Collective Spaces - A study in the conversion of storage to living spaces
in City of Industry, California

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ABSTRACT

A research and design study was instigated to rethink the phenomenon of storage in relation to contemporary living spheres. Although few historical traces of personal storage remain, the study of the evolution of commercial storage revealed a progression from spaces for hoarding goods to spaces for housing activities of production.

Zooming in on site, City of Industry, in Los Angeles, California, an island of warehouse typologies was found in the midst of diverse residential neighborhoods facing increasing housing pressures. Furthermore, mappings of “big box” warehouse spaces within Industry revealed inefficiencies in storage practices and the potential for remaking the City into a more porous oasis of living/working. It would not only be made more porous simply in terms of providing multi-use living spaces, but in terms of providing living accommodations for a range of constituents, ranging from laborers, students, to recent immigrants who have not yet assimilated to typical suburban single-detached housing. As a test case, one warehouse building exemplifying typical construction/use of Industry was examined in more detail and strategies of conversion from storage to living were illustrated.

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More than four thousand years ago, the idea of storing away surpluses of water and other agricultural products was critical to the success of the Egyptian civilization. In times of flooding in the Nile Delta region, water could be channeled to reservoirs that could be drawn upon in times of drought. Storage facilitated the regular supply of water and other natural resources.

With the rise of seafaring and trade, especially in Mediterranean ports like Venice in 1400 AD, storage grew to encompass more than an act of accumulation. Storing not only resources essential for survival, the warehouses at ports stored goods and luxuries that could be exchanged with others for profit. Storage became linked with transportation and moving of goods across distant regions.
By the time of Industrialization in the West, warehouses became centers of production. Machines were housed in them and people spent much of their working lives involved in manufacturing goods out of these types of spaces. One could argue that at this point in history, there grew a disjunction between spaces and users. Large span halls for housing machines were not necessarily the most friendly environments for people.

The drive to amass, produce, and exchange goods thru industrial efficiency produced many variants of storage containers, both static and mobile. Railroad companies often used warehouses at strategic locations to consolidate shipments of goods. To service large clients, rail cars would also be deployed as storage to compete against other modes of transportation.
After World War II, mechanization continued to transform the shape of warehouse spaces. Specifically, the development of the forklift and a standard pallet for packaging/shipping goods facilitated relocation of storage to non-urban areas. Land to develop warehouses was usually cheaper away from urban transportation hubs and the forklift lessened dependence on human labor.

The development of the highway system and the automobile in the U.S. contributed to the sprawl and suburbanization of commercial warehouses not unlike their effects on residential developments away from urban centers. Having been developed on unconstrained sites, warehouses usually have been designed in a fortress-like manner with a moat of parking lots and a small fraction of floor area devoted to offices. They have been constructed with utmost attention to the flow of goods, neglecting their impact on the scale of pedestrian movement.
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Ironically, the sprawl of residential and commercial programs converge in an urban condition in City of Industry, a city of warehouses thirty minutes east of Downtown Los Angeles. It is mostly a light industrial zone occupied by warehouses which store and/or produce goods. With an area of 14 square miles, its population numbers less than 1000. Cambridge, Massachusetts, occupies 6.5 square miles and has a population of over 100,000. Walnut, a city directly north of City of Industry, occupies 9 square miles and has a population of about 30,000. These density comparisons suggest that a rise in housing demand in the region could certainly be accommodated by Industry.

In terms of location, it is also well suited to bring together adjacent communities. It straddles a major freeway, the 60 East/West Pomona Freeway and is at the intersection of diverse suburban communities. La Puente, to the northwest, is predominantly middle/lower class and claimed by Hispanics. Walnut and Rowland Heights, to the North and South, is
heavily populated by recent immigrants from China, Taiwan, and Korea. The range in social classes amongst the latter group of immigrants are also diverse, ranging from unskilled laborers to educated. Interspersed and cutting across these groups/classes are students attracted to local colleges, no less than three of which are located within 20 miles of the area. They include California State Polytechnic University, Pomona, Mt. San Antonio Community College, and Whittier College.

Macro Site Analysis-
As shown in the drawing, the grain of City of Industry is more coarse than surrounding communities. Relatively large city blocks and parcels characterize the area. Presently, big box retailers line the southern edge of Industry, providing the only public interaction with surrounding neighborhoods. Two rail networks traverse thru Industry as well.
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So what to do? One might say the only way to remake City of Industry into a more habitable and accessible place is by razing some big box warehouses and inserting smaller buildings of mixed use. It would be nothing short of the tabula rasa strategies we have been so fond of in previous eras. A finer look at what goes beyond existing warehouse buildings in Industry reveals more interesting possibilities. In one warehouse, seen in the image to the left, one finds a house of worship. In other operations, one finds regulation-sized basketball courts and bar lounges constructed to entertain employees and clients. If these warehouses, as a building type, can already accommodate such a range of uses, why would one want to start over, other than to achieve aesthetic appearance befitting typical residential neighborhoods?

Towards “ugly” preservation...

Analyzing more warehouse facilities, one gleansthe importance of repetitive modules in their construction and functions. In the following mappings, a public storage facility, Costco, printing company, and a shoe company are examined. All are operations which take place within parcel boundaries and also behind the concrete walls of Industry warehouses. In the Costco and public storage compositions, one can discern more disciplined use of modules, probably due in part to their being international operations which have nearly perfected efficient use of space for storage. In the Costco case, for example, the standard pallet size that is linked with the forklift determines the aisle length and width, not pedestrian friendliness, despite the operation being visited by shoppers with carts.
DNA's of warehouse operations

store (public storage facility)

store & display/sell (costco)

produce & store (printing company)

design & display/sell & store (shoe company)
Public storage spaces as variations on a single module

store

1/128' = 1'

generative module 5'x5'

1/32' = 1'
store & display/sell

Costco spaces as variations on a single module, the pallet

generative module 48"x40"
In smaller scale operations, such as the shoe company above, there is less efficiency in terms of storage. Although the pallet module is evident, it does not determine the entire layout inside the warehouse. There are offices to accommodate, which is less likely to be the case in bigger operations which have specialized corporate headquarters for offices and distribution centers solely for storage, for instance.

But it is precisely these types of warehouses which begin to offer an opportunity to speculate about a more dynamic City of Industry. Inefficiency in the context of commercial logistics and a trend towards just-in-time delivery business models give way to efficiency when one speculates about conversion to alternative use. Interviews with
the operation’s executives revealed that the company was actually outgrowing this space in terms of both storage and office space. In terms of fiscal efficiency, it would also make more sense in the long-term to keep most of the storage in cheaper real estate markets overseas.⁶

Looking beyond the physical form of the operation, the schedule of activities which occur in the course of the company’s business operations were also taken into account. The important discovery that was made was that there were also gaps in the usage of the site that could accommodate alternative non-commercial use. And although the official work schedule is 9 am to 5 pm, much work occurs beyond the span in a domestic setting. For instance, since many contacts are overseas in a different time zone, teleconferencing often takes place at night after regular work hours.
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Having established an evolution of storage building typologies which has increasingly neglected human scale despite accommodating more human activities, one can argue that the commercially “inefficient” remnants in City of Industry are ripe for experimentation. Through experimentation with a conversion of a warehouse exhibiting typical characteristics of construction and space, one can begin to re-envision the context of Industry.

**site selection/application**

- **Building/Site Traits**
  - 370’ x 150’ = 55,500 sf Lot
  - 21,500 sf Building
  - 6,500 sf Landscaping
  - 40% Coverage
  - 5,000 sf Offices
  - 50 Parking spaces

*Street perspective facing north at night*

Within a light industrial zone, most buildings are "hidden" and not visible from major access routes. Their large lot size also contributes to this lack of visibility.

Therefore, the "typical" condition is un-ideally located and private.

If one can introduce change on such a condition, then one can easily apply the proposition to ideal conditions with respect to location and visibility.
As a first pass, the scale of the warehouse is related to typical housing parcels in suburbs and in cities. At one extreme, the suburban plot, one family occupies one parcel and separates itself thru landscaping. At the other extreme, in a Manhattan city block, one residence is stacked atop another and contiguous with adjacent buildings. The warehouse site offers much outdoor space due to building coverage rules, but at the same time can achieve substantially more density than adjacent suburban developments even if it partially emulates the Manhattan model.
Micro Site Analysis-
As shown in the drawing, the building only has four internal columns supporting a primary line of beams. This primary line of beams divides the building into two approximately 50-foot halves. Perpendicular to these are secondary joists (approximately 50-foot long each) spaced every eight feet. The walls are made up of tilt-up concrete panels which are approximately 24' wide x 31.5' high each.
Study models/sketches of different scales
Conversion studies-
Taking the 8-foot joist spacing as the starting module, variations were studied that could accommodate living units. Negative spaces which had largely been neglected on the site were made into positive spaces of circulation, courtyards, and stacked programs. In the model to the right, the 24'x20' modules were arranged to provide circulation and sun exposure to each unit. The circulation was modeled in solid.
Programmatic & Site studies-
To give interior units exposure to light, additional skylights were punched in the roof, again falling within the 8-foot roof joist spacings. Existing skylights are 4'x8' and perpendicular with respect to the central aisle of new skylights.

The two schemes to the left are identical in terms of conversions within existing walls. In the above left scheme, units are maximized. In the lower left scheme, the units preserve more of the existing open spaces and reshape them into a series of courtyards. Being in Los Angeles, where density like that of Manhattan is undesirable, the scheme still achieves more density in relation to neighboring suburban developments.

Phasing studies (right)-
A phased approach of intervention acknowledges the different lifespans within the structure and functions of the building. It allows the building to remain operational as it is being transformed. As the company’s inventory decreases due to consolidation of goods elsewhere, the office staff can still be functional and even take advantage of new communal amenities. For the developer, there is less risk involved in phasing because he/she can gauge the market and release units as they are demanded.
Phasing concepts-
As a new type of housing in the region that is to encourage interaction and shared resources, especially appealing to students and laborers, each phase of the project would be anchored by a communal amenity.
Final illustrations of vision for conversion and activation...
Phasing Diagram - Accumulation of "goods"

Upper Level

Lower Level

Existing uses - distribution warehouse and offices

Phase I uses - distribution warehouse and offices

1. Communal laundry
2. Cooking space
3. Living spaces
Phase II uses - distribution warehouse and offices + communal laundromat, cooking space, and living spaces + living spaces

Phase III uses - distribution warehouse and offices + communal laundromat, cooking space, and living spaces + living spaces, courtyard spaces, and gym + (6) living spaces, and living spaces, and living spaces.
Above- Perspective showing second level units along south wall and balcony connection to second level courtyard.

Right- Perspective showing internal central court and adjoining living spaces, gym
Right- Sectional perspective showing double height units with double exposure as well as larger communal living unit adjacent to internal central court.

Left- Sectional perspective showing internal courtyard locations and external balcony/walkway.
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Since a central premise of the thesis involved exploiting existing standards, whether they be big box warehouses or structural modules, research into logistics pertaining to cargo handling methods were also explored. After all, it is quite amazing how despite the variety of goods that are exchanged globally, they all are tailored to fit into standard-sized containers, which not coincidentally also do not exceed the width of highway lanes they must ultimately traverse be towed by trucks. Even humans, one can argue, are fitted into jumbo jets which initially was intended to carry cargo, and not people.

Containers transport solids as well as liquids. They can be rigid or collapsible. They are handled with super-sized forklifts which can pick and stack containers.
Standard container variations

- open-top
- collapsible
- fridge
- liquid/gas
- hangers
Air transporters
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Macro Site Proposal-
The building conversion should not be seen as an "one off." If imagined as the first of several transformations within the context of Industry, then porosity and exchange with neighboring populations becomes more convincing. New streets are introduced to improve circulation and a railyard takes on commuter transport functions.
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