PLOCAN PROJECT

THE OCEANIC PLATFORM OF THE CANARY ISLANDS

J. Magro Yudego, A. Carrasco Conejo, J.M. González Herrero.

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1.- ABOUT PLOCAN

- Non-profit consortium located in Gran Canaria dedicated to science and technology in the marine and maritime sector in the region.
- Participation of the Ministry of Economy of Spain, the Government of the Canary Islands and also European funds.
- Its mission is the cost-effective combination of services such as observatories, test beds, underwater vehicles support, information technology, training and innovation hub.
- Main goal: Promote sustainability and long-term observation of the ocean and marine research.
- Main future infrastructure → **PLOCAN PLATFORM** → **TENDER**

planned to be ready by 2014, though scientific and research activities are already taking place trough other projects.
2.- TENDER OF THE PLOCAN PLATFORM. PLANNED CONSTRUCTION PROCESS.

2012 → Joint Venture ACCIONA Infraestructuras and LOPESAN won the public tender with their own design.

 Detailed design → ACCIONA INGENIERÍA

- Planned design in the tender stage → Foundation of the platform: Caisson of reinforced concrete
- Planned construction process in the tender stage → The caisson was going to be build on a drydock in Cadiz and then be towed to Gran Canary Island (Las Palmas de Gran Canaria Port). There, the construction will continue, and finally the platform will be towed to the final location in order to finish the construction there.

After awarding → Once the final design process begun, it appeared the possibility to build the caisson in The Canary Islands on a floating dock, avoiding the construction in Cadiz and the long transport though the Atlantic Ocean.

Construction process was redesigned
3. LOCATION

- 1.5 Km from the East Coast of Gran Canaria Island.
- 30 meters depth
4.- GENERAL DESCRIPTION

- Structure at the edge of the continental shelf
- Laboratories and experimental facilities to access and make studies of the deep ocean
- Technical complexity mainly due to its special offshore location and the complexity of the construction process

**MAIN FIGURES:**
- Working life: 50 years
- Layout dimensions: 37,95 m x 32,03 m
- Total height: 62 meters
- Total weight of the structure: around 23,000 tons without ballast
  - around 58,000 tons with ballast
- 2.500 m² of work surface
- Designed for 40 people working at the same time
- Autonomy for more than 10 days
5.- PARTS OF THE STRUCTURE (I)

- Heliport
- Control Center
- Three floor building
- Hangar / Shed
- Two levels of reinforced concrete
- Caisson of reinforced concrete
- Protection berm Stone 1 ton
- Foundation Stone 50-100 Kg
5.- PARTS OF THE STRUCTURE (II)
CAISSON OF REINFORCED CONCRETE
5.- PARTS OF THE STRUCTURE (III)

TANK FOR MARINE TRIALS

- Layout: 6 x 7,20m
- 6 m depth
- Need to be constructed after the construction of the caisson

Part of caisson to be demolished

Initial caisson

Main level (+7)

Tank

Caisson

6m
5.- PARTS OF THE STRUCTURE (IV)

FIRST LEVEL

- Above the caisson → 32 m from the bottom of the caisson
- 12 manholes 0,8 x 0,8m: 6 for inspecting the filling valves
  - 6 for introducing the bombs to draw the water outside the caisson
- Level for the majority of the facilities of the platform
- In order to built the main level → 42 concrete columns 0,3 x 0,3 m
5.- PARTS OF THE STRUCTURE (V)

MAIN FACILITIES AND NECESSARY EQUIPMENT

- Crane to move containers 20 tons
- Necessary facilities such as lightning, water supply and necessary treatment, firefighting, etc.
- Most of them located on the first level above the caisson.
- Use of renewable energies → solar panels on the highest level
- Special materials → make easier the constructive process and to respect the ecosystems of the area.
6.- DESIGN CRITERIA

- WORKING LIFE: 50 years → Surveys with TR = 50 years, 225 years and 475 years
  - DOW point (1948 – 2008)
  - Different wave theories, depending on the wave period → MORISON
  - Checks with other theories (Goda...)

- Platform oriented with the beam perpendicular to the worst wave (NNE)

Worst wave features → NNE:

\[
\begin{align*}
T_R &= 50 \text{ years} \rightarrow H_s = 4.5 \text{ m} \quad T_p = 12 \text{ s} \\
T_R &= 225 \text{ years} \rightarrow H_s = 4.75 \text{ m} \quad T_p = 13 \text{ s}
\end{align*}
\]
7.- CONSTRUCTION PROCESS (I)

1.- CONSTRUCTION OF THE CAISSON. SANTA CRUZ DE TENERIFE PORT.

- Construction of the caisson
- Final location

32,63m

- 6 filling sectors → 6 valves

39,95 m
7.- CONSTRUCTION PROCESS (II)

1.- CONSTRUCTION OF THE CAISSON. SANTA CRUZ DE TENERIFE PORT.
7.- CONSTRUCTION PROCESS (III)

2.- TOWING OF THE CAISSON AND SINKING IN LAS PALMAS DE GC PORT
7.- CONSTRUCTION PROCESS (IV)

2.- TOWING OF THE CAISSON AND SINKING IN LAS PALMAS DE GC PORT

Necessary ballast during transport → 1,20 m of water
After transport → sinking with water to continue the construction
7.- CONSTRUCTION PROCESS (V)

3.- PLACING OF THE NECESSARY BALLAST

- 4 meters of sand, in order to improve the stability on the final location.
- Rest of the caisson will be filled with water → Avoid security problems during the rest of the process.

4.- CONSTRUCTION OF THE TWO LEVELS OF REINFORCED CONCRETE AND THE SEAWALLS
7.- CONSTRUCTION PROCESS (VI)

5.- REFLOATING OF THE STRUCTURE AND TOWING TO THE FINAL LOCATION

- Take out almost all the water of the caisson
  → Max. draft → 24,6 m

- 4 meters of sand inside the caisson
  → Assure the naval stability of the platform during transport.

6.- SINKING OF THE PLATFORM AT THE FINAL LOCATION AND CONSTRUCTION OF THE PROTECTION BERMS AROUND IT

- Before towing the caisson, the foundation of the caisson will have to be built on the final location

- Rest of the ballast → Only water
7.- CONSTRUCTION PROCESS (VII)

**7.- CONSTRUCTION OF THE BUILDING**

- Construction of the structure of the building, the control center and the heliport.
- Avoid using more concrete on the structure → Steel Frontage → prefabricated panels of concrete and High strength ceramic panels.

**8.- ENDING OF THE BUILDING, CONTROL CENTER AND HELIPORT**

Placing also the necessary facilities and equipment
8.- SPECIAL FEATURES OF THE DESIGN

SEA WALLS

Initial weight of the sea walls → problems of naval stability during transport (Center of gravity too high).

**ALTERNATIVE:** Reduce the weight of sea walls in order to lower the center of gravity.

Seawalls not symmetric → different heights of sand (3.5 - 4.25 m) in order to avoid the tilt.
THANK YOU FOR YOUR ATTENTION

J. Magro Yudego
A. Carrasco Conejo
J.M. González Herrero