Figure 12: Texture as design informant.
12 EXPLORING TECHNÉ

Tectonic and material exploration are shown in this chapter.
“We shape our buildings and thereafter they shape us” – Winston Churchill (1944)
12.1. TECTONIC CONCEPT

The intervention will consist of two main element types, namely permanent and impermanent. The material choices, construction and fixing methods have been considered in terms of these two states.

To respond to the ever changing and transient nature of the site, portions of the proposed intervention will be able to be dismantled and re-erected on another site. Once this black box of the park has recorded what is needed and has added to the nature of the park and its surroundings, it can be removed and relocated elsewhere in the city to document alternative situations and conditions.

This portion of the pavilion is made from premanufactured rib-like elements that are clad using premanufactured ‘sandwich’ panels that are then wrapped in cladding. The means by which these elements join together is simple; easy to erect and dismantle. The cladding is continuous and, due to the nature of the programme, has no openings punched into the façade which creates a monolithic and solid aesthetic.

Once the temporary structures are removed, the permanent elements will remain. They are formed from concrete that appears to grow from the park, creating a network that will form part of the historic layering of the area. These elements are sculptural in nature, and are designed to create intimate spaces as well as form anchor points for public infrastructure to attach to or build from. The presence of these will act as informal memorials to remind people of the absence of the pavilion. Through these fragments the collective memory of the events and people connected to the pavilion as well as the pavilion itself will be maintained.

The permanent elements will become ruins in the landscape which will weather over time. There has been an on-going fascination with ruins and why people find them intriguing and fascinating. If buildings are the most accessible and understood forms of archive then ruins offer people an insight into the not only time, but also give indications as to the reason for their decay.
PHASE 1 - concrete elements that form sculptural elements for seating, playing and as support of basic infrastructure like public toilets.

PHASE 2 - introducing the temporary elements that hover above the ground plane. These spaces are entirely enclosed and appear as heavy and solid forms that invert the commonly accepted forms of buildings. The pods are clad in materials that are in various states of weathering that give the enhanced understanding of time in the built form.

PHASE 3 - Once the pavilion is removed the concrete elements remain. These then become permanent features in the park and will eventually be grown over adding a new dimension to the park landscape.
PHASE 1 - Concrete elements form part of the landscape, creating spaces for interaction and recreation in the park.

PHASE 2 - Concept plan sketch of pavilion

The structural concept for the design consists of the following themes for investigation:

- Permanence and impermanence of structure
  Making use of permanent and movable parts in the pavilion design.
- Creating a pavilion that lightly touches the ground plane, respecting the park as a green public space
- Structure that appears to extend from or pierce into the landscape
- Strategies for creating sculptural forms with solid building elements
12.3. CONSTRUCTION EXPLORATION - ITERATION 1

Exploring steel construction

Current and opposite pages:

Figure 12.3: First construction iterations explored on section.
This first attempt at construction exploration was the starting point for the development of the tectonic concept (page 181).

The method employed here did not do justice to the sculptural qualities of the design. The structure appeared heavy and rigid and the connection between the ground plane and the elevated plane was under-developed.
12.4. STRUCTURAL CONCEPT

Current page:
3-D view of urban archive pavilion.
Opposite page:
Figure 12.4: Tectonic concept sketch (Author, 2016)
Custom cut corners/connector

MS. Flat sections

Rib structure to hang off of steel beams, supported by columns.

NGL.
Figure 12.5: Completed Co-Space blimp. (Raw Studios, 2015)

Figure 12.6: Diagram of assembly.

Current page:

Figure 12.7: Range of images showing the assembly of the Raw Studios Co-Space pod - example of premanufactured elements, erected on site at Boukunde, University of Pretoria. (Swart, 2015)
The raw studios Co-Space is a pre-manufactured pod that is easily assembled and dismantled due to the nature of the components and fixing methods that are used. The floor, structure and display panels were all developed in their studio in Pretoria using imported plywood and a range of machinery. The studio makes a range of office furniture, from chairs to adjustable shelving and desks, but the Co-Space is an example of the first prototype for creating a complete space.

By using two dimensional, three metre high ribs, Raw Studios has managed to create an object that is spatially and formally enticing by gradually adjusting the shape of each rib. This is a simple method of creating a desired form and the way the elements are used and joined together allows for easy manufacture and assembly.

By using the principals of this design and construction method, a larger scale application could be viable for the creation of the pavilion.

Local case study - structure

ASSEMBLY METHOD

- The plywood ribs are assembled using the straights and the custom cut corner pieces.
- The floor panels are assembled.
- Ribs are fixed to floor panels in pre-made slots.
- Stabilising struts are then threaded through the rib structure. These keep the ribs erect and prevent them from falling in on each other by keeping the spacing between them.

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12.5. IMPLEMENTING CONCEPT
The method used to extract the forms of the ribs was rather hands-on. A 1-100 concept model was built to represent the pods and the desired forms. The model was then cut into strips at 2.5m intervals. Each piece was traced and the forms were scanned and redrawn in Archicad and Sketch-up where the ribs could be assembled and clad. These forms were later adjusted when sections were drawn and investigated, providing each space with the required or desired spatial quality.

Current Page:

Figure 12.8: Model cut into 2.5m intervals.
Figure 12.9: Images depicting the slicing of the form to create ribs.
Opposite page:
Figure 12.10: Images of 1-100 concept model.
12.6. BUILDING SYSTEMS

Water Management

Completed Pavilion

When pavilion is operational the water demand can be broken down as follows:

- Kitchenette - 1.1 l/person/per day (including cleaning)
- Toilet (in house) - 7 l/person/per day
- Dark rooms - 100 l/week x 2 dark rooms = 200 l/week
- Cleaning - 25 l/week

There will be approximately 5 people working in and around the building each day (this is an average including weekends and holidays). Therefore the requirements per person per day could be calculated as follows:

\[5(1l + 7l) + \frac{225l}{7} = 72.142 l/day\] for the enclosed spaces in the pavilion

The public ablutions will play the biggest role in the consumption of water. Based on the population of Joubert Park in 2001 the usage of the public amenity can be calculated as follows:

- 29,000 people in 2001, therefore approximately 30,000 people in 2016.

If 20% of the local population visit the park on a daily basis (not merely for commuting) there are approximately 6000 people who visit the park each day. An estimated half of these use the public restrooms each day with 5 bathroom facilities scattered throughout the park. Therefore approximately 600 people will frequent this public toilet on a daily basis.

Products Installed

- Water efficient flush valve urinals - 1.5 l/flush
- Toilets with leak free cisterns with dual-flush mechanism - 3-6 l/flush
- Aerated push-button taps - 1-3 l/wash*

Men's Toilet

If 20% of the men who visit this facility use the w.c. & 80% use the urinal -

\[300 \times 20/100 \times 5l = 300l/day\]
\[300 \times 80/100 \times 1.5l = 360l/day\]

Female Toilet

300x4l = 1200 l/day

Communal Wash-up Area

600x2l = 1200 l/per day

* The average flow of water through taps is 15 l/minute. Using aerated low flow taps with self-closing taps the washing usage can be reduced to 6 l/minute. The total usage per wash is determined by the amount of time the tap is left running. This can be restricted by using self-closing taps which run for periods of 30 seconds, ensuring a 1-3 l water usage per wash.
This gives us a total demand of 1860 l of water per day for the public w.c. If we use the water from the basins to flush toilets we can reduce this demand to 800 l/day (total demand - basin usage - 10% wastage).

Therefore the total demand for the pavilion, in its completed state, is 872.1 l/day.

Storage Required

Based on the alongside information it was deduced that a storage facility of 87 m³ is required to meet the demands of this facility in the dry months. This storage will take the form of a submerged concrete reservoir and some tanks that will feed directly to the building.

Figure 12.11: Concept sketch of roof plan of building indicating water storage facilities.

Figure 12.12: Graph indicating the total water demand (Pieterse, 2014)

Figure 12.13: Graph indicating the total water yield (ibid.)

Tables indicating the rain water harvesting capacity, water yield and water budget for both the initiation phase and the first year of operation (ibid.)
Permanent Infrastructure Post-Pavilion

Similarly when the building has been removed the demand will still be based on the public toilet facilities that support the bandstand event space. Therefore the same usage applies here:

- Men's Toilets - 660 l per day (for urinals and w.c.s)
- Female Toilets - 1200 l per day
- Communal wash-up - 1200 l per day
- General Cleaning - 25 l per day

Therefore the proposed water storage systems will remain to support the ablution block and the excess can be used for cleaning of the bandstand area or irrigation.
Water treatment diagrams stemming from different points of origin:

- Rain run-off from roof falls to ground level paving.

Water drains through porous paving into subsoil sand filters which allow clean water to drain into a perforated polyethylene pipe.

- Water from sand filters is stored in 510m³ storage tank.

Storage tank below ground level hospital. Filtered run-off is then piped into tanks positioned close to public ablutions.

- UV filters are installed at the outlets of these tanks that feed the basins whilst the other tanks feed directly into toilet systems.

Water from basins is stored in cistern and used for flushing.

Solution from the dark room is sent through a steel wool filter to separate the silver from the liquid, allowing clearer water to exit the building into the channels and paving.

Lead water to biowashes that filter the water creating spaces of leisure and eco-systemic awareness.

Water from biowashes is released into open points or the sub-surface storage tank.

UV filters are installed at the outlets of the tanks that feed the basins whilst the other tanks feed directly into toilet cisterns.

Water from basins is stored in cistern and used for flushing.
Mild steel as the structural rib material.

The cladding structure was pulled inward making the extents of the ribs the outer most structural element. The cladding was then hung off the purlins using premanufactured hangers.

Threaded rods with washers and clamps were used as a means to space the ribs making them easy to install and dismantle.

An element was introduced that extended from the ground plane through the pod, creating an anchor point for stability of the structure. Each pod should include an anchoring member.

Positive aspects:
- Methods of easy assembly were explored
- Corner pieces were introduced as special elements to connect the straights.
- The structure remains light.

Negative aspects:
- The structure was not braced well.
- The fins appeared unstable.
- The thin edges of the steel are a health hazard when moving through dark spaces.
Iteration 2 - Structural timber

In this instance timber was used as the structural element, both for the ribs and the support columns. The thickening of the members resulted in a heavier structure, detracting from the overall form of the pavilion. The solidity of the pavilion should be promoted when it is clad, in order to strongly juxtapose the portions of the intervention where the structure is exposed to the public.

The timber columns required an alternative adjustment method, therefore steel brackets and bolts were used as a means of fixing and adjusting the column height. This hampered the freedom of adjustability that the first iteration’s column-adjusting method provided. The use of steel pegs in the timber column may also eventually strip the timber so the holes would have to be lined with steel plugs to ensure longevity.

Concrete ground elements as markers of intimate social spaces were introduced, in this case in the form of a pond and seating underneath the pod investigated. This space is an exhibition space with sculptural elements printed with photographs of the park suspended from the structural ribs in the void of the pod.

Cladding of certain sides of the pod with translucent polycarbonate sheets was introduced as a means to gradually expose certain portions of the structure to the park, leading up to the entirely translucent camera obscura pod.
The pavilion columns are adjustable to make the structure more flexible when being erected on various sites.

The footings of the columns are submerged so that the columns appear to grow from the landscape, stretching from the ground plane, disappearing into the cladding of the structure above.
The support columns are adjustable so the height can be altered according to the terrain of the various sites on which the pavilion will be housed. The mechanism used is adapted from beam and block construction were permanent columns are installed and adjusted using negative and positive threading in the column parts and then fixed in place with concrete or similar.
Clay pavers on a 20mm sand setting bed with 250 micron polyethylene damp proof course with 100mm overlaps. 250 micron polyethylene damp proof course covered with a woven geotextile layer, tucked under edge paver above sand setting bed. Geotextile layer installed to protect DPM from sharp gravel fragments.
Column iteration 2 - adjustable length and angle

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Detail of movable casing for photographic panels
12.9. MATERIAL PALETTE CONCEPT

Approach - permanence and decay

The theme of permanence and temporality should be continued when selecting materials for the project. These materials do not necessarily have to deteriorate themselves, but should be indicative of passing time. Materials that display more reluctance to change should be used for permanent elements whereas materials that are affected by time can be representative of the temporary. Such materials make the viewer aware of the continuum of time and the affects this time has both on architecture and on themselves.

Ruinophilia (Boym, 2011) is a term for our current fascination with ruins. They act as placeholders and reminders of our temporary position in the expanse of time. The overlapping of the built and nature create an unintentional architecture that can only take place over time, creating elements that are beautiful in their degradation. The ruin becomes nature’s canvas, an opportunity for expressing and creating something out of the ordinary. Ruins, in a sense, are the unintentional memorials that are in a constant state of change, resulting in a platform for time, the built and the natural to exist in harmony. “Ruins make us think of the past that could have been and the future that never took place” (ibid.).

Similarly the permanent structures should be made of materials that promote the collaboration with the natural, while maintaining form so as to remind the viewer of the once complete pavilion. These materials are therefore more resistant to change.

The materials used to clad the forms of the pavilion on the other hand, should adopt an appearance of decay, while still maintaining longevity. The seeming decay will emphasize the temporal nature of the pods, giving suggestion to their ultimate removal.

The contrast between the materials of permanence and those representing impermanence will then be in contrast with each other, emphasizing the effects of time.

Still, there is a tougher, more critical edge to the acceptance of the decay of buildings and their inevitable ruin that places architecture in a unique position to inform our understanding of the human condition and enhance its experience. Chiefly, this is to include in design a degree of complexity, even of contradiction embodied in the simultaneous processes of growth and decay in our buildings that brightens and intensifies our humanity. – Lebeus Woods, 2012
12.10. **PERMANENT PALETTE**

Ground plane surface palette

- 30mm Thick red asphalt made with recycled aggregate and tinted with a recycled glass pigment additive.
- Dove grey square clay pavers.
- Blurring lines between park and the built by softening the edges of walkways.
- Merging walkways with the park creating slower paced movement routes.

**Figure 12.24:** Images indicating materials to be used in the design of the ground floor plane
Materials for the ground plane were chosen according to the ease of movement when walking over them and their haptic qualities. They were arranged from fast to slow and will be implemented in spaces accordingly.
12.11. TEMPORARY PALETTE

Case study:

Materials that give the illusion of age

The American Folk Art Museum façade

One of my favourite architectural projects of all time, the once American Folk Art Museum (demolished in 2014) displayed ingenuity in the creation of its façade. The building nestled between the high-rises of New York, silently and respectfully placed and designed to not attract immediate attention but rather to develop interest. The demolition of this project caused an uproar in architectural communities resulting in major upsets regarding the Diller Scofidio + Renfro extension project for the Museum of Modern Art.

The façade of the building comprised of metal panels made from Tombasil, a white bronze alloy. The panels were poured onto a concrete surface, giving each panel a unique textured finish. The presence of copper in the material gave the panels colour properties that transcended the static. With each shift of light, the façade would change colour, responding to the amount and type of light falling on it.

The panels are essentially impervious to decay but give the appearance of being weathered despite this. When the building was completed in 2003 it looked like it had always been there, a contemporary ruin in the city fabric.

Opposite page:
Figure 12.25: Close up of facade panels. (Axis Facades, 2012)
Current page:
Figure 12.26: In Memoriam: American Folk Art Museum (Careaga, n.d)
Figure 12.27: In Memoriam: American Folk Art Museum (Careaga, n.d)
Image exploration of temporary materials
The materials investigated for the cladding are able to rust and form patinas. In this way the building will change over its life span on the site.

These materials can also be pre-aged to give the effect of weathering prior to the pavilion’s erection on site.

The structure is built from steel and timber. Steel adds to the robustness needed when designing a movable structure. Structural timber is used to support the steel members and act as bracing between ribs. Timber is also used for its haptic qualities, creating a warmer and more inviting visual appearance when designing in a park.

while timber offers the haptic qualities desired when designing in a park.

The materials chosen are also complimentary of the materials found on site.
Photographic exploration of various methods of applying copper cladding.

The intention of this exploration is to find an appropriate finish that will create a solid and weighted aesthetic for the pavilion forms. The type of cladding chosen should not be fixed in such a manner that the material is destroyed in the process of dismantling the pavilion.
Physical exploration of textures and colour qualities of copper-based sheets.

An exploration to understand induced weathering and texture qualities that can be achieved when using a copper-zinc sheet (90% copper to 10% zinc).

This material is the same sheeting used to manufacture bullets. This sample piece was obtained from Pretoria Metal Pressings, a sub-division of Denel.

The sheets where dipped and rubbed with various acid solutions as well as sand-blasted to better understand the properties of the material. Once the final construction method is chosen the cladding method and form of induced weathering will be chosen.
12.12. PANEL FIXING ITERATIONS

Progression of fixings

Lipped channels act as anchoring points for mild steel hangers as a means to fix cladding panels to structure.

Exposing the structure through the cladding pattern on the facade.

Hanging the panels onto the structure.

Current and opposite page:

Figure 12.32: Series of sketches indicating the progression of the fixing designs.
Connection between stabilising members and ribs at the base of the structure.

Structure as a means to connect cladding panels.

Spacer between cladding panels.

Steel “sandwich” pannels.

Connection between stabilising members and ribs at the base of the structure.
In this construction method in this exploration is fixed to the inside of the structural rib using steel angles. There were both positive and negative aspects in this detail.

Positive aspects:
- Using steel lipped channels provides a space for the required insulation to be installed, making the building thermally sufficient.
- The plywood panel between the steel frame and the copper cladding acts as a buffer between corrosive materials.
- Steel purlins can be spaced according to copper widths (less than 900mm)

Negative aspects:
- Panels may prove difficult to handle on site.
- Oddly shaped panels will be difficult to construct.
- The manufacturing may prove over-complicated for the type of pavilion.
- Water-proofing proved to be challenging on intersections with the cladding being pre-fixed to the panels.

This construction method was presented in the technical crit in September and it was suggested that an easier method, utilising the steel in the structural ribs for potential fixing methods.

Current and opposite pages:

Figure 12.33: A series of images depicting the connection between sandwich panels and ribs using mils steel angles.
Copper sheeting fixed to 9mm plywood with zinc-coated countersunk, self-tapping wood screw with neoprene washer at seam overlaps. Plywood used as a stiffener for the sheeting, a spacer between the copper and steel and as a thermal break within the panel.

21mm thick marine plywood pivot door clad with copper sheeting on exterior to achieve a uniform material finish on exterior facade.

Reinforced felt seal on door reveal fixed to 40x40x3 treated and painted MS angle to ensure a tight seal when door is closed.

Copper sheeting fixed between 38x38 SAP brandering and 21mm thick marine plywood using zinc-coated countersunk, self-tapping screws.

Copper cladding to be wrapped between reinforced felt layer and 100x50x3 cold formed MS lipped channel by using a plywood spacer to separate steel and copper.

Recycled cellulous fibre insulation fills the voids between the MS 100x50x3 lipped channels, spaced at 825mm cc. Lipped channels form the frame of the premanufactured cladding panel.

Pre-manufactured panel fixed to flitch beam with a 50x50x3 treated and painted MS angle with a galvanized MS M8 hexagonal headed cap screw.

Translucent cover for red LED strip foot lights between rib structure.

Recycled cellulous fibre insulation used in door panel.

Pre-manufactured panel fixed to flitch beam with 50x50x3 treated and painted MS angle with a galvanized MS M8 hexagonal headed cap screw.

21mm thick marine plywood pivot door clad with copper sheeting on exterior to achieve a uniform material finish on exterior facade.

Reinforced felt seal fixed to 40x40x3 treated and painted MS angle to ensure a tight seal when door is closed.

Recycled cellulous fibre insulation used in door panel.
12.14. PANEL ITERATIONS

Steel framed panels

**COMPOSITION OF PRE-MANUFACTURED CLADDING PANELS - ITERATION 1**

- 12mm plywood primed and painted with two coats of matt black paint to finish internal face of panel
- 100mm thick polyester blanket installed in strips between panel studs
- 100x50x25 lipped channels at 800mm centres form the structure of the pre-manufactured panels
- Rubberised strips mounted between copper sheeting and studs prevent the corrosive action between copper and steel
- Acid treated copper sheeting with standing seam overlaps and concealed fixing

**COMPOSITION OF PRE-MANUFACTURED CLADDING PANELS - ITERATION 2**

- 12mm plywood primed and painted with two coats of matt black paint to finish internal face of panel
- 100mm thick polyester blanket installed in strips between panel studs
- 50x50x3 treated and painted MS angle welded to studs and fixed to flitch beam with M8 hexagonal head cap screw
- 100x50x25 lipped channels at 800mm centres form the structure of the pre-manufactured panels
- 9mm thick plywood panel to support copper sheeting and act as a buffer between corrosive elements
- Acid treated copper sheeting with standing seam overlaps and concealed fixing

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Figure 12.34: Opposite page:
Figure 12.35: A series of sketches exploring external fixing methods for panels made from cross-laminated timber.
Figure 12.36: Current page:
Figure 12.37: Diagrams showing two iterations of the composition of cladding panels.
Cross laminated timber panel fixed to steel member of rib.

This method uses cross-laminated timber as a full panel instead of a steel constructed frame with infill.

The benefits of using this material is

- that it offers structural support;
- can be easily cut to almost any size and shape in a factory;
- creates an already finished wall panel in the interior.

This exploration will be investigated in greater detail at a later stage.
12.15. **TECTONIC MODEL**
Model depicting tectonic concept of support structure, rib structure and cladding.

*Figure 12.38: Photographs of first construction model (scale 1:50)*
Assembly series

Figure 12.39: Sequence of assembly
Laminated timber panels fixed to structural ribs.

The building is then wrapped in copper cladding.

The anonymous object.
Figure 12.40: Photographs of detail model

DETAIL MODEL OF BUILDING SKIN
ORIGINALLY AT SCALE 1:10

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Figure 12.41: Building in context.
Figure 12.42: Ground floor plan.
PUBLIC ABLUTIONS

STORAGE & KITCHENETTE

RENOVATED BANDSTAND

BERM

AS SEATING FOR BANDSTAND

GROUND FLOOR PLAN

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Figure 12.43: Ground floor plan.
Figure 12.44: Interior renders depicting the haptic qualities of the enclosed spaces.
Figure 12.45: South elevation
Figure 12.46: North elevation

- Top of concrete wall
- Top of roof
- Top of roof
- Top of roof
- Top of roof
- Flush jointed brick
- Pre-weathered standing seam copper cladding
- Off-site concrete
- Off-site concrete
- Pre-weathered standing seam copper cladding
Figure 12.47: Renders of a view from the street.
REM NANTS REMAINING IN JOUBERT PARK
ENTRANCE TO PARK WITH JAG IN THE BACKGROUND
VIEW FROM CENTRAL PATHWAY OF PARK