

Stirring things up

By Correspondent Tonia Jurbin, P.Eng

One of the more distinct and beautiful scenes on any Canadian travel brochure is that of the towering sails at Canada Place on Vancouver's waterfront. Recognized across Canada and by thousands of international tourists as the gateway to the west, these impressive monuments have also become a centre of attention lately for another reason.

The building and pier under the famous sails of Canada Place, the signature building of Vancouver's waterfront, are undergoing a major expansion to accommodate more cruise ships.

Currently the pier has two full-size berths and one smaller berth. The existing sides of the pier are 314 and 326 m long and the end is about 140 m wide. With a new extension

roughly 300 m long, the port will eventually be able to handle a super cruiser along one side of the pier, and two regular-sized cruisers on the other.

Work on the new extension started in March, 2000, 14 months late because of permitting delays for the underwater ground improvement work, the high political profile of

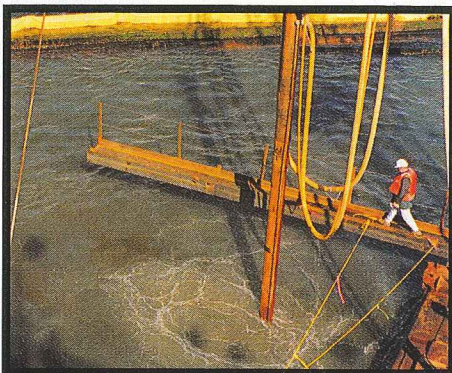
the location, and the controversial plans to include a casino in the building expansion. The marine work is scheduled to be complete by February 2001.

Canada Place is located a few blocks north of Vancouver's central business and shopping district, and a few blocks west of Gastown which is why it is the more popular of the two passenger ports in Vancouver. As a result, both berths are booked almost every day in July and August.

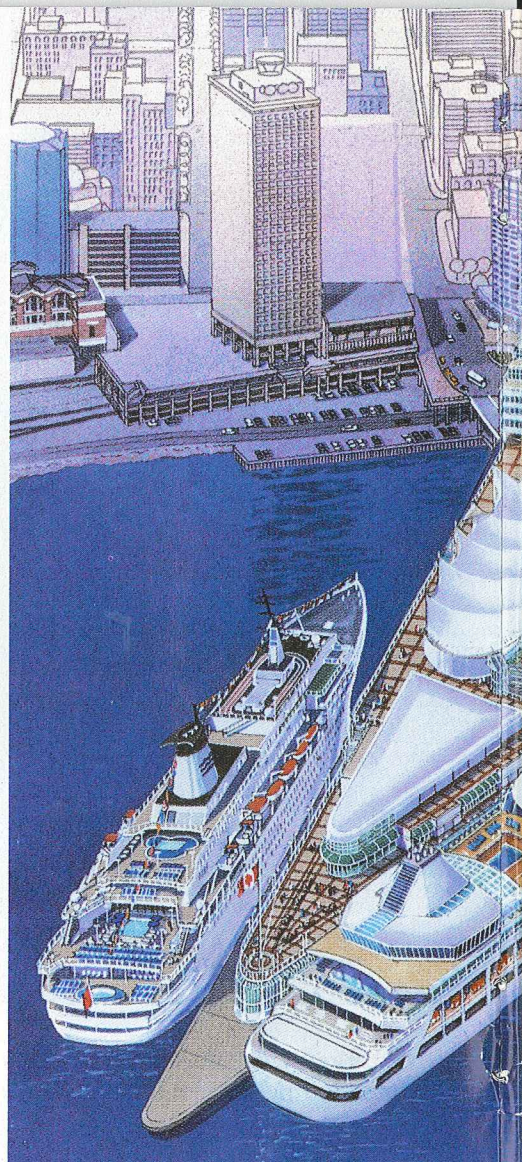
"Access to this site is pretty challenging, and I expect it to get worse this summer," says Tom Lively, Fraser River Pile and Dredge's pro-

ject manager for this contract. The only land-based access is a single, long and dark, one-way ring road that at times could be shared with up to 40 service trucks and 30 passenger buses per ship.

"If anyone has to be inconvenienced on this project, it's us because if the cruise ships aren't running, neither are we. Fortunately barge access is excellent! There won't be much chance to make up for delays when the piles for the expansion are being driven either, because evenings and weekends are peak times for taking in an



Silt curtains are used during drilling to help control silt migration into outer waters of harbour.

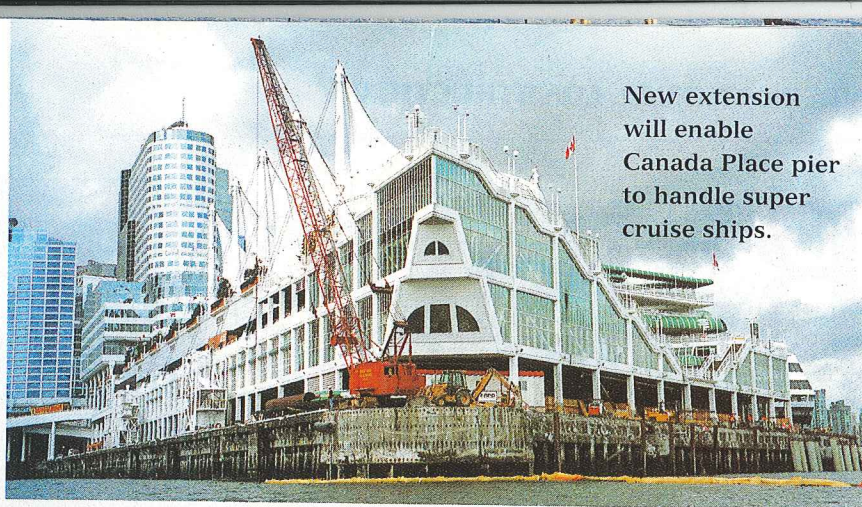
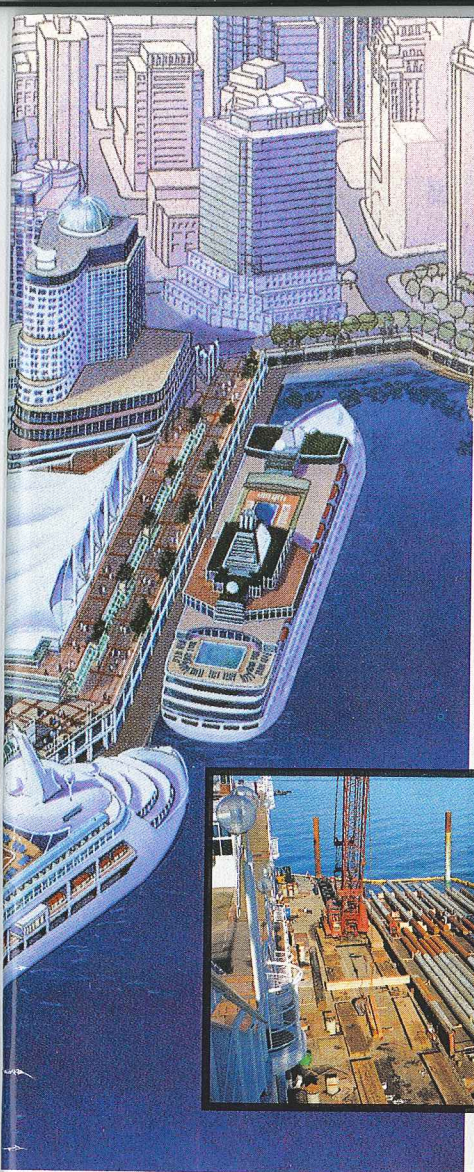


IMAX movie at Canada Place.

"Cooperation is key in keeping this job moving, we have a lot of meetings with the owners, and daily coordination meetings with Canada Place Convention Centre staff and the longshoremen that work on the pier," says Lively.

The 11 kms of steel piling, most of the reinforcing steel, the majority of the formwork and the falsework, and all of the precast concrete will arrive by water. The 8000 m of cast concrete, and other peripheral materials will arrive by land. These plans are subject to change as the cruise season progresses.

Before the pier extension could be built, a sort of semi-circular strip at the end of the existing pier, about 140 m along the edge and about 50 m wide, had to be densified to improve the performance of the site



New extension will enable Canada Place pier to handle super cruise ships.

COURTESY OF PORT VANCOUVER



Barges make task of delivering materials to site easier.

during an earthquake. Additional piles had to be driven through the existing deck and through the densified area because the existing piles were not designed to support a future building expansion.

The ground improvement design called for installing 1,257 underwater stone columns on a 2 m triangular grid, ranging in length from 13 m to 16 m. Because the specifications dictated an installation method, or work procedure, rather than a performance criteria, there was a lot less risk for Geopac West Limited, the ground improvement contractor.

The stone columns were installed using the top feed wet method, however, no replacement stone had to be imported for this work because the lower portion of the stone column was in till, and the upper portion was in an existing fill material that was

'fed' into the underlying till by the hole created with the 16 in. vibroflot.

The ground improvement work took about six weeks to complete and caused an average settlement of about one metre.

Site preparation for the ground improvement work included installing a silt curtain that was about 400 m long, about 5 m wide and secured with 10 piles, it took about 2 weeks to install. Silt curtains are used to prevent silt migration, they are time-consuming to install, have a high mortality rate and are generally trashed by the end of a job.

The 39 (610 mm x 19 mm) apron piles, those underneath the existing deck outside of the building line, will be driven from the land as will the 22 restricted headroom piles.

"The restricted headroom piles are going to be time consuming because we will probably have to drive them in 10 to 15 foot sections, every weld is going to be x-ray inspected, and they are being driven eight metres into the pre-existing, improved fill," says Lively.

The piles may be driven using an internal hammer that is dropped inside the closed ended piles, "the pile is the hammer head in this case," says Lively. "We will probably have a few of those going at once."

Once the apron is constructed, and the demolition at the end of the pier complete, Fraser River will go into full production driving the 22 restricted headroom piles through holes in the existing pier, and the remaining 335 (610 mm and 914 mm) piles from the water to a maximum depth of 43 m. Twenty-four (914 mm x 23 mm) fender piles will be driven adjacent to the pier to a depth of about 25 m to protect the pier from the cruisers.

All of the piles being driven inside the densified apron will be open ended, cleaned out using compressed air, and partially plugged with concrete. The rest will be driven closed ended and plugged with concrete.

Other works and materials for this project include 51 soil anchors to be installed on the batter piles outside the densified zone. The soil anchors are 60 m Dywidag bars with one end in the till and the other through a concrete cap in the top of the battered piles.

About 3600 m³ of riprap slope protection will be placed to protect the existing fill under the pier from the turbulence caused by the docking tugs and bow thrusters, and from the scour caused by the cruise ship propellers. 419 pieces of precast concrete and over a million kg of rebar will also be installed.

The foundation work will be a hard act to follow, but the building is sure to be interesting. An impressive project that will have an economic, cultural and architectural impact on Vancouver's waterfront for years to come. ♦