Optimizing the Urban Landscape | Omaha, NE

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The College of Architecture at the University of Nebraska
In Partial Fulfillment of Requirements
For the Degree of Master of Architecture
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“After more than two decades of seeing architecture and urbanism as the spatial manifestation of the effects of globalization, it is time to consider the expanded agency of the designer. Designers are increasingly compelled to shape larger scales and contexts, to address questions related to infrastructural problems, urban and ecological systems, and cultural and regional issues. These questions—previously confined to the domains of engineering, ecology, or regional planning—now require articulation through design.” -GSD, New Geographies
At one point in history, the Highway served as evacuation facility from urban areas in time of war. The plan had an adverse affect, however. The highways allowed people from rural areas to pick up and move to urban areas. The automobile industry took off before there were adequate roads to drive on, and to compensate, more roads were built. This resulted in even greater sales in the auto industry. These illogical steps in which the car and infrastructure were sold separately became the model for the development of modern infrastructure. In 1956, Dwight D. Eisenhower signed the Federal Aid and Highway Act of 1956. This seemingly wondrous plan to build 64,000 miles of highway has proven detrimental to the country, encouraging sprawl and suburbanization. The pioneering-America was really catering to a long-standing tradition of infrastructure: a system that stands today as the manufactured urban environment.

This manufactured landscape became the model for global infrastructure. The landscape contours, designed by engineers, are a part of every urban environment. Essentially, the network is “dumb”; it is not specialized to interface with the complexities of the city. The urban fabric concerns that were once short-sited, are still employing the same initiative, yet the span of concern has realistically been ‘long-term.’ Looking at the patterns of the last 25 years, automobiles have shown an explosive growth. New infrastructure, roads, and highways follow the addition of the car. The environment, the landscape, and public spaces of cities will suffer because of the car. The future needs the right balance of the environment, the economy, and technology. Transportation and the infrastructure needed to support the system needs to be rethought before new highways are built and old rebuilt. Moreover, the population is expected to be 9.3 billion people in 2050, compared to 2.5 billion in 1950. Given the amount of change likely to occur in the coming decades, the design process must be started.
While road infrastructure is at the forefront of the thesis, patterns of Omaha’s road history were studied to get an understanding of the deeper issue. The research suggested that the problem with road infrastructure is largely based in the creation of arterial streets. Widening roads and creating additional arterial streets initially reduces costs and reduces delays, however the perceived benefits are far less than the actual cost: more home-sprawl, more business-sprawl, more big-boxes, more strip malls, new construction, more cars. On the other hand, if the congestion can be managed rather than creating arterial streets, the opposite occurs: initial increased delays and increased costs, but overtime, homes are improved rather than relocating in new developments, the encouraged use of alternative modes of transportation, businesses and jobs stay in the original locations, people drive less, own fewer cars, and the vehicle miles traveled per person decreases. How can the congestion be managed in Omaha? The solution is rooted in Omaha’s history: return to the malleability of the grid, and regularize the fabric of the city. The grid is an organizational system that allows for the creation of urban space — the network of streets has a great efficiency to accommodate various functions. Most importantly, the grid distributes traffic, creating more capacity on each street, managing congestion. The proposal of the grid, along with Omaha’s plans for a greenbelt boundary, public transportation, and speed limitations, support a new model of urban mobility through intervention of transportation.

As the grid is reinserted into fragments of the city, reconstructing the city on the basis of empty spaces — voids, large parking lots, and dying regions — the larger arterial streets become obsolete. While I-80 is the only arterial street to remain due to its connectivity to the US interstate system, the highways become geographies of space that needs to be rethought. How can design transform the old highways, Omaha’s new spine, into positive zones that add to the value of the city?

How can arterial, vehicular infrastructure be reprogrammed to anchor valuable channels throughout Omaha?
Through the research and study of road infrastructure, this thesis strives to optimize the urban landscape, investigating the social and the physical, the form and the context, the very large and the very small.
Figure 2.—Estimated status of improvement of the National System of Interstate Highways as to lane width, in 1965.
RESEARCH PHASE I: history of the highway
President Dwight D. Eisenhower understood the value of roads. In 1919 he was aboard the U.S. Army’s first transcontinental convoy, a two-month journey from Washington, DC, to San Francisco, CA, to assess the readiness of military vehicles to make such a long trip and to promote good roads. During and after World War II, he traveled on Germany’s network of rural superhighways, which were studied and envied by American engineers during the prewar 1930s. Eisenhower would say, “The old convoy had started me thinking about good, two-lane highways, but Germany had made me see the wisdom of broader ribbons across the land.”

Today, the Dwight D. Eisenhower National System of Interstate and Defense Highways, commonly called the Interstate Highway System (or the Interstate), is a network of limited-access highways in the United States that is named for President Dwight D. Eisenhower, who championed its formation. The entire system, as of 2006, has a total length of 46,876 miles, making it both the largest highway system in the world and the largest public works project in history. The Interstate Highway System is a subsystem of the National Highway System.
RESEARCH PHASE I: visionary thinkers
RESEARCH PHASE I: visionary thinkers

1. Corbusier
2. Frank Lloyd Wright
3. Norman Bel Geddes
This version of Le Corbusier's plan for the North African city of Algiers, developed to the Chicago chapter of the American Institute of Architects. This version of Le Corbusier’s plan for the North African city of Algerian, developed between 1930 and 1933, represented the culmination of his work on urban design in the 1920s, especially his concept of the ville radieuse, or "radiant city." The architect called this the abus, or “shrapnel,” plan, signifying his ambition to destroy existing urban fabric to make way for new architecture and a better future. His design featured a business center on the docks, a residential zone on the hillside of the Fort l'Empereur, and an immense motorway with homes for 180,000 people below. On the right half of the blue pencil. The plan on the left shows his vision for the city, culminating in the new buildings on the docks, marked in red.
Corbusier: Ville Radieuse

Corbusier formulated a new vision of the ideal city, the Ville Radieuse. It represented an utopian dream to reunite man within a well-ordered environment. Unlike the radial design of the Ville Contemporaine, the Ville Radieuse was a linear city based upon the abstract shape of the human body with head, spine, arms and legs. The design maintained the idea of high-rise housing blocks, free circulation and abundant green spaces proposed in his earlier work. The blocks of housing were laid out in long lines stepping in and out. He exhibited his first representations of his ideas at the third meeting in Brussels in 1930 (although he withdrew the Moscow proposals).
Broadacre City was the antithesis of a city and the apotheosis of the newly born suburbia, shaped through Wright’s particular vision. It was both a planning statement and a socio-political scheme by which each U.S. family would be given a one acre plot of land from the federal lands reserves, and a Wright-conceived community would be built anew from this. In a sense it was the exact opposite of transit-oriented development. There is a train station and a few office and apartment buildings in Broadacre City, but the apartment dwellers are expected to be a small minority.

All important transport is done by automobile and the pedestrian can exist safely only within the confines of the one acre plots where most of the population dwells.
Norman Bel Geddes: Futurama

Geddes writes, “Motor traffic is expected to double in the next twenty years. The radius of traffic is also growing. In the East congestion is rapidly growing to the saturation point. To break up that congestion it is necessary to open up new ways out, to decentralize, to redistribute, to create breathing space—that is the coming need. It is a need that can be met first of all by a national highway policy.” Geddes thinks centralized planning is the best thing, a common viewpoint in the 1930s, hence his calling for a Federal solution to the problem.

Bel Geddes’s book Magic Motorways (1940) promoted advances in highway design and transportation, foreshadowing the Interstate Highway System (“there should be no more reason for a motorist who is passing through a city to slow down than there is for an airplane which is passing over it”).

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RESEARCH PHASE I: editing the highway system
The project puts into question conventional roadway engineering that is based on design speeds and traffic fluidity to propose a new approach based on contemporary traffic patterns, road-way typologies and regional structure.
Minimum Design Speed: 50 MPH
Curves: 5 @ 50 MPH, Total Length = 4,900 ft.
Tangents: 5 @ 70 MPH, Total Length = 19,400 ft.
Speed Change: 10 @ 60 MPH, Total Length = 3,000 ft.
Total = 26,000 ft.

AVERAGE HIGHWAY SPEED - ALT. 1
Minimum Design Speed: 50 MPH
Curves: 9 @ 50 MPH, Total Length = 72,000 ft.
5 @ 55 MPH, Total Length = 4,800 ft.
3 @ 60 MPH, Total Length, 3,100 ft
3 @ 65 MPH, Total Length, 2,900 ft.
Tangents: 3 @ 70 MPH, Total Length = 3,300 ft.
Speed Change: 8 @ 55 MPH, Total Length = 2,700 ft.
9 @ 60 MPH, Total Length, 2,700 ft.
Total = 26,400 ft.

AVERAGE HIGHWAY SPEED - ALT. 2

Min. turning radius for a P-design vehicle, showing paths for left front overhang and outside read wheel.
RESEARCH PHASE I: the highway
Minimum design of median openings (effect of skew)

T and Y Diamond, and Partial Cloverleaf Interchanges for one or two exits

Cloverleaf and Directional Interchanges for one or two exits
Weaving Sections: A latent osmotic property embedded in the specification is the weaving diagram, area where the traffic pattern is not governed strictly by signals or lanes, but is rather made most efficient by being freed from both.

Various Curves in Section: Diagrams of profile grading illustrate the connection between regional effects and local consequences. When field personnel adjusts a grade profile locally to meet a cross street, disruptive geometries adversely effect automobile performance. By extending the range of influence over a broader region, the local condition is mollified.
Highways | Urban areas with pavements providing “unacceptable ride quality”
RESEARCH PHASE I: consequences of the highway system
The HIGHWAY and the CAR

PROS of an autocentric system:

- cars are tools
- they all for individual mobility
- rural areas, cars improve social systems by making it easier for people to associate

CONS of an autocentric system:

- danger to pedestrians, cyclists
- third highest cause of death
- destruction of social systems
- isolation (drivers are not a part of the landscape)
- disturbing the peace
- ”not in my backyard” highways
- limits the city
- poisons the air
- global warming
- poisons the land and water
- resource consumption

### COMPARATIVE PLANS OF TRANSPORT SYSTEMS (drawn to the same scale)

<table>
<thead>
<tr>
<th>System Description</th>
<th>Economic Distance Between Stops or Stations</th>
<th>Passenger or Vehicle Capacity Per Hour One Way</th>
<th>Average Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Car on Surface Street in City</td>
<td>as required</td>
<td>700-900 vph</td>
<td>up to 30 mph</td>
</tr>
<tr>
<td>Private Car on Automated Motorway (Autoline) System</td>
<td>interchange points 2 mile intervals (minimum)</td>
<td>7200-9000 vph</td>
<td>40-70 mph</td>
</tr>
<tr>
<td>Mini Car on Surface Street in City (no other traffic)</td>
<td>as required</td>
<td>2000 vph</td>
<td>30 mph</td>
</tr>
<tr>
<td>Mini Car on Elevated Automated Motorway (Starrcarr) System</td>
<td>as required</td>
<td>3000-5000 vph</td>
<td>15 mph (city use)</td>
</tr>
</tbody>
</table>
(2010) $75.9 billion to $92 billion: Estimated annual spending needed at all levels of government to maintain highway system. Results of the highway:
CONCEPTUAL DESIGN : scheme one, walkable nodes

This design proposal questions the purpose of a city. Cities are an invention to maximize exchange (goods, culture, friendship, knowledge) and to minimize travel. The role of transport is to maximize exchange. In this design, city cores are densified into ‘walkable nodes’ in which the area is no longer accessible by car, but rather by pedestrian only. The nodes are determined by population density. The periphery of the rings becomes a parking garage so access to one’s car is always within a short walking distance. Public rails support the ‘rings’ within and to other nodes.
As population density increases, the “no car zone” increases;

RURAL areas = car accessible;
URBAN areas = public transportation;
UBURBAN areas = obsolete over time;

Long-Term Temporal Method;
01. set boundaries - new ELEVATED rails,
02. create border parking garages,
03. heavily tax cars within said boundaries,
04. no cars within said boundaries,
05. elevated rails are eliminated, all rails on ground.
Why voronoi cell?

For each node, every point in the region is closer to that node than to any of the other nodes. In essence, the center is the point of interest of the district.

Input

Output

Design Strategy | Nodes can be determined by locating areas of interest, or 'attractor' points.

Centric Flow

Would begin with the interest point, or the center of the node. Parking garage located a maximum of 1300 ft (0.25 mi) from node.
rail
garage parking
surface parking
building footprints
water
green/open space

all parking*

new parking structures
open space
future towers

*does not include meter/street parking
Developmental Periods throughout History

outflow: early settlement / exploration on foot / horse
reflow: railway settlement and industrialization
inflow: to urban areas
backflow: to suburbs caused by extreme densities

*centric flow: densified city cores*
CONCEPTUAL DESIGN: scheme two, surface accumulation

Phenomenon: *Induced Demand*

As parking lots decrease, demand of public transportation increases. As parking lots decrease, the demand of living close to one’s place of work increases.

Design strategy: Eliminate downtown parking, replace surface lots with housing, grocery stores, urban living amenities.

“[Parking minimums] distort transportation choices toward cars, and thus increase traffic congestion, air pollution, and energy consumption. They reduce land values and tax revenues. They damage the economy and degrade the environment. They debase architecture and urban design. They burden enterprise and prevent the reuse of older buildings. And they increase the prices for everything except parking.” - Donald Shoup, author of “The High Cost of Parking”
How to get rid of minimum parking requirements?

01. Create population and development density, focus on land use.

02. Public transportation must be available, focus on connectivity, *LEFT.*
CONCEPTUAL DESIGN : learning from precedents
Fort Worth Texas Plan - Victor Gruen

They were advised to dig deep into the heart of their beloved Texas to create subterranean truck lanes, park every arriving automobile, and turn streets within a downtown square mile into a pedestrians’ paradise of shrubbery, statuary, malls, covered walks and sidewalk cafes. The cost ($100 million) would be partially paid in parking fees and through higher tax values. All of parking garages were placed on the perimeter of downtown and current parking lots had new buildings placed on them.

Gruen believed that simply removing automobile traffic from a few blocks of a downtown street in favor of pedestrians was nothing more than publicity gimmick that failed to address fundamental functional problems with downtown cores.

The downtown mall was tried, but planners failed to provide enough convenient parking space; in the Texas long hot summer, the few potted trees they installed did little to shade the wide concrete expanse, and business declined.

City Center Plan for Almere - Rem Koolhaas

OMA has proposed for Almere the essential elements of Gruen’s Fort Worth plan: the downtown ring road connecting major freeways with huge parking garages that access a pedestrian only retail and office environment.

One-third of the city would be dedicated to industry, one-third to housing and one-third to parks and open space. Eighty percent of the dwellings would be devoted to single families, and 70% to low to middle income residents. Sidewalks wide enough for children to play on.

Today, Almere’s only tourists are archi-tourists. Many critics have denigrated this neighbourhood for its lack of unifying identity. “... The dearth of entertainment is so disheartening that many don’t consider Almere a city at all, just a expansive stretch of homes surrounding by a whole lot of agricultural areas and ecological zones.”
Philadelphia Traffic Study - Louis Kahn

*The drawing’s abstract notational system corresponds to different tempos of traffic, such as the stop-and-go movement of trucks and buses (dotted lines), the fast flow of vehicles around the periphery (arrows), and the static of cars in parking garages (spirals).*

He felt that in order to preserve the quality of life in urban environments, people, buildings, and services should be brought to the city center and cars and roadways should be placed on the periphery, or outer edges.

- Ultimately, Kahn’s plans were not considered as part of the redevelopment of Philadelphia due to conflicting opinions within the city planning administration.

Kalamazoo 1980 - Victor Gruen

*The 1959 Victor Gruen Associates Plan, Kalamazoo: 1980, forecasts that over fifty-percent of urban land should be dedicated to parking by 1980.*

- Industry and housing would be pushed to the suburbs as Gruen, a renowned planner of shopping malls, sought to remake the central business district in the image of a suburban shopping mall.

- The unprecedented decision to construct a pedestrian mall in the heart of its business district placed Kalamazoo in the national spotlight in 1959. Today, critics argue that the heyday of the pedestrian mall has passed. Of the over two hundred pedestrian malls constructed in the 1970’s and 1980’s, only a few remain.
RESEARCH PHASE II: understanding congestion
WIDEN ROADS

[PERCEIVED BENEFITS]

- REDUCES DELAY
  - Move Home
  - Range Farther

[ACTUAL COSTS]

- Move Business
- Move Job
- Mega-Boxes
- More Strip
- More Lane Miles
- New Construction

- REDUCES COST
  - Drive Home
  - Own More Cars

Theoretical Traffic Planning

The Reality

Cyclical Widening
MANAGE CONGESTION

[PERCEIVED COSTS]

- INCREASE DELAY

[ACTUAL BENEFITS]

+ Improve Home
+ Use Alt. Mode

- INCREASE COST

+ Drive Less
+ Own Fewer Cars

+ Keep Business
+ Keep Jobs
+ Main Street
+ Less Strip
+ Less VMT
+ Community Reinvestment

4 Same Total Lanes

2 2 More Capacity

6
The “Bones” - the Underlying Structure of the city
Manhattan - the most effective public transportation cities in the US
RESEARCH PHASE II | grids around the nation
No Network = BIG ROADS

Connected Network = SMALL ROADS

“The simple extraction of a grid fragment from a continuous spatial field draws out hierarchies, eliminates choice, implies boundaries, and ultimately generates a closed system.” Albert Pope, Ladders
Cities have been imposed by the excessive presence of the car. The concept of this project is to explore what an auto-centric American city could be, if the city were devoid of its arterial streets, and if the vehicular infrastructure were reprogrammed. The challenge is dealing with the automobile, and managing congestion while removing arterial streets. Conceptually, how can the removal of infrastructure anchor urban growth?
Transportation research has been focused within megaregions, but this leaves several cities out of the study.
A study of *highway removals* in 11 different countries found that *14-25% of the traffic disappeared completely*, and that few if any of the removals resulted in the “traffic chaos” warned of by opponents.
BEFORE
Embarcadero Freeway, San Francisco
“America’s first freeway revolt!”

A 1989 earthquake caused damage to the two-tiered highway structure that separated San Francisco from the waterfront for nearly 40 years. It was a complete barrier. Once the freeway was torn down after the earthquake, land opened up for pedestrians to enjoy the San Francisco waterfront. Today, the area experienced a reduction in total traffic volume, and is used for recreation on a fairly basis.
AFTER

POST-Embarcadero Freeway, San Francisco
POTENTIAL OF ERASURE

Site: I-480 and Hwy 75 interchange in Omaha, NE

Question: If the interchange were removed, what program or activity would replace the highway scar?
The Jeffersonian grid imposed upon Omaha, NE
The grid corrodes as it meets post-war suburban development.
the URBAN VOID logic, based off inventory and analysis of Omaha traffic. Removal of arterial streets.
the URBAN VOID proposes the new development border of North Omaha to follow I-680 to preserve the existing agricultural land.
Light-rail proposal for Omaha, NE; transit hubs as urban activitors.
the URBAN VOID
URBAN VOID: 03 CONDITIONS

The urban void is split into three conditions. Each condition has unique characteristics of the void. The conditions are as follows:

01. URBAN CORRIDOR - the highways that are primarily along residential and urban corridors, road infrastructure between the interchanges.

02. BORDER - the new proposed border along I-680 becomes its own condition, functioning as the edge of the city.

03. INTERCHANGE - the interchanges are all unique in spatial characteristics and land formation due to the complex grading of the site, so they, too, become a distinct condition within the urban void.
Hwy 75 exemplifies the Urban Corridor condition. The neighborhoods are stitched together with the Urban Void proposal.
Barrier, existing condition

Neighborhoods connected with grid

Neighborhoods connected with grid

New fabric

Public light-rail transportation runs along corridor

Land becomes open for development or park space.
NEW DEVELOPMENT ECONOMIC

Eight lanes of traffic reduced to four lanes + 55'-0" additional ft of developable land

URBAN CORRIDOR | Developable land around the Urban Void creates profit for the city.
TAX MAP - Omaha
URBAN CORRIDOR | Site 50th and Dodge Street, Dundee Theater

BEFORE
BORDER CONDITION | Proposed border along I-680
IF YOU COULD DESIGN THE EDGE OF THE CITY, WHAT WOULD IT LOOK LIKE?
OMAHA POPULATION [2010]: 408,958
LAND: 15,419,968 ft²

= 6’x6’ plot of land/person
BORDER CONDITION

If you could design the edge of a city, what would it look like? This proposal suggests that based upon the Douglas County population census, every ten years the land would be divided. Each person has their own plot of land. Using the 2010 census data, each person gets a 6’ x 6’ plot of land. Individuals can merge plots of land to share a space to allow for a larger program.

Within the thesis studio, a poll was taken: “what would you do with your plot of land?” The proposals are as drawn, on the right.
BORDER CONDITION | physical model
INTERCHANGE CONDITION | 2'-0" contours of Hwy 75 and I-680 site
I-480, HWY 75, + US-6 INTERCHANGE, BEFORE
I-480, HWY 75, + US-6 INTERCHANGE, AFTER
INTERCHANGE CONDITION | aerial of site

Interchange as barrier

Grid stitching city back together

Important site connections

Site connections as Master Plan Vision
Interchange as barrier
Grid stitching city back together
Important site connections
Site connections as Master Plan Vision
Sequence of building form
Buildings bridge with existing grades over roads
BEFORE
Optimizing the Urban Landscape
all conditions_URBAN VOID
Final Presentation
Thursday, April 7, 2011, 1:30pm
Architecture Hall, East Gallery

Jurors

John McDonough | University of Michigan
Jeff Day | University of Nebraska-Lincoln
Sarah Thomas | University of Nebraska-Lincoln
Steve Hardy | University of Nebraska-Lincoln
Chris Ford | University of Nebraska-Lincoln
Brian Kelly | University of Nebraska-Lincoln


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Steve Hardy, ditto. I’ll keep it short.

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