Interstices: the Architectural Appropriation of Transportation Infrastructure in the City Center

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The Urban Interstitial Condition

This paper is a synopsis of ongoing design research regarding the urban edge or interstice, "a space that intervenes between one thing and another."[1] Interstices may be the result of intentional incisions, as in the insertion of a limited-access highway into an established urban order, or may open up within the unorchestrated processes of urban change. In all cases, however, interstices produce discontinuities in the physical and even social fabric. Given current concern with the uncontrollable physical dissolution of the North American city, this paper focuses on those linear indeterminate spaces within the morphological continuity of the central city—voids created by changes in the technologies of mobility. The condition under study occurs within dense North American cities largely developed prior to extensive 1950's highway construction, thus excluding urban configurations like Atlanta, Houston or Dallas. The pervasiveness of urban interstitial spaces prompted investigation of their potentials, the disciplinary complexities involved in their reconfiguration, and the following research question: Can specific strategies be identified for the reconfiguration and regeneration of interstitial space, particularly through strategic architectural appropriations of transportation infrastructure? Although the investigation focuses primarily on physical form, a range of issues are considered and often challenged, such as implementation mechanisms, political complexities, land values, and environmental concerns. This project argues that design ideas can positively influence those parallel considerations.

The landscapes of both active and underutilized limited access transport systems present opportunities to simultaneously invigorate negatively impacted adjacent spaces, increase physical engagement through urban density, reduce rural development pressures through urban infill, and support design exploration at the intersection of architecture, landscape and urbanism. In these locations, a strong correlation between urban morphology and architectural typology has not developed. Rail line and highway air rights and right of ways offer architectural sites with the potential to restructure or suture these cuts in the urban fabric. How then can the presence of dynamic movement lines become a positive force in contemporary urbanism?

Design Precedents

This question was examined in the 1960's, when a brief and intense interest in Joint Transportation Development was spurred by 1961 Federal Highway legislation that legally sanctioned airspace use above and beneath federal highways for the first time.[2] Many design proposals, government studies and Federal Highway Administration publications, such as the Highway Joint Development and Multiple Use Study and A Book About Space, promoted the concept with the following lofty language.

> Where is to be found the answer to the troubling space problems of our cities and their citizens?
>
> It is being found
>
> ...above, below, and around the urban highways we are building today
> ...and those we must plan for tomorrow
> ...in the farsighted, imaginative use of what was once called 'waste space' in our cities
> ...in the willingness and ability of urban planners, highway builders, community leaders and private talents to cooperate in the wise development of multiple
> uses for America's untapped urban space potential.
> Highway developers and urban planners call these answers 'Joint Development'
> ...the planned use of land and space for more than one purpose.[3]

The Federal Highway Administration's 1968 report, A Book About Space, stated the objective of Joint Highway Development as "a higher measure of compatibility between the highway facility and its environment. This attainment may be measured in terms of savings and replacements as to land, money, public facilities, time, land uses or in terms of area improvements to be made at the opportune time of highway construction."[4] Given mounting public resistance at that time to federal highway construction and associated urban devastation, we must question the seemingly benevolent nature of this government

initiative. However, designers of the time were also intrigued with conditions created by highway insertions within the city. Lawrence Halprin's 1966 book, Freeways, proposed compelling sectional designs for highway "condensation." A "one up one down section" (a local road at grade with one direction depressed and the other elevated) and his interlocked and incremental "traffic architecture" creatively engaged urban highway interstices.[5]

Highway megastructures were also proposed as a means of urban renewal.[6] Paul Rudolph's Lower Manhattan Expressway proposal entitled City Corridor combined a planned cross-town highway and rapid rail spine to structure a linear architectural insertion. Rudolph's accompanying project text stated, "Out of these investigations comes the implicit suggestion that urban throughways and city transportation systems of all kinds should be recognized as a major generator of urban form, as meaningful—even fundamental—elements in urban design."[7] Rudolph understood a transportation corridor as "a continuous volume of space in which the transportation system is but one potential and appropriate element."[8] This understanding guided his sectionally complex sequence of interwoven architectural programs and forms related to specific conditions along the length of the highway cut. For example, the section parallel to Soho matched the height of that district, while the project dramatically increased in height to form an immense urban gateway at the Williamsburg Bridge. Fortunately the Lower Manhattan Expressway was not built, but the complete synthesis between architecture, urban form and transportation infrastructure is compelling nonetheless.

Prior to the 1960's, early twentieth century urbanists also envisioned interwoven architecture and transportation infrastructure. Examples are linear cities such as Edgar Chambless' 1910 Roadtown and Le Corbusier's Fort l'Empereur project from the 1931 Algiers plan, Hugh Ferriss' optimistic combination of technology and colossal forms in Metropolis of Tomorrow, and the circulational complexity of New York's Grand Central Station. The Futurist Sant'Elia arrayed a three-dimensional network in and around buildings to provide "routes for cars, lifts, trains and especially for the transport of energy to suggest rapid and racing movement in the monumental weight of building volumes. Like an abstract latticework, the new network of traffic routes is to lie over the city, land and continent. Architecture becomes a receptacle for movement."[9] Perhaps this paper proposes an inversion of that equation—spaces of movement become a receptacle for architecture.

Frequently the urbanists' fascination with transportation infrastructure made buildings and spaces secondary to the means of conducting inhabitants from place to place. Movement in the void, along one of any number of axes rather than in a defined space, had become the measure of the new city. As Adolf Rading wrote in 1928, "It seems that we are gradually coming to the point of directing all of these movements, horizontally as well as vertically, into special paths, making them visible and transparent, and of building the large and distinct framework of the city out of them; in comparison, that which we at present call a building is merely something secondary and small, a point of rest, utterly removed from the great construction of movement, yet completely determined by it and incorporated into it."[10]

The complex networks of interwoven architecture and high-speed circulation imagined by early twentieth century visionaries, for the most part, never materialized. However, the limited-access highway changed the inter- and intra-city interstitial voids in ways these visionaries could never have imagined. A chronological examination of highway cross-sections reveals a dramatic increase in right-of-way dimensions and overall space allocations, supposedly in response to increasing safety standards. Inflated highway design criteria changed little when inserted into dense metropolitan conditions. The resulting urban devastation was a shock for President Eisenhower, who upon seeing a 1959 highway construction site in Washington, was surprised to discover that his "national defense highways" extended into and even through cities—rather than distributing traffic via multiple arterials.[11] If we must accept the presence of urban highways, can we again create positive visions for the engagement of architecture and high-speed movement?

The current restructuring of transportation infrastructure, necessary as a result of post-industrial urban changes and aging highway structures, affords an excellent opportunity to open this inquiry again. Certainly difficulties exist in the sheer size and complexity of such projects, which require complicated political and technical coordination. Recent increases in large-scale public/private partnership projects bode well for a coordinated approach. Although the exponential outward flow of urbanization cannot be checked by these strategic densification efforts, the recycling of vast tracts of inefficiently consumed urban land is environmentally proactive. Rather than conceive of such infrastructural "non-places"[12] as impossibly difficult, we must be receptive to these hybrid and heterogeneous spaces where potentials for the making of the city, architecture and landscape coincide.

Design Research: 3 Interventions / 1 Boston Site

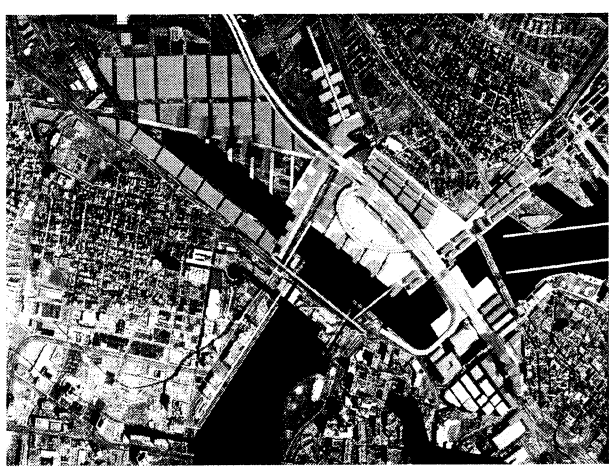
In response to this challenge, a series of design research projects by Michael Petrus and I investigated specific physical tactics in three projects for a single Boston site. The primary strategies explored were: layering of transport infrastructure and architecture, formal and programmatic hybridization, and programmatic transformation of disused infrastructural elements. These strategies were not meant to be exhaustive or restrictive, but merely worked as a means of initially structuring the inquiry.

1. Layering of Transport Infrastructure and Architecture: North Point District + Rail Terminus

The use of transportation systems as a device for separating distinctly zoned uses, and the design of movement lines as autonomous elements within the overall circulation network were approaches frequently employed by twentieth century planners and architects. Contemporary cities bear the physical consequences

of what Joan Busquets calls the "fatal dualism between infrastructure and architecture."[13] The emergence of the traffic engineering profession contributed to the increasingly independent, purely functional design of transportation systems. Complex urban issues were optimally "solved" by separate disciplinary specialists. However, the roles ordinarily filled by planners and traffic engineers again are becoming the realm of architects, landscape architects and artists. This change is occurring because of Federal highway legislation such as the 1991 Intermodal Surface Transportation Efficiency Act (ISTEA) and the Transportation Equity Act for the 21st Century (TEA-21), as well as renewed interest in infrastructural issues by designers. Possibilities exist for new urban typologies in a more complex spatial, environmental and functional layering. This idea is certainly not a new one. Historic precedents exist in the multi-level Pont de Passy in Paris, the compressed infrastructure of Chicago's riverfront Wacker Drive, and the Brooklyn-Queens Expressway, where vertically stacked traffic lanes culminate in an upper level pedestrian promenade. Another New York example spans the Cross-Bronx Expressway with a series of four apartment towers, Pierluigi Nervi's 1965 three-level bus station, and a subway station beneath the highway. OMA's urban configuration for Eurolille is a more recent project that adopts this layering strategy. New and existing railway stations and tracks, highways and subterranean parking garages interlock with office and residential blocks to artificially create what Koolhaas terms "a culture of congestion—the metropolitan condition of functions interacting to spawn unpredictable new ones." [14] Originally elaborated in Delirious New York, this idea relies primarily on programmatic conflict and compression.

The underutilized marshaling yard of Boston's North Station provided a site for our exploration of infrastructural layering. An area of numerous edges and voids within the shadow of the planned Central Artery highway interchange, the site is a wasteland bordered by four cities: Boston, Charlestown, Somerville, and Cambridge.



The many river crossings that play a key role in the history and future of the site allow for the linking and layering of architecture, landscape and infrastructure—thereby creating a legible piece of the city where one had not existed. The project bundles dam, rail, road and pedestrian circulation to reduce haphazard river crossings, minimize environmental impact and visually uncover the Charles River. This revealing allows the river to again become central to the four cities that meet at its edge. The existing Charles River Esplanade, a pedestrian circulation system, is extended around the new basin and reclaimed tidal marsh that had been slowly infilled over the past two centuries. Restoration of this water body serves three purposes: it defines the East Cambridge edge, ameliorates flooding, and increases available water frontage for public recreational space and architecture. Development areas are strategically inserted between the four cities' urban morphologies and the reconfigured basin. These new insertions are conceived autonomously from one another, allowing for an incremental development of pieces over time. Large program uses such as big box retail and athletic facilities are sandwiched between the elevated highway and submerged rail line. Playing fields are enclosed within the sloping earthen embankment of the highway interchange. The layering strategy is extended to the architectural scale as the raised highway deck becomes the roof for a relocated North Station rail terminus, which in turn sits atop a new Charles River dam.

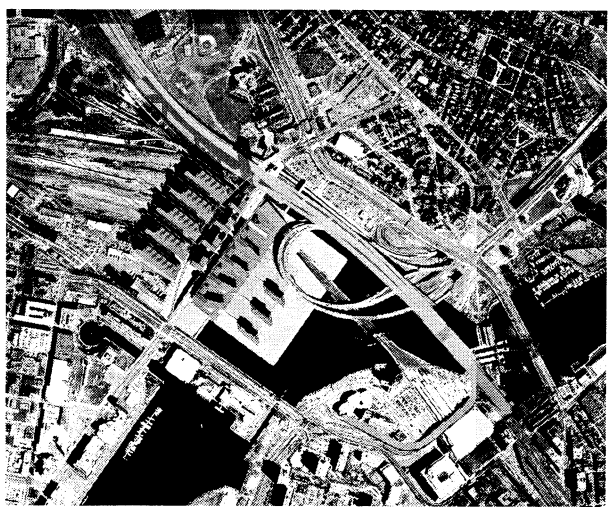
Ultimately, a hybrid of new and existing transportation systems and architectural programs emerges.

2. Formal and Programmatic Hybridization: North Point Intermodal Transport Intersection

Such occasions for formal and programmatic hybridization are frequently found within the vast spaces and crossings of multi-level highway interchanges and railway lines. Even the particular building type, train station as terminus, has been replaced by that of interchange—a place that connotes someplace else in a web of transportation infrastructures within and between cities. For example, many European stations are being reconfigured to respond to these programmatic shifts. Michael Wilford & Part-

ners' Bilbao Transport Interchange project valiantly accommodates the intersection of three rail termini, a bus station, a new subway system and a parking structure, with shops, offices, hotel, post office, housing and a public plaza. As a catalyst for regeneration of the medieval quarter, the project allows three public streets severed by the nineteenth century railway to pass through and reconnect with the contemporary center. Perhaps even more complex is Norman Foster and Partners' proposal for the King's Cross Transport Interchange in London. Multiple new and existing rail lines, the Underground system and the Stanstead Airport link intersect beneath an immense vaulted space. This new interchange organizes a 125-acre site containing two great train stations, a multitude of historic industrial buildings, vast marshalling yards and a proposed central park. Formal and programmatic hybridization strategies informed another of our design investigation on the same Boston site.

The second Boston project again accepts the planned Central Artery interchange and incorporates the highway into an intermodal transport intersection.



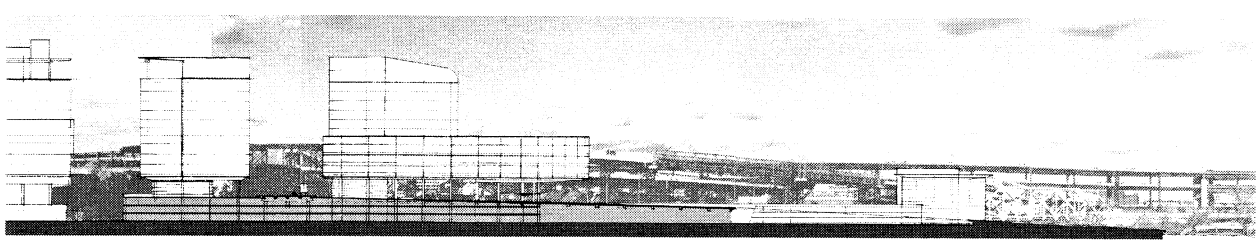
All circulation modes cross through the new canted surface of the site—a plane raised to match the height of an existing bridge connecting Cambridge to Charlestown, and angled to meet the river edge. Vast parking decks and rail connections are situated beneath the artificial plinth, while residential and commercial activities occur above.

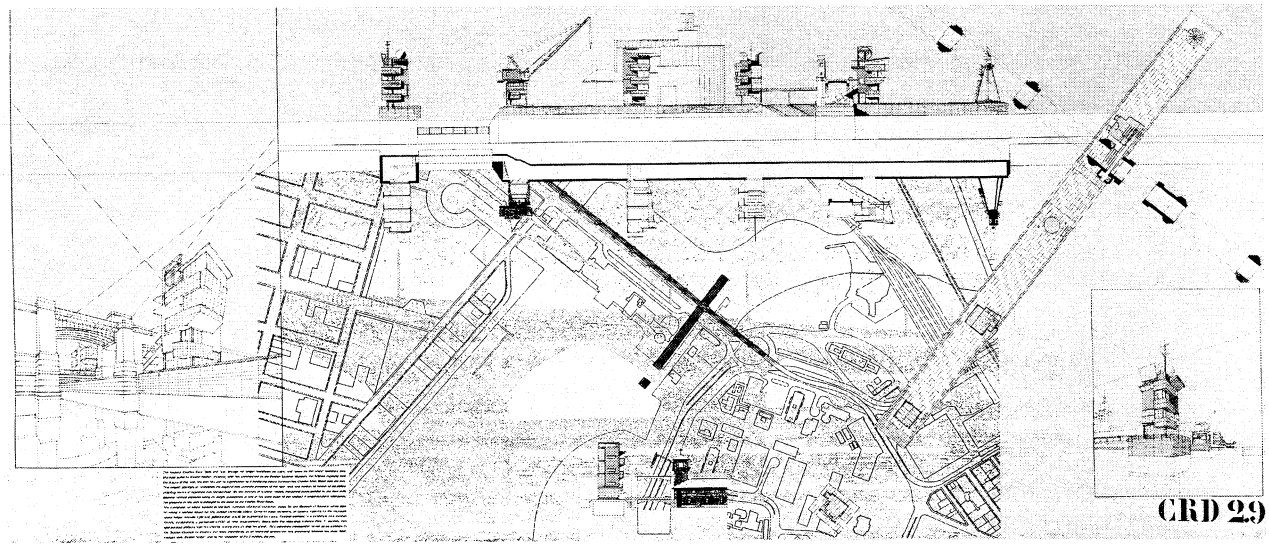
With the purpose of stemming the flow of cars from the north, the highway enters the enormous parking garage via dedicated ramps, where connections to commuter rail and subway lines are made. This intervention is also a catalyst for regeneration of the marginalized area to the northwest with the creation of new blocks and activities. Buildings are raised above the plinth to allow circulation across this public landscape that continues the esplanade along the Charles River Basin. The scheme appropriates the vague terrain at the meeting of four cities: Boston, Charlestown, Somerville and Cambridge. Rather than colliding or resolving the four shifted street grids as in the first project, this project makes a fifth zone, asserting the intersection of transportation infrastructure, public open space and political boundaries as a discrete landscape object.

3. Programmatic Transformation of Disused Infrastructural Elements: Charles River Dam + Lock

The third strategy, the programmatic transformation of disused infrastructural elements, preserves the physical integrity of the existing object or space while developing a new understanding through a change in use. This transformation may occur within a landscape of infrastructural systems or at the scale of a specific architectural artifact. At a large scale, Von Gerkan Marg Architects have designed projects for a number of underutilized, German railway marshaling yards. In the proposed Munich and Frankfurt projects, tracks are submerged to avoid the raised ground plane problem while recovering land for a linear park. Bringing fresh air into the city and structuring urban development, the park is a synthesis of ecological and transportation requirements. An excellent example of a re-programmed, redundant infrastructural element is the Bastille Rail Viaduct, which cuts across Paris' twelfth arrondissement. Built as part of Haussmann's improvements, closed in 1969 and slated for demolition in the mid-1970's, the viaduct's potential as an elevated promenade finally became apparent. Architect Patrick Berger maintained transparency through the vaulted viaduct spaces while supporting new activities within. This strategy of programmatically transforming obsolete infrastructure was investigated in our third project for the Boston site.

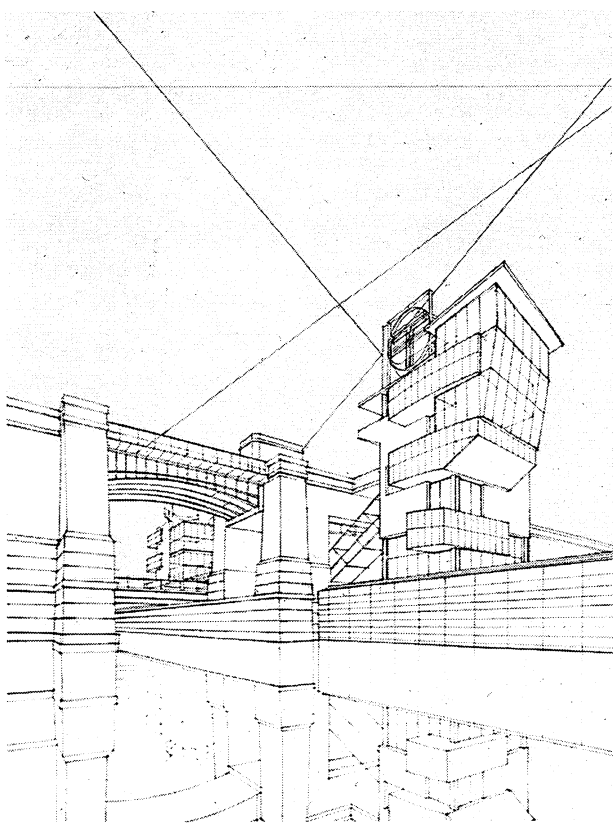
The original and historically significant Charles River Dam and lock, no longer functional having been replaced by a larger lock downstream, still serves as the visual terminus and physical outlet to Boston Harbor. However, the significance of the dam and lock as mediating devices between the Charles River Basin and the sea has been lost with the disuse of the lock and





unfortunate construction of the Museum of Science on the earthen dam itself. Through the addition of a raised, horizontal plane of museum program parallel to the lock and perpendicularly intersecting the viaduct, the physical and symbolic presence of the lock is enlarged to the scale of the Charles Basin.

This museum plinth connects to the existing Museum of Science below grade and provides a surface datum for outdoor exhibits above. Two appropriated artifacts from the Charles' history sit atop the plinth, while tower elements bring light and views to Museum galleries below. By relocating the elevated T Station, now stranded inside a busy traffic circle, travelers engage in the dramatic intersection of viaduct and lock.

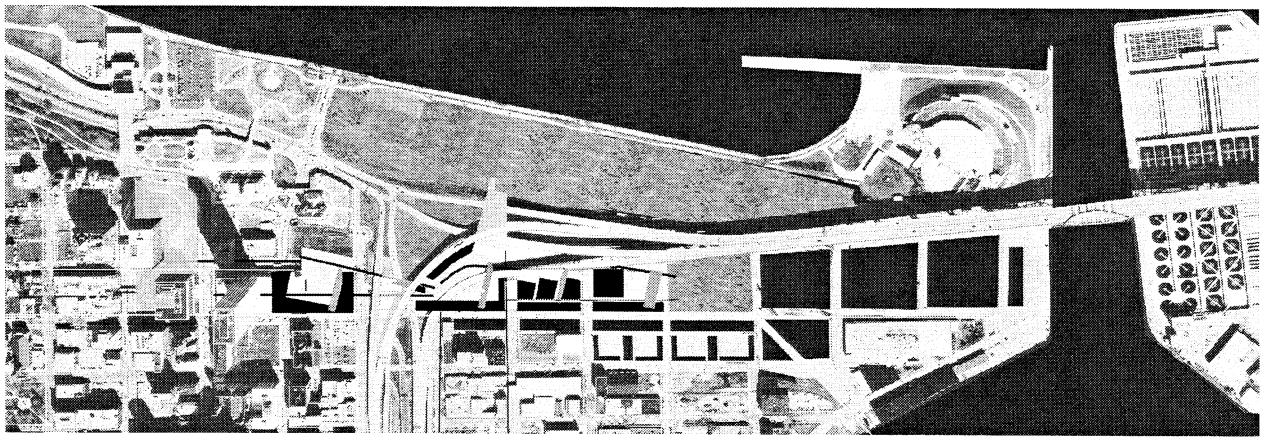


Disembarking through the new station tower into the shadowy underbelly of the previously inaccessible viaduct, the interstitial space of the viaduct becomes a space of mobility. Although the programmatically transformed lock and viaduct support a new museum and public transit stop, perhaps more important is the regenerative potential of the improved connection between the river, dam, viaduct, disused lock, Boston Harbor, and by the relocation of the T Station, the city.

While the previous precedents and design research projects vary in scope, geographic location and program, they possess two common characteristics. Each is located within an interstitial space left outside the growth and consideration of the city, and each is created by and understood in relation to limited access transportation infrastructure. Although the above projects are rooted in particular sites, the conceptual bases are translatable.

Studio Exploration: Milwaukee I—794

A linkage was made between our design research and a graduate architecture studio that I taught at the University of Wisconsin in the fall of 1999. A pedagogical model based on both research and design allowed the students to explore the above strategies and conceptualize new ones. The studio focused on a de-densified, inactive area of downtown Milwaukee bounded on two sides by water and on two sides by the elevated I—794 expressway, which harshly separates the Central Business District from the "historic" Third Ward. Although Mayor Norquist and the Department of City Development recommended removal of the elevated highway and replacement with an on-grade boulevard, the Wisconsin State Legislature recently rejected the proposal and allocated funds to rebuild the aging highway. The decision was supported by a traffic study claiming that the proposed surface road could not absorb current and projected traffic volumes. The studio accepted the existence of the elevated highway, but investigated new formal and programmatic possibilities for the relationship of highway and city. Students collaborated to conceive ideas for the four urban edge conditions. Individual students then elaborated those concepts into specific formal strategies and architectural projects that engaged the elevated highway. While the number and complexity of the studio projects preclude in depth examination here, the work of a few students serves to exemplify the range of ideas.



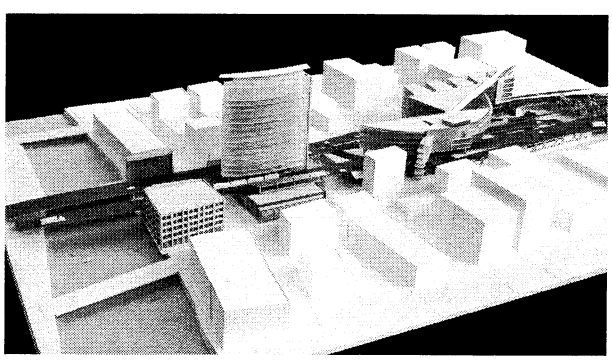
1. Eastern Edge: Through / Along (Christopher Fischer, Douglas Gerlach)

The eastern Lakefront edge of the Third Ward has a history of infrastructural devastation—first the railroad and later the highway cut through this district leaving the land virtually uninhabited. The project seeks to reclaim this evacuated landscape by appropriating the highway into a larger parallel architectural armature that reconnects the now-fragmented city by four primary means.

An integrative sectional swath extends the Central Business District's second level and connects through to a major public open space to the south. A transportation interchange collects three vectors of traffic at the 'eye' of the highway. A de-privatized lakefront park connects laterally to the normative Third Ward street grid and longitudinally to the Milwaukee Art Museum Complex, and a series of mutable tower-object elements mediate between scales, adapt to, and spatially transform highway and pedestrian realms. The towers visually allude to and align with both the industrial iconography south of the site, and the office and residential towers to the north. The highway passes through the architectural armature as it turns south and departs the downtown, forming a strong urban gateway for Milwaukee.

2. Northern Edge: Enframe / Between / Above + Below (Michael Jelinek, James Medinger, Tarun Kumar)

The northern edge contains the I—794 highway cut that bifurcated downtown Milwaukee in 1962. This act created two distinct edge conditions and two separate time zones—the time of industrial growth (Third Ward) and the time of contemporary development (Central Business District). The highway itself became the site of an intermediate zone—the time of high-speed motion. The project overlays three sequential architectural interventions into the linear highway interstice.



Motorists are now enframed by a strong portal as they cross the Milwaukee River into the downtown. The second architectural intervention occupies the ample space between opposing travel lanes with a hotel tower, while street related program is situated beneath the highway. Linking the two vertically stratified realms, a three story internal public space running the length of the block joins street level with a new light rail line that appropriates two highway travel lanes. Situated where the highway on/off ramps meet the city grid, the third project uses an above+below strategy to create interlocking layers of activity. A diagonal, internal circulation spine bridges the highway and connects the diverse building program with street level. The complex formal geometry of the project creates a series of experiential events for both motorists and building occupants. Finally, an intermodal transportation interchange, shared with the eastern edge project, concludes the highway sequence. By physically engaging the elevated highway, these students examined issues of vertical layering and intersection, visual perception and movement in the city, scalar shifts, and the generation of activities by programmatic combinations among others. Formal strategies ranged from suturing to accentuating the interstitial space. The research value of these design investigations is in the embodiment of conceptual strategies and the resulting physical evidence of their potential.

The long-term objective of this research is to produce a Primer, Design Strategies for the Reintegration of Transportation Infrastructure within the City Center, intended as an educational device for mayors, planning officials, transportation engineers, architects, developers and citizens. Perhaps the published results could be an impetus for change in the interstitial spaces of transportation infrastructure existing outside the active life of the city.

NOTES

1 Interstice is derived from the Latin word interstitium-"to stand still or stop in the middle of something". Webster's Third International Dictionary, unabridged edition.

2 Real Estate Research Corporation & the Office of Research and Development Bureau of Public Roads, A Study of Airspace Utilization (US Department of Transportation, Federal Highway Administration, June 1968), p.1.

3 US Department of Transportation, Federal Highway Administration, A Book About Space (US Government Printing Office, 1968), p.1.

4 Ibid., p.2.

5 Lawrence Halprin, Freeways (New York: Reinhold Publishing, 1966), p.95.

6 See Reyner Banham, Megastructure: Urban Futures of the Recent

Past (London: Thames and Hudson, 1976). It is important to distinguish between a megastructural approach and the strategic project insertions that are discussed later in the paper. Banham cites Ralph Wilcoxon's 1968 definition of megastructure as "not only a structure of great size, but...also a structure which is frequently: 1) constructed of modular units; 2) capable of great or even 'unlimited' extension; 3) a structural framework with smaller structural units; and 4) a structural framework expected to have a useful life much longer than that of the smaller units which it might support", p.8.

[7] Peter Wolf, The Evolving City: Urban Design Proposals by Ulrich Franzen and Paul Rudolph (New York: The American Federation of the Arts, 1974), p.52.

[8] Ibid., p.53.

[9] Wolfgang Pehnt, "Always Straight On: The Straight Path in Modern Architecture," Daidalos (March 1993), p.23.

[10] Ibid., p.23, from Adolf Rading's 1928 "Die Typenbildung und ihre stadtebaulichen Folgerungen".

[11] Phil Patton, Open Road: A Celebration of the American Highway (New York: Simon and Schuster, 1986), p.98.

[12] Marc Augé, Non-places: Introduction to an Anthropology of Supermodernity (London: Verso, 1995).

[13] Joan Busquets, "New Urban Phenomena and a New Type of Urbanistic Project," Present and Future: Architecture in Cities (Barcelona: UIA, 1996), p.286.

[14] Rem Koolhaas, Delirious New York: A Retroactive Manifesto for Manhattan (New York: Oxford University Press, 1978).

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