal angle of diagonals is highly dependent upon the building's height. Since the optimal angle of the columns for maximum bending rigidity is 90 degrees and that of the diagonals for maximum shear rigidity is about 35 degrees. It is expected that the optimal angle of diagonal members for diagrid structures will fall between these angles, and as the building height increases, the optimal angle also increases- typical angles tend to range between 52 and 73 degrees.[2] However determining these angles are not necessarily an exact science or universally applicable. The CCTV building by OMA is not a straight up down tower, so the geometry of the building causes different areas to experience unequal loading and stresses- some parts are constantly under severe pressure while others are relatively placid. The diagrid becomes a meshed grid of the stress diagram which reflects stress patterns under different loading conditions- increased loads are equalised by increasing the density of diagonal sections; this method is inverted where stress is void. The regular base pattern was optimized by adding or removing diagonals, and changing brace plate thickness to match the strength and stiffness requirements of the design.

Resent software innovations and scripting techniques have further pushed the potential of diagrids which could be an additional technology research thread.

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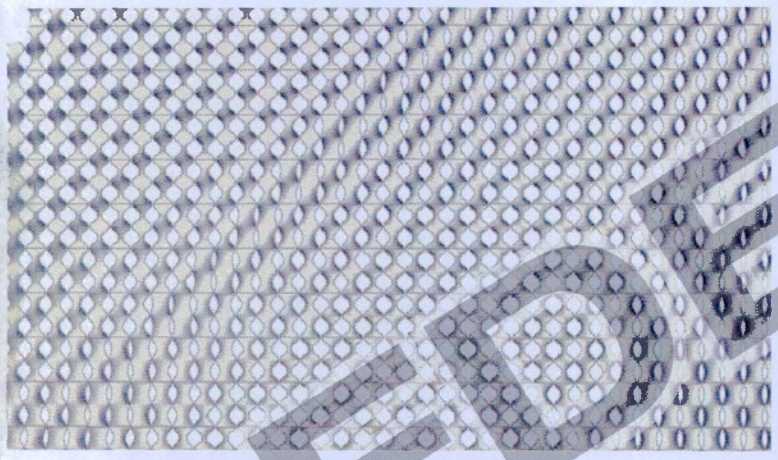
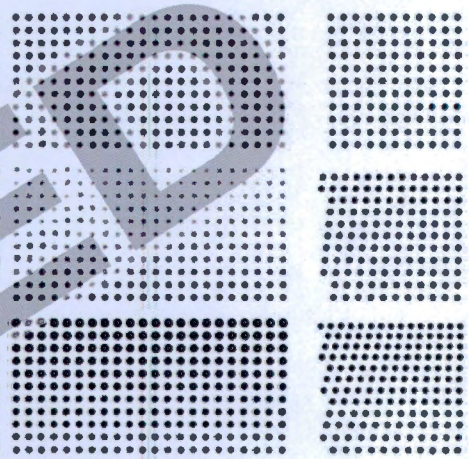
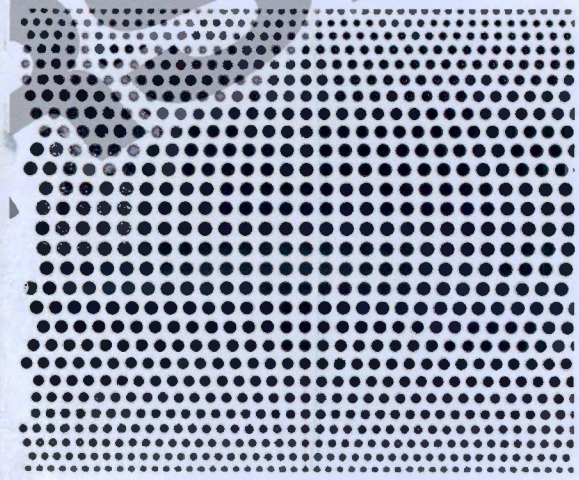
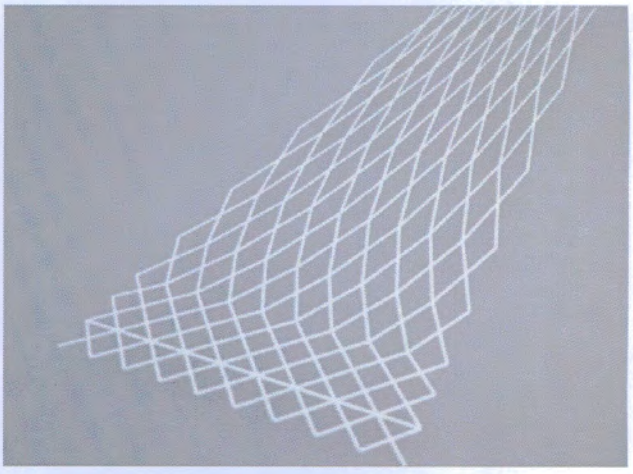
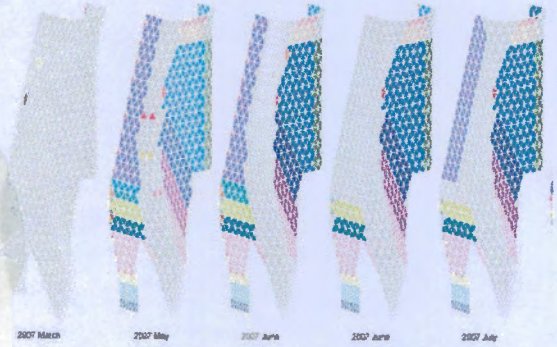
2 MOON, K., CONNOR, J. J. and FERNANDEZ, J. E. (2007). **Diagrid Structural Systems for Tall Buildings:** Characteristics and Methodology for Preliminary Design, The Structural Design of Tall and Special Buildings, Vol. 16.2, pp 205-230.











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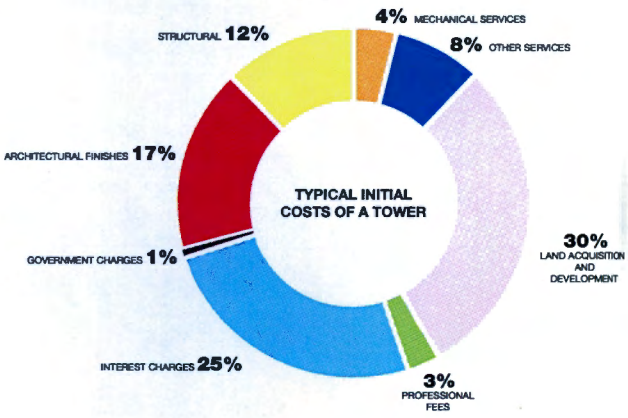

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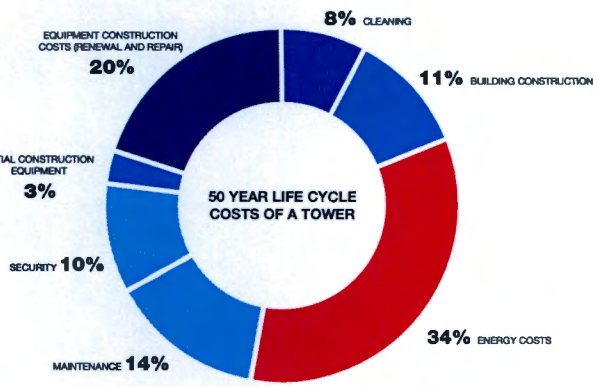

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