Viaduct Architecture

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Highways are a web-like surface that convey materials and people across territories. When elevated as viaducts, these two-dimensional surfaces are transformed into three-dimensional spaces. These spaces are dually characterized by large physical artifacts- columns, walls, decks- as well as dramatically altered atmospheric conditions, like expanses of shadow. In cities, the complexity of this two-part space, physical and atmospheric, is compounded by a third dimension – the sectional interface between local flows of urban life and the region scaled flows of the highway.

This project undertakes the study of the spatial relationship between the viaduct and the city in two parts. First, the physical architecture of the viaduct was analyzed to decipher the atmospheric conditions generated by it. Second, a collection of inter-related installations and retrofits were designed to re-shape its landscape, atmosphere, and programming. The intent of this design research is to understand how the often neglected spaces created by large scale infrastructure can be designed to simultaneously mitigate the infrastructure's impact while also translating its operating logics and spatial particularities into new urban use and performance.

Presented here are studies of four dimensions of the relationship between viaduct and city:

Water, Shadow, Maintenance, View

ABSORBING AND FILTERING VIADUCT RUN-OFF

The expansive surface of viaducts collects large volumes of water that dissolve and emulsify roadway chemicals and particulates. The polluted run-off drops through storm-grates and downspouts to pipes that discharge unfiltered into nearby waterways. This project analyzed the pitch and flow of the roadway to quantify existing roadway catchment zones. The design incorporates a new 'catch and dissipate basin' retrofit that is inserted midstream in a downspout to re-route run-off into constructed wetlands for evaporation and filtration, prior to discharge into waterways.

VARIABLE DAYLIGHT AS LANDSCAPE FRAMEWORK

Elevated viaducts cast highly differentiated patterns of shade and sunlight onto the ground. This project used daylight simulations to identify spatial volumes capable of sustaining different types of plantings under the viaduct. Plantings are distributed based on hours of daylight, and coordinated with the functions of the constructed wetlands - resilience to flooding, salt tolerance (from highway run-off), and storm-water filtration. The shaded areas under viaduct ramps are left as maintenance access and recreation zones.

MAINTENANCE SPACE AS COLLECTIVE SPACE

Viaduct structures, tasked with safely transporting people and goods, require regular maintenance inspections from man-lifts for signs of structural fatigue. This project analyzed the maintenance regiment of highway inspectors and the specific reach and turning radius parameters of their man-lift machines. The design translated these machine parameters into paved pathways and zones that simultaneously provide machine access and support public open spaces - basketball court, dog park, and event space - within the wetland landscape.

FILTERING VIEWS THROUGH THE VIADUCT

The viaduct filters sunlight from above, as well as views from below. This project catalogued the apertures that the viaducts' deflections and overlaps create towards the city. A new elevated boardwalk allows pedestrians access through the storm-water landscape. The boardwalk's undulations orient walkers to the apertures framed by the viaduct.¬¬

VIADUCT ARCHITECTURE

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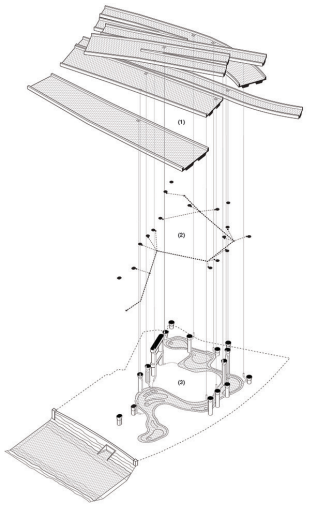
Below Top: New catch and dissipation basin being installed mid-stream in viaduct downspout.

Below Bottom: Water dissipation bowls adjacent to new pedestrian boardwalk under construction.

Right: Diagram of water re-directing surface:
(1) Existing water catchment areas on the overhead ramps.
(2) Eliminated network of subterranean catch basins and drain lines.
(3) New stormwater retention and evaporation landscape surface.



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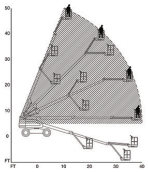
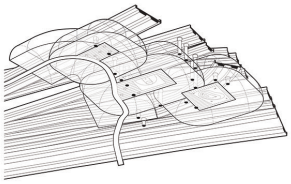
Below Top: Crack monitors on the viaduct structure need to be accessed regularly.

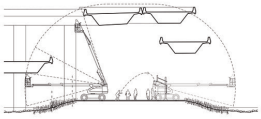
Below Bottom: Manlifts with a 40 foot reach are used to inspect the viaduct.

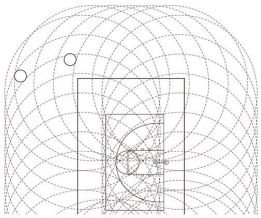
Right Top: The pathway and three paved plates allow full man-lift access to the ramps above.

Right Bottom: The pathway and paved plates allow full manlift access to the ramps above, and double function as hardscape recreation areas.









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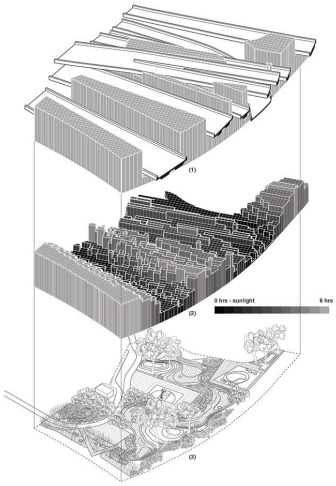
Below: Shadows cast by the viaduct on the ground define boundaries where plants can survive.

Right: Daylighting simulations and planting design:
(1) Model of highway viaduct used for daylight simulations.
(2) Volume of summer sunlight exposure.
(3) Plantings are distributed based on hours of daylight.



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Below: Pedestrian boardwalk through the stormwater landscape (Under construction, 2016).

Right Top: Apertures created by the viaduct.

Right Bottom: Site plan of under-story landscape.