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11. Super CIDS, Concrete Island Drilling System

Owner:	<i>Global Marine Development, Inc. USA</i>
Engineer:	<i>Global Marine Development, Inc. USA</i>
Contractor:	<i>Nippon Kokan K.K., Japan</i>
Construction Period:	<i>9 months</i>
Service date:	<i>1984</i>
Design Criteria	
<i>Ambient air temperature:</i>	<i>- 50° C ~ + 26° C</i>
<i>Sea water temperature:</i>	<i>- 3° C</i>
<i>Ice thickness:</i>	<i>2.0 m</i>
<i>Water depth:</i>	<i>11 ~ 16 m</i>
<i>Wave height:</i>	<i>10 m</i>
<i>Wind speed:</i>	<i>51 m/sec</i>
<i>Ice force, global:</i>	<i>680 t/m²</i>
<i>local:</i>	<i>630 t/m² on 1.5 m × 1.5 m foot print</i>

Introduction

Super CIDS (Concrete Island Drilling System) is a mobile island to operate in the Arctic. It is a hybrid structure consisting of two steel modules and a concrete module. Such a mobile hybrid structure has never before been constructed in the world. Furthermore, the fact that the construction period of the entire structure was only 9 months has attracted worldwide attention.

Steel Mud Base (SMB)

Steel plates of ASTM A537 Class II which are 25–50 mm thick are mainly used for the SMB which supports loads from BB-44 and DSB. The SMB contains pump rooms and ballast tanks, and has 1.5 m-long skirts under the

bottom plate. The skirts penetrate into the seabed when the SMB lands on the sea bottom, and act to resist the horizontal load due to sea ice imposed on the CIDS.

Deck Storage Barges (DSB)

The DSB was built in two units, namely starboard and port side units. Potable water tanks, ballast tanks and fuel oil tanks are contained inside the DSB.

Drilling modules, storage tanks for bulk mud and cement, cementing units, etc., are arranged on the deck of the port DSB. On the deck of the starboard DSB, living quarters which can accommodate 93 persons and machine rooms are provided. There is a service well for access to the BB-44 and the SMB, and for piping. Steel class of EH36-060 is used for the DSB.

Concrete Basic Brick (BB-44)

BB-44, the reinforced and prestressed post-tensioned concrete brick, is the central module of the CIDS. It is exposed to severe arctic environmental conditions, including ice forces at the air/water interface.

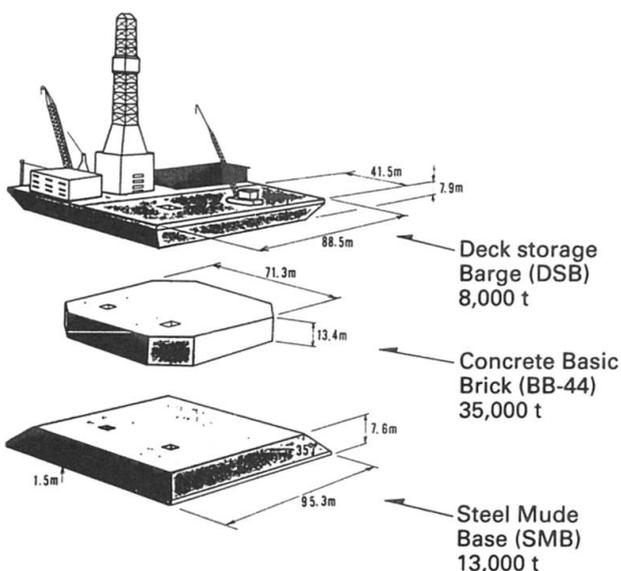
This vertical sided octagonal concrete brick consists structurally of top and bottom slabs, external and internal walls, shear walls, silos and connecting walls.

All the elements of the BB-44, except the internal and shear walls, are constructed of high-strength lightweight concrete with sufficient durability against freeze/thaw action.

High strength normal weight concrete is used for the internal and shear walls.

The BB-44 was the world's first project involving massive application of the recently developed lightweight concrete.

The top and bottom slabs are post-tensioned to 35 kgf/cm² in both the longitudinal and transverse directions. The external wall is post-tensioned to 35 kgf/cm² in the horizontal direction and 21 kgf/cm² in the vertical. This horizontal post-tensioning is applied for crack control purposes. The internal and shear walls are vertically post-tensioned using prestressing deformed bars of 32 mm and 36 mm in diameter.

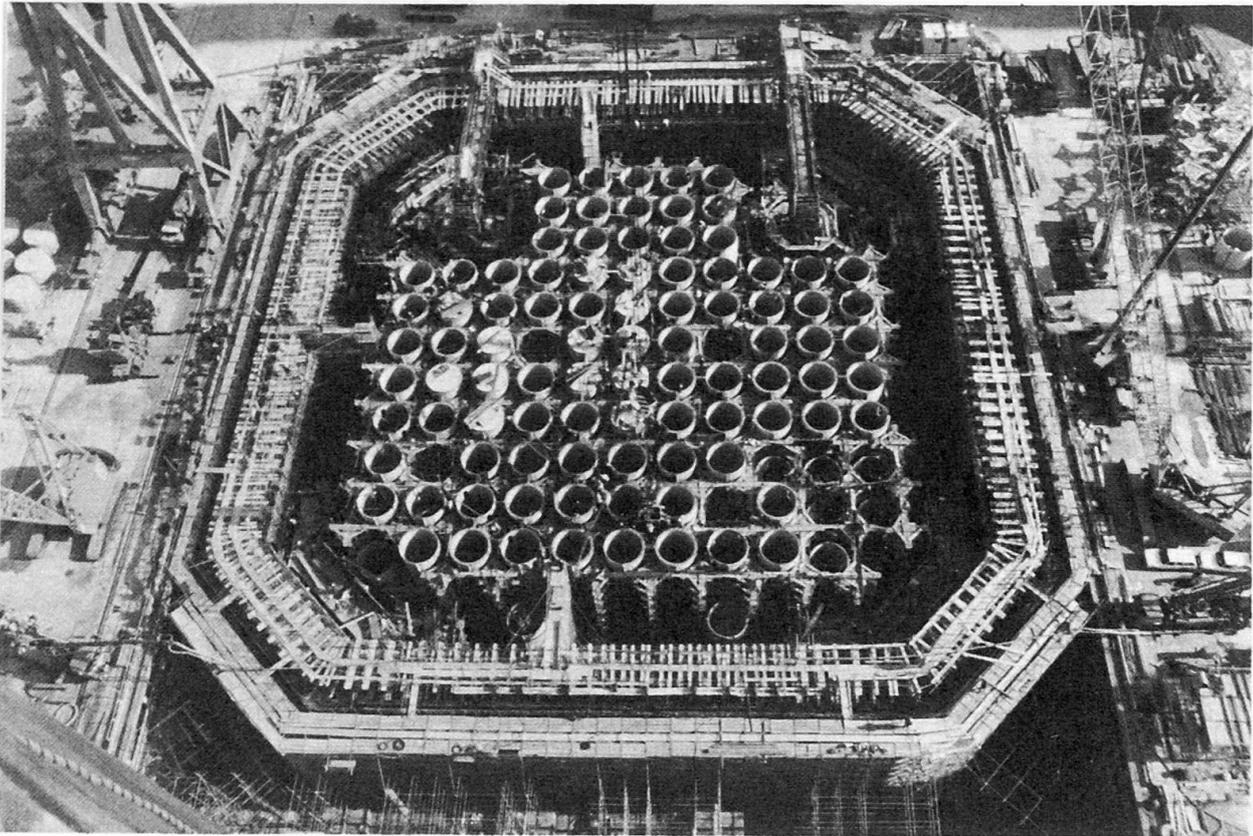


Concept of Super CIDS

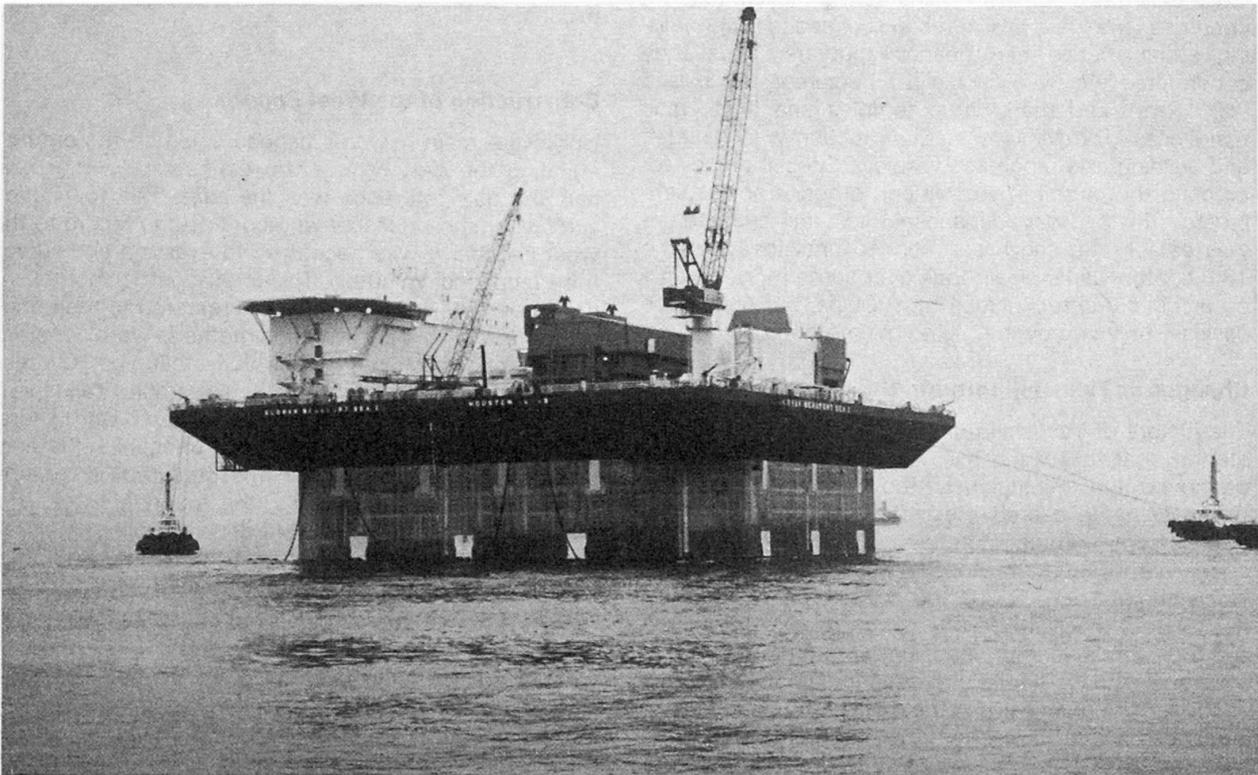
Materials of BB-44

Item	Specification	Volume
Lightweight Concrete	$\sigma_{5.6} = 457 \text{ kgf/cm}^2$	9280 m ³
Normal weight Concr.	$\sigma_{5.6} = 562 \text{ kgf/cm}^2$	5070 m ³
Re-Bar	ASTM A 615 Grade 60	6060 t
Prestressing Strand	JIS G 3536 SWPR 7B	360 t
Prestressing Bar	ASTM A 722 (de- formed) $\varnothing 36, \varnothing 32$	300 t

(T. Suzuki)



CIDS under construction



CIDS as a mobile island