

The steel was specified to have a tensile strength of from 56,000 to 65,000 per square inch, the elastic limit not to be less than 31,000 lbs. per square inch, plates to double back to close contact by hammering, without showing signs of fracture or cracking, plates to be free from lamination, etc. See Fig. 11 for general details of riveting and joints, etc.

On page 419 is an extract from one of the test sheets:

Taking the joint efficiency of the 3/16-in. pipe at .656 (details of riveting are given in the detailed plans), the factor of safety with a free flow is 4.4 and for 1/4-in. pipe with joint efficiency of .610 the factor of safety is 4.

This is taking the maximum head at the lake over spillway at 512 ft. Static head on the pipe is never likely to occur as the pipe can be controlled by the numerous sluice gates, 24 in number, and no occasion can ever arise when the full static head should be placed on the pipe. Allowance for water hammer was neglected.

From various sections taken from the 14-in. steel main which had been in service 19 years, no deterioration or corrosion was perceptible, owing to the remarkable purity of the water; therefore no allowance was made for this factor. From examination of the soil along the new pipe line and the old pipe line, no soil was discovered which would be detrimental to the pipe. Neglecting these elements the factors of safety are as follows:—

Thickness of pipe.

	1/4 in.	3/16 in.
Tension	3.42	3.38
Shear in rivets	3.58	4.41
Bearing in rivets	3.65	3.81
Joints	4.00	4.4

It must be stated that at the time the pipe was designed, and the tenders were let, the question of raising the lake level by building the dam by the Power Co. was not decided; as the city was legally opposing their action, it was not justified in increasing the thickness of the pipe to meet this uncertainty, and admitting a legal defeat by making provision for the increased head; further, in case it should be considered that these factors of safety were not sufficient, a pressure regulator has been installed just below the dam to prevent increased pressure.

In the writer's opinion the factors of safety as given above are sufficient for this case and the full head can be given the pipe with a free flow without danger.

The pipes were manufactured in the city, a plant being installed for this purpose. After the plates were punched, rolled and the pipes riveted, an inspector who was permanently on the works, made a thorough inspection of every length and any loose or defective rivets were immediately cut out and replaced. The pipes were then caulked by pneumatic caulking tools.

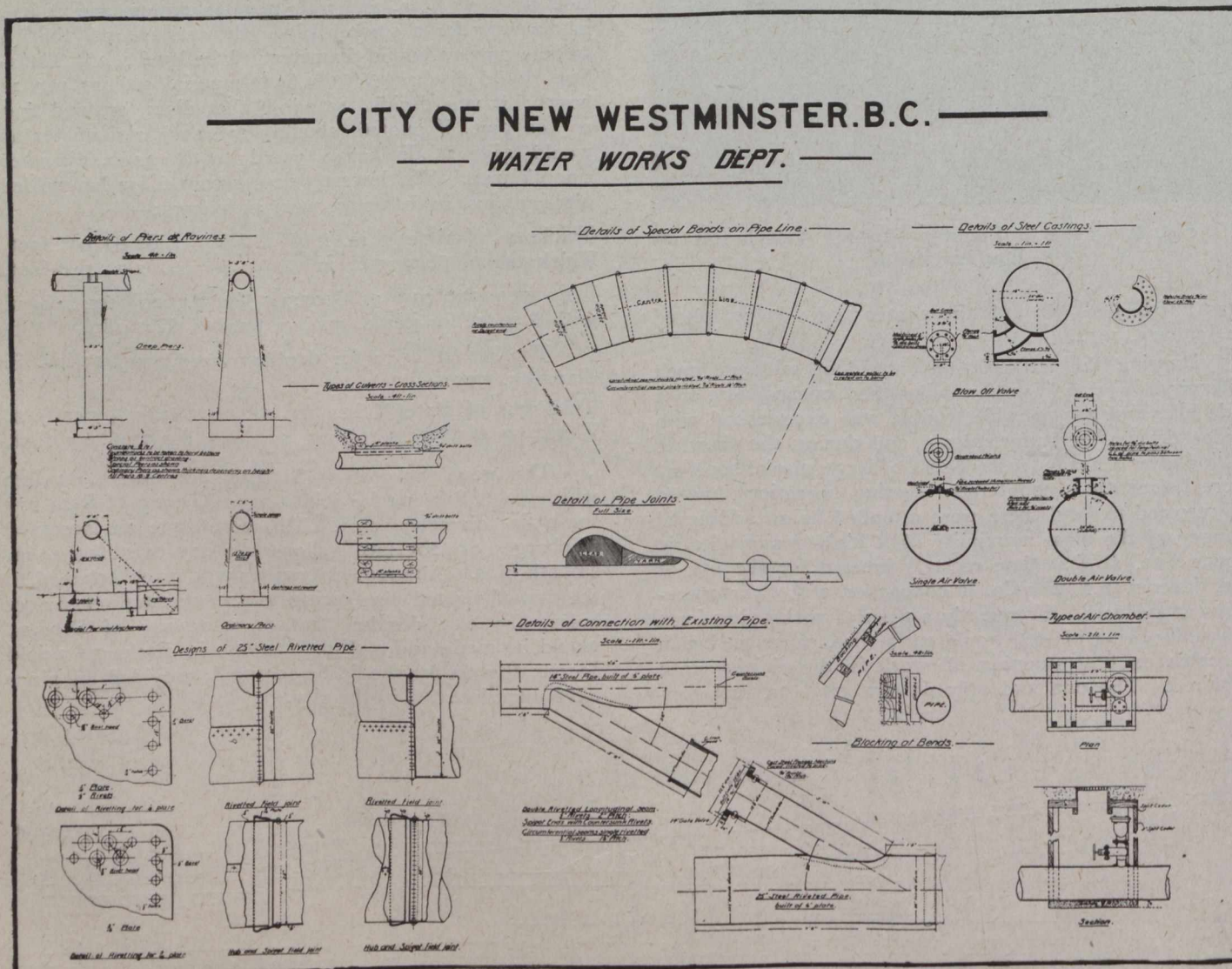


Fig. No. 11.