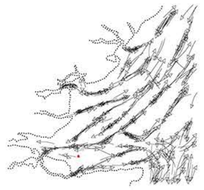
Red Sands Project - a new neighborhood in the ocean

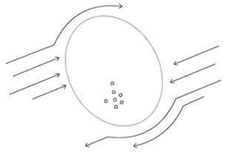
Offshore Engineering: transformation of the former army sea fort and prefabrication of a new dam

site

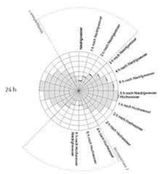
Thames estuary



direction of current



orientation of ellipse



tides/ installation phases

wind
N-E [4-5 bft]
[20-40 km/h]

soil condition
sand, gravel, mud

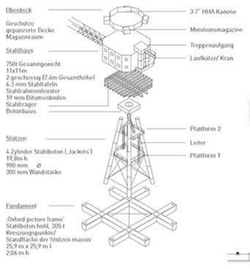
current 1-2 m/s
unstable

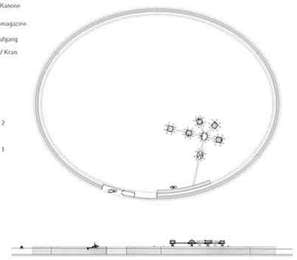
shallow current
deep durrent

depth
6.46 m - 14 m

tidal range
7.50 m

waves
0.5-1.5m





view into the basin

view inside the dam

historic site - specific location
The former army sea forts Red Sands in the Thames Estuary off the coast of Great Britain were built in 1943. After the end of WWII it was occupied by different groups and uses but finally being abandoned again until now.
My proposal for a new usage of the towers is an astronomy and marine power research center as a new neighborhood in the ocean due to its specific location factors.

offshore engineering
My following work will explore and discuss the historical existence of the sea forts, analyze the location factors and their potentials, display my own design and development for this location due to a possible implementation within the framework of offshore-engineering.

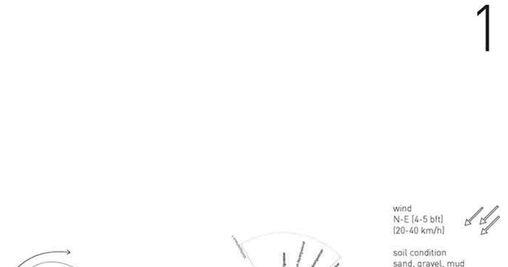
This special location demands specific structures for building. The historical steel towers were fully prefabricated at a dry dock - the idea for the new structure is to develop a possibility for prefabricated concrete elements.

The conditions for researching celestial bodies at this location are ideal due to its great distance to the next civilization and city. There is almost no stray light, no considerable air turbulences and a clear night sky. The second research focus is hydropower and ocean energy. Its location offers different possibilities of generating, storing and transporting energy. At this location hydroelectric installations are the most efficient ones using water current and wave power.

landmark
Red Sands as being the last completely exisiting sea forts of Great Britain standing as solitaire in the ocean. From aerial perspective they are hardly visible, from space not to be seen. The idea is to establish a visible and known address as research center.

A protective structure surrounding the towers create a new own world. This structure keeps away natural forces and creates a place of tranquility with the towers as center. The dimension of the dam wall covers a length of 1.5 km and frames the setting.
The towers now contain planetarium, observatory and visitor platform, whereas the dam wall as enclosing ring offers space for research and installation of hydropower and ocean energy such as temporary housing for researchers.

dam
Specific location factors determine the type of construction and base of the building in the ocean. To implement the idea of the protecting wall for this historic site a elliptical dam is formed. This enclosed elliptical structure creates a basin with constant water level for the towers to stand in. Natural forces such as wind, water current and tides still determine the situation outside of the new structure.
The appearance of this massive building structure depends on the time in the tidal cycle. In times of high water only a narrow edge of the surface shows- at low tide the construction presents its massive protecting shape.
The ellipse is tilted at a 20 degree angle towards the Thames Estuary to offer the most appicable surface for wind, waves and current. Installtations generate energy through this impact of ocean power.

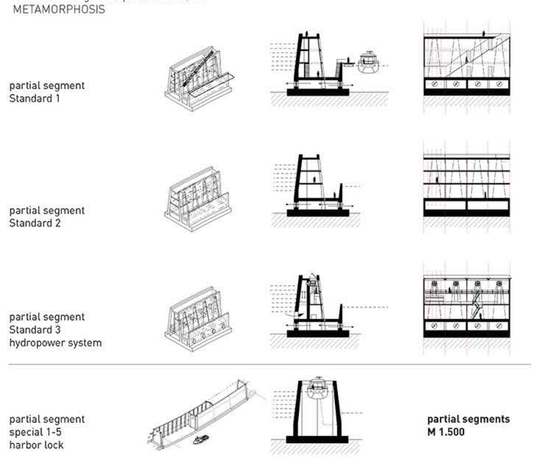


planetarium

circulation deck

observatory

Red Sand towers
M 1.500



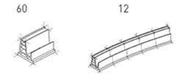
partial segments
M 1.500

prefabrication

The complete elliptical structure is set up of 60 production segments, each 25 m long. They produced at the dry dock Tilbury Harbor. As 125 m long floating units they are shipped to its final location, flooding compartments are opend and sunk on the sea bed. Gravitiy foundation and flooding chambers of each segment keep the structure on the sea bed in its position.
By putting all segments together the overall elliptical structure is undisplaceably formed and counteracts against water pressure, natural and tidal forces. These forces are transformed through hydropower stations into energy.

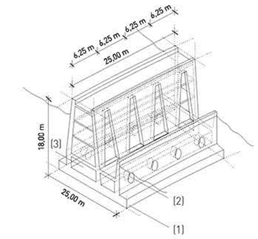
number of units

60 | 12 | 4 (A B C)



estimated production time

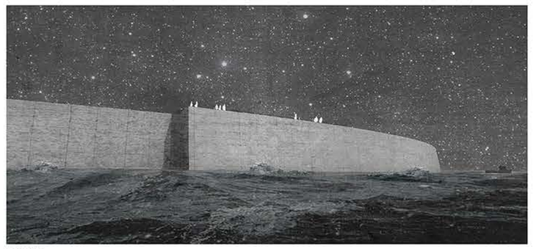
1 partial segment 25 m	1 week
1 segment 125 m	5 weeks
3 segments, 3 production lines	5 weeks
total 12 segments	20 weeks



partial segment 25 m (production section)

buildung structure 18 x 18 x 25 m
volume m^3
total floor area 564 m^2
5312 t reinforced concrete

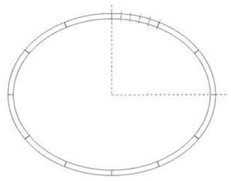
base
gravitiy foundation (1)
lockable opening (2)
adjustable in and outflow,
water exchange of basin
flooding compartments (3) to sink element



low tide

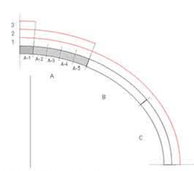
high tide

partition



partition into 12 elements

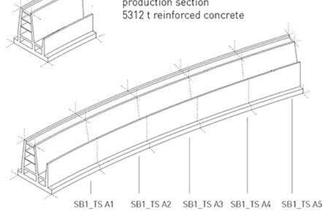
marking



elliptical arch (SB1_TS A1)

1 elliptical arch (SB 1-4) 375 m (quarter of ellipse)
2 segment (S 1-3) 125 m (transportion element)
3 partial segment (TS 1-5) 25 m (production section)

partial segment, 25 m
production section
5312 t reinforced concrete



segment, 125 m
transportion element, floating
26.500 t

production- transportation- installation

1 Port of Tilbury
dry dock, production line
2 preparation reinforcing bars in 3 production lines
transportation of reinforcing bars into casting bay
production of partial segments 1-5
3 transportation of partial segments to external area and joining to transportion element
interior fittings
installation of steel bulkhead
4 preparation of transportation
flooding of dry dock
5 towing of floating segment to location
6 positioning of segment
open flooding compartments to sink element to ground depending on tidal phases (see diagram)
7 joining of all segments
8 lower water level within the basin

production- transportation- installation