Dubai: Re-Designing Labor Worker Communities

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CHAPTER 1: THESIS PREP
ABSTRACT

In an effort to provide humane living conditions for immigrant workers in Dubai who are trapped in the flawed immigration system, I will design a ‘worker community’ to replace the ‘labor camps’ where workers live today. These communities will be tested at a variety of levels, from planning, infrastructure, modularity to materiality; and while certain elements such as planning will play a much more significant role than, for example, infrastructure, the goal will be to generate a worker community which will provide necessary amenities and act as a temporary city - immediately next to the construction site.

The immigration of workers from overseas into Dubai is an overlooked humanitarian issue; from the moment they are deceived into an idealized lifestyle, to their day to day living/working conditions once they arrive in Dubai, all the way to the deprivation of their rights as humans. Dubai and almost all other GCC countries have a shameful way of luring uneducated foreigners into their countries as immigrants, and treating them as modern day slaves. Companies and individual citizens control immigrants by enforcing the Kafala sponsorship system, and waive international guidelines and rights set by organizations such as the International Labor Organization. While an issue such as the Kafala system is just one of many facets of the overall situation, this thesis will focus on the impact architecture can have to improve the lives of the South Asian labor force behind the luxurious facade of Dubai.

Most labor camps where construction workers live today exist as a rentable development designed for profit and lacking basic living amenities. In order to raise the standard of living of the workers, this thesis will propose a redesign of the labor camps into worker communities, which will be located immediately next to the construction site. The community will include amenities and public spaces, which will be built up of modular typologies based on workers’ temporalities and needs. The structures will be built primarily out of compressed earth bricks, as they have proven to be an efficient building material in climates such as Dubai. The redesigned communities will act as temporary cities near the construction site.

Once the construction project is over and labor workers relocate, the worker community will be disassembled. The compressed earth bricks will either be reused in a new project, or will be recycled back to the earth. If a worker community is situated in a location where no new projects are taking place, the structures which were once home to labor workers will be modified, and converted into low income housing. These low income houses will be put on the market to be rented by a certain employee class such as cashier, janitors, waiters, etc. The compressed earth bricks will play a large role in both the disassembly of the worker communities, or their eventual conversion into low income housing.
AN OVERVIEW OF THE THESIS

THESIS
BACKSTAGE
SURFACE
IMMIGRATION ISSUES

COMMUNITIES
INFRASTRUCTURE
MODULARITY
MATERIALITY

EXTREMES
LOW-COST DEMAND
PROPOSAL
THESIS: RECREATING WORKER COMMUNITIES
BUSINESS BAY DEVELOPMENT

Business Bay is a development in the heart of Dubai, right next to main highway, Sheikh Zayed Road. The development is a mixed use, 80 million square foot planned area of Dubai that is meant to bring a variety of international businesses into one area. Filled with offices, residences, restaurants, shopping malls, and a variety of international expatriates, it is one of the fastest developing areas of Dubai.

While the site of this thesis is essentially any part of Dubai where there is a construction project, as an example scenario, Business Bay is a great location for the implementation of this thesis. Currently, some parts of the Business Bay are completed and up and running, there are still lots of free land where projects are planned to begin. While certain land prices in the Bay are high due to projected revenues, other areas will not be filled for years, making it potentially a great location for temporary low income housing.
THESIS:
LABOR COMMUNITY TO DISASSEMBLY

Construction site is determined. A site to build the worker community is allocated in a nearby location to the project.

Construction moves forward, more workers come in, and the worker community grows with the addition of modular pieces.

As both construction and worker community expand, generators provide electricity, trucks bring in clean water, and take away sewage waste.

Construction nears completion, and the worker community reaches full capacity. Modular pieces and amenities have created a city-like community near the construction project site.
Construction is almost complete, and less labor work is necessary. Due to high land value and planned projects, the worker community which housed the construction workers begins to get disassembled.

Construction area begins to get cleaned up. Generators are removed while trucks continue to bring in clean water and take away sewage at a less frequent rate.

Worker community shrinks to much smaller sizes while the construction site is almost completely cleaned up.

Project is fully completed, construction site is cleaned, worker community is disassembled and eventually rebuilt in a different location.
SCENARIO 2: LABOR COMMUNITY TO LOW-COST HOUSING

- Project is initiated as construction site and worker community site are determined.
- Infrastructure is constructed as the worker community grows. Infrastructure is built continuously due to plans to convert camp to low-income housing.
- Construction moves along as the worker community grows, and infrastructure is constantly expanded.
- Project is near completion, labor camp is at maximum capacity and infrastructure is laid out along the entire site.
After a few years, surrounding areas begin to develop, driving land prices up. Renters either move out due to their short-term expatriate contracts, or relocate.

Modular houses are disassembled to potentially be reassembled elsewhere. Infrastructure remains to serve for upcoming projects. Surrounding areas continue to develop, driving land prices even higher.

The low-income housing is completely taken apart and new projects begin on the land, planned to bring in large revenue.

Project is completely finished. With additions to the modular pieces of the worker community, it is converted into low-income housing and people begin to rent on short-term leases.
BEHIND THE SURFACE OF LUXURY
UN DATA GRAPHS

IMMIGRATION INTO THE UNITED ARAB EMIRATES IN 2013

GROWTH OF TOP 3 IMMIGRANT COUNTRIES SINCE 1990
Every GCC (Gulf Corporation Council) country employs the Kafala system; where ‘temporary’ migrant workers are brought in under the sponsorship of the employing company. 5

The Kafeel (employer) sponsors an immigrant employee so the foreign worker can gain a legal working visa and residency. This is called the Kafala system. 3

Under the Kafala system, the employee is almost completely controlled by the sponsor who has control over many aspects of their lives including, most importantly, their passport. Unfortunately this leaves the employee exposed to potential exploitation. In many cases, they cannot even leave the country without their employer’s support. 4

The Kafala system gives an incredible amount of control to the employer over their employee. For example, the employee needs permission in order to change jobs or sometimes even leave the country. This means that any changes in their contract, such as extended hours, lower pay, etc., can happen without the worker’s consent. If they do quit, they are considered illegal immigrants. If they cannot afford to pay for their ticket home, they can be ‘stranded’ in the country for years at a time. 6

THE KAFALA SYSTEM
SPONSORSHIP OF IMMIGRANT WORKERS

Figure 4
"THE WORK IS ‘THE WORST IN THE WORLD,’ HE SAYS. ‘YOU HAVE TO CARRY 50KG BRICKS AND BLOCKS OF CEMENT IN THE WORST HEAT IMAGINABLE... THIS HEAT - IT IS LIKE NOTHING ELSE. YOU SWEAT SO MUCH YOU CAN’T PEE, NOT FOR DAYS OR WEEKS. IT’S LIKE ALL THE LIQUID COMES OUT THROUGH YOUR SKIN AND YOU STINK. YOU BECOME DIZZY AND SICK BUT YOU AREN’T ALLOWED TO STOP, EXCEPT FOR AN HOUR IN THE AFTERNOON.’

- Anonymous Construction Worker

Sources 8,9,10
LABOR CAMPS

Figures 5 - 7

Figures 8 - 11
RENTABLE CAMPS

CAMPS AVAILABLE FOR RENT IN DUBAI, FOUND ONLINE FOR VARIOUS USES.

Al Quoz Area 13
- 120 room labor accommodation
- Neat and clean near Grand City Mall
- Dining and Kitchen at on ground floor
- Enough toilet and shower on each floor
- $39/SqFt

Dubai Industrial Area 12
- Rooms for 1, 5, 6, 7, or 9 residents
- Average space per resident is 40 square feet
- “High quality standard accommodation for their staff”
- $26/SqFt

Jebel Ali Industrial Area 13
- Two dining halls and kitchens
- 116 rooms in each floor
- 3 bathrooms in each floor
- Close to main roads
- Labor Camp is 6 minutes from main road
- $6/SqFt

Jebel Ali Industrial Area 14
- 60 bedrooms
- 9 bus parking spaces
- Prayer rooms
- Wash Area
- $2/SqFt

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DUBAI
AT THE
SURFACE
DUBAI: THEN AND NOW

DUBAI: 1990

DUBAI: 2005
DUBAI

Series of aerial photographs showing Dubai as a concrete jungle in the middle of the city. These photos highlight the incredible growth of Dubai and the various developments that have been created in the last two to three decades.

Figure 24
An image of an intersection on Sheikh Zayed Road, the main highway that connects Dubai.

Figure 25
A view of Dubai’s skyline. Most buildings are lined along Sheikh Zayed Road. The developments on the right hand side are mainly residential such as Jumeirah Lake Towers and Jumeirah Beach Residences. Burj Khalifa can also be seen in the centre.
A view over the Palm Jumeirah, showing the hotels (bottom-right of image), along with residential villas on the ‘leaves’ of the palm.

A view of part of Sheikh Zayed road, showing the world trade center towers in the center.
Dubai: A Quick History Timeline

1820s
Dubai was once called the Trucial Coast once Britain made a truce to make peaceful trades.

1870s
Now independent from Abu Dhabi, Dubai flourished as a main trade route of the Gulf coast, trading mainly pearl and making most of its trades through it.

1860s
Dubai was flourishing in trade and began boasting largest markets in the Arab world. Also around the 1950s, oil discoveries were made.

1960s
With the increase in taxes on the Lingeh port in Iran, Dubai began welcoming migrants from Iran and the rest of the Middle East. Foreign immigration became a big part of the trade and culture.

1971
As Dubai grows, so does the Indian and Pakistani population. The immigrants bring in new trades and skills as the textile trade grows more from East India.

1979
A historic moment in Dubai’s history, where oil was discovered in the oil field named Fateh.

1980s
The United Arab Emirates was formed, consisting of seven Emirates. This gave a sense of mutual security and prosperity, and the UAE joined the Arab League. The first airport in Dubai also opened.

1996
Dubai World Cup was launched, along with Dubai Shopping Festival, attracting many shoppers from all over the world.

2001
Dubai’s first high rise was built, which acted as the World Trade Centre. Similarly, Jebel Ali port opened.

2003
A historic moment in Dubai’s history, where oil was discovered in the oil field named Fateh.

2006
Emirates Airlines was launched. Jebel Ali Free Zone began to become more popular, attracting more and more investments from overseas.

2008
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2010
Many projects were launched, including the island projects and the world’s tallest tower.

2011
Internet and Media city, along with other private areas for foreign investments were launched by Sheikh Mohammed.

2016
Many projects were launched, including the world’s tallest tower.

2018
A third terminal in the Dubai International Airport was launched, along with a railway system along the highway for the growing population.

2019
Dubai officially became the tallest building in the world. A mixed-use building with office, residences, hotels, restaurants, and more.

2020
Many projects were launched, including the world’s tallest tower.
SUPERLATIVE SUPERFICIALITY

News regarding labor workers, crimes, construction accidents and other 'hurtful' news are highly censored and kept quite. However, superlative (largest, tallest, longest, etc.), are extremely publicized and marketed to create an iconic image of Dubai. An article featured on CNN highlights all the superlatives Dubai has attempted to achieve.

1999: ONLY 7 STAR HOTEL

The Burj Al Arab claims itself to be the only 7-star hotel in the world. Each hotel room is spread across two floors. The hotel rests on its own man made island, with a helipad, a 'floating' restaurant facing the ocean, and many more luxuries within.

2006: LARGEST MAN-MADE ISLAND

The construction of the Palm Jumeira Island was officially completed in 2006. As the largest man made island in the world, it cost around $12 billion to develop.

2008: LARGEST INDOOR MALL

One of the many malls in the city, the Dubai Mall was opened in November 2008 and holds the record for the biggest shopping mall in the world based on square footage. At 3.7 million square feet, it holds 1,200 retail outlets, 160 restaurants and cafes, an amusement park, ice rink, and more. The Dubai Mall symbolizes Dubai’s role as one of the biggest shopping cities in the world.

2008: LARGEST ACRYLIC AQUARIUM PANEL

As if the biggest mall wasn’t enough, Dubai Mall also ‘boasts’ the biggest acrylic panel. The panel allows the placement of a 2.64 million gallon aquarium, which houses 400 sharks and rays.
At 2,716 feet tall, Burj Khalifa is the tallest tower in the world, located in the heart of Dubai. It was initially supposed to be called Burj Dubai, however, the Sheikh of Abu Dhabi had to finance the rest of the project once Dubai was hit with the economic crisis in 2008.

Right along side the Sheikh Zayed Road, Dubai launched its metro system on September 9, 2009, at 9:09:09 pm, exactly. With the unsafe conditions of the highway, combined with the regular traffic jams throughout the day, Dubai felt it needed a better public transport infrastructure. The trains are completely automated, with no human drivers.

These fountains shoot up water up to 900 feet twice a day, putting on a show of dancing to Arabic music, spraying over 2,600 gallons of water in the middle of a desert.

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A big milestone in Dubai’s history; the opening of the largest airport in the world. The development cost about $33 billion dollars. While the airport is open and operational for cargo flights and has been for a few years, it will be open to public use by the year 2017. This delay is due to the economic financial crisis that Dubai is finally beginning to get out of. Symbolically, Emirates Airlines, owned by the UAE, will only operate out of this airport.

2009: LONGEST AUTOMATED METRO
2009: TALLEST WATER FOUNTAINS
2010: TALLEST BUILDING
2013: LARGEST AIRPORT

Figure 30
Figure 31
Figure 32
Figure 33
"WITH A GROWTH RATE OF 2.5 PER CENT IN 2010 AND AN ESTIMATED GDP PER CAP-ITA OF $37,000, THE UAE IS RANKED AS ONE OF THE RICHEST ECONOMIES IN THE WORLD. MUCH OF THIS SUCCESS CAN BE ATTRIBUTED TO A VAST SUPPLY OF CHEAP LABOUR, CONSISTING OF THOSE WORKERS KEEN TO ESCAPE THE POVERTY OF THEIR HOME COUNTRIES. IN THE UAE, MIGRANT WORKERS MAKE UP A STAGGERING 90 PER CENT OF THE LABOUR FORCE."

- Emirates Centre for Human Rights

In the 1830s, Dubai’s ports were called the Trucial Coast and became a very significant trade route. The exploration and trade of pearls was the main income of the area. In the late 1950s, oil discoveries were slowly being made in certain areas of Dubai. While trades and immigration grew in the background, Dubai made it’s first great oil discovery in 1966. However, as Dubai continued to grow, it was apparent that it’s oil reserves were not as large as places like Abu Dhabi, Saudi Arabia, etc. In 1990, Sheikh Maktoum bin Rashid Al Maktoum was appointed as the leader of Dubai. Sheikh Maktoum was a visionary and saw something that changed Dubai’s future. He believed that the Emirate had to invest primarily in tourism and real estate. He believed that what he envisioned for the future of Dubai would not be sustained by the “depletion of these oil resources and the fickleness of demand.”

Dubai’s goal was to be one of the hot-spots on the map. The ‘superficial superlatives’ alludes to the images of luxury and wealth that Dubai displays to the rest of the world. This was, in fact, a very strategic marketing scheme in order to first grab the world’s attention, but also to show that Dubai was no ordinary Middle Eastern city. The main goal was to slowly make sure that Dubai would be able to sustain itself without being dependent on oil only. The facade that of Dubai’s superlatives, tallest, biggest, largest, were hopefully going to attract tourists and expatriates from across the world.

With major investments such as the Emirates Airlines in 1985, and starting the Dubai Shopping Festival in 1996, Dubai was slowly making it’s way up to the list as one of the best places to visit. Projects like the Palm Islands, The World Islands Project, plans for the tallest tower in the world, the largest mall in the world, and much more, were all part of Dubai’s efforts to give itself a name. However, with the 2008 global market crash, Dubai may have come to a realization. It is inevitable that something that went up so fast could potentially go down so fast too. Furthermore, the world began to notice what was behind all the luxuries. Buildings were going up at unprecedented speeds, where construction never seemed to stop working. But who was behind all this?

Unfortunately behind the scenes was a completely different story. At the bottom of the social ladder, the force that was actually building Dubai, was in bad condition. Immigration had always been part of Dubai’s trade, however, immigration of labor workers from prominently East Asian countries were being brought into Dubai and the rest of the UAE, and being treated in ‘slave-like’ conditions, which were described as ‘worst examples of labour abuses’, by the human rights organizations.
ISSUES OF IMMIGRATION
MONITOR/PUNISH
Establish organizations that monitor the situation at labor camps and construction sites to make sure the companies are compliant with regulations. If there are any offenses, it is essential that the companies are punished through fines or penalties. This type of strictness would advocate companies to not violate workers’ rights.

AGENCIES
Recruitment agencies are at the core of the problem with GCC immigrations. Private companies could completely abandon using recruitment agencies who are not licensed, force workers to pay visa and flight fees, and don’t follow the worker’s rights laws.

ORGANIZATIONS
The GCC governments do not allow the establishment of human and workers rights organizations. For example, in multiple occasions in Dubai, organizations have asked for permits and been denied by the government to acknowledge them as so. Without these organizations, it’s hard for the public to recognize that there is a problem in the first place.

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YAFALA SYSTEM
The Kafala System for immigrants is the root of many problems in GCC countries. With the sponsorship program, employees are essentially at the mercy of their employers, whether a company or a family, as the sponsor has control over many aspects of the employee. Ending this Kafala System would immediately restore many kinds of primary rights that the workers should have.

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THE CULTURE OF IMMIGRATION

ACGMENTS
It is essentially the GCC citizens and companies who are responsible for the inhumane methods of immigration, as they are the ones who sponsor these workers. Citizens and companies can make sure they use licensed agencies. Furthermore, citizens can choose to abide by humane labor regulations, even if they are not enforced or monitored. Also, it is crucial to give employees their rights as temporary citizens, specifically with mobility in and out of the country and the freedom to switch to other jobs.
Just as the countries of origin need to educate their citizens, private companies who hire immigrants for labor work need to put the workers through an orientation status. This is done for most companies with their Western expatriates. The workers need to be notified of their rights as temporary workers and immigrants. This orientation phase would also educate the immigrants of the local traditions, culture, laws, etc.

From the moment a company travels to a foreign country for potential recruits, the locals have no idea about what the way of life in Dubai for the immigrants is. It is crucial that areas like Kerala, where a lot of companies go to find potential immigrants, be educated as to not fall for any tricks, etc. This would allow them to make educated decisions. Furthermore, the origin countries need to make sure they monitor overall immigrant situations to make sure their citizens are being treated appropriately.

Dubai does not follow its own labor law of minimum wages that was set back in the 1980s. Many companies do not pay overtime. There are even cases where companies have not paid workers for extended periods. Furthermore, overtime is illegal especially once the heat exceeds a certain temperature.

Health issues are a huge concern when it comes to workers, especially working overtime in incredible temperatures. The UAE should once again incorporate the ILO’s convention no. 155 which sets a standard on workers’ health and safety. Many times, workers who have issues are intentionally not recorded and kept quite. This needs to change, especially since we do not even know how great the problem is due to misleading reports.

The International Labor Organization’s conventions which state the freedom of association and collective bargaining. This essentially gives the workers the right to have strikes and counter violations from their employees. These unions could go as far as to have leaders and official representatives.
RE-DESIGN THE LABOR CAMP COMMUNITY
ELEMENTS OF A COMMUNITY

PLANNING

INFRASTRUCTURE

MODULARITY

MATERIALITY

INFRASTRUCTURE

COMMUNITY

MATERIALITY

MODULARITY/PRE-FAB
While there are a large number of factors that influence and factor into the design of a community for labor workers, some will inevitably take precedence over others, especially in a project of this scale. While infrastructure is crucial, it is one of the least influential aspects of the community design. Planning the aspect of a community, on the other hand, is crucial to the overall project in order to create a sense of community in the labor worker phase, and further in the conversion to low-income housing. Modularity, pre-fabrication, and materiality play an important role as they allow for the open structural growth of the communities while creating micro-climates in the comfort zone in specially hot and humid environments.
Dubai’s unprecedented rate of growth is astonishing. With so many projects, residents of Dubai will argue that certain aspects of the city are poorly planned. While this issue is on a city-wide scale, it’s an even bigger issue when it comes to labor camps. The main goal behind the plans of a labor camp are to condense living accommodations as much as possible. Most of the immigrant workers come from villages, and are used to a certain kind of lifestyle. The storage-unit like designs of a labor camps are immediately and issue of lifestyle. In regards to redesigning the labor communities, planning is a huge factor. It plays a vital role when attempting to create a community of living, with social amenities and public spaces. Furthermore, the planning allows for growth in phases as projects grow, and furthermore will play an even bigger role when being converted into low-income housing.
“STOP DESIGNING BUILDINGS AND CITIES AS COMPLETE CONCEPTS THAT WOULD BECOME OBSOLETE IN NO TIME, BUT TO TURN TO OPEN SHAPES THAT ALLOW FOR CHANGE AND EXPANSION AND ARE OPEN TO THE INFLUENCE OF RESIDENTS.”

- Open Versus Closed Structures 26

“AN ARCHITECTURAL PROJECT IS NO LONGER UNDERSTOOD AS A PROJECTION OF A PERFECT STATE, BUT RATHER AS AN INTERACTION WITH OTHER SPATIAL AGENCIES: OF COMMUNITIES, OF INHABITANTS, OF FUTURE USERS, AND SO ON. HENCE, IT IS CERTAINLY ABOUT OPEN SYSTEMS.” 27

Structuralism is about openness. This means a design that is sustainable, transformable and adjustable based on the situations. Even during construction, technology and time can affect the program within. No buildings remain the same and architects should learn to design changable buildings.

In most cases throughout history, cities are not designed. They have a starting point and shape themselves based on internal forces. “Cities ... usually design themselves from the inside out, ultimately led by hardly controllable forces within society.” Advancements occur naturally over time based on need.

Buildings, on the other hand, can be seen as being opposite to this. With a vision of what the building should look like, one of the architect’s main goals is to make sure the ‘final’ design fits the surroundings. Therefore, the sculptural shape of the building takes precedence over the internal influences, and often the internal influences may even be limited to the exterior shape. 28

Open structures are defined as being open to the influences around them, while simultaneously having the ability to influence the things around them. Dutch Structuralism states that many architects have a hard time disconnecting themselves from the fact that a design does not have to be a complete composition. In fact, many buildings and even urban designs are not ‘structuralist’ and are unable to react to internal developments. 26
The Orphanage in Amsterdam, designed by Aldo Van Eyck in the mid-1950s can be seen as being organized almost as a small ‘walled in city’, with the square public space in the center being the core. The individual spaces are repeated as modular pieces, almost like houses, and build onto each other to create a variety of spaces and amenities.

If each modular piece is considered as a ‘neighborhood’ or a ‘district’, one can imagine this as a model for a designed and growing city. While each modular piece is essential to create space for the required program (inside-out), it is also concerned with the overall circulation and layout of the building (outside-in). Therefore, with both inside-out and outside-in characteristics, the orphanage highly represents a growing, flexible city.

When the program of the building had to change in the early 1960s from ‘age groups’ to ‘family groups’, Paul van Eyck saw his building as a closed system as he had designed specific program such as cribs tailored for the age group. However, the truth was that the modular pieces which both allowed inside-out and outside-in design influences created a flexible fabric and allowed an easier transition of program.
In a time where there was conflict between the labor workers and capitalists making millions from their business ventures, the situation of Pullman seemed to be an unusual situation where there was a mutual advantage for both parties. Ultimately a win-win situation.

One of the reasons for the Pullman worker housing development was the location of the construction site being far away from the rest of Chicago. This made it clear that the development needed to have the appropriate accommodations, both residential and any other necessities one would find in a functioning city. These developments were all considered a company investment.

The town was organized in a grid pattern. Infrastructure such as sewage systems were designed. Equally as important, open spaces and a market square were integrated into the city’s design.
The city was commissioned to have just under 2000 dwellings. The most common type of housing was the row houses in long blocks (Figure 1). Others included apartments for individuals, duplex apartments, and some family homes. Even though these structures were somewhat modular and repetitive, little details show the architects trying to give a "plastic quality" to the city.

"A church, a school, casino, shops, public meeting rooms, and a large central stable were all built. However, after all, Pullman was an investment. Almost all aspects of the built city were controlled by the company, from the social life and activities, to structures and land, etc. With the Pullman Strike in 1884, the people began to have their voices heard. Had everything been run in a more democratic way, Pull could have been even more exemplary."

"OTHER INDUSTRIALISTS TURNED FROM ACTIVE CONSIDERATION OF HOUSING CONDITIONS. WITH SUCH LOSS OF INTEREST, EXPERIMENTATION IN HOUSING AND TOWN DEVELOPMENT CONTINUED TO BE A NEGLECTED FIELD IN AMERICA."
The Al Yas Operative Village (preferred term over ‘labor camp’), was designed to house the construction workers working on the Al Yas Island development. It was planned to hold up to 40,000, with a variety of amenities both for regular necessities and entertainment planned into the village. During a tour in 2008 of the site, a representative from the Ministry of Labor, Mr. Ghobash, said that almost all labor camps should aspire to be more like the Al Yas camp. “There are no more excuses for the private sector to not meet these standards”, said Mr. Ghobash. The village is not perfect, and it is still run by the development company. However, the laborers definitely prefer these kinds of conditions over other camps, such as those in the Mussafah region of Abu Dhabi, only 20 minutes away, but with completely different standards of living. Mussafah represents a more commonly seen standard of living, close to ten people per room, extremely dirty living conditions, and little to none amenities. One crucial aspect of better living conditions is not just the better accommodation, but also the sense of respect the workers have not only for themselves but also for their employers. This ultimately leads to better attitudes and better productivity on the laborers’ end.
IMAGES OF THE OPERATIVE VILLAGE WITH COMMON AREAS
The rate of growth in Dubai creates a variety of issues, especially considering that the foundation of the city is on a desert with extreme temperatures and limited natural resources. Electricity, water, sewage and transport begin to become problems in certain situations. While Dubai boasts improving infrastructure, there are still a lot of issues with acres of residential areas with no sewage systems that rely on septic tanks. This, ultimately, plays a major role in the redesign process of labor communities where the residences will either rely on temporary and mobile forms of infrastructure such as septic tanks, clean water transportation, and generators for electricity, or more grounded forms of infrastructure will have to be developed for the conversion to low-income housing.
SEWAGE

"SOME LABOUR COMPANIES OFTEN IGNORE OVERFLOWING SEPTIC TANKS TO AVOID PAYING FOR SEWAGE TANKERS TO DISPOSE OF THE WASTE." 37

Al Quoz, a neighborhood in Dubai, is home to various labor camps available for rent along with lower income houses. At 4688 acres, it covers a large area right off of Sheikh Zayed Road. In 2009, it was announced that 282 acres of the neighborhood was going to have proper infrastructure built. While this was made to look like big news, it is astonishing that such a large land was initially built without any sewage infrastructure to begin with.

Both the camps and the rest of the housing in the area rely on transportable infrastructure systems. Sewage management relies on mobile septic tanks that are supposed to be emptied regularly. Trucks come to the area and take the sewage to one of the closest waste management plants, which is approximately 20 minutes away. However, besides the lack of modern infrastructure, the next biggest issue is that companies try to make profit by not sending trucks regularly. Furthermore, drivers will sometimes pick up the sewage, but dump it out in the middle of the desert, creating extremely hazardous environments. 38

SEWAGE WATER FROM SEPTIC TANKS [WERE DUMPED] ON TO OPEN GROUND. LABOURERS ENDURING THE STENCH OF SEWAGE HAVE REPEATEDLY REPORTED HEALTH PROBLEMS. 39
SUSTAINABILITY

MASDAR CITY

Foster and Partners are designing a 6,000,000 m² walled city in the middle of the desert that is planned to be carbon neutral and be close to levels of zero waste. While the city has plans for energy, water, and waste on larger scales, it also aims to change the way of life for day to day activities. The mixed use program of the city is designed in traditional street styles where shaded streets can encourage walking even in hot climates. The city is linked through a ‘rapid link’ system and is connected to the rest of Abu Dhabi’s neighborhoods, airports, and other areas via existing roads and newly planned highways.

SHAMS SOLAR FARMS

The world’s biggest solar farm mirrors will generate power for approximately 20,000 homes. Abu Dhabi, just like Dubai, will soon run out of oil. Similar to how Dubai has focused on tourism and real estate to secure their future, Abu Dhabi, one of the seven UAE emirates, is focusing on Sustainable Energy. They aim to become a global center in this topic, and are spending billions of dollars on projects like Masdar, a zero-carbon footprint walled city, and projects like Shams. Located an hour south of Abu Dhabi, Shams 1 is currently the world’s biggest solar panel system and cost Abu Dhabi approximately $600 million dollars is said to creat enough energy for 20,000 homes. The design is said to avoid 170,000 tons of CO2 usage every year, which can be visualized as saving 1.5 million trees, or taking about 15,000 cars off the roads. Abu Dhabi hopes to pave the way for more projects like this in the UAE.
Ideas of modularity and prefabrication have been experimented with by many architects for over a century. Prefabrication has been a fascination for many, pushing architecture to a more industrial level of mass-production. While there have been many studies, prototypes, and plans to execute mass-produced housing, almost all have fallen short. Modularity and prefabrication create great advantages of mobility and flexibility for housing in labor communities. Issues of assembly and disassembly become more feasible, and play an equally important role in the conversion into low-cost housing as additions can be made to the labor housing for the specific needs of individuals, couples, and families that will eventually move into the low-income area.
A quick history time-line

- **1908**: Edison Single Cast
  - United States

- **1920**: Citrohan House
  - Corbusier

- **1928**: Dymaxion House
  - Buckminster Fuller

- **1931**: Assembled House
  - Frank Lloyd Wright

- **1935**: Prefab Prototypes
  - Jean Prouve

- **1941**: Quonset Hut
  - United States/United Kingdom

- **1945**: Eames House
  - Charles + Ray Eames

- **1945**: Levittown
  - United States

- **1954**: Mobile House
  - House on Wheels

- **1958**: Archigram
  - House on Wheels

- **1960**: Richards Medical
  - Louis Kahn

- **1960**: Richards Medical
  - United Kingdom

- **1966**: Habitat
  - Moshe Safdie

- **2008**: Home Delivery
  - MOMA

- **1967**: Archigram
  - Plug In City

- **1970**: Pompidou Center
  - Piano/Rogers

Figure 59
One of the most important figures in the ideas of a prefabricated house is Le Corbusier. In his book, *Towards a New Architecture*, Corbusier brings up the idea of prefabricated and mass-produced houses. The Dom-ino house from 1914 is the classic three-floor slabs with the columns, repeated within itself, allowing for additions and expansion. In the same chapter, looking at Corbusier’s Maison Citrohan from the 1920s, the idea of mass-produced housing comes into play. First, the name is quite curious as it is a play off of the French car maker Citroen. When we look at the rendering of the villa Citrohan, one can immediately see a copy of the house in the background, oriented differently, which hints at the repeatability of the design. 44

In a 1968 competition called ‘house for Today’, Richard Rogers placed second with his Zip-Up house design. Insulated aluminum sandwich panels were formed in rectangular sectional tubes and compiled together to create a house. The end pieces were fully glazed. The user could adjust the rectangular sections as they pleased based on necessity. The mobile sectional pieces would then lock into place. 45

Buckminster Fuller is probably most famous for his Geodesic Dome and the Dymaxion House. Although not an architect, one of his greatest dreams was to create mass-produced housing. The opportunity arose in 1944 when there was a need for mass housing when aircraft factories were finding it difficult to keep their workers interested due to the over-crowded housing provided for the workers. He had also designed the Dymaxion Deployment Unit, and thousands of units were actually ordered by the U.S. Army. Furthermore, he had designed the Dymaxion bathroom and the Dymaxion car. Fuller’s dream was to create a factory line of mass production of houses. 46

**THE PREFABRICATED HOUSES THAT CONVENTIONAL ARCHITECTURAL HISTORY Chooses to Canonize and Celebrate, Mainly Because They Were Designed by Famous Architects, Were All Complete Failures by Any Objective, Non-Architectural Measure.**

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88 89
Kirinda, Sri Lanka

Disaster Relief Housing by Shigeru Ban

1/3 of the world’s population lives in compressed earth brick structures.

After a destructive tsunami in the fishing village of Kirinda in Sri Lanka, Shigeru Ban worked to recreate housing for the residents of the village. One of the most important things for Ban was to respond to what the villagers needed, while complying with government regulations. It was also important to use local materials and labor. Ban used compressed earth bricks, which also made the villagers part of the construction process. CEBs meant that the building material was cheap, reusable, and readily available in the village. Partitions, windows, and openings for wind passages were made out of local wood. Ban built 45 homes with just $1 million. 48

Locals
It was important to know what the villagers who were actually going to live in these houses wanted. One of the important things for them was to include a kitchen and bathroom in each house.

Government
Regulations from the government said that a covered, semi-open area were to separate the kitchen and bathroom from other rooms. 49

The hot climate meant that open spaces and breezes were a crucial aspect of design. Windows and large doors/openings allowed for adjustable openings. Permanent openings made by the roof of the houses allowed wind to flow through and create breezes through hot and humid climates.

CEBs were made locally and stacked to build the houses. A layer of concrete was poured as the foundation.
The vertical rebars play an important role in the placement of the CEBs (compressed earth bricks). One of the first steps is the placement of the ties in the vertical rebars in order to ensure the rebar, along with the CEBs, will be in place. The stacking can now begin, and can be completed by even people with little to no experience as the modularity makes it straightforward. In places not prone to earthquakes, bricks can be laid without any mortar, making disassembly easier. However, in earthquake prone areas, mortar will be applied between layers of CEBs, and sometimes concrete will be applied on every 5th or 6th layer. Vertical stacking can be done fast, especially when bricks are plentiful and mortar is not needed. Openings for doors, windows, electrical sockets, etc., will need to be planned out and executed by more experienced builders. Bolts for door frames, electrical pipes for wires will also be placed as the CEBs are continuously stacked.

The foundation of each structure is fundamental to the rest of the construction. In areas where earthquakes are more common, foundations are deeper. Different soil and geographical conditions will determine certain construction techniques such as first applying a layer of rocks. The foundation of each structure is fundamental to the rest of the construction. In areas where earthquakes are more common, foundations are deeper. Different soil and geographical conditions will determine certain construction techniques such as first applying a layer of rocks. Different soil and geographical conditions will determine certain construction techniques such as first applying a layer of rocks.

The foundation of each structure is fundamental to the rest of the construction. In areas where earthquakes are more common, foundations are deeper. Different soil and geographical conditions will determine certain construction techniques such as first applying a layer of rocks. Testing the soil prior to building individual compressed bricks is very important. Aspects such as amount of clay and sand in the soil, depth of which the soil is dug from, are crucial. Sometimes about 10% of concrete will be added for weather-proofing in certain climates. Bricks will be stored to keep their moisture for weathering purposes.

Testing the soil prior to building individual compressed bricks is very important. Aspects such as amount of clay and sand in the soil, depth of which the soil is dug from, are crucial. Sometimes about 10% of concrete will be added for weather-proofing in certain climates. Bricks will be stored to keep their moisture for weathering purposes.
When designing for efficiency in climates such as Dubai, materiality plays an important role, especially in controlling factors such as sun, humidity, and wind. While modern pre-fabricated materials may provide a certain type of convenience, specifically regarding mobility and flexibility, traditional building materials tested over centuries have the potential to provide better solutions. Redesigning labor communities, materiality will play an important role and create a balance between reliable performance versus pre-fabrication and flexibility.
CURRENT PRODUCTS

EXAMPLES OF MODULAR CONTAINERS AND THEIR MATERIALITY

Available through Qingdao Rayfor Industry, this modular container can be used for temporary office spaces, living quarters, meeting rooms, and other uses on more administrative levels. With its modularity, multiple pieces can be ordered through the company and set up for a variety of purposes.

Each modular piece includes air conditioning, internet and phone lines, electrical systems, rigid insulation with a variety of furniture for flexible uses.

However, these containers are considered to be more on the 'luxurious' end and are almost never used for housing labor workers. This is a market standard that is easily accessible in Dubai and surrounding areas. 51
One of the biggest challenges when it comes to designing in hot, humid climates is to protect against heat and design to provide natural cooling. Furthermore, issues of wind and humidity also come into play and directly affect the micro-climate of a structure. It is crucial to plan and design with these factors in mind in order to create living spaces within the comfort zone. Facade openings, building orientation, neighboring structures which can provide shade, design of public areas, and other factors all affect micro-climate conditions. One of the most important elements of design, however, is materiality. Being aware of the types of materials used in construction can impact thermal conductivity, transmission reflectivity, and resistivity. One of the main goals is to reduce thermal conductivity, which means increasing the resistance of air moving from inside the building to the outside. Thickness of material is also a major factor. Alongside thickness, using insulating materials can also reduce thermal conductivity. Hassan Fathy’s studies of building materials and their respective thicknesses to have a thermal resistance of 1.1 kcal/hrm²°C.

Hassan Fathy’s studies of traditional building materials used for decades, and their respective thicknesses to have a thermal resistance of 1.1 kcal/hrm²°C. 52

**BUILDING MATERIALS**

Hollow Brick Block

- 12 inches

Double-Wall Brick

- 4.7 inch
- 3.1 inch cavity
- 4.7 inch

Brick Wall With Holes

- 15 inches

Sand Line Brick

- 20 inches

Hollow Block Sand Line Brick

- 20 inches

Concrete

- 39 inches
In most Middle Eastern countries, Eastern and Western facades are shaded by other buildings. However, if it is a single dwelling, architectural techniques such as balconies, loggias, verandas, or devices such as venetian blinds, and brise-soleils. 52

During the summer, the angle of the sun is very high making it easy to block unwanted sunlight. In the winter, when sunlight and warmth is more desirable, the sun angle is lower. The South facade also gets much less wind as wind mostly comes from Northern directions in the Northern Hemispheres. 54

North Facade is least exposed to the sun. In early and late hours during the summer when the facade is exposed to the sun, the light is evenly distributed throughout the room due to the tangential exposure of sunlight. This makes the facade ideal for programs such as classrooms or hospital operating rooms. 55

This facade is very ideal for bedrooms as it only receives directly sunlight in the morning hours and cools down quickly by the night time. 56
### Concrete/Mud Analysis

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**Concrete**

**Compressed Earth Bricks**

Testing of pre-fabricated concrete structure over a 24 hour period, comparing indoor and outdoor temperatures and the level of comfort zone. Indoor temperature fluctuates about 20 degrees Celsius, going well out of the comfort zone. 57

Testing of pre-fabricated concrete structure over a 24 hour period, comparing indoor and outdoor temperatures and the level of comfort zone. Indoor temperature varies less than 5 degrees Celsius and stays within the comfort zone. 58

With a variety of Brick maker companies available, creating compressed earth bricks is a much more accessible resource. Groups such as Open Source Ecology even describe in full detail how to create a machine that will be able to lay about 1,200 bricks a day. One of the most efficient things about compressed earth bricks is the ability to quickly assemble structures. With spacing for vertical metal structural support, laborers do no need to be highly experienced in order to lay the CEBs. With just a little bit of training, a whole group can create a small dwelling in days. 59

![Concrete graph](image1)

![Compressed Earth Bricks graph](image2)

**Notes:**

- Figure 75
- Figure 76
- Figure 77
- Figure 78
EXTREMES OF LIVING STANDARDS
KERALA, INDIA

23% of homes in Kerala have a female as the head of the house. This is the most female-headed place in India. Most men in the village will go to other towns or work in the Gulf. Women would usually get married so they could have children; in the older years anywhere up to 8 or 10. Today, however, women choose to have around 2 or 3 children.

Kerala locals often have a living situation referred to as the Taravad. This usually includes the female ancestor, her children, and other descendants. The male also partially becomes a part of this Taravad.

Most Kerala homes are made out of clay bricks and with a roof made out of weaved coconut leaves.

“Mukkola” is a rural market which has many shops which sells anything from fish, vegetables, baskets, mats, and other goods.

“Stree Neelakanta Anganwadi”, a school for children under six. Kerala is known to be one of the most literate parts of India.

Coir-making is a big time activity especially for the females in the village. This acts also acts as an activity which keeps a strong bond between the women in the village.

Kalari is an ancient martial art.

Figure 63

Figure 79

“Mukkola” is a rural market which has many shops which sells anything from fish, vegetables, baskets, mats, and other goods.
JEBEL ALI CAMP

Workers live in all-male labor camps. Camps are often hours away from the construction site. In most common cases, there are anywhere between 4 to 10 people to an average sized room. Some camps don’t even have air conditioning.

Limited number of bathrooms and kitchen space for a large number of people. In one example, 2 toilets per 45 people, and 600 people to 2 kitchens.

Lacking sewage infrastructure causes sewage to spill onto the streets where the workers work.

Water provided at the camps are the same kind of water used for the concrete at construction sites.

Workers use water from buckets and cups to clean themselves.
JUMEIRAH ISLANDS, DUBAI

Jumeirah Islands is a development that was completed by late 2006, and represents a common type of luxury housing in Dubai for expatriates. Most homes on Jumeirah Islands will have about 5 bedrooms, driveway for multiple cars, a pool, and other luxuries.

Most families will have a maid in the house, if not more. These maids will often help out with cleaning and sometimes cooking. Sometimes they will have separate stairways and areas to live.

It is not uncommon to have a small family of three living in one of these houses, regardless of the house size.

Typical families have either one or more working parents, children who attend private schools.

There are about 50 clusters, organized in circles, with about 16 villas per cluster. This adds up to approximately 800 houses in one development.

Almost all the rooms will have their own bathrooms, along with guest bathrooms. Sometimes there will be a secondary kitchen upstairs.

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Almost all the rooms will have their own bathrooms, along with guest bathrooms. Sometimes there will be a secondary kitchen upstairs.
A NEED FOR AFFORDABLE HOUSING
“43% of households in the UAE currently earn less than AED 9,000 ($2450) a year. This creates an active market for affordable housing.”
WHO NEEDS LOW-INCOME HOUSING?

- Abra Driver: AED700/month ($190)
- Construction Worker: AED800/month ($217)
- Cashier: AED1,000/month ($272)
- Chauffeur: AED1,250/month ($347)
- Taxi Driver: AED2,500/month ($680)
- Waitress: AED3,000/month ($817)
- Cabin Crew: AED9,000/month ($2,450)
- Doctors: AED50,000/month ($13,620)

RANGES OF RENT

- AED375/month ($102): Rooms in low-income areas as seen in Al Quoz.
- AED2,300/month ($626): Al Khalil Community.
- AED15,000/month ($4,082): A 3 bedroom house in Emirates Lakes community.
- AED23,000/month ($6,250): A 4 bedroom house in Jumeirah Islands community.
- AED41,700/month ($11,350): A 5 bedroom house in Emirates Lakes community.
- AED79,000/month ($21,500): Mansion on the Palm Jumeirah development.

Low-Income Market

- Figure 82 - 89
**ISSUES TO BE SOLVED**

- **Land Costs**: A general approximation is that the price to buy the land should not be more than 30% of the overall project value. This creates a big problem for developers to be able to provide homes at an affordable cost.

- **Infrastructure Costs**: As the site gets further out of the city, and number of dwellings increase, the price of infrastructure goes up. These kind of additional costs could mean that affordable housing could be placed in more central areas with existing infrastructure.

- **Construction**: Risky due to the high cost of materials and labor. Poorly designed and minimal amenities run risk of creating 'ghettos'.

- **Developer Business Model**: If the site gets further out of the city, and number of dwellings increase, the price of infrastructure goes up. These kind of additional costs could mean that affordable housing could be placed in more central areas with existing infrastructure.

- **Sustainability**: Due to smaller units, sustainability becomes a more feasible issue. Water conservation, better use of solar energy, optimization of environmentally friendly products, etc., have a multitude of advantages for bringing down costs.

- **Social/Cultural Factors**: Uniformity of most affordable housing designs force families with rising incomes or growing families to move out. Leads to isolation of one kind of demographic.

- **Management**: International precedents have shown that affordable communities, unless properly managed, begin to ‘deteriorate’ within 5 to 10 years. Furthermore, pricing becomes an issue as in some cases prices even go up, making it ultimately less affordable.

- **Price Control**: Many countries like the UAE have a lack of urban planning system. (The Dubai Metro was an effort to compensate for this.) However, many of these systems do not extend outside of the metropolitan areas, making transport and issues with affordable communities.

---

**UAE AND LOW-INCOME HOUSING**

- Economic downfall caused lower house prices. Still big market for low income.

- 43% of residents in UAE need low cost housing.

- There is a definite shortage for low income housing for this market.

- Affordable house prices not regulated and not raised.

- Workers housing in ‘camps’ is provided by employers.

- 43% of residents in UAE need low cost housing.

- Worker housing in ‘camps’ is provided by employers.

- Abu Dhabi requires developers to allocate 25% of any project to low income housing.

- Speculated value of land has raised prices to unaffordable numbers.

- Affordable income housing is provided by private companies.

- However, low revenues discourage companies to design affordable housing.

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INTERNATIONAL CITY

ATTEMPTS AT LOW-COST HOUSING

"INTERNATIONAL CITY IS A HOLE. THE GHETTO OF DUBAI. IT’S A SAD PLACE. LIKE, ONE STEP AWAY FROM BEING A LABOR CAMP."
- 24 year old resident in Dubai

International City is a development aimed for lower income residents. It is made up of 10 different neighborhoods with different themes of construction designs. The entire development is spread over almost 2000 acres and is right next to Dubailand. While International City is considered outside of Dubai’s main areas, Dubailand will provide amenities and entertainment. Amenity such as roads, water, electricity, sewage and cooling have been in place since 2004. Furthermore, the Dubai Metro will have a stop right in the development. However, renders and advertisements have not met reality. One of the biggest complaints is the lack of trees and greenery. Furthermore, issues with infrastructure are constantly a problem with burst sewage pipes. While Dubai is in need of affordable housing, International City is an example of a poorly executed plan.

- 68 year old resident in Dubai

*Figure 90 - 93*
PROPOSAL
Infrastructure will take a back seat in the overall design. However, communities that are planned to be disassembled will rely on temporary infrastructure as seen in Al Quoz area. Sustainability, and solar technologies will also be considered for the final design. In labor worker communities that are planned to be converted into low-income housing, more permanent infrastructure systems will be set up.

Materiality will play hand-in-hand with construction of the modular CEB structures. Compressed earth brick building techniques have been around for a very long time, and have ultimately been standardized to a certain extent. Different types of bricks, using ties, horizontal and vertical rebars, will all act together to create a sustainable and efficient structure with a climatically appropriate building material.
The planning will include designing an 'open structure' that is not designed as a complete 'city', but is open to adapt and reflect changes based on residents' needs. Amenities will play a large role in the design to bring people together and create a sense of community, which will also act as nodes of growth. At the end of construction projects, labor worker communities will either be disassembled or converted into low-income housing depending on location and predicted land value.

Modularity will play a big role both in construction and overall planning. Compressed Earth Bricks are the building material of over a third of the world’s housing and have been a tried and tested method of building in climates similar to Dubai. CEBs will be the primary building material of the houses. Disassembly will be efficient and CEBs are mainly earth, and can be recycled. In scenarios where the communities are converted to low-income housing, CEBs can be added to existing designs to create additions based on future residents’ needs.
CHAPTER 2: THESIS
MODULE 1.0 - THE UNIT
MODULE 1.0 - THE UNIT

MODULAR ARMS ALLOW FOR VARIOUS TYPES OF ADDITIONS TO EACH UNIT

LAUNDRY ACTS AS SHADING DEVICE

RAILINGS ALLOW FOR SECOND FLOOR CIRCULATION

THROWING TARP OVER ARMS ACTS AS SHADING DEVICE

STEEP STEP STAIRS ALLOW FOR SECOND FLOOR UNITS

DEHUMIDIFICATIONS IN THE UNIT CEILING ALLOW HEAT TO ESCAPE THROUGHOUT THE DAY
MODULAR UNITS ARE USED TO RAISE THE WATER TANK ABOVE GROUND TO GAIN PRESSURE

STRETCHED TARP BLOCKS DIRECT SUNLIGHT ONTO WATER TANK

STRETCHED TARP ACTS AS SHADING DEVICE FOR WATER TOWER AREA

PEERED STRUCTURE ALLOWS FRAMEWORK FOR SHADING DEVICES

RAISED WATER TOWER CREATES SHADY AREA FOR COOLING SPACES
A third of the world lives in compressed earth brick structures. CEBs are extremely affordable, natural, and partly recyclable. In many communities, the act of building dwellings out of CEBs brings the community together and creates an immediate sense of identity.

Concrete is one of the cheapest ways of building, especially in areas like Dubai where there is no seismic risk. A lot of the current labor camps are 4-5 storey concrete buildings. Precast concrete blocks are part of the infill inventory of the steel frame for each unit. One of the primary infill materials is a blue fence used to deter most construction sites in Dubai. The material is made up of wood and metal sheeting.

Similar to the blue metal infill material, corrugated sheet metal is readily available and cheap. This material will likely absorb a lot of sunlight, making it almost necessary to keep shading devices on the facades where this is used.

Similar to the infill material used, the idea behind fenestrations is that whatever material is available will be used in place of regular windows and doors. Figure B shows a fenestration which opens in an outward direction in order to create more shadow. Figure C, on the other hand, shows an opening in the wall that is simply covered with a piece of wood.
DESIGN DRIVERS
BUILD STEPS
PROGRAM EXAMPLES

WASHING/WASTE

LARGE SINKS ARE USED FOR BOTH WASHING UP AND LAUNDRY.

COMPOST TOILETS NEED TO BE SIMPLY VENTILATED.

WATER TOWERS PROVIDE WATER FOR THE COMMUNITY.

COMPOST TOILETS AVOID WASTE TRUCKS AND REMOVAL.

COOKING/EATING

SIMPLE KITCHEN COUNTERS ALLOW ADEQUATE COOKING SPACE.

UNVENTED WALLS CAN ACT AS VENTILATION AND CONNECTION TO EXTERIORS.

CENTRAL AREA WITH STOVES, VENTILATED WITH HOT AIR RISING.

UNFILLED WALLS CAN ACT AS VENTILATION, AND CONNECTION TO EXTERIORS.

CENTRAL AREA WITH STOVES, VENTILATED WITH HOT AIR RISING.

2000 GAL 4

1000 GAL 4

30 24
NIGHT GATHERINGS
LIT-UP ZONES


4. Ibid.


6. Ibid.


8. Ibid.


10. Ibid.


12. Ibid.


15. Ibid.


18. Ibid.

19. Ibid.

20. Ibid.


22. Ibid.


24. Ibid.

25. Ibid.

26. Ibid.

27. Ibid.

28. Ibid.

29. Ibid.


31. Ibid.

32. Ibid.

33. Ibid.

34. Ibid.

35. Ibid.

36. Ibid.

37. Ibid.

38. Ibid.

39. Ibid.


42. Ibid.


44. Ibid.

45. Ibid.

46. Ibid.

47. Ibid.


53. Ibid.

54. Ibid.

55. Ibid.
56. Ibid, 30.


58. Ibid, 33.

59. Ibid, 35.


63. Ibid.


67. Ibid.


71. Ibid.


74. Ibid.

75. Ibid.


77. Ibid.


79. Ibid.


81. Ibid.


83. Ibid.


85. Ibid.
