Collection

1. Concept Narrative • Discuss materials, concept, visitor and community experience, co-benefits, shared land uses, and any other important aspects of your design.

Rather than a specific technical architectural vision, this project is a design philosophy that will generate a collaborative and iterative product. It is a proposal of a strategy.

The structure in the design site is a traditional Fijian Bure. It could be approximately 60 feet long by 30 feet across and 40 feet high, but its specific design should be the product of collaboration with local builders. It will likely have a raised platform wooden floor, and might use modern materials for some components as deemed necessary. The structure should be oriented with respect to the Northern sun exposure, but just about all other design elements will come from a team of locals empowered by the resources from this competition.

The primary use of the structure is as an art gallery and a museum. Inside the gallery, villagers can display things for sale and for education to tourists. It can become a museum of the culture and history of the island and its people. This space can be a go-to destination that simplifies how the village receives visitors as it expands its tourism industry. When sports, events and activities are taking place in the design site field, Collection is a common house to be comfortable in with a group.

A series of small complete solar system modules collect power in a basic and easily replaced battery bank. The solar panel surfaces are arranged in a way that they collect rain water into stainless steel cisterns. During times of drought, the full direct power of the solar array can be used to create drinking water from salt water in a direct-drive electric water distiller. The systems implemented should have as few components as possible, and be as easily re-obtained as possible. It should be that with more of the components available, the technology can be built by locals on their other buildings, and re-built after harsh storms.

The primary objective is to create social infrastructure for people to study how to solve environmental problems together. It should be that following this project, if further financial resources became available, there would be people to receive it who were used to working together, who knew comprehensively how to make these basic power and water systems. In other words, the project is to create institutional knowledge. This is in the same vein as what the Bure does as an art gallery or a museum- it generates and holds cultural knowledge.

The project is called Collection because that is what it does. It collects water, art, power, and people. It will bring tourists to Marou Village, and provide revenue for villagers. It will be the stage to prototype water and power solutions, and to educate one another on how to build and

maintain them. It will be the reason why a group of people knows each other, and this is truly the root of resilience.

2. Technical Narrative • What technologies does your design incorporate? Why did you choose them? • How much energy and water does your installation generate each year? • What are the system inputs? What are the system outputs?

These thoughts are a starting place, one example of how things could come together. The design philosophy is to use systems that are as easily obtained as possible, use as few components as possible, and to create opportunities for comparison of different techniques. Here is one way that that might manifest.

There is a large solar array on the north side of the Bure, and another on the ground. Standard 4x8 400W panels are used. As many as comfortably fit on the Bure are used there, approximately 50 (approximately 18kW), and space is kept available on the ground nearby for additional panels. The panels on the ground are propped up by simple mounts so that if a large storm comes, they can be brought inside or laid flat on the ground.

Power is managed inside of a corrugated aluminum shed structure off the back of the bure. Rather than one large management system, power is managed by a series of small systems that can operate independently of one another. For example, these small systems can consist of off-the-shelf charge controllers and alternators on ordinary lead acid car batteries. This allows for many failures to occur without losing full functionality. The power grid infrastructure should transmit both the Fijian standard 240V alternating current, and 12V DC current for lighting and small appliances. The battery bank could hold something like 7500Ah with 50 lead acid car batteries.

Furthermore, the power management system should include bypasses from the charge controllers and batteries to a direct-drive line. There is a growing movement for the use of powered systems that can operate on variable power coming directly from a solar array, drastically minimizing a system's financial and technical scope. Most DC motors for instance can be run comfortably at 0.03%-300% of their expressed power draw, and this difference simply causes the machine to run slower or faster. This is especially relevant to machine shop tools like lathes and band saws that the Marou Villagers might want to use in expanding their manufacturing. This is many times more reliable than relying on a set of complex power storage and distribution hardware.

When setting up many replicates of small solar power systems, one has the opportunity to try out and compare different products. We could easily try components from many different suppliers simultaneously and use the natural selection function to land on the best choice. In this way, the power system on Collection can produce practical research on which components to use for island communities in this region.

Water is collected off of the roof panels in common practice (250,000L/yr from a 50 panel array), and it is stored in stainless steel 3000L cisterns. Collection can also distill drinking water from salt water. In a simple system that uses a direct-drive heating element to evaporate and condense salt water, one 400W panel system is able to produce all of the drinking water required by one adult for less than $100.

3. Prototyping and Pilot Implementation Statement • How will your team approach the prototyping process and full-scale pilot implementation process? How will you collaborate with local community in both of those efforts?

Community engagement will be totally instrumental to our process. If our team builds something beautiful and functional that no one in the village knows how to replicate, we will have failed.

The prototyping process would begin by identifying an institution on the main island that could host a prototype, and building a relationship with them. Ideally this institution would be a museum, like the Fiji Culture Village in Navo, Nadi. This place should be an existing cultural reference point that would know how to find local enthusiasts in Bure construction, solar energy, and water management. The best ideas for addressing the environmental challenges in Marou likely already exist in the minds of people on the island who only need to be empowered by resources.

Working with our new friends at such an institution, we would put out a call to action for participation in this project. That participation probably looks like open invitations to regular virtual meetings, where we can discuss the ideas from this project submission and invite new perspectives. To include people in more remote areas, we should create a mechanism for sending written ideas and feedback.

This team building effort would be towards the end of building a prototype on the main island, and then towards full construction of Collection at Marou Village. The prototype would probably be a small structure similar to a Little Free Library, that showcases local art on a rotational basis. The structure could use a basic solar system to run spotlights, and perhaps demonstrate other functions like water distillation. The prototype would be built at a place where it could garner interest from tourists towards the end of generating resources for the project. The expressed mission of the project would be to develop appropriate technological solutions to the environmental challenges in island communities.

Construction of the Bure structure could begin whenever the right resources are in place. Since the structure itself is not contingent on its environmental technology, we could take our time planning out the myriad of small systems to prototype while building the Bure. Building the Bure will take experienced local builders, but also individuals to curate the space. The best way to accomplish gathering these people will be through consistent regular meetings and activities. It

should be increasingly well known over time, and it should be patient for new voices to decide to participate.

The role of this design team will begin as facilitators and instigators, and diminish over time until it is not needed. The primary actions of it will be to facilitate meetings, collect information, make friends, and research solutions to discuss with stakeholders. Throughout the project, we will constantly be looking for ways to engage new people to participate, and make it known that this research and education project is taking place. We will be keen to listen to what the Marou villagers want from us to support the project that is fundamentally their own.

4. Operations and Maintenance Statement • How will your design be operated and maintained during its life? How will the local community contribute to operations and maintenance?

There will be a number of Marou village locals who fill roles for the maintenance of Collection. These will probably be infrequent and irregular roles, but it should be well established who fills them when necessary.

One person should lead the Bure build as an architect and construction boss. This should be someone who has built Bures before, who can generate lists of physical and personal resources that will be needed, and make construction plans for the building materials available onsite. If that person is on Naviti island, they could also be the point of contact for maintenance and repair of the structure. If not, then someone in the villiange who participated in the build should be a designated maintenance person.

Someone should be the director of operations within the structure. This long-term role includes curating the art gallery, maintaining a system for sales and inventory, and coordinating events in the space. There will probably be several people delegated to assist with various parts of the role, but the operations director should be well known and respected.

Finally, someone in the village should be the leader for technical maintenance and construction. This should be someone who was heavily involved in the process for designing and building the power and water systems, who is capable of teaching and leading others to create new systems. This person should work with others within and beyond the village to create and maintain systems beyond the scope of Collection.

The ongoing maintenance work should be paid for by the proceeds that the installation generates from art sales and tourist events, along with any further resources that our team is able to identify.

It is essential that these roles, and any others that emerge, are generated by the people that will fill them. There may be many creative ways to manage the space, and so rather than designing

a mold to fit people into, the villagers should make a system that makes sense for them. Our team will be available long term to discuss strategies and solutions.

5. Environmental Impact Assessment • What effects might your installation have on natural ecosystems? What steps can be taken to mitigate any foreseeable issues?

The most direct environmental effect is the collection of natural building materials to create the Bure. Bures are typically made from lumber and grasses that are collected close to the build site. Roughly estimated, two acres of plant material will need to be harvested. These are naturally replenishing resources, so the impact is small, but measures could be taken to spread out the harvesting more thinly over a broader area.

The next opportunity for environmental impact comes from waste from imported materials. Just as we learned that there are stacks of old unused solar panels currently in Marou Village, we should be conscious of bringing in things before they're needed. This is mitigated through two ways. First, the solar systems are modular and variable from one another, meaning that we can install just a few to assess viability and utility, and then bring in more based on what we learn. Second, the basic technological design philosophy is to arrive at a few components that people are familiar with, which can be used in many different ways. This ensures that if the components are brought to the island, they have a high chance of being used for something.

The battery chemistry used in the solar system should be carefully considered for ease of disposal and recycling. Certain chemistries like lithium ion are particularly toxic if mishandled, and only recyclable at far away facilities. Nickel-metal Hydride batteries are less toxic if mishandled, as well as lead acid batteries, which are also likely the most accessible. Some types of components might prove to be impractical to import to the island at all. There will be much to learn about the options available to us for waste and toxicity management once we are in collaboration with the community, but options should not be used if they result in an unsustainable pattern of products coming to the island that can't be taken away and recycled.

Another way to reduce the environmental strain of construction is to source components from suppliers that are closer to the island, easily done in southeast Asia. This reduces the carbon footprint, and probably also the cost, of sea transportation. An early step in creating design options will be to spend time on the ground in Fiji studying what materials and components are most commonly available, and prioritizing them. The best form of any technological system in collection will be one that can be rebuilt from a trip to a local hardware store.