



Local Design Principles for Global Construction

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Climactic Design Principles for Suva, Fiji

9 Principles established using Climate Consultant and Precedent Studies

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Fiji Climactic Design Principles Set 1

[Winter Principles]

“Winter” Climactic Design Principles

The following climactic design principles are described in comparison to the previous precedent of the Federal Reserve Bank in SuSuva, Fiji.



image: <http://clivebest.com/blog/?p=1699>

Climactic Design Principles for Rainy Season (Suva, Fiji):

Cross Venilation

Ground Moisture Utilization

Rainwater Managment

The chart below suggests that the region experiences a more mild wet and dry season, as opposed to four distinct seasons. The range in temperature is not drastic and the region for the most part is generally warm and tropical year round. As a result, the following design principles for winter months do not focus on containing heat within buildings, but like the summer focus on maintaing a cool and comfortable temperature as well as dealing with any excess rain.

Temperature Range: Nadi, Fiji (Climate Consultant)



image: Climate Consultant

Fiji Climactic Design Principles Set 1

[Winter Principles]

Cross Ventilation

As previously stated, the warm temperature present year round in Fiji discourage the need for efficient means of heating local structures. Instead, design strategies that continue to cool dwellings during a more mild rainy season are necessary. One important climactic design principle that many buildings use for passive cool in cross ventilation. Cross ventilation works by allowing existing winds to flow through the house and cool the interior space. This ventilation would also discourage mold growth that might be encouraged by the damp environment.

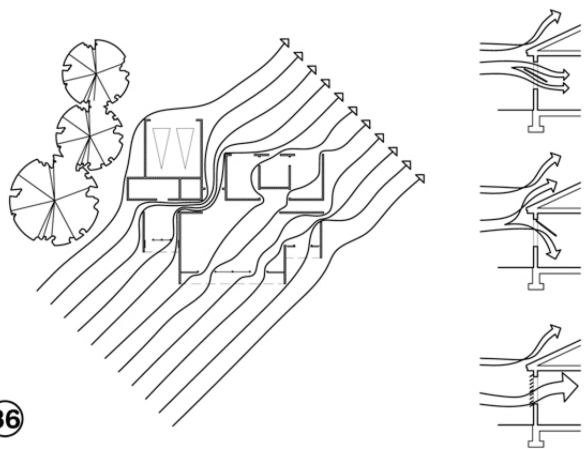


image:
Climate
Consultant

“To facilitate cross ventilation, locate door and window openings on opposite sides of building with larger openings facing up-wind if possible” (Climate Consultant)

This design principle can be applied very easily and efficiently not only to the proposed gateway of entrance, but to many different kinds of dwellings.

The Reserve Bank of Fiji is on local structure that does not take advantage of this simple design principle. The windows are consistent around the perimeter of each floor and are not oriented in regard to prevailing winds and breezes. Additionally, the construction of the windows appears to discourage them from actually being opened and instead is merely the aesthetic purpose of providing sweeping views of the surrounding landscape. Instead, the Reserve Bank relies on its internal, mechanical mechanisms to regulate the interior environment.



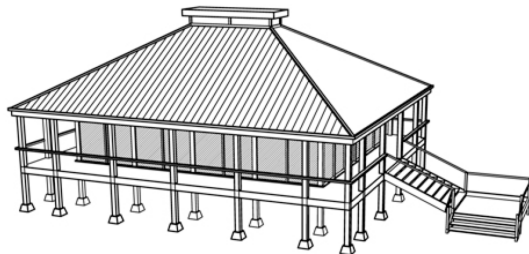
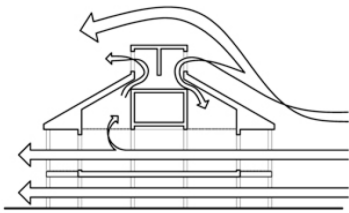
image: Architects Pacific

Fiji Climactic Design Principles Set 1

[Winter Principles]

Ground Moisture Utilization

The next design principle describes ways to deal with ground moisture that result during the rainy season. The proposed technique involves using air cooled by the moist soil as a means of cooling the above interior. “If soil is moist, raise the building high above the ground to minimize dampness and maximize natural ventilation underneath the building” (Climate Consultant).



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image: Climate Consultant

When designing a hypothetical site for the entry way, one could apply this climatic principle in the series of entry. The entryway could incorporate a raised platform or ramp that elevates the visitor above the ground and allows the moisture below to create a cooler transition from exterior to interior.

The Federal Reserve Bank applies the second design principle of dealing with ground moisture in an incomplete and possibly unintentional way.

“Innovative functional design was necessary to ensure the building met the requirements of a national vault, with the incorporation of tsunami floodgates to protect the underground vaults” (Architects Pacific).

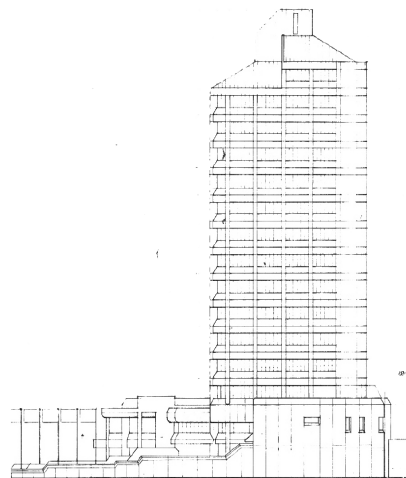


image: Architects Pacific

The climactic principle is utilized in the sense that consideration of the tropical and rainy climate is considered in the design of the building and the building is raised above the moist soil. However, while this is done it appears to be merely for the protection of these lower vaults as opposed as a way to help ventilate the structure. As before, the building relies inefficiently on mechanical manipulation of the interior atmosphere to create comfortable interior thermal levels.

Fiji Climactic Design Principles Set 1

[Winter Principles]

Rainwater Managment

While the previous climactic design principle deals with water that accumulates on the ground, this principle refers to effective ways to manage rain water that also encourage ventilation, but from higher elevations.

“In wet climates well ventilated attics with pitched roofs work well to shed rain and can be extended to protect entries, porched, versants, outdoor work areas” (Climate Consultant).

One way this principle could be incorporated into the hypothetical entry-way might be a pitched roof extending over the structure and that sheds rain water and helps to regulate the temperature of the interior structure.

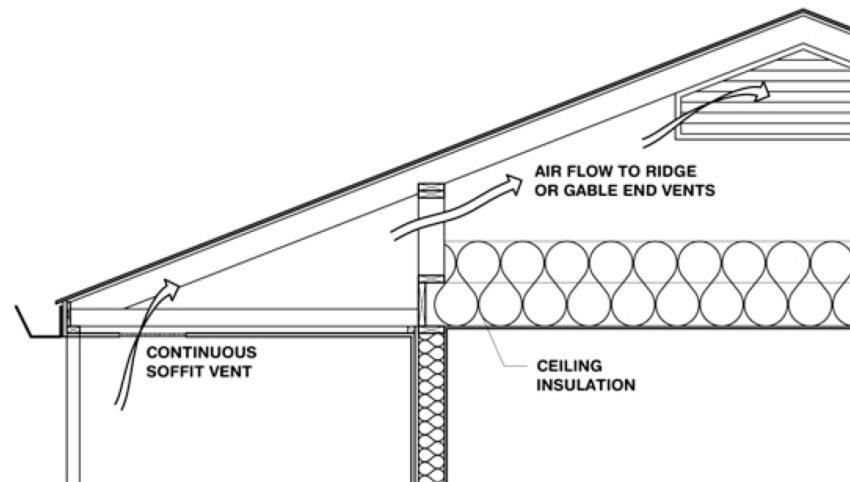
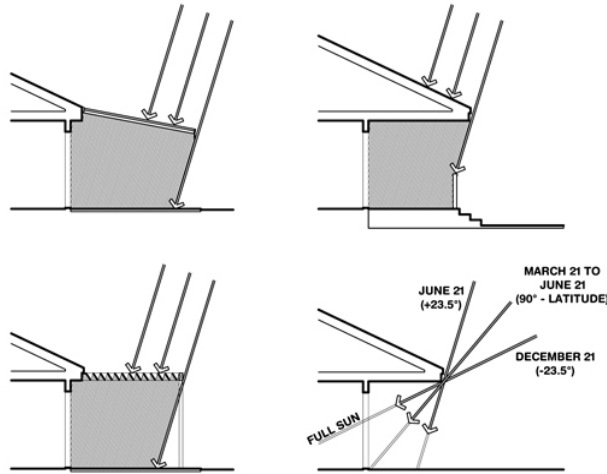


image: Climate Consultant

The Federal Reserve Bank almost in no way incorporates the third climatic principle of design regarding shedding rain water. The roof of the structure is relatively flat and does not extend to the lower levels in a way the encourages ventilation of the higher levels. The building in general fails to incorporate sustainable practices or climatic design principles that make it harmonious with the surrounding environment.

Fiji Climactic Design Principles Set 2

[Summer Principles]

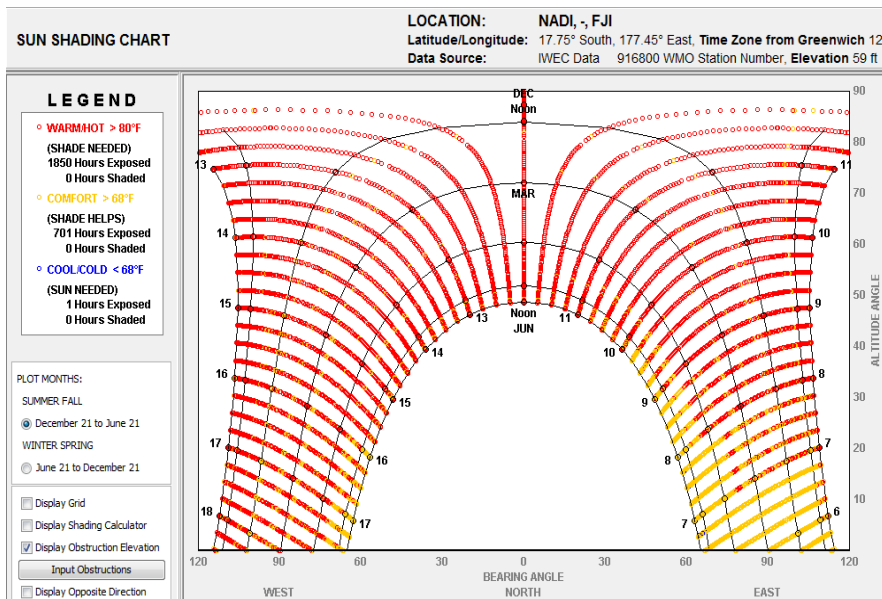


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Window overhangs (designed for this latitude) or operable sunshades (awnings that extend in summer) can reduce or eliminate air conditioning

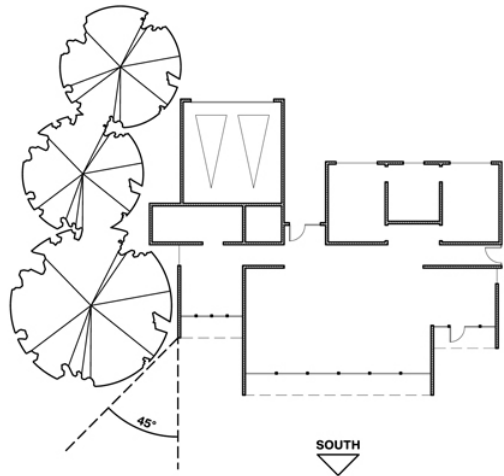
Overhanging and natural shading

To minimize the use of mechanical air conditioning and thereby reduce running costs of the building, it is in our best interest to prevent overheating by creating plentiful shade. This can be done by providing overhangs outdoors to protect walkways and entrances. We have designed a wide overhang that covers the south end of the building, as this is the side that will receive the largest amount of sunlight (see sun shading chart from Climate Consultant).



Fiji Climactic Design Principles Set 2

[Summer Principles]

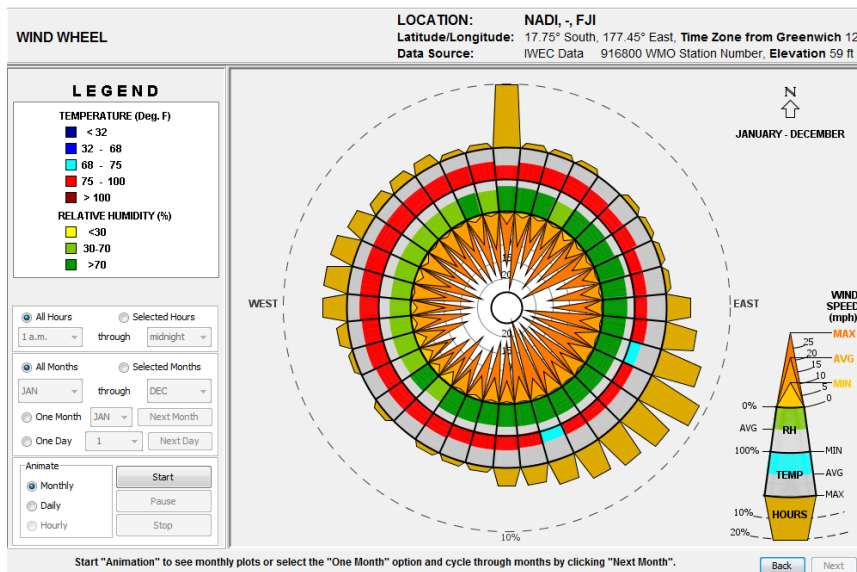


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Use plant materials (bushes, trees, ivy-covered walls) especially on the west to minimize heat gain (if summer rains support native plant growth)

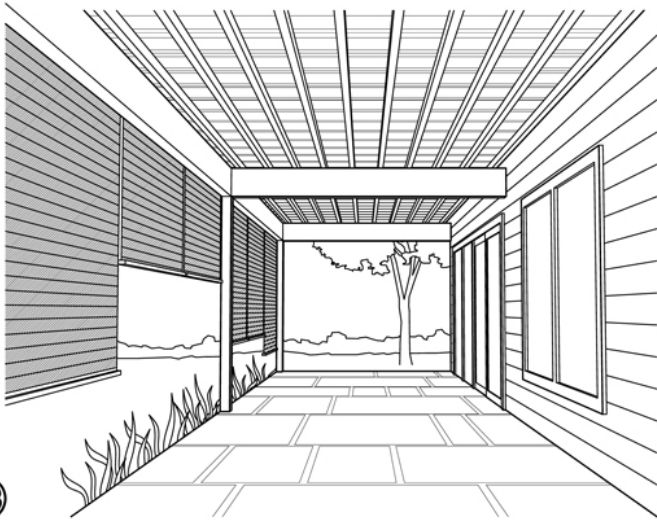
Trees

We plan to landscape in order to provide natural shade in the immediate area around the building and near the structure on the west end. We intend to plant trees to prevent the walls from heating up and warming the indoor air to an uncomfortable temperature. The implementation of local foliage should also help the design better blend into its surrounding environment. As can be seen from the wind wheel from Climate Consultant, this placement will not prevent the majority of incoming breezes to enter the building.



Fiji Climactic Design Principles Set 2

[Summer Principles]



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Shaded outdoor buffer zones (porch, patio, lanai) oriented to the prevailing breezes can extend living and working areas in warm or humid weather

Screens

Our inclusion of screens will allow breezes in during the warmer summer months and also let in the heat during cooler days. These screens surround the building to let in the greatest amount of air. Moreover, they allow occupants to become active members of their surroundings and take responsibility for thermal comfort.

Fiji Climactic Design Principles Set 3

[Cultural Principles]



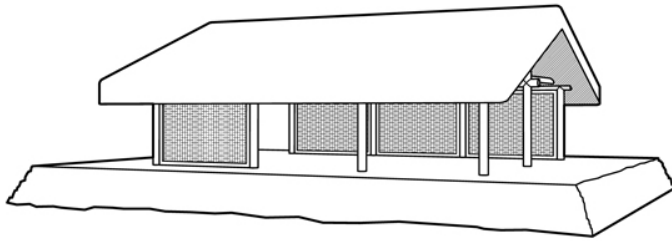
Height limitation

Fiji is comprised of 322 islands, 106 of which are inhabitable. Subsequently, customs vary from island to island although villages had the same general setup nation-wide. The most important building was the bure kalou, or the spirit house. It was traditionally the tallest and most elevated building in the village and had white cowry shells hanging from the roof as the highest form of respect. Out of respect for this tradition, our building will still feature the high, steep-pitched roof but will not be the tallest in its area.



Fiji Climactic Design Principles Set 3

[Cultural Principles]



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Traditional passive homes in temperate climates used light weight construction with slab on grade and openable walls and shaded outdoor spaces



Lightweight construction materials

Buildings were made, traditionally, of layered reed and sugar cane leaves, held together with coconut fibers. This choice of materials was lightweight and allowed air flow while still providing insulation. It protected its inhabitants from the sun and let the cool air that circulated to keep the temperature down. In our design, we intend to use this same idea but use modern materials such as lightweight steel for the skeleton. With our incorporation of screens and shaded outdoor areas, as suggested by Climate Consultant, this should further decrease the need for mechanical cooling systems and keep the running cost of the building down.

Fiji Climactic Design Principles Set 3

[Cultural Principles]

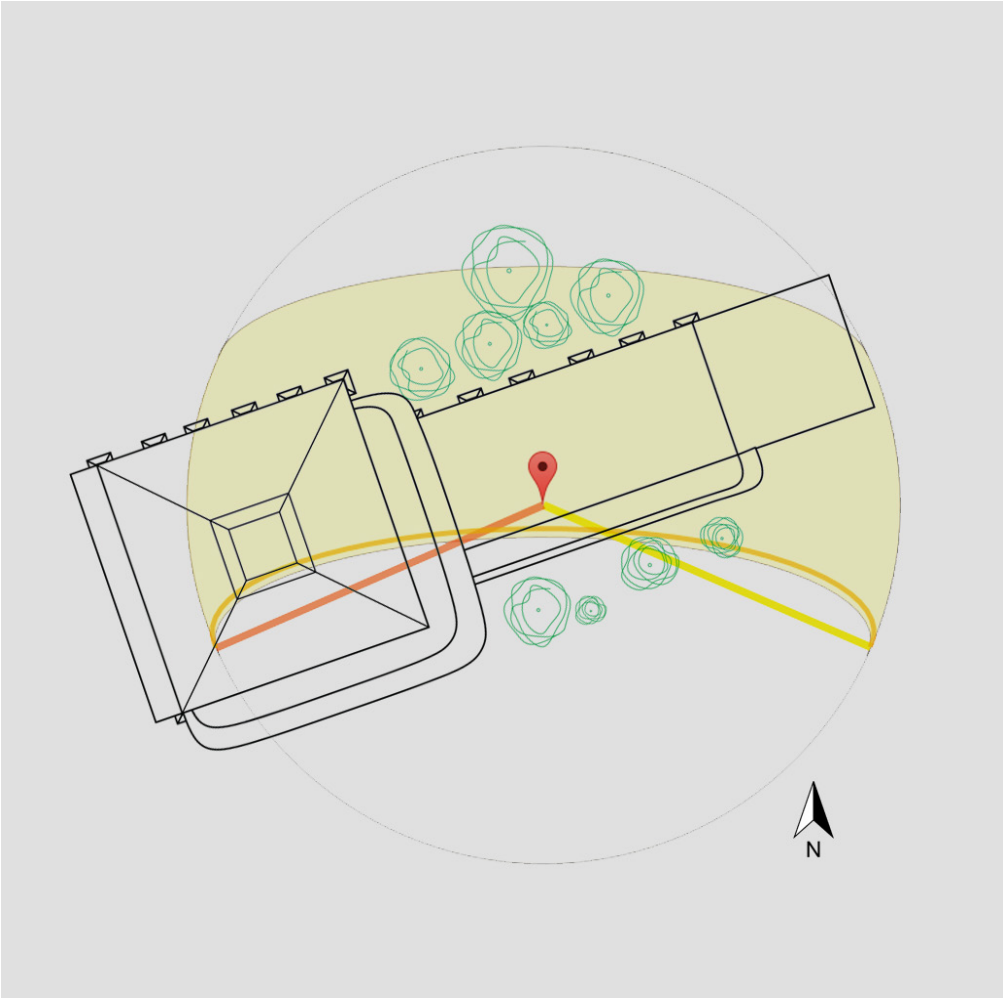


Incorporating trees to blend with natural surroundings

There is a strong tradition of gathering and meeting in Fijian culture; courtyards and public places are abundant on the islands. The Thurston Gardens are one of the tourist highlights and we hope to incorporate this same environment in to our design. Not only will it help the building blend in with its natural surroundings, but strategically-placed local flora can double as rain gardens to help with storm-water management and provide shade to prevent heat-gain in the building. Moreover, with the addition of seating, this area could be used by the employees to relax and allow visitors to come and view the building. The ni bose meeting house on another island uses their plot to meet with visiting ambassadors and members of parliament, continuing on the customs of the native people.

Fiji Climactic Design Principles

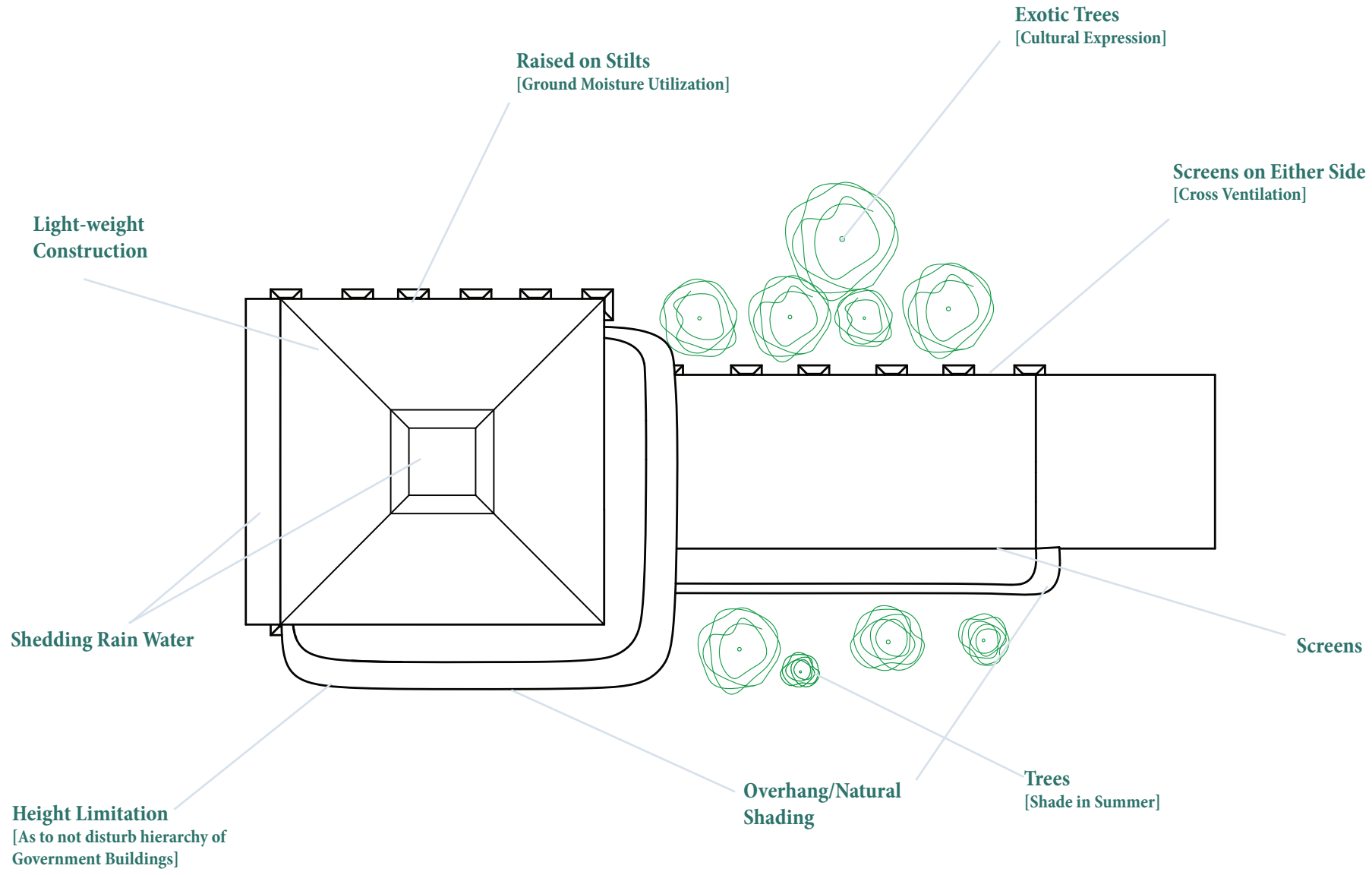
[Orientation Diagram]



SunCalc Overlay to show
Orientation of Building

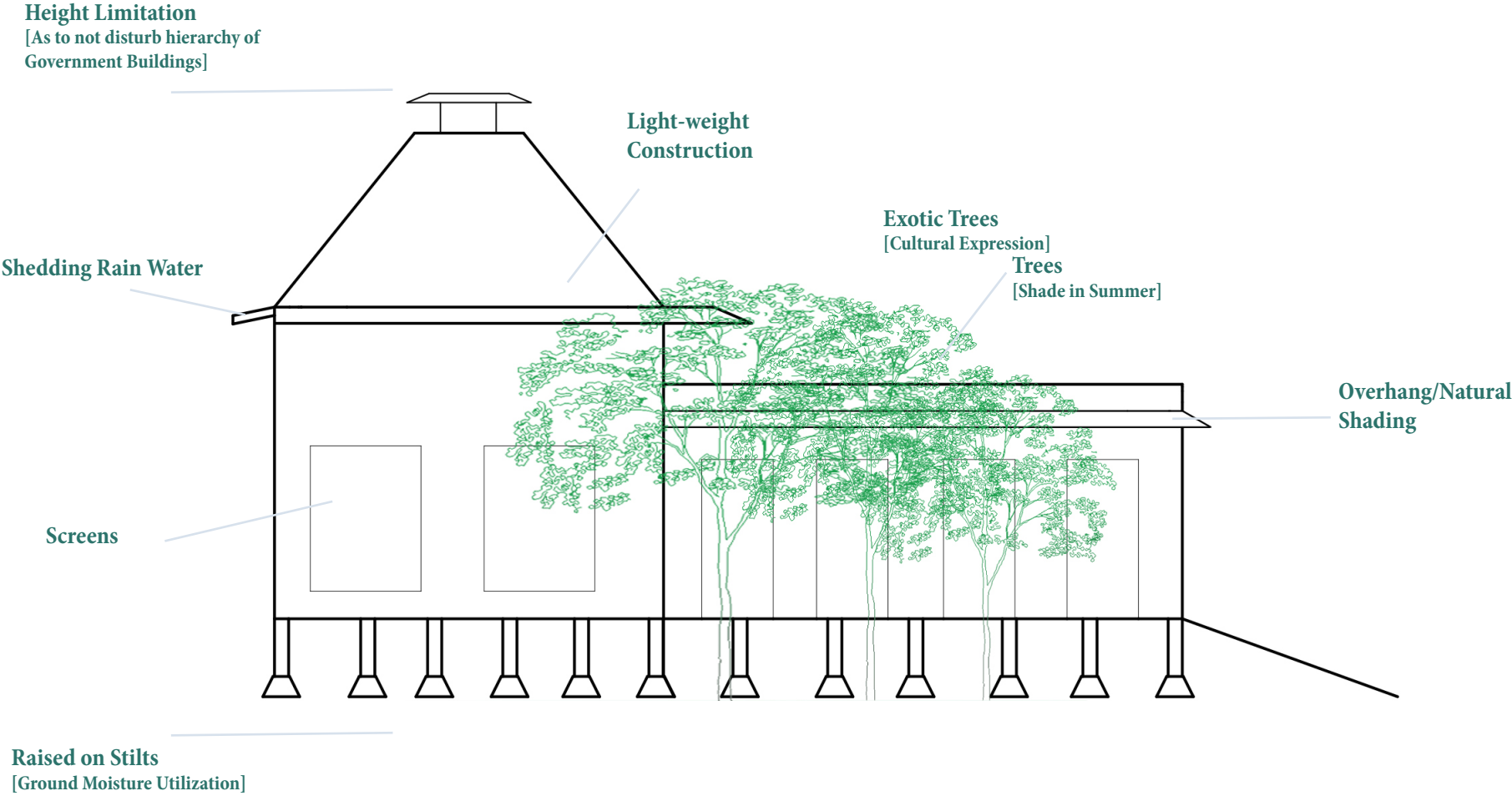
Fiji Climactic Design Principles

[Entrance Diagram]



Fiji Climactic Design Principles

[Orientation Diagram]



Fiji Climactic Design Principles

[Collective Render 2]



Hybrid render showing main entrance and position relative to trees

Fiji Climactic Design Principles

[Collective Render 1]



Hybrid render showing main entrance and size comparable to people

Fiji Climactic Design Principles

[Diplomacy]

Because of the research we have done, this entrance should be an acceptable entrance into any space in Suva, Fiji. The main characteristic that accomplishes this is the restriction of height. Having the main government buildings as the tallest is a sacred tradition that dates back centuries. Our entranceway abides by this and fits in with the vernacular of its surroundings.

Our design encourages communication by the small gathering space and walkway. The strongly encouraged interaction is essential in sparking discussion.

Works Cited:

Architects Pacific. Reserve Bank of Fiji, Suva, Fiji Islands (n.d.): n. pag. Architects Pacific. Web. 24 Nov. 2014.
<<http://www.architectspacific.com/index.html>>..

Climate Consultant