[AC-CA] SYDNEY CONTAINER VACATION HOUSE COMPETITION

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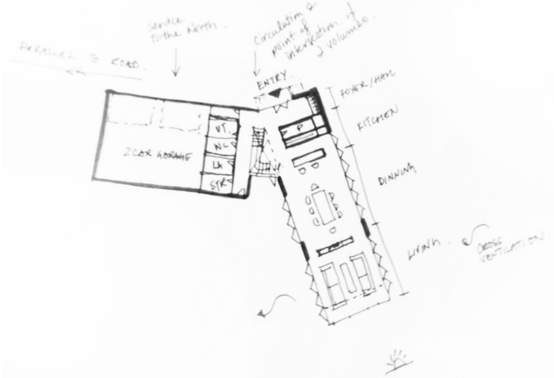

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ON THE STRUCTURAL FRAME: *THE SHIPPING CONTAINER*

The word, container originated from the Latin word “continere” which means to hold, to store or to surround something. Shipping containers are technically five sided metal boxes that are constructed with corrugated weathering steel, or better known as Cor-ten steel. Cor-ten steel is a group of steel alloys that has been invented to reduce the long-term maintenance such as the need for painting. This particular type of steel has been especially designed to resist exceptionally well against extremely harsh environments in comparison to any other types of steel, hence a very sustainable material.

Freight containers, also known as intermodal containers, are manufactured with standardized sizes to ease the transport of goods from one mode of transportation to another, like trucks, ships and trains, without having to unload and reload the contents being carried within. The standardization of containers began in the mid 20th century by a former trucking entrepreneur in the United States of America, Malcolm McLean, who wanted to simplify the loading process of loading cargo from trucks onto ships for his trucking company. Before his time, all cargos were loaded and unloaded using irregular sized wooden crates, which greatly slowed down the transportation process. After experimenting numerous ways to better load and unload trucks and ships, what is known as the Shipping Container today was born. He came up with a design of a metal box that was uniform, strong, theft resistant, storable, stackable, and extremely easy to load and unload onto trucks, rails and ships. He was also the first one to revolutionize trans-ocean shipping with the introduction of the first container ship in 1956. During the same period, the US military also started using 20 feet long metal boxes for the delivery of goods to crisis areas by water and land. After that, the rest of the world had begun adopting these uniformly dimensioned metal containers. By the 1970s, the dimensions and strengths of freight containers had been standardized worldwide through a system known as ISO or the International Standard Organization.

According to the ISO standards, freight containers are normally 8 feet wide, ranging from 8 feet to 56 feet in length and 8 feet to 9 feet 6 inches in height with a set of double leaf doors on one of its ends. (*fig. 1.0*) The most commonly used shipping containers worldwide, however, are those that measure 8 feet wide by 8 feet tall by either 20 feet long or 40 feet long. All freight containers have been designed to carry heavy loads and with the substantial strength to be stacked vertically up to 9 units in height. To make these stacked units stable during the process of transportation, casted openings for twist-lock fasteners are designed at each of the 8 corners of any freight container. Generally, a 20 feet long container, which weights about 2.4 metric tons, can take up more load than a 40 feet long container, which weights about 4.5 metric tons. The overall load of each container, regardless of overall length, is still supported by the four corner columns of the metal box. Hence, the stacking ability of 40 feet long containers is lower compared to 20 feet long ones.

		20′ container		40′ container		45′ high-cube container	
		imperial	metric	imperial	metric	imperial	metric
external dimensions	length	20′ 0″	6.096 m	40′ 0″	12.192 m	45′ 0″	13.716 m
	width	8′ 0″	2.438 m	8′ 0″	2.438 m	8′ 0″	2.438 m
	height	8′ 6″	2.591 m	8′ 6″	2.591 m	9′ 6″	2.896 m
interior dimensions	length	18′ 10 5/16″	5.758 m	39′ 5 45/64″	12.032 m	44′ 4″	13.556 m
	width	7′ 8 19/32″	2.352 m	7′ 8 19/32″	2.352 m	7′ 8 19/32″	2.352 m
	height	7′ 9 57/64″	2.385 m	7′ 9 57/64″	2.385 m	8′ 9 15/16″	2.698 m
door aperture	width	7′ 8 ⅛″	2.343 m	7′ 8 ⅛″	2.343 m	7′ 8 ⅛″	2.343 m
	height	7′ 5 ¾″	2.280 m	7′ 5 ¾″	2.280 m	8′ 5 49/64″	2.585 m
volume		1,169 ft^3	33.1 m^3	2,385 ft^3	67.5 m^3	3,040 ft^3	86.1 m^3
maximum gross mass		66,139 lb	30,400 kg	66,139 lb	30,400 kg	66,139 lb	30,400 kg
empty weight		4,850 lb	2,200 kg	8,380 lb	3,800 kg	10,580 lb	4,800 kg
net load		61,289 lb	28,200 kg	57,759 lb	26,600 kg	55,559 lb	25,600 kg

fig. 1.0

The standard 8 feet width of shipping containers is often insufficient for the design of a typical free standing housing unit. Usually, a minimum of two shipping containers joined side-by-side is necessary to generate standard sized living spaces of a house. Below is an example of a simple 640 square feet container home with two bedrooms and one bath. (*fig. 2.0*)

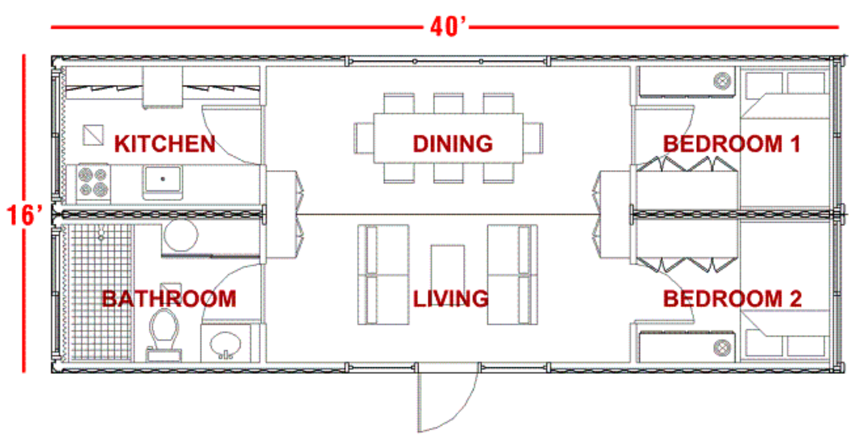

fig. 2.0

All freight containers are highly stable self-supporting structures. (*fig. 3.0*) At each corner of the container is a structural post. These posts are designed to distribute the self-load of the container’s roof, as well as loads from other containers that may be stacked above. Structural rails, which act like beams in this case, are used to tie the four corner posts together through specially designed corner fittings, creating a framework for the walls, roof, and floor of the box. On the base of each container, lateral structural members are attached to the two bottom side rails at constant distance apart, acting as support for the floor of the container. Flat or corrugated sheets of metal are used to generate the side panels of the box. The interior flooring material of each of these metal boxes may vary depending on the kinds of goods that it will be used for, as well as the manufacturer. Typically, they are made with laminated wood planks, sheets of plywood, composite materials, sheets of steel or aluminum, sandwich panels or a combination of both metal and wood. Thus, the use of shipping containers as building blocks substantially increases the overall construction speed of any given architectural project.

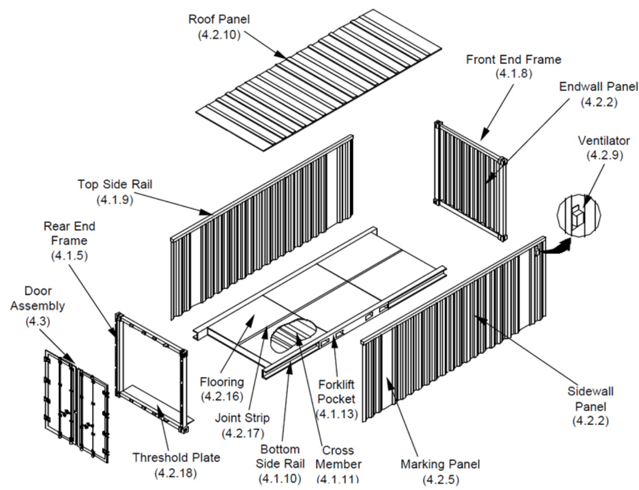

fig. 3.0

Furthermore, when shipping containers are used as building blocks, they are essentially demountable and re-mountable elements. Whenever the planned service life of a container building has been terminated, all container modules of the building can easily be recycled and reused at a subsequent location.

As described previously, the strength and durability of just one shipping container on its own already exhibits great loading capacity. Better yet, when numerous of these containers are connected together as one entity, whether vertically or horizontally, an uni-body construction unit is formed. This uni-body structure, like the uni-body construction of most automobiles and airplanes, exhibit much greater strength than a singular container on its own. The structure thus becomes much stronger when multiple of these containers are connected together from the top, the bottom and the sides. Even with extreme modification to the walls of these containers for the creation of larger interior spaces, the strength of this ensemble of containers is undeniably greater than any conventional home or building. However, when exhibiting a design with combined shipping containers, it is important to have all dead and live loads of the structure effectively transmitted onto the ground. This can easily be executed by carefully positioning all corners of the containers directly above one another, just like how they were originally designed for.

A variety of options are available to connect different shipping containers together to form a strong uni-body. Twist locks and latch locks are two types of connection devices that are commonly used to secure containers together through their unique corner fittings as described earlier. Stacking fittings, or otherwise known as stacking cones, are only capable of securing containers horizontally. This type of fitting, when used, often accompanies other types of securing devices. The stacking fittings, although being very similar to twist locks and latch locks, they are one only directional and cannot be rotated to lock things in place like the other types of fittings.

When the design intention of a given building structure requires an irregular organization of shipping containers, such as the staggering or the rotating of these metal boxes in relation to one another, usual connection devices are no longer sufficient for the proper connection of the modules. In such scenario, additional reinforcement is required at the where the corners and the beams of any shifted containers intersect. This eliminates the twisting and shifting of these container modules during the intended lifespan of the building. It also ensures that all loads are properly transferred downward into the foundation below.

Freight containers, whether new or used, can be found everywhere across the globe, from as cold as the Artic to as hot as the Dessert. Thus, the impacts done to the environment during the shipping process of usual construction materials can definitely be avoided when shipping containers have been chosen as the primary building material of a given architectural project. Approximately 90 percent of the goods around the world are transported in shipping containers. Every year, over 5,000 container ships cross back and forth the ocean carrying more than a hundred million shipping containers during each crossing. Unfortunately, most shipping companies tend to discard the containers after they have been used for a few crossings. This is because the cost to ship empty containers back to their point of origin eventually becomes higher than for any shipping companies to simply purchase brand new ones directly from Asia. As a result, in many port cities and inland freight transit terminals around the world, thousands of empty container boxes are stacked up like mountains, casting long shadows to the neighbouring buildings. Unfortunately, the way we trade globally today is not likely to change drastically over the upcoming years. Hence, the number of empty containers sitting in these coast cities will simply continue to generate a disposal problem worldwide. (*fig. 4.0*)

fig. 4.0

The use of these containers for housing, thus, can not only help solve this waste disposal dilemma faced globally, it can also provide a sustainable alternative for building developments, from the construction of emergency shelters to apartment complexes. Additionally, to recycle idle containers for the generation of raw materials is not the most efficient and effective way of solving the problem. A new container consists of approximately 8000 pounds of steel. To completely melt it down, over 8000kwh of power is necessary to operate all the machineries. To modify it for the use of building structure, however, only a mere one fifth of this power is required. Hence, the use of shipping containers as building modules deems to be a sustainable alternative.

On average, a brand new 20 feet container costs approximately 2,500 euros, while a used one costs roughly 1,300 euros. Constructing buildings from freight containers, therefore, can definitely be more cost effective than buildings that are constructed from other labour intensive materials, such as brick and mortar. Container homes, like any other steel metal buildings, when properly detailed can have a life expectancy of over 30 years under normal wear and tear conditions.

Altogether, the modularity, the durability, the strength, the transportability, and the affordability of shipping containers have thus made it a widely used alternate material selection in the realm of building construction, both within the commercial sector, as well as the residential sector.

ON THE STRUCTURAL BASE: *THE CONTAINER FOUNDATION*

Although shipping containers are rather strong self-supporting structures, when used as building shells however, they still need to be constructed onto stable foundations. Typically, shipping container buildings are rather lightweight, therefore their foundations do not need to be extensively strong. The specific type of foundation used varies depending on many factors such as location, soil conditions, the particular geometry of the building design, as well as the intended lifespan of the building itself.

Large pieces of prefabricated concrete slabs are one of the suitable foundation options for container buildings. (*fig. 5.0*) They are inexpensive and easy to install on site. Since these concrete slabs are prefabricated, they come in standard sizes, ranging between two by one meter and two by two meters with about a typical thickness of 14 centimeters. Prior to the installation of these concrete slabs on site, the subsurface of the foundation must be carefully prepared using a mixture of fine minerals. A layer of coarse and fine sand mixture is than applied over it to level out any unevenness of the ground. This procedure eliminates the cracking of any concrete slabs when placed on site due to unevenness, as well as the stability of the building in the long run.

fig. 5.0

Other than prefabricated concrete slabs, pad foundations are also suitable for the construction of container buildings. Pin foundation and removable pre-cast concrete foundations are two commonly used types of prefabricated pad foundations. (*fig. 6.0*) In this case, steel rods are inserted directly into the ground at a specific angle to adequately fix the precast concrete foundation pad in place.

fig. 6.0

Once the foundation for a shipping container structure is established, regardless of the type chosen, shipping containers must then be securely fastened to foundation itself. Typically, steel footings are used as means of connections by attaching them to the four corners of the container box itself. These footings are specially designed to be adjustable; height differences can easily be evened out while transferring loads effectively into the foundation below.

ON THE STRUCTURAL FRAME: *THE CONTAINER WEAKNESSES*

Although shipping containers have become universally used as a modular building base due to its numerous positive qualities as discussed above, just like any other materials, they also express some weaknesses when used for the construction of buildings.

First of all, the standard dimensions of freight containers, 8 feet wide by 8 feet tall by 20 feet or 40 feet long, generate rather tight space conditions when used for the design of buildings. With depths of interior walls and ceilings added, the end result is usually a long narrow space with an unpleasant floor to ceiling height that is less than 8 feet high. Although there are high cube containers that are 9 feet 6 inches in height, which can create more pleasant floor to ceiling height, they are not as abundant as traditional 8 feet tall ones. In most cases, more than one shipping container is required, either placed side-by-side, or stacked up vertically, to increase overall floor space and to generate more standardized room sizes. Due to the weight and size of these metal containers, additional fuel energy is therefore needed to maneuver them on site using cranes or forklifts. (*fig. 7.0*)

fig. 7.0

Since shipping containers are primarily made from metal, they are extremely good conductors of heat. When transformed as habitable shelters, the temperature inside the containers can easily drop too low in cold seasons for human comfort, and conversely, rise too quickly to unbearable levels during hot seasons. Therefore, controlling the interior temperature of a container building becomes the biggest challenge in most container architecture designs. In most cases, the proper adaptation of HVAC systems, wall insulations, and exterior cladding materials are required solutions to reduce energy consumption, as well as to keep the container building's interior temperature livable. In some cases, a green roof or an additional structural roof is required to be constructed over the existing container box itself to minimize unwanted heat transfer. Alternative solutions include the insertion of openings at higher levels, such as clerestory windows or skylights, to let out the unwanted hot air that had been collected within the metal container space.

Once the structure of the container has been modified to meet design intentions, such as openings for windows and doors, or the openings for the enlargement of interior spaces, the overall strength of the box immediately decreases. Thus, additional reinforcing structural elements are often required to hold up the necessary loads, especially those from the roof of the building itself. In most cases, torches and fireman's saws are required for the alteration of the original containers. During this process of modification, not only a great amount of waste material can be generated, extra fossil fuels used for the operation of the heavy-duty machineries is also required, adding largely to the ecological footprints of container buildings.

The Cor-ten steel finish of all freight containers, although being highly resistance to harsh climates is in fact a victim of degradation caused by natural elements. As a result, numerous harmful chemicals, such as chromate, phosphorous and lead-based paints have been applied as exterior and interior coatings for these freight containers, making them more durable for ocean transport. When these containers are to be used in the form of habitable space however, the structure needs to be sandblasted thoroughly to avoid the emission of any toxic gas over time. Moreover, to keep pests away during transport, the majority of the floors of shipping containers are infused with hazardous chemical pesticides such as arsenic and chromium. These chemicals are highly harmful to human when breathed into the body through our respiratory system on a daily basis. Thus, the entire floor of the container needs to be replaced in order to make it a suitable environment for human habitation.

Consequently, it may seem convenient to use freight containers for the construction of buildings because of their availability, adaptability, modularity, and affordability, the added labour that is necessary to transform them into livable spaces may not be the most sustainable choice for the construction of buildings. In most places, it may even be more cost effective and ecologically friendly to build using traditional wood frame construction. In places where there is a surplus of containers and an immediate for shelters, this unique kind of building may perhaps be a more worthwhile option. Moreover, not all areas around the world are allowed for the erection of metal buildings. To obtain a building permit might be difficult if there is a restriction of such building types in certain locations. Hence, additional time and money may be required to push such kind of architectural project forward.

ON THE PRECEDENTS: *THE CONTAINER AS SHELTER*

Shipping container architecture is a unique style of architecture that existed for several decades. It is not until recent years, when the green theme grows in popularity across every possible sector in the world, that it has become more popular and more widely accepted as a building alternative.

The first altered usage of shipping containers, beyond for the transportation of goods, was for the storage of tools and equipment in the form of a shed. During this early stage of redefined usage, the shipping container remained untouched, with no changes being exhibited to its original structural form. It was not until 1987, a man by the name of Philip C. Clark, who contacted the United States government to file a patent that describes a "*method for converting one or more steel shipping containers into a habitable building at a building site and the product thereof.*" This specific patent provided a thorough set of diagramed instructions showcasing the installation of one or more containers onto a foundation, the removal of internal sidewalls, the erection of roof and ceiling, as well as the insertion of windows and doors onto the container box. Two years later, the submitted patent was successfully granted. From then on, the diagrams and the information contained within this documentation have served as the most inspiring source of reference for most of the shipping container architectural ideas conceived up to the present day.

During the Gulf War in 1991, the United States military made use of shipping containers available in crisis areas as makeshift shelters for soldiers, as well as means of transportation for Iraqi prisoners. They also used them to set up offices as well as instant medical facilities in remote areas of need. Openings were strategically cut along the perimeter of the containers to provide sufficient light and ventilation into these modified dwelling units. For additional protection against death threatening weapons such as grenades, sandbags were used to pile along the exterior walls of these container units as fortification.

In 2001, an architectural firm called Urban Space Management conducted a project shipping container housing project at a much larger scale in the London borough of Tower Hamlets, known as the Container City. While the on-site installation process of the containers lasted for four days, the final fitting out of the housing units took place over a short period of five months to complete the original twelve work studios, at a height of three stories. Millions of dollars were saved in labour and contractor fees during this speedy construction process. Because the project was so well received and the construction process being so highly economical, Phase Two of this housing complex occurred merely a year later offering an additional twenty-two studio spaces. Being five stories high in this second phase, Container City II is conveniently connected to the first phase by walkways. Because the whole Container City project was intended to be low cost and environmentally friendly, more than eighty percent of all the building supplies used were recycled materials. (*fig. 8.0*)

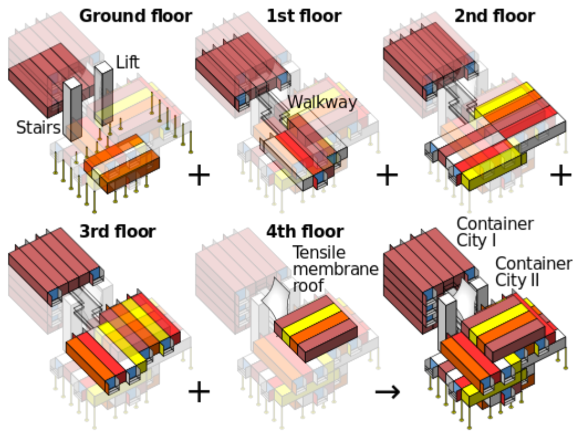

fig. 8.0

By 2006, the largest container village in the world, Keetwonen Complex, was constructed in Amsterdam by a Dutch company known as Tempohousing. (*fig. 9.0*) Within this village, a total of 1,000 housing units were provided to nearby students at an affordable price within the city's tight real estate market. All of these units had been constructed by modifying abandoned shipping containers sourced directly from China. Each unit is well insulated and sound proofed, with access to a private balcony, bathroom, kitchen, a separate sleeping and studying room, as well as large windows with an abundance of natural light.

fig. 9.0

Around the same period in 2006, the first official two-story standalone container home, called the Redondo Beach House, was designed and constructed by Peter DeMaria, in the United States of America. (*fig. 10.0*) The structural system of this groundbreaking container home was carefully designed to fulfill all the strict requirements listed within the nationally recognized Uniform Building Code. Since then, this house has inspired many architectural and construction firms worldwide to use shipping containers as building as housing alternatives.

fig. 10.0

Over the years, shipping containers, in addition to their usages as housing, have also been applied to numerous other types of buildings like event facilities, research offices, classrooms, hospitals, temporary housing in cases of emergency, and shopping centres. In Bishkek, Kyrgystan, for example, there can be found a wholesale and retail market called Dordoy Bazaar. (*fig. 11.0*) This bazaar, in fact, is one of Asia's largest public markets. It has been constructed entirely from double-stacked shipping containers. In most cases within the market place, the lower container serves as a shop, while the upper one serves as additional storage for the store below. On a rough estimate, about 6,000 to 7,000 shipping containers can be spotted in total within this Asian bazaar.

fig. 11.0

ON THE VACATION HOUSE: THE DESIGN INTENTIONS

The site for the vacation house, as outlined in the competition brief, is to be located in Bondi Beach. This beach is one of Australia's most popular beaches, attracting both local Australian visitors as well as international travelers throughout the year. This one kilometer long beach is found within East Sydney's most eclectic suburb known as Bondi, which is located approximately seven kilometres away from the central business district of Sydney.

Located in the southern part of Australia, Bondi Beach experiences a rather temperate climate along with beautiful sunny summers and mild winters with occasional rainfalls. The warmest days of the year lies within January with averaging temperature of 18 degrees Celsius to 26 degrees Celsius. As for the coldest days, they are found in the month of July with temperature ranging from 8 degrees Celsius to 16 degrees Celsius. During the winter, however, temperature hardly drops below 5 degree Celsius. (*fig. 12.0*)

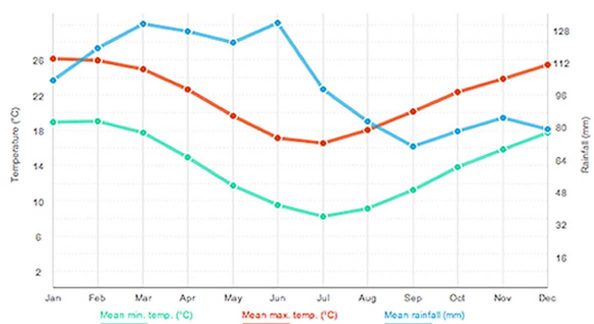

fig. 12.0

The specific site chosen by the competition committee for the vacation house is located on an existing parking lot, directly overlooking the ocean by the edge of a rocky cliff. Because the site has clear exposure and sight lines in the south and west directions, the orientation of the vacation house and its respective interior programs, have thus been carefully considered to fully embrace the spectacular view of the sunset that the site has to offer. The water near Bondi Beach is well known for the frequent appearance of whales and dolphins in the open water during their months of migration. Thus, the major living spaces of the house had been designed to incorporate the watching of these marine animals as a primary social activity. (*fig. 13.0)*

fig. 13.0

To fully take advantage of the rectilinear shape and form of shipping containers, the spatial organization of the vacation house is intended to be simple and efficient, without major alterations to the original structure of these metal boxes. The required list of programs for the house, as outlined in the competition brief, had been distributed into four major categories: the guest quarter, the private quarter, the communal quarter, and the service quarter. Each of these quarters are formed by two or more 40 feet long shipping containers, where respective programs can easily be distributed within. (*fig. 14.0*)

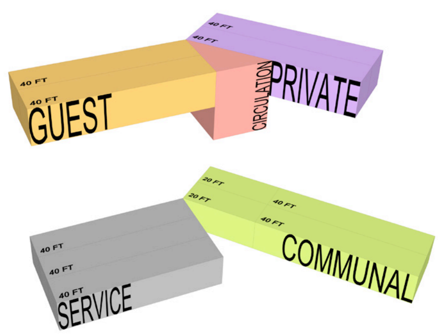

fig. 14.0

The service quarter, comprised of three 40 feet containers, is strategically placed to the north end of the site, with the two-cars garages aligned to the main road. This site organization does not only ease vehicular access to the house, it also reduces the number of window openings necessary on the north elevation. Other servicing programs including the storage room, the laundry room, the guest bathroom, and the utility room are all found within this quarter of the vacation house with direct access to the exterior patio spaces. (*fig. 15.0*)

fig. 15.0

Directly above the service quarter can be found the guesthouse, which is composed of two 40 feet containers. Each of the three ensuite guestroom is designed to have unobstructed view of the bay. Thus, the bathroom of each unit is efficiently tucked towards the back, allowing each bedroom to be as open as possible along the window edge. All three guest-bedrooms have direct access to a private balcony where view of the sunset on the west can be quietly observed. Because these bedrooms are west facing, the extended trellis over the private balconies contribute largely to the control of light that is permitted to enter into the bedroom units, ensuring that none would be overheated during hot summer months. (*fig. 16.0*) The guest quarter, being a volume of its own, has been intended to operate independently as a house on its own mechanically. This particular portion of the house can easily be shut off from the rest of the vacation house by simply closing the door at the end of the hallway when no guests are visiting. Under such scenario, any energy necessary to operate this portion of the house can be efficiently conserved.

fig. 16.0

To the south of the site can be found the communal quarter which contains the entrance foyer of the house, the open kitchen, the dinning area, as well as the living space. This particular portion is composed of a combination of two 20 feet containers and two 40 feet containers. Its configuration is intended to create a long linear space, extending one's view out to the open waters at the end of the living space from the moment you step into the entrance hallway of the house.

The viewing deck extends gently outward at the end of this quarter, creating a subtle extension for the living space during warm days of the year. The large amount of glazing that surrounds this communal quarter of the house provides unobstructed views to the bay and the ocean outside from every position within. Direct access is provided from the dinning area to the private exterior patio, generating a continuous space during barbeque seasons. The direction of prevailing winds in Bondi Beach originates mainly from the south. Hence, this highly used quarter of the vacation house had been oriented to fully take advantage of the cool breezes of air that the wind carries as it blows across the ocean water, cooling the house naturally during hot summer months. Cross-ventilation is highly encouraged through the large amount of operable windows that is located in the south and north face of this communal quarter. Moreover, operable windows are designed all along the perimeter of this communal quarter, close to the level of the ceiling, to ease the escape of hot air. (*fig. 17.0*) During the winter, when unwanted north winds need to be blocked from entering the space, the outer skin of the house can be closed off to maintain higher control of the interior temperature. The communal quarter of the house is intended to perch over the steeper portion of the site, creating a floating sensation while standing in the living room, while enjoying the spectacular scenery of the surrounding site directly from within the building. Whereas the exterior swimming pool, which is embedded into the earth at a lower altitude than the rest of the house, allows for a closer connection to the cliff's edge while observing the sunset on the west when swimming inside the pool.

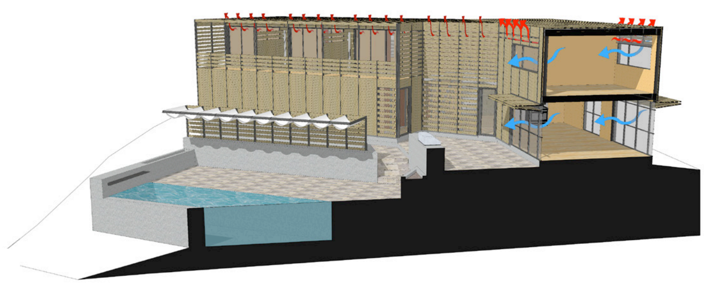

fig. 17.0

Lastly, the private quarter, which is composed of two 40 feet containers, sits directly above the communal quarter of the house. It contains the office space, the ensuite master bedroom, as well as its accompanying walk-in closet as outlined in the program list. With the office located towards the back of this quarter and windows opening towards both the east and south directions, the room receives a lot of natural light throughout the day for the performance of work or study. Both the closet and bathroom that act as services for this quarter of the house are strategically located towards the middle section, creating a natural division between the working and sleeping areas, as well as opening up the view out towards the ocean from the bedroom as much as possible. This spatial organization also creates enough privacy, with the entry to the bedroom located further down the hallway such that the installation of doors becomes unnecessary. The bathroom is designed to have a window at the level of the tub, allowing one to fully enjoy the ocean during moments of long relaxing baths. Again, cross-ventilation is considered in the bedroom area with operable windows on both the south and north walls of the quarter. Floor to ceiling glass doors are located in the front of the bedroom, allowing direct access to the private observatory deck outside. To better control the west light from entering the bedroom from this large opening, the outer skin of the building extends as a trellis system, similar to the language used in the guest quarter of the house, for shading and partial weather protection while out on the deck. (*fig. 18.0*)

fig. 18.0

All four different quarters of the house are tied harmoniously together through a vertical circulation volume, which also acts as a heat chimney that allows for the escape of hot air cumulated throughout the building. To minimize unwanted heat gain from the west exposure of this circulation space, horizontal wooden slats of the outer building skin helps control the amount of light permitted to enter into the space. Operable windows at the very top of this circulation space easily allow the escape of hot air as it rises upward. This circulation space will be constructed from steel beams, which are welded directly to containers that form the guest and private quarters of the house on either end. Metal decking and insulation are then applied to finish the roofing structure of this space.

For the construction of the vacation house, a combined total of nine 40 feet containers and two 20 feet containers are needed. Each quarters of the container home can easily be constructed separately and assembled on site to accelerate the construction process. Rather than using the most common 8 feet tall shipping containers, the 8 feet 6 inches tall versions are chosen instead for this specific project. The additional 6 inches of the container is used to accommodate floor and roof thicknesses, thus ensuring the finished interior floor to ceiling height of the building to be comfortable at a height of at least 8 feet. To overcome the heat gain from the original steel finish of shipping containers, wooden slats are used as an outer skin for the vacation house. This wooden skin does not only reduce the absorption of heat from the sun and protect the containers from corrosions over time, but also allow for a more refined exterior finish for the house in relation to its surrounding buildings. Wooden slats are also a great system because of its flexibility to create openings at different intervals and contribute largely to the control of light penetration. (*fig. 19.0*)

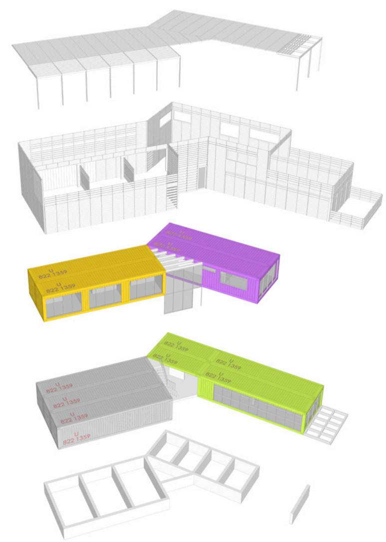

fig. 19.0

In conclusion, the vacation house, although designed based on the modularity of shipping containers, it is intended to create a space that fits harmoniously with its surrounding and where one may enjoy the ocean scenery from every part of it. It is also designed with the intention of reducing energy consumption through numerous passive-cooling approaches. After all, this should be a house, regardless of one's role being a guest or an owner, where the beauty and sound of the ocean can fully be experienced and enjoyed year round.

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