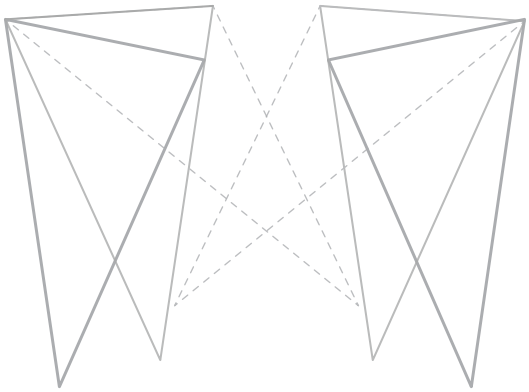


TROPICAL TRANQUILITY:
FROM LINE TO SPACE

TEAM MEMBERS

HARSHITA BATRA
Second year
Master of Architecture 2021
University of Virginia

SOMRITA BANDYOPADHYAY
Second year
Master of Architecture 2021
University of Virginia

PRIYANKA PARACHOOR
Second year
Master of Landscape Architecture 2021
University of Virginia

VEENA SHAH
Second year
Master of Architecture 2021
University of Virginia

MAIN CONTACT

PRIYANKA PARACHOOR

HARSHITA BATRA

Biography

Hometown:
Rajasthan, India

As a child I always enjoyed taking the time to observe the environment around me, considering what it is I like or dislike about it, thereafter sketching and recording my thoughts about the same. As a hobby, I scribbled mandalas to date which has given me an unusual perspective of interaction of the shapes and forms, forcing me to contemplate how we move through space and the importance of features such as corridors; how they connect various other spaces. Starting from the curiosity to know how things work which transferred into the thoughts of logical reasoning and problem solving; I started my journey with architecture.

I have experienced architecture and art from diverse cultures through travel, emphasizing the endless creative and technological possibilities found in art, architecture, and design. I worked with SMS Consultants, an industrial design firm based in Ahmedabad, India for a month and then I moved to Milpitas, California to spend the next few months at Levitch Associates in Berkeley, California during the winter of 2015, where I assisted them as an intern. Their attention to minute details as well as undeniable focus on transforming each piece into a new and unique work of art left me contemplating the statement- God is in the details. I was dumbfounded by their level of multitasking and the knowledge they possessed. It was then that I decided I would like to learn more about their architecture, detailing, and working style.

Design, for me, has always been all about creating spaces that could accentuate a user's experience, and thus my primary focus always remained on creating user-centric spaces. During my dissertation, 'Aesthetical Exposition', I studied Space Aesthetics wherein I attempted to investigate the factors that affect the user group and also shape the aesthetics of a space. I also actively participated in NASA. I worked in the HUDCO trophy for NASA held in Hyderabad, organizing social events. It reinforced my belief in honing my skills and consolidating my confidence. Since year one, I occupied the center stage for presentations and worked with people from different disciplines. Working with students from Strasbourg and Udaipur as a part of the Eco Mobility Workshop, I represented my team's work in the City Palace of Udaipur.

After graduation, I worked at SAK Designs, a residential firm based in India. Through my work experience, I've come to realize that architecture is a special overpass between imagination, reality, creativity, and a world of dreams. I've learned that no successful project emerges from a singular idea or person, rather a good teamwork.

Presently I am pursuing a Masters in architecture degree at UVA and over the last year, I have worked on urban level projects as a part of our studio. I have also received special recognition for my studio project for the first semester. I strongly believe that design is a subject that offers unending opportunities to explore and learn from our immediate environment and I have successfully been able to maintain remarkable grades in the subject throughout.

HARSHITA BATRA

ARCHITECT

EDUCATION

MASTERS OF ARCHITECTURE

(University of Virginia; 2019-2021)

Currently pursuing the degree with latest GPA of 3.51

BACHELOR OF ARCHITECTURE

(JNVU; 2012-2017)

Honors degree with an aggregate of 77.7%

AWARDS | PUBLICATIONS

NEXT NY CITIES

Fall 2019; University of Virginia

Nominated to be published in 2020 Next NY Publication

GOLD MEDALIST (JNVU)

Batch of 2017; MBM College of Architecture and Engineering

PARTICIPATION | CONFERENCES

PRESENTATION, JAIPUR, INDIA

Presented the concept note on Visual Merchandising of Rajasthali Emporium, Jaipur under the mentorship of Dr. Aditi Mertia

WINTER SCHOOL, BEDFORDSHIRE, UK

Participated in the Cultural Exchange Programme; Winter School at the University of Bedfordshire

FIELD WORKSHOP, UDAIPUR, INDIA

Presented paper for a workshop on Eco Mobility by Indian Heritage Cities Network in Association with Government of Rajasthan, French Embassy, City of Strasbourg, U.I.T., U.M.C. and MMCF

WORK EXPERIENCE

RESEARCH ASSISTANT FOR MONA EL KHAFIF AND SETH MCDOWELL

University of Virginia (Spring 2020)

Working on the Next NY Publication

RESEARCH ASSISTANT FOR MONA EL KHAFIF

University of Virginia (Fall 2019)

Worked on Waynesboro light study project

JUNIOR ARCHITECT (2018- 2019; 1 Year and 2 Months)

SAK Designs

Ahmedabad, Gujarat, India

INFORMAL INTERNSHIP (2015; 4 Months)

Levitch Associates

Berkeley, California, U.S.A.

FULL TIME INTERNSHIP (2015; 2 Months)

SMS Consultants

Ahmedabad, Gujarat, India

SKILLS

SOFTWARE

Rhinoceros 6, Karamba, Autodesk AutoCAD, SketchUP Pro, Chief Architect, 3ds Max, V-Ray, Adobe Illustrator, Adobe Indesign, Keynote, Corel DRAW, Microsoft Office Suite

MAKING SKILLS

Laser Cutting, 3D Printing, Physical Modeling, Hand Drawing

OTHER INTERESTS

Sketching, Pen and ink rendering, Poetry, Photography

PRIYANKA PARACHOOR

Biography

Hometown:
Delhi, India

After completing a Bachelor's degree in Architecture, the desire to remain in close association with nature motivated me to travel the dense rainforests of South India. The Wayanad district, Kerala, and the Biligiriranga Hills, Karnataka exhibited a diverse range of flora and fauna comprising of green canopies covering the undulating mountains. The tea plantations, dense vegetation, narrow streets, the valleys, and streams stimulated my senses throughout the journey. Furthermore, Andaman Archipelagos comprised of dense verdure, unlike the city of New Delhi, where I reside. The lifestyle and the vertical expansion made it the most polluted city on Earth in 2017. The quality of livelihood in the city and the places I visited, displayed a sharp contrast that ignited in me a strong desire to create a positive change for the environment.

My enrolment in Bachelor of Architecture helped me to shape my interest in formal education. The curriculum included courses like Architectural design studio, Ecology, Urban Design, etc. that allowed me to develop a thorough understanding of the principles and elements of design, climate responsive design techniques, etc. The process helped me to gain knowledge in establishing a relationship between a site and its context.

During my seventh semester, I worked in a group for the 'Urban Design' exercise. The concept of wetland water remediation with the native plant species was proposed by me for biomass generation of the drain passing through the site, voiding into the river. The research process and the design proposal strongly impacted me about the importance of green and blue infrastructure. The understanding that space's ecological condition can greatly affect the public health ignited in me an inclination for landscape architecture.

Furthermore, during the college internship (August 2016 - April 2017) at Tropic Responses, Bengaluru, India, I carefully observed and understood the construction details of the projects I was involved in, through the documentation or frequent site visits. One of the documented projects, titled, 'Magadi Farmhouse, Karnataka' (July 2015), helped me gain knowledge of Compressed Stabilised Earth Blocks used in construction that was made from the on-site earth; the project also involved the employment of the recycled wood and terracotta roof tiles to achieve reduced carbon footprint in the design. The entire experience has changed me into a sensitive designer towards the environment.

At the School of Architecture, the University of Virginia, the curriculum structure of the Master of Landscape Architecture is contributing towards a community-minded approach and re-shaping my goal to address environmental challenges at the regional and global levels.

P. PRIYANKA

EDUCATION.

2019 - 2021
Master of Landscape Architecture
School of Architecture, University of Virginia

2012 - 2017.
Bachelor of Architecture[B. Arch.]
M.B.S. School Of Planning and Architecture, New Delhi, India [affiliated to Guru Gobind Singh Indraprastha University, New Delhi]

1999 - 2012.
Primary - Secondary Education.
Suraj Bhan D.A.V. School, New Delhi, India

EXPERTISE.

Digital.

Autodesk AutoCAD
Rhino 6.0 + Grasshopper
Sketchup + V-Ray
Autodesk Revit Architecture
Lumion 6.0
Adobe AfterEffects
Adobe Photoshop
Adobe InDesign
Adobe Illustrator
Microsoft Office
Arc GIS

Manual.

Hand Drafting
Hand Rendering
Freehand Sketching
Model Making

INTERNSHIP/ EXPERIENCE.

May 2020 - June 2020
Research Assistant, **Material Ecologies**
School of Architecture, University of Virginia
Role: Mapping the connections of different aquatic ecologies

August 2019 - May 2020
Research Assistant, **Yamuna River Project-Jaipur**
School of Architecture, University of Virginia
Role: - Vegetation of the city Jaipur,
- Mapping the migration pattern within the city,
- Preparation of Annual Report 2019-20
- Board compositions
- Data compilation: *Solid Waste Management and Transportation System*

October 2018 - April 2019
NMP Design Pvt. Ltd, Delhi: Project Architect
Role: Design proposals in the rejuvenation of the city drains and abandoned lakes.

December 2017 - January 2018
Epistle Communications, Delhi: Architectural Consultant
Role: Content Writing

August 2016 - April 2017
B. Arch.(Year V): Tropic Responses, Bangalore
Internship Span : 36 weeks
Role: Learn about design strategies to reduce the carbon footprint and employ efficient utilization of natural resources

June 2015
B.Arch.(Year III): Häcker Kitchens, New Delhi
Internship Span : 4 weeks
Role: Kitchen Design proposals and detail work

ACHIEVEMENTS & EVENTS.

2015.
Stage Design Head for **Aagaman**: Annual College Fest.

2014
Participated in the Stage Design for **Aagaman**: Annual College Fest.

2014.
Laurie Baker Workshop, Trivandrum.

2014.
Participated in the Event Design for **Annual Easter Carnival** at Hyatt Regency, Delhi.

2013.
Participated in the Design for **Impressions:** Annual College Exhibition.

2013.
Poster Making Competition held at K.R.Mangalam, Delhi.
Awarded: Rank I.

HOBBIES & INTEREST

SOMRITA BANDYOPADHYAY

Biography

Hometown:
West Bengal, India

My roots as a designer grow from a journey that began in my second year of undergrad in architecture when I engaged with the two ends of migration in studying a community of farmers in their native village and as slum dwellers in the city. It shook my idea of people and the great sacrifice in migration as I saw the recasting of culture and how design could be a powerful way to translate aspirations and induce a mutual acceptance with one's social and natural environment. My internship was an education in imbibing a new culture in the hills of Gangtok. Our office was designing a network of tourist attractions in the state and I was primarily engaged with the extension to the state directorate of handicrafts and handloom in Gangtok. Since it was a small office and I interned during the construction season, I was able to engage with the project at its very core. It was a challenging experience that opened my eyes to the real world decisions that actually shape a project, especially one of such cultural and political significance and the different actors that shape the identity of a place, packaged as tourism. During my dissertation, I studied the urban and social implications of a novel solution in flat-pack architecture and explored the influence of the lifestyle choices of Remote working in shaping the urbanscape of cities in India in an academic seminar and exhibition. Questions on the tension between conservation, capitalist industry and the people's right to the city guided my undergrad thesis to understand 'balance' in the redevelopment of a centuries-old flower market on the edge of a dying river and made me realize my proclivity for assimilating the memories of a place through research and using design as a vehicle to empower people.

A fledgling artist in school, my real foray into art came with joining the fashion design society in my college. In creating shows, I feel unbridled creativity, synonymously inspiring my architecture. I have endeavored to create a show each semester, striving to balance my studies and finances, while being a self-taught designer. To me, art reflects contemporary thought and a way to increase the emotional accessibility of design.

My research interests lie in understanding how culture shapes practices which in turn shapes places. In the year since my graduation, I had the honor of presenting my thesis at the intersection of architecture, regional migration, and trade linkages at the international Urban Arc 2019 conference at IIHS Bangalore as Young Scholar grant awardee. Concomitant with these themes, in my graduate studies at UVA, I am focusing on Urban Design through the school's certificate program while engaging with subjects like sociology, history and memory studies through my research thesis on the role of collective memory in the transformation of Colonial-era industrial landscapes of extraction in India. As a teaching assistant, I have had the privilege to learn and gain knowledge from my younger peers and as the new editor of the A School journal, Lunch, I hope to use this platform to disseminate the ideas of change rooted in culture to a larger community.

SOMRITA B.

Education

2021 M. ARCH

University of Virginia
Charlottesville

GPA - 3.709

TOEFL - 117/120
GRE - 321/340

2018 B. ARCH

School of Planning and Architecture
New Delhi

First Class - 70%

Skills

PROFICIENT

Autocad
Photoshop
Sketchup
Indesign
ArcGIS
Office Suite
Sketching
Drafting
Ecotect
Site Surveys
Presentation
Climate Consultant

MODERATE

Revit,
Lightroom
Rhino
Vray
Illustrator
Sefaira
Grasshopper
Karamba

Work Experience

TEACHING ASSISTANTSHIP

2020 **Arch 2020**
Prof. A. Averbeck + Prof. J.S. Haro

Collective Housing Studio

2019 **Arch 1020 | Prof. Sanda Iliescu**

Experiencing Architecture

INTERNSHIP

2017 **PAN Architecture, Gangtok**
Ar. Naveen Pradhan

Site survey on hilly terrain, Good for construction drawing set, Electrical layout, Plumbing layout, Structural drawings, Drawings of handicraft details, Conducted meetings

2015 **MNC One Design | Kolkata**

Apartment elevations, Unit plan, Electrical layout

PROFESSIONAL FASHION SHOW

2016 **Indian Institute of Interior Designers**
Annual national conference

Design and construction of garments, Choreography, Set design

2015 **Festival of Architecture and Interior Design | New Delhi**

Design and construction of garments, Choreography, Set design

Qualifications

Architectural License
Council of Architecture, India

Graduate Aptitude Test in Engineering
All India Rank 43 (Architecture)

Research

ACADEMIC RESEARCH

2020 **Perception of Echoes**
Prof. Mathew Jull

Role of Colonial memory in the redevelopment of post - colonial industrial landscapes

2020 **Kolkata Riverfront**
Prof. Felipe Correa

Urban design and Heritage Preservation

2019 **Approaching Architecture**
Prof. Mona El Khafif

Perception of Facade and Volume in NYC

2019 **Confluence of flowers**
Prof. Arpita Dayal

Redevelopment of the Mullickghat flower market as a tourist destination

2018 **Projecting 2037**
Prof. Rajiv Bhakat

The Remote working Phenomenon

2017 **Knock down Architecture**
Ar. Archana Khanna

Occupation of vacant land to serve the needs of young entreprenuers in the city

2015 **asculturemoves.com**
Prof. Parul Kiri Roy

Footprints Collective

2019 CONFERENCE

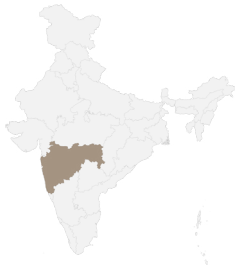
Urban Arc conference
Indian Institute of Human Settlements

Architecture and the urban setting of Bazaar defining socio economic linkages in the process of urbanization

Recipient of Young Scholar Travel Grant

VEENA SHAH

Biography



Hometown:
Maharashtra, India

Fascinated by the curious nature of the human mind, the manner in which it associates one aspect to another apparently independent feature, I explored through the realms of psychology that ventures upon the association of emotions to the built spaces. After extensive readings, starting off with mere curiosity to the comprehensive research carried out for my final year project, I am driven towards a more empathetic approach towards the way in which the environment we live in is shaped. I believe that a building is not a stand-alone piece of design; therefore, its effects reverberate through the macro-environment, having lasting effects on casual passers-by. In brief, my interests are centered around the implications of environmental psychology to designing architectural spaces in lieu of the creation of a sustainable urban environment.

I completed my Bachelor of Architecture at Dr. B.N. College of Architecture. Named as the best architecture college in Asia by World Consulting & Research Corporation, it is affiliated with the University of Pune. The five-year-long program is structured such that the initial three years focus on the foundation of architectural studies upon which the latter two years of advanced studies in design and building construction stand upon. The second stage of the program is critical and evidence of the proficiency of the student as an architect. Students with special academic success are awarded a 'distinction' and my perseverance in achieving perfection led to a distinction in the final stage of my course, during which I attained a more focused perception towards architecture.

In order to gain deftness in the finer shades of architecture taking into consideration the economic, social, and cultural tones, brushed upon in my undergraduate studies, I decided to deepen my palette by pursuing a Master of Architecture program. Academia provides an equilibrium between innovation and practicality. The prior is often getting lost in the real-world factors restricted by time, cost, and floor space index, a hard lesson I learned during my internship period in the final year. I aim to make architecture humane and a strong tool in the betterment of society. As an undergraduate, I grasped the fundamentals of building construction and attempted to incorporate the intangibles at a conceptual level. But as a graduate student, I intend to strongly intertwine technologies and vehement emotions into long-lasting ties.

Curiosity led me thousands of miles away from my home. I was interested to learn more about the design process and work culture in the United States. The Fall semester at the A-school allowed me to broaden my perspective and enhance my technical and graphical skills. In order to expand my knowledge into the public realm, one of my core interests, I enrolled in the Urban Design certificate at the A-school. Further, through my role as a Teaching Assistant, both last semester and this semester, I got more sensitive towards the various backgrounds people come from and the hurdles that they face. I always believed in a people-oriented designing of space, but coming into a new country has allowed me to gain an even wider perspective and a more sincere approach towards just spaces.

VEENA SHAH

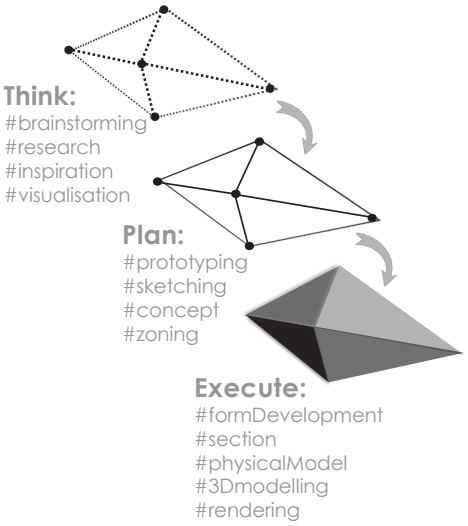
PLANNER | RESEARCHER |
ANALYST| DESIGNER | ARCHITECT

My goal is to help better shape the built environment through the creation of functional and livable urban life and development of sensible urban policies. I believe a good research & participatory design is a key to a sustainability.

DETAILS:

Charlottesville, VA

http://www.linkedin.com
/in/architect-veena-shah



EDUCATION:

School of Architecture, University of Virginia
[2019-Present]
Master of Architecture
3.74 GPA
Candidate for Urban Design Certificate

Dr. B.N. College of Architecture, Pune, India
[2013-2018]
Bachelor of Architecture
62.9% Cum. Percentage

EXTRA-CURRICULAR:

+ "**Nomadic Pods**" workshop, a UN Academic Impact Initiative, with DEMOLA, Budapest [2017]
+ "**Our City, Our River**" a twin workshop with National University of Singapore [2016]
+ **Constro exhibition volunteer** [2015 & 2016]
+ **NASA ANDC** Trophy competition [2015]

TECHNICAL SKILLS:

DRAFTING/3D MODELLING-

- Arc GIS
- AutoCAD
- Autodesk Revit
- Google Sketchup
- Lumion
- Rhinoceros

EDITING/GRAPHIC-

- Adobe Illustrator
- Adobe InDesign
- Adobe Photoshop
- Corel Draw
- Grasshopper
- Microsoft Office

LANGUAGE SKILLS:

- English
- Hindi
- Marathi
- Sanskrit
- Windows

WORK EXPERIENCE:

A-School of UVa, Virginia: Teaching Assistant
[Jan-May 2020]
For Arch 2070- Design +Thinking introductory course.

A-School of UVa, Virginia: Teaching Assistant
[Aug-Dec 2019]
For Arch 3070- Design Thinking Foundation Studio.

BNCA Consultancy Pune: Assistant Architect
[Jan-May 2019]
Conceptualization, working drawings and details of Facility Centre for the differently-abled people, including site visits and site coordination

Abhikalpan Architects & Planners, Mumbai: Intern
[June-Oct 2017]
Setting out drawings for Landscape features in residential societies, Organic waste composter design, Environmental clearance drawings for a township

INTERESTS:

Urban Design
Sustainability
Graphic Design
Info. Arch.
Architecture
Community

SITE SELECTION

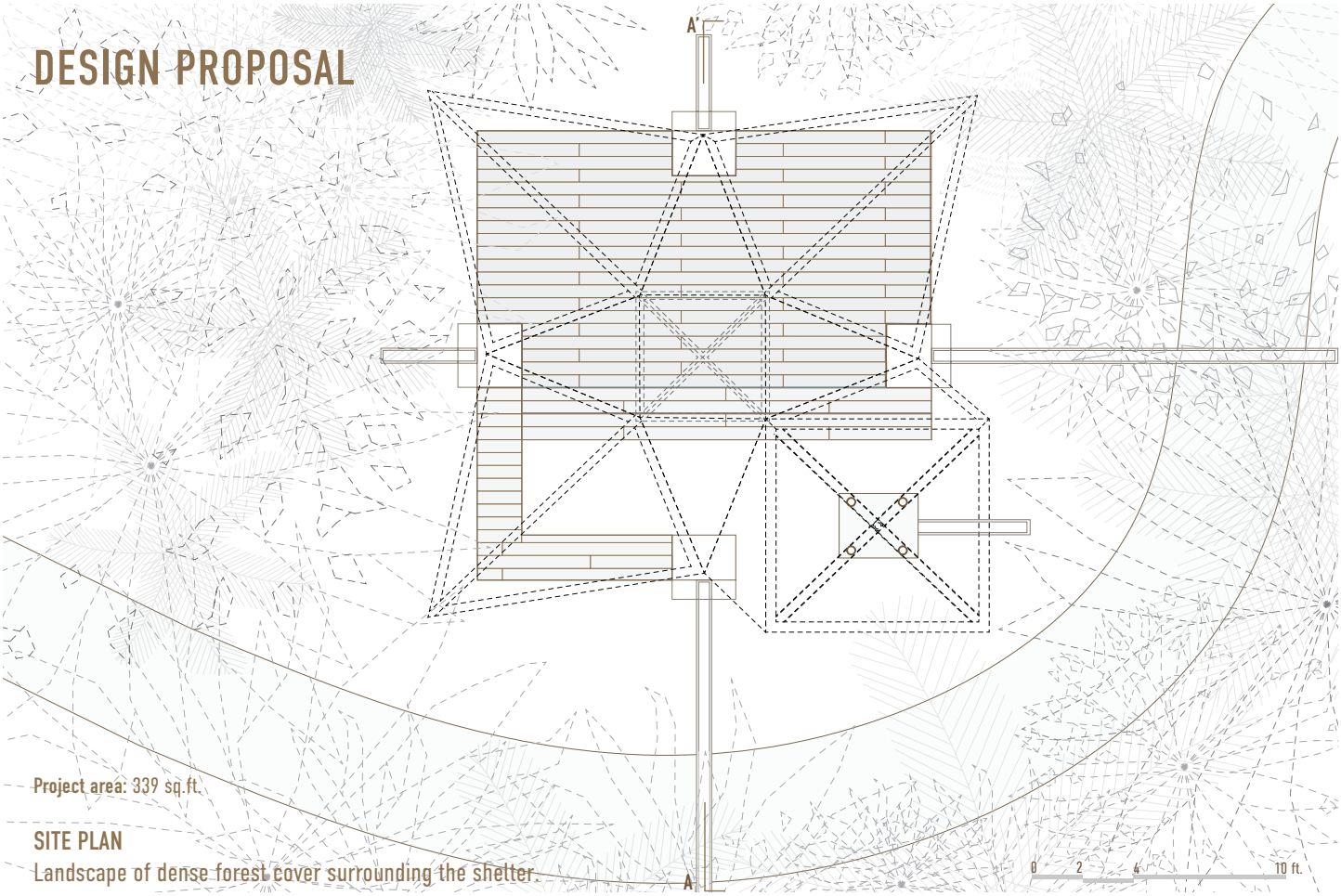
Tropical Rainforest

Between the years 2014 and 2019, 124 million hectares of primary tropical rainforest were lost to deforestation and forest fires alongside a greatly accelerated rate of loss of biodiversity. We live in a time where political leaders all over the world are in support of mass deforestation, whereas advocates and indigenous people protecting these forests are silenced. A presage of climate change, rampant fires through these forests have burned and ravaged. Though international agreements like the REDD+ and restoration efforts like the Bohn Challenge of 2011 do exist, their impact is not sufficient to tackle this cataclysm. At the beginning of the new decade, as promising protection policies like the UN Decade on Ecosystem Restoration kick into action, leading agencies like the Global Forest Watch insist that the biggest change will be brought about by individuals protecting their natural heritage. As a group of young designers, we feel that this is an opportunity to create a project that propels this environmental stewardship.

Tropical rainforests are fascinating biomes representing a world sustained by the rain that engenders a fertile microclimate, manifesting in picturesque streams and waterfalls. These dense and complex landscapes foster some of the rarest species in the world and are home to distinctive and critical ecosystems. Every year thousands of people traverse these forests to immerse in the realm of this ancient and diverse community of nature. Meandering through the verdant stratum of dense understory overrun with roots and rock outcrops, past bodies of water, shaded by tall canopies, the trails slowly unravel to the visitor an experience that extends into untouched habitats and wildlife. These trails have emerged as destinations of ecotourism based on promoting the conservation of these natural reserves in a way that fosters respect and environmental awareness.

Tropical Tranquility was conceptualized to espouse these values in defining a renewed relationship with this landscape. As a space of pause and reflection on the journey of the visitor, its emotive quality bears the reminder of the gift of water that we receive from the rainforest. We were inspired by the Pyau system in India, which means "to offer liquid (water) to drink as a form of respite". They were water fountains historically built by the emperors at public junctions and emblematic of their benevolence. The design intent was to convey this nurturing presence of the forest to the weary travelers on the trail. The rain that sustains the forest is collected and offered to refresh the visitor. The structure holds spaces that invite the visitor to rest, framing the verdure setting to engender contemplation and intrigue. Its system of construction and rainwater harvesting aims to inspire and educate the visitor on sustainable methods and become a mode of collaboration with local communities, travelers, and students in workshops to kindle a sense of responsibility towards the rainforest.

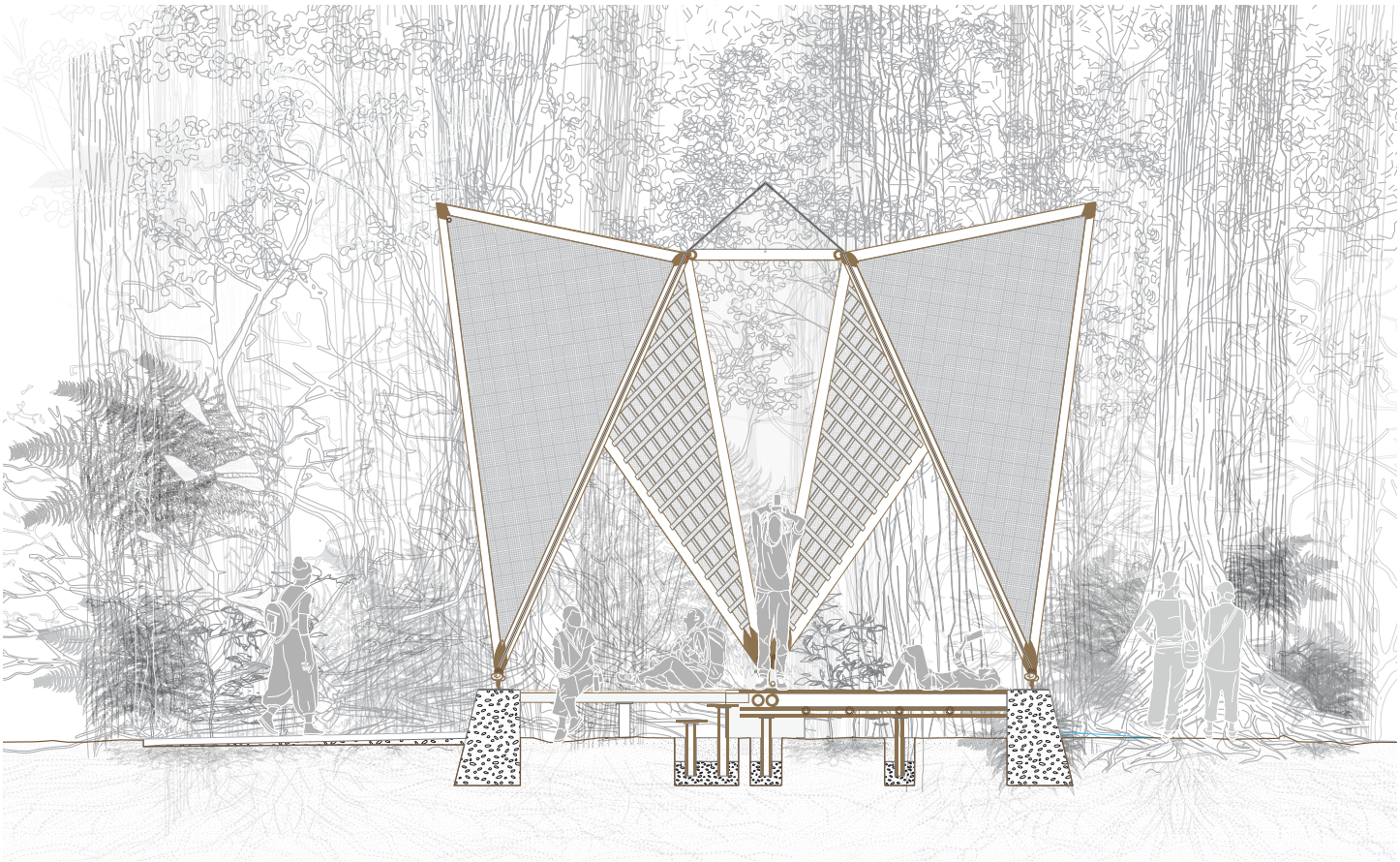
DESIGN PROPOSAL



Project area: 339 sq.ft.

SITE PLAN

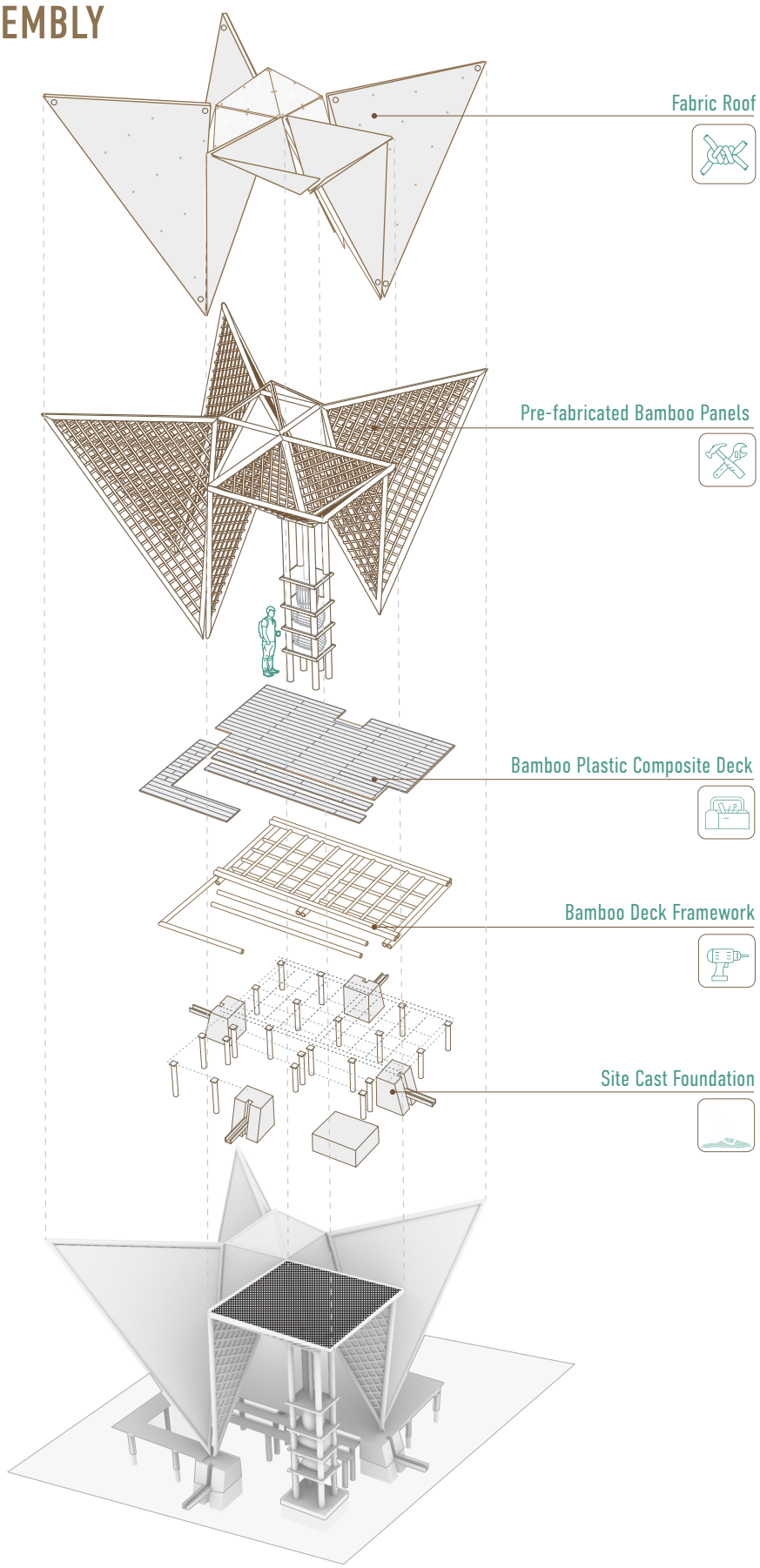
Landscape of dense forest cover surrounding the shelter.



SECTION AA'

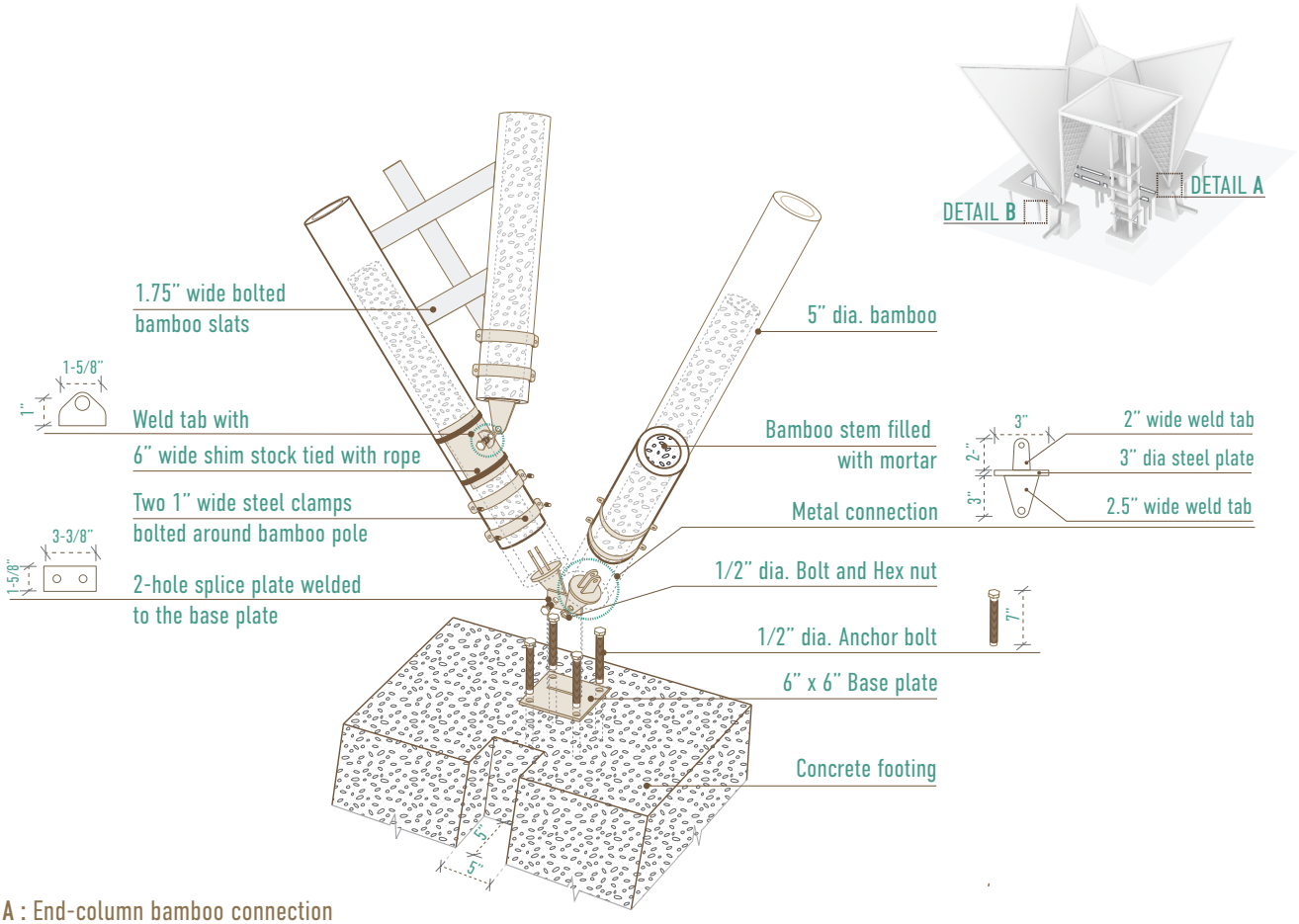
The shelter transforming into a medium of interaction and relaxation within the diverse ecosystem of the Tropical rainforest.

STRUCTURAL ASSEMBLY

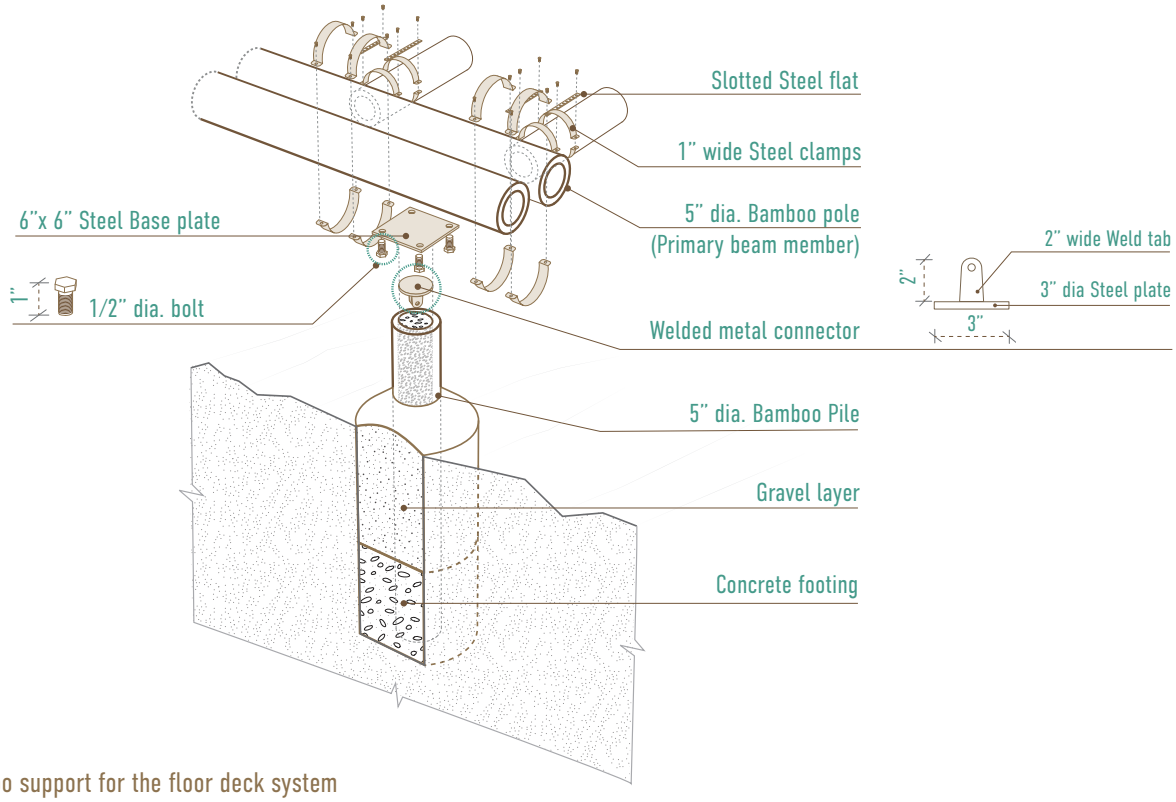


On-site installation of the Bamboo components and other members into a shelter.

BAMBOO CONNECTION DETAILS

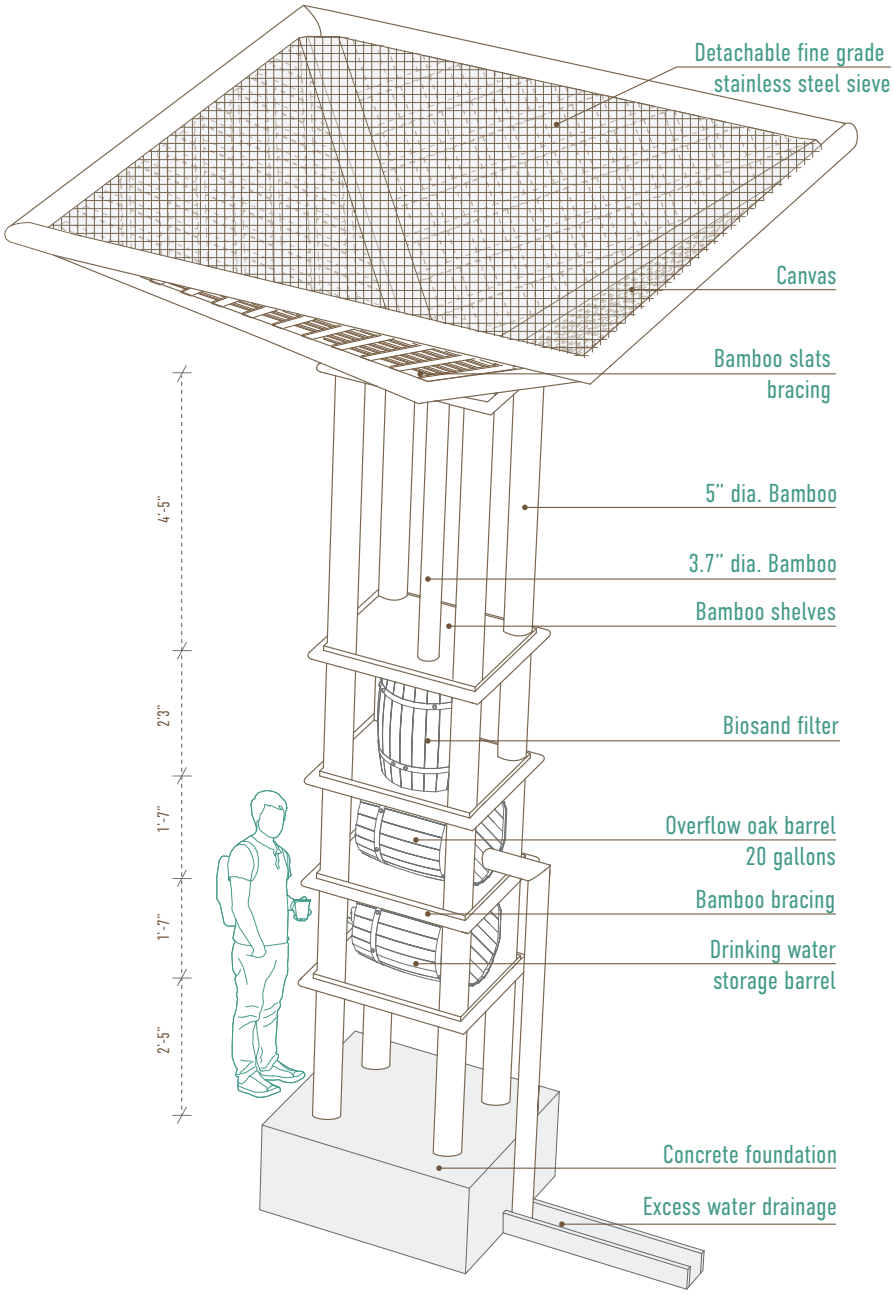


DETAIL A : End-column bamboo connection

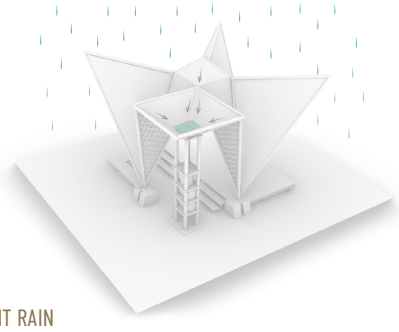


DETAIL B : Bamboo support for the floor deck system

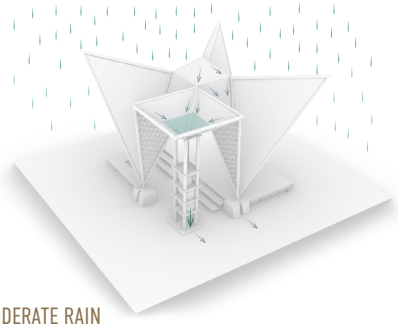
RAINWATER HARVESTING SYSTEM



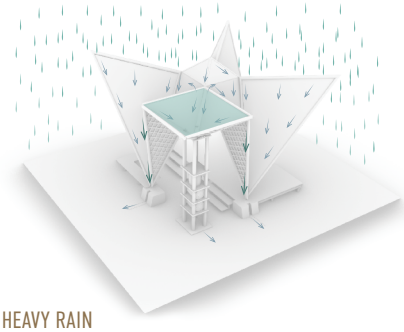
WATER FILTER ASSEMBLY



LIGHT RAIN



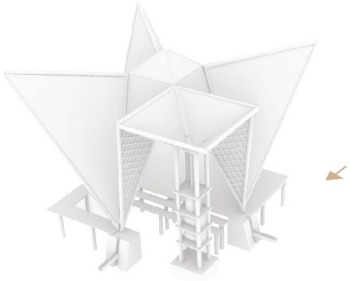
MODERATE RAIN



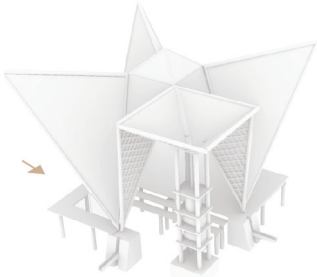
HEAVY RAIN

WATER PERFORMANCE

The forest trail is a tunnel of melting green walls broken by tall spires. The ground is soft and overrun with roots. The sound of birds chirping echo through the silence. Somewhere, water drips down and patters onto the leaves. One feels a sense of the great knowledge of time, borne by these silent trees; it feels like walking through a city in history.



The true beauty of the roof is revealed during the rains when comfortably seated inside the pavilion, one can hear and see the nuanced pattern of water sliding down along these panels. It inspires one to ruminate as the streams of water intersect and diverge as they chase each other along the transparent surface.



PROJECT NARRATIVE

Tropical forest reserves are a vital platform to disseminate knowledge about sustainable co-existence with nature. Trails through these forests are designed to encourage observation and engagement. The pause points have thus become popular grounds for public art and sculpture that bear this message. We envisioned the site of *Tropical Tranquility* to become a place of peaceful repose that is didactic through the synthesis of passive systems and design strategies.

In constructing the structure, we wanted to use materials that harmonized with the forest and had a minimum carbon footprint. Bamboo was our primary material of choice because of its natural abundance. It is a fast-growing species that reaches maturity within 4 years. Research shows that the cultivation and adoption of bamboo in construction can significantly counter deforestation by reducing dependence on timber. Its widespread availability cuts down resources spent on transportation. Bamboo species feature as structural systems and as flooring systems of composite tiles which are made of bamboo fibers cast in epoxy resin. The graceful lines of bamboo are accentuated by a light canvas roof inset with panels of transparent acrylic that create apertures to the forest and a surface for the play of falling rainwater. All of these materials have high water resistance and are designed as smaller parts that can be transported through the dense forests and easily assembled without the use of big machinery.

The installation is designed to create minimal disturbance to the topsoil and the forest floor. The structure is supported on raised footings made of fly ash cement-based concrete that reduces the net energy and greenhouse emissions by displacing manufactured cement. The outer edge of the footing is inclined at a gentle slope with a channel to direct water run-off into the base of nearby plants. The substructure also comprises of short bamboo piles whose bases are cast in concrete to prevent moisture from creeping up. The concrete is overlaid with a layer of gravel that prevents water accumulation around the pile. These piles support the framework of the bamboo deck system. It consists of a grid of primary beams made of a set of two bamboo members interconnected, by secondary bamboo beams. The primary beams are supported across opposite footings and on bamboo piles. The bamboo plastic composite tile flooring is nailed onto these beams.

The structural system of the design proposal occurs in two parts. The first part comprises of triangular panels that support the roof and are framed by interconnected bamboo members. The second part is a set of four vertical bamboo columns that support a funnel-shaped structure on its top that acts as the catchment area of the rainwater harvesting system. It is made of triangular panels whose edges connect to the roof and are suitably inclined to allow the excess water to overflow onto the larger roof structure.

The critical part of using bamboo is in the detail of the joinery. Traditional methods of joints tied with rope have proven to be ineffective over time if assembled by unskilled craftsmanship. In order to allow the structure to be built by anyone without a requirement for specialization, we chose to use metal connections, which are simply bolted or welded in place. This system of non-penetrative joinery allows the structure to be dismantled and re-erected elsewhere or its members reused in new construction. Bamboo framing members are fitted with weld tabs using slotted joints, which are in turn bolted to another weld tab to be connected with other members. Metal clamps are placed around the bamboo to resist the pressure building up inside due to the filled mortar in the bamboo stem. The bamboo beams are fitted with bolted circular steel clamps that are then mutually connected to each other using metal strips. The steel clamps solve the problem of the variable radius of bamboo and work as a system similar to the tied joints.

The roof of the structure is made of panels of canvas that are specifically cut to size and tied with bungee cord onto the primary members. A secondary lattice structure made of bamboo slats is attached to the lower surface of the triangular frames to add stability and act as an internal finish. The canvas roof is further tied to the lattice structure. Triangular pieces of transparent acrylic are located in between the canvas panels and at the crown of the structure. They are directly screwed onto the primary members. Thus, the materials are assembled to create the structure that comprises the raised platform shaded by the triangulated roofing system.

The construction process for the installation has a shop process and an on-site setup. The shop process begins with the arrival of the bamboo poles which are coated with layers of external sealant after which they can be cut to required lengths. This will

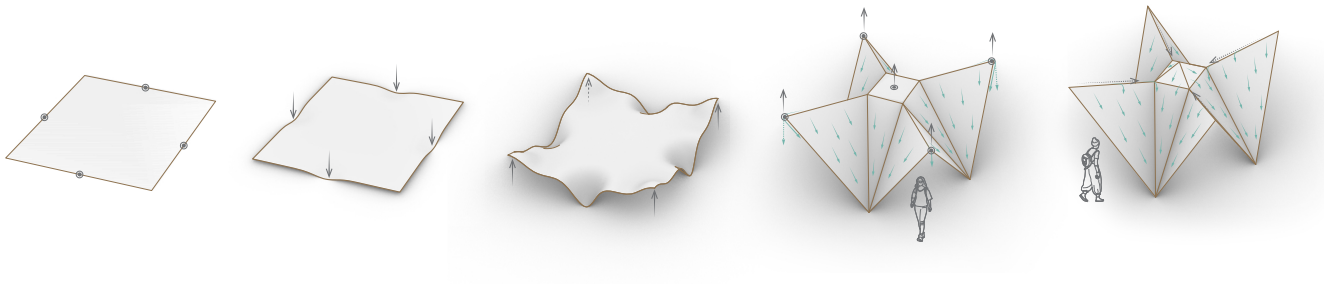
take 3 days to dry. In the meantime, steel joints can be welded and prepared. The canvas can also be cut to specification and fitted with grommets (steel rings). The site can simultaneously be cleared and marked for construction. Then the footings can be excavated and cast along with the bamboo piles which will also take at least 3 days to cure properly. The setting time of the concrete can take longer based on rainfall and humidity conditions. Both footings and piles will be fitted with metal base plates on top to connect to the superstructure. These processes will take 4 to 5 days after which the structure is then ready to be assembled on site. Based on the location of the site inside the forest, the transportation of the fabricated materials can take anywhere up to 1 to 2 days. The erection of the structure and fitting of the barrels should be completed in another 4 to 7 days. With contingency for time, the whole process can be completed within 15 to 20 days.

The translation of the design is based on collaboration across a range of disciplines and expertise. The first stage of the process involves meeting with the forest rangers and the designers of the trail system to locate viable sites for the structure. The locations need to be studied further with the help of a surveyor to test the soil bearing capacity in supporting the foundations. This is corroborated by input from an ecological expert to identify any threats to the local ecosystem and the location of nearby tree roots that could interfere with the footings. The next step is the purchase of materials from local small businesses that are especially important in the support of rural communities invested in the industry of bamboo. The team of designers and engineers can have a further dialogue with the local vendors for the final selection of materials and fine-tuning of the metal connections. The influence of the many specialized inputs and the ecological sensitivity of the process is an educational experience and can be translated into the workshops for students and anyone interested in engaging with the rainforest. This project is also a platform for outreach to the community as people can contribute to the project by providing materials to be reused like the barrels, etc. Once the structure is established on the trail, travelers who pass through can participate by tying small mementos or writing messages on the lattice structure thus, over time creating a site of memory rooted in the local community of the rainforest.

The project is situated in a clearing along a winding curve on the trail such that it emerges from the greenery as visitors approach the site. Situated in the middle of the curve, the prominent form of the rainwater harvesting system acts as a visual anchor for the entrance, aligned such that it invites the visitor to approach from either side of the structure. The strong silhouette of the columns rises up to meet the funnel on top that extends onto the roof of the structure. During the rains, the overflowing water from the funnel guides the visitor's eye along the choreographed path of water coursing through the roof and into the channels laid on the ground. The visitor can draw water from the barrels and refresh themselves. Adjoining the water spout, lies the ingress to the space. The visitor enters beneath the angled panels of the funnel into a space that is partially encompassed by the white panels of canvas. At night, it is illuminated and appears as a delicate web of members. The breaks of transparency of the acrylic triangles within the white draw the visitor's eyes as they converge to form the crown that rises over the heart of the design and frames fragments of sky beyond the canopy.

The crown acts as the focal point that centers the person within the internal space. This further steps up to a wide platform and extends to wrap around the structure as an L-shaped bench. These different spaces are adaptable to varying conditions of privacy and occupancy. While smaller groups can lie back on the platform after a tiring walk, a larger group can use the steps as an amphitheater seating that could extend along the benches and the platform. Furthermore, the project itself can become a site to stimulate conversations regarding deforestation and the steps necessary to save our forests.

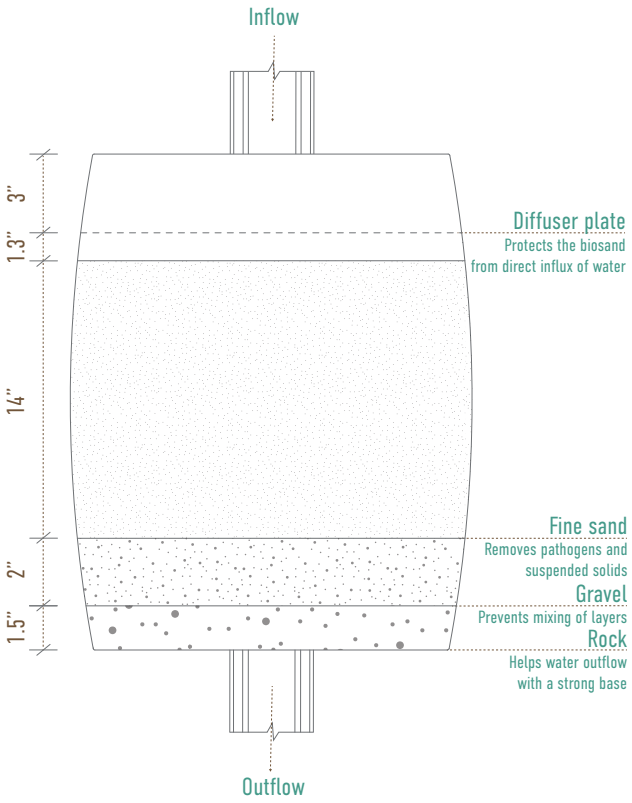
When lounging or sitting facing outwards, the bench and the platform can become more private, engaging visitors to rest. Sitting beneath the roof, it lifts up to create framed views of the forest. The surface of the canvas itself becomes a stage for the play of the dappled shadows of the canopy in the sunlight. During the daytime, the pattern of latticework on the white background contrasts with the greenery around to provide shade. The true beauty of the roof is revealed during the rains when comfortably seated inside the pavilion, one can hear and see the nuanced pattern of water sliding down along these panels. It inspires one to ruminate as the streams of water intersect and diverge as they chase each other along the transparent surface.



From Left to Right :

Development of form based on the incidence of rainfall and water movement into triangulated elements.

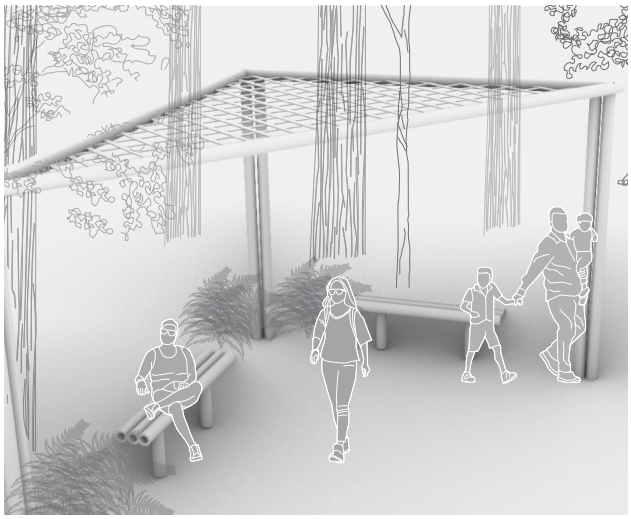
In order to orchestrate the movement of rainwater that is characteristic of the tropical forests, we were inspired by the form of drip tips adaptation that occurs in the native plant species. This is a feature where the pointed tip of a leaf allows the rainwater to quickly run off of them, without damaging the leaf. The roof is similarly configured so that rainwater can easily flow through to the channels below. The geometry of the roof form is derived from the calculations of the rate of precipitation. This helped us formulate the angle of inclination of each roof panel to ensure a steady flow of water into the drainage channels. Besides this, the large openings created by the roof are meant to facilitate cross ventilation through the structure, preventing condensation due to humidity. The raised base of the structural members and the platform prevent flooding during heavy rains, thus making the structure a marker of refuge within the forest.



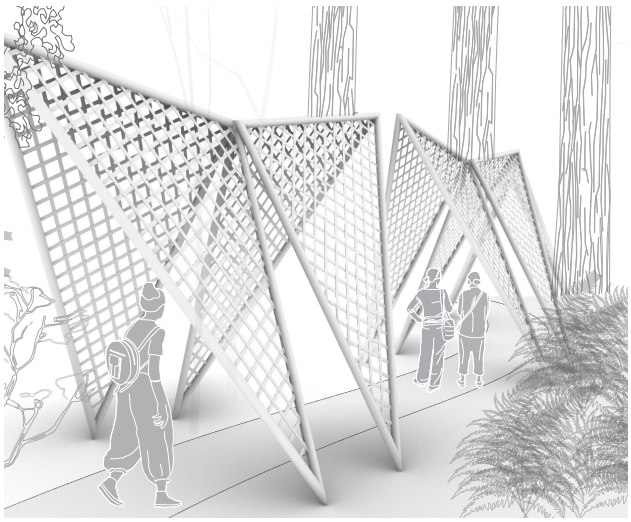
Biosand filtration technique uses layers of gravel and sand to filter out the finest particles.

The technical consideration in the development of the form and the construction system in the project is concomitant with the Low-Tech system of the process of rainwater filtration that is easy to maintain and replace. The insides of the funnel are lined by triangular canvas panels that are stitched together to form a catchment area. The top of the funnel is covered with a removable metal sieve to catch falling leaves and other debris. At its base, a bamboo pipe carries the water downwards. At the junction of the two is a removable metal sieve to catch further smaller debris before the water enters the filtration system. The water travels from the funnel through the filtration tank to storage containers made of reused oak barrels, chosen due to its resistant nature and availability. These are supported on shelves made from bamboo slats. We chose the low maintenance and chemical free process of the *biosand filtration* technique that uses layers of gravel and sand to filter out the finest particles. The filtered water is purified of physical impurities and passes onto the storage barrels. The topmost barrel has an overflow pipe that lets out excess water and visitors can draw water from the lowermost barrel. This water is safe to use and can be made potable by using filtered bottles. These are very popular amongst hikers and the inbuilt bacteria filters within these bottles can make the water safe to drink.

Concrete footings on site can serve as seating.



Triangular panels suspended from a cluster of trees to form a shading structure. Platform reused as benches.



Triangular panels are re-erected to form a shaded walkway.

From the choice of materials to the system of filtration, our main objective has been to maintain the design at the lowest environmental impact. As a collaboration between architects and a landscape architect, the project was shaped as an ecologically sensitive negotiation of spatial demands. In a space as dynamic as a forest trail, we wanted to create a design that was adaptable throughout its life cycle. Thus, the *Tropical Tranquility* was envisioned as a series of modular elements. As mentioned before, each of these elements is detachable and designed to be used as individual elements that can be reinterpreted in many different ways. The concrete footings on-site can remain as seating elements within the clearing along the trail. The platform can be dismantled and reassembled as benches within the forest. The bamboo framed triangular panels can be re-erected to create shading devices or suspended from tree branches to define a collective space. This concept is meant to encourage innovation and creativity in the budding local artists and fosters a sense of belonging within the community. Thus, the structure can live on and be redesigned to create new spaces within the forest.

The organization of the modular elements within its structure, derived from the system of bamboo construction is the defining aesthetic of the project. The design proposal is a functional sculpture that is crafted by the rain. In deriving the geometry of the form, we started with a simple square, focussing on the midpoints of the edges and studying its reaction to a simulated incidence of rainwater on the surface. We let the water movement mould the surface and arrived at the final form of the pavilion. By following this design process, we were able to direct the flow of rainwater over the structure and make it the featuring element. We chose to use the triangle as the base geometry because of its structural stability and directing lines of its form. Following the poles of bamboo, these lines radiate from four midpoints of the base. A pair of these diverging rays expand along the transparent panel, fold and merge at the top from all four directions to form the crown at the center. This point of convergence, highlighted by natural light, creates a calming focus that inspires a meditative mood. Another pair of rays expand out from the base to encase the larger panels clad in a light opacity and converge at the corners of the square, creating a visual frame that the eye is drawn to trace upwards and outwards towards a view of the forest canopy.

In presenting a sanctuary born of the critical and extraordinary environment of the rainforest, as young designers of today, we aimed to design a project that is respectful, emotive, and dynamic. The premise of *Tropical Tranquility* generates a new dialogue with nature through sustainable design that is economical and adaptable. It aspires to become a stage for collaboration and outreach that we hope will bolster the effort to re-engage with our forests and stand up for its protection.

PROPOSED BUDGET

Sr. No.	Item	Description		No. of Units (A)	Rate		Total	Notes	Link
		Material	Product Size/ Weight		Rate (B)	Per unit	(A x B)		
1	**Footings**	**$4,050**							
a	Cement	Portland Fly Ash Cement		10	$45.00	metric ton	$450		https://www.alibaba.com/product-detail/Wholesale-Price-Coal-Fly-Ash-Price_50030666885.html
b	Sand	All purpose coarse grade sand sized upto 1/32"	50lbs	400	$4.40	bag	$1,760	The same materials will also be utilized in the filtration system.	https://www.homedepot.com/p/Quikrete-50-lb-All-Purpose-Sand-115251/100318450
c	Gravel	High quality clean medium-grade gravel with an approximate top size of 3/8"	50lbs	400	$4.60	bag	$1,840		https://www.homedepot.com/p/Quikrete-50-lb-All-Purpose-Gravel-115150/100318444
2	**Main structure**	**$2,344**							
a	Bamboo poles	Guadua Angustifolia with sandy/beige color	4"-5" diameter of 20' length	360	$2.50	m	$900	The company is located in Columbia, hence the price is relatively cheap.	https://www.thebestbamboo.com/bamboo-poles
b	Bamboo slats	Guadua Angustifolia	1.75" wide x 7.2' long. x 1" thick	300	$2.20	slat	$660		https://www.thebestbamboo.com/bamboo-slats
c	Bamboo treatment- Water Proofer	Clear non-toxic exterior sealer infused with juniper (natural preservative)	1 Gallon	6	$54.00	can	$324	In order to expand the durability in the tropical climate, two coats applied	https://www.greenbuildingsupply.com/All-Products/Vermont-Natural-Coatings-PolyWhey-Exterior-Penetrating-Water-Proofer-Finish
d	Bamboo Plastic Composite	Engineered bamboo flooring made 60% Bamboo + 30%HDPE +10% Additives	6" wide x 8' long x 1" thick	23	$20.00	sq.m.	$460	Alternatively, reclaimed wood planks can be used	https://www.alibaba.com/product-detail/100-recycled-bamboo-plastic-composite-decking_62232648211.html
3	**Metal Connections**	**$890**							
a	Clamps	Galvanised Steel	1" wide x 3-1/4" long	100	$1.67	piece	$167	Two clamps shall be bolted together around a bamboo pole as seen in detail drawing B	https://www.grainger.com/product/GRAINGER-APPROVED-Two-Hole-Strap-4HYD1
b	Slotted Flats	Galvanised Steel	1.37" wide x 72" long x 0.8" thick	5	$13.00	piece	$65	To be used in the perpendicular joints (framing of the platform) as seen in detail drawing B	https://www.walmart.com/ip/Stanley-Hardware-Steel-Slt-Flt-Gal-08X1-3-8X72-180141/48033330
c	Weld-on Flat tab	Steel	2.165" x 1.25" x 0.19"	50	$4.00	piece	$200	To be used for the slotted joint, which goes inside the bamboo stem as seen in detail drawings A & B	https://www.speedwaymotors.com/EMi-Eagle-Motorsports-Sprint-Weld-On-Front-Motor-Mount-Tab,138724.html
d	Flat plate	Stainless steel	3" dia	25	$2.50	piece	$63	Weld-on tabs to be welded over flat plates	https://www.ebay.com/itm/1-4-Steel-Plate-Disc-Shaped-3-Diameter-250-A36-Steel-Round-Circle/192248832821
e	Weld Tab	Steel	1.635" x 1" x 9/64"	25	$0.99	piece	$25	To be used in the connection of the triangular panels as seen in detail drawing A	https://www.ebay.com/itm/TABS-WELD-TAB-WITH-HD-1-4-HOLE-FLAT-MOUNTING-TAB-10-Gauge-THICK-/263496998907
f	Shim Stock Roll	Stainless steel	50" length x 6" wide	1	$29.50	roll	$30		https://www.grainger.com/product/MAUDLIN-PRODUCTS-Stainless-Steel-Shim-Stock-2NZW6
g	Weld-on Flat tab	Steel	3" x 2.5" x 0.25"	10	$3.00	piece	$30	To be used to connect to the welded splice plate at the footing as seen in detail drawing A	http://www.2040-parts.com/weld-on-tabs-laser-cut-brackets-shocks-custom-1-4-034-thick-steel-3-034-x2-5-034--i1973163/
h	2 hole Splice Plate (2 each)	Zinc plated steel finish	1/4" thick	4	$1.40	piece	$6	To be welded to the base plate	https://www.gordonelectricsupply.com/p/Garvin-Sff30-2Hl-Splice-Plate/6255120
i	Base Plate	Steel	6" x 6" x 1/4" thick	25	$5.00	piece	$125	To be bolted over the footing	https://www.ebay.com/i/232649695889?chn=ps
j	Anchor Bolts	Steel	1/2" dia. x 7" long	4	$27.80	pack of 25	$111		https://www.homedepot.com/p/Simpson-Strong-Tie-Strong-Bolt-1-2-in-x-7-in-Zinc-Plated-Wedge-Anchor-25-Pack-STB2-50700R25/300591994
k	Bolts	Steel	1/2" dia x 1" length	2	$13.27	pack of 25	$27		https://www.homedepot.com/p/Everbilt-1-4-in-x-1-1-2-in-Hex-Galvanized-Lag-Screw-25-Pack-803710/204282530
l	Nuts	Steel	1/2" dia	2	$15.50	pack of 25	$31		https://www.homedepot.com/p/Everbilt-1-2-in-13-Stainless-Steel-Hex-Nut-25-Pack-812140/302007720
m	Washer	Zinc plated steel finish	1/2" dia	2	$6.00	pack of 25	$12		https://www.homedepot.com/p/1-2-in-Zinc-Plated-Flat-Washer-25-Pack-802334/204276390
4	**Roofing**	**$1,043**							
a	Canvas Tarpaulin	White	12' x 20'	3	$145.00	sheet	$435	To be cut according to the required sizes	https://www.amazon.com/CCS-CHICAGO-CANVAS-SUPPLY-Tarpaulin/dp/B007FVDFEU
b	Ball Bungee cord	Black	11" long (including ball) ; 1/5" dia cord	2	$9.95	pack of 25	$20		https://www.amazon.com/Kotap-BB-11B-Bungee-11-Inch-25-Piece/dp/B00DPLM62G
c	Grommets	Silver	1/2" wide	1	$17.85	pack of 100	$18		https://www.amazon.com/Pangda-Grommet-Setting-Grommets-Diameter/dp/B07FKHHTMZ
d	Acrylic	Clear	4'3" x 8'4" x 3/8"	6	$95.00	sheet	$570	To be cut according to the required sizes	https://www.acmeplastics.com/acrylic-sheets/lucite-ltrade-clear-sheet
5	**Water Harvesting**	**$491**							
a	Sieve	Three layered nano-fiber screen mesh	59" x 96"	2	$88.00	roll	$176	To be cut and joined together to put over the funnel	https://www.metroscreenworks.com/allergy-filter-screen-rolls-59-x-96/
b	Screen mesh	Woven stainless steel of mesh size 40	6" x12"	1	$5	sheet	$5	To be cut as per the bamboo pipe size	https://www.wildwext.com/home/223319-1247622-5-8-20-30-40-mesh-stainless-steel-woven-cloth-screen-wire-filter-sheet-6x12-.html
c	Barrels	Solid oak 20 gallon barrel	26" tall x 18" wide	3	$90	barrel	$270	Alternatively,reclaimed from nearby wineries	https://www.etsy.com/listing/805685288/used-wine-barrels
d	Diffuser Plate	Galvanised steel sheet	24" x 36" ; 30 gauge	1	$11.50	sheet	$12	Equally spaced holes need to be punched in the plate	https://www.lowes.com/pd/IMPERIAL-24-in-x-3-ft-Galvanized-Steel-Sheet-Metal/3234805
e	Rock	Crushed gravel	20 pounds	1	$28.00	bag	$28	Alternatively, can be found from around the site and washed before use	https://www.walmart.com/ip/Landscape-Rock-amp-Pebble-Galaxy-3-8-20-lbs/906361884
	Subtotal (C)						**$8,817**		
6	**Other considerations**	**$6,350**							
a	Onsite survey	Inspection of the site area		340	$0.14	sq.ft.	$48		
b	Labour	Including site clearing, excavation, footing, site clearing etc.		20% of the subtotal (C)			$1,763		
c	Shipping and transportation	Including material transportation to shop and then to the site		20% of the subtotal (C)			$1,763		
d	Additional materials/equipments	Any special tools/ machinery needed for assembly like concrete mixer, etc.		Lump sum amount			$1,500		
e	Contingencies	Including wastage, defective items, etc.		15% of the subtotal (C)			$1,323		
	Net Estimated Project Total						**$15,214**		