

SPECIFICATION FOR SEWER IN WATERMAN AVENUE BETWEEN  
 RIALTO AVENUE AND A POINT 1455 FEET SOUTH OF  
 THE SOUTH LINE OF RIALTO AVENUE, IN THE  
 CITY OF SAN BERNARDINO, CALIFORNIA.

Approximate estimate of work to be done.

To furnish all labor and materials necessary for and to construct a vitrified pipe sewer together with manholes, connecting sewers and wyes as shown on the plans.

Lineal feet of 8" vitrified pipe sewer including 6"x4" wyes 1296.23  
 Lineal feet of 4" vitrified pipe connecting sewer 101.00  
 Number of 8" x 4" wyes and 4" connecting sewer 23  
 Number of manholes 2

#### PLAN AND PROFILE

The work herein provided for shall be done in accordance with these specifications, plans and profiles on file in the office of the City Engineer of the City of San Bernardino.

#### EXCAVATION

The subgrade for pipe sewers shall be the exterior bottom of the pipe and the excavation shall be made a sufficient distance between the depth indicated by the grade line on the profile and shown on the grade stakes set by the City Engineer as shown on the plans, to allow for the placing of the sewer invert.

The width of the trench shall be at least twelve (12) inches more than the exterior diameter of the pipes.

The materials taken from the trench shall be deposited neatly at the sides in such manner as to obstruct the sides as little as possible, and a clear space of at least two (2) feet next the trench shall be left on the side on which the Engineer places stakes. Great care shall be taken to preserve and not to cover up the stakes set by the Engineer.

#### REFILLING

After a section of the pipe sewer has been laid and the mortar used in the joints has sufficiently set, earth free from stones shall be carefully placed by hand, under and around the pipe, and to the height of one foot above the top of the sewer.

The remainder of the refilling shall be carefully done.

Scrapers may be used if desired. The refilling shall be thoroughly flooded according to the directions of the City Engineer.

Surplus material not required in refilling the trenches shall be promptly removed by the contractor as the refilling progresses and disposed of by him, and in case of deficiency of material, it shall be supplied by the contractor.

All paving removed by the contractor shall be replaced at the expense of the contractor and the surface shall be left in as good a condition as it was originally. The ditch must not be filled until after the wyes are measured.

When existing sewer, water or gas mains are encountered in the work, all necessary precautions shall be taken to prevent injury to them and in case of injury, it shall be made good by the contractor without additional compensation.

#### SEWER PIPE

All sewer pipe shall be of the first quality, vitrified clay sewer pipe, of the hub and spigot pattern, of standard thickness and dimensions of hubs.

The dimensions of the hubs shall be sufficient to leave an annular space for cement of at least three-eighths (3/8) inch

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 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.

#### 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

All soft and spongy material shall be removed to a depth of one (1) foot below grade and shall be replaced with clean sand or gravel which shall then be moistened and tamped until it is solid. Passerway six (6) feet wide shall be kept open on lines of intersecting sidewalks and free access must be left to all fire hydrants and water gates.

#### SHAFTING

Whenever necessary to prevent caving of the banks or injury to adjacent pipes, the contractor shall, at his own expense brace and sheath the trenches sufficiently to overcome the difficulty to the satisfaction of the City Engineer. If such bracing and sheathing is left permanently in the trench by order of the City Engineer, it shall on refilling, be cut off one foot below the finished grade of the street and shall be paid for by the City but otherwise the contractor will receive no extra compensation for it.

#### WATER IN TRENCHES

In general all water encountered in trenches must be drained away through sub-drains or pumped or bailed out, and the trenches must be kept dry for pipe laying. In no case shall the sewer be used as a drain for such water. The ends of the sewer pipe must be kept properly blocked during the time that the sewer pipe is not being laid. All necessary precautions shall be taken to prevent entrance of mud, sand or other obstruction materials into the sewer and on completion of the work, any such materials which may have entered must be cleaned out and the sewer left clean and unobstructed.

thickness for four (4), six (6), eight (8) and ten (10) inch pipe, and one-half (1/2) inch thickness for larger diameters.

All pipes and specials shall be sound and well burned, with a clear ring, and smooth on the inside and free from blisters, lumps or flakes which are thicker than one-eighth (1/8) the normal thickness of the pipe and whose largest diameters are greater than one-eighth of the inner diameter of said pipe, and all pipe having broken blisters, lumps or flakes of any size shall be rejected unless the pipe can be so laid as to bring all of these defects on the top of the sewer.

Pipes having fire-cracks of any kind extending through the thickness shall be rejected. No pipe shall be used, which, designed to be straight, varies from a straight line more than one-eighth (1/8) inch per foot of length, nor shall there be any variations between any two diameters of a pipe greater than one-twenty-fourth (1/24) of the normal diameter.

No pipe shall be used which has a piece broken from the spigot and deeper than one inch or longer at any point than one-fourth (1/4) the diameter of the pipe, nor which has a piece broken from the bell and if the fracture extends into the body of the pipe, or if such fracture cannot be pierced at the top of the sewer. Any pipe 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

diameter and one-half (1/2) inch in thickness at the center, tapering to at 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	200
28 days	1 day in moist air, 27 days in water	300

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

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