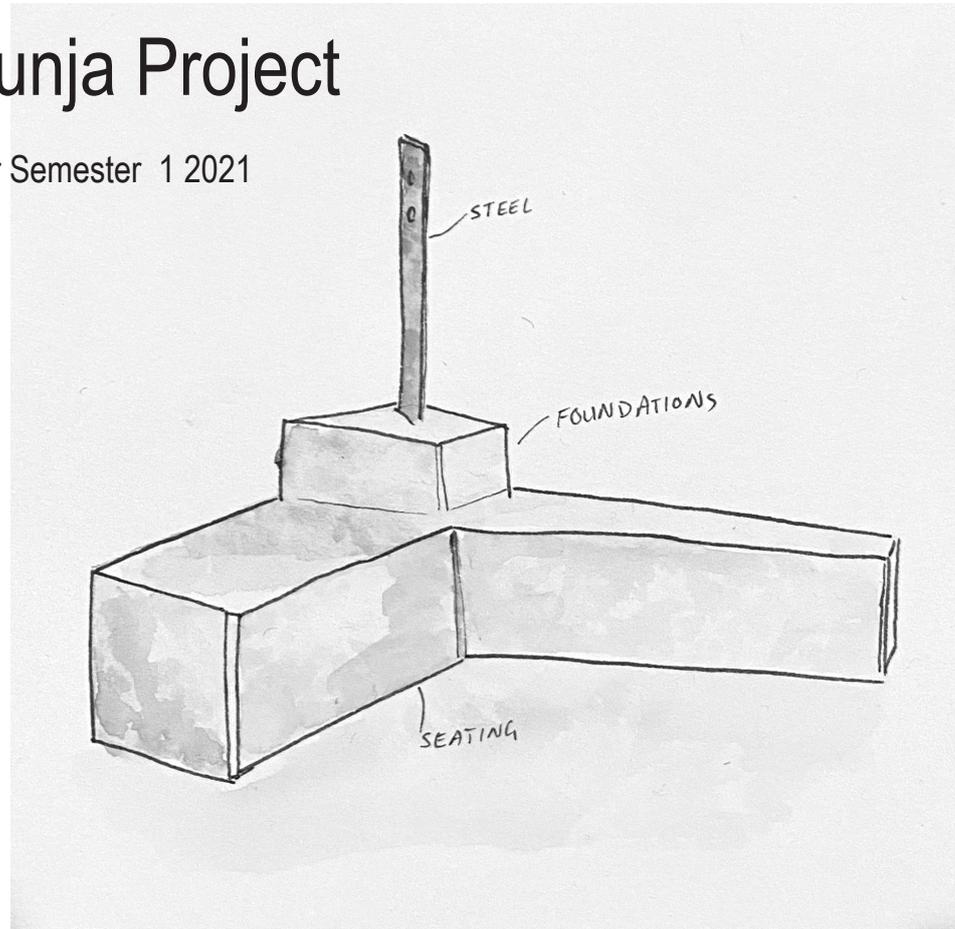


# Cummeragunja Project

Megan Helper Semester 1 2021



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## Introduction



This booklet describes the construction of the form work for casting concrete seating as well as the introduction of decorative elements in relief in the concrete and the pouring and finishing of the concrete. There were three seats created during this phase of the project, two larger and one smaller. This booklet focuses on the smaller seat. These seats were constructed as part of a larger project to create a pavilion beside the Murry river for use by the Cumeragunja community. This pavilion is intended to provide a meeting place for various community gatherings including classes, small groups and ceremonies including dance performance. The design for the seating, as with the rest of this project, has been developed through input from community members and particularly elders. For this particular portion of the design the form and layout of the seating was created to reference the shape of a boomerang and the reliefs on the face of the concrete drew inspiration from stories of the area told by Uncle Col, a Yorta Yorta elder.

## Location

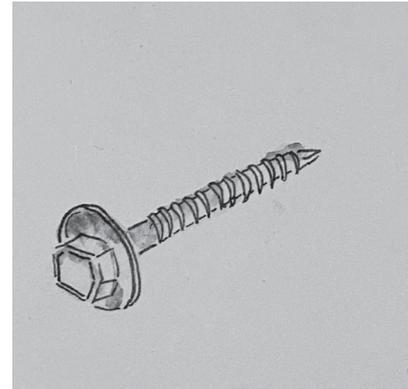
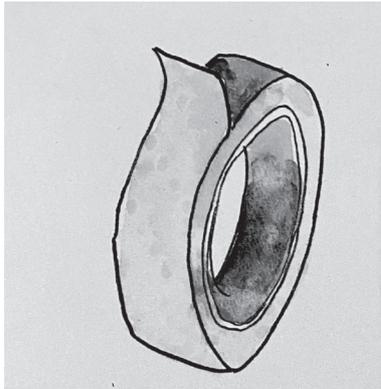
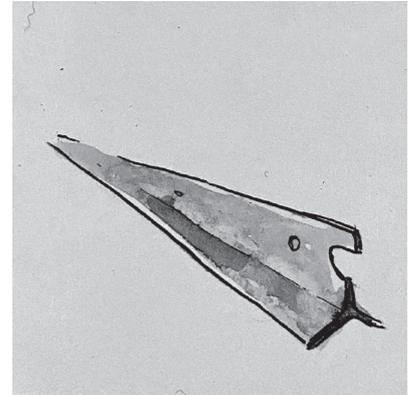
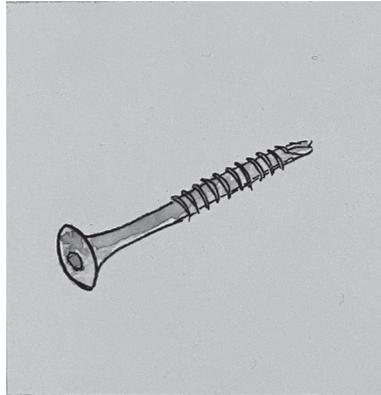
The site for this pavilion is beside the Murry River. It is set back approximately 30 meters from the river to allow for appropriate soil stability and protect from future erosion of the river bank. There is access via a dirt road facilitating construction including delivery of concrete and other materials. The site is close to Viney Morgan Aboriginal Medical Service and community hall space which is at the centre of community activities. This was chosen by the community as the best location to allow maximum use of the pavilion once constructed.

There are existing fire pits between the river and the pavilion site suggesting this is already a gathering place.



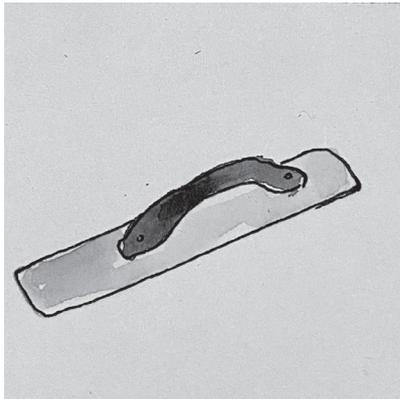
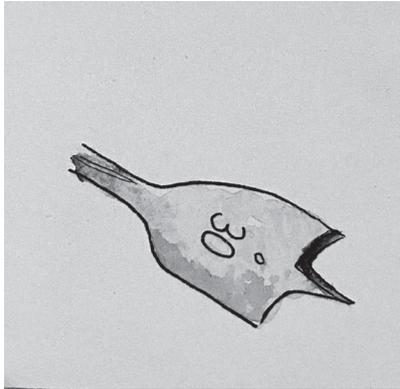
## Materials Used

- Concrete 25 MPA
- Form ply 17mm thickness
- 90/45mm pine members MGP10
- 19mm quad moulding
- Star pickets
- Star picket safety caps
- Galvanised tek screws 65mm
- Galvanised batten screws 65mm
- Tack nails
- Steel reinforcement 7mm mesh + bar
- Wire for joining reinforcement components
- Bar chairs
- Impression materials – sand, bamboo
- Masking tape



## Tools

- Shovel
- Spirit level
- Sledge hammer
- Circular saw
- Drop saw
- Electric drill
- Spade bit
- Tek screw driver bit
- Laser level, tripod and staff
- Tape measure
- Quick clamps
- Pliers
- Concrete float – handheld
- Concrete edging trowel



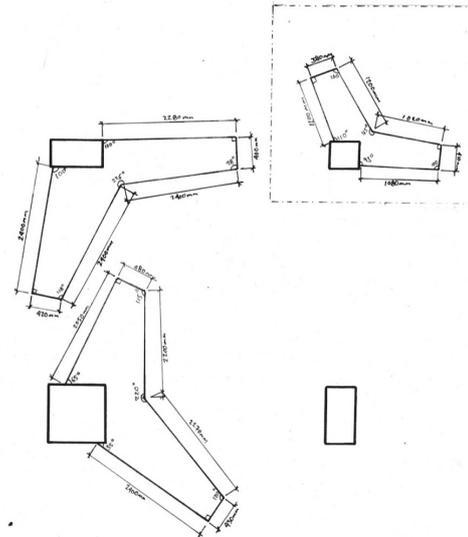
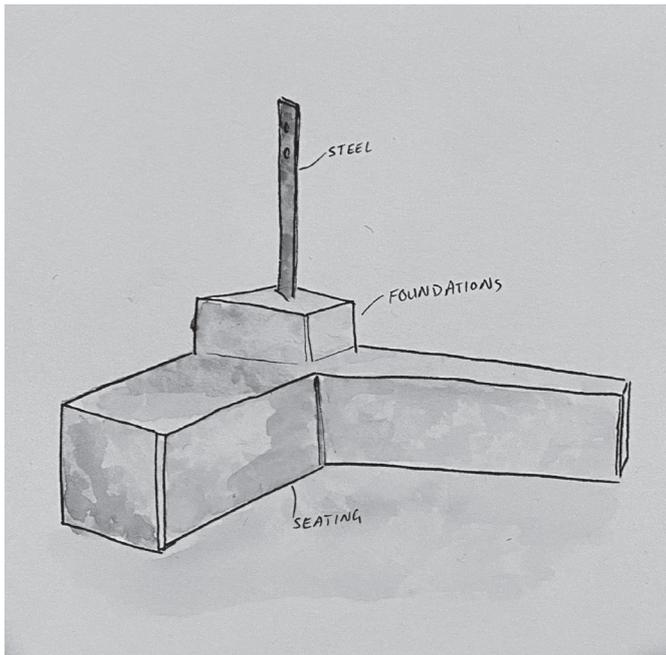
## Safety Gear

- Eye protection
- Ear protection
- Gloves
- Boots
- Sun protection

# Construction Process

## Foundations

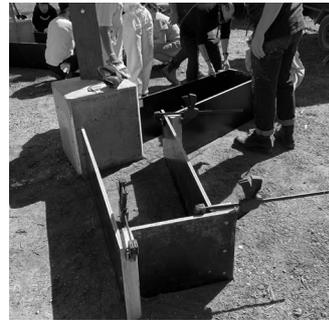
Concrete foundations with embedded steel brackets for the support of the pole and roof structure of the pavilion had previously been constructed prior to the start of the seating portion of this project. The concrete seats described in this booklet are positioned against these foundations and connected with a steel rod. Therefore, the location and construction of the foundations was integral to the positioning and construction of the concrete seating element.



## Positioning of the Seating

The positioning of the seating will significantly impact the function, use and feel of the finish pavilion. The overall concept behind the positioning of the seating was based on the shape of a boomerang. This was an idea that came from Uncle Col. While not literally shaped like a boomerang, each of the three seats consist of two arms protruding from a concrete foundation at an angle to approximate the arms of a boomerang. The arms are also tapered at the ends to further give the impression of the idea of a boomerang. This shape allows for small intimate groups to sit on a single seating arrangement angled towards each other and larger groups to be positioned to view performances or other larger events. Thought was also given to capturing the views of the river and maximising shade over the seating during the hottest part of the day. Considerations regarding shade also determine which three of the four foundation blocks were used to position the seats.

While the main idea of the positioning of the seating with the foundation blocks at the centre or pivot point of each seating arrangement determined the overall layout of the seating, the exact angle and relationship between the seats was determined by collaboration and through a series of experiments moving the formwork around.



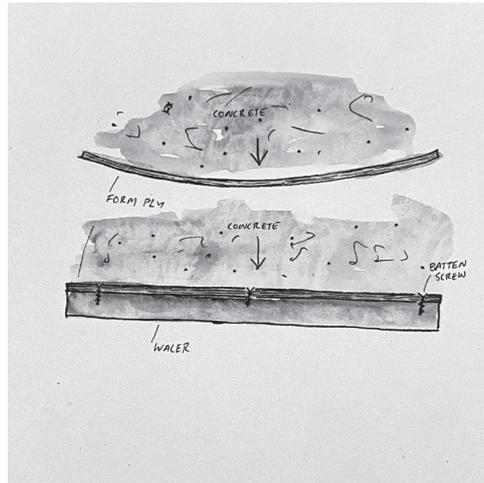
## Site measurement and Preparation

Because of the concrete is liquid when poured it is obviously necessary for the formwork to be level. To prevent spillage of concrete under the formwork the ground should also be flat. To achieve this a laser level on tripod and staff were used to ensure all of the seats were at the same height relative to the ground/foundations. A spirit level was used to check that the ground on which the formwork was to be placed, and therefore the formwork, was level. Areas where the ground was high were scraped back with a shovel and the dirt spread to give a level and flat surface.



## Formwork Design

Considerations in the formwork design included the desired height of the seating (400mm), initial flexibility in the length and positioning of sides and the connection between each arm of the seat and foundation block. The basic design of the formwork consisted of sheets of 17mm form ply cut to a height of 400mm and 90x45mm pine members screwed to each of the adjacent pieces of ply where they meet to form the corners. The long segments of formwork were designed with walers (also 90x45mm pine members) to give support and prevent bowing or blowout of these sections which are under the greatest force from the volume of concrete. Each of the corners were designed to have a segment of 19mm quad moulding on the inside to give a bevelled edge on the corner of the finished seating. This reduces the chance of injury on a sharp edge and also makes the seats more durable by preventing chipping of the corners.



## Formwork Preparation

Prior to assembly on site the following elements of the formwork were prepared:

1) 17mm form ply all segments 400mm high each set of seating required:

- a. 2 x end/short segments 400mm x 600mm
- b. 4 x long segments 400mm x 2400mm for the 2 larger seats and 400mm x 1200mm for the smaller seat.

2) 90 x 45mm MGP 10 pine members 400mm long. Each seat required 5 of these.

3) 90 x 45mm MGP 10 pine members for use as walers. Each seat required 4 of these of the same lengths as the long edges (2400mm for the large seats and 1200mm for the small seat)

4) 90 x 45mm MGP 10 pine members shorter segments of approx. 500-1000mm for use as props on the sides of the formwork

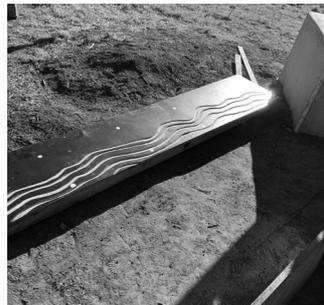
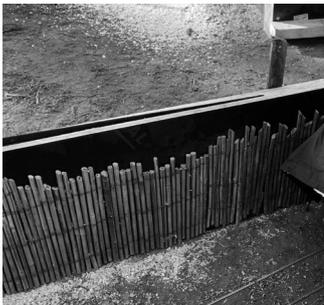
The ply segments and members were prepared at their maximum length to allow for flexibility in the ultimate layout of the seating as these segments could be shortened on site to the required length.



## Concrete Patterns

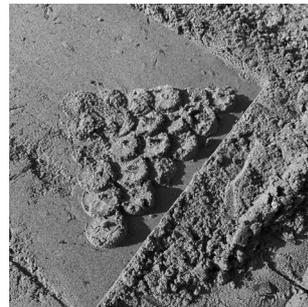
As part of the collaboration with the Cumberagunja community during planning and construction of this pavilion stories about the local area including the land, the river and animals important to the community such as fish in the river have been told. These stories were referenced in patterns imprinted on the sides concrete seating to give a sense of place and connection to the stories and experiences of the community. These reliefs were created in a number of ways:

- 1) Attaching objects such as bamboo to the inside of the formwork creating an imprint in the concrete.
- 2) Placing sand on the inside edge of the formwork while the formwork was partially filled with concrete to create pockets of sand on the sides of the seating. The sand was later removed to reveal cavities.
- 3) Carving into the form ply on the inside surface to create a pattern in relief. This was the process used on the smaller seat and therefore is described in more detail here in this booklet focussing on the smaller seat.



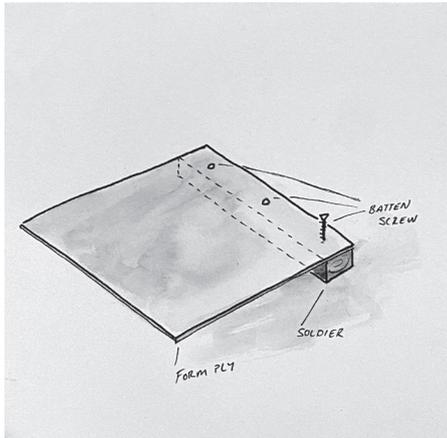
The story reference on the smaller seat related to fish from the Murry river, fish being an important traditional food source. A pattern reminiscent of fish scales was created by using an electric drill and spade bit in the following way:

- 1) Experimentation with various designs regarding depth and positioning of the holes (close/tight spacing versus loose spacing and regular versus irregular pattern).
- 2) River sand piled up and loosely flattened into a surface before form ply with design experiments pressed into the sand to give an idea of the possible finished design. The low angle on the sun in the morning gave a rough idea in horizontal of how the shadows might work in vertical later in the day.
- 3) Determined that close, regular pattern could be read most easily as fish scales. Guidelines traced in pencil vertically at 15mm intervals onto the actual form ply to be used. Outline of maximum extent of the design on the surface also traced.
- 4) Electric drill with 30mm spade bit used at a 30-45 degree angle to the form ply surface used to drill to a maximum depth of approx. 10 mm at the leading edge. Horizontal position of holes approx. 30mm apart (by eye) so that each "scale" was just touching.
- 5) Pattern drilled to the edge of the guideline which was in a wave from to give a soft transition between the edge of the patterned area and the unmarked form ply where the concrete will be flat.

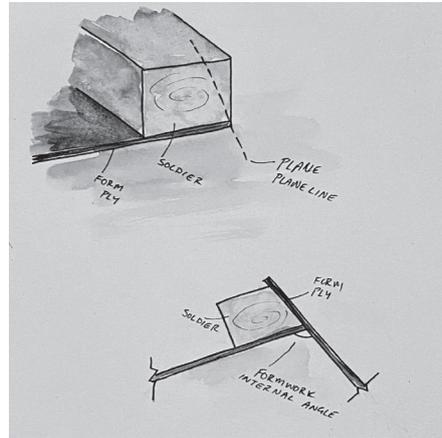


## Formwork Assembly

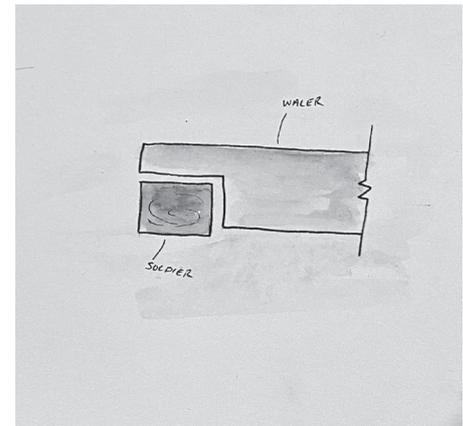
Once the final position of the formwork was determined (using a process of experimenting with different seating layouts holding the formwork temporarily in place using quick clamps) it was assembled and secured:



1) 900x450mm MGP 10 400mm long soldiers screwed onto the edge of each segment of the form ply to create a support for the interface with the adjacent segment of form ply at the corner. The soldiers were screwed in place with 3 x 65mm galvanised batten screws from the inside edge of the form ply through to the soldier.

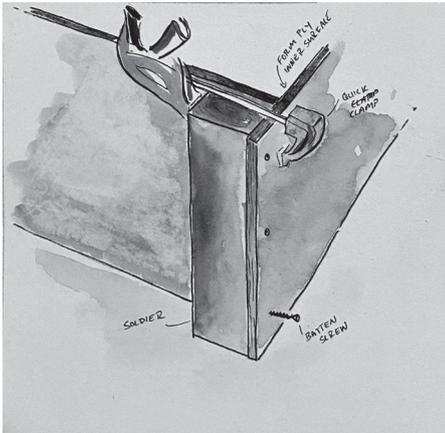


2) Edge of the soldiers planed down at an angle to give complete surface contact with the adjacent portion of form ply. This was necessary because most of the corners were not 90 degrees.

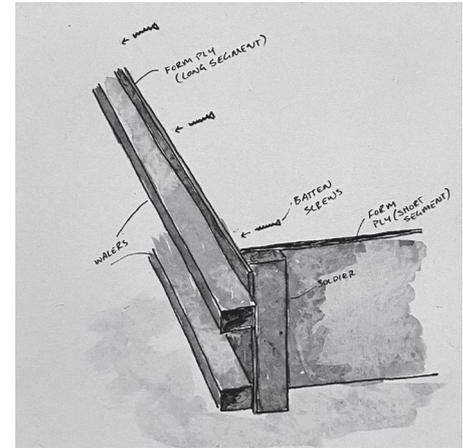
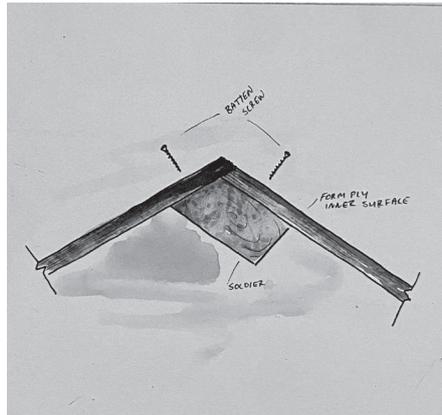


3) Walers notched out to fit around soldiers using circular saw.

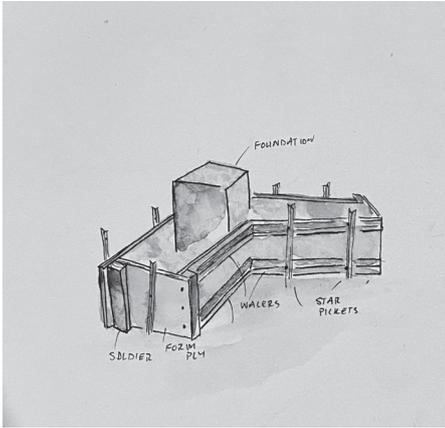
4) Form ply positioned in place with quick clamps then secured by using 65mm galvanised batten screws (3 per soldier) from the outside form ply surface through into the soldier attached to the adjacent corner form ply segment.



5) Middle corner (between both arms of seat) secured by screwing through from the inside surface of the form ply into the soldier using 65mm galvanised batten

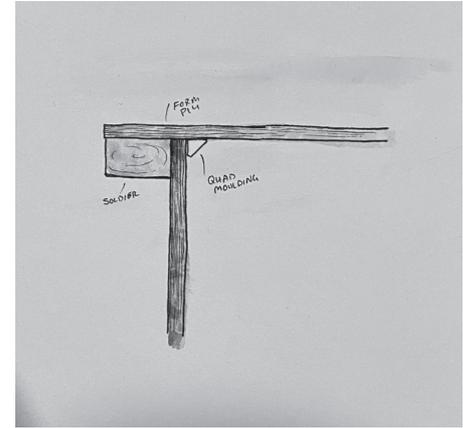


6) Walers attached to the upper and lower portions of the form ply at or close to the edge. Screwed on with 65mm galvanised batten screws from the inside edge of the form ply. A minimum 3 screws used for each waler with the outermost screws placed not more than 100mm from the end of the waler to allow the waler to support the form ply all the way along its length.

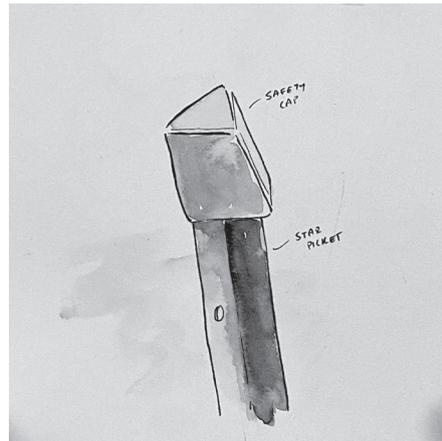


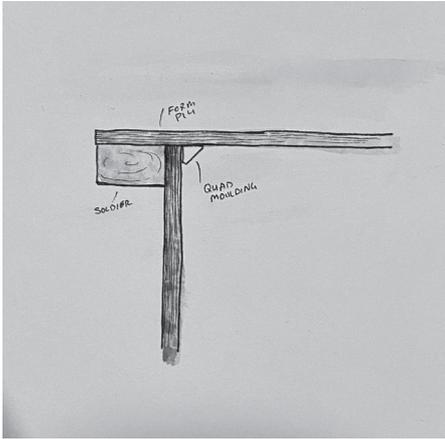
7) Star pickets driven into the ground with a sledge hammer against the outer edge of the form ply. One on each short segment and two for each long segment. Star pickets secured to walers with 6mm galvanised tek screws.

8) One of each of the star pickets on the long form ply segments braced with short (approx. 800mm) 90x45mm bracing member. Bracing member secured with another star picket where it sits against the ground.



9) Safety caps applied to ends of star pickets.





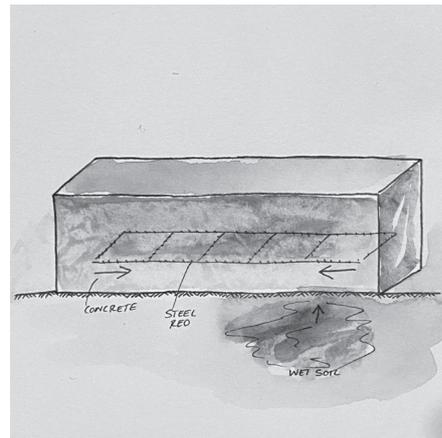
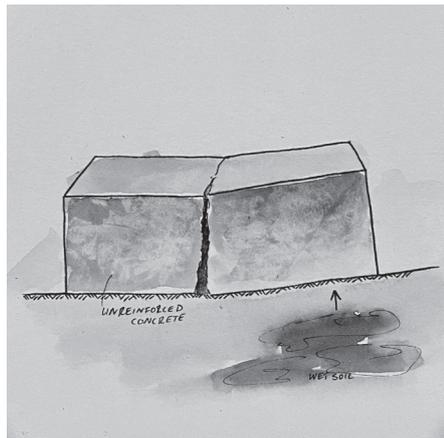
10) Quad moulding 19mm placed into inside corners of form ply mould and secured in place with tack nails.

11) All screw head depressions on the inside surface of the form ply taped over with masking tape to minimise the impression in the finished concrete.

## Reinforcement

One of the qualities of concrete is that it has excellent strength under compression but relatively poor strength under tension. As the ground moves, practically due to expansion from water of retraction when dry the concrete seats will be put under tensile forces. To mitigate this and reduce the chance of cracking steel reinforcement is used. For the seats the following reinforcement process occurred:

- 1) To secure the seat elements to the existing concrete foundations 7mm steel started bars were placed into the foundations. This was at approximately 65mm above ground level and penetrated into the foundations 150mm and protruded 150mm.
- 2) 7mm steel reinforcing mesh was secured to the started bars using wire. The mesh was held off the ground using 50mm high bar chairs so that it would be embedded ware from the surface of the concrete preventing contact with water and rusting.
- 3) 2 x 7mm steel reinforcement bars approx. 1000mm long were secured between the two segments of mesh reinforcement connecting the two arms of the seat. This was also wired in place to prevent movement during the concrete pour.
- 4) A second set of 2 segments of mesh reinforcement and bars were prepared and later pressed into the top of the concrete immediately following the concrete pour. These were pressed down into the concrete to a depth of 50mm using a shovel, again to prevent contact with water and potential rusting.



## Concrete Pour

The volume of concrete required was calculated based on the formwork measurements. For the small seat this was approximately 0.5m<sup>3</sup>. The concrete used was 25MPA. The total amount of concrete required was ordered and delivered via concrete truck. The concrete was poured out of the truck along the discharge chute which was directed into the formwork. The concrete was spread out with shovels and the formwork was vibrated by striking with hammers to prevent air pockets.

A handheld float was used to smooth the surface of the concrete and encourage the aggregate to drop away from the surface slightly. A concrete edging trowel was used to neaten the top edge and give a slightly rounded edge for comfort and to prevent chipping of the concrete.



## Sustainability and Reflection

I have chosen to examine the issue of sustainability less from the perspective of the environmental impact of materials or building; and more focused on the longevity of the design concept and the durability of the relationships made through the project. At its inception, this project began with the Cummeragunja community identifying a resource, in the form of felled timber, and looking for a use for the timber. However, they were also seeking a partnership and ultimately a structure to serve their community. They were looking to draw value from the timber through connections and engagement not only within their community, in the form of a meeting place, but also with the broader community. It is clear, particularly from the talk given by Uncle Col, that they are very proud of their community and their land and that they are committed to achieving a process and finished project that serves and honours that community. It is evident that this desire was understood in the design, for example in the patterns expressed on the concrete seating which referenced stories and important themes for the community.

I was particularly interested in the collaboration between Uncle Col, David and the rest of the community in the design phase. This is obviously a complicated process and somewhat different to the more conventional architect/client relationships. The building of rapport is clearly central to the success of this collaboration. The community evidently felt able to express what they wanted and needed out of the design and to participate in and even drive the iteration of the seating layout. I was impressed that this was the case even with 30 people, essentially strangers, standing around observing. This reflects trust which has been built through multiple visits and interactions. The physical scale model as well as the post model out the front of the medical centre were clearly important communication tools which allowed the community to easily understand the design and therefore to participate in modifying it. The laying out of the seating formwork on site and moving them around was also a process which allowed for an understanding of how the seating would work spatially, before it was set in concrete. The flexibility to do this 'on the fly' style of design appears to be well suited to this project and this style of collaboration.

It would be all too easy for the designer/designers of this project to give the community a 'I know what you want or need' version of this pavilion however even if that was a highly successful structure without engagement with the community it is doubtful that they would have the same sense of ownership and I suggest ultimately the pavilion will not be utilised as fully. Another aspect of this project which is central to its ability to achieve the less tangible goals of connection and engagement is the participation of students, both MSD students and local indigenous VCAL students. This project provides a way for MSD students to start to get an understanding of some of the issues around working with indigenous communities and gives an example of how this collaboration can be achieved. My feeling is that too often in the process of providing services to indigenous communities, be that design of buildings or any other service, the community is disempowered rather than empowered by the process. Hopefully this example of an empowering building design process will be carried forward in some way into our future practice as architects.

