

far the larger portion of the lines record in the notes recommendations as to repairs and renewals at the time the notes are taken. While 85% of the reporting mileage use regular forms for the reports, there is no uniformity in the manner of handling the notes when completed or the final disposition thereof.

General practice is about evenly divided as to giving authority to the inspector to order repairs or replacement in distinction from simply making recommendations as to these matters. The officer most often made responsible for bridge inspection is either the supervisor or the superintendent of bridges and buildings.

#### Conclusions of the Committee

A well organized plan of thorough and periodical bridge inspection should be in effect on all railroads. Inspection should preferably be made semi-annually and in any event not more infrequently than annually.

The inspector should be particularly fitted by training and experience for the work, technical training being requisite for metal bridges and both judgment and experience for wooden structures.

Motor cars afford the best means of conveying the inspection party over the line.

Such tools, either special or standard, as he may consider useful for his purpose should be furnished the inspector.

Special inspection forms for taking and recording notes are essential. Adequate provision should be made for reporting the conditions of bridge members individually or by groups and classes, dependent upon the facts disclosed by the examinations.

Sufficient assistance to insure thorough and comprehensive examination of a structure should be supplied.

Where necessary to determine the extent of deterioration, actual measurements of members should be made.

Recommendations of the inspector as to corrective measures which should be applied to observed conditions are not only desirable, but practically necessary. These recommendations should be recorded in the notes at the time of inspection and upon its completion should be followed up through proper channels for necessary action thereon.

The inspector should be vested with authority to order through proper channels the correction of any imminently unsafe condition discovered.

Prescribed limitations in stress should, if possible, be established, especially for metal bridges.

The general program of inspection can best be formulated by the individual railroad and must needs be developed by a consideration of the operating organization in vogue, methods of effecting repairs and renewals and the number, magnitude and character of bridges maintained.

At least one complete counterpart of all notes, recommendations, records and papers pertaining to the inspection and corrective measures applied as a result thereof should be kept in one file of ready access.

The annual report of the J. G. White Companies, of New York City, shows net profits for the year 1919 amounting to \$479,935, before providing for federal taxes. The assets of the companies now amount to \$6,412,216. The surplus or undivided profits amount to \$820,090, and the liabilities to shareholders in regard to capital stock, \$4,300,000.

The Proprietors' League of Montreal has secured a report from independent engineers on the proposed completion of the Montreal aqueduct. As a result of the report, the league has written to the Administrative Commission calling attention to the fact that there is little assurance that the completion of the aqueduct will not seriously endanger the water supply conduit which in many places borders the aqueduct excavation. Attention is also called to a number of other objections which the league has in regard to the present scheme for completing the aqueduct, and it is stated that no solution is offered to the difficulty of getting sufficient water pressure in certain parts of the city.

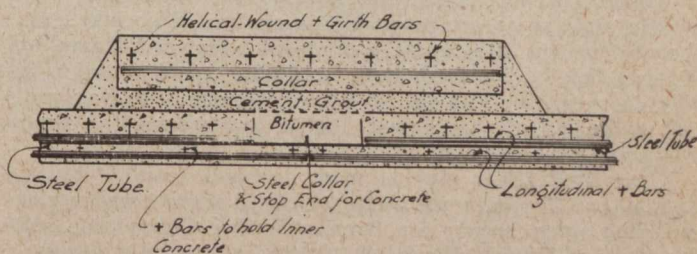
## PLAIN AND REINFORCED CONCRETE PIPE\*

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ONE of the very few reinforced concrete pipes now made which can successfully withstand the higher pressures, and which is consequently becoming increasingly popular in England, is the Bonna pipe, invented by Aimee Bonna, of Paris, and at present controlled by Hughes & Lancaster, of London, Eng. Its chief features consists of a mild steel tube, 1 m.m. thick, built up from sheets of steel. These are rolled to the required diameter in lengths from 9 to 12 ft. The longitudinal joint is butt-welded by oxy-acetylene or electric processes. The ends of the steel tube thus formed are turned up and welded to the adjoining edge of the next tube, thus forming a flexible expansion joint. A collar of the same material is then welded on and this forms a receptacle for the bitumen covering of the joint. The reinforcing steel is wound around a mandril in helical form to the required diameter. A heavy section is passed over the steel tube to resist the internal pressure, and a lighter section inside the tube to hold the inner coating of cement in place.

The pipe is moulded vertically, using steel forms, and remains in this position four or five days, and is used after a month's duration. In laying the pipe the circumferential joints are welded, and bitumen is run over them and a collar of reinforced concrete placed over all, and the space between



BONNA PIPE JOINT AT SWANSEA, ENG.

this and the pipe is run with cement mortar. This joint necessitates jointing holes in the trench. In the case of high pressures the bends should be buttressed by concrete to resist the outward thrust of the water pressure.

This system was employed in Swansea, Eng., 15 years ago. The water main was 1,200 yds. long and 19.7 ins. diameter, and working head 185 ft. On completion it was tested to 382 ft. and proved satisfactory. The longitudinal butt welded joints were also tested, with the following results: Strength of steel in tube, 21.35 tons per sq. in.; strength of butt-welded joint, 21.5 tons per sq. in., the joint being slightly stronger than the sheet steel. Bends and specials are made by hand moulding instead of pouring. There has not been a single burst on this main since completion.

In 1909 Norwich City built 4,500 yds. of 36-in. sewage pumping main. The lowest tenders for delivering, laying, jointing and specials (excluding excavation) were: Bonna pipe, \$3.50 per ft.; steel pipe, \$4.50; cast-iron pipe, \$6.50. The working head was 120 ft., and the city engineer, E. Collins, considers the main is quite safe now at 300 ft. head.

Several other types of joint are used and include a gas-ket-filled lead pipe driven into a corrugated steel ring. I will not go into any further details about this pipe as it is not yet manufactured in this country.

A plain concrete sewer pipe is manufactured at Woodstock by the Independent Pipe Co., Ltd., and is called the McCracken pipe. This pipe is different from most plain concrete pipes in that the outer surface is corrugated, giving it an extra crushing strength. It is cast vertically in a patent machine. A belt-driven vertical shaft revolves a number of packer wings slightly larger in diameter than the

\*Excerpts from paper read April 15th, 1920, before the Toronto branch of the Engineering Institute of Canada.