CONCRETE CONSTRUCTION AT CEDARS RAPIDS, QUEBEC.

ON December 17th the Canadian Society of Civil Engineers will have under discussion at its general meeting the paper read at a former meeting (October 22nd, 1914) by Mr. John E. Conzelman, chief engineer of the Unit Construction Co., Montreal. This paper had to do with the system of unit concrete construction employed in the erection of the power house and transformer stations of the newly completed hydro-electric plant of the Cedar's Rapids Manufacturing and Power Co. *The Canadian Engineer* has presented, in previous articles, the general details of design and construction of this development, and we abstract herewith some notes on the above method of construction, from Mr. Conzelman's paper, believing it to be one conducive to some very interesting and valuable discussion.

For the essentials of the layout our readers are referred to issues of this journal for January 1st, 1914, and July 9th, 1914. It will be remembered that the superstructure of the power house is built over the dam and that it is of structural steel frame construction with reinforced concrete floors, walls and roof. It was originally intended to construct the walls of brick, but unfavorable transportation facilities, etc., effected a change in the plan, the result being a decision to use concrete throughout.

The power house is about 643 ft. long x 125 ft. wide, with 35 bays 16 ft. 8 in. long and 3 special bays 18 ft. 4 in. long. Fig. 1 shows the typical section. The exterior walls are 12 in. thick, consisting of two independent 4-in. concrete slabs with a 4-in. air space between. The steel columns were provided with slots to receive the slabs (which were lowered down from the tops of the columns) and after two opposite slabs had been set, they were held apart by a piece of one-inch plank which fitted into notches in the slabs. This board also served as a form for the grout which was poured into the space between the column and the slabs. The purpose of this grout is

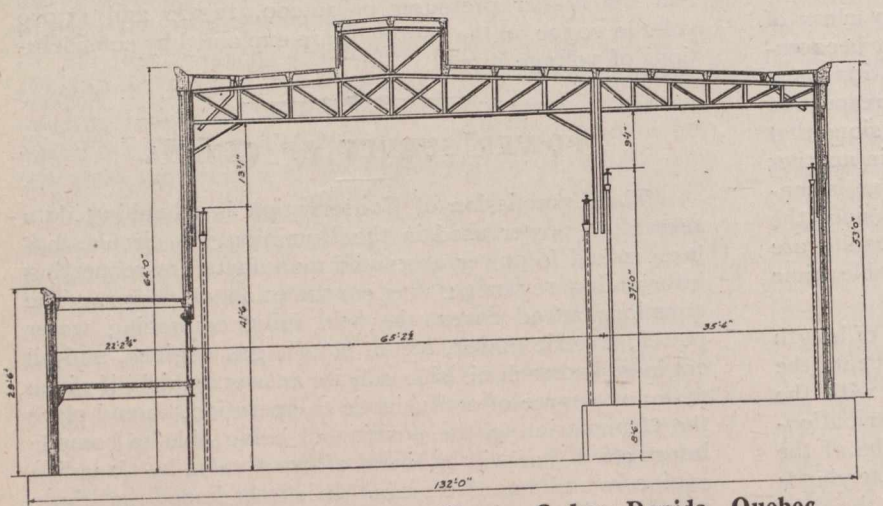

Fig. 1.—Section Through Power House, Cedars Rapids, Quebec.

to hold the slabs in place and also to protect the columns against corrosion. The construction is shown in Fig. 2.

Fig. 1 shows the form of roof construction. The roof units consist of a reinforced concrete plate 3 in. thick cast integral with the beams, which are carried around the four sides. The units are 16 ft. 6½ in. long and 16 in. deep over all. The entire unit acts as a beam between trusses; the reinforcement in the beams acting as the tension flange and the entire slab providing compressive strength. A uniform distribution of load on the trusses is assured by the stiff end beams of the units, and the mortar bed upon which the units are set. The roof units are so dimensioned that a space one and a half inches wide is left between the ends and over the centre line of the trusses. These spaces, as well as the spaces between the slabs themselves, are filled with grout. Reinforcing

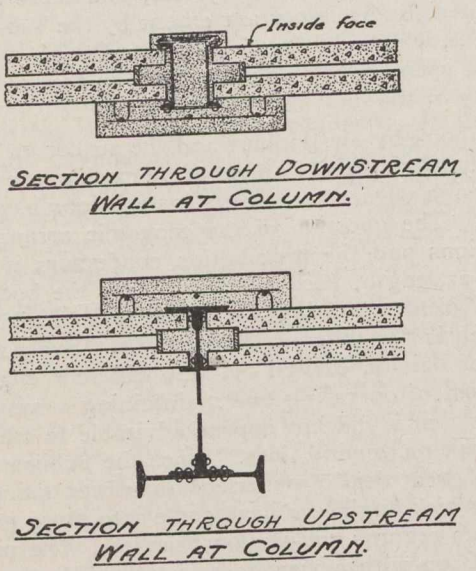

Fig. 2.

bars 3 ft. long are placed in the space between the units and extending over the trusses. These fars form an effective tie after the grout has hardened. Concrete saddles were formed on the roof for the purpose of directing the water to the downspouts. The roof covering is 4-ply Barrett specification material mopped directly to the concrete.

The steel work was erected by the Phœnix Bridge and Iron Works Co., Montreal. The roof trusses are designed to carry a load of 100 lbs. per sq. ft., and the crane girders and main aisle columns are designed to carry two electrically operated travelling cranes of 150 tons capacity. The high columns were spliced at the level of the crane girders. All connections, except the butt joint between the ends of the crane girders, were riveted. One expansion joint was provided.

Erection of structural steel and concrete units was done by means of a structural steel stiff-leg derrick mounted on a triangular steel tower 60 ft. in height with an 80-ft. boom. The weight of the heaviest steel member was about 5¾ tons and of the heaviest concrete unit, 8 tons. Each unit was provided with lifting hooks or bent steel bars for the purpose.

The reinforced concrete transformer house is a 4-story building with basement, and is supported on spread footings with concrete curtain walls. The foundations rest on hard clay about 7 ft. below grade, and each footing carries a load of approximately 4,000 lbs. per sq. ft. Fig. 3 is a typical section. The building is 228 ft. long and 88 ft. wide. It comprises 10 bays 20 ft. long and 4 bays 7 ft. long. A special column spacing was necessary as the transformers are arranged in groups of three. Instead of the typical spacing of 20 ft. and 7 ft., as noted above,