To resist the upward pressure of the concrete on the curved form of the downstream side of the spillway, these were securely wired to large stones embedded in the footing concrete.

The last section of the dam completed was about 30 ft. long and, being at a low point in the river bed, had served as an outlet for all the seepage through the cofferdam, unwatering the adjacent sections of dam. To close this, a cofferdam was quickly built across the opening and a box drain, sufficient in size to maintain the water at a level below the top of the cofferdam, was placed with the outlet below the dam. This was afterwards plugged and filled with grout.

Owing to the short period of time expected between the completion of the dam and the break-up of the ice in the river, the forms were left on the recently completed portion so as to protect, in a measure, the concrete from the ice. The stop-logs were left out at the sluiceways until after the break-up, and as these openings discharged the bulk of the flood and ice, the spillway was not submerged, with the exception of the section in the upper part of the rapids.

Placing Forms for Draft Tubes

Power House Construction

The power house is 71 by 66 ft., and provides for the installation of two units, with provisions for extending to enclose the remaining two units required to bring the plant to capacity. The transformer building is 37 by 101 ft. and forms a wing to the main building and both are under the one roof. The sub and superstructure walls, beams, columns, floors, roof and intake piers are of reinforced concrete construction. The intakes, scroll cases and draft tubes formed in the mass concrete of the substructure are heavily reinforced, also all air and cable ducts.

Considerable care was taken in the construction of the scroll cases and draft tubes and the cylindrical tapered forms for these were built very carefully in two sections, the bases of which corresponded to the horizontal plan in the scroll case and the vertical plan in the draft tube. The plan of the piece to be formed was marked out on a working platform on which sets of transverse frames were erected, accurately aligned, and covered with sheeting composed of narrow wooden strips used to facilitate bending and nailing to the required form. Nails were then countersunk and the work dressed to a smooth surface.

The draft tubes sections were swung into position with a derrick, securely fastened together, and the outlet brought to the proper line and level marked out on the downstream wall form. To prevent displacement by the upward pressure of the wet concrete, they were loaded with rock and securely wired to the rock foundation. The concrete was carried up to a point which cleared the bottom of the scroll cases. About this mass a ring of concrete was placed around the top of the draft tubes to support the speed ring, to which, after levelling and bolting, the scroll cases were attached and joined up to the intakes.

The superstructure walls are from 12 to 15 ins. thick, stiffened inside and outside by pilasters placed between the windows. The walls terminate at the roof in a parapet 8 ins. thick, capped with vitrified coping tile. The roof is a 4-in. reinforced slab, with 8 by 10-in. concrete purlins supported on steel trusses. This carries a false roof finished with five-ply tar and gravel roofing of Barret specification.

Quantities and Personnel

The major quantities involved in the construction were the removal of 21,000 cu. yds. of rock and 22,000 cu. yds. of other material in the preparation of the foundations of the dam and power house, also to provide suitable depth in the tail race and forebay. Concrete quantities amount to 23,350 cu. yds., the bulk of which was reinforced, 370,000 lbs. of reinforcing steel being used for this work. Structural steel used for roof supports, racks and stop-log guides amounted to 170,000 lbs.

The design and layout of all the work and the entire construction, were under the direct supervision of F. W. Teele, vice-president and chief engineer of the Southern Canada Power Co., Ltd. The work was performed by Morrow & Beatty, Ltd., engineering-contractors, of Peterborough, Ont.

CEMENT-CONCRETE BASE PROPORTIONS FOR BITUMINOUS PAVEMENTS

By W. L. Hempelmann
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As the economic life of any permanent type of highway improvement is so dependent upon a satisfactory base, this very important matter is engaging the thought of many engineers and highway officials concerned with new improvements for future traffic conditions.

Snap judgment would suggest one of three methods to provide for the future's accepted, increased highway traffic: (1) a richer concrete base; (2) a thicker concrete base; (3) a richer and thicker concrete base. No one would advocate a base likely to fail under traffic such pavement may be called upon to carry. On the other hand, funds must not be wasted in the construction of a base which is too thick and rich.

As a result of extended personal observation and experience, most engineers recognize that rich concrete foundations crack more easily than the leaner mixtures. Foundations under bituminous pavements ten years old and older, of 1:3:6 or leaner concrete, laid without the care of present day practice, in general have been found to be practically free from serious cracks such as so frequently have been revealed in removing the bituminous wearing surfaces from 1:2:4 concrete bases three or four years old. In spite of expansion joints, and with every construction precaution to insure a dense, uniform pavement, concrete pavements of 1:2:4 or richer concrete, over five years old, show a larger number of serious cracks than are to be found in the leaner