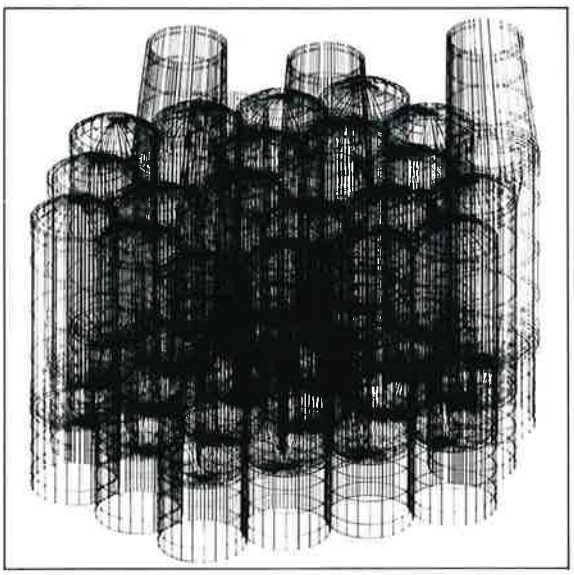
GULLFAKS C

Norwegian Contractors

Design

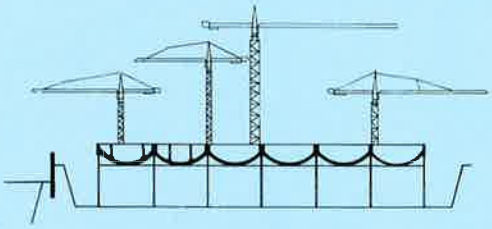
NC has the overall design responsibility for the world's largest offshore platform structure. The detail engineering work started in April 1985 and involved the mobilization of approx. 200 engineers in order to prepare the documentation required for construction work to be started in January 1986. The design work, being performed partly inhouse and partly by external consultants, comprises:

- Foundation design based on "Skirt Piling" which is a new foundation system for gravity structures on soft soil.
- Extensive computer analyses. Approx. 325,000 degrees of freedom in the finite element model used for the Global Structural Analyses.
- Design of concrete, reinforcement and pre-stressing arrangements.
- Design of piping and electrical systems in the lower parts of the structure and in the storage cells.
- Design of instrumentation systems for monitoring of platform behaviour during construction, installation and operation.
- Design related to major platform operations such as deck mating, towout and installation offshore.

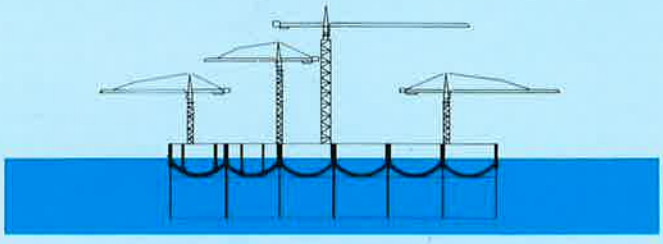


Global Structural Analyses.

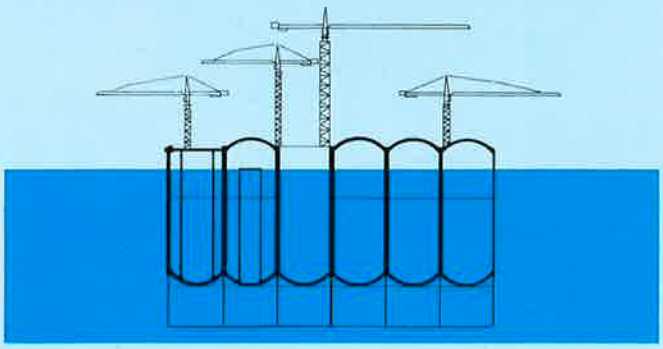
Construction sequences



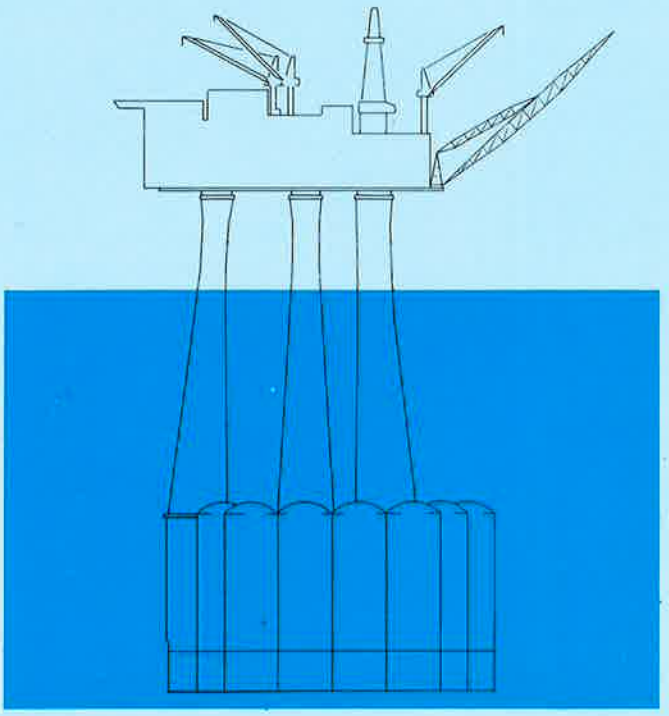
1 Dry dock, Hinna, Stavanger: Concreting of skirts, lower domes, and lower cell walls. Mechanical outfitting. Height in dry dock 40 m.



2 Tow to Vats, (North of Stavanger): Draft at tow 34 m. Displacement 570,000 tonnes.



3 Construction at Vats: Concreting of cell walls, upper domes and shafts. Mechanical outfitting. Total height of concrete structure 262.4 m.

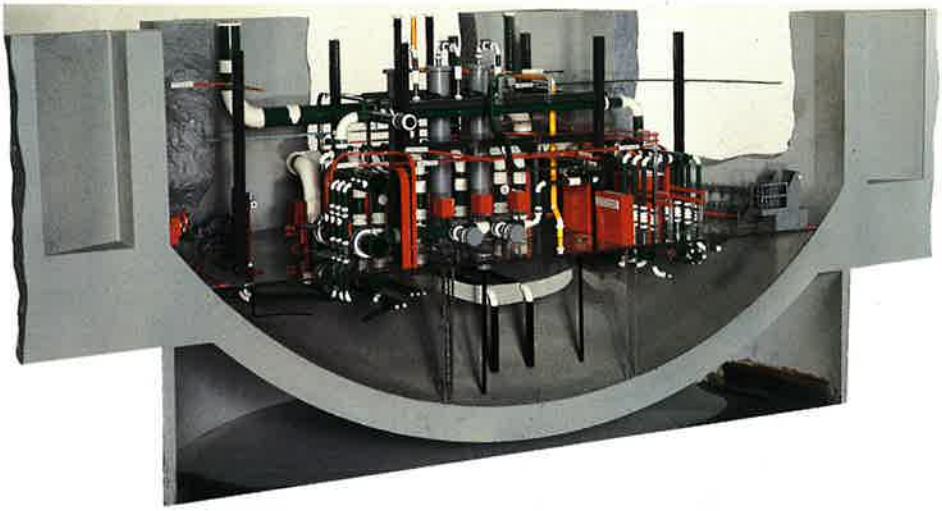


4 Tow to field: Displacement 1,500,000 tonnes. Draft at tow 210 m.

Mechanical outfitting

NC is performing extensive mechanical works on the bottom section and in the storage cells. The work comprises prefabrication, installation, testing, commissioning and operation of the mechanical systems, i.e.:

- Prefabrication and installation of approx. 2300 tonnes of structural steel and piping, of which 100 tonnes are high quality, stainless 6MO steel.
- Installation of a comprehensive instrumentation system which will record the platform's behaviour during construction, installation at the field and operation.
- Installation of approx. 200 tonnes of sacrificial anodes which will safeguard the mechanical systems exposed to seawater during their 30 year working life.
- Installation of a large number of embedment plates, penetrations and fastenings.
- Installation of 1500 m^2 of drainage filters on the skirts due to the special and difficult soil conditions at the field.

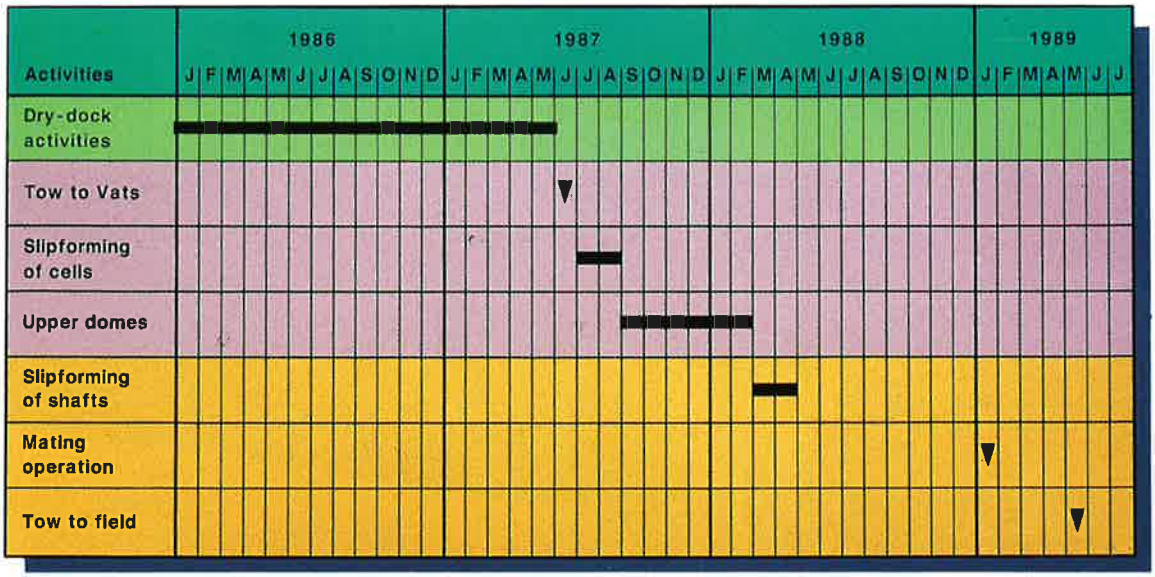


Construction

The construction work on the record-breaking Gullfaks C structure started at NC's yard at Hinna, Stavanger in January 1986. After two months construction the sixteen concrete skirts covering an area of 16,000 m^2 were all completed to their full height of 27 m. The lower part of the storage cells will be completed before the structure is towed out of the dry dock in May 1987. The remaining construction work will take place at NC's construction site at Vats, North of Stavanger.
Highlights in the construction program at Vats are:

- Slipforming of the storage cells involving placing of more than 110,000 m^3 of concrete and 30,000 tonnes reinforcing steel.
- Construction of the upper domes.
- Slipforming of the 170 m high conical shafts which are also inclined to the vertical axis. This is the first time such an operation has been performed.
- Mating of the 49,500 tonnes deck structure to the top of the shafts involving deep submergence of the structure to a draft of 256 m.
- Towing out the completed Gullfaks C platform with a displacement of 1.5 million tonnes.
- Installation in 216 m water depth at the offshore location including the penetration of the concrete skirts 22 m into the sea bed.

Construction Program



Key figures

Client:	statoil	Concrete Quality:	C65–C70
Water Depth:	216 m	Reinforced Steel:	75,000 tonnes
Production Capacity:	245,000 bbls./day	Prestressing:	4,000 tonnes
Number of Cells:	24	Deck Weight during Tow:	49,500 tonnes
Number of Shafts:	4	Number of Conductors:	52
Concrete Volume:	246,000 m³	Number of J-tubes:	16

Gullfaks C in dry dock, April 1986
– 4 months after start of construction!

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