ness for a period of three months during winter and severe cold prevails for several months of the year.

An offshore drilling technique involving the construction of artificial islands built from dredged material has been tried with some success in the Beaufort Sea by Sun Oil and by Imperial Oil of Canada. These islands are relatively cheap to construct and are suitable as year-round production facilities. Their main drawback is that they are practical only in water depths of 40 feet (12 m) or less. Another offshore drilling technique with some limited usefulness is the drilling of directional wells: these slanted wells can be drilled from shore, extending a few thousand feet (up to 900 m) under the sea floor. Finally, the Department of Indian and Northern Affairs has granted Dome Petroleum Limited of Calgary permission to proceed with a drilling program at two sites in the Beaufort Sea in the summer of 1976, using two specially modified ships.

In the fall of 1973, Panarctic Oils Limited achieved a significant advance in Arctic drilling techniques with the construction of an artificial floating ice platform to support offshore drilling. This technical breakthrough led to the drilling in 1976 of an offshore well in 900 feet (250 m) of water.

Although Panarctic was the first organization to use an offshore ice drilling platform, it could draw upon a large body of accumulated Canadian experience in the use of floating ice cover for transportation and for storing pulp wood temporarily until spring. As a matter of fact, a railroad crossing was laid on the frozen St. Lawrence river between Longueuil and Hochelaga near Montreal for four consecutive winters between 1880 and 1883. Numerous crossings and winter roads have also been used over various frozen bodies of water in Canada for several years. A recent example of this was a temporary winter road giving access to a mine site at Wollaston Lake in Northern Saskatchewan. This road was first built in 1970 and was 230 miles (371 km) long, of which 173 miles (279 km) were on lake ice. Ice bridges were also built recently in the James Bay area of Quebec to allow heavy supply traffic to cross large rivers. It was thus well known that floating ice of sufficient thickness can support very large loads.

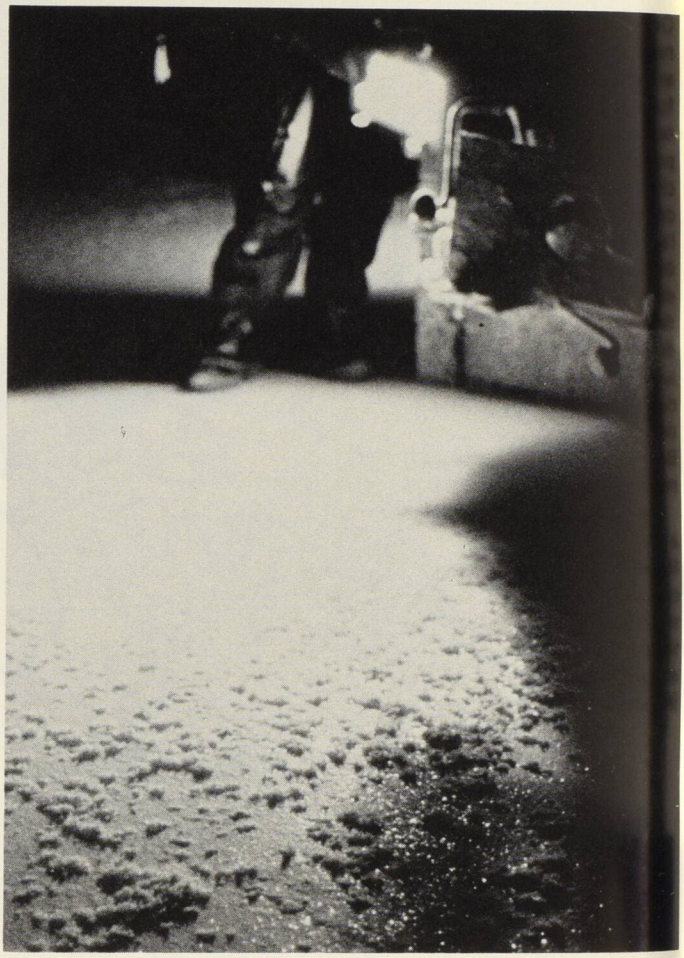
According to Mr. D.J. Baudais, project engineer in the operations department of Panarctic Oils Limited, the first major hurdle of the project was to ensure that horizontal movements of winter sea ice at prospective drilling sites would be within acceptable limits. Starting in the fall of 1971, ice movement studies were conducted at a number of potential offshore drilling sites between Melville Island and Ellef Ringnes Island, using conventional surveying techniques and, starting in January 1975, acoustic location sensors. The data gathered showed that horizontal ice movements on near-shore locations were less than 20 feet (6 m) during the period January to June, well within acceptable limits for drilling equipment.

In the spring of 1973, Panarctic conducted a first field experiment by drilling four test wells with a small 150-ton (135 t) drilling rig placed on the ice of Kristoffer Bay near Ellef Ringnes Island. Natural sea ice, ranging in thickness from 6 to 8 feet (1.8 to 2.4 m) proved entirely adequate to support the 150-ton weight of the rig over the eight-day drilling period. In the light of this successful field test, and after an engineering feasibility study, Panarctic obtained permission from the Department of Indian and Northern Affairs to drill a gas delineation well using a full-scale drilling rig supported by an ice platform.

Explains Mr. Lindsay Franklin, head of the offshore petroleum technology unit of the Department of Indian and Northern Affairs: "The Department is responsible for licensing and monitoring drilling programs in the Canadian Arctic. It evaluates the technical and environmental implication of each drilling application from companies planning Arctic oil or gas exploration projects and imposes on the operator appropriate restrictions."

Flooding the ice platform. The pebbled surface of this ice was due to an excessive ice-building rate during flooding tests performed to determine the optimum platform construction rate.

Construction d'une plate-forme de glace. Au cours de tests d'arrosage de la glace, on a constaté qu'un arrosage trop rapide provoque la formation de nodules de glace.



Division of Building Research, NRC/Division des recherches en bâtiment, CNRC

Foundation of Canada Engineering Corporation (FENCO), a Canadian-owned company based in Calgary, was retained by Panarctic to design and build a safe drilling platform for the 500-ton (450 t) drilling rig. The well site, designated as W. Hecla N-52, was situated in Hecla and Griper Bay, eight miles (12.8 km) off the Sabine peninsula of Melville Island, 950 miles (1 520 km) from the North Pole and about 120 miles (192 km) west of the Magnetic North pole. Previous drilling on the Sabine peninsula had revealed the presence of a substantial gas field which was expected to extend some distance under the sea floor. Water depth at the site was approximately 440 feet (132 m).

Upon receiving an application from Panarctic Oils Limited for permission to use an artificial floating ice platform for offshore drilling, the Department of Indian and Northern Affairs asked the Division of Building Research of the National Research Council of Canada for advice on the general properties of ice and the load-bearing capability of