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"Wishbone Tree" Pipe Layout for Concrete Pumping

Nouveau procédé pour le pompage du béton

Neues Verfahren zum Pumpen von Beton

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1. PREFACE

The new "Wishbone Tree Pipe (Bifurcating Pipe) Layout Method" for pumping concrete represents a breakthrough in concrete casting. It has solved all the problems inherent to conventional methods. The new method has been developed and used for the construction of inground liquefied natural gas (LNG) storage tanks, where concrete has to be cast downward through vertical pipes into tank walls and base slabs.

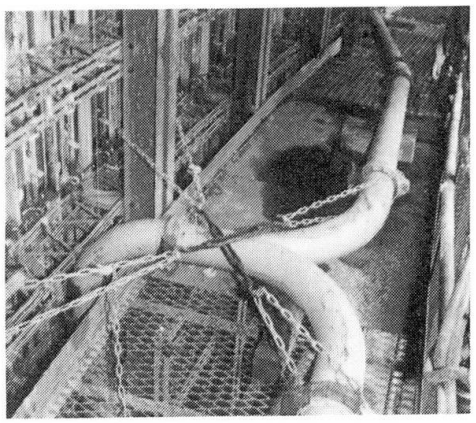

Photo 1 "Wishbone Tree Pipe"

2. CONCRETE PUMPING METHOD

Conventional methods for such construction work employ a single pipe for each pump outlet. The procedure is repeated for each casting lift, where disjointing and rejointing of pipes is required. This previous method suffers several drawbacks: (1) The efficiency of concrete casting is impaired because of the interruption of about 30 minutes required for the disjointing and rejointing of pipes. (2) Safety and working environment in the work area are problematic because during the disjointing and rejointing operation the pipe members and residual concrete are in a state of disarray. (3) Cold joints are likely to form between the subsequent concrete lifts.

The new method employs a fixed positioning of the pipe systems, as illustrated in Fig.1. The pipe system originates at the pump outlet, bifurcates symmetrically at several steps

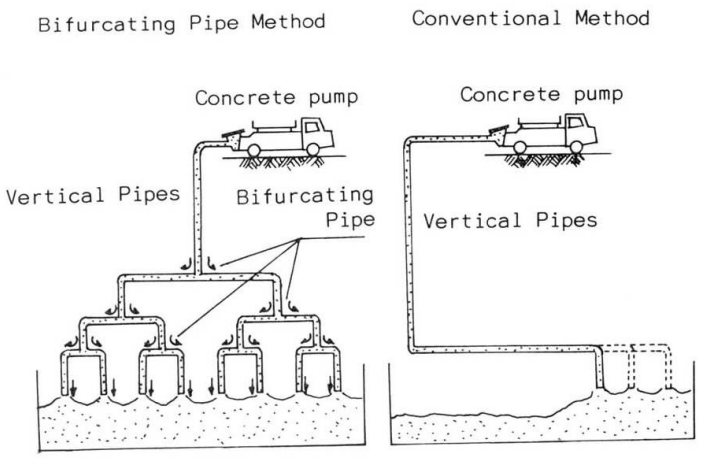

Fig. 1 Concept of concrete pumping

(Photo 1), and ends at multiple outlets, the number of which varies between 2 and 16, depending on the requirements. This method enables casting of monolithic concrete by concurrent and continuous casting operations.

3. EXAMPLE OF AN UNDERGROUND LNG STORAGE TANK

Actual pipe layouts for the casting of the walls and slab of an LNG tank are illustrated in Fig.2 and Photo 2.

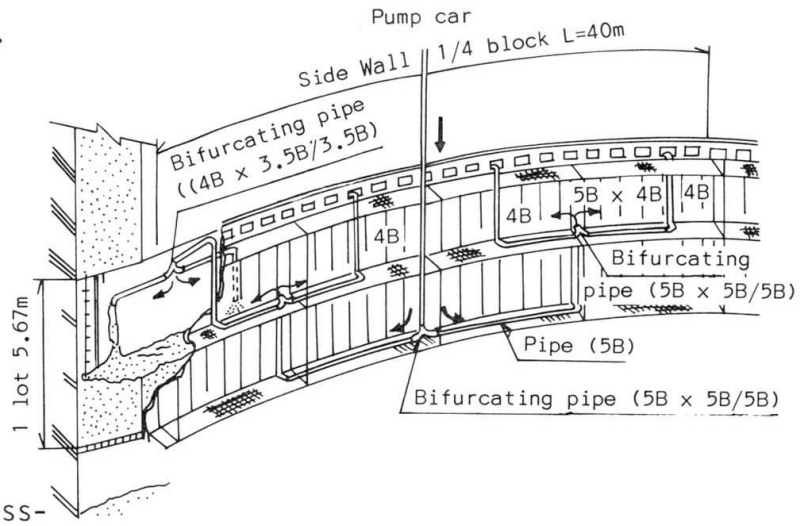

Fig. 2 Layout of pipes of wall

The concrete casting was successful. No pipe clogging occurred despite the adverse conditions of: (1) very lean mix proportion concrete to restrain hydration heat; and (2) downward casting with a maximum vertical descent of 40 m. A total volume of 15,000 cubic meters of base concrete, diameter 55 m and thickness 7 m, was place continuously in 48 hours using only 6 pumps.

4. CONCLUSION

The favorable results experienced can be summarized as follows:

(1) The casting capacity was increased by about 30% to 40%. The enhanced efficiency is attributed to (a) elimination of the operation of disjointing and rejointing pipes, and (b) reduction of the casting and consolidation work load, both of which are a result of the new fixed concrete pipe outlets;

(2) The quality of the concrete was improved by the elimination of cold joints;

(3) Labor safety was improved by (a) reduction of the size of each work area, and elimination of the heavy labor previously required for disjointing and rejointing pipes.

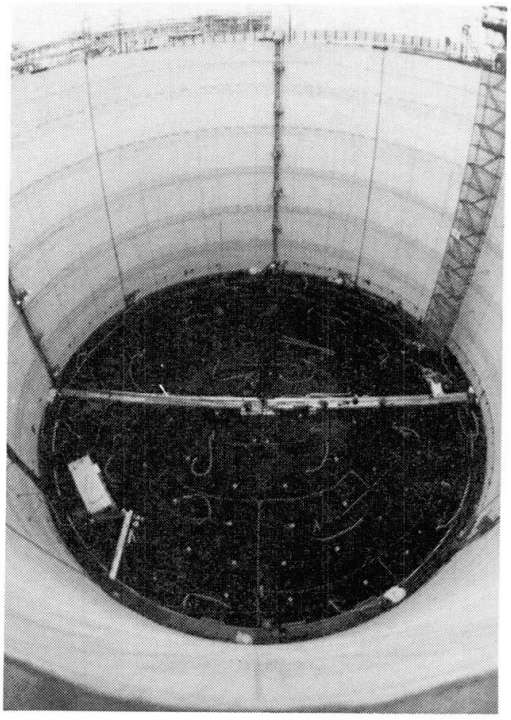

Photo 2 Layout of pipes on bottom slab