WHEN THE COWS COME HOME
POST POST-INDUSTRIAL URBAN AGRICULTURE

ARCHIVES

BY MARISSA CHENG
BACHELOR OF SCIENCE [2005], MASTER OF CITY PLANNING [2007] MASSACHUSETTS INSTITUTE OF TECHNOLOGY

SUBMITTED TO THE DEPARTMENT OF ARCHITECTURE IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARCHITECTURE

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ABSTRACT

Over the past few decades, the industrialization of food has become increasingly influenced by the consolidation of its controlling corporations. This consolidation has isolated meat processing facilities from small farmers, favoring corporations who have built enormous processing facilities to match their demand. Given that the consumption of beef has leveled out in the past few decades, the environmental costs of producing enough beef to meet demand continue to rise. Factory farming transforms huge tracts of land into wastelands of polluted land, and cultivates animals in unsanitary conditions. The centralization of major farming, packing, and processing facilities has left more distant, more environmentally conscious farmers to struggle with the economics of profit margins.

This thesis proposes is a new model of industrial facility that can transition with changes in the industry as it moves towards a co-op model from an industrial model. Its urban location pits private and public against each other in conditions that force them to negotiate a truce.

THESIS SUPERVISOR ALEXANDER D'HOOGHE
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CONTENTS

ON THE AUTHENTICITY OF FOOD

Today we are exhorted to know the name of our farmer, to eat local, to eat organic, to reconnect to our food. All of these things are touted to make our food more **authentic**. But what makes food authentic? Does an emotional connection to the source of our food really make us feel better about eating it? No – it is a false veneer for the guilt of those who can afford "authentic," organically grown food. The honesty and the authenticity of food come not from the quality of the ingredients, but what we **do** with those ingredients. The emotional connection that we have to food comes from who made it for you, who you are making it for, who you are sharing it with. The importance of that emotional connection is that it is, at its core, a social connection.

We all want our food to be more nutritious, more environmentally responsible. In the current climate that defines "real" food to be that which is produced by a named, identifiable farmer, it is socially unacceptable not to know that name. But what if some of us don't care to know the name of the farmer who milks the cow who produces the butter that we bought at the supermarket? What if we eschew trips to the local farmers' market for trips to the local chain supermarket? Take, for example, someone who takes anonymous supermarket produce and transforms it into sustenance that reinforces social connections between members of a family. Is it fair to fault this person for valuing family before being able to identify their produce farmer? No. Does buying a food item come with an implicit link to the farmer who produced it? No. What is important is what you do with the food you buy - knowing your farmer's name is merely a bourgeois conceit, another way to claim moral superiority. What is important is that you can afford to buy food, because the reason why we buy food is for sustenance, physical and emotional. Is it ethical to assault people with guilt when they are merely attempting to buy food within a budget? Public shame may be an effective strategy, but it is not a humane strategy; you can't eat social status.

This project is a testament to that belief – that the production of food is allowed to be impersonal, a completely functional process. Food may come with emotional baggage, but that baggage is related to how we consume it, not how it is produced.

AMERICAN BEEF

We may no longer consume beef in more quantities than any other kind of meat, but it holds a unique place in American culture. Besides our obsession with hamburgers and hot dogs, beef plays a pivotal role in American staples of life, from today's backyard barbecue and steakhouse, to the Sunday pot roast of the 1950s. We may eat more chicken than beef these days, but we eat it blindly: we choose beef when we eat out, beef on special occasions. Beef is our aspirational meat. We take pride in our steaks, hamburgers, and barbecue.

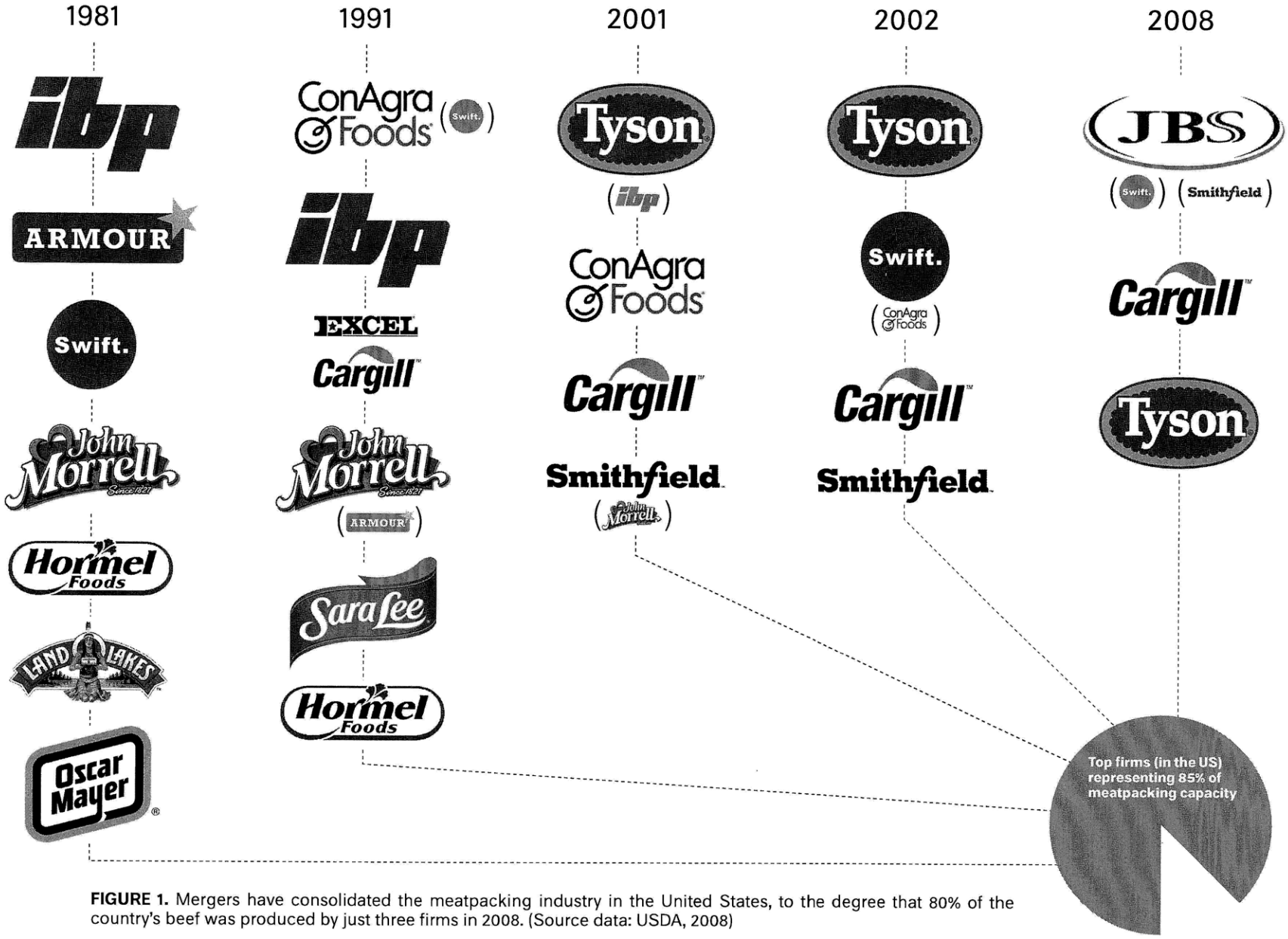


FIGURE 1. Mergers have consolidated the meatpacking industry in the United States, to the degree that 80% of the country's beef was produced by just three firms in 2008. (Source data: USDA, 2008)

FIGURE 2. Over the past century and a half, the territory occupied by the production of beef has spread out and consolidated into five states in the Midwest. (Source data: Walsh, 1982; USDA, 2008.)

In the early twentieth century, five meatpacking companies controlled the price of beef: Armour, Swift, Morris, Wilson, and Cudahy. These companies, dubbed the Beef Trust, controlled 55 percent of the market at the height of their influence (Schlosser, 137). The threat of a federal antitrust trial in 1920 forced the Beef Trust to disband and break up their monopoly in production, processing, and retailing operations. Fifty years later, the top seven meatpacking companies controlled 21 percent of the market (Schlosser, 137).

However, with the deregulation enacted during the Reagan administration, the industrialization of food again became increasingly influenced by the consolidation of its controlling corporations. By 1981, 85 percent of the market was controlled by seven meatpacking companies. Multi-billion dollar mergers and acquisitions shrank this number to four companies in 2001, far surpassing the consolidation enjoyed by the Beef Trust. Consolidation has progressed to the point that, after a century and a half, the largest meatpacking corporation in the American market is no longer American. In 2008, when Brazilian meatpacking giant JBS Friboi acquired both Swift and Smithfield - rendering it the biggest meatpacker in the US, and in the world.

This consolidation has played out not only in the decreasing nutritious value of our food, but also in the consolidation of meatpacking and feedlot operations in the American Midwest. Consolidation has isolated meat processing facilities from smaller producers, favoring corporations who have built enormous processing facilities to match their demand. In the competitive marketplace, large corporations gain the economic edge, with the volume and profits to be able to run their own meatpacking operations.

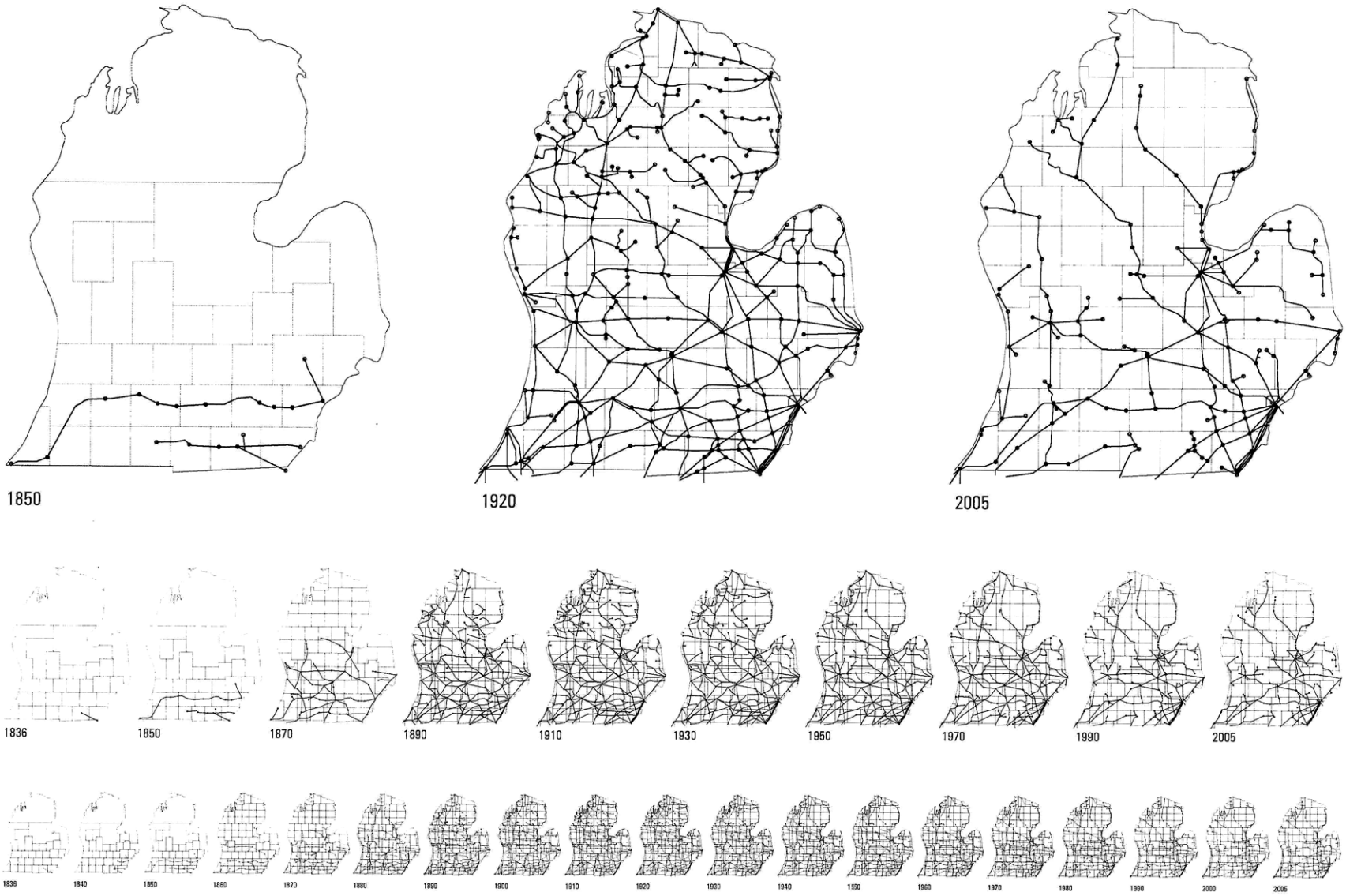


FIGURE 3. The spread of railroads across the state of Michigan peaked in the late 1800s, moving northwards from major hubs in Detroit and Lansing. As Detroit grew in economic strength throughout the first half of the twentieth century, its periurban railroad network became increasingly important for the transfer of goods from factory to factory, and from factory to retailers out of state. (Source data: Michigan Railroads)

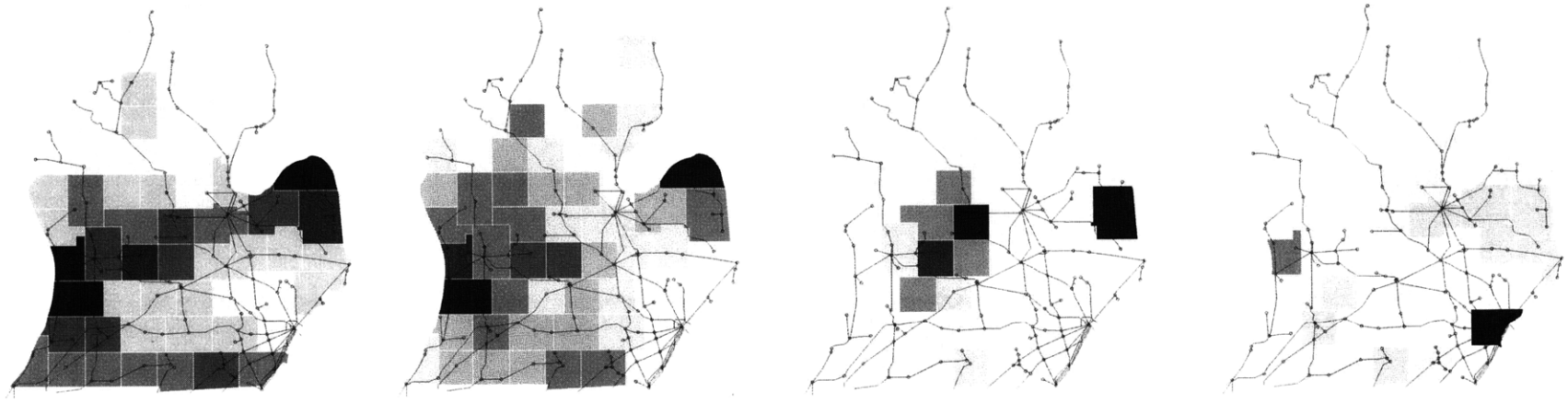


FIGURE 4. Besides its automobile industry, Michigan has a strong agricultural economy. The southwestern and eastern regions of the state are the most fertile and productive agriculturally. The agricultural industry has adapted to other industries over time, moving farther north and west to accommodate the territorial needs of the automobile industry. Allegan County, located in the thumb of the state, is the state's largest producer of cattle, with nearly $250 million of cattle in 2008. (Source data: Michigan Department of Agriculture, 2008)

What of those smaller producers, then? By providing processing facilities that are more accessible to them, they can benefit economically, and the region in which they operate benefits by corollary. Meatpacking, however, is a singular industrial building type in the public's aversion to it. Instead of relegating the processing facility to the country, this thesis looks towards a future pattern of development in which agricultural land can infiltrate residential and industrial areas that are facing foreclosures and economic hardship. The location of a processing facility in a city provides an economic boost, which plays out architecturally through the conflict between public and private. In serving multiple small producers, the facility can maintain the output of a corporation, while presenting a model for a more responsible kind of industrial facility.

Focusing on those small producers, the facility is located in Warren, Michigan. Warren is south of Allegan County, home to the bulk of the state's $2.3 billion cattle industry. While agricultural production is spread across the bottom half of the state, cattle production is concentrated in Allegan County; however, most processing facilities are located south of Detroit in Wayne County. A processing facility in Warren, between Allegan County and Detroit, reduces the distance that cattle have to travel, thus increasing the quality of the final product, in addition to propping up the flagging Warren economy. Utilization of the rail lines that run through the state allows for easy transfers of goods.

At the peri-urban scale, the processing facility offers a strategy for creating regional centers in which urban consumption areas

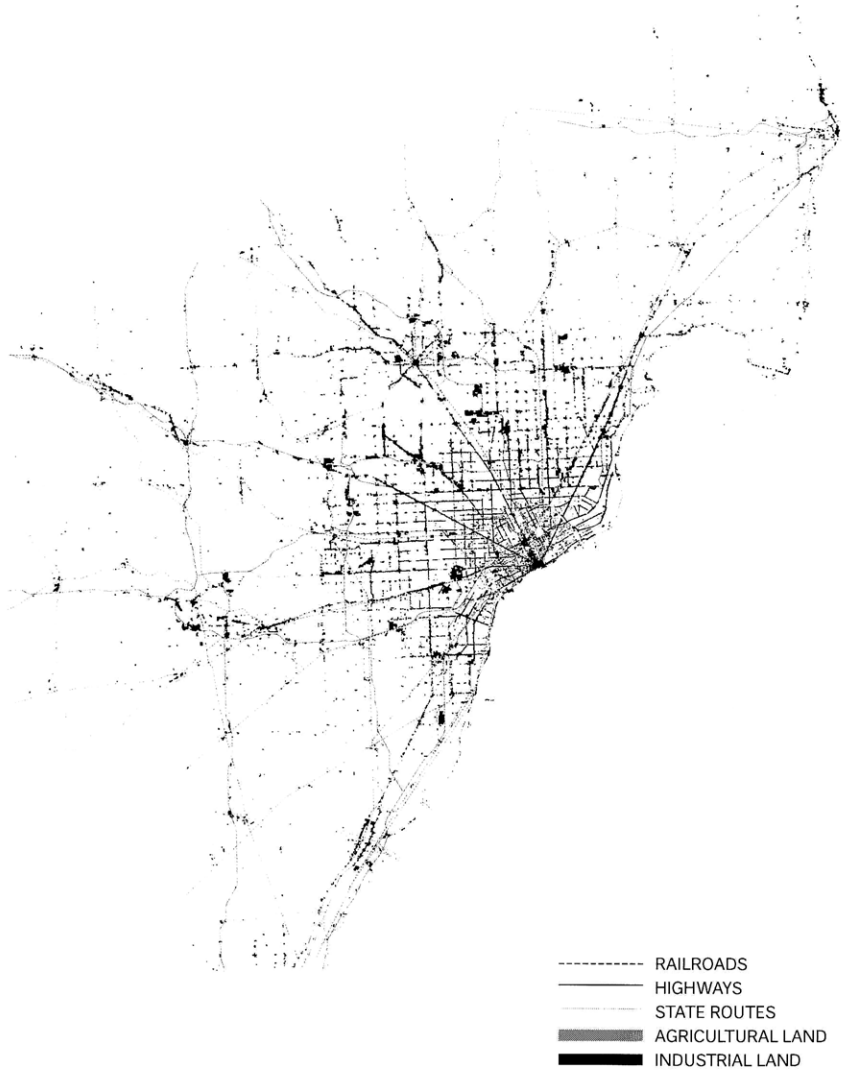


FIGURE 5A. Agricultural land has been pushed to the periphery of the Detroit metropolitan region, marginalized by the higher real estate value of residential, retail, and industrial land. (Data source: SEMCOG, 2000.)

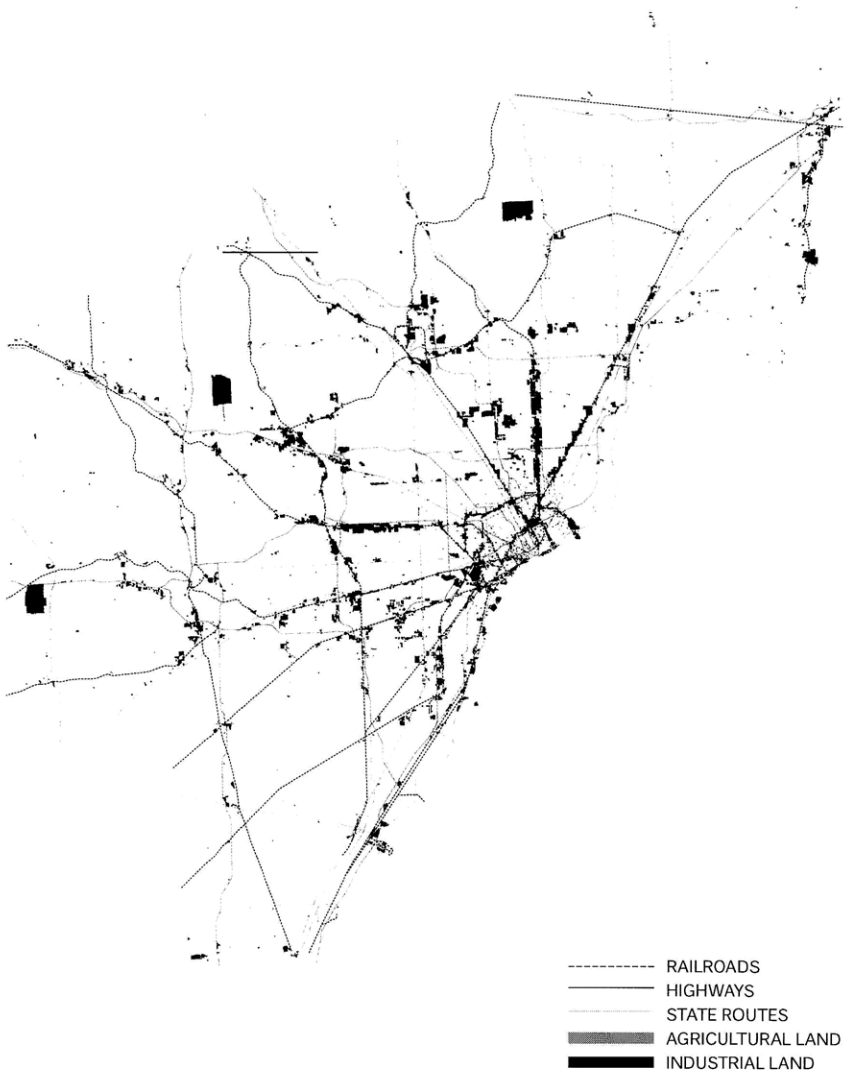


FIGURE 5B. Agricultural land has been pushed to the periphery of the Detroit metropolitan region, marginalized by the higher real estate value of residential, retail, and industrial land. (Data source: SEMCOG, 2000.)

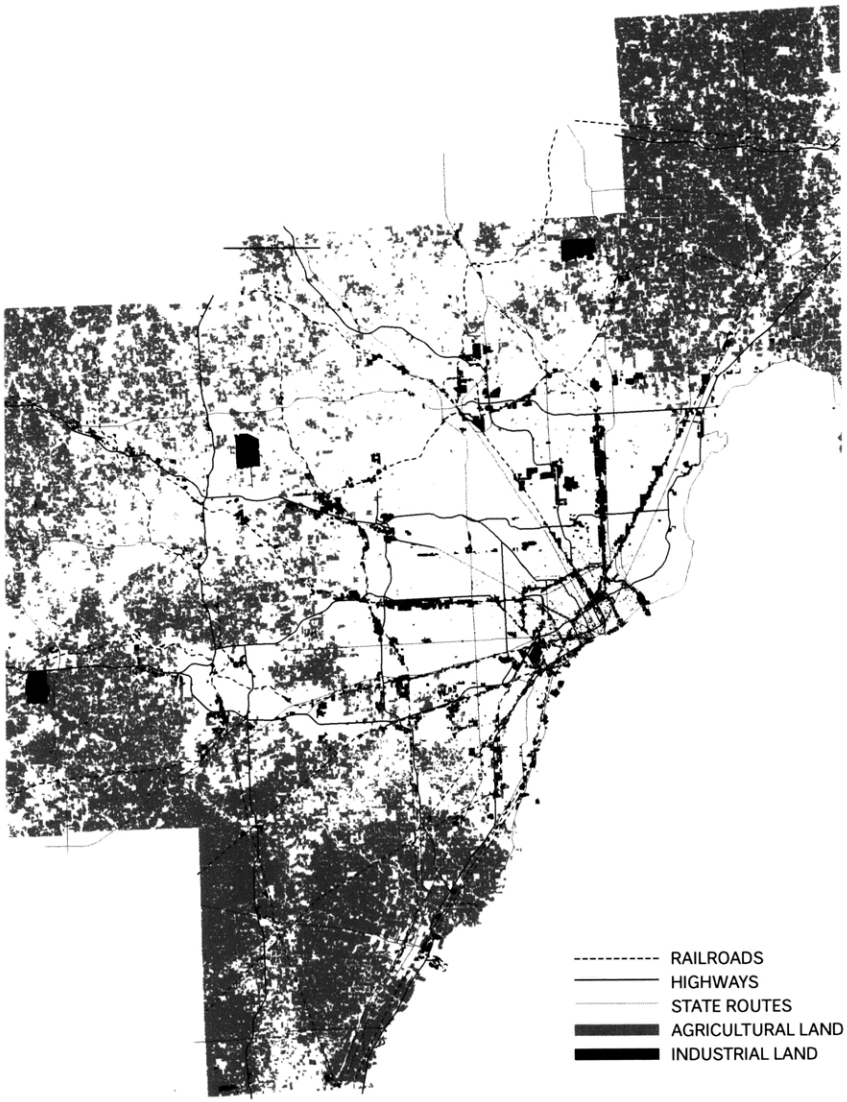


FIGURE 5C. Agricultural land has been pushed to the periphery of the Detroit metropolitan region, marginalized by the higher real estate value of residential, retail, and industrial land. (Source data: SEMCOG, 2000.)

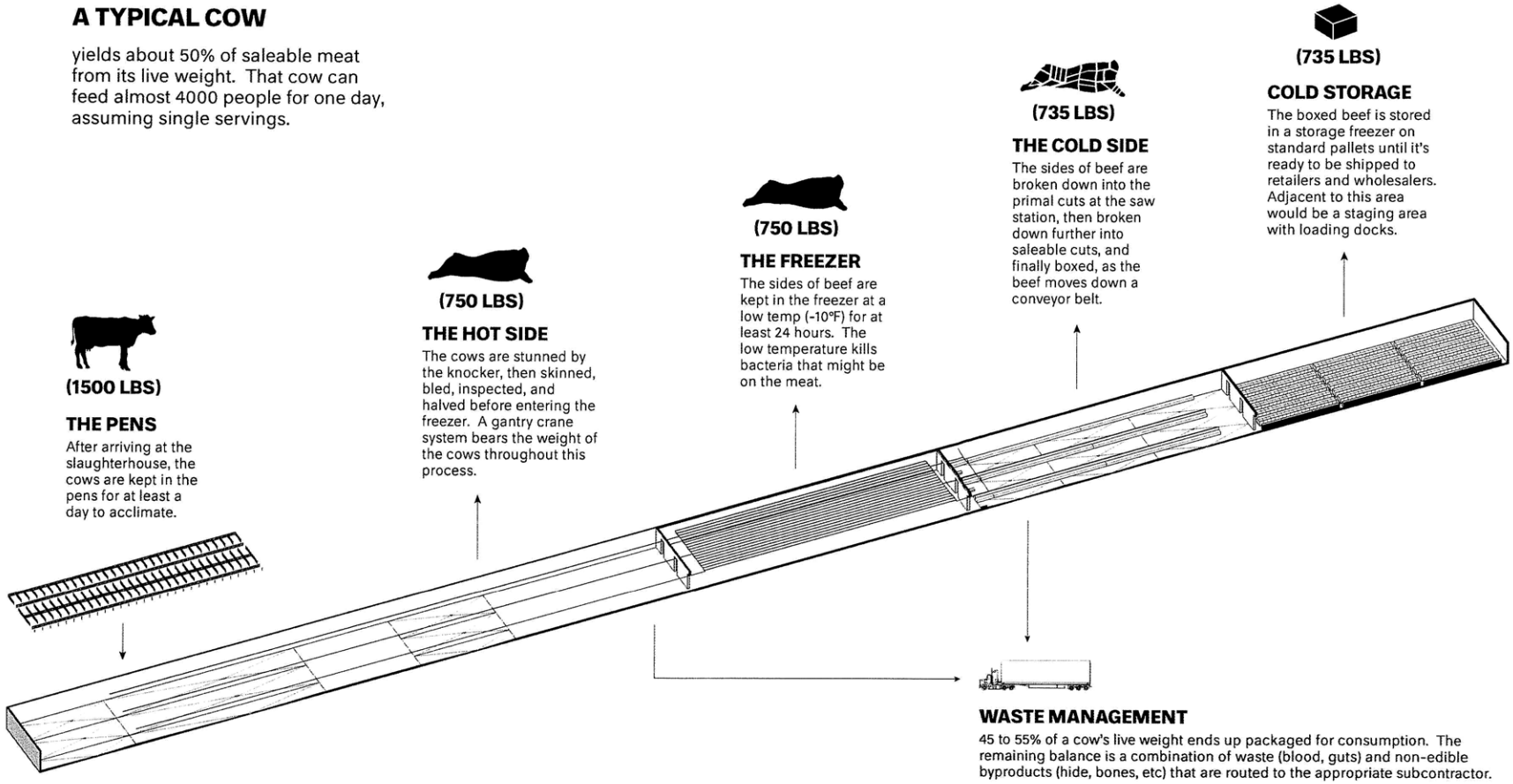
can be infiltrated by agricultural and industrial productive areas. Industrial land and the development of the railroad network are co-dependent, while commercial land and the highway network are similarly co-dependent (see diagrams at left). However, these symbiotic relationships have pushed agricultural land out of the metropolitan region, relegating it to a position of little power and influence. The environmental and economic potential of agricultural land presents a case for returning it to the metropolitan region, allowing it to recolonize cities via foreclosed lots and transportation networks.

Facing economic decline, the Detroit metropolitan region needs new industries to sustain growth in the future. The region can prepare for this growth by providing the proper infrastructure for agricultural industries. While the land can always be reclaimed for the growing of agricultural products, processing facilities are manmade infrastructure. Access to these facilities, in proximity to production sites, is of the utmost importance to preserve the quality of the product. For Warren, as a city, the confluence of its freight capacity and a meat processing facility offers a way out of the automobile industry, towards the diversification of its economy.

Economic conditions are not isolated, playing out only on paper. The consequences of economic decline are rife throughout our daily life, from unemployment to desolation in the built environment. Preparing for economic growth can, by corollary, be triggered by changes to the built environment. This processing facility for Warren presents not just a single project, but a proposal for a new way in which industry and the public can coexist in an urban environment. The industrial component of this facility is tied into the city's agricultural economic future, while the public component is tied into the city's civic future.

A TYPICAL COW

yields about 50% of saleable meat from its live weight. That cow can feed almost 4000 people for one day, assuming single servings.



(1500 LBS)

THE PENS

After arriving at the slaughterhouse, the cows are kept in the pens for at least a day to acclimate.

(750 LBS)

THE HOT SIDE

The cows are stunned by the knocker, then skinned, bled, inspected, and halved before entering the freezer. A gantry crane system bears the weight of the cows throughout this process.

(750 LBS)

THE FREEZER

The sides of beef are kept in the freezer at a low temp (-10°F) for at least 24 hours. The low temperature kills bacteria that might be on the meat.

(735 LBS)

THE COLD SIDE

The sides of beef are broken down into the primal cuts at the saw station, then broken down further into saleable cuts, and finally boxed, as the beef moves down a conveyor belt.

(735 LBS)

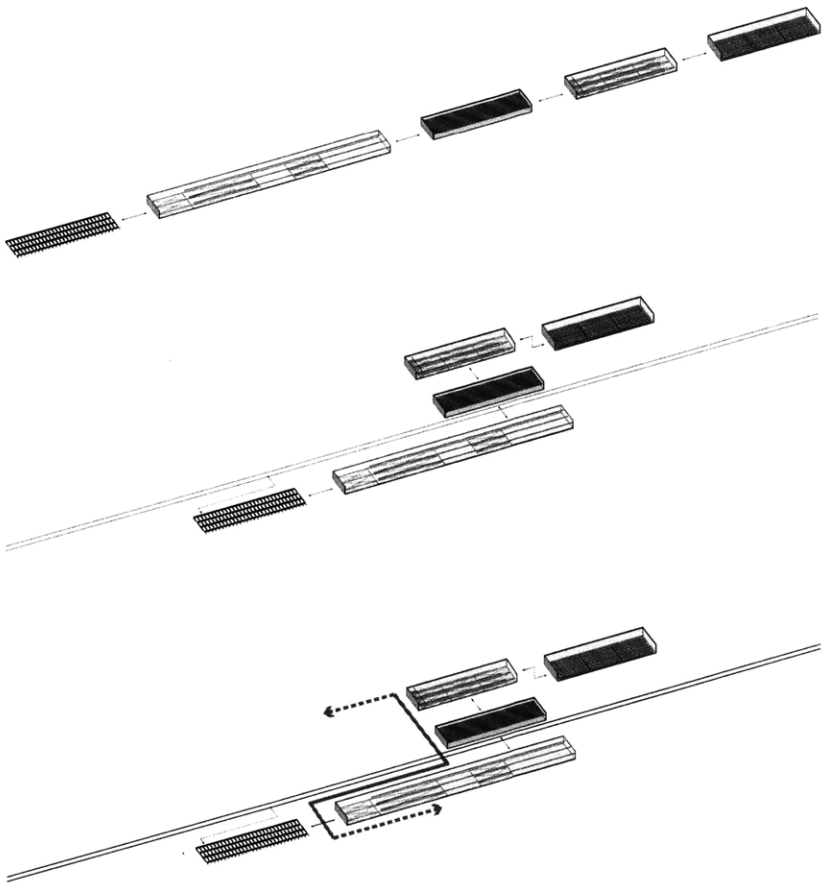
COLD STORAGE

The boxed beef is stored in a storage freezer on standard pallets until it's ready to be shipped to retailers and wholesalers. Adjacent to this area would be a staging area with loading docks.

WASTE MANAGEMENT

45 to 55% of a cow's live weight ends up packaged for consumption. The remaining balance is a combination of waste (blood, guts) and non-edible byproducts (hide, bones, etc) that are routed to the appropriate subcontractor.

THE DISASSEMBLY LINE



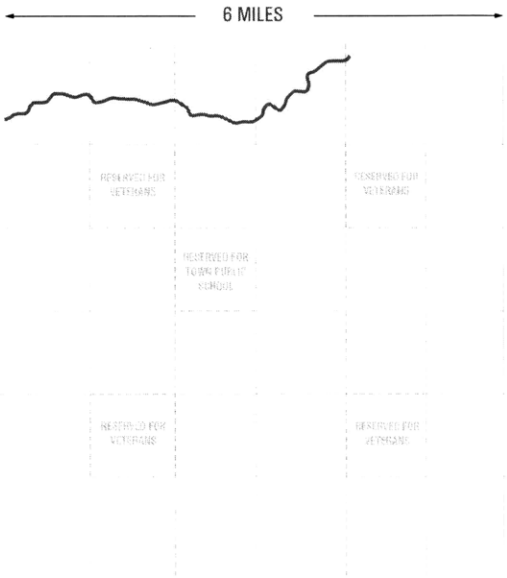
The slaughter of animals, dubbed "the disassembly line," has come a long way in efficiency over the past century and a half. In the 1950s, it was so smoothly choreographed along an assembly lines that Henry Ford visited a number of stockyards before designing his automobile assembly lines. The basic process of slaughtering animals (diagrammed at left) has not changed much in the past fifty years, although new technologies and machines have streamlined the temporal element of the assembly line.

The assembly line provides architectural potential; if it is designed for efficiency, is there any benefit to introducing an inefficiency into the line? The short answer is yes. By pulling apart the pieces of the assembly line, which, with respect to meatpacking, is meticulously defined physically, it becomes possible to insert disparate programmatic elements into the assembly line. In the case of this thesis, the line is pulled apart so a public path can be inserted into the building; the structural facade mediates the interaction between these public and private programs.

As the assembly line is applied to its site along the railroad tracks, from which cattle will be supplied to the facility, it deforms to the physical requirements of trains along the tracks. The beginning of the assembly line is anchored on one side of the tracks, while the end of the line is anchored on the other side of the tracks. The bridging of the building over the tracks also provides a crossing for the public path. The public path meanders around the pieces of the assembly line, with a large public open space that overlooks the railroad tracks.

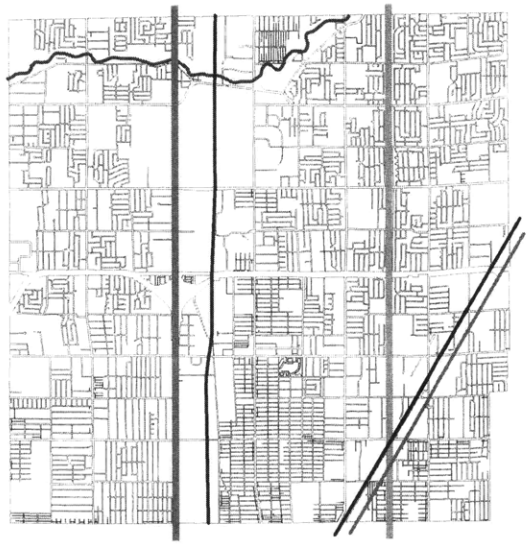
View of railroad corridor and Groesbeck Highway

WARREN, MI



LAND ORDINANCE OF 1785

1880 : THE RAILROAD ERA

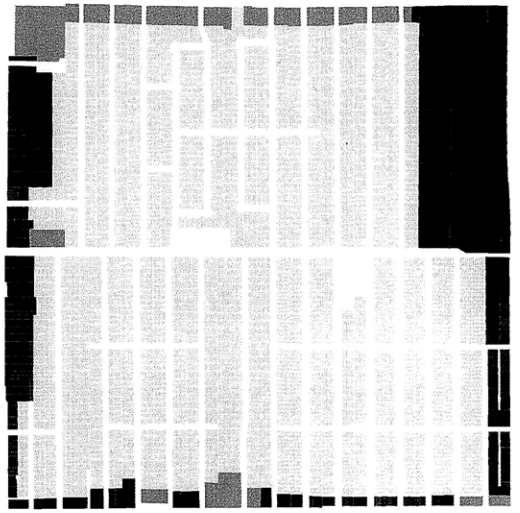


1950 : CONSTRUCTION OF M-97, I-75, I-95

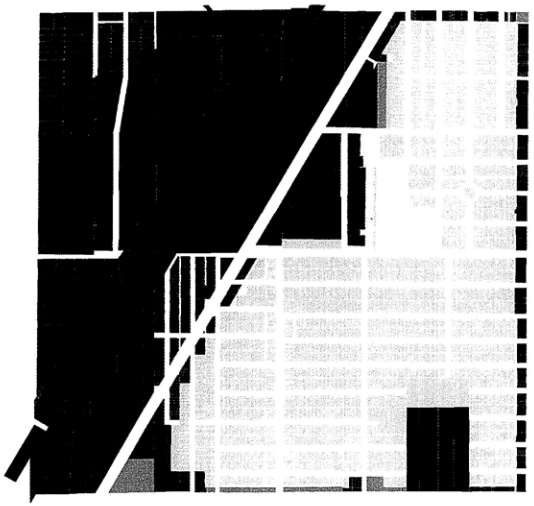
The development of the city of Warren follows the Jeffersonian grid: a 6x6 set of 1-mile-square blocks. This grid proliferated naturally until the growth of the railroad network across the state. While one railroad runs along the grid, the other deviates from it, running diagonally across the southestern corner of the city.

Warren is the third largest "city" in Michigan, after Detroit and Grand Rapids, with a population of about 140,000, living within a six mile by six mile square territory. Essentially a suburb within the Detroit metropolitan region, Warren, incorporated as a town in 1950 and as a city in 1957, was originally the result of white flight from Detroit. The story of Warren is the story of the automobile industry; the city's six-by-six mile territory developed around a core of industrial buildings that house production by GM and Chrysler.

INDUSTRIAL LOTS IN WARREN



INDUSTRIAL LOTS RESIDENTIAL BLOCK



INDUSTRIAL LOTS GROESBECK BLOCK

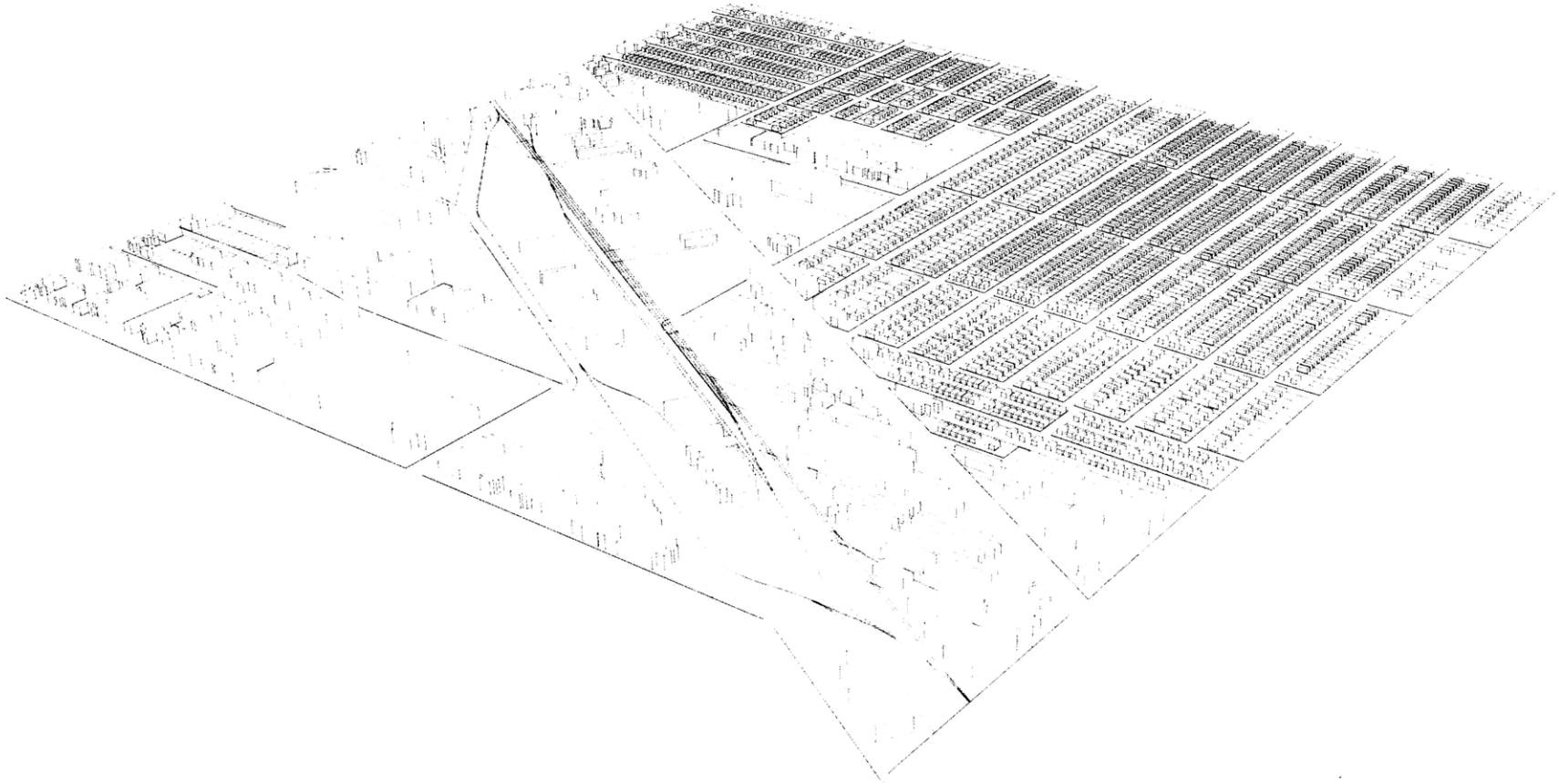
The physical territory of Warren is characterized by flatness - the city is stretched thinly over a large territory, emphasizing vacancies in its civic fabric. The majority of Warren - its residential land - is comprised of low-rise housing with low population density (1,670 people/km2 as opposed to 10,964 people/ km2 in New York City). Two conditions fragment the city: its lack of density and a wide buffer zone between industrial and residential territories. Because of the industrial core of the city, the daily population of the city is constantly in flux - Warren gains about 28,000 in population each day due to commuting workers (City Data, 2008).

Warren is in decline. Its population is shrinking, the automobile industry is in dire straits, and unemployment is higher than the statewide average. Warren is thus a perfect candidate for a new industrial typology, which can be deployed as a strategy to increase density and civic infrastructure in Warren.

Looking more closely at the industrial fabric of the city, it is apparent that residential and industrial lots are carefully segregated from each other. The typical residential block has a cellular morphology, comprised mainly of residential lots with a commercial buffer at its edges. The typical industrial block also has a buffer of commercial lots that separate it from adjacent residential blocks. However, along Groesbeck Highway, where the railroad and highway cut the Jeffersonian blocks into jagged pieces, industrial and residential lots lie side by side, forced to coexist by the geometry of the diagonal.

Specifically, on the site of this project, residential lots follow the Jeffersonian grid, while industrial lots follow the railroad. These commingled land uses require the resolution of a long-standing conflict between the territory of the public (residential), and the territory of the private (industrial). This conflict can be mediated by a hybrid architecture: combining public and private in a way that builds the city's density, with respect to the physical environment, the city's economy, and its civic space.

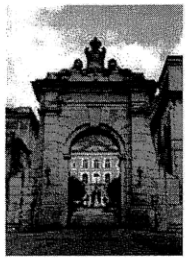
FIGURE 1. Residential foreclosures in Warren are distributed in accordance with economic wealth, clustering most densely towards the southern border of the city that is shared with Detroit. Fewer residences in the wealthier, northern part of the city have experienced foreclosures, while the southeastern corner of the city has experienced significantly more foreclosures than other areas of the city. (Source data: Warren Department of Economic Development, 2008.)



view of Groesbeck Highway, June 2009

factory typologies

paternal/social



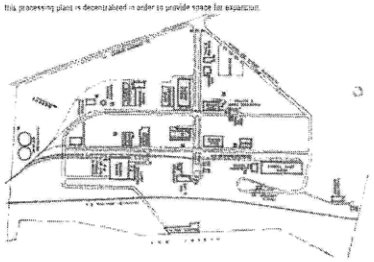
gateway into the royal silkworks in Naples, in the 1780s

factory combined with worker housing at the Cristalleria de la Reine, Burgundy, 1786

functional

corn processing plant, united states

this processing plant is decentralized in order to provide space for expansion

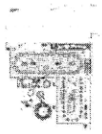


iconic

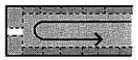
volkswagen factory, dresden

henn architekten, 2002
31,000 m²

Part of the factory is public, containing automobile exhibits, restaurant and shops, while the glass cladding allows visitors to see how the cars are produced in the main part of the plant.

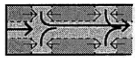


functional



CENTRALIZED - all functions under one roof, open plan organization

DISPERSED - each function in a separate building, allowing for easy expansion



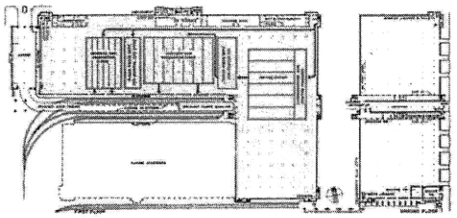
ASSEMBLY LINE - assembly occurs in a single straight flow, for efficiency

manufacturing
offices, design
employees, maintenance

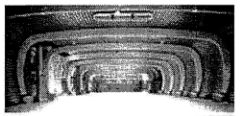
from *Industrial Buildings*

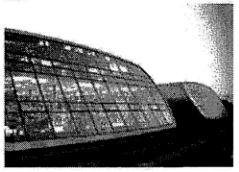
functional

crown can company, philadelphia



functional

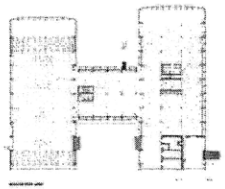




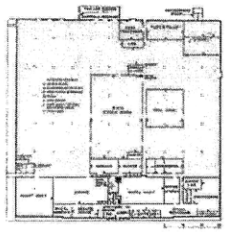
grau assembly bldg, hamburg

bothe richter teherani architekten, 1999
2,700 m²

This laminate factory has a frontal skin that allows the plan organization to remain open for maximum functionality.



functional



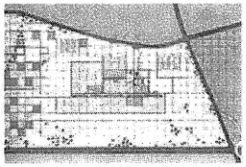
scale factory, united states

iconic

aplix factory, nantes

dominique perrault, 1998
18,000 m²

This factory produces velcro products. The plan is a typical courtyard building (a typology not often used in industrial buildings), with a skin that dominates the entire building.



boutique

ferry building,
san francisco

chelsea mkt,
new york

STRUCTURE + SKIN

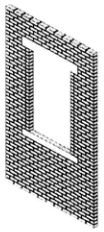
During the Industrial Revolution, the architecture of industry was openly manifest in the city, which embraced the wonders of engineering and manufacturing. Monuments of this time - the Eiffel Tower, the Crystal Palace - are a physical testament to civilization's fascination with the power of industry. Industry enjoyed such favor that the factory tour became a family vacation destination. Some of these factory tours still exist - the Hershey's factory in Pennsylvania, for example. However, in the post-industrial phase of mass customization, economies diversified and moved away from manufacturing, towards the suburban ideal of the American dream. The architecture of the factory reacted accordingly, retreating towards a single archetype: a cheap, one-story box surrounded by parking, pushed as far out of the city as possible.

This negative perspective of large-scale industry is reinforced by the rise of hands-on artisanal production. Whereas one used to be able to buy directly from the factory, now retail acts as an immovable middleman between producer and consumer, manipulating the way in which we consume. The romanticism associated with artisanal production prefaces the emergence of the boutique, a fully customized, "unique" retail model calculated to wring the highest possible prices from consumers' wallets.

The study of factory typologies and the progression of its morphology over time provides a foundation from which a new typology can be derived. While the typical factory at the beginning of the Industrial Revolution was a paternalistic structure that expressed wealth and social values of the time, the corporation and the drive for efficiency transformed that archetype. Artifice and ornament that was lavished on nineteenth century factories disappeared in twentieth century factories, in the interest of lowering costs. Fordism and assembly line production processes led to a rehaul of the factory architecture: the assembly line process was literally translated to the architectural form of the factory. Transportation - usually rail lines - were sometimes bundled directly into the factory, and were always at least located in proximity to the factory. In Chicago, the stockyards were such a large sector of the economy that railroad companies were directed to locate at least one stop in the stockyards (Wade 1987).

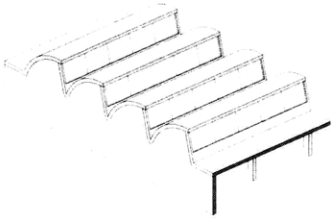
The modern factory has hewed close to the open-plan, one-story archetype. However, contemporary architects have transformed the traditional archetype. The new typology leaves the open plan intact, but takes the only mechanism for formal exploration to the extreme - the building skin. Some factories - such as the Aplix factory by Dominique Perrault - are purely supreficial, while others, like the Volkswagen factory in Dresden, use the skin to put the factory's inner workings on display.

These factory typologies must also be considered within their physical context. The early productive landscape was an urban phenomenon. Factories originated in cities, where they could minimize costs by their proximity to major networks of transportation - first by ship and canal, and later by rail. Early factories were both an economic and a social construct, giving rise to factory towns in which the values of the factory owner were memorialized in their architecture. As consumption of luxury goods became the norm, industrial territories were pushed out of the city by rising property taxes and cheaper labor in the



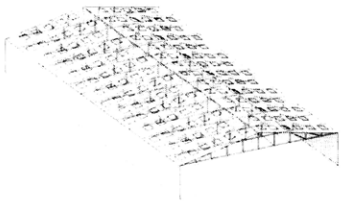
1800s

During the Industrial Revolution, most factories were made out of brick. In line with the architectural conventions of that time, most of these buildings had typical brick punched opening windows. These windows were generally larger than typical windows, matching the scale of factory floor heights.



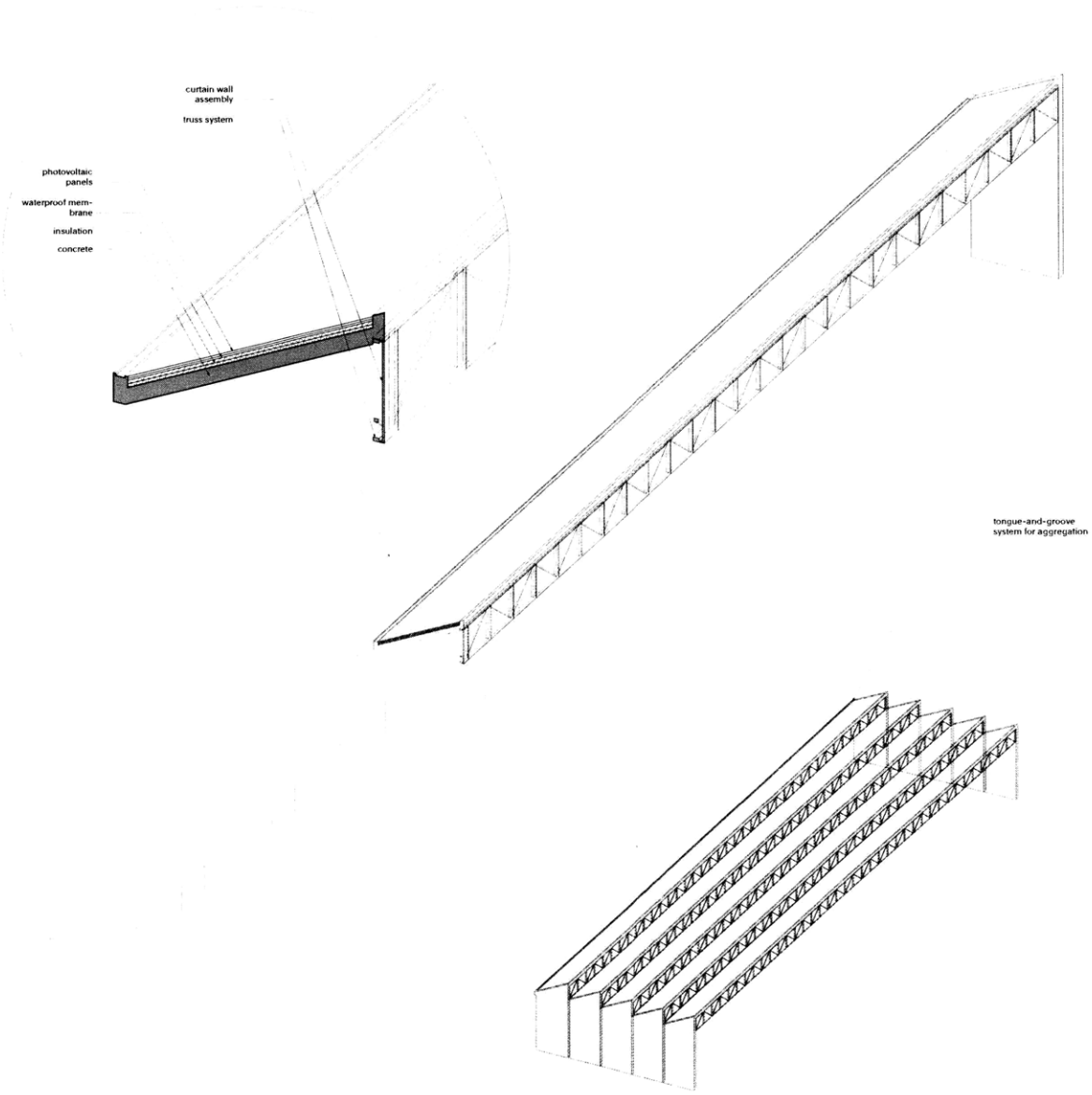
1900s

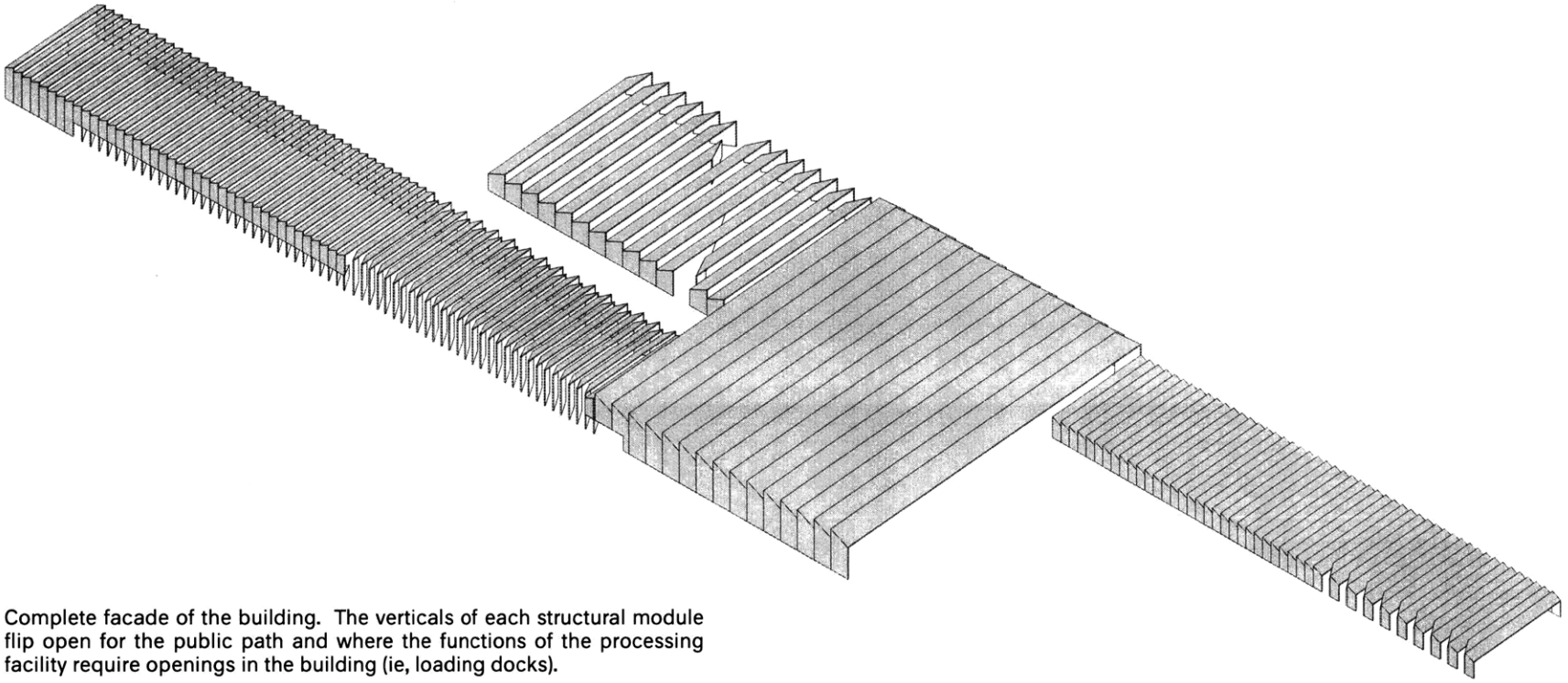
Concerns about economy and security transformed the placement of openings in factory buildings. Opaque walls ensured total flexibility of interior program, while skylights provided an adequate working environment. In many cities, these buildings are being converted into artists' studios (notably, in the 798 district of Beijing).



2000s

Many factory buildings have moved towards further economy with massive shed buildings, though concrete buildings are still common. These buildings are constructed with steel trusses and corrugated steel, providing a lightweight structure. The tradeoff for cheaper construction is a corresponding decrease in the building's lifespan and reuse potential for programs other than warehousing or manufacturing.

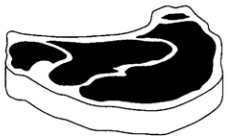




Complete facade of the building. The verticals of each structural module flip open for the public path and where the functions of the processing facility require openings in the building (ie, loading docks).

country. Industry was perceived as a blight for its pollution of the urban landscape, both environmentally and architecturally. Post-industrial land consumption has shifted towards programs of leisure: parks, shopping, sports, libraries, convention centers, movie theaters, restaurants, nightclubs.

New industrial typologies have the power to transform the landscape, as evidenced by Industrial Revolution-era company towns, and 1950s hermetically sealed, assembly-line boxes. Entering the 21st century, the current industrial typology - a hermetically sealed box with an articulated architectural skin - is impotent, lacking any transformative power. The structural skin, described above, modifies the 21st century closed facade by proposing a structural facade module. This module has degrees of variation that allow its vertical members to shift, allowing the building to open to the exterior environment according to programmatic functions. The shifting verticals also create a thickness of bays along the consequent openings, which can be used for public and private programs. This system thus becomes embedded into the urban landscape as an infrastructure, integrating industry into the daily life of a city and mediating the consequent scalar shifts.



66
lbs per year
per person

3900
lbs manure
per cow

1200
gallons water
per serving

CONSUMPTION, WATER USAGE, AND MANURE PRODUCTION OF MAJOR AMERICAN MEATS

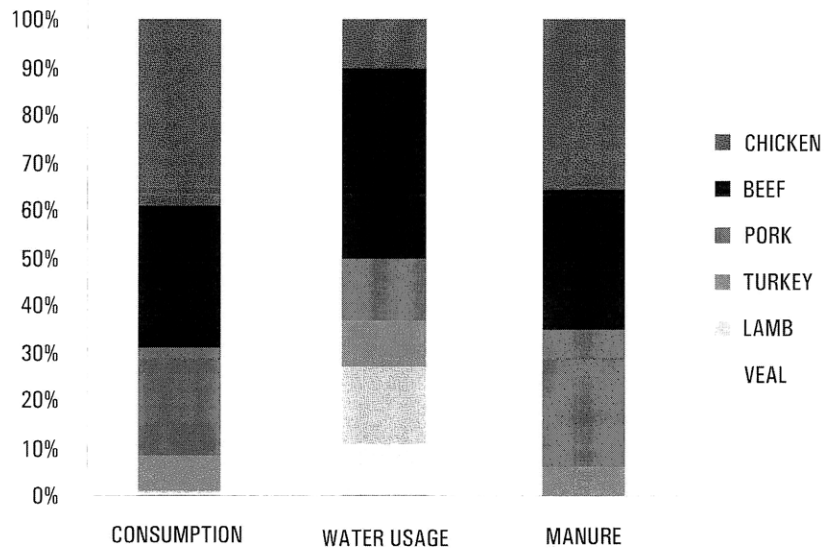
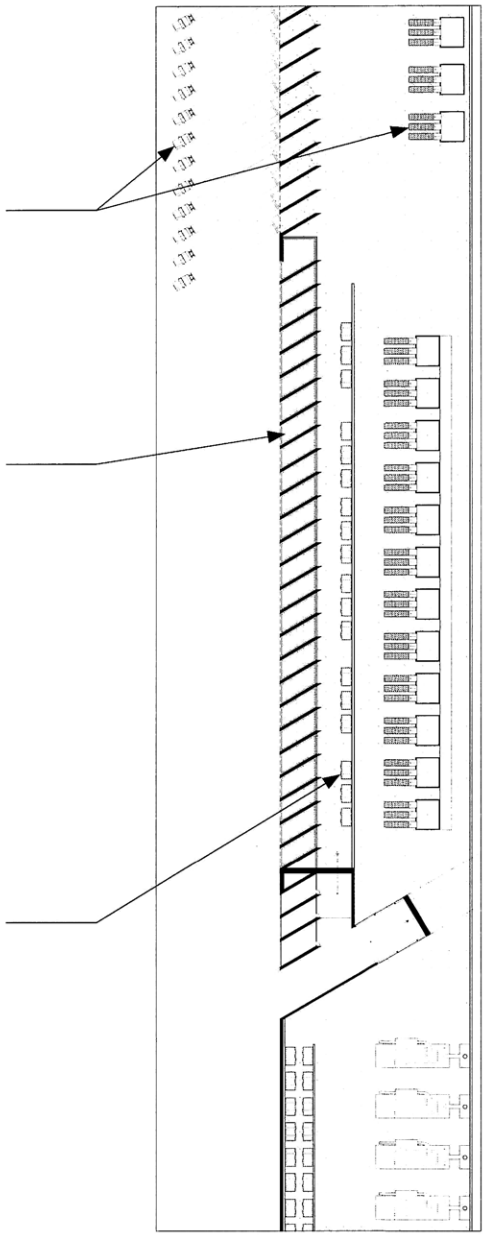


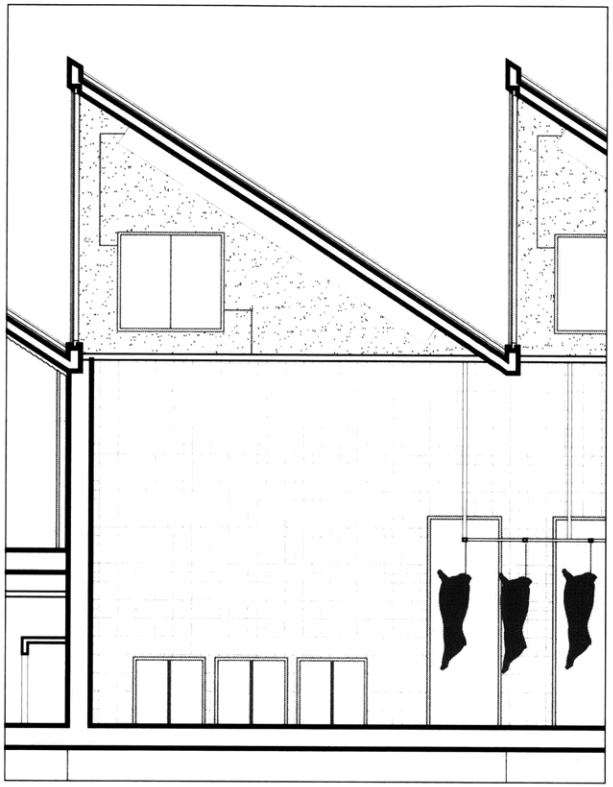
FIGURE 6. Beef, while no longer the primary meat in the American diet, ranks second in consumption to chicken. The production of beef still consumes vast amounts of water and produces thousands of tons of manure each year, at rates that are higher than most other produced, processed meats. Each person in the US is responsible for 390lbs of manure and millions of gallons of wastewater, for their consumption of beef. (Source data: US Department of Agriculture, 2008.)

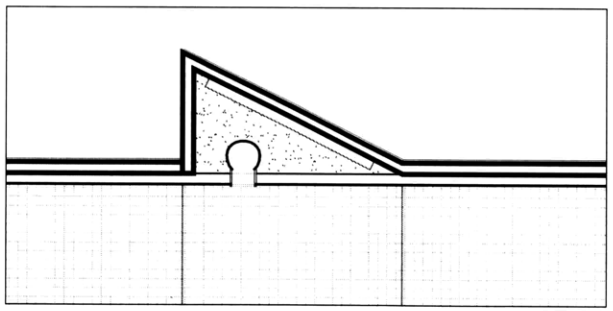
slaughtering waste travels down chutes from the upper level, transferred to containers, and trucked away for further processing

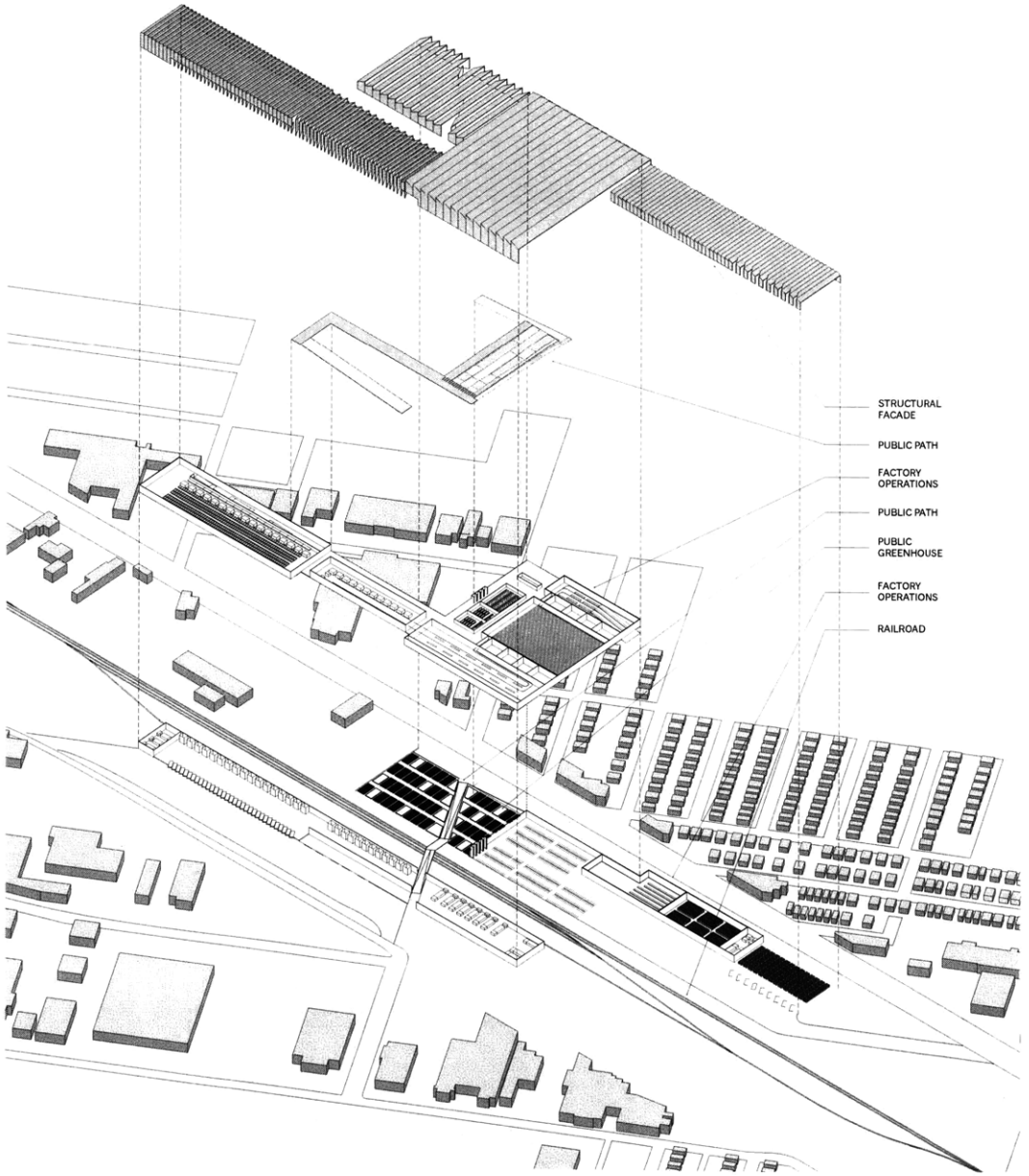
the manure is composted in planters, and cycled through the greenhouse

water is used to sanitize the slaughtering areas, then cycled through a sanitation system and re-used; some of the water is cycled through the plantings in the greenhouse

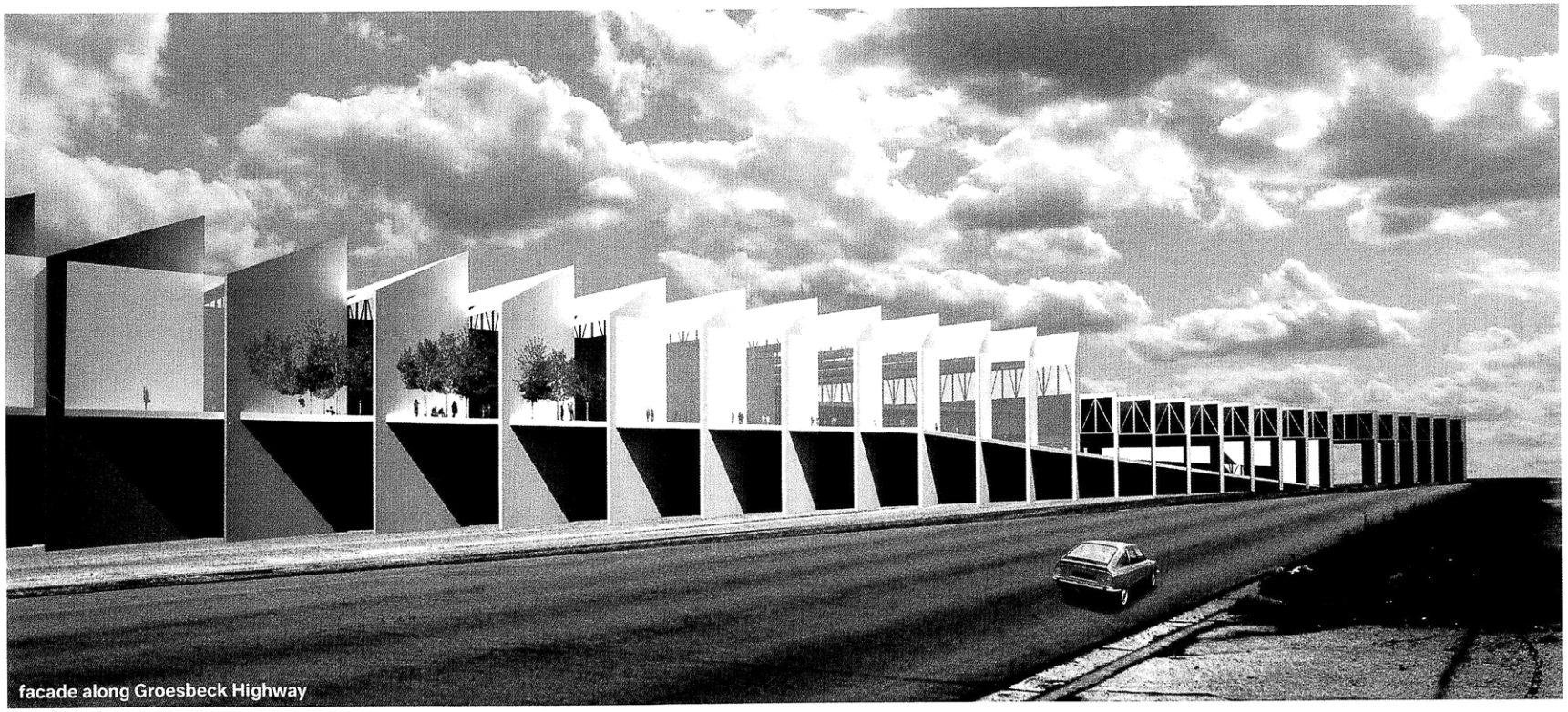








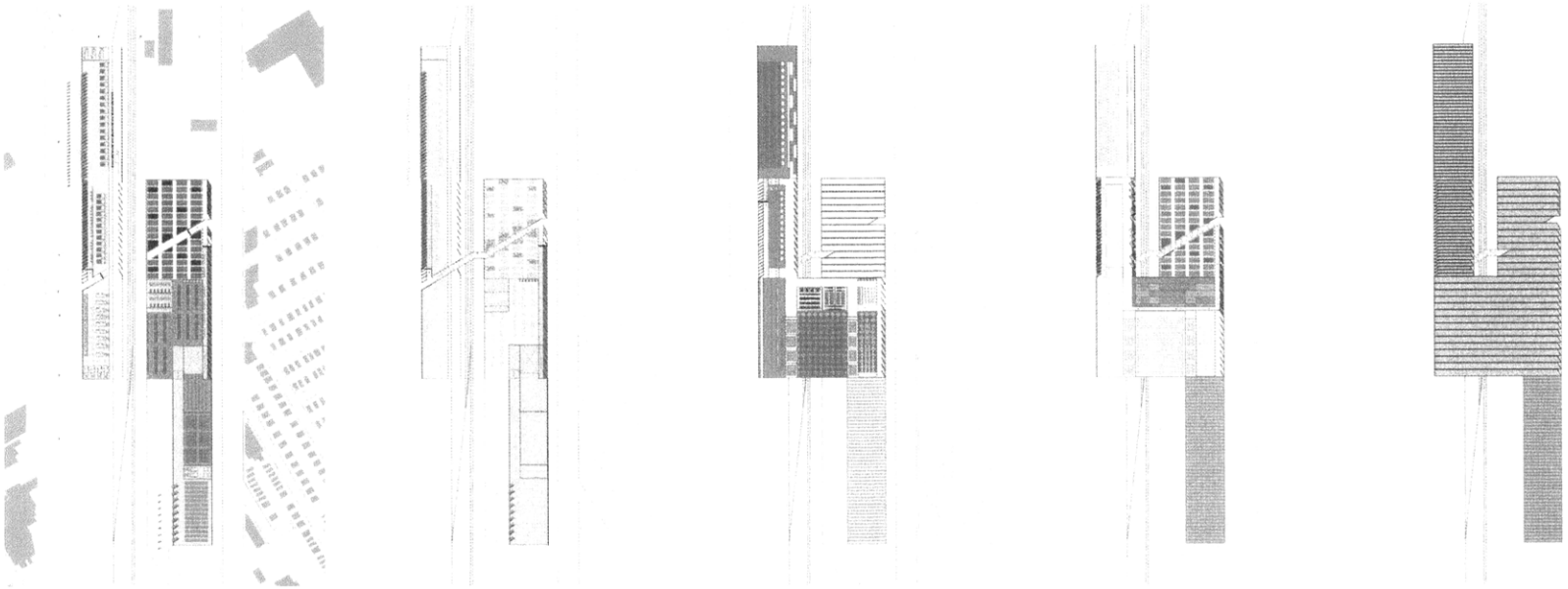
The north-facing facade modules are tiled with photovoltaic panels. The photovoltaic panels collect energy that is used to power both the lighting system and the HVAC system.

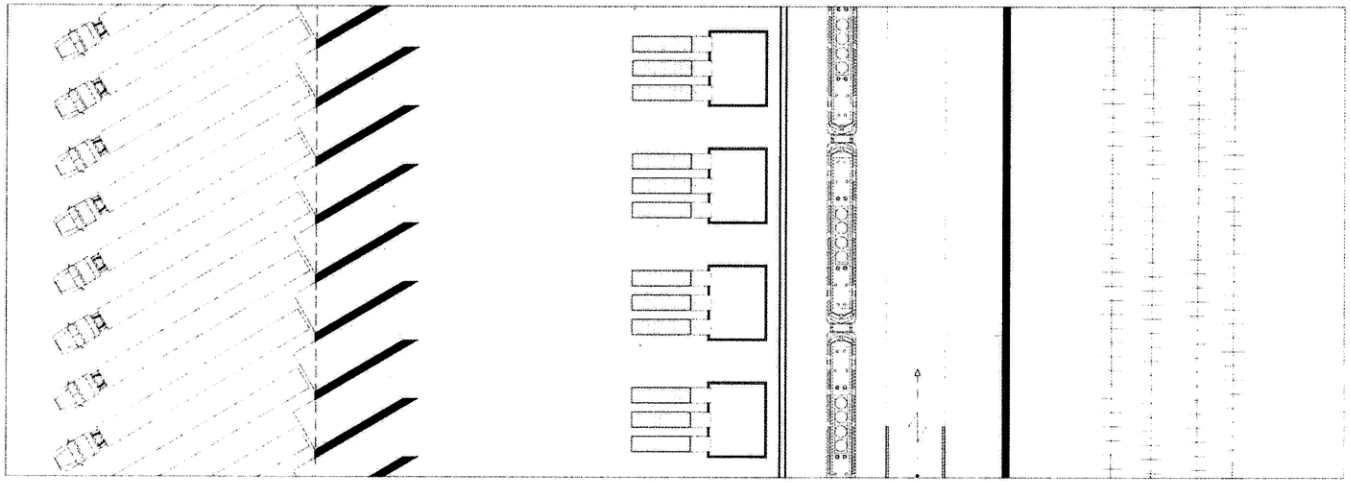


facade along Groesbeck Highway

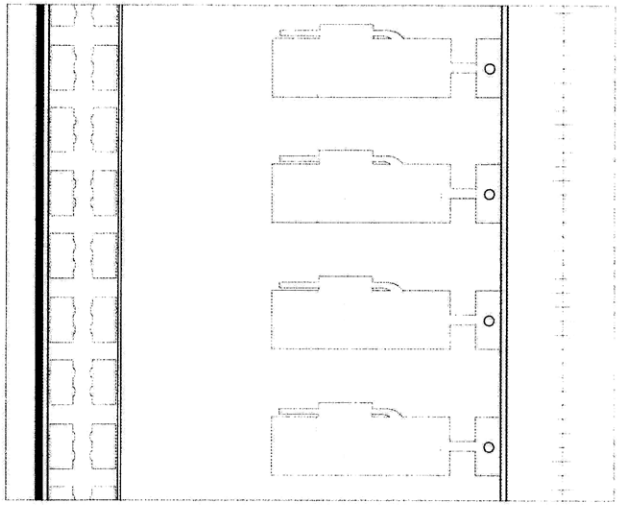
view facing Groesbeck Highway from public ramp

PLANS

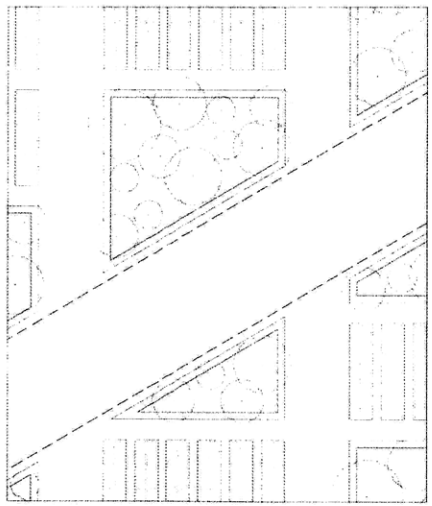




01 Plan detail of waste disposal area. Vertical chutes collect manure and slaughtering waste from the upper levels. Manure is processed through the greenhouse, while slaughtering waste is transferred to containers and trucked away.

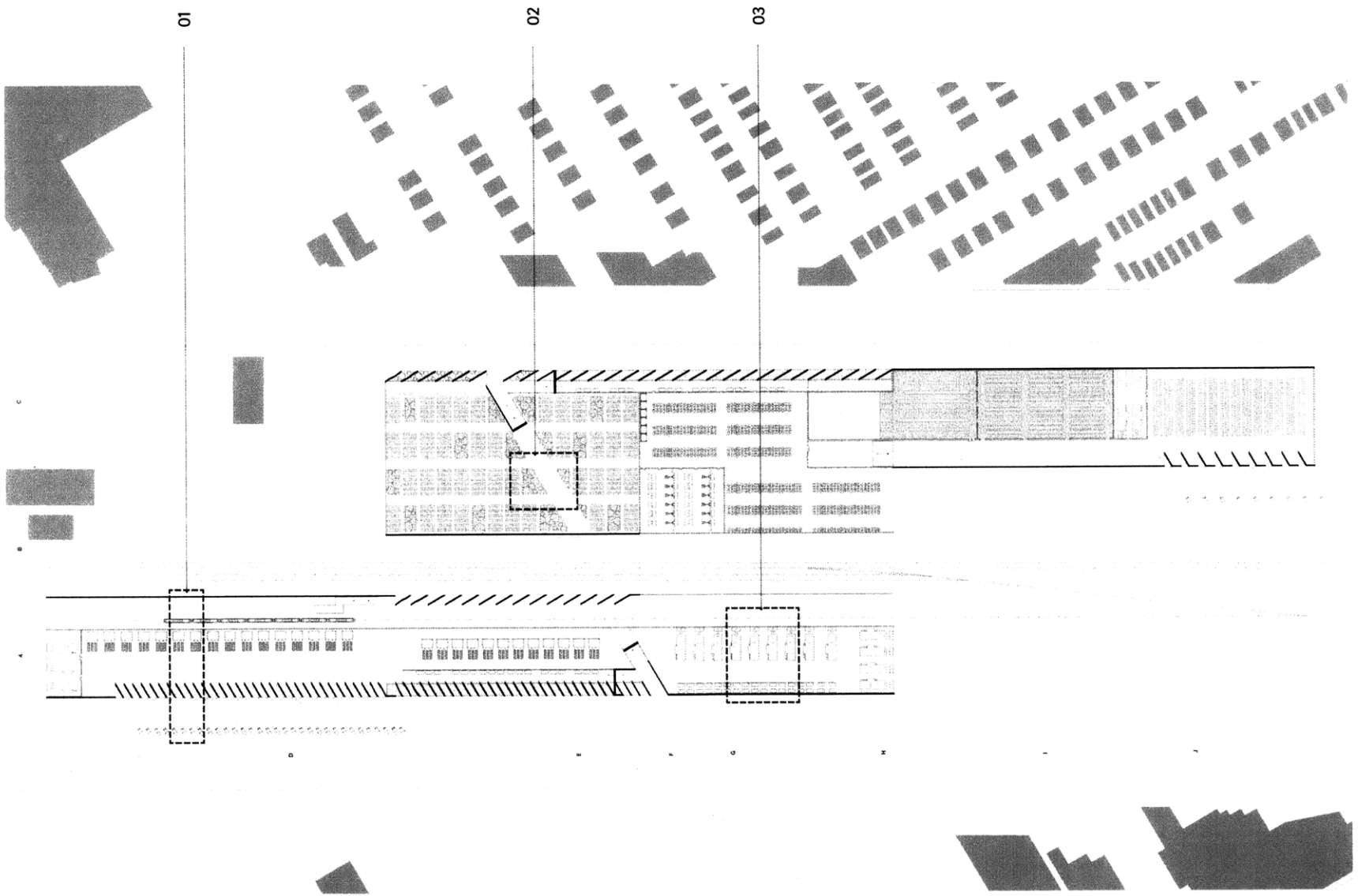


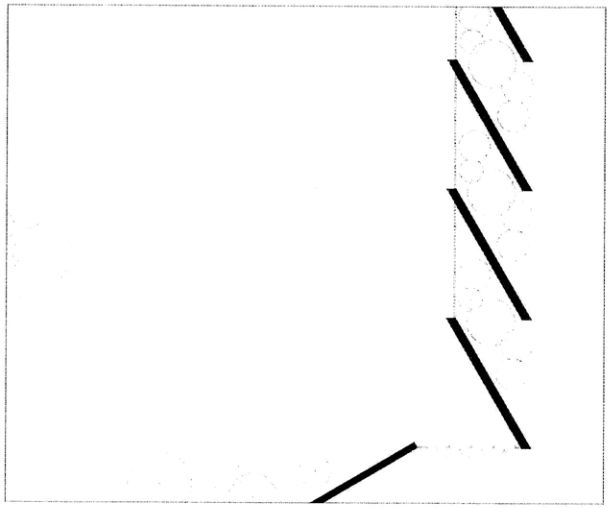
02 Plan detail of power and water management area. Water is used to keep slaughter areas sanitized, and is treated and recycled within the building. Energy is collected via photovoltaic panels on the roof, and distributed to the HVAC system.



03 Plan detail of public greenhouse. This greenhouse is for public use, and is supplied with water and composted soil from the slaughterhouse operations.

+0’





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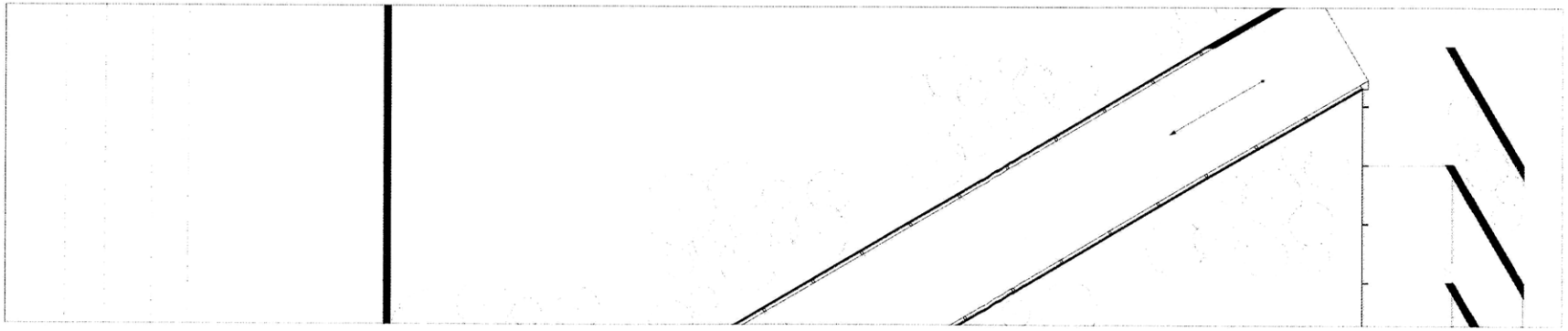
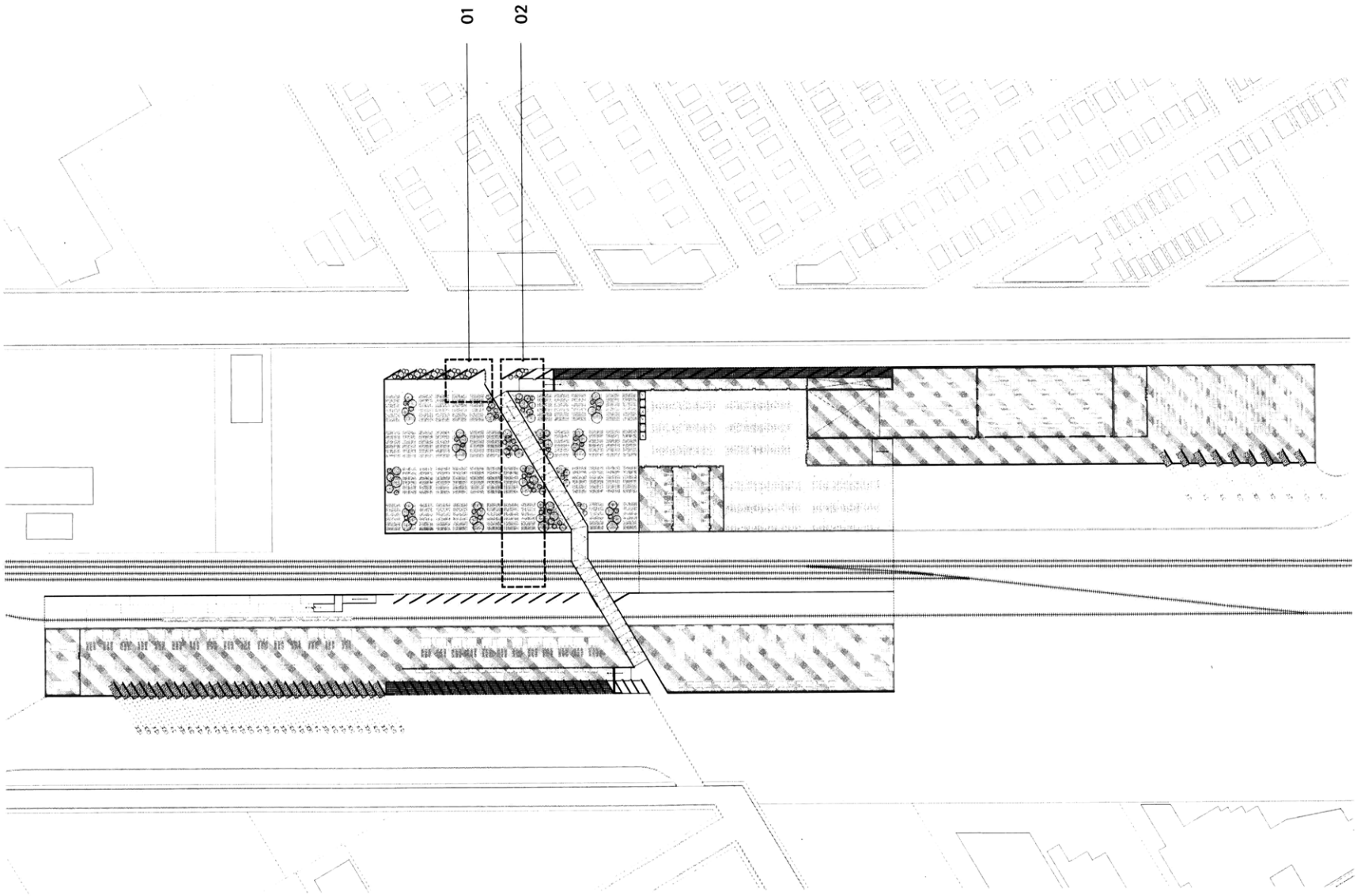
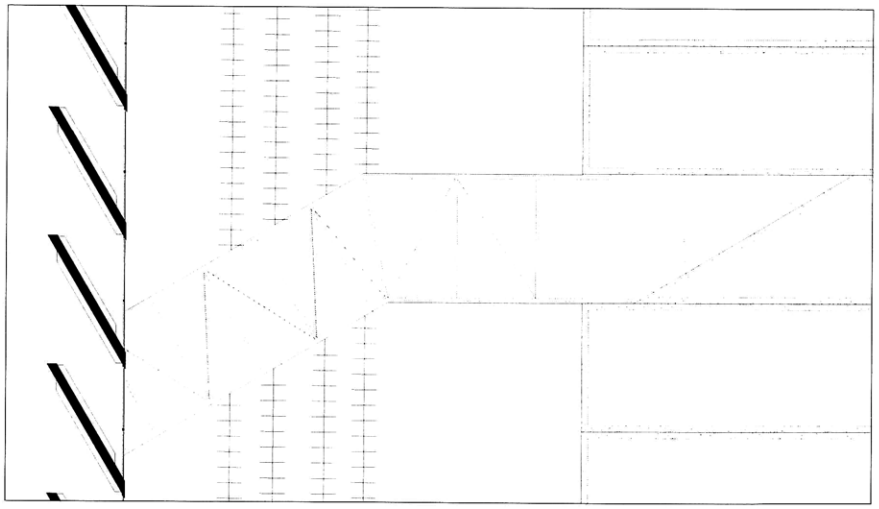


+20’

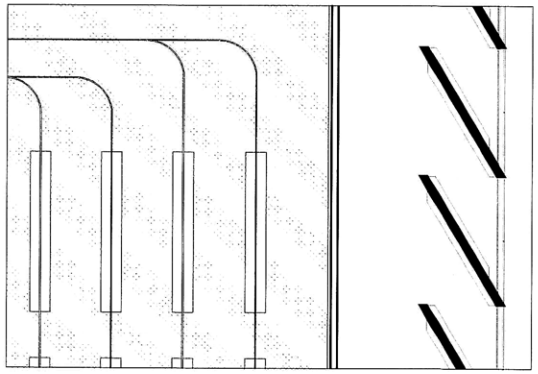


01 Ramp from railroad to cattle pens
02 Cattle pens (skylight above)
03 Hot side. Initial slaughter (the kill, skinning, bloodletting, gutting, and inspection) happens here.
05 Hot side (2). Carcasses are halved here with saws.
06 Main offices (conference rooms, etc).
07 Workers' locker rooms.
08 Cafeteria and kitchen.
09 Freezers. Carcasses are stored here for at least two days to sanitize them and kill and dangerous bacteria
10 Cold side. Frozen carcasses are broken down into the primal cuts.
11 Carcasses travel down conveyor belts to packing area on the ground level.
13 First floor packing room.

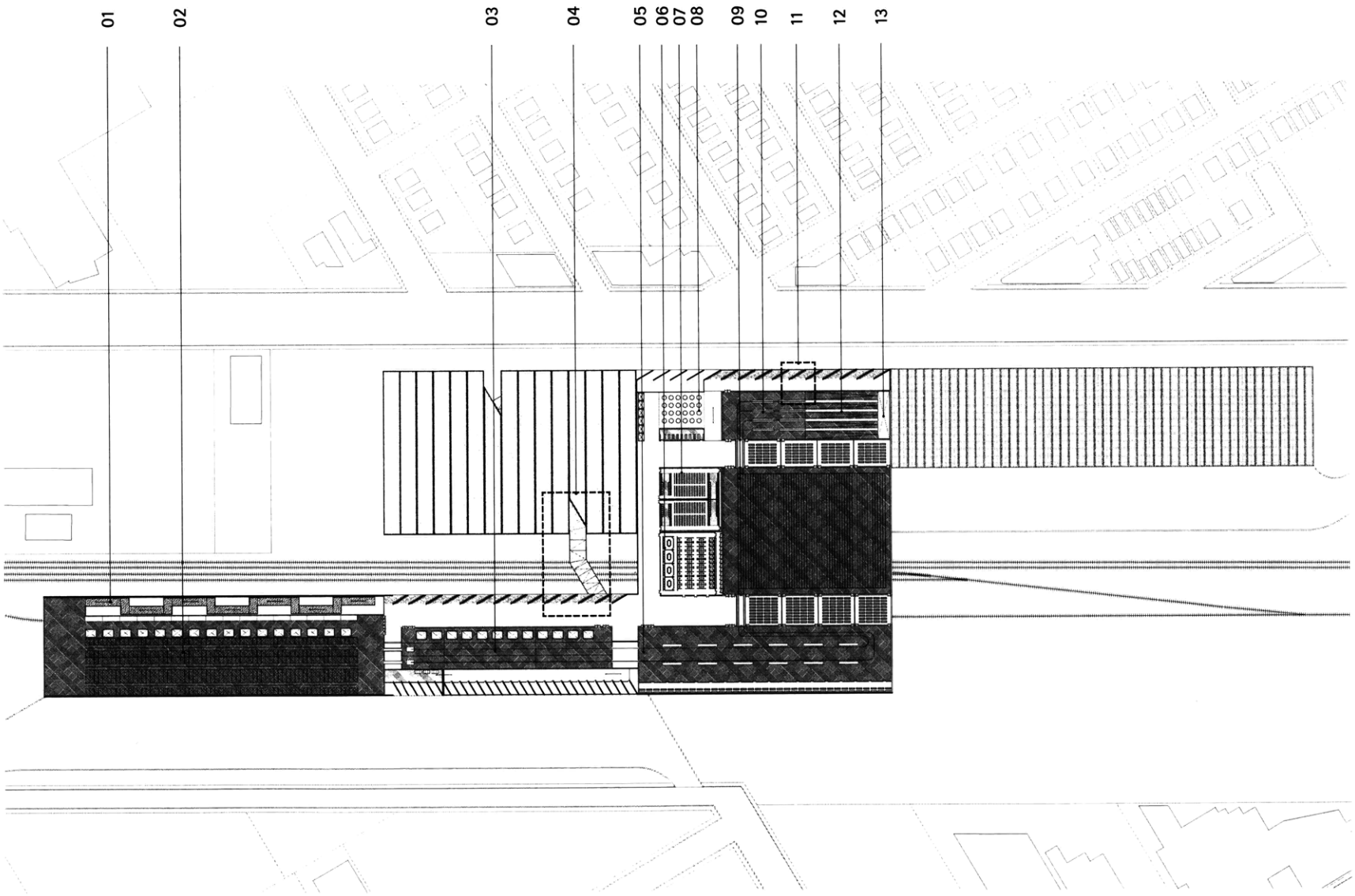


04 Plan detail of power and water management area. Water is used to keep slaughter areas sanitized, and is treated and recycled within the building. Energy is collected via photovoltaic panels on the roof, and distributed to the HVAC system.

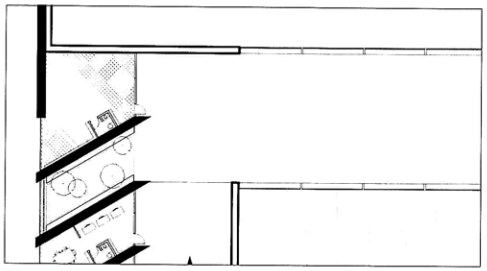
12 Plan detail of public greenhouse. This greenhouse is for public use, and is supplied with water and composted soil from the slaughterhouse operations.



+35’

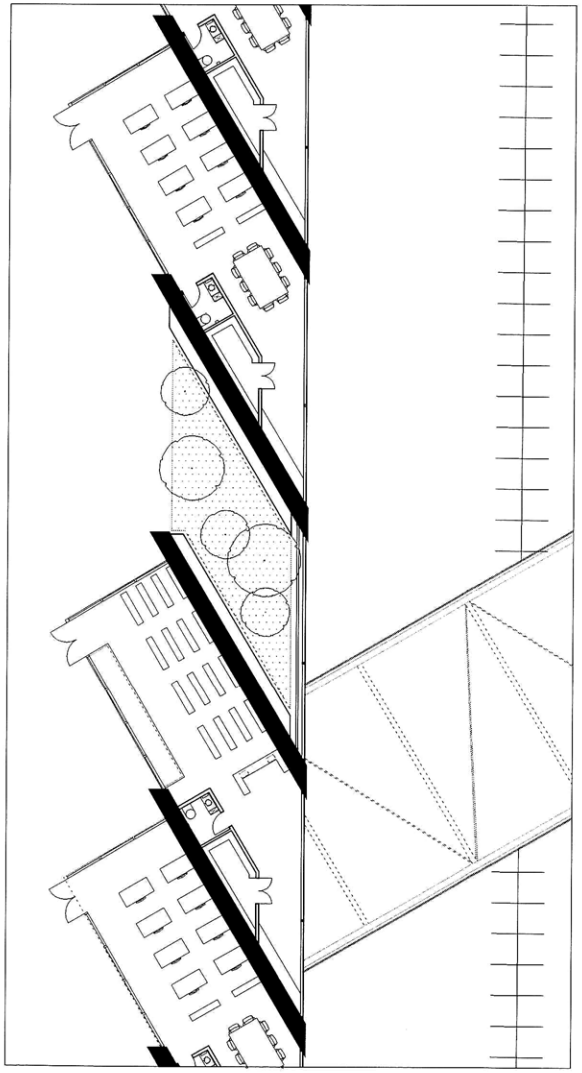


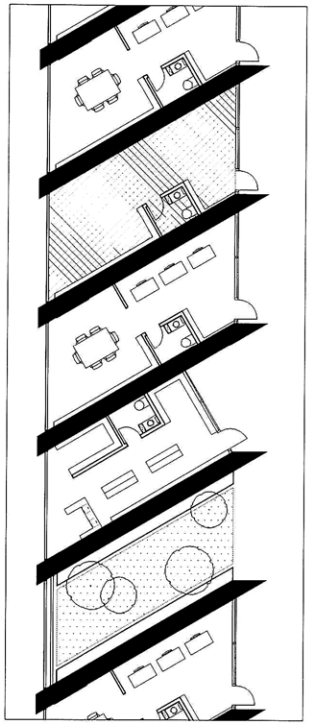
05 Benches lining main public space.
06 Main interior public leisure space.
07 Ramp from Groesbeck Highway entrance to main public space.



01 Plan detail of viewing space into cattle pens and slaughter area. Viewing area comprised of floor-height windows are set above benches.

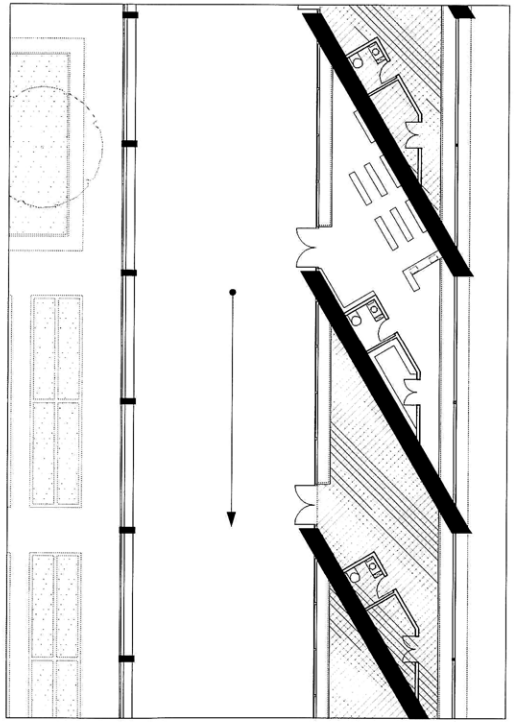
04 Different unit types in wall bays facing out onto railroad. Units include retail, medium office (<15 people), artist studios, and planted, public open spaces.



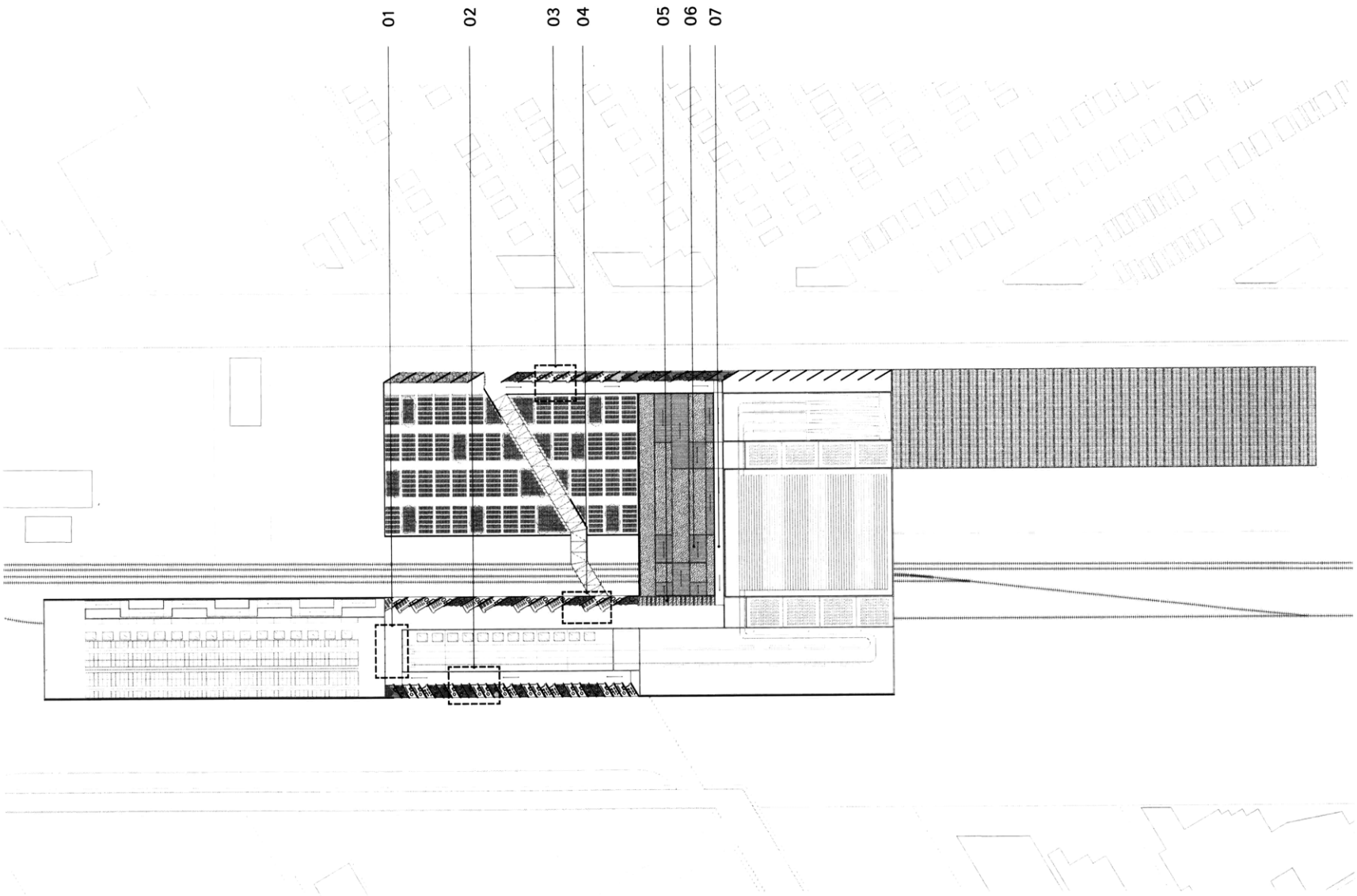


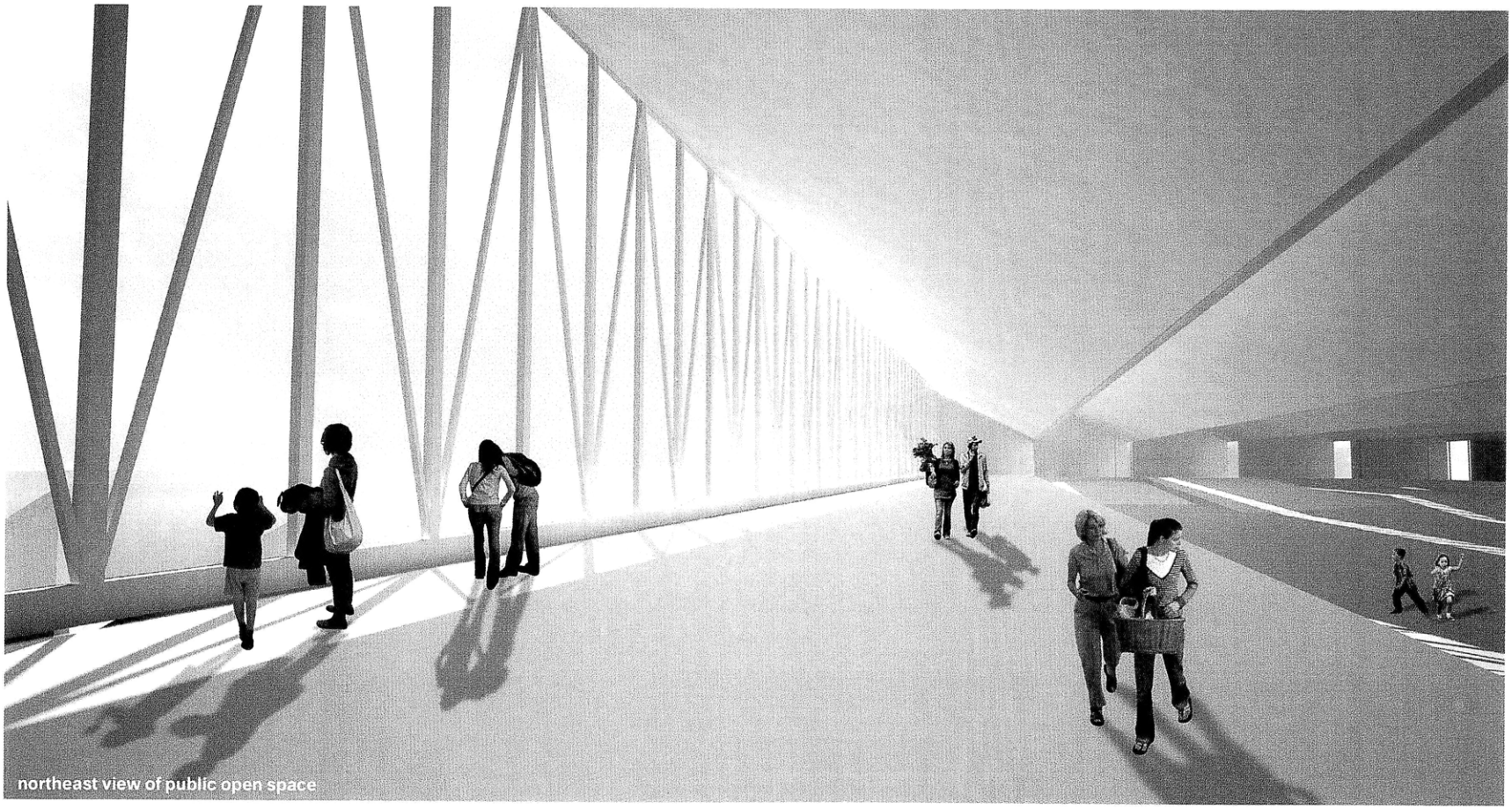
02 Different unit types in wall bays along Toepfer Road. Units include retail, small offices (<6 people), and artist studios, in addition to planted, public open spaces.

03 Different unit types in wall bays along Groesbeck Hwy. Units include retail, artist studios, and planted, public open spaces.



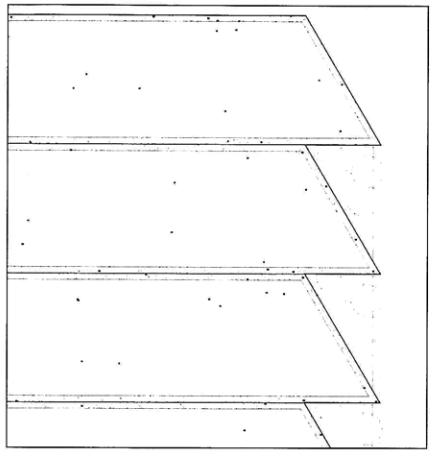
+50’



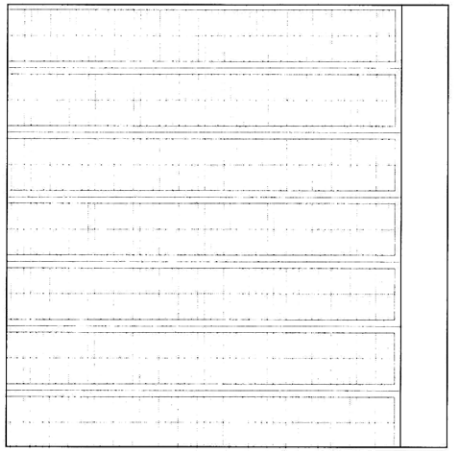


northeast view of public open space

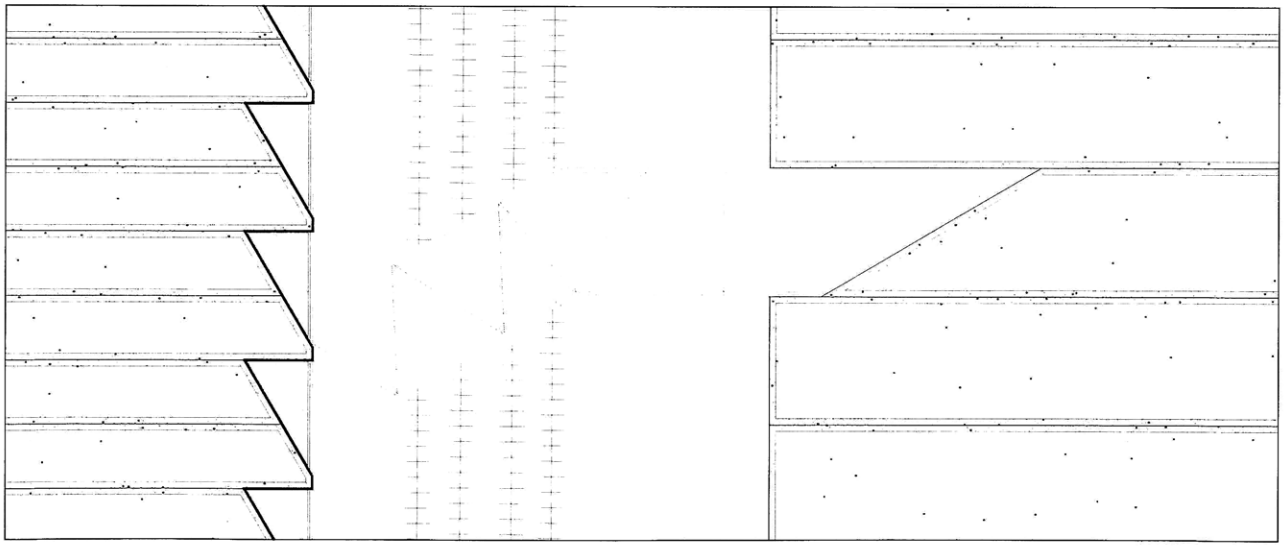
northwest view of public open space



01 Plan detail of roof at Groesbeck Highway edge. The facade of the greenhouse on the interior of the building is pulled inside, transforming the bays into exterior park benches.

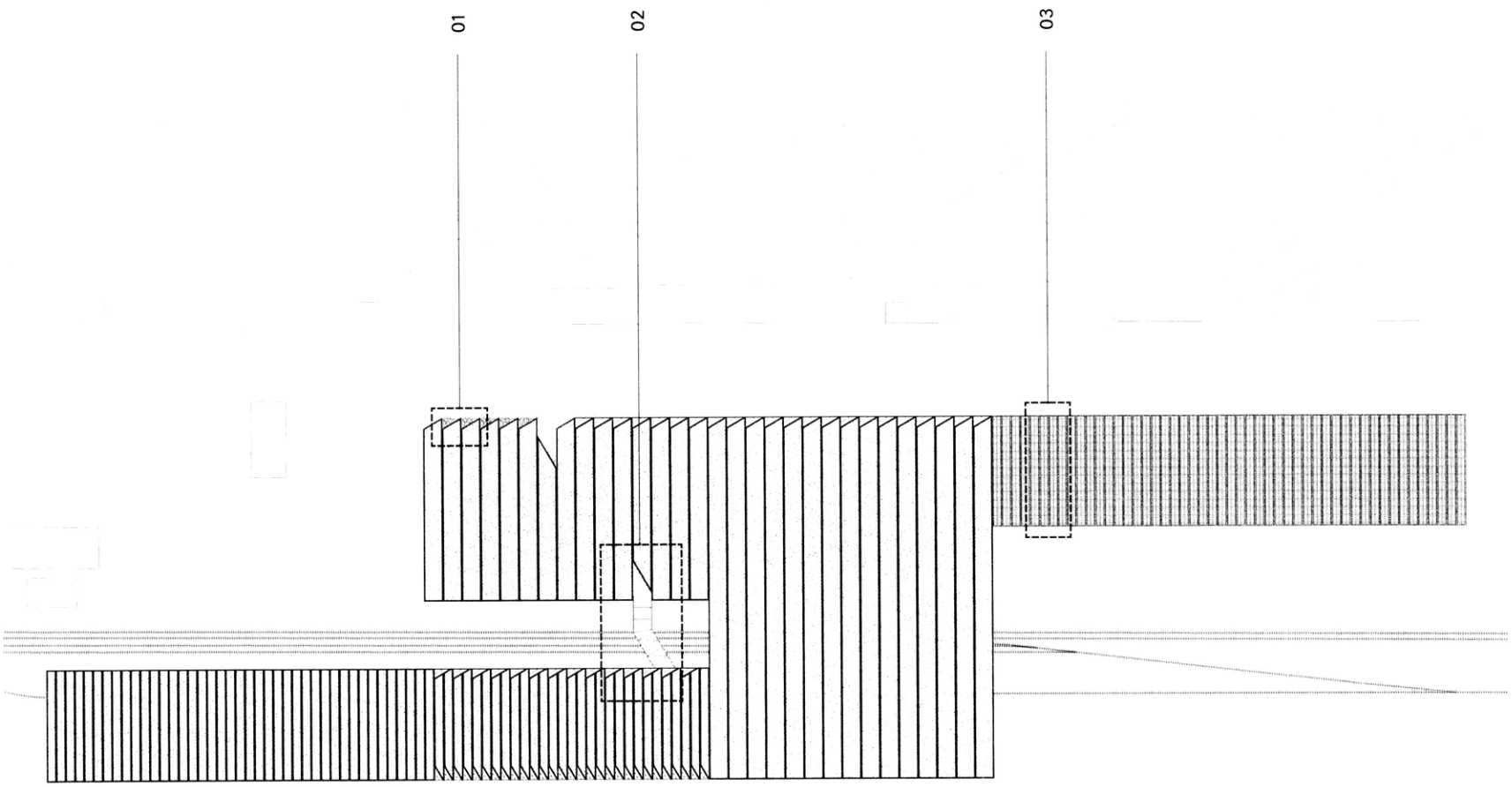


03 Plan detail of loading area roof. The north-facing roof modules are tiled with photovoltaic panels that generate energy for the processing facility's HVAC system.

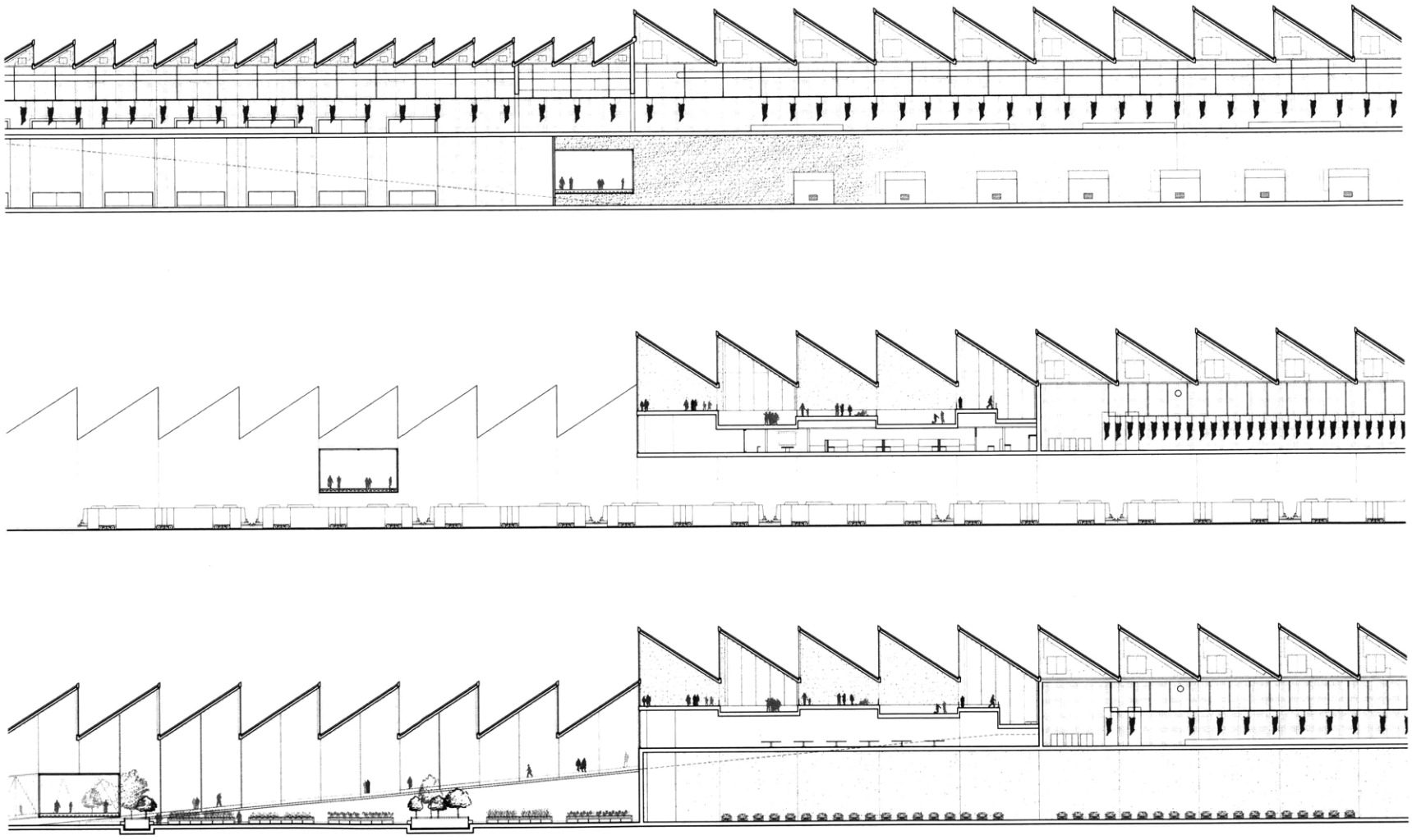


02 Plan detail of roof system adapting to the direct public ramp cutting through the building. The public ramp is comprised of a truss system enclosed by a glass curtain wall.

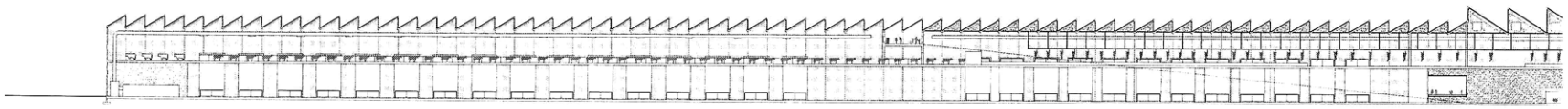
+80’



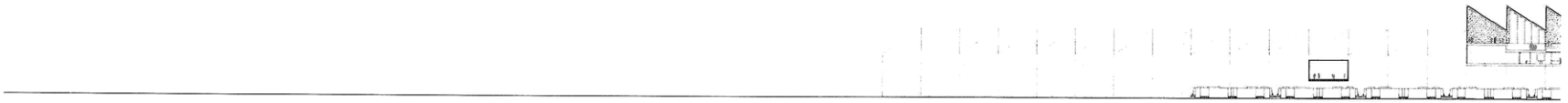
SECTIONS



longitudinal sections



SECTION A
SCALE 1' = 1/32"



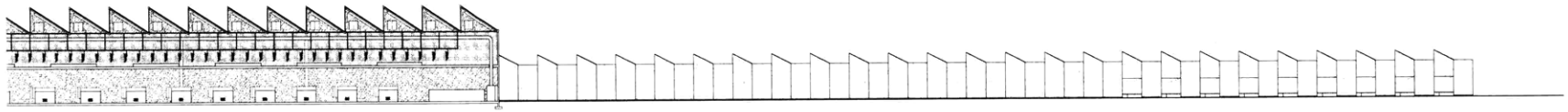
SECTION B
SCALE 1' = 1/32"

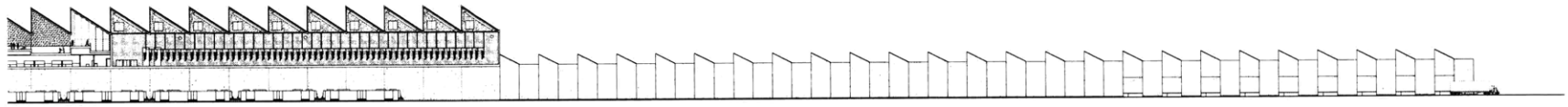
SECTION C
SCALE 1' = 1/32"

SECTION A
SCALE 1" = 1/32"

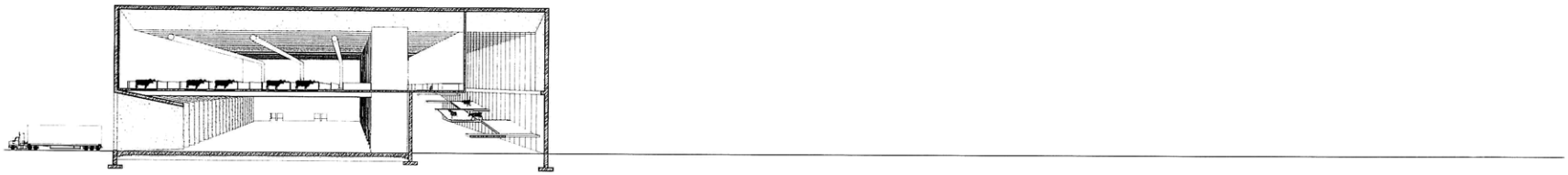
SECTION B
SCALE 1" = 1/32"

SECTION C
SCALE 1" = 1/32"

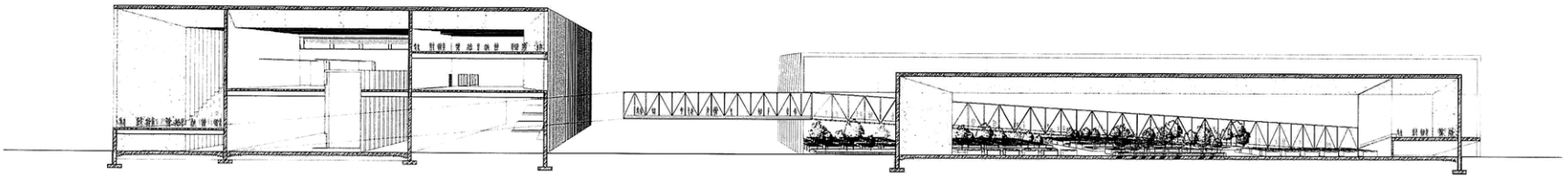




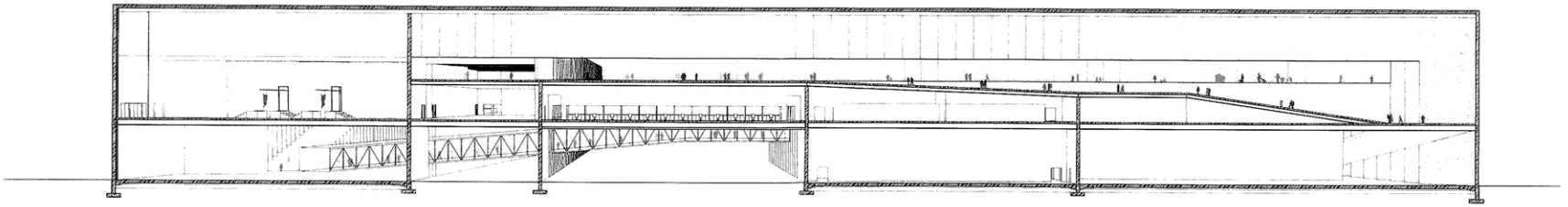
cross sections



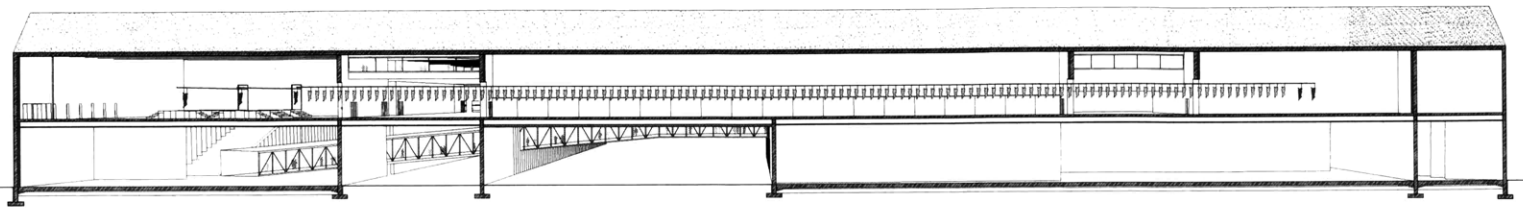
SECTION D



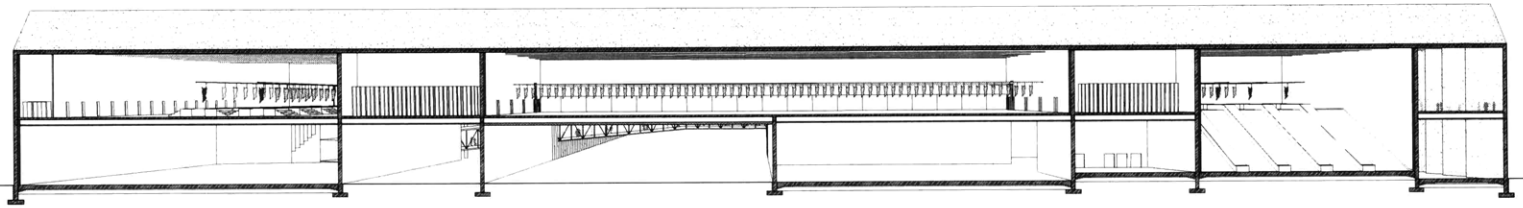
SECTION E



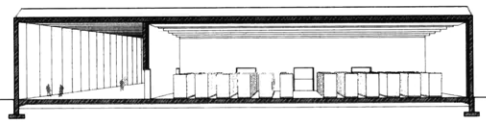
SECTION F



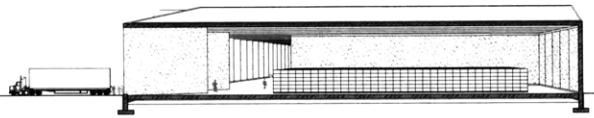
SECTION G



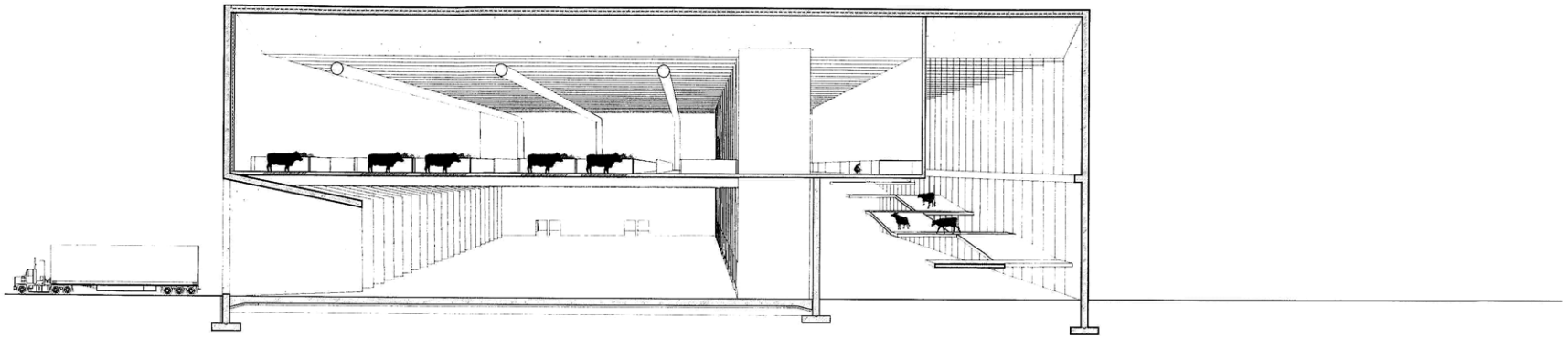
SECTION H



SECTION I



SECTION J



SECTION D
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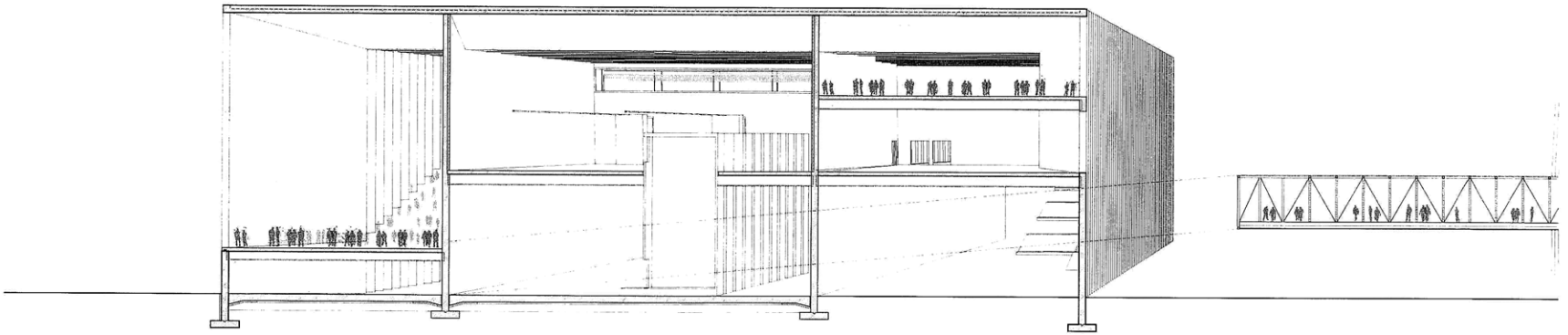

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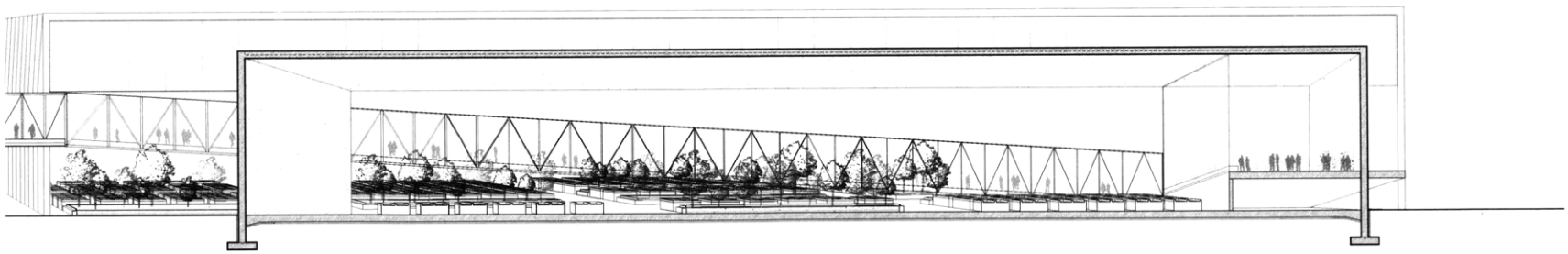

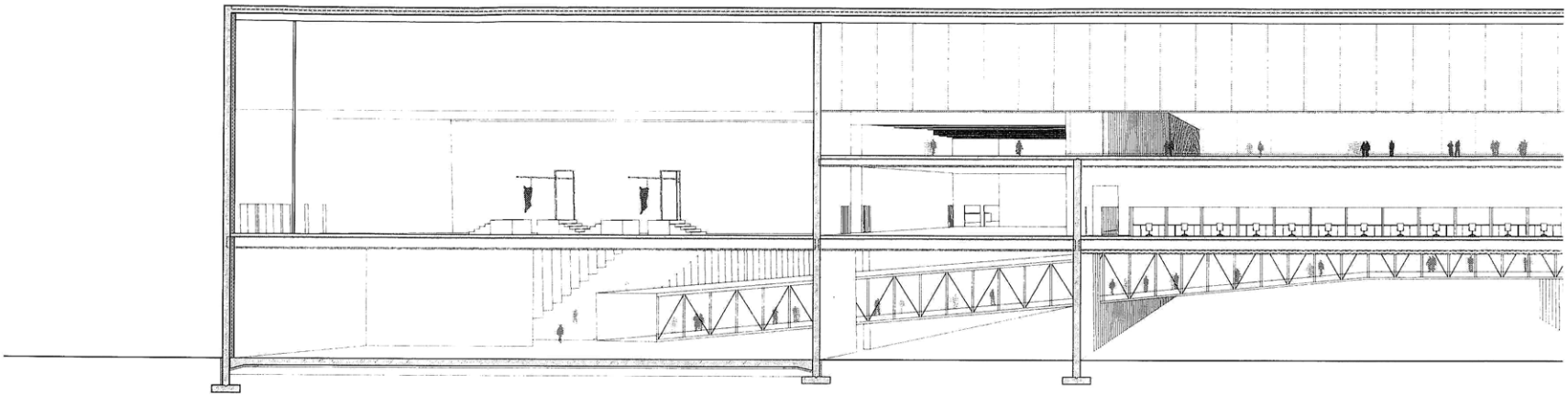

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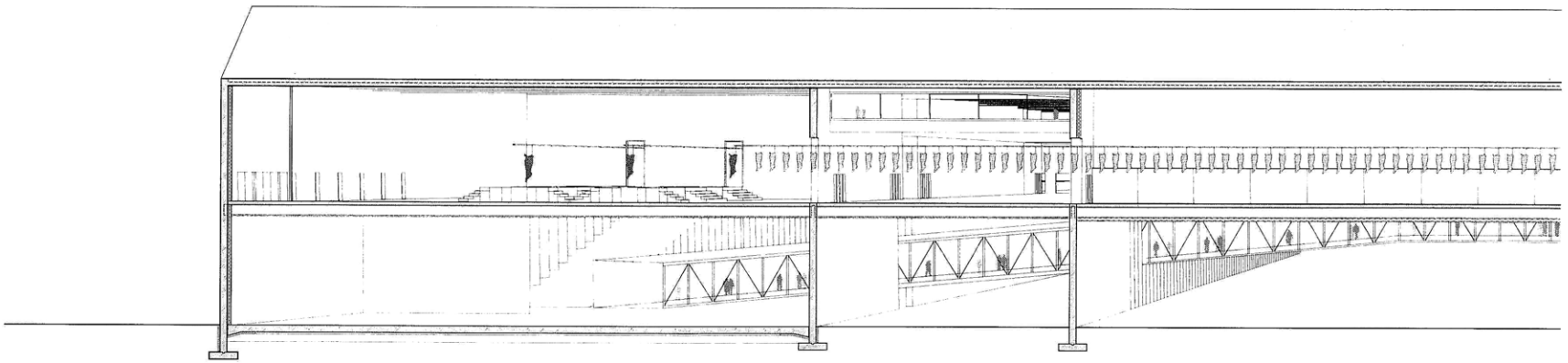

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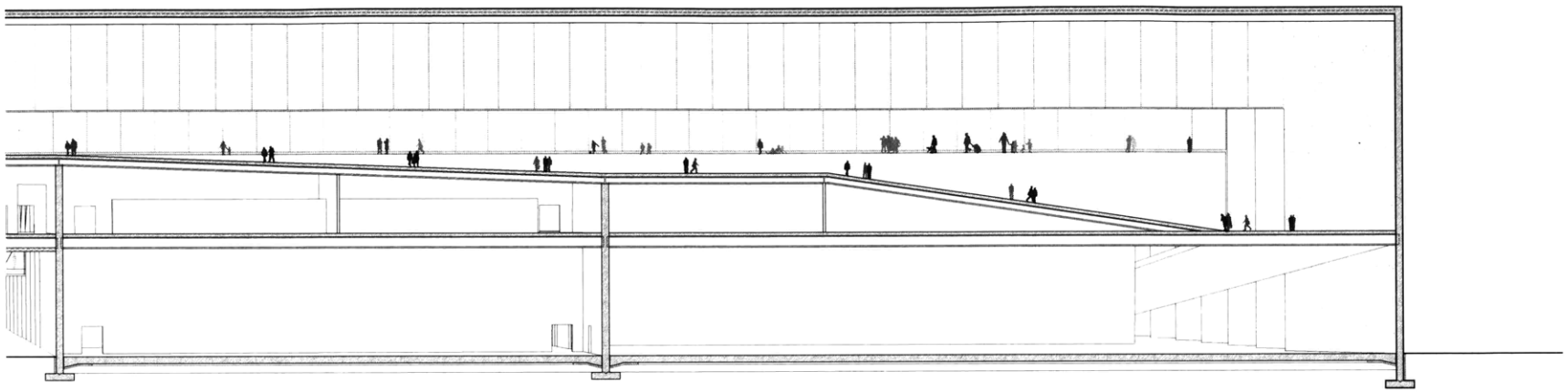
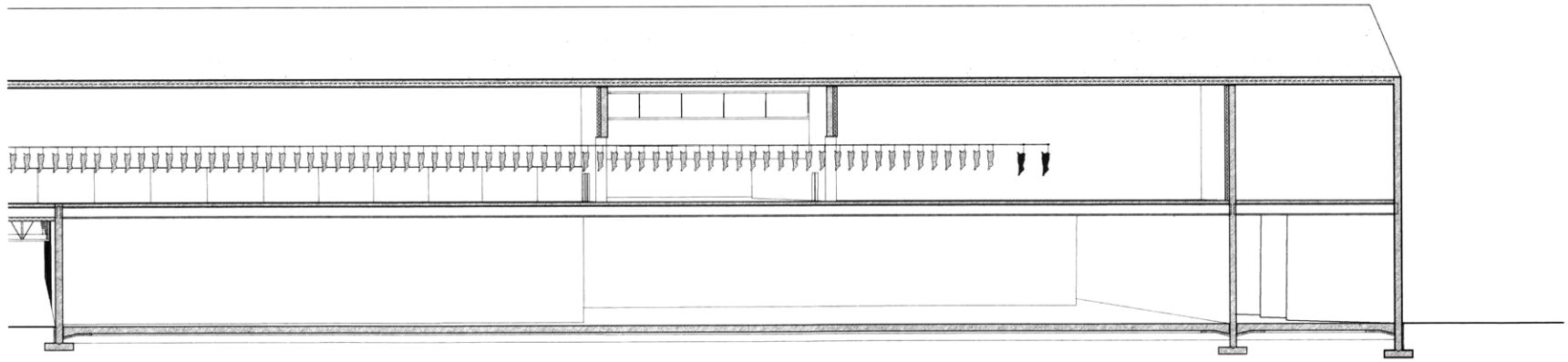
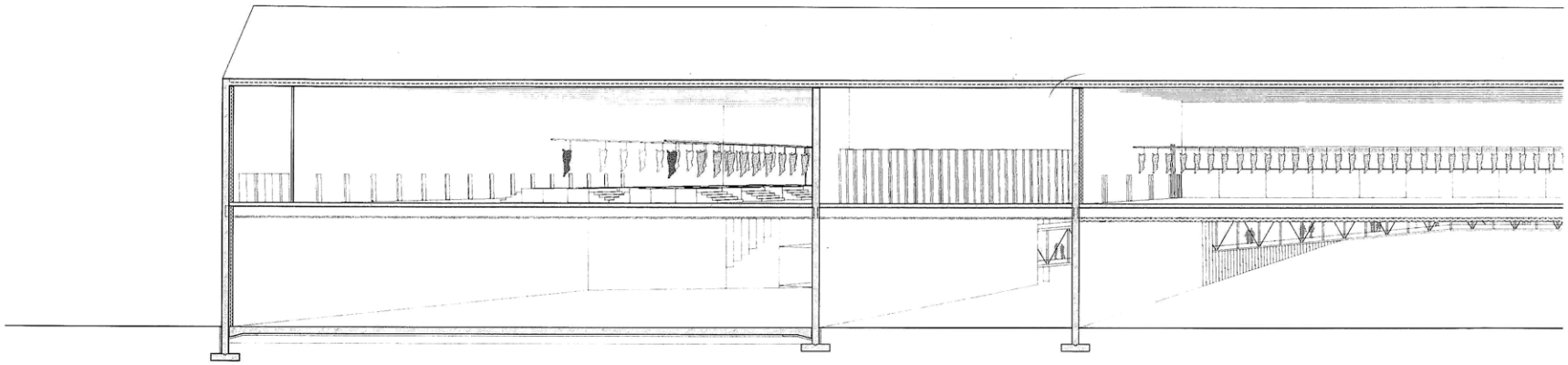


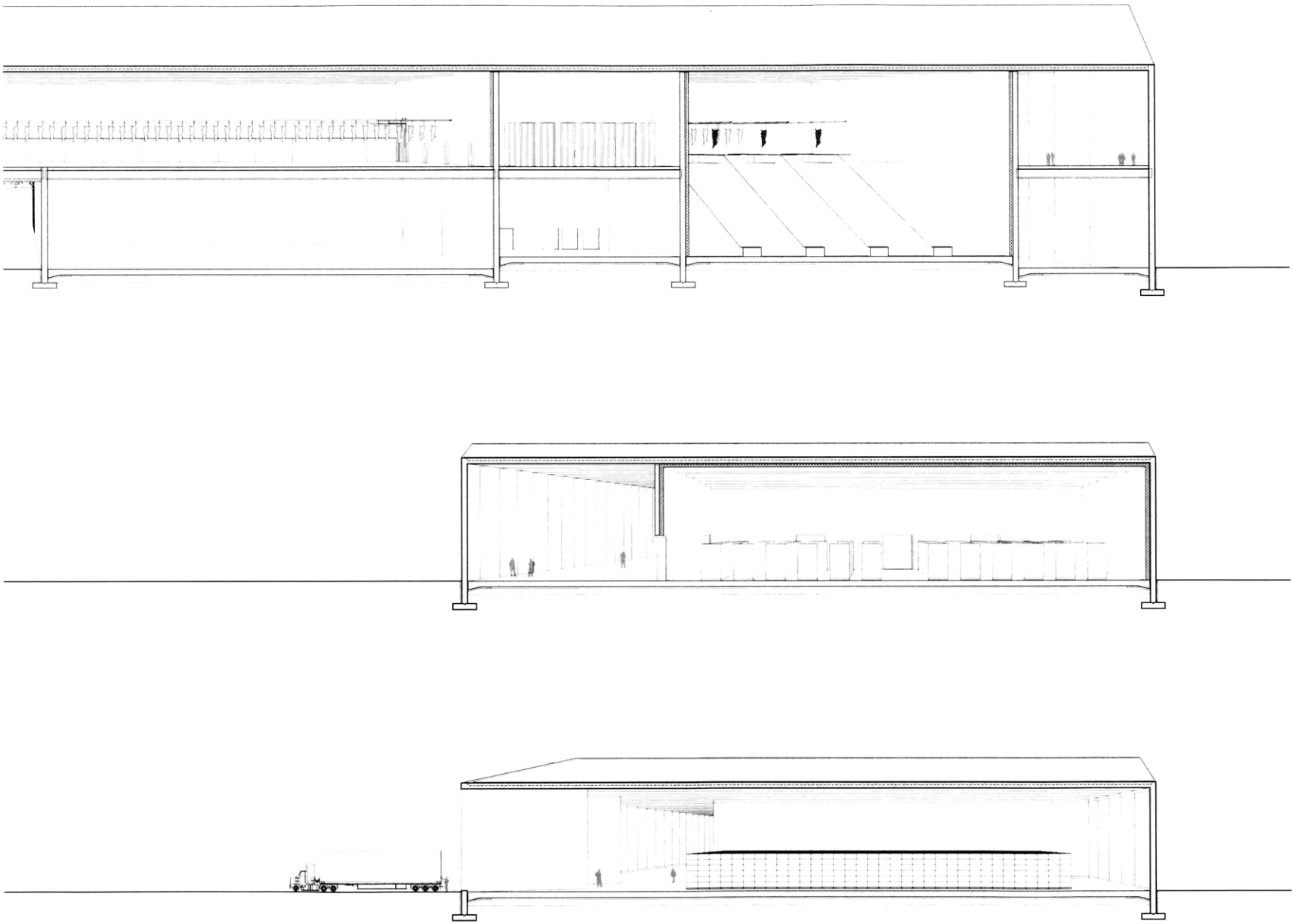




SECTION H
SCALE 1' = 1/16"

SECTION I
SCALE 1' = 1/16"

SECTION J
SCALE 1' = 1/16"



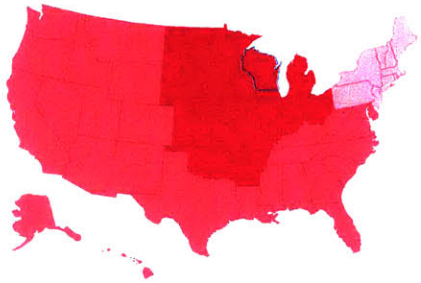
appendices

previous research

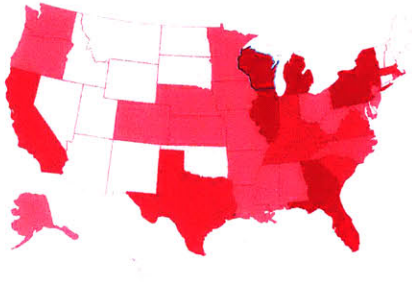
- HIDE 12%
  - HAIR
    - FELTING, UPHOLSTERY
    - PLASTER RETARDANT
    - BRUSHES, ARTISTS' BRUSHES
  - LEATHER
    - SHOES, CLOTHING
    - LUGGAGE
    - LEATHER GOODS
- CARCASS 80%
  - ORGANS
    - EDIBLE
    - PHARMACEUTICALS
      - PEPSIN
      - TESTOSTERONE
      - LIVER EXTRACT
      - THYROXINE
      - EPINEPHRINE
      - ALBUMIN
      - INSULIN
      - THROMBOPLASTIN
      - BILIRUBIN
      - ACTH
  - MEAT
    - FOR HUMAN CONSUMPTION
    - ANIMAL FEED
- BONES
  - FOOD
    - GELATIN
    - ANIMAL FEED
  - GOODS
    - CANDLES, SOAP
    - GLUE
    - BUTTONS, HANDLES, COMBS
- BLOOD
  - FOOD
    - PUDDING
    - SAUSAGE, SAUSAGE BINDER
    - MEAL (ANIMAL FEED)
  - GOODS
    - FERTILIZER
    - WEATHERPROOF GLUE
- FAT 7%
  - FOOD
    - ANIMAL FEED
  - GOODS
    - SOAP
    - GLYCERINE
    - FERTILIZER

SOURCE *PACKERS' ENCYCLOPEDIA*

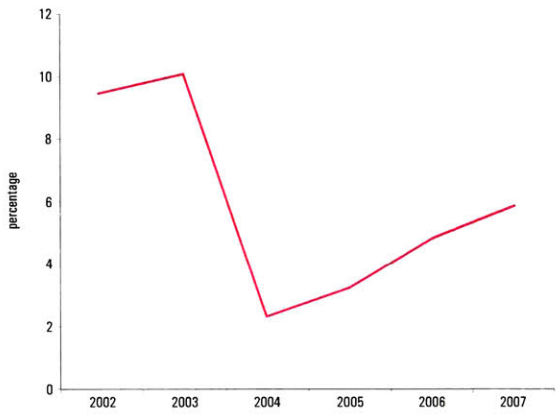
BEEF CONSUMPTION BY REGION



RISK OF RECALLS BY STATE

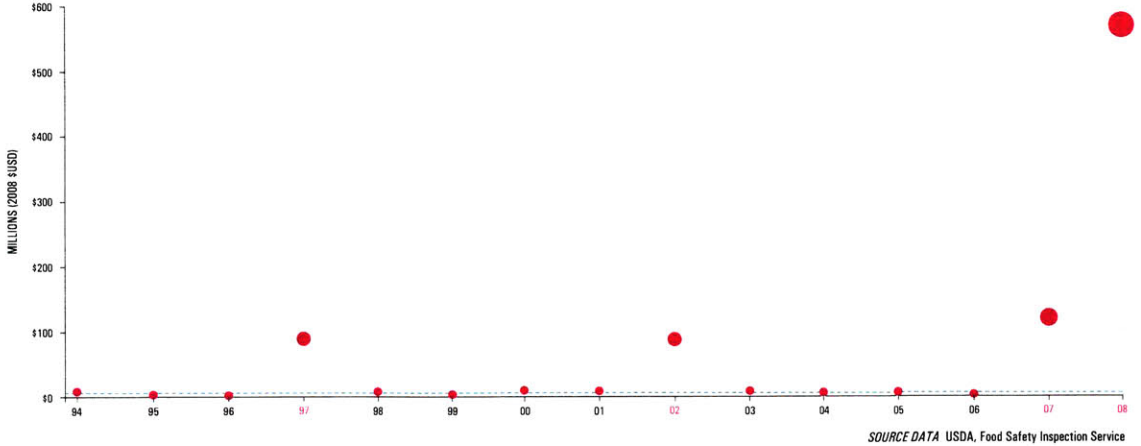


EXPORTS AS % OF PRODUCTION



SOURCE DATA USDA

VALUE OF RECALLED BEEF IN THE UNITED STATES, 1994-2008



SOURCE DATA USDA, Food Safety Inspection Service

LEGEND

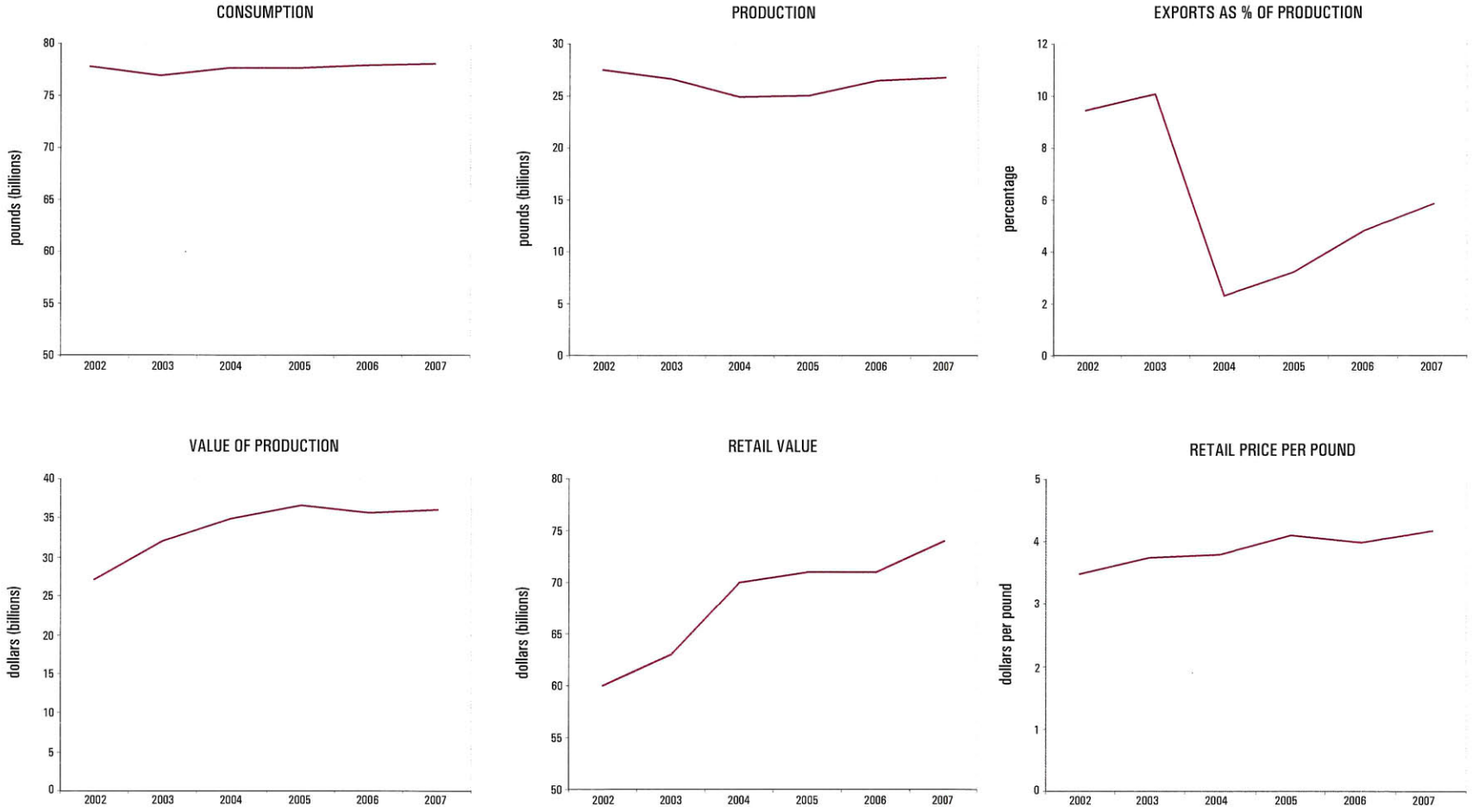
Approximately $8,000,000 worth of beef is recalled each year, most commonly because of E.Coli contamination

AUGUST 12, 1997
HUDSON FOODS RECALLS 25,000,000 LBS of beef processed by a plant in Columbus, Nebraska; the company was later bought by Tyson Foods

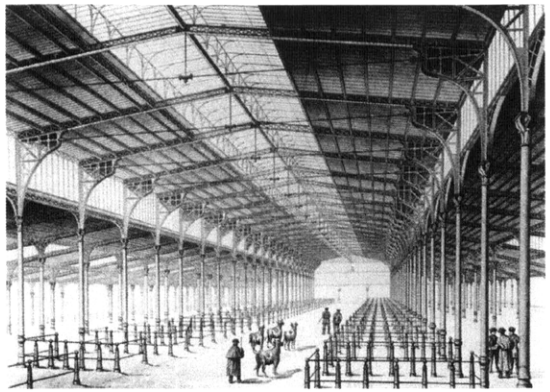
JUNE - OCT 2002
In 4 months, 23,000,000 lbs are recalled by Emmpak, ConAgra, and GFI America; fears of mad cow disease cause exports to drop

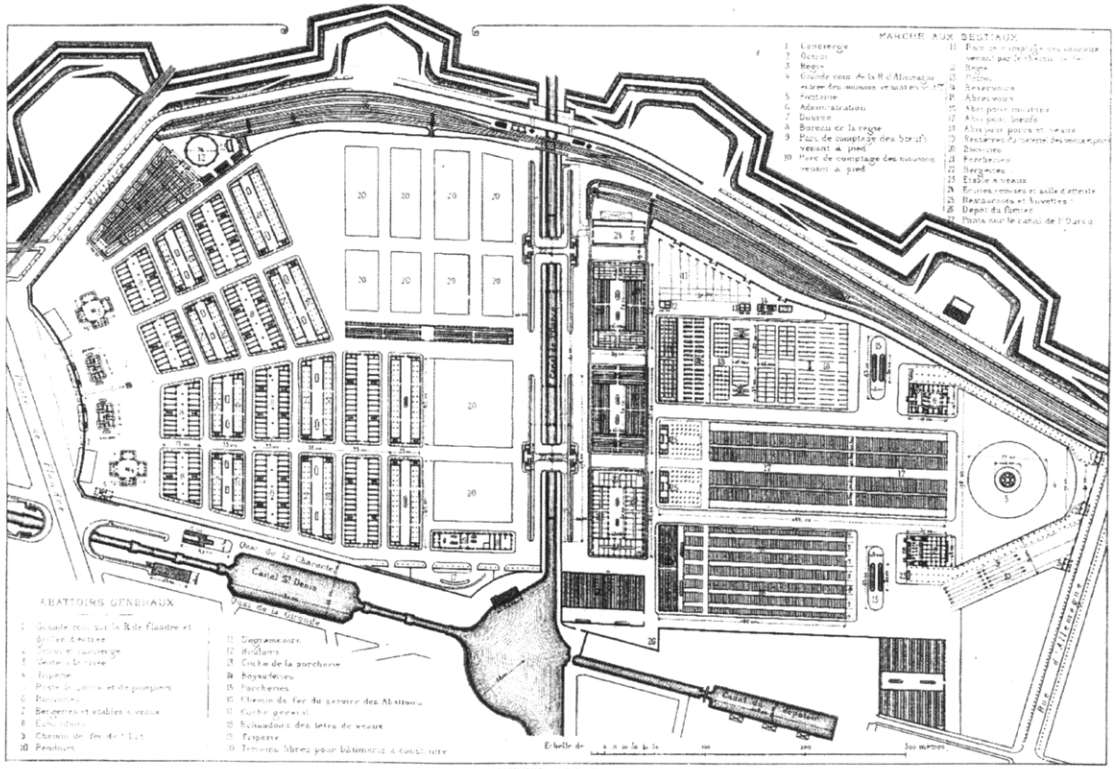
SEPTEMBER 25, 2007
United Food Group, LLC recalls 5,700,000 pounds of beef because of E.Coli contamination

FEBRUARY 17, 2008
Westland/Hallmark recalls 143,000,000 pounds of beef when an activist discovers that workers are using forklifts to force downer cattle onto the kill floor



Source: USDA, 2008





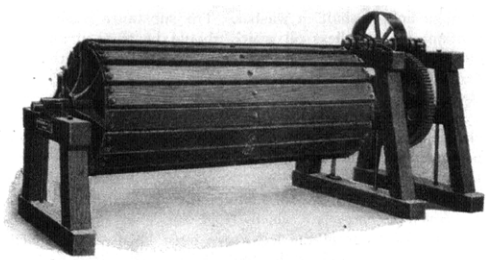


FIG. 64.—REVOLVING BONE WASHER.

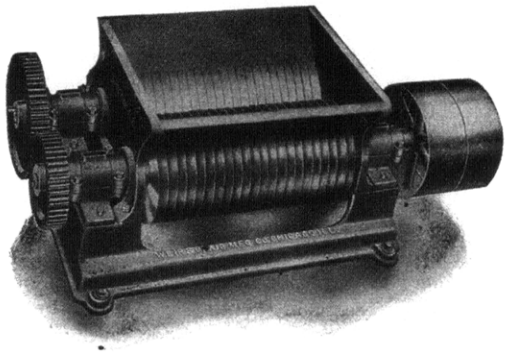


FIG. 53.—OLEO FAT CUTTER.

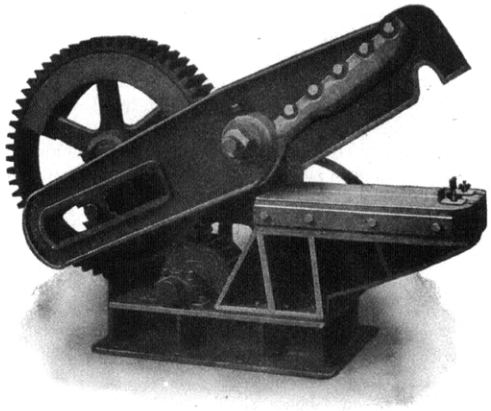
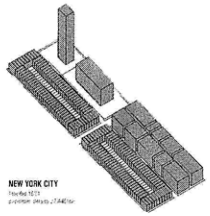
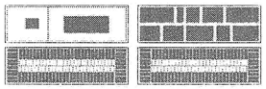


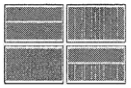
FIG. 60.—CATTLE HEAD SPLITTERS.

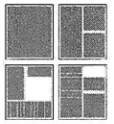
STOCKYARDS AT LA VILLETTE; LATE 1800S MEATPACKING EQUIPMENT

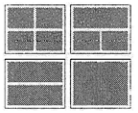
SOURCE: ORLANDINI, 2003 AND WADE, 1987.

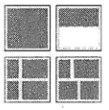


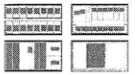


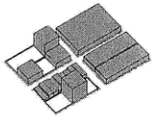


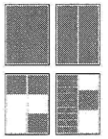


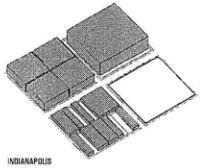


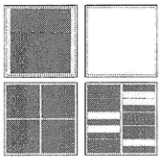


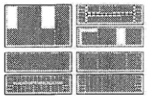


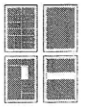


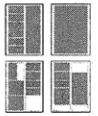


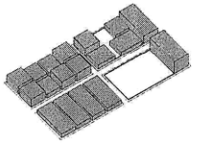


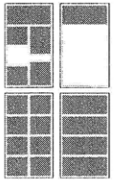












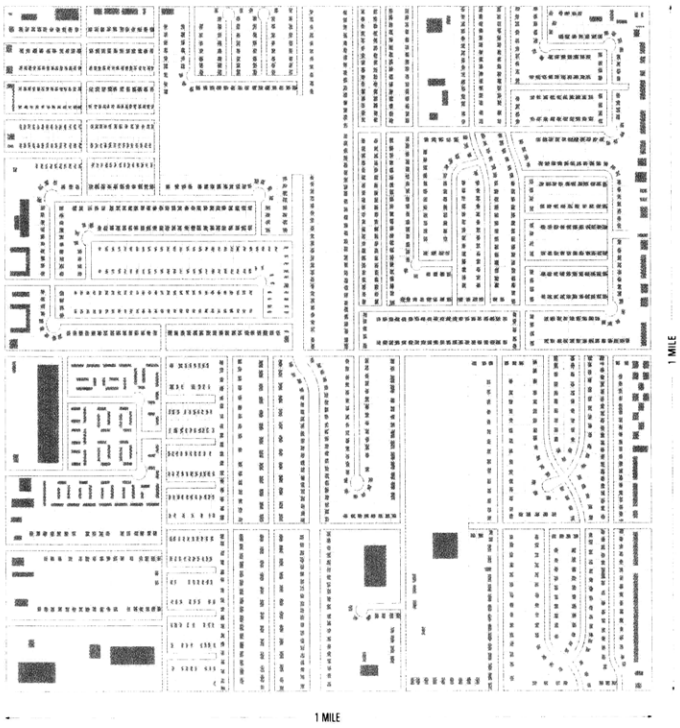
URBAN GRID DIMENSIONS

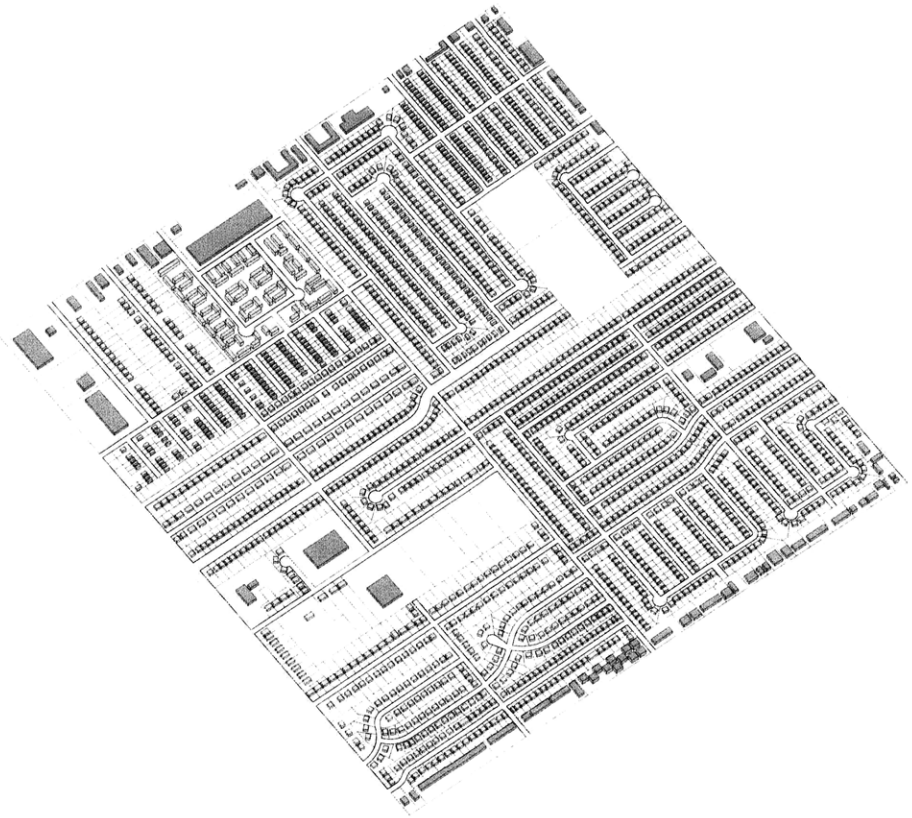
FIGURE-GROUND OF GROESBECK HIGHWAY INDUSTRIAL CORRIDOR

WARREN

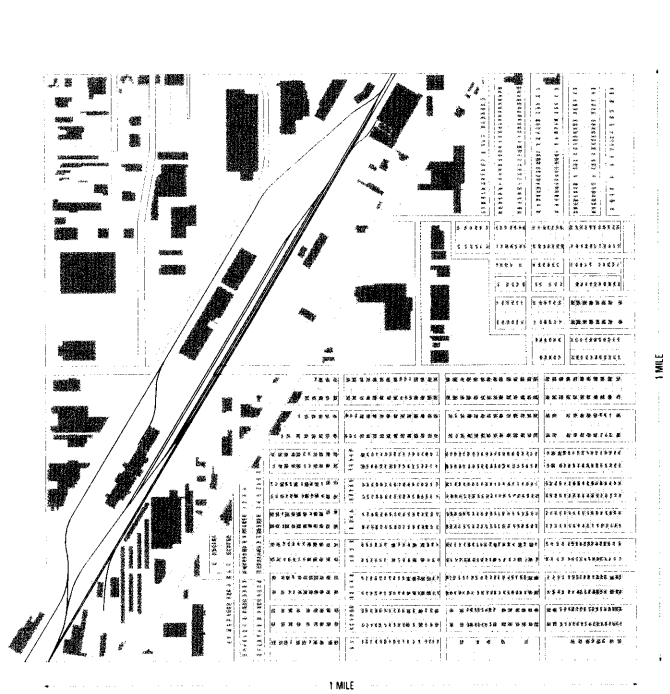
founded 1951

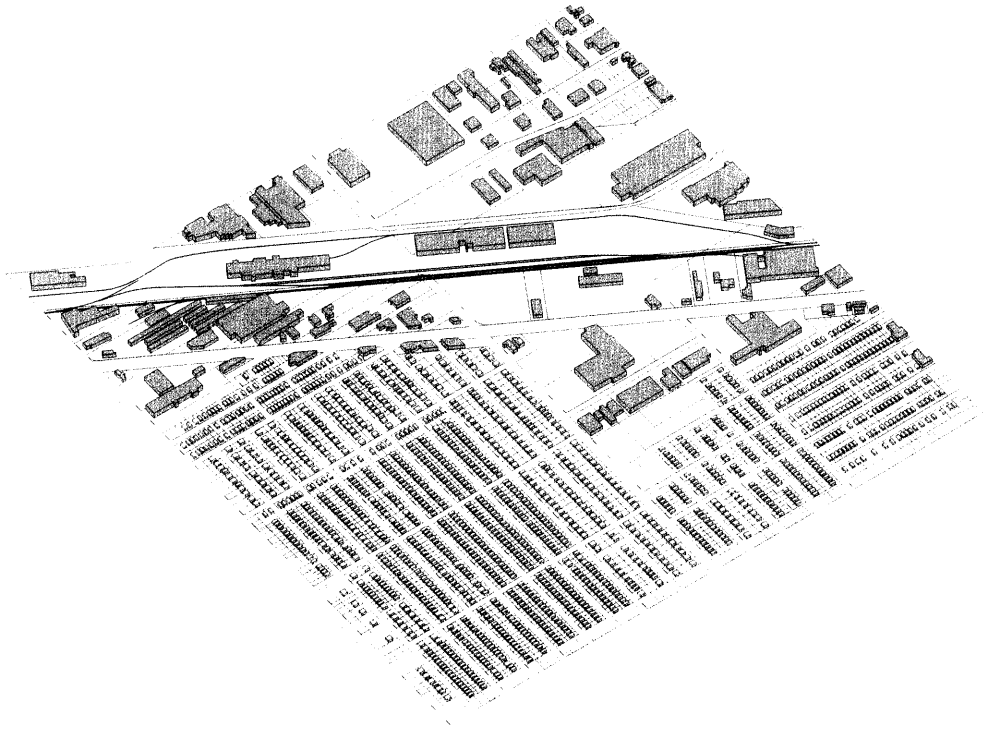
population density 3,904/mi²





① TYPICAL RESIDENTIAL BLOCK





① TYPICAL INDUSTRIAL BLOCK

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Warren zoning map, 2009. Courtesy of City of Warren.

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colophon

This thesis is about sustenance - specifically, nutritional sustenance. To survive this world we need more than nutritional sustenance.

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