Decolonizing Urban Landscapes: Reclaiming a Black and Indigenous Right to the City through Structural Design

Abstract
Black and Indigenous communities have historically been exiled from the urban environment. The proposed research aims to study exemplary structures that address race relations in both process and form. These examples will inspire future works so that racially equitable projects may one day become the norm rather than the exception.

Introduction: Social Justice in Infrastructure Design
Social justice in the built environment has often been considered an urban planning and political issue rather than an engineering concern. The most well-known examples of using the built environment to perpetuate injustice include redlining, unfair housing policies, and gentrification. However, injustices can also be seen at the scale of individual structures: highways divide neighborhoods, skyways between buildings literally elevate private users above the public, and building column layouts and bridge alignments can inhibit accessibility. In New York from the 1920s-1970s, one master builder even purposefully designed bridges with low clearances to discourage buses on his parkways and limit bus-riding low-income racial minorities from accessing the beach.¹

Structures are more than the product of technical parameters, building materials, and scientific tools. As engineers, and especially as engineering students, we are often provided with problem statements and quantitative information and asked to find solutions. This results in decontextualized problems in which the social framework has been rendered irrelevant. However, our structures not neutral, timeless, and placeless; they are physical manifestations of our contemporary values.

Just as culture informs structures, structures can also inform culture. As built environment practitioners, there are three stages during which we can effect social change:

1. **Planning:** when deciding where, what, and when to build, we need to consider the implications of our decisions. What is this project’s socioeconomic legacy? When we designate heritage structures, whose heritage are we honoring and whose are we neglecting? “Good” design is typically reserved for high-profile landmark projects; how can we lend our technical expertise to projects that may be smaller-scale but more impactful?

2. **Conceptual design:** in developing a structural system and architectural program, we inherently define a problem statement and design objectives. Who are the assumed target users of this structure, do their demographics align with those of the greater community, and does the conceptual design reflect their needs? Does the public get similar benefits as private users? Does the structure enhance social connectivity?

3. **Detailed design:** does the spatial layout reinforce or confront users’ biases? Do entrances cater to pedestrians at the street level or wealthier users in a private garage? Are walkways and cycling paths on bridges prioritized over the roadway? Do structural elements weave in artistic elements that reflect the local culture and use sustainable materials?

The proposed research will examine how structures and designers respond to these questions. Emphasis will be placed on structures that address the intersection of race and the urban environment, particularly where Black and Indigenous groups have been underrepresented.

¹ Caro, 1975
Example: Bending toward Justice on Chicago’s South Side
In the United States, racial disparities have been woven into the urban environment since the country’s inception. Today, many cities are addressing their troubled histories of racialized marginalization through urban regeneration. One case study exists in Chicago’s Bronzeville neighborhood on the South Side: until the 2010s, Bronzeville was separated from Lake Michigan by railroad tracks and Lake Shore Drive; meanwhile, the North Side is mostly railroad-free and connected to the lakefront every quarter mile.2

To address Bronzeville’s lack of lakefront access, the 41st and 43rd Street Bridges were constructed in 2018. Each bridge had to span over active rail, catenary wires, and eight expressway lanes, all of which were to remain operational during construction and restricted the possible footprint of the bridge. Combined with ADA slope requirements and a desire to mirror the sweeping lakefront park paths, these design conditions led to a solution consisting of complex inclined arch bridges with S-curved decks that are supported by hangers on only one side.2

![Figure 1: 41st Street Bridge](image)

The bridges provide ADA-compliant access to the lakefront, integrating aesthetic form with structural function to address community needs. Residents even displayed signs thanking the team for connecting their community to the lakefront.2 While regeneration may be complex and controversial, reinvestment in disadvantaged communities has great power to improve social outcomes.

Example: Reestablishing an Indigenous Urban Narrative in Aotearoa New Zealand
Another country in which racial inequity in the urban environment is being addressed is New Zealand, or Aotearoa in Māori. After centuries of adapting to Pāhekā (Eurocentric/non-Māori) culture, Indigenous Māori started protesting for social justice in the 1970’s. Today, their influence spans across all realms, including in the building industry: the Te Aranga Māori Design Principles within the Auckland Design Manual are promoted across all Auckland Council building projects,3 many of which will be studied for this proposed research.

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2 Yoders, 2020
3 Hoskins & Kake, 2013
Auckland is not the only city where Māori principles have taken root. Christchurch has had a unique opportunity to decolonize the city and incorporate innovative seismic-resistant systems into its rebuilt structures after its 2010-2011 earthquakes. For the Tūranga Christchurch Central Library, designers collaborated with the Matapopore Charitable Trust, local iwi (tribes), librarians, and other stakeholders to design a resilient, culturally-sensitive, and technically-advanced community building. Architectural elements and the spatial layout were informed by Māori cultural concepts.

Structurally, the building will sustain minimal damage under a large earthquake. To achieve this, engineers created a novel seismic force-resisting system that consists of post-tensioned concrete rocking walls with seismic extrusion dampers developed at the University of Canterbury. These work alongside a steel moment-resisting frame with rocking base connections. Under small earthquakes, the building responds like a fixed-base structure; with increased loading, it sways at the base and then self-centers after shaking stops.

This structure is one among many projects that have embraced Aotearoa New Zealand’s Indigenous heritage and empowered Māori professionals, from authorities to building industry professionals and artists, throughout the entire process. With widespread participation across the country, Māori culture permeates through all of the built environment rather than being restricted to individual sites or rural reservations.

**Conclusion**

For too long, Black and Indigenous communities have been exiled from the urban environment – both physically, through lack of connection or spatially-embedded cultural values, and programmatically, through unjust design practices and project development processes. Reinvesting in these communities not only improves social outcomes for marginalized groups, but also positively impacts all citizens. By studying exemplary inclusive projects through this fellowship, we can be inspired with ethical practices to create a more equitable, sustainable, and inclusive urban landscape for all.

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4 UC engineering, 2018
5 Tūranga – engineering (n.d.)
Itinerary: Introduction

The selected structures and solutions fall into four general categories to address social justice (SJ) and are indicated as such in the itinerary:

1. **Community** engagement (C): public design without engagement is a colonist process – without user input, elitist individuals assume to understand the needs of the community better than the users themselves. A project does not truly benefit or belong to the community unless the community leads development efforts.

2. **Inclusivity** in its design team (I): as designers, we approach problems with a mindset informed by our personal experiences, education, and privilege; by including planners, architects, and engineers from underrepresented backgrounds, different perspectives that are often invisible are made visible.

3. Sustainable **development** where infrastructure is needed (D): regeneration attempts are often messy, complex, and controversial. However, there is a clear relationship between infrastructure and social mobility. When successful, [re]development can foster growth and improve outcomes while also offsetting the project’s environmental impact.

4. **Addressing SJ in program** (P): structures that house social justice initiatives are underrepresented in the architectural canon, but many are masterworks that should be studied. They include civic centers, libraries, and public spaces that truly invite in all individuals.

While these common threads exist, issues of race are nuanced and need to be examined in context to be fully understood. The researcher must understand culture – historical traumas, race relations, and politics – through a local lens rather than as a tourist; hence, the number of countries in the itinerary is limited. Each country and its structures will be experienced in depth during an extended stay.

Each destination will be coupled with prior reading and office visits to better understand the design process and context (many of the structures are designed by local firms/offices). Visits/calls will also be made to researchers who can provide insight on systematically evaluating structures through a social justice lens. These include:

- **Prof. Toni Griffin**, Prof. of Urban Planning & author of The Just City Index/Just City Indicators, *Harvard Graduate School of Design*
- **Dean Chahim**, anthropologist & researcher on engineering, cities, and social justice, *Stanford University*
- **Jade Kake**, Indigenous architect, researcher, & writer based in Whangārei, Aotearoa

The next pages include proposed structures for visit followed by a travel schedule with budget. To avoid excessive footnotes, citations for the itinerary are only included in the references list and not in-text.
<table>
<thead>
<tr>
<th>United States</th>
<th><strong>Gordie Howe International Bridge</strong>&lt;br&gt;Detroit, MI &amp; Windsor, ON (expected 2024)</th>
<th>![Bridge Image]</th>
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</thead>
<tbody>
<tr>
<td>Arch: -&lt;br&gt;Eng: AECOM&lt;br&gt;Client: Michigan DOT &amp; Ministry of Transport. of Ontario&lt;br&gt;Structural concept: Cable-stayed bridge&lt;br&gt;SJ concept(s): D, P</td>
<td>Currently under construction, this bridge will provide an alternative to the current monopoly under the privately-owned Ambassador Bridge. The bridge consists of pedestrian &amp; cycling paths in addition to typical road lanes. When completed, it will be among the top five longest bridges in North America.</td>
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<td><strong>35th Street Pedestrian Bridge</strong>&lt;br&gt;Bronzeville, Chicago, IL (2016)</td>
<td>![Bridge Image]</td>
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<td>Arch: Cordogan Clark&lt;br&gt;Eng: AECOM&lt;br&gt;Client: City of Chicago&lt;br&gt;Structural concept: Arch bridge&lt;br&gt;SJ concept(s): D</td>
<td>This mono-cable, self-anchored suspension bridge connects the South Side (specifically Bronzeville, known as the city's &quot;Black Metropolis&quot;) to Lake Michigan, bridging over Lakeshore Drive and railroad tracks that historically made the lakefront inaccessible from the South Side, whereas the North Side is largely railroad-free.</td>
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<tr>
<td>Arch: Freelon Adjaye Bond/ SmithGroup JJR&lt;br&gt;Eng: Guy Nordenson and Associates&lt;br&gt;Client: Smithsonian Institution&lt;br&gt;Structural concept: Steel-framed &amp; concrete-core building&lt;br&gt;SJ concept(s): I, P</td>
<td>The NMAAHC is featured on the National Mall, symbolizing African-American history's prominence in American history. Its silhouette is emblematic of the corona used in Yoruban art from West Africa. The building consists of complex structural steel framing and four concrete cores. Outside, visitors are welcomed by The Porch, a steel-and-concrete cantilevered canopy that spans 175 feet.</td>
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<tr>
<td>Arch: Douglas Cardinal&lt;br&gt;Eng: Severud Assoc.&lt;br&gt;Client: Smithsonian Institution&lt;br&gt;Structural concept: Concrete core &amp; framing with steel cantilever building&lt;br&gt;SJ concept(s): I, P</td>
<td>The NMAI was designed by Indigenous architect Douglas Cardinal with advising by members of Native American communities. The building features Native symbolism throughout. Its structure is mainly a concrete framing system with a concrete core, plus steel trusses that allow the east face to cantilever significantly.</td>
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<td><strong>New Frederick Douglass Bridge</strong>&lt;br&gt;Anacostia, Washington, D.C. (expected 2022)</td>
<td>![Bridge Image]</td>
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<tr>
<td>Arch: -&lt;br&gt;Eng: AECOM&lt;br&gt;Client: D.C. DOT&lt;br&gt;Structural concept: Arch bridge&lt;br&gt;SJ concept(s): D</td>
<td>Under construction since 2017, this bridge encourages multimodal transportation with its bike lanes and pedestrian overlooks. As part of the Anacostia Waterfront Initiative Program, it aims to revitalize a historically disadvantaged, majority Black neighborhood.</td>
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<td>Arch: MPFP&lt;br&gt;Eng: Silman&lt;br&gt;Client: Forest City Realty&lt;br&gt;Structural Concept: Cantilever bridge&lt;br&gt;SJ concept(s): D</td>
<td>This bridge is part of The Yards at Southeast Federal Center redevelopment along the Anacostia waterfront. The formerly industrial location now houses several mixed-use facilities. The primary structural elements of the bridge are canted arches, while the aesthetically-driven ribs also provide lateral stability.</td>
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<td><strong>11th Street Bridge Park</strong>&lt;br&gt;Anacostia, Washington, D.C. (2017-TBD)</td>
<td>![Park Image]</td>
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<tr>
<td>Arch: OMA&lt;br&gt;Eng: WRA LLP&lt;br&gt;Client: D.C. DOT&lt;br&gt;Structural concept: Beam bridge&lt;br&gt;SJ concept(s): C, D</td>
<td>As an adaptive reuse project, this bridge will be built atop existing piers of the old 11th Street Bridge. The development has acted to preserve housing affordability, invest in small businesses, hire local construction workers, and bring in investments from private firms.</td>
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<tr>
<td>Canada</td>
<td>Woodward’s 43 &amp; Woodward’s Redevelopment</td>
<td>TELUS Garden Office</td>
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<td>Eng: Glotman Simpson Engineers</td>
<td>The Woodward’s Redevelopment was one of the biggest redevelopments in Vancouver history. Many relied on it to address social problems in the Downtown Eastside, a high-poverty neighborhood where only 50% of the population speaks English. The project consists of a 43-story mixed use tower with subsidized housing in addition to a grocery store, shops, and other amenities.</td>
<td>This development added new life to an outdated Downtown Vancouver street. Though the offices are private, the development features a public media wall and ground-floor public spaces under a 220-ft. arched cantilevered glulam-and-steel canopy. A prominent structural feature of the building is its four-story cantilevered boxes, which are made possible by a long-span steel deck resting on composite steel beams, which are then supported by a mega truss.</td>
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### Flora Footbridge
**Midtown Ottawa, ON (2019)**
The Flora Footbridge provides a much-needed link between the neighborhoods of Old Ottawa East, the Glebe, and Old Ottawa South. Designers considered the often-overlooked pedestrian passage under the bridge: the v-shaped supports rest on piers that are wide enough to be resting places for ice skaters in the winter.

### Humber Bay Pedestrian Arch Bridge
**West End, Toronto, ON (1994)**
This bridge is located at the start of an ancient Aboriginal trading route. It features structural and artistic elements that recall its native heritage, such as the abutments' anthropomorphic form and steel plating between the two arches that represent thunderbirds. Today, the bridge is part of a city trail for pedestrians and cyclists.

### Mimico Creek Footbridge
**West End, Toronto, ON (1998)**
The Mimico Creek Footbridge was built as a smaller companion to the Humber Bay Arch Bridge along the same pedestrian trail. It is a single-span reverse inclined arch structure. As a Calatrava structure, it has a relatively humble design and was completed on schedule and within budget, costing 1/6th the amount of the Humber Bay Bridge.

### William Barak Apartment Tower
**Melbourne Central (2015)**
Architects designed this tower to portray William Barak, an Aboriginal Elder and social justice advocate, along its entire 85-m. facade. The representation has been controversial: some consider it to be cultural appropriation; others (including clan Elders) argue that the building is a bold tribute to the Aboriginal community.

### Webb Bridge
**Melbourne Docklands (2003)**
This bridge joined together the remaining sections of the Webb Dock Rail Bridge with a new link to complete the crossing, resulting in a sustainable and cost-effective solution. The design references Koori fishing traps and the joining of the two segments represents the linking of European and indigenous cultures.

### Bunjil Place
**Narre Warren, Melbourne (2017)**
Bunjil Place is a civic events centre near Melbourne named after Bunjil the Creator, a central figure in Aboriginal stories and whose reference raises questions about Aboriginal symbolism in the public space. The timber gridshell roof is dramatic and terminates in two points at the ground to create an entryway into the building.

### Vodafone Events Centre
**Manukau, Auckland (2005)**
The form and architecture of the Vodafone Centre are clearly representational of traditional Māori and Pasifika houses: the roof is suspended from an exterior truss that symbolizes the Waka. The designers arrived at this form after consulting local iwi.

### Auckland Art Gallery Toi O Tāmaki
**Auckland Central (2011)**
Toi O Tāmaki's columns and timber canopies are based on the narrative of Tāne Mahuta, a forest deity who reigned over Tāmaki Makaurau (Auckland) before the city was established. The canopies appear to be wood-sheathed steel structures, which brings into question architectural symbolism vs. structural transparency.
<table>
<thead>
<tr>
<th><strong>Architects:</strong></th>
<th><strong>Structural concept:</strong></th>
<th><strong>Eng.:</strong></th>
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<td>Warren and Mahoney</td>
<td>Concrete core-steel framed high-rise</td>
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<td>Auckland Central</td>
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<td>Jasmax</td>
<td>C</td>
<td>University of Canterbury (UC)</td>
<td>Rutherford Regional Science and Innovation Centre</td>
<td>Univ. of Canterbury</td>
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</tr>
<tr>
<td>Jasmax</td>
<td>C</td>
<td>Beca</td>
<td>Beatrice Tinsley Building</td>
<td>Univ. of Canterbury</td>
<td>2019</td>
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**Commercial Bay Tower**
Auckland Central (2020)
The Commercial Bay development was one of the largest projects that incorporated the Te Aranga Design Principles and thoroughly engaged with Māori authorities in the planning, design and construction process. The tower straddles two City Rail Link curved train tunnels on varying ground conditions in an earthquake-prone area, which complicated structural load transfer to the earth. Additionally, the tower needed to be isolated from tunnel vibration due to passing trains.

**Te Oro Community Centre**
Glen Innes, Auckland (2015)
Te Oro is a music and arts community centre that consulted with local iwi (tribes) for its design. It uses a sustainable engineered wood (laminated veneered lumber) for its structural components.

**Tirohanga Whānui Pedestrian Bridge**
Pinehill, Auckland (2019)
This pedestrian bridge was designed in consultation with Māori artist Graham Tipene, who informed the design team on the cultural nuances of area and how to incorporate Māori concepts into the structure. The final result was a steel truss with uniquely rounded corners based on the artist’s vision and parametric design.

**Turanga Christchurch Central Library**
Christchurch Central (2018)
The Central Library demonstrates the nexus of bi-cultural authorities’ involvement in the planning phase, stunning architecture, innovative engineering design, and incorporation of research into practice. Architectural elements and layout reference Māori tradition, engineering integrates research on earthquake-resistant design, and ultimately the community is able to gather in this building as a symbol of resilience.

**Te Omeka Justice and Emergency Services Precinct**
Christchurch Central (2017)
As the first major development of the Christchurch Central Recovery Plan, the precinct had an immense symbolic role in public perception of Christchurch’s resilience. The design was also especially important as it is a physical representation of the justice system, police, and government: it could either be foreboding/exclusionary or inviting. The building is designed to remain in operation under a large earthquake through base isolation.

**Rutherford Regional Science and Innovation Centre**
Univ. of Canterbury, Christchurch (2018)
Central to the Rutherford building are the embedded Māori values in the space. The designers consulted with local iwi on the spatial elements, which include a large atrium flanked by bright red buckling-restrained braces. The seismic force-resisting system is highlighted and repeated on both the interior and exterior the building.

**Beatrice Tinsley Building**
Univ. of Canterbury, Christchurch (2019)
The Tinsley Building is New Zealand's tallest all-timber moment-framed structure. It uses laminated veneer lumber to achieve sustainability and structural efficiency as a relatively lightweight and less carbon-intensive material. It also incorporates the Pres-Lam rocking joint system, which was pioneered by UC researchers. This building was designed in consultation with Māori authorities.
Schedule & Budget

The itinerary and schedule have been planned under the assumption that COVID-19 travel advisories will be lifted and travel will generally be considered safe by the listed dates. If necessary, the travel may be broken into multiple discontinuous phases. All budget numbers are in USD.

<table>
<thead>
<tr>
<th>Approx. Dates</th>
<th>Country</th>
<th>Air/regional rail fare</th>
<th>Local transport*</th>
<th>Lodging</th>
<th>Food &amp; Misc.**</th>
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<tr>
<td>Jan. 7- Feb. 17, 2022</td>
<td>Australia &amp; N. Zealand (Melbourne, Auckland, Christchurch)</td>
<td>3000 (USA-Melbourne &amp; within Aus/NZ)</td>
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<td>2000</td>
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*public transit, rental car, rideshare, and taxi
**visas, museum admissions, international phone cards, etc.

Itinerary Summary and Image Credits

USA
- Gordie Howe Bridge .................................................. aecom.com
- 35th Street Bridge .................................................. exp.com
- 41st & 43rd Street Bridges ........................................... cordoganclark.com
- NMAAHC ............................................................... nordinson.com
- NMAI ............................................................... severud.com
- Frederick Douglass Bridge ........................................ walshgroup.com
- The Yards Pedestrian Bridge ...................................... silman.com
- 11th Street Bridge Park ............................................... oma.eu

Canada (continued)
- Flora Footbridge .................................................. dtah.com
- Humber Bay Bridge ................................................. Wladyslaw (wikimedia.org)
- Mimico Creek Footbridge ........................................... calatrava.com

Australia & New Zealand
- Barak Tower .......................................................... aurecongroup.com
- Webb Bridge .......................................................... robertowen.com.au
- Bunjil Place ............................................................. fjmtstudio.com
- Vodafone Events Centre ........................................... ghdwoodhead.com
- Toi O Tāmaki Gallery ................................................ fjmtstudio.com
- Commercial Bay Tower ............................................. woodsbagot.com
- Te Oro Centre ......................................................... designersinstitute.nz
- Tirohanga Whānui Bridge ........................................... aurecongroup.com
- Tūranga Christchurch Library ........................................ lewisbradford.com
- Te Omeka Justice Precinct ........................................... coxarchitecture.com.au
- Rutherford Centre ..................................................... jasmax.com
- Beatrice Tinsley Building ........................................... lightforge.co.nz

Proposal Image Credits
- 41st Street Bridge photo: cordoganclark.com
- Tūranga photo: shl.dk
References


