

which betrays the use of improper or insufficient materials or methods in its manufacture shall be rejected.

#### PIPE LAYING

In laying the pipe each piece must be set exactly to grade by measuring from the invert to a tightly stretched cord set parallel to the grade line of the sewer, according to stakes given by the City Engineer.

In making each joint, care must be taken so as to make the inverts match exactly, giving a true, smooth flow line. The joints shall be tightly packed full and levelled off with a one (1) to two (2) Portland cement and sand mortar. The bell shall then be immediately filled up so as to hold the cement in place. Special care must be taken in forming with the joints on the under side of the pipe. The pipe shall be laid with the socket end up hill.

#### MORTAR

All mortar for brick work shall be composed of one (1) part Portland Cement to three (3) parts sand. All mortar for pipe joints shall be composed of one (1) part Portland Cement to two (2) parts sand. All sand shall be clean, sharp, river sand, free from mica, oil, clay, silt, or organic matter. It shall be thoroughly mixed before being wet.

#### BRICK

The brick shall be hard, well burned, equal to a No. 2 paving brick. All soft brick will be rejected.

be greater than the average tensile strength in seven (7) days.

The City Engineer shall have the authority to require any lot of cement to be held in storage until seven (7) days test can be completed where the cement is of a brand not previously tested by him or where previous samples of the same brand tested by him have fallen below the requirements herein set forth. The City Engineer shall have the authority to require the reconstruction of the work in which cement has been used which subsequent test show to be not in conformity with requirements.

Cement shall be received on the job in sacks filled at the cement factory, each containing not less than ninety-four (94) pounds net weight of cement.

#### SAND AND GRAVEL

The sand shall be clean, sharp river sand, hard and durable, free from mica, oil, or organic matter. The gravel shall be hard and durable, the largest piece of which shall be, in its largest dimensions not greater than two (2) inches.

#### CONCRETE

The concrete for the floors of manholes and flue tanks shall be composed of one (1) part Portland Cement and two (2) parts sand and four (4) parts screened gravel.

#### MANHOLES

Manholes shall be constructed in accordance with, and at the locations shown on the plans. Manholes shall have a concrete founda-

#### CEMENT

All cement used shall be Portland Cement and must conform to the following requirements and be subject to the following test, which will be open at all times to the contractor.

(a) FINENESS. The residue on a 200 mesh screen shall not exceed twenty-two (22) per cent by weight.

(b) SOUNDNESS. A pat of cement paste about three (3) inches in diameter and one-half (1/2) inch in thickness at the center, tapering to a thin edge, stored in moist air for twenty-four (24) hours and then kept in an atmosphere of steam of ninety-eight (98) to one hundred (100) degrees centigrade for five (5) hours, shall show no signs of distortion, cracking, checking or disintegration.

(c) TIME OF SETTING. The cement shall not develop initial set in less than forty-five (45) minutes when tested with a Vicat needle, nor in less than sixty (60) minutes when tested with a Gilmore needle. Final set shall be attained within ten (10) hours.

(d) TENSILE STRENGTH. The average tensile strength in pounds per square inch of not less than three (3) mortar briquettes, composed of one (1) part by weight of cement and three (3) parts by weight of sand, shall not be less than the following:

Age at Test	Storage of Briquettes	Pounds Per Sq. In.
7 Days	1 day in moist air, 6 days in water	300
28 Days	1 day in moist air, 27 days in water	300

The average tensile strength in twenty-eight (28) days shall

ation covering the entire area of the base, said foundation being of the dimensions shown on the detail plan. The base shall be circular in form and shall have an internal diameter of four (4) feet in the clear. This size shall be carried to a point three and one-half (3 1/2) feet below the top of the manhole, and the walls shall then be gradually and uniformly drawn into a circle, six (6) inches below the top of the manhole and having a clear internal diameter of two (2) feet. The walls shall be of brick, eight (8) inches thick and every fourth course shall be laid as headers. The brick shall be thoroughly saturated with water before laying and shall be laid with push joints in full bed or mortar. All joints shall be left full of mortar and inside joints shall be neatly struck. The inside of the walls and the floor of the manholes shall be plastered with a one-half (1/2) inch coat of cement mortar composed of one (1) part Portland Cement and two (2) parts screened sand.

Manholes shall be capped with cast iron frames and covers of patterns shown on the plans and weighing not less than three hundred and fifty (350) pounds and set in concrete, as shown on the plan.

The casting shall be sound, free from cracks or flaws, and thoroughly cleaned. Ladder rungs of three-quarter (3/4) inch round iron shall be securely bedded in the sidewalls of manhole fifteen (15) inches apart vertically as indicated on the plans, and shall be painted with asphaltum paint.

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