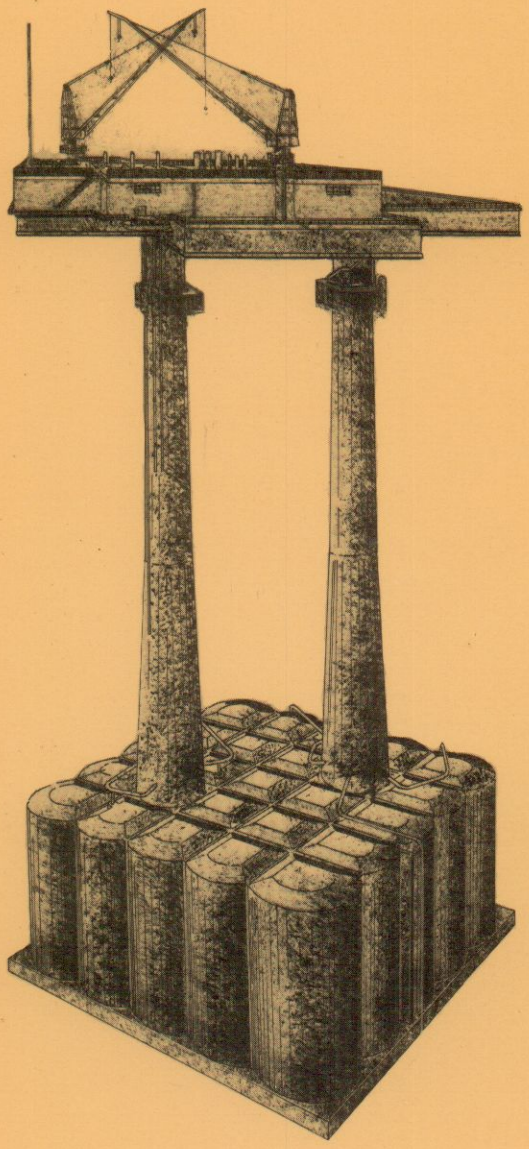
ELF NORGE A/S

FRIGG FIELD

TREATMENT PLATFORM TP1



SEA TANK CO - MAC ALPINE - Main Contractor for Structure.
CONSTRUCTIONS METALLIQUES DE PROVENCE - Construction of Support Frame.
MERCANTILE MARINE ENGINEERING - Construction of Treatment Modules.
MAC DERMOTT U.K. - Engineering for Support Frame and Treatment Modules.
BROWN & ROOT U.K. - Project Management for Pipeline, Risers
and Mechanical Appurtenances.
Georges WIMPEY - Mechanical Installation.
DET NORSKE VERITAS - Certifying Authority.

FRIGG GAS FIELD DEVELOPMENT

1. INTRODUCTION

The FRIGG GAS FIELD was discovered in 1971, by ELF NORGE, acting as operator of the Norwegian Association composed of ELF-NORGE A/S : 27,613 % AQUITAINE NORGE A/S : 13,807 %, NORSK-HYDRO A/S : 32,87 %: TOM NORSK A/S 20,71 % and STATOIL A/S : 5 %.

The field is located approximately 180 km East of Shetland, 190 km West-North-West of KARMOY Island - NORWAY, and 370 km North-East of Peterhead (Scotland). It straddles the median line between the British and Norwegian sectors of the North Sea Continental Shelf. The gas reservoir is situated at 1920 m under sea bed level in Eocene sands.

The British extension was confirmed by TOTAL OIL MARINE in 1972, acting as operator for the British Association composed of TOTAL OIL MARINE : 33 3/9 %, ELF OIL EXPLORATION and PRODUCTION (UK) Ltd : 44 4/9 %, AQUITAINE OIL (UK) Ltd : 22 2/9 %.

An agreement was reached in 1973 to unitize the FRIGG field and entrust ELF NORGE with the operating of the field developement and exploitation.

The FRIGG gas has been sold to British gas corporation and will be transported to Scotland by two lines.

2. OFFSHORE SITE CONDITIONS

The following summarized information have been obtained from various detailed surveys.

2.1 - Water depth : 96 to 106 m

2.2 - Sea conditions :

- maximum wave height : 29 m
- maximum wave period : 16 s

2.3 - Soil conditions :

The upper layers are very heterogeneous, main layers are as follows :

- top hard sand bottom : 0 to 15 meters thickness
- clay with very heterogeneous resistance (8 t/m2 to 20 t/m2) ; 3 to 17 meters thickness.

3. EQUIPMENT FOR FIELD PRODUCTION

For the development of the FRIGG Field the following equipment will be built.

3.1 - Platforms

- 2 Drilling platforms :
  . CDP1 (Concrete Drilling Platform Phase I) is a concrete gravity platform designed by C.G. DORIS-HOWARD. This platform has now been on site since 1.09.1975.

  . DP2 (Drilling Platform Phase 2) is a steel jacket with 8 legs supporting a main deck. This platform is under construction.

- The Treatment Platform (TP1) is a concrete structure with a caisson and two columns supporting a steel deck and the treatment installation. TP1 is designed by SEA TANK CO and construction is being performed at ARDYNE site (UK).

- The Treatment and Compression Platform TCP2 is also a concrete structure with a caisson and three columns supporting a steel deck and treatment and compression units. TCP2 is designed by CONDEEP and construction is being performed at ANDALSNES site (Norway).

- The Quarter Platform (QP) is a steel jacket supporting a steel deck with 2 three floor quarters building, being installed now. QP platform will be connected with TP1 and TCP2 platform with two steel bridges.

- The Flare Platform (FP). is an articulated steel platform with two main parts : base and column designed and built by C.F.E.M.

3.2 - Submarine Lines

3.2.1 - Lines between platforms

. Four 26" lines with working pressure of 172 bars will transport gas produced from CDP1 to TP1 (two 500 m lines) and from DP2 to TCP2 (two 700 m lines).

. Two 4-½" lines with working pressure of 172 bars will transport gasoline produced from CDP1 to TP1 and from DP2 to TCP2.

. Two 8-5/8" kill lines with working pressure of 345 bars to transport mud to kill the wells in case of emergency, will connect the two drilling platform CDP1 and DP2 with TP1 and TCP2.

. One 24" lines 500 m long to evacuate gas to be flared off from TP1 to FP.

. Two 2" lines 500 m. long which feed the flare pilot flame from TP1.

3.2.2 - Lines between platforms and Scotland

. Two 32" lines will connect the two treatment platform with St-Fergus Terminal (Scotland), one line with TP1 and one line with TCP2.

3.2.3 - Other lines

Several connecting lines between TP1 and TCP2 are supported by the bridge.

4. DEVELOPMENT WELLS AND DRILLING PROGRAMME

48 production wells will be drilled from the two fixed production platforms, CDP1 and DP2 with 24 wells on each platform. The wells on each platform will be divided into 2 clusters of 12 wells each.

The wells will be directionally drilled.
The equipment and completion methods have been chosen according to the following criteria :
- maximum safety
- facility of operations
- minimum damage to wells
- maximum diameter

5. WELL POTENTIAL AND PRODUCTION PROGRAMME

A potential of 2.0 to 2.5 10^6 m3/day per well can be expected. Production will be made in two phases :

- Phase 1 : Gas will be extracted from CDP1 and treated on TP1, the treatment capacity will be 30.10^6 m3/day.

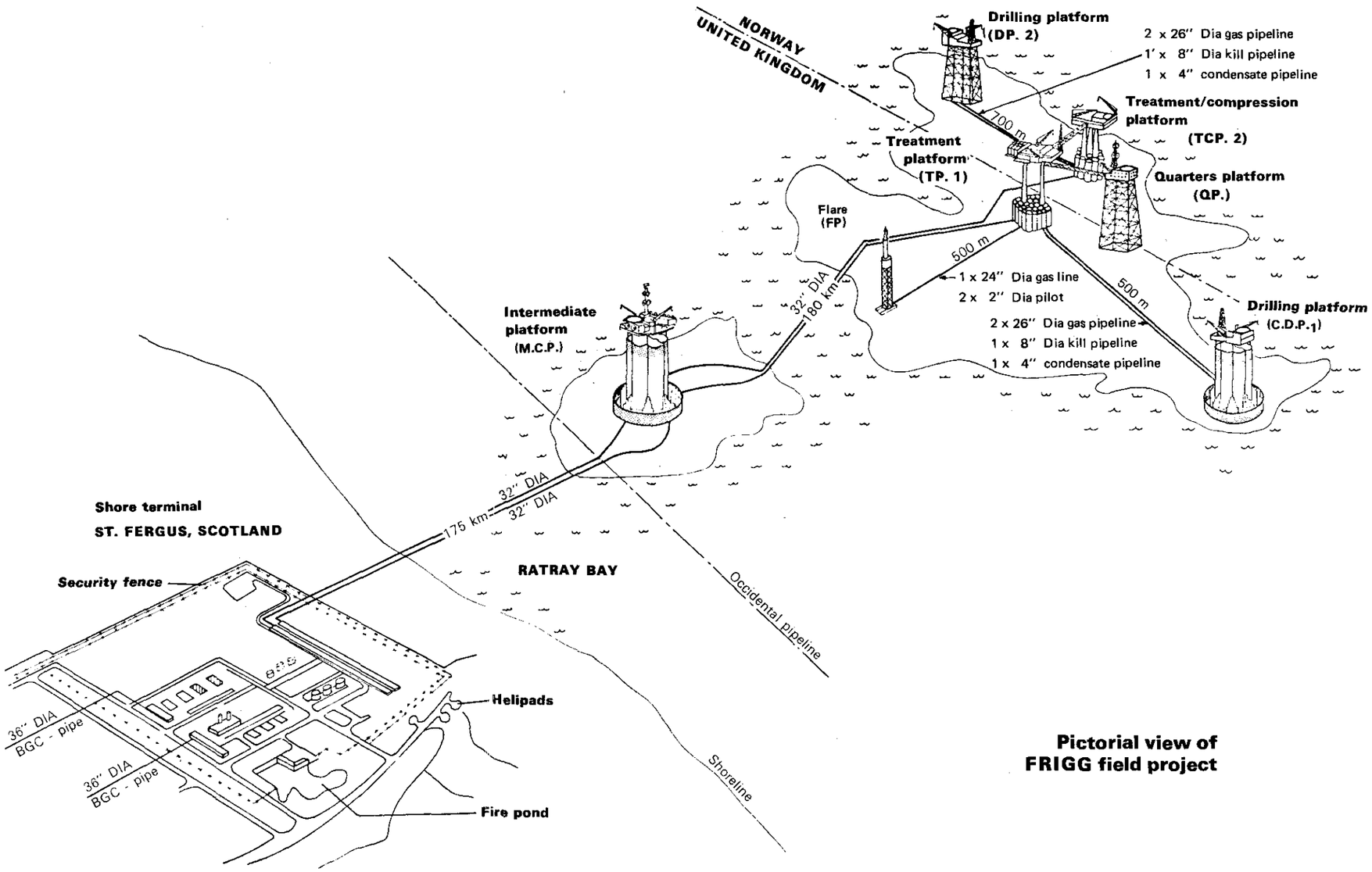
- Phase 2 : Gas will be extracted from CDP1 and DP2 and treated on TP1 and TCP2; the treatment capacity will be 60.10^6 m3/day.

The gas is treated by a glycol dehydrator system supported by TP1 and TCP2. Each platform supports 3 dehydration lines (2 in service and 1 as a spare) of a 15.10^6 m3 per day per line output. Maximum flexibility of operation is provided by inter connecting lines at several levels of the process.

Later on, compressors will be added on TCP2 platform to maintain an inlet pressure in the gas line to Scotland at the same level of about 145 to 150 bars when the well head pressure decrease.

This huge compressor station will require about 150.000 HP to be installed on east side of the TCP2 support frame.

Both compression and treatment equipment are pre-built in full packaged elements.



Pictorial view of FRIGG field project

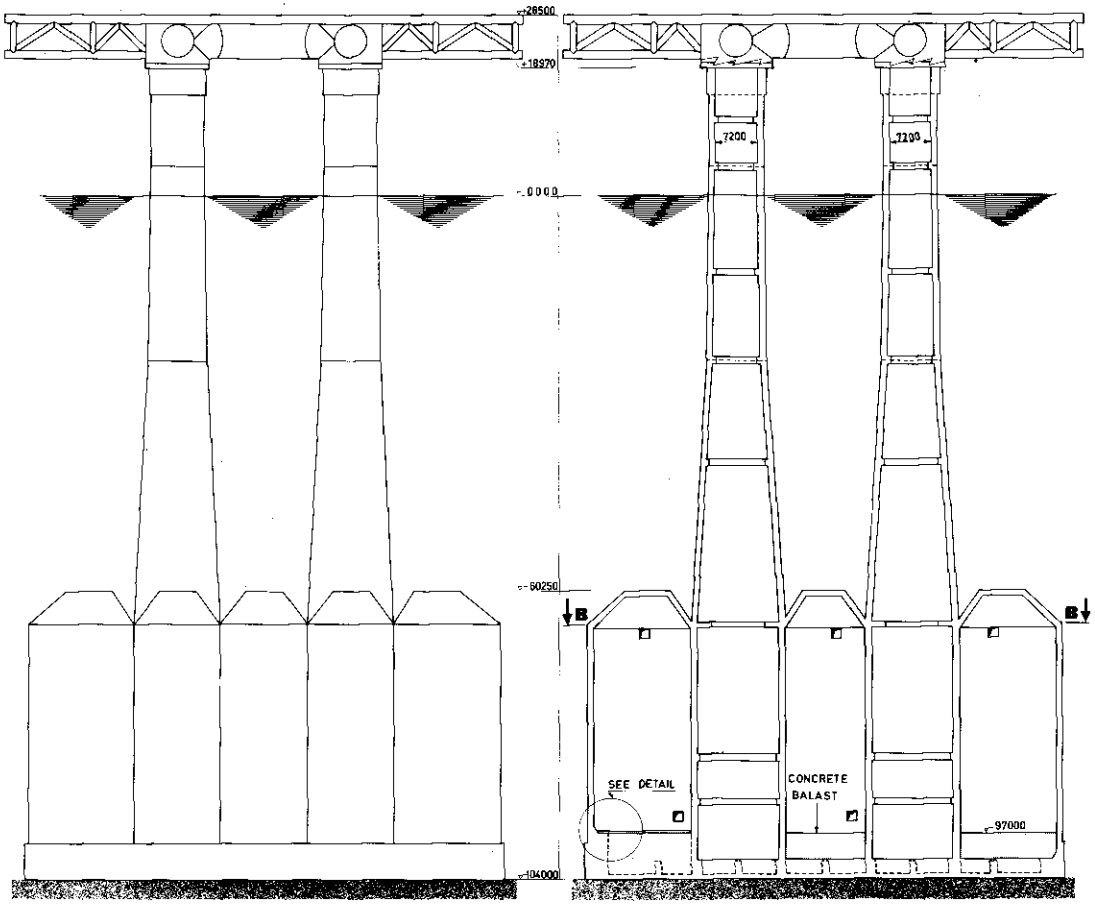
6. SCHEDULING FOR FRIGG FIELD DEVELOPMENT

Phase 1

. Installation of TP1 Platform on Frigg Site	May-June 1976
. Installation of QP Platform on Frigg Site	Summer 1976
. Connection of lines between Platforms TP1 and CDP1	Summers 1976-1977
. Start up treatment on TP1 Platform	October 1977

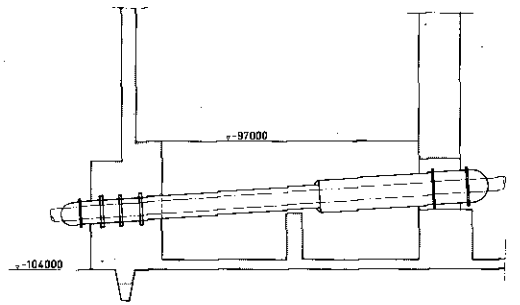
Phase 2

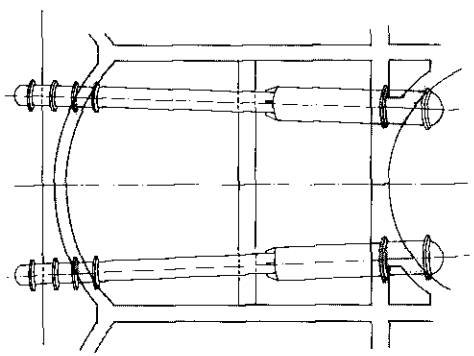
. Installation of DP2 Platform on Frigg Site	Summer 1976
. Installation of TCP2 Platform on Frigg Site	May-June 1977
. Connection of lines between Platform TCP2 and DP2	Summer 1977
. Start up treatment on TCP2 Platform	Spring 1978
. Start up of compression units on TCP2 step by step	1980-1985



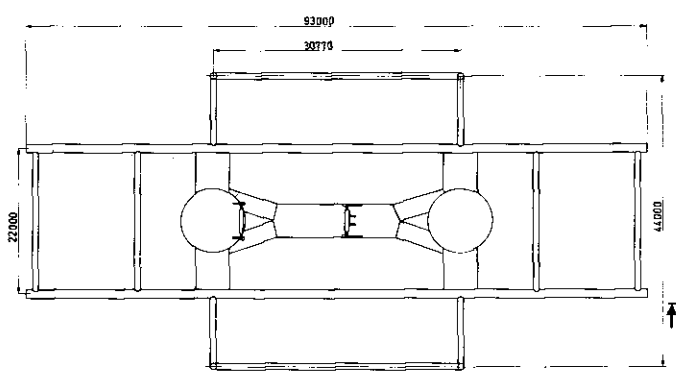
ELEVATION

SECTION AA

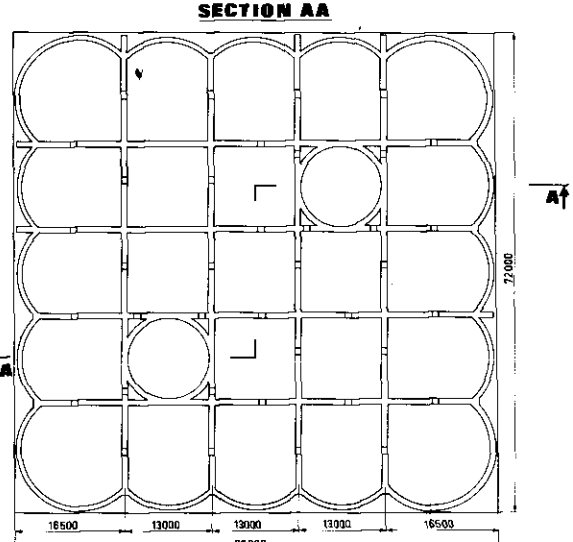




DETAILS RISERS

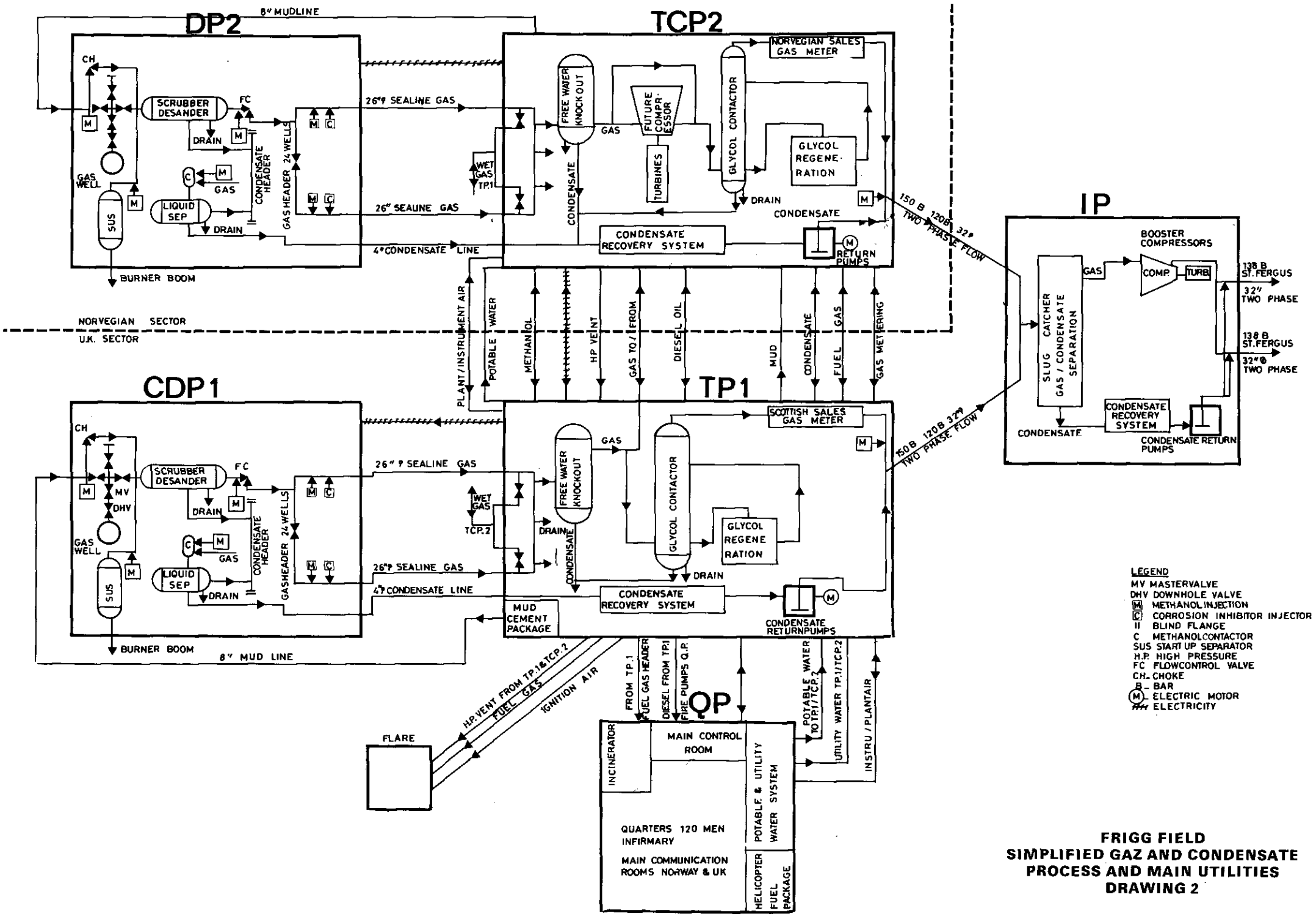


PLAN

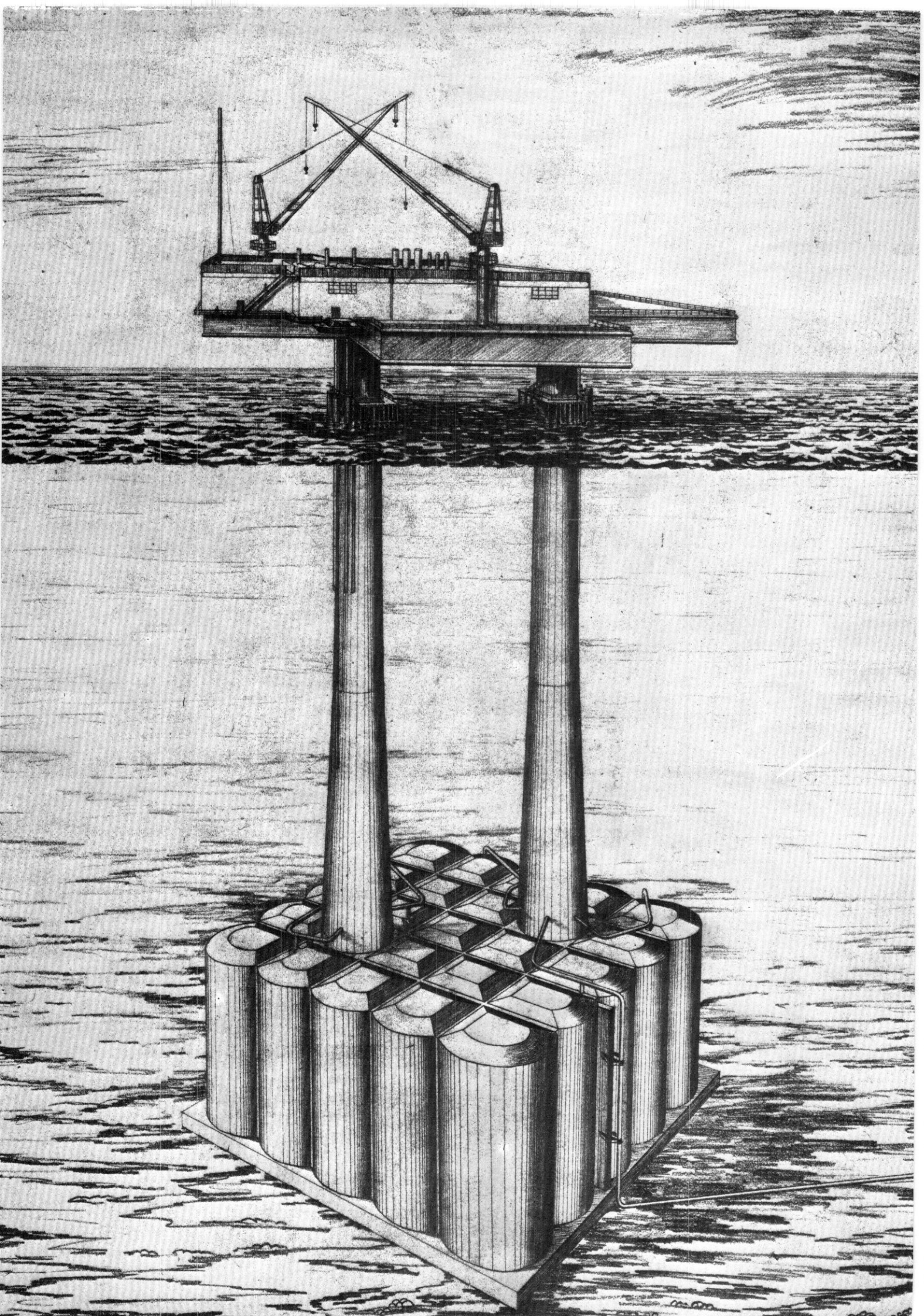


SECTION BB

FRIGG FIELD
TREATMENT PLATFORM TP1
GENERAL DRAWING
OF STRUCTURE
AND SUPPORT FRAME
SCALE 1 2500
DRAWING 1



FRIGG FIELD
SIMPLIFIED GAZ AND CONDENSATE PROCESS AND MAIN UTILITIES
DRAWING 2



SUMMARY OF MAIN INFORMATIONS ON TP1 PLATFORM

1 - General Geometrical Characteristics	
1 Foundation	Square 72 x 72 m
Slab	3,00 m thick - Prestressed Concrete skirts 2,00 m deep
2 - Caisson	25 square cells - Overall height : 44,00 m Thickness of vaults : 0,60 m Thickness of internal walls : 0,80 m
3 - Columns	2 conical columns - Height above caisson : 83,00 m Diameter : 12,20 m to 8,00 m Thickness : 0,80 m to 0,40 m
4 - Steel deck	Surface : 3 500 m2 - Overall length : 93,00 m. Width from 22 to 44 m Height : 6,50 m Weight : 2.000 t.

2 - Main Figures on Construction of Concrete

	Form works m2	Slipforming L.m	Reinforcement tons	Prestressing tons	Concrete m3	Total Weight tons
Skirts	2.000		75		600	**2.000**
Slab	6.500		1.600	150	16.000	**42.000**
Caisson Walls		900	2.800	20	23.000	**60.000**
Caisson Roofs	11.500		700		6.000	**16.000**
Columns		80	700	250	3.500	**10.000**
Total Structure	**20.000**	**980**	**5.875**	**420**	**49.100**	**130.000**

3 - Estimated weight of TP 1 Platform on Site

	Dry weight in tons
Concrete structure excluding concrete ballast	130.000
Concrete ballast in caisson	32.000
Risers, J Tubes, Pump Casings	2.000
Grouting between slab and sea bottom (estimate)	4.000
Steel support frame and treatment modules	8.000
Platform on site	**176.000**

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