



**Title: Process Attributes and Characteristics of Emergent Vernacular Architecture in Tijuana Slums**

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**Abstract:**

Examinations presented in this paper attempt to reveal the prominent process attributes and characteristics of emergent vernacular architecture in Tijuana slums. Specific details of the structures, how they are constructed, by whom they are constructed, and materials used will give an insight into the functionality, creative inspirations, and building techniques that are unique to Tijuana, a city that receives over 40% of people who were deported from the United States back to Mexico. The vernacular architecture found in Tijuana is idiosyncratic in its orientation as the main international crossing between the United States and Mexico, and the most heavily trafficked border region in the world.

Emergent folk architectures such as those found in slum regions in Kibera, Nairobi, Kenya, and Dharavi, Mumbai, India can traditionally be characterised by illegal, impermanent structures that lack municipal resources such as emergency services, water, electricity, and gas, and defined or mapped road systems. In Tijuana, these trends persist, but are also mitigated by the establishment of communication between government, developers, and the people who create slum dwellings.

These dwellings are also uniquely transformative in nature because of the symbiotic relationship between residents and refuse which is widely available and utilized in construction. In fact, the critical defining parameters are set by the acts of disposal and the consumer cycle which are heavily dominated by maquiladoras in Mexico and consumption trends in the United States. Currently, transformative processes include a move towards beautification through looking to nature and art as inspiration, and non-profit organizations are working towards improving processes that will allow more structures to be built using recycled tires, bottles, and other refuse.

This paper will chronicle the process of construction and fluidity of domicile utilized by people who craft and enhance buildings in the slums of Tijuana.

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**Key words:** vernacular architecture, border spaces, found materials, refuse symbiotics, immigration, deportation, slums, folk construction

**Main References:**

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[2] Kingston WM. Heath, "*Vernacular Architecture and Regional Design*", Elsevier, Oxford, UK, 2009

# Process Attributes and Characteristics of Emergent Vernacular Architecture in Tijuana Slums

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## Abstract

Examinations presented in this paper attempt to reveal the prominent process attributes and characteristics of emergent vernacular architecture in Tijuana slums. Specific details of the structures, how they are constructed, by whom they are constructed, and materials used will give an insight into the functionality, creative inspirations, and building techniques that are unique to Tijuana, a city that receives over 40% of people who were deported from the United States back to Mexico. The vernacular architecture found in Tijuana is idiosyncratic in its orientation as the main international crossing between the United States and Mexico, and the most heavily trafficked border region in the world.

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## Introduction

Vernacular architecture in Tijuana, Baja California, Mexico is created through the specific defining parameters of historical influences, border politics, migration and deportation trends, natural and human altered landscape, the consumer cycle, *maquiadoras* and labor trends, and the flow of materials in the Tijuana River and tributary canyons in the area. These defining parameters are traditional in expressing the area's cultural attributes through their architecture and can be conveyed through specific grammars or rule sets that are also traditional and unique. According to Chomsky's ideas of generative grammars, "Using a small number of rules, an infinite set of expressions can be created. With a larger set, it is possible to create rich and varied expressions reflecting both complex structures and subtle nuances - in natural language, music, and the visual arts" [1]. In fact, this grammar can also be applied to architecture, specifically generative architecture, and this serves as an

excellent example of how vernacular architecture also adheres to a set of rules and steps in the process of creation, without the use of software implementations. The slum areas of Tijuana may appear chaotic and while the dwellings therein are considered impermanent, they follow a vernacular algorithm of long tradition for the output of functional house designs which often do become permanent and render a complexity that can be reproduced by following a specific set of procedures. Currently, the variables in these traditional procedures are being transformed to incorporate more safety, sustainability, and greater harmony with nature. Given the fusion of traditional and new parameters, Tijuana can be seen as a model for the ways in which these transformative processes can inform future constructions.

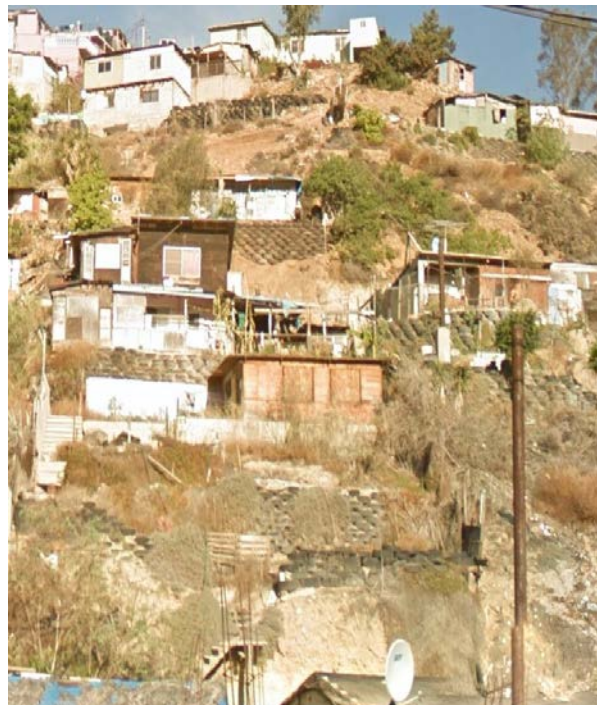
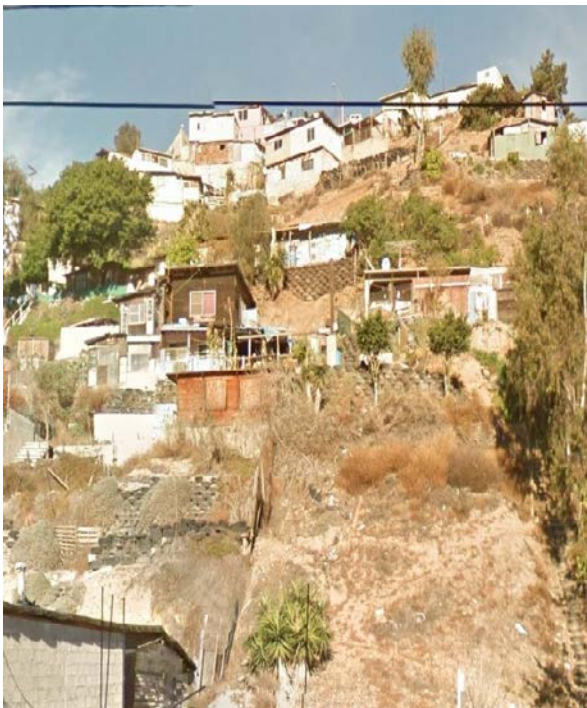
## Historical Background

The complex history between the United States and Mexico is one of the unique factors that helps define the possibilities of vernacular architecture in Tijuana. This border region has historically been a space of contestation and conflict. After the *Treaty of Peace, Friendship, Limits and Settlement* between the United States of America and the Mexican Republic was signed in 1848, the southern border of the United States was established and many people of Mexican descent were encouraged to join the United States and become citizens or to move to the Mexico that was now south of the California border. While many of these people chose to become citizens, the conflicts and cultural indignation that came with having to relocate or give up ties to their native nation began and have yet to abate. Currently, over a thousand people attempt to cross the border from Mexico into the United States every day, and of those who are caught by the U.S. Border Patrol, roughly 40% are deported back to Mexico through Tijuana whether they were from Tijuana or not. This trend creates a large population of displaced individuals in need of emergency housing as they usually have little to no money to get back home.

People who do live in more impoverished areas of Tijuana often work in *maquiladoras*, which are large factories that produce and assemble goods for foreign companies seeking cheap labor. This arrangement has been in effect since the 1960s, but in 1994, after the implementation of NAFTA (North American Free Trade Agreement), more companies moved their factories to Mexico to profit from the benefits of cheaper labor and new tariff-free import/export capabilities. Given the surplus of refuse and lack of financial means, emergent vernacular architecture in Tijuana is characterized by the use of recycled material. In addition to traditional tire, pallet, and scrap metal use, as more and more people started to consider refuse as potential building materials, the more diverse the materials became and now include deconstructed tires, plastic bottles filled with trash, garage doors, and even small houses that are already built but that are unwanted and considered waste north of the border. From a generative perspective, the pattern produced is dependent upon the shapes, sizes, and other physical characteristics of the refuse items. These new building blocks have the potential to produce many, more stable outcomes, and as building techniques progress, artistic expressions begin to emerge. These artistic expressions are also creations of refuse re-purposing and have the unique ability to express the complex culture of the area.

## Tires: The Foundational Element

People have been using scrap pneumatic tires as building material for over 50 years. In Tijuana, this trend is particularly common as over 20,000 scrap tires are deposited into the area from the United States every year. These scrap tires are sent from the U.S. to *llanteras* in Mexico, and at the end of their use on vehicles, they make their way into landfills and other outdoor areas such as fields, rivers, flood basins, and the ocean, and as such, the tires are a significant source of pollution. Fortunately, these tires also act as a useful building material. As Steven Wright of *4 Walls International* explained, building with tires is solving problems with problems; additionally, it costs 15 dollars to retrieve each scrap tire and put it into a landfill, so salvaging the tires and building with them is a much more efficient way of dealing with them [2]. Once the tires are salvaged, they become a crucial building block in the preservation of the integrity of many otherwise unstable hillsides. The below photos feature support walls that both prevent erosion and act as foundations for homes and other structures [3].



Geographically, much slum housing in Tijuana is located on hillsides that are susceptible to mudslides. The city is located amongst hills and canyons, and urban development has caused unnatural erosion resulting in landslides and silt deposits. Despite the danger of landslides, people still build their homes on these unstable hillsides, specifically in Los Laureles Canyon. In order to build on the otherwise unusable property of the hillsides in the canyon, builders level off shelves, usually a space of about 30-40 square feet. Houses will be built on these shelves, and to prevent further erosion from rain and landslides, tire walls are constructed. These walls are typically made from salvaged tires. Specifically, whole pneumatic tires are salvaged from dump sites and river basins. The tires are then placed side by side, filled with dirt, and then a second layer of tires is stacked on top of one another in a traditional running bond pattern, and then those tires are also filled with dirt. This pattern is repeated with a height ranging anywhere from 2 to 10 plus layers of tires. This method is the foundation of a majority of structures in Los Laureles Canyon despite the dangers that it presents to the residents. When the tires are filled with dirt and have no other solid





foundation, if it rains heavily, the dirt washes out and landslides still occur.

More modern techniques are safer and more permanent. These techniques present a reliable rule for generating a more consistent outcome in the generative process. One of the first and most important evolutions in using salvaged materials began when people started to engineer tire-based structures such that they would be resistant to landslides. As rain and sewage runoff is one of the biggest threats to structures built in Los Laureles Canyon, constructing stable walls to prevent major mudslides is crucial in saving lives and preserving structures. To use the tires as sustainable building blocks, they need to be considered as such. The tires offer characteristics that make them a more flexible building material if used in a diverse way. The tires can be stacked to varying heights, used as stairs, and deconstructed to create different shapes as well.

A tire wall is a feature of Border Fields State Park and exhibits the aesthetic potential of tire construction.



These walls utilize size 14 pneumatic tires filled with silt and stacked 4 high in a curved running bond pattern. They are decorated with cobblestones that have washed into the area and have been collected for construction. The silt and cobblestone are an effect of the unnatural run off of the area and left as they lay are a detriment to the native plant life and

natural erosion patterns.

In addition to using the tires as is, the deconstruction of tires can give them more versatility. One man, Oscar Romo, is at the forefront of a new technique in salvaged tire building that involves cutting the tires apart in order to reconstruct them. Using this technique, he has used up to 35,000 tires on one construction project. As one interviewer from *High Country News* explains, “Instead of leaving the tires intact and stacking them, Romo cuts out the sidewalls, leaving an O-shaped tread. He pinches and sews or staples the waist of the O together, forming a figure-eight. By hand, he then weaves or staples these eights into a long row — 88888888. He ties the leftover sidewalls to the top of the row. He lays the row of eights horizontally, so only one end is visible. Stacked up, the rows are much more dense and stable than stacks of intact tires” [4]. Using this method also allows builders to grow native plants in the dirt that is used to fill in the tires.

In traditional tire structure building which uses a running bond pattern, creating a solid bottom layer or foundation for the tires structures is crucial to their ability to resist damaging landslides. To solidly pack the tires with silt helps the bottom row to stay solid, but adding concrete or a layer of cardboard on the bottom adds extra stability, making the tire act as a solid anchor for the foundation. Additionally, the ground that is being built upon needs to be cleared of any debris. To create a solid foundation, the Earthship foundation recommends the following technique: “The first course of tires of any tire wall must be leveled and dug into undisturbed soil free of organic surface matter such as plants, tree roots or other biodegradable substances. The first course of tires must be as large in diameter or larger in diameter than any other tire in the wall. No tire may appear in a wall that is larger in diameter than the tires on the ground course of that wall. Tire walls over six courses high must have a ground course of tires #15 or larger exclusively. All tire walls must use staggered running bond coursing. Joints between tires on any given course must be aligned with the central area of all tires on courses above and below. No joint between tires on any given course may align with any joint on the courses above or below” [5]. Once the foundation has been set in place, tires must be arranged according to size. Pneumatic tires come in different sizes, usually fit a rim between 13” and 30”. This is a wide range of sizes, but tires fitting rims between 15” and 16” are the most common ones found as refuse. Regardless of the tires’ size, the important thing about building with salvaged tires in a running bond pattern that will create more stability for a structure that is higher than four tires tall, the bottom layer of tires needs to be made from the larger tires, and smaller tires will get stacked in subsequent rows. Given these parameters, the outcome of tire constructions are safer, more versatile, and more environmentally friendly than in previous years.

## **Bottles**

Thousands of plastic bottles are deposited in the Tijuana River Estuary each time the rains come. These bottles are used in Mexico and then improperly disposed of in the dry riverbeds. When it rains, the contents of the riverbeds are swept downstream and end up collecting in large quantities. Below is a photograph taken of one such deposit. This is a picture of plastic bottles and other trash that has washed in from Tijuana. The deposit of trash in this picture is 10-15 feet deep.





These bottles are collected and stuffed with other trash so that they become dense enough to not collapse and can then be used as bricks. There are several different types of bottles that are the most commonly found and used. Most 20 oz. bottles that are distributed by the *Coca-Cola* company and comparable beverage companies are 2.89" in diameter with a height of 8.95". Other common sizes are produced by the *Gatorade* company and are 2.87" in diameter and are 9.94" tall [6] In addition to the differences in volume, the opening of the bottles are different and this makes the technique and time used stuffing the trash into the bottles vary from size to size. 3D printing is one way to solve the issue of uniformity of bottle mouth openings. This creation makes stuffing time 50% more efficient [2]. Below is a picture of a bottle brick with the device that is now being 3D printed to help stuff bottles more efficiently and a fully stuffed bottle.



After the bottles have been packed with trash, they are placed in a repeating pattern to build

walls, benches, pillars, sign frames, and the like. Below are photos of the process.





These images present



some examples of the finished products of bottle construction.



## Implications for Cultural Expression Through Constructions

There is a clear parallel between the vernacular architecture patterns and the unique features of Tijuana culture and its relationship to the refuse of the United States. Tire structures are one of the most distinctive and defining features of the landscape in Tijuana, and the wall patterns have become a common expression of the functionality of this material



and the people's relationship with it, along with their ability to master this technique of building. According to Kingston Heath, "Regionally distinct patterns are the result of an innovative application or exploration of new technologies or materials brought into a region" [7]. Indeed, innovative applications of materials brought to Tijuana have contributed to the distinct building pattern and definition of space within the region. Spacemaking and ideas of home are at the heart of folk architecture and using materials which unnaturally litter the landscape to build homespaces gives creative agency to local builders and residents.

The concept of time, space, and history in Tijuana slums is more pronounced through these construction patterns as temporality and permanence themselves are visible in the landscape. According to Gaston Bachelard, "All really inhabited space bears the essence of the notion of home [...]the imagination functions in this direction whenever the human being has found the slightest shelter" [8]. Home and the feeling of permanence are placed upon the patterns no matter their materials original use or purpose because the imagination of the creator and the necessity of home space transforms individual objects into patterns that repeat and therefore exude this new image of home throughout the landscape. In fact, pattern implicitly means home as it takes the intent and skill of people to shape materials into livable structures. Bachelard continues, "Memories are motionless and the more securely they are fixed in space, the sounder they are" [8]. The relationship between memory and home are complex and depend a great deal on the origin of construction materials.

While new materials allow the occupants to imprint their dreams onto an empty canvas, refuse carries with it its own history, its own story, its own poetry. This historical identity is all temporal, shifting, in flux, and malleable for the builder to use as a hybrid of old and new to represent home. Bachelard explains the nature of home and dweller: "Whenever life seeks to shelter, cover or hide itself, the imagination sympathizes with the being that inhabits the protected space. The imagination experiences protection in all its nuances of security, from life in the most material of shells, to more subtle concealment through imagination of surfaces" [8]. In the imagination of the dweller, a pile of tires becomes a wall, a staircase, a garden. A pile of bottles becomes a living room, a window. In Tijuana, the most dominant input used to produce the recognizable patterns of home are the dwellers desires for home and an imagination into a future where refuse becomes the building blocks of community instead of the destruction of environments.

## Notes

With the exception of the first three photographs, all of the photographs in this paper were taken by B.T. Franklin.

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