Designing Housing in the Third World:
A Prototype for Housing the Maquiladora Workers in the Northern Cities of Mexico

by
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ABSTRACT

The difficulty in designing low-income housing is that it will not sit quietly, other problems keep jostling about it. To design low-income housing one must consider the extreme conditions of poverty and urban problems, deal with sociology, history, politics and the economy. The second difficulty is the breadth of the subject. But this thesis project is not meant to answer all of the problems that low-income housing might have to deal with. It is meant to be a positive contribution to the development of this subject in Third World Nations, particularly Mexico.

This thesis develops a housing prototype for the northern border cities of Mexico, in this case, is the city of Reynosa. The reason for choosing this area is because northern border towns are expected to be the faster growing cities in Mexico in this decade, due to the large industrial development resulting from the Free Trade Agreement with Canada, Mexico and the U.S.A.

The number of people that come to these cities looking for employment are encountering housing problems. Different housing programs and solutions have been established by governmental institutions, private interests and individuals. All of these solutions, have tried to answer the problems in their own way.

This thesis will compare these housing solutions for both their positive and negative characteristics in order to identify particular architectural design solutions that these communities need. On the basis of this research a new housing prototype for border towns will be designed. The housing prototype hypothetically is intended to be used by the INFONAVIT, a private developer or a self-help community group. This prototype is developed from an existing project taking this research into consideration, with the notion that by drawing from these experiences and looking at these constraints, budgets, and overall proposals one can design a prototype for a real case and problem.

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Today, between a quarter and half of the inhabitants of most Third World cities cannot afford the cheapest house or apartment which meets rudimentary health and safety needs. They usually find accommodation in one of three ways. Those with no money sleep on the streets or other public places. Others may rent a room in a slum or squatter town. The most fortunate of these build themselves a shelter with the help of friends and family on land that they do not own. None of these options offer the space, security, safe water or sanitation which are essential components for adequate shelter.

More than three million people live in unauthorized housing developments in many large cities of the Third World: Manila, Mexico City, Sao Paulo and Lima among them. This means that between a third and three-quarters of the inhabitants of the major cities live in unauthorized developments. But the scarcity of urban land for poor families is not uniquely a Third World problem. The cities of developed nations have their slums, their ghettos, their squatter towns. In fact, although the proportion of inhabitants of such illegal settlements is increasing in the Third World, no land tenure system has found satisfactory means of providing poor families with healthy, legal housing near jobs in large and expanding cities.

Finding the poor legal alternatives to illegal housing is one of the major challenges facing governments and international agencies as this century draws to a close.

Mexican housing problems are complex in that they go beyond simple housing solution. As a third world nation, we have tried for forty years to meet the legislated goal of providing a decent home for everyone; the government has and will continue to spend billions towards this end and indeed, impressive statistics can be cited which would seem to indicate that Mexico is solving its housing problems. Unfortunately, a major part of the problem lies in Mexico's urban population.

Mexico's annual population growth has slowed to just under 2% in recent years, but the workforce is still expanding by 3% a year, reflecting a higher population-growth rate 15-20 years ago. More than a third of the population is under 15 years old and more than 80% is under 40 years old. Mexico still has to create more than one million jobs each year. What is good is that there is also opportunity in the challenges. Mexico has
a plentiful supply of labor. The problem remains however, that this labor force needs to be housed.

At the moment these poor communities live in self-help settlements, occupying land through informal processes. Which have been a characteristic trait of most Latin American cities. The problem, already complex, becomes more so as we focus on particular cases, such as the poor households that rent or share their accommodations as a means to gain an income.

A large fraction of the Mexican urban population now lives in self-help settlements. Many live in rental accommodations: other shares homes with kin: young adults continue to live with parents; others share accommodations with friends and relatives. If there was a pronounced shift towards owner-occupation after 1950, but that tendency has slowed drastically. The proportion of Mexican families occupying their own self-help homes has declined during 1980's. A combination of falling real incomes, rising costs of land and materials, and changing state policies, have all played their part in frustrating Governmental attempts.

But we do know the needs, reality and aspirations of the Mexican poor and their need for better housing conditions. Most aspire to the ownership of their own home, but the lack of resources and assistance, make it difficult for them to realize this dream. The debate lies in the degree of help that the poor need to be provided with in order to have a proper and decent housing unit. We must decide to what extent housing projects should receive government assistance and how self-help housing can be controlled in a community to avoid the use of urban land for speculative purposes.

Usually the growth of urban areas increases the value of land, and this is a common phenomenon in most cities. But, it is always risky to generalize about Latin America because situations vary considerably from one region to another and from one country to another.

In practice, housing behaviors even vary within the same country. Within the northern border cities of Mexico, housing behaviors of the poor are complex. Solutions vary from self-help housing in squatter settlements, to many different varieties of public housing sponsored by the Government Institutions or private corporations.
Architects, planners and the communities involved in this problem have looked for general solutions dictated from abroad rather than finding the solution within the communities where the answers lay. Most of the time the spatial solutions that the community has provided for itself satisfy its needs more accurately than governmental and private institutions, although a combination of all these three is necessary for success.
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HOUSING:
Housing conditions at the side of a factory in Reynosa.

FACTORY:
Maquiladora industry in Reynosa.
This table has been designed to show the different case studies that have been researched. It shows where these three different projects stand in comparison to each other and with respect to the prototype designed. This table compares the initial stages of these communities, the different housing conditions of each community, and the time these units took to be "completed."

Each of these cases tends to have similar characteristics, once the unit reaches its maximum capacity of growth, change and renewal. Due to the similarity of the "final" characteristics of the houses, it is difficult to know at which level they initially started. Unless one sees the community as a whole, one can not find characteristics that indicate at which level these communities began. Low income housing solutions are quite similar in construction methods and formal expression. Variations between settlements, spatial and dimensional capacity are larger and more varied in the squatter settlement when compared to those of governmental units.
## Housing System Framework Entry Points for Low-Income Families

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**Prototype**
- Expandability limited
- Government projects
- Private projects
CASE STUDIES

The following section contains studies describing selected low income dwelling environments within the City of Reynosa. These three cases were selected on the basis of low income projects for groups whose main source of income and work is the maquiladora industry. Two of these cases are already established communities, one is the squatter settlement of San Martin and the other is a governmentally funded low-income housing project for workers in the electric company. The third case is a housing project that has not been constructed, but is designed for blue collar workers of a steel maquiladora industry. This project will be constructed and funded by INFONAVIT.

The factors taken into consideration for the selection of these three specific cases were the way in which these communities have formed, the dwellings units' characteristics, the way they have changed, and the way individuals have answered the spatial and material arrangement of their dwelling. Another factor that was taken into consideration was the different types of housing solutions that were done depending on the amount of time that the workers and their families had been living in those communities.

The two already constructed communities differ
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Government:
Housing units of Governmental Project.

Proposed:
Steel structural frame for proposed project.
in their evolution as projects, their changes and renewal stages being totally different.

These case studies were approached with two very simple questions in mind; What is good housing, and what is unique about the solutions that these communities have given to housing.

In reviewing these three cases one wants to see the relationship between the interior and exterior space; between the dwelling and the setting and how these relationships became critical in shaping the form and value given to space. The objective of this section is to provide clarity of form based on values found in low cost housing and to explore designing methods and tools.

Professor Renee Chow's criteria for researching residential environments was a guide line for looking at these case studies. The points that were taken into consideration were that residential environments should have the potential to contain multiple arrangements of habitations. Housing should convey different meanings to different people and housing should be connected to a variety of levels of community. A range of territorial claim is necessary. There should be no "not claimed" space between transitions of "public" and "private" space. Housing should reflect the nature of the material and construction. Good housing should be capable of change and renewal.

San Martin Case Study

The premises of this section are to understand the community, to see the pros and cons of the three types of houses researched and study their potential solutions for housing the maquiladora workers.

This community is located about four kilometers southeast of the maquiladora area and the major industrial zone of Reynosa. The San Martin community has been growing now for about ten years and covers an area of some 100 hectares. The settlement of the community began between 1983 and 1984, at a time when other low income settlements were created by the invasion of land originally owned by the municipal government.
The recent legalization of this community has provided the squatters with clear titles and basic services that have improved their housing conditions and encouraged home owners to make their own improvements.

Systems of title registration have been kept simple and cheap. As the community grows and changes, land is now being bought, sold and transferred from the hands of the municipal government to the hands of people that have been renting or have just arrived in the area. The government choose to play an active role in this process, by limiting the amount of land individuals could hold, by trying to guide growth, legalizing the provision of services that use to be dragged illegally from other communities, and by implementing building codes.

In this case, as in many others through out Reynosa, the state government has been helping to urbanize and bring basic services to these areas under a federal program established three years ago. The program is meant to provide the community with the construction materials needed if the community can organize a community working force.

The population of San Martin is primarily made up of very low to low income groups that live in one room rental vecindades, three to four room apartments and single or duplex housing. The population is primarily people who work at the maquiladoras in the industrial zone, although there are also construction workers with no fixed workplace, textile laborers and auto-workers.

The number and sizes of these communities has been growing faster in the past two years due to the large number of immigrants from the rural areas that come searching for work in the maquiladora industry. The usual cycle that people go through when arriving to these communities, is to first rent a room in a vecindad or low income tenement and share basic services with six to seven other families until they are able to buy a small lot within the same vicinity and move out.

Within this community four different housing units have been documented to help as support and background for the development of the housing prototype and understand the context for which this prototype is intended. To help us answer this criteria a series of studies have been done to understand the different levels that need to be addressed and to be able to identify and document those characteristics that distinguish these types of dwellings.
First Case: The Vecindades

The vecindades (low income tenements) are the dwellings units where most people initially settle. These vecindades are made up of several rooms ranging from sixteen to thirty-two square meters which are rented out to young families or to young men sharing accommodations. These rental units share bathroom services and water services.

In this drawing we can see the four different locations of the housing units researched in this community. They are all particularly different in their spacial solutions and they are at various building stages. Dwelling one is the vecindad, were one room rentals house a small young family with two to three children or a group of young men that work at the maquiladoras. Lot two houses a number of various activities, there are two housing units, four rental rooms and one shop. The lot in the corner, lot number three has two housing units of brick and mortar and the a unit made out of wood and cardboard which is rented out.

Right: The four lots that were studied in San Martin.
Lot number four, has a one room unit made out of cardboard and wood. Most of the landowners start out occupying these lots in one room cardboard and wood units.

Dimensional Capacity

The lots in this community, need to be seen as a private cul-de-sac housing community. Each lot in this community usually houses from two to eleven families. One of the major characteristics of the construction in these lots is that they have the capacity to grow from being only one room family units to either eleven one room units or three or more larger apartments.

The rental unit is a room of approximately 18 square meters, and is divided inside with wood, cardboard or furniture partitions to make spacial distinctions. The room will be transformed partially everyday to be a kitchen, a bedroom or a living and eating area. Each activity area contains the minimal dimensions necessary to house a particular activity and each area also depends on each others spacial capacity to function. The food preparation area is only two square meters, the living and dining area is six square meters, and the sleeping area is ten square meters.

*Right: Three housing units researched in San Martin.*
Unit number two within lot number two is even smaller and has fewer area for these three basic activities. What is interesting to see is that even though the room is empty and no specific use has been preassigned to the areas of the room, all tenants have arranged their activity areas in the same way. The food preparation area is the closest to the door, the living and eating area are in-between the sleeping and food preparation areas, with the sleeping area in the corner farthest away from the entrance in almost every dwelling.

Figurative Capacity

"The potential of form (and it's space) to receive impressions."

These activity areas rely on each other to exist, to be able to move around each of these activities one has to invade the other spaces activity. The judgement of these particular solutions as being right or wrong is not the intent, but to draw characteristics of these spaces and to view their solutions can useful to understanding the minimum standard, of spacial dimensions that these particular communities need.

Right: Vecindad one room rentals in San Martin.
Territorial Claim

"Area that can be claimed by a certain party."

The public spaces of the vecindad, the corridor and the open upper space at the entrance, seem to have an informal space claim arrangement that exists among the tenants. Each unit claims the area in the corridor in front of their own room and uses it to grow plants, store cleaning utensils and keep their water supply.

Bathroom services are claimed by the tenants from the three or four units closest to them. The open space found at the entrance seems to be communal, where kids will play and women will chat or watch what is happening on the street. The access door to the vecindad during the day is always open.

Right: Infrastructure such as water is found in the open corridor.
Infrastructure

"Primary systems that are least likely to change over time."

Services such as water supply and gas are found in the communal area, the corridor. The corridor holds all of the infrastructure of the vecindad. This particular layout can be seen as a small scale *cul-de-sac*. It also serves as a ventilation and light source for each room.

Material Assemblage

"Contribution of the construction to the definition of form."

The methods of construction of these dwellings are made up of reinforced concrete structure and brick walls.

Change and Renewal

"Physical formal changes that have been made by the inhabitants of the space."

*Right: Two room housing unit in San Martin under construction.*
Once the vecindades have reached their building capacity there are few spacial changes. But to build these vecindades to their maximum capacity it usually takes the land lord six to ten years.

This particular housing solution has worked well because it has provided cheap and fast rental housing for the people that arrive in this area looking for employment. People will live in these units for three to four years until they have the possibility to buy a small lot next to this community or in a similar squatter settlement and move out to a cardboard and wood one room dwelling of their own. This investment will sometimes be a ten to fifteen year project as the family grows or as they see the possibility of renting to newcomers.

**Second Case: Two Family Unit**

In the case of this lot, two four room units have been built, four single rooms for rent, and a shop have been built. The two family units are found on the second floor of the construction. The first level houses the shop, two rooms for rent and the access to the central courtyard were the other two rooms for rent are and the two family units are located.

*Right: Elevation and plan of second unit (San Martin).*
Dimensional Capacity

There are three different types of activities in this case: rental rooms, a shop, and small apartments. Each activity area in this lot has more than the minimal dimension necessary to house the activities needed. This is true if we take the vecindades units dimensions as the minimal standards for housing.

The access and circulation in this unit are not independent from each other. Even though the dimensional capacity of the rooms is larger, the circulation continues to overlap and invade the activity areas of the different rooms. The interior spaces of these units are solved in the same way as in the rental rooms of the vecindades.

Figurative Capacity

"The potential of a form (and its space) to receive impressions."

The potential of this lot has accommodated three different types of activities. The spacial layout in these units defines the specific use for each space. There is no flexibility for changing the use or size of the space.

Right: Second unit figurative capacity study (San Martin).
At the room level; form, space and dimensional capacity are not possible to change. In the contrary, at the building level, there is great flexibility, the rental one room units have been used for storage, small home workshops, and even as a extra separate room for the four room units. The central patio is used for all type of activities.

At the site level, the way services and infrastructure work within the cul-de-sac, is similar to the way the individual lots work. The layout of the building on the lot works as a small cul-de-sac where the infrastructure and services reach communal areas and then the owners take it to their building.

Territorial Claim

In this particular case the access corridor, the patio and the roof tops, are the communal spaces of this housing complex. None of these area have been claimed, except for the roof tops which are used to hang laundry to dry. In the central patio, the spaces right next to the individual entrances are the areas that is claimed by each unit. Dwellers will use these spaces in the same manner as they were used in the vecindades. The centra courtyard plays an important role within these small communities, they are used as
as an extension of their living space, where they socialize, play and work. Not in this case, but in the vecindad courtyard was also used as a garage at night. These open courtyard space are used for a great variety of activities and are the spaces that hold most of the activities and services of these housing units.

Infrastructure

"Primary systems that are the least likely to change over time."

Structural elements are the least likely systems to change over time in communities like these. Most elements that are built of a permanent type do not change. The elements that are possible to change are those structures that are built of wood or cardboard.

Material Assemblage

"Contribution of the construction to the definition of the form."

They are several building methods with in these units which that characterize the spaces and buildings of the community. In this case the building comes right up to the border of the street. The streets in these cul-de-sac are bordered by walls, one and two stories high.
They are usually part of the house that differentiates private from public property. Another element that plays an important part in the layout of the building is the courtyard which serves as an open space for ventilation. The built elements in these lots are usually constructed in a symmetrical fashion.

Changes and Renewal

Identify the physical, formal changes that have been made.

The physical changes that occur in these units are done through a series of progressive stages. There is never a finished product, the construction activity of most of these houses last a long time. It is noticeable when certain element were built due to either the use of different materials or the structure elements of the building.

Third Case: Three Family Unit

Dimensional Capacity

This lot has not been built to its maximum potential. To the front of the lot, two single family units have been built and at the back of the lot the initial cardboard and wooden house still stands. This
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is the stage in between that most of these lots go through, as they build a permanent structure. The old cardboard and wooden structures are still up. The maximum capacity of the space is utilized even though the construction of the building is not of a permanent type. Each activity area within this unit contains more than the minimum dimensions necessary to house these activities. Even though the bedrooms are still not completely independent, the spaces in this unit have a better layout and the circulation does not interrupt or invade the activities of the other spaces.

Figurative Capacity

"The potential of a form to receive impressions."

The occupants of these houses have left the form of the building untouched without making too many changes in its structure. In the last bedroom they have canceled a door by placing the bed next to it. At the site level change will occur probably in the same way as they have occurred in the other units. Most probable the back part of the plot will be enclosed into a central open courtyard space, to be shared by both dwellings.
Territorial Claim

The open space that is next to the brick dwelling and the open space next to the wood and cardboard unit, because of the level differences, are claimed as an extension of each individual unit. In general, open spaces that have a certain degree of privacy and proximity to a specific unit are claimed by them.

Material Assemblage

The form definition of this unit is identified by its reinforced concrete structure, and brick walls. The walls of the building extend to the border of the lot and the street. The building process of these units will start by claiming their territory and defining their boundaries. There seems to be the idea of building rooms along the border of the lot.

Fourth Case Study: One Room Unit

Inclusion of this case study is to show the initial steps taken by new lot owners. This particular unit is immediately adjacent to the San Martin Community in an area that has been recently legalized by the Municipality and will depend on the San Martin Urban Services. The San Martin community started, by people squatting in these
types of dwellings. When the legalization of the land in which they squatted took place, they invested in more permanent means of construction. This housing process has become a long and extensive project.

**Government Low-Cost Housing Case Study**

This community was built about eight years ago for the electrical workers. This community is located at the edge of the industrial zone and is about the same size of the San Martin community. The people that got one of these units has been with the electric company for an extended period of time. Most of the people that live here have a fifteen year mortgage with the electric company.

The streets are made up of small clusters of homes that are arranged around a square open space that is owned by the six houses that surround it. This space has parking spaces assigned for each individual unit, and the owner has the possibility to do with it as he pleases.

Most of these clusters, have gone through great changes, none look the same. Some of the housing units have changed radically to express the owners values. Not many of them have changed to expand, for their capacity to grow is limited. The only possibility that they have to
expand is to build a third floor and the stair space has not been designed to be continued. The capacity to expand in these types of units, should not be only to build more rooms, but to expand the ones that already exist.

There are several characteristics within this community that should be considered. There is only one type of unit and that does not allow the possibility to house any other type of activity in these spaces. The possibility to house different income levels of the same social group does not exist. The communal spaces do not seem to be taken care of well and the construction done is individual claiming their share and in most cases without consent of the neighbors.

The problems of these community designs is that they have been approached and built as a finished unit that do not need any changes. The design also expects the community to correspond in harmony and agree with every decision that is made and in most cases it does not work that way.
Dimensional Capacity

Each activity area in these particular units contains more than the minimum dimensions necessary to house their individual activities, except for the living area and the kitchen. The dimensions of the kitchen are limited and some of the kitchen appliances such as the refrigerator usually are placed in the eating area. The access into all of the different areas of activity are quite independent. It helps the dimensional capacity of the living and eating area to have the main entrance of the house in the middle of these two because when it is not being used as circulation space it helps the space to seem bigger.

Figurative Capacity

The potential of these dwelling to receive impressions from their inhabitants is limiting. No elements within the unit have a multivalent association or use. Spaces have been clearly defined for a specific use. At the site level the capacity for these activities to expand or express themselves is only on the facade, where some people have completely done away with the formal expression of their dwellings to build completely new ones.
Territorial Claim

The clear definition of public space, semi-public and private space is jeopardized when the community owed semi-public spaces in each cul-de-sac are privates. This privateisation is achieved by fencing of gardens or actual extensions of buildings into these areas. The lack of privately owned space for expansion "the capacity of the lot" is non existent and this jeopardizes the semi-public community space and activities. Such spaces can not be maintained by regulation alone. The need for capacity for expansion and growth must be inclined in the design of the individual private lots, and not of the community spaces.

Infrastructure

The primary systems that are least likely to change is the structure of the unit, and the over all infrastructure. The concrete structure has always remained in all of the changes that these units have gone through. The formal environment that the community was conceived with is not their anymore. The communal spaces that where meant to open up to the street have been blocked and protected with gates and walls.

Within the unit all of the spaces have remained the same, except for the kitchen which in cases...
has expanded and taken over the patio spaces.

Material Assemblage

The reinforced concrete structure of the unit is the one element that remains unchanged and visual. But a good percentage of the facade that where originally made out of glazed apparent brick have been taken out to place bigger windows and some have been covered with tiles and stone to express a different character.

Change and Renewal

In these units a great deal of remodelling activity has happened. Almost every single unit now looks completely different from the other. The changes that have occurred in these units are visible expressing a certain character destroying the previous facade.
Private Funding Project Case Study

This third case study is a project that is meant to be built for the maquiladora workers of a steel company. This is the project that I will be reviewing and comparing its program to develop a prototype unit based on the other two case studies already seen. This prototype unit design is meant to be more flexible and meet the needs of the people that will live in them. This third case study will help show the context of low-income housing projects for these types of communities and the solutions that are meant to be implemented to try alleviate the housing problem for a small group of the maquiladora workers.

It is apparent that the design solutions of this project presents the same problems as the government project that has been reviewed in the prior case study. I do not intend to review this project in the same way as we have studied the prior cases, because I find the spacial solutions to be similar to the government project. Their capacity to grow, to change and their flexibility are all aspects that have not been taken into consideration in the development of this project. For example these four units due to their arrangement within the lot, their is no possibility for them to be able to expand, and their parking space is the only open space that they own.

Their are three aspects that I want to consider by studying these units. The first one is the way these units are built, their infrastructure, such as water and electricity. Secondly, the way these units form blocks and communities, and the aspects that were taken into consideration while forming these communities. Thirdly the way these units age and become personalized by their dwellers.

One of the positive aspects of this model is its fast method of construction, a large number of them can be built due to the use of prefabricated materials such as the steel structure frame. The counter-side of this construction method is that due to the use of the prefabricated materials the labor needs to be specialized.

The amount of housing stock of these units is partly available in a short period of time. The way these units are lined up, and conform at the planning level, leave may aspect unanswered. Such projects have not taken into consideration the way these units should be capable of change and renewal, of forming community public spaces, of being able to grow or have flexibility in which the space is used and leave room for personal decisions of habitation.
Another aspect that is not taken into consideration is that the parking space that belongs to each unit has the characteristic of being public open space that belongs to the community. The problem with spaces that have this characteristic is that the owner will claiming this space either by building on it or by putting a fence around it. In the second case study we saw that people stared building on these spaces and claiming this property without any concern of how it would affect the total community or even their immediate neighbor. Aspect such as security, of being able to claiming your property, and being able to use it to make the unit more flexible were not considered in the design of these units.

These communities original conception tend to decay within time. Self-expression in the community and housing unit changes the character of the place. Expansions made on the unit and community do not fit with what the community was meant to be. This is the problem of trying to design a low-income housing unit that leaves no room for change or self expression, were the unit is considered to be a finished product.
SUMMARY

These case studies are three different approaches that have been taken in trying to answer the problem of housing the poor. Most of these answers have tended to come up with extremist solutions. From projects of site and service to low-income housing units and communities that have tried to answered every single detail in the planning and growth of the community.

There is a need for being able to understand and answer the needs the communities need. The way a building changes and its inhabitants personalize them and transform them according to their customs and needs as families.

Housing projects need to comprehend the range of necessities that a community will have in time. Projects must provide sufficient capacity for change and most important of all they must be flexible and let the inhabitant make its own decisions on how they want to live.

Housing units must provide the essentials for its inhabitants to make use of the units right away. Architectural design decision, not made or avoided are decisions that will be made later on by the dwellers. And decisions made to avoid the real problems will fail.

This housing prototype is intended to answer the problems that most of these types of units have. By drawing solutions and characteristics from the different case studies that have researched.

Two newcomer’s houses next to railroad tracks.
The review of these three different cases have place the prototype design in a real context and see the elements that influence a particular case. By comparing and contrasting these three different cases I have been able to draw characteristics from each other that are important in the design of a unit for the maquiladora workers.

From the squatter settlement case study the elements that were taken into consideration for the design process of the prototype. The attitude that the San Martin community, have towards housing as a continuous project. For them housing it is an ongoing process that changes with respect to their needs, extended family growth and income level. It is a unit that is built progressively through an extended period of time.

The priority in the different stages of building are characteristic of consideration in the design process. These self-help unit first, will define the territory with respect to the public space of the street. The first permanent structure that they build and inhabit usually define the boundaries of the lot with the street.. This territorial definition is usually done by building the first room of the unit at an the edge of the lot that boarders the street.

Most of the time, by defining their territory with habitable space, the central space of the lot serves as a service patio that is shared among the housing units that occupy it. The community activity that exist in these lots takes place in these area. A larger sense of community activity occurs at the street level were the cul-de-sac serves as a play area for children and interaction with other neighbors that do not live in your small housing community.

The rental units case study helped to place in perspective the minimal needs that these families have. The need of three different spaces, a cooking area, a living and eating area and a sleeping area are the three basic services that are needed by a unit in this community to be habitable.

In the other two housing examples that we saw within the community of San Martin these three spaces even though they where bigger in area, their conformation with respect to the layout of the rooms was the same as in the one room rental units. The cooking space in general was always located next to the main entrance of the unit, and the sleeping area was further away from the entrance.
From the second case studied, the governmental project concepts were drawn with respect to, community spaces, the flexibility that is needed for the unit to expand and the distinction that needs to exist among private, semiprivate and public spaces. With respect to community space there are two levels of interaction that the design of communities like these should have, one at the street level and the second one at the cul-de-sac level.

One of the characteristics that was visible through this case study was that the cul-de-sac level of community interaction was interrupted due to the need for space and limited capacity to grow. This happened because of several reasons, first the need of available space for units to expand; secondly semi-public and public spaces were not distinguished.

If compared the community activity of the governmental project case study, with the San Martin settlement case study, the control of community space is better managed in the San Martin community. This is because the cul-de-sac in the squatter settlement is not owned by any individual and it serves several purposes at a collective community scale.
The open spaces that exist in each individual lot houses community interaction among two or three housing units. The limited possibility to expand and the complete destruction that exist in the Governmental housing unit are two other aspects that I have considered in the design of the prototype. Leaving available space to expand not only in room numbers but in room dimensions and in providing flexibility for the use of space.

The third case study, the privately financed housing unit, has been viewed throughout this design process as the project that will set certain limitations. The building process of this project has been kept as a constraint, to make this design process pragmatic. The more in depth exploration of the spacial capacities of the prototype has been possible do to the use of the frame of reference from this project and other elements that were drawn from the two previous cases. Another characteristic that has been drawn from this project is that infrastructure services need to be as close as possible to keep cost down.

*Right: Structure of Proposed Prototype*
Design

Prior to the three case studies and throughout the research and elaboration of this document the design process of the prototype evolved. Before the field study visit a prototype was designed through a sketch problem. In this sketch problem the consideration was to create a space that could be flexible, that would meet the needs of similar communities such as the ones that have been researched. With the basic knowledge of knowing these communities, I speculated on the problem searching for a design solution that could be expandable in every direction and where the structure could provide a guide to the development of the unit.

The drawing on this page is one of the initial sketched that I saw as a possibility of being a model for this prototype unit. The concepts behind these initial considerations was to design a unit able to expand not only in number of rooms but that the dimensional capacity of the rooms could grow. It was important to providing a unit that could provide a frame work that would not change and that would guide future growth. As a prototype housing unit the design had to be flexible enough to be built on any type of ground.

There are many considerations in a housing unit of this type that need to be considered to make
a design like this one work. This sketch problem help me to understand and see several miss conceptions in attempting to answer the problem. One of them is that a low-income housing unit that had no sense of community is a step in the wrong direction. It was noted that the characteristics that I was seeking in a unit of this type were important only if the unit designed could exist within a low-income community such as the ones researched.

All of the housing units within these types of communities most of the times, do not have the capacity to grow every single side of the property to expand. The limitation of space caused by the cost of land and infrastructure, make most of these units grow vertically. Most prior low-income housing projects for these communities have failed to answer important questions, such as these, either by ignoring their existence or providing ignorant solutions. Designs like these need to address these questions, and seek for logical answers in such communities.

Primarily answers to the limitation of space needs to be addressed. Necessary minimal demension for initial habitation need to be provided to house the different activities, but at the same time allowing growth latter on, as the family expands or as their income level rises.
The criteria used to evaluate and research the different case studies has been continued to evaluate the design and evolution of the prototype proposed.

The units potential form and space needs to be flexible enough to receive the impressions of its own dweller or the community and land that is going to be developed. Space and form needs to be habilitated at the beginning stages of the unit and needs to be functioning as soon as possible. Another aspect that has been taken into consideration is that territorial space claiming is an important factor within these communities that needs to be defined. The claiming and definition of territory has to be clear, and space that is left for community activities needs to be defined by several specific necessary uses, such as means of communication or major infrastructure services, to prevent invasion.

Each units dependability on one another should only be for infrastructure services or community activities, but independent property ownership is crucial. This independence will provide the unit with the possibility to expand without interrupting or harming the other units potential.

Right: community layout studies.
The first limitation that the steel maquiladora project set upon the prototype design, was the size of the plot that the four units of this previous design is meant to occupy. By dividing the plot in four equal plot sizes one is able to see the amount of land that can be used to design a unit of this type.

By using the same area in plot size one is also taking into consideration the cost of major infrastructure which will not need to be prolonged. The division of the lot in four equal separate lots will provide the flexibility and independence that each unit needs to expand and exist independently, and at the same time depend on the communities infrastructure and services.

The design of the prototype unit within this topology of lot is also restricted by the dimensions of the steel frame structure that will also be used. This is to place how far the design in a real perspective can be stretched within certain limitations. The structure will also serve as a framework that will help to guide future building in each unit. Every element in the prototype unit should be intended to have a multivalent use and association, both for the unit and the community.

Right: Studies on the units flexibility within the land typography.
These drawings show the different studies done on the different type of community relationships that the unit should have with the community and planning process as a whole. Before any housing design can be done it needs to be tested to see how it works within the community. How the relationship of open and closed space work and speculate on the ways that a unit might grow without invading public open spaces.

The proposed design has taken into consideration the main spaces that a unit like this one should have. It has been a logical process where the prior studies helped to explore the different design alternatives. It was important to view these studies as a design prototype that has evolved from a logical design process based on a real problem and has taken a logical process.

The design proposed is made up of the three different necessary spaces that a low-income housing unit needs: a service area, a living area, and a sleeping area. These three spaces are all independent from each other and are linked by a circulation hall. The design of the unit is meant to provide the dweller with the option of expanding without affecting the other spaces activities.

*Territorial Claim preliminary design studies.*
Built elements define territorial claim

Massing
Each space in the unit has more than one specific use for the dweller and the community as a whole. Each built space also help in defining property lines among neighbors and the cul-de-sac and also help to define the use of the different open spaces formed.

The three main built spaces define the territorial claim of each lot as opposed to the circulation hall which helps to define the use of the different open that exist between the unit and its neighbor. All of these spaces are all meant to work structurally independent from each other. This is to be able to make the unit capable of being on any topology.

Both the structural frame work and the partition walls help to define the lot as the help conform the different dwelling spaces. Each built element especially the circulations hall were designed to be able to expand without intervening with the activities of the other spaces.

Right: Preliminary design studies.
Designing Housing in the Third World

This is the design prototype proposed. The prototype takes into account all of those aspects that I have considered in the design research and proposal.
Prototype Expansion Possibilities

Living/Dining Area

Bedroom

Patio

Entry Hall

Kitchen

Patio
Designing Housing in the Third World

Conclusions

One has seen the different ways low-income housing in Third World nations have adopted various solutions depending on the region and type of development program that take place. As we have seen these programs go under many names and take many forms and shapes.

At first they all seem to be tackling the problem in a particularly different and ambitious ways, but the common problem that they all deal with makes their solutions quite similar. The initial investigation of the case studies and the design of the prototype help me to place in perspective and within context the immediate problems that Third World low-income housing.

Housing of the poor is the result of the lack of opportunity for progress that exist in the Third World; economic and intellectual progress are the two main reasons among many. This will be a subject that will continue to be discussed until some of these problems find a cooperative solution. I see that this problem will continue to exist and penetrate the culture of many generations in society till we make a conscious effort to alleviate the problem. This is not due to the failure of government and their regulatory systems, or of NGOs or international development funding institutions but it is a problem of society as a whole.

The exhaustion, frustration and aggression among those most affected is a responsibility of all. While the poorest groups are strongly penalized in their search for shelter and source of income, major acting parts of society ignore the consequences that this brings to health aspects, safety, social security, pollution and the disposal of wastes and their effect on the environment.

Such failures contribute much to the large mismatch between the number of urban citizens and the possibilities open to find adequate jobs, homes and public services. Cities in any part of the globe have become centres where vast number of people compete for basic services. The Third World may be less urbanized than the First and Second World but it has much larger urban problems. If the present trend continues, we can expect to find tens of millions more households living in undesirable settlements or in very poor quality and overcrowded rented accommodations owed by highly exploitative landlords, ironically often former squatters.
As we have seen in the case studies researched, government actions and institutions are not only the dominant influence in the conditions under which most urban citizens live but they also strongly shape future society, culture, and the environment. If for any housing proposal the absence of investigation of the community's needs will guarantee failure. A failure today in answering basic logical solutions hinders the rest of the cycle in the development process.

Third World housing solutions are developing some common characteristics: demographic pressures, class structures, insufficient public investment, and are generating two parallel urban histories among Third World cities due to the lack of opportunity that is not only apparent in their dualities but in their housing units also. The lack of capacity to expand to and develop and "exploit" the land to its maximum capacity. The lack of opportunity that exist among these low-income settlements to be considered in the near future as low-middle or even middle-income neighborhoods.

The design of this prototype is an attempt to provide a logical solution to this problem, hopefully by the final housing solution or by the methodology taken to come up with this solution.

However, the search for new approaches and changes in direction are important for any problem to be viewed as an opportunity and not as a mere stagnated answer. It has constantly strikes me how paradoxical the subject of housing can be, the extent of the problem and the with that such a simple problem can grasp. At the same time I have tried to extract unifying or comparable answers to the theme.

The improvement of the human habitats require the involvement at all stages of the "users" of those habitants, of the "institution" involved in development aspects and of society as a whole even just by consciously understanding and finding logical solutions to large scale simple problems.

Of course, this is insufficient to solve more fundamental problems, as was already stressed. Of course it demands complementary aspects to protect progress and strategic development but the initial process can help to initiate more effective and appropriate responses to contemporary housing problems in the Third World.
Massing; growth capacity.
DESIGN Bibliography

Books


56


Articles

CONTEXT Bibliography

Books


Zarembka, Arlene. *The Urban Housing Crisis.*

Articles


“CHS Studies Community Development Needs in the Colonias of Mexico”.
*CHF News brief* (Oct. 6, 1990) p.19


ILLUSTRATION CREDITS

Note:

All illustrations used in this document have been drawn and photographed by the author.