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Title:

ClubStead Preliminary Analysis:  
Architecture

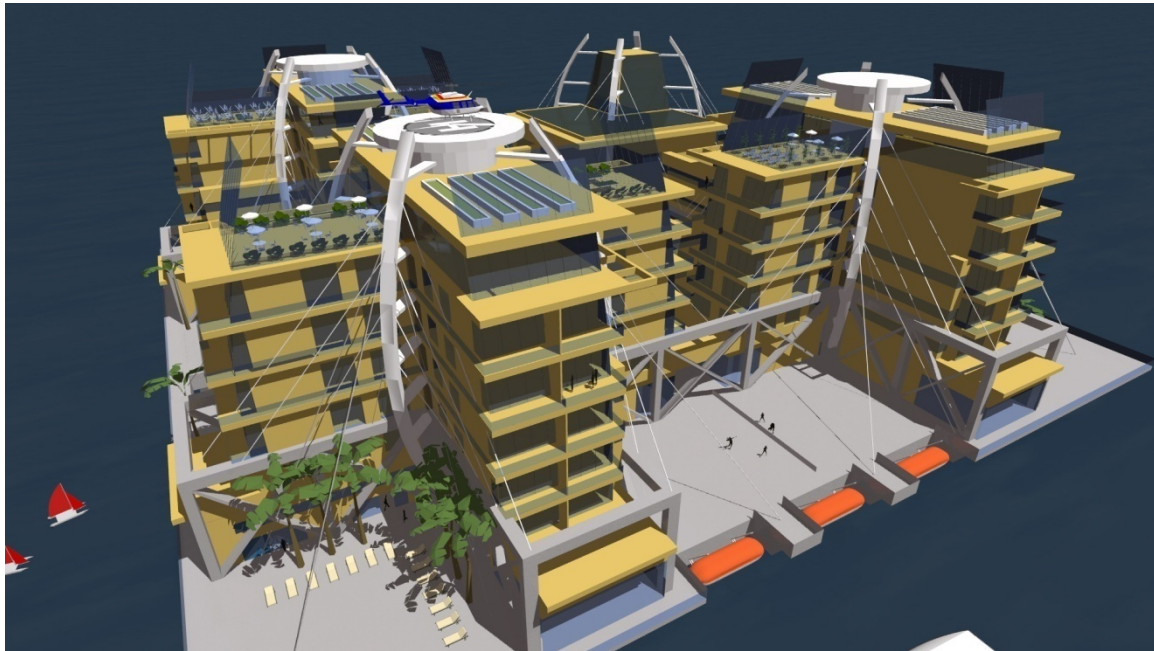
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Title:

**ClubStead Preliminary Analysis: Architecture**



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## 1. Introduction

MI&T designed and engineered the platform for the proposed ClubStead structure and Wendy Sitler-Roddier was commissioned by MI&T to conceptualize the architecture on the 400'-0" by 400'-0" square deck. The program for the platform is an offshore resort with a luxury hotel and club casino intended to accommodate up to 270 people at a time. Although this first conceptual design is charged with spaces rendered for the hospitality program, the design of the platform and the conceptual form of the architecture can be used for a variety of business and residential functions. The flexibility is inherent to the form of the architecture. Some components such as major columns and truss systems, the operable boat landings and seaward machinery are central to the design for life at sea and will remain unchanged regardless the function of the final ClubStead. These components and others, along with their locations on the platform are described herein.

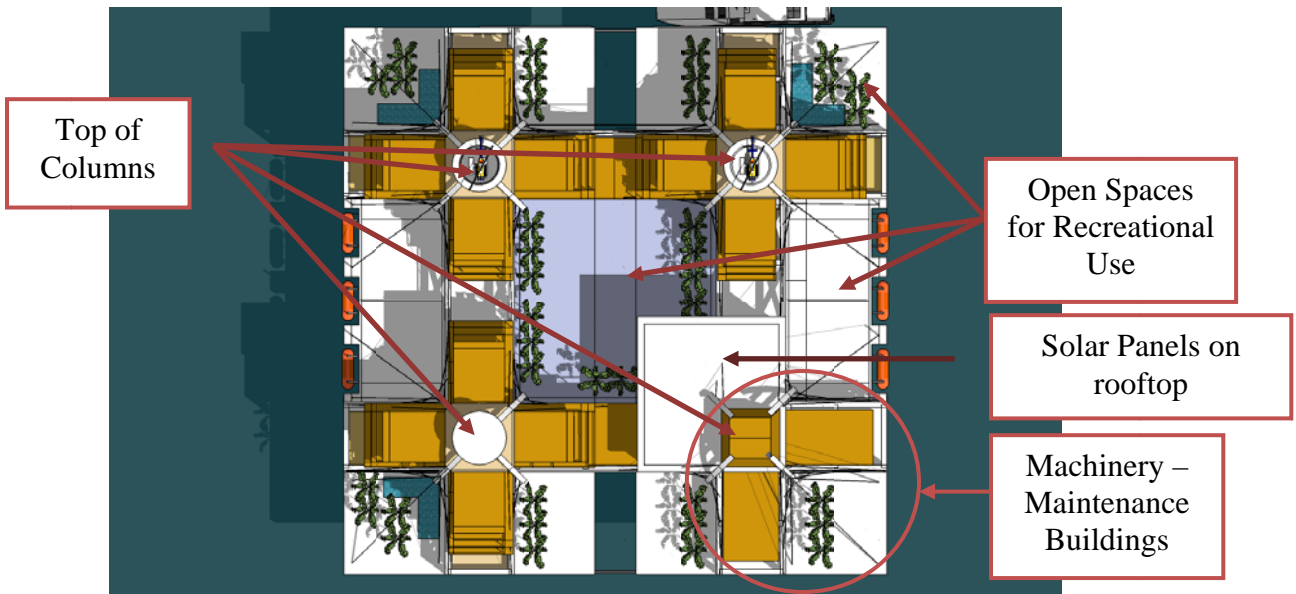
## 2. General Layout

The architectural program for the ClubStead takes into account a number of constraints and the layout of the architecture is driven by the engineering considerations of the platform. The allocated area of the platform is limited to a 400'-0" x 400'-0" square deck surface. The maximum structural support for the architecture is provided between columns of the platform which are located 200'-0" apart from each other in plan as illustrated in Figure 1.

The architectural program for the ClubStead is as follows:

- 100 room luxury boutique hotel with staff quarters to accommodate up to 70 staff persons.
- A club casino
- Fitness and Spa amenities
- Meeting and flexible function spaces
- Retail spaces
- Food and Beverage Venues
- Rooftop spaces and vegetation gardens
- Rooftop areas for solar panels
- Outdoor public spaces for leisure and sporting activities
- Operable boat landings and leisure water access
- Building Mechanical and Seaward Mechanical spaces
- Desalinization spaces
- Fire and Life Safety spaces
- Trash and Recycling spaces
- 2 Helipads

The use of the available surface area of the platform must be optimized and the architecture must provide to its guests a sense of openness and space comparable to that of an onshore resort and give a more spacious sense to that of a typical cruise ship.



**Figure 1: Top View of ClubStead Deck (building in yellow, open spaces in white)**

The buildings are organized on the deck around the 4 main structural columns that connect to the submerged columns below the deck. It is these columns that carry the structural load for the architecture at the deck and continue below the platform as the submerged columns that enable the balance of the platform in the water. The cruciform plan of the architecture at each column is supported by the primary 40'-0" box trusses. A pyramidal form at each column was realized to maximize the surface area at the deck level. It also keeps the center of gravity low, by minimizing the weight at the upper levels of the buildings. A low center of gravity is critical to the stability of the platform.

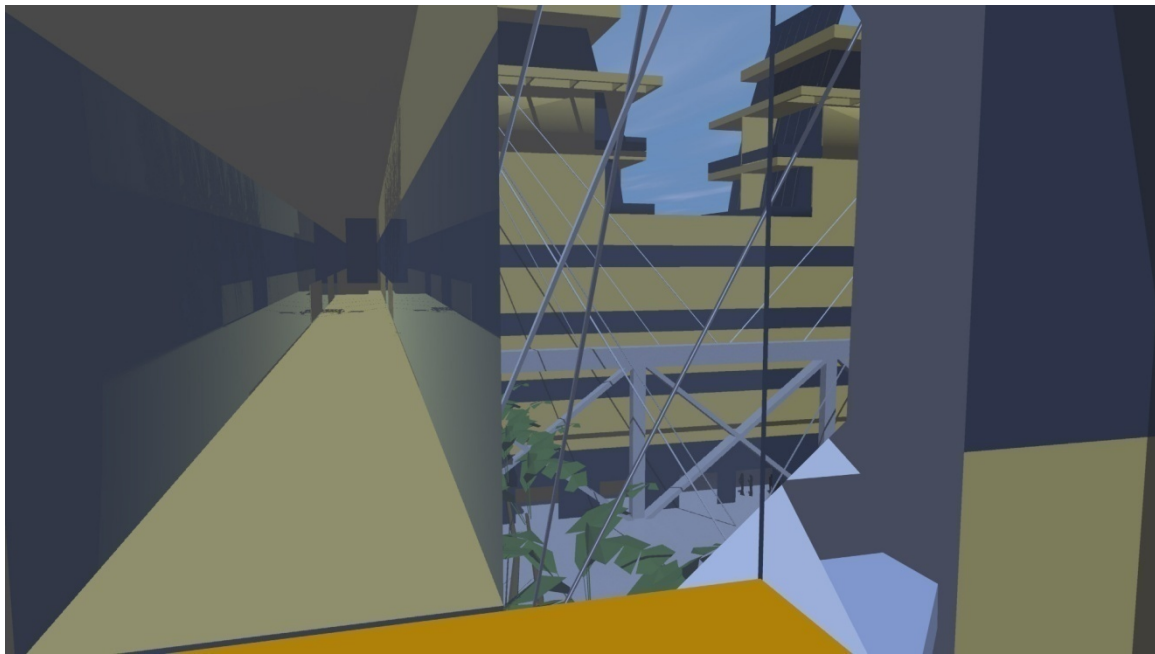
3 of the 4 columns are dedicated to the program of the hotel for hotel rooms, staff quarters, function spaces, restaurants and bars and spa and fitness areas. The fourth column is a mechanical tower that houses the equipment and spaces needed for operations of the building and for life at sea. The club casino is located near the mechanical tower and separated by sound and safety isolation walls.

The hotel buildings have 7 floors of interior spaces. The first floor houses a hotel lobby and back of house service spaces, retail spaces, 3 restaurants, the spa and fitness amenities and public circulation. The second floor houses the staff quarters, function and meeting spaces along with additional spa and fitness level spaces. There are four levels of rooms above level two. There are varied sizes of rooms at each level with the more spacious rooms and penthouses located at the end bays. The seventh level, or rooftop level, houses the specialty restaurant, the observation and learning center for life at sea,

and the rooftop lounge. Vertical circulation of elevator and stairs for each tower are located inside the columns. There are also enclosed walkways at levels 2, 3 and 4 to provide cross-tower access.

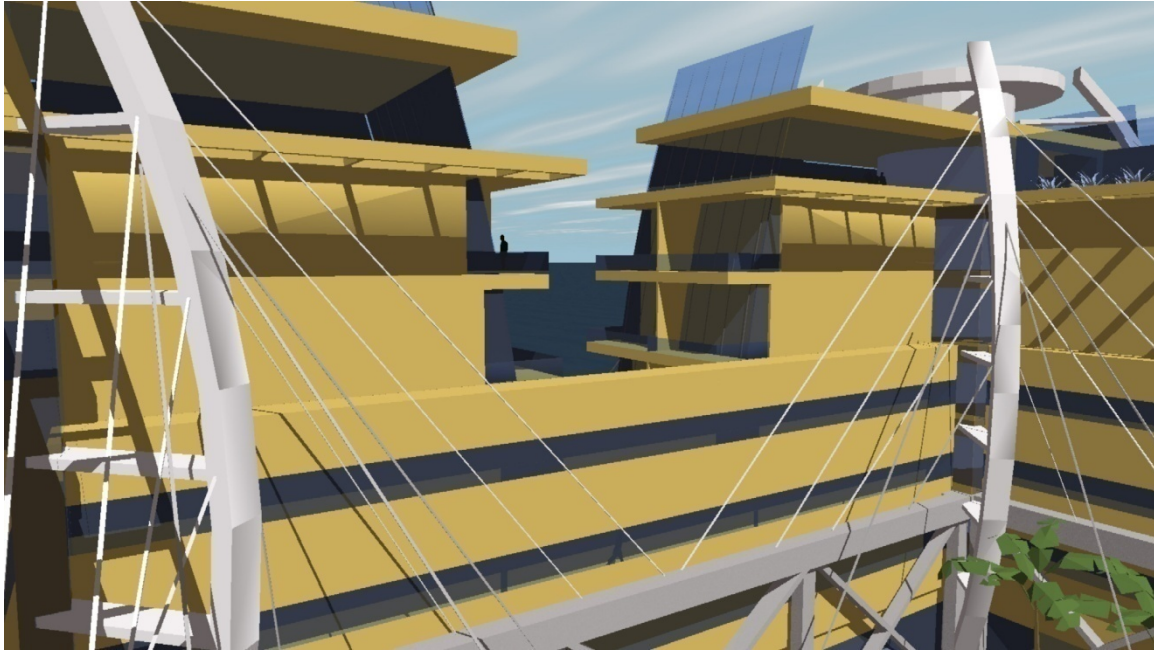
At the deck level, light-weight surface areas at the platform perimeter and center are suspended off the columns with cable stays; they provide recreational space for gardens, tennis courts, exterior dining areas, lookout points, etc. (Figure 1).

The form of the architecture at the end bays of the hotel towers are shaped with sail-like transparent surfaces that echo the shape of the arch beams supporting the stay-cables. They are visible in Figure 9. These surfaces provide large window bays for the penthouse room and maximize the views of the sea. The cable stays are integrated to the landscape.

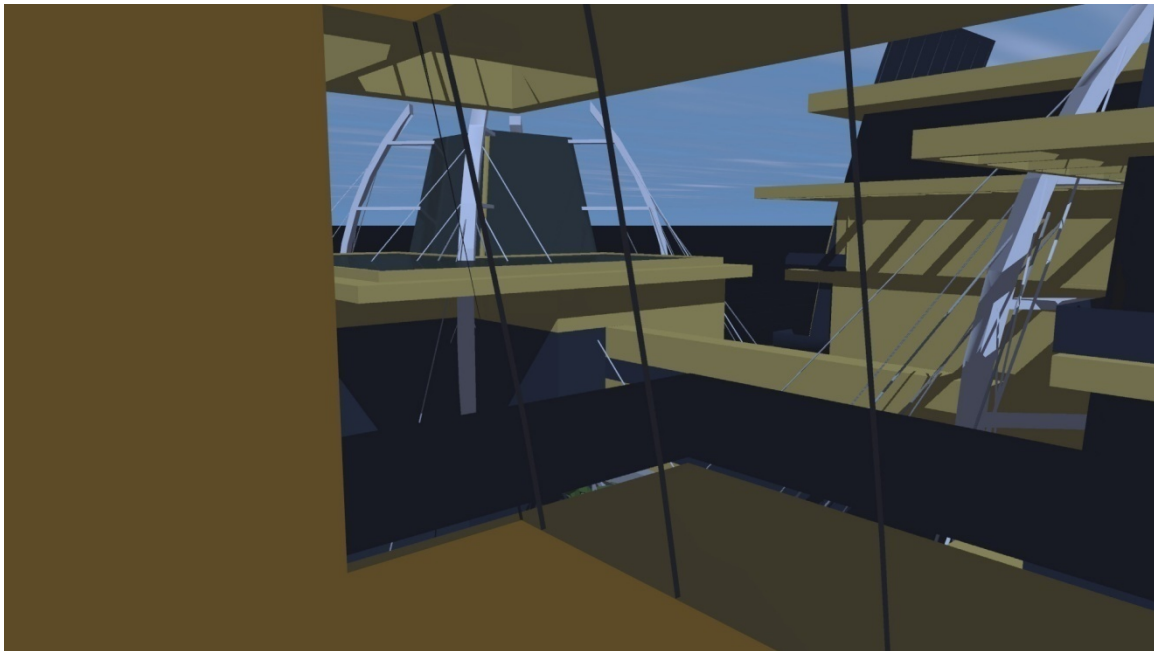


**Figure 2: Interior View - Corridor**

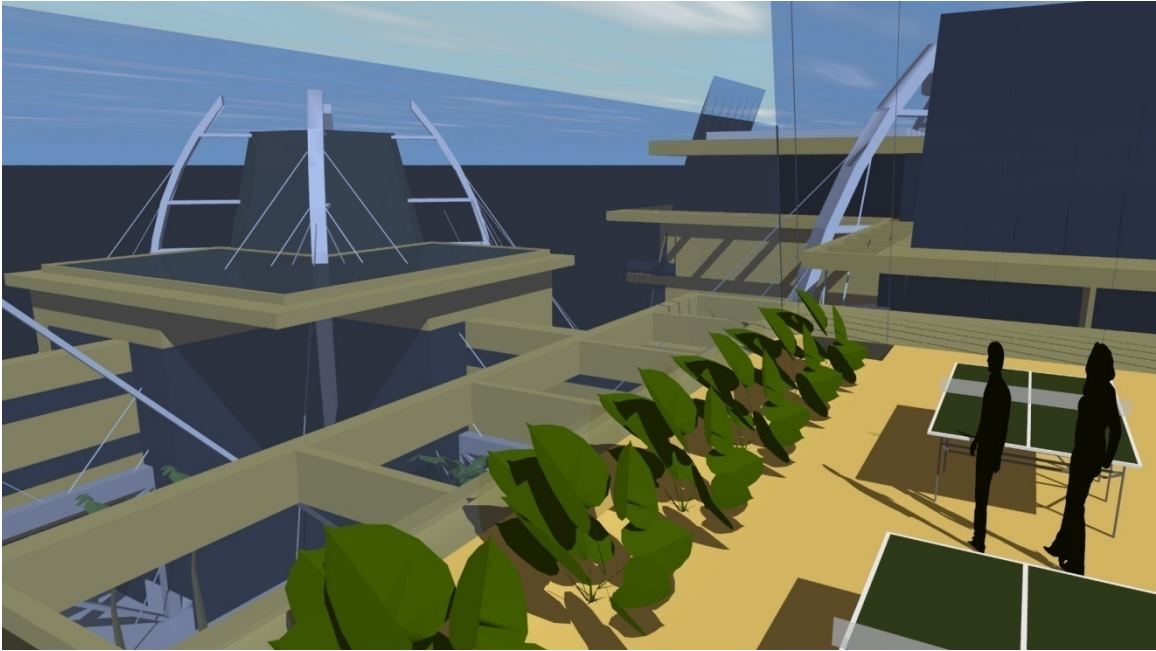




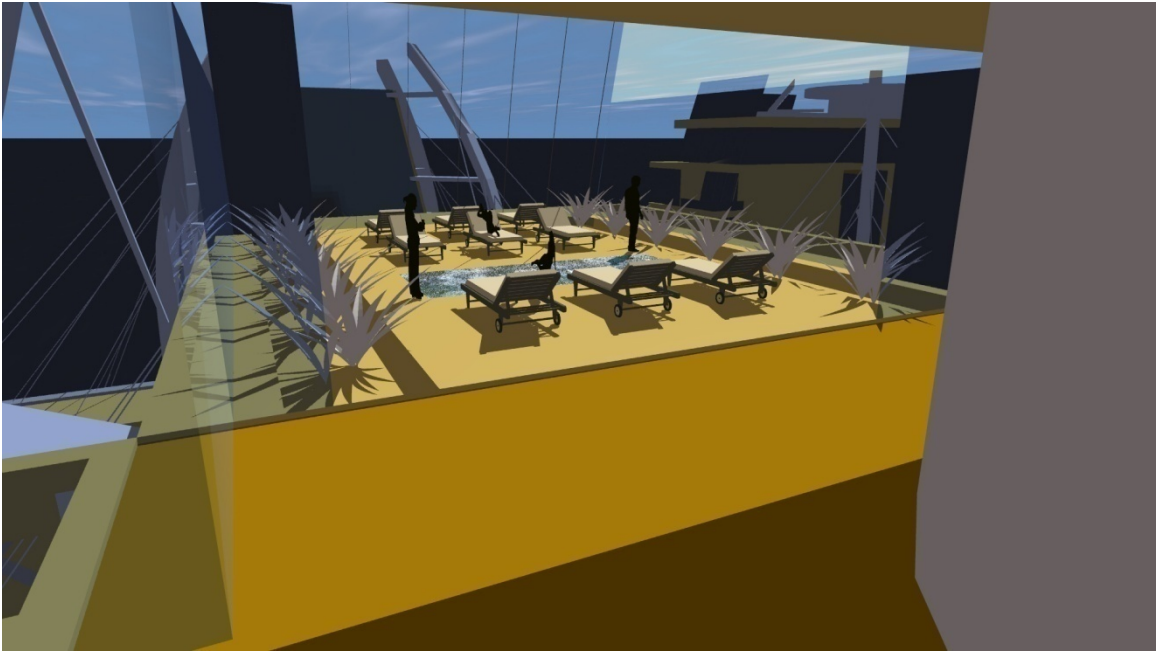
**Figure 3: Exterior View - Upper Floors**



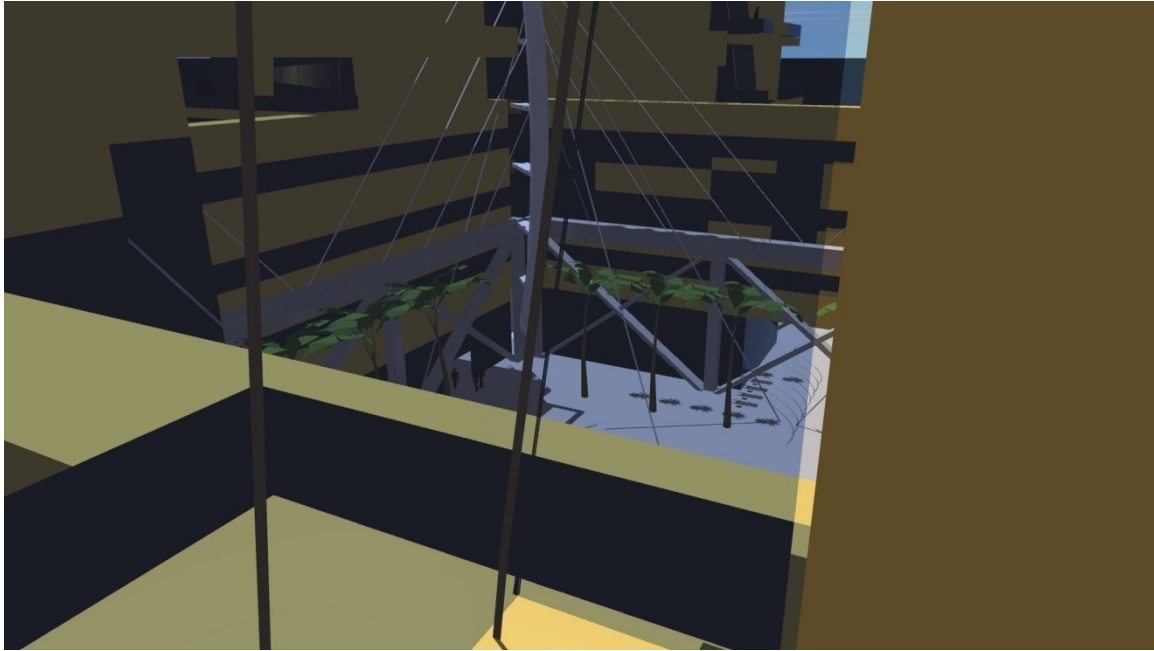
**Figure 4: Interior View at Penthouse, Level 6**



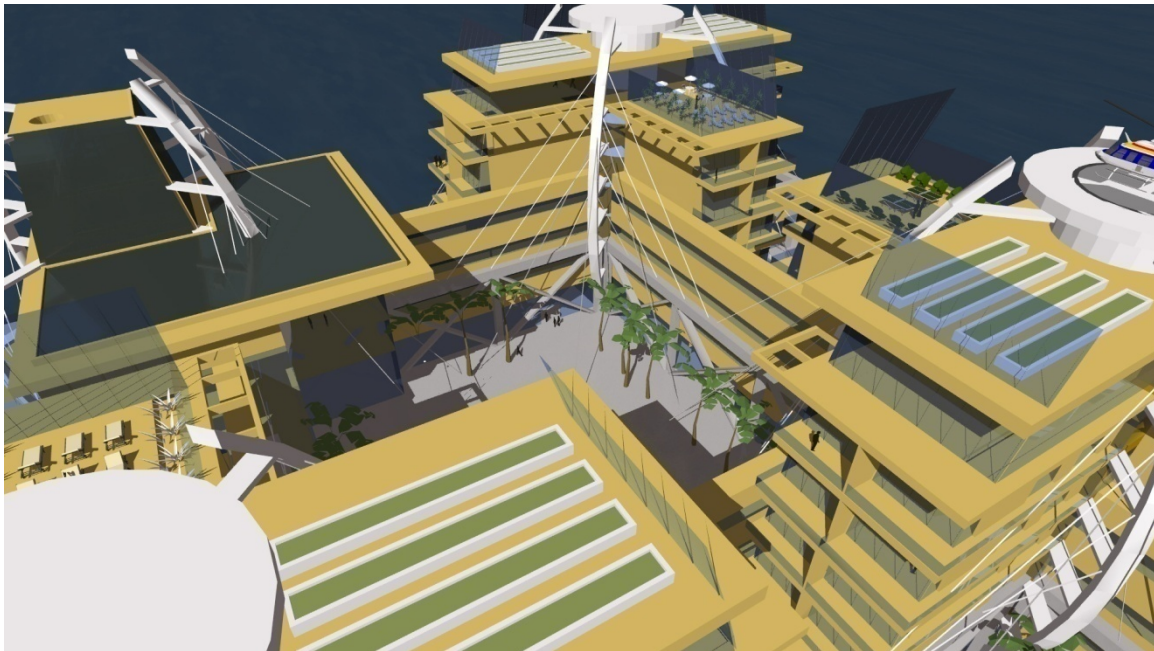
**Figure 5: Exterior View – Roof Top Recreational Areas**



**Figure 6: Interior to Exterior View at Rooftop Lounge**

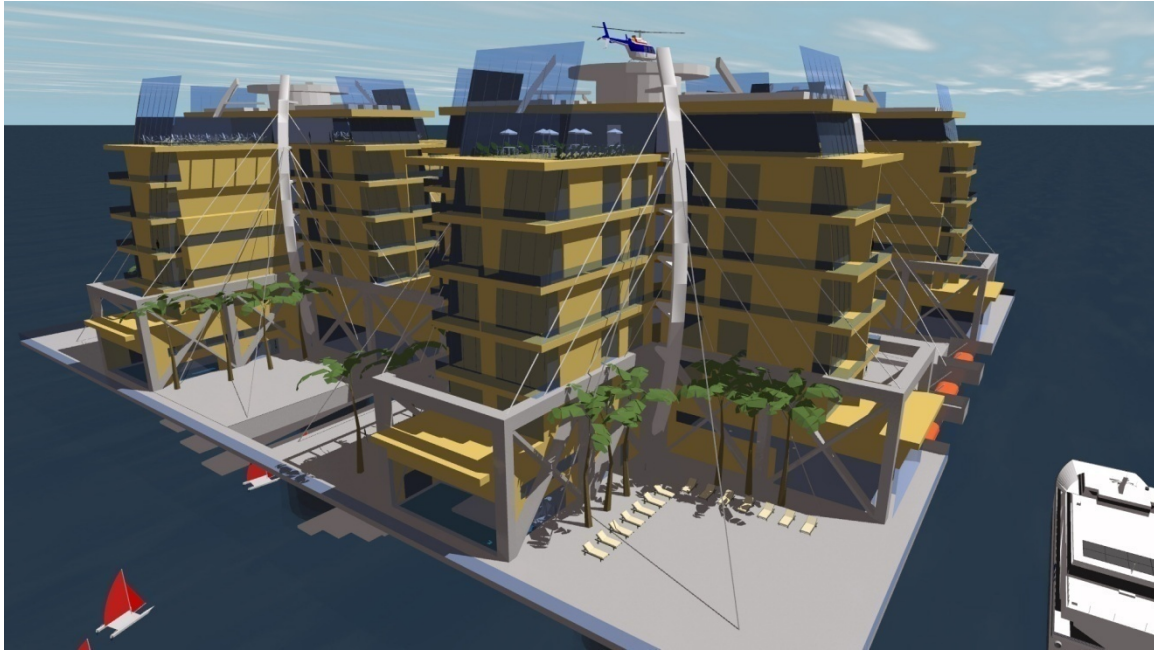


**Figure 7: Interior View at 5th Floor Suite**



**Figure 8: Exterior View - Rooftop gardens**





**Figure 9: General View of the ClubStead**

### 3. Operational Facilities for the Ocean-Going ClubStead

The architecture integrates mechanical and safety components necessary for ocean-bound operations. The majority of these components are located at the mechanical column. On Figure 1, it is located at the bottom right hand corner of the plan.

#### 3.1. Inventory of the Machinery in the Mechanical Tower

The mechanical components needed for life at sea vary slightly from that on land. While dome components are similar, a few additional components must be integrated in the design. The mechanical components are listed hereafter and their relative size is illustrated in Figure 10.

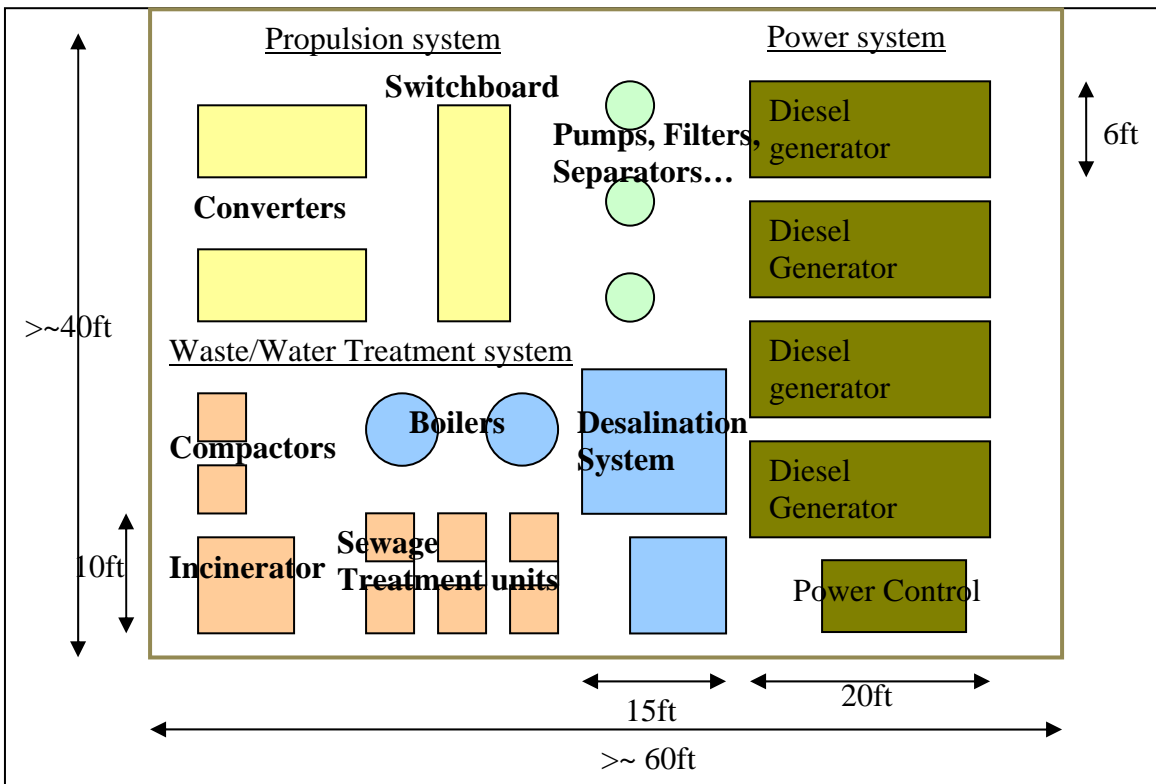
The electricity is generated with **Diesel generators (2 operational and 2 for backup)** and its distribution is controlled with utility power controls. Each operational Diesel generator has a maximum available power of 2,000 MW. It provides enough electricity to feed the propulsion system to maintain the platform position and the local grid for domestic use.

The platform is dynamically positioned to avoid the expense and administrative constraints (permits) of a mooring system. The energy for the **propulsion system** is

derived from the Diesel generators. The Diesel electric propulsion system consists of components like a switchboard, converters, motors in the machinery room and thrusters in the columns.

An advanced **water distribution and treatment system** is necessary to optimize the energy use on the platform and prevent pollution of the surrounding waters. Freshwater, grey-water and black water should be duly separated and treated. Fresh water is for drinking and domestic use only. To maximize autonomy, it is produced onboard, out of the pumped sea water. A desalination system is needed to produce 20,000 gallons of fresh water per day<sup>1</sup>. Grey-water needs less treatment and may be used for surface washing, gardening, etc. Pools will be filled directly with salt seawater to avoid spending unnecessary energy on desalination.

The black-water is treated as part of the waste and water treatment system. Compactors, separators and a number of black water treatment units are necessary to sort garbage, destroy the non-recyclable and store the pollutants. Three or four black-water units should suffice to treat the estimated 7000 gallons per day produced on the platform. Recyclable goods are taken to the **recycling center** adjacent to the tower and other non-recyclable trash is burned in the incinerator.



**Figure 10: Components of Machinery and Attempted Layout**

<sup>1</sup> According to the US Geological Survey website, freshwater consumption per capita varies between 80 and 100 gallons per day. This includes activities for which the use of water may be minimized aboard the ClubStead (ex: dry flushing system) so the lower bound is considered in this case.

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The **heating and cooling system** consists of a boiler and chiller system with piping and water pumps laid out as required. The water ballast system at the bottom of each column under the deck is fed by pumps and pipes. It is used to adjust the displacement of the platform.

### 3.2. Safety and Emergency Equipment

In addition to a machine room, the platform must be equipped with a sound safety system for fire prevention and fighting, evacuation, and medical emergency. Recommendations on equipment and plans to provide passenger safety at sea were drafted at the International Convention for the Safety of Life at Sea (SOLAS) organized by the IMO (International Maritime organization) in 1974 [1].

#### Medical Emergencies

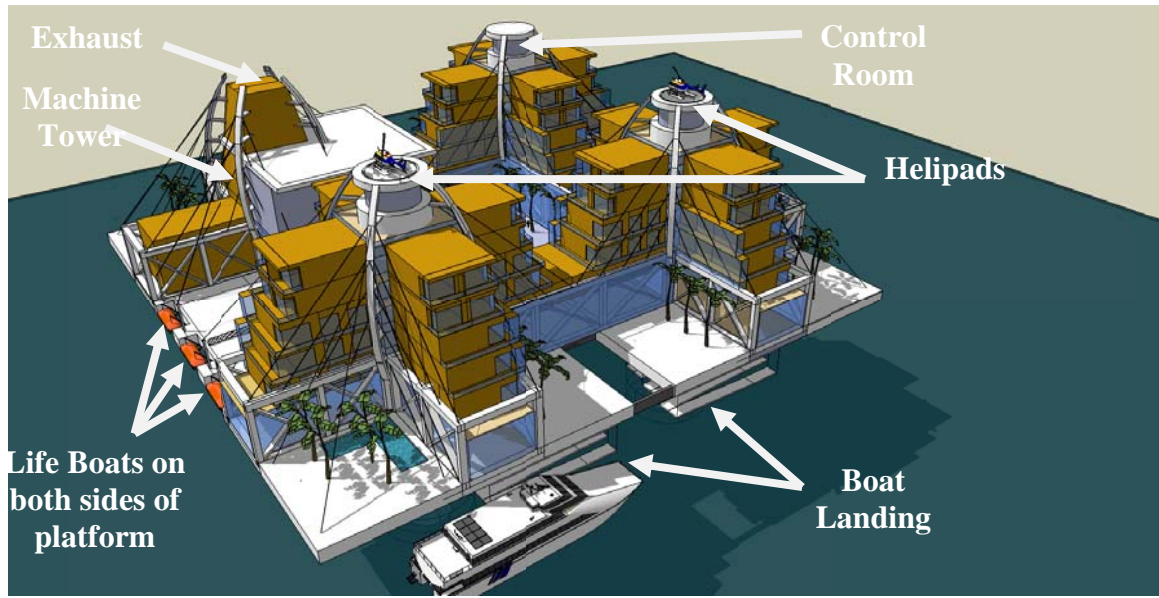
There is a medical treatment center on the ClubStead and one of the helipads on top of the towers can be used for emergency medical evacuations.

#### Fire Safety

A fire-fighting room, next to the mechanical tower, is equipped with pumps, hoses and gear for trained staff members. Additionally, small fire-fighting sub-stations with emergency gear and light equipment are located as required on the platform. Fire alarms and small extinguishers and sprinklers are installed in all rooms to increase the chances of fast detection and containment. The construction of fire doors and the use of thermal and structural boundaries in the building plans will take into account recommendations by Chapter II-2 of SOLAS. The machinery should be well insulated and where necessary the mechanical equipment should be redundant to prevent failure of the safety system.

#### Life-Saving Equipment and Communications at Sea

Chapter III of SOLAS and amended sections outline the recommendations for the life-saving equipment, including rescue boats, life jackets and gathering areas. As typical on passenger ships, rescue boats are located on each side of the platform and have enough capacity to carry twice the number of passengers and crew. Additional self-inflating life rafts are located at other extremities. Gathering areas for evacuation have easy access to the life rafts and are located in a structurally safe part of the platform. A safety center with access to the internal communication system including audio equipment, the fire monitoring system and the alarm system is developed.



**Figure 11: Perspective View of ClubStead - Safety and Transportation Equipment**

### **3.3. Transportation and Communications**

Transportation to and from the ClubStead is provided by helicopter for emergency or elite access and by boat for supply and typical passenger loading and unloading. A boat landing is designed on one side of the platform to accommodate a ferry-size transfer vessel. To transfer people onboard, the side of the ClubStead is equipped with operable landing bridges and articulated slides. Such articulated bridges are brought up when the boat leaves the platform so it doesn't remain hanging under the deck level. Additional boat landings are set up on the columns for smaller supply boats or visitor boats to land.

A diesel electric propulsion system with thrusters on the columns is devised to dynamically position the platform. A control room is equipped with all monitoring and control system for platform maneuvering and with a radio-telecommunication system in accordance with SOLAS Chapter IV. The control room is located on the top floor of one tower, above the level of the buildings. Radars and satellite transmitters are above the control rooms on top of a tower.



## 4. Square Footage

The buildings and the outdoor spaces provide a large available surface area for living facilities and recreational use. Table 1 summarizes the contributions to the entire surface area on the deck. A total of 368,200 ft<sup>2</sup> is available for passenger use on the ClubStead. It includes 90,000 ft<sup>2</sup> of open recreational surfaces.

Based on an estimated 50 lb/ft<sup>2</sup> for buildings<sup>2</sup> and 30 lb/ft<sup>2</sup> for open areas, the total payload is 7,705 st.

**Table 1: Summary of Available Living Areas on Deck**

Item	Description	Square Footage (ft <sup>2</sup> )	Weight (short tons)	Center of Gravity Above Deck Level (ft)
Hotel Casino Level 1	Restaurants, shops, entertainment, lobby, fitness and spa	56,525.00	1,413.13	12.50
Hotel Casino Level 2	Staff quarters, spa and fitness, function spaces	56,525.00	1,413.13	32.50
Hotel Casino Level 3	Typical and end suites	44,025.00	1,100.63	47.50
Hotel Casino Level 4	Typical and end suites	41,325.00	1,033.13	62.50
Hotel Casino Level 5	Master suites	29,100.00	727.50	77.50
Hotel Casino Level 6	Captain suites	26,700.00	667.50	92.50
Hotel Casino Level 7	Roof top dining, restaurants, bars, gardens	24,000.00	N/A	N/A
Open suspended areas	Recreational areas, gardens, tennis	90,000.00	1,350.00	0
<b>Total</b>		<b>368,200.00</b>	<b>7,705.00</b>	<b>38.75</b>

## References

[1] “Safety Of Life At Sea”, revised version 2004, SOLAS’04, International Maritime Organization

<sup>2</sup> The weight per sq.ft on comparable buildings ranges from 50 to 100 lb/ft<sup>2</sup>. 50 lb/ft<sup>2</sup> is used in this case, assuming light weight materials will be preferred for construction. This approach will have consequences on the cost estimate of the platform.