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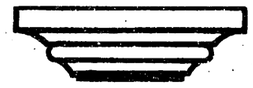
STANDARD PLANS AND SPECIFICATIONS OF THE CITY of SEATTLE



Approved by the Board of Public Works June 27, 1913

Reapproved by the Board of Public Works Oct. 10, 1913

A. H. DIMOCK

CITY ENGINEER

SEATTLE - - WASHINGTON

STANDARD PLANS AND SPECIFICATIONS

The general plans for any improvement, showing the location and the method of construction of the several parts thereof, together with the standard specifications and standard plans, the proposal blank and such special specifications as may be attached thereto, shall form the complete plans and specifications for any particular improvement, and shall be considered as a whole. The special specifications and detailed plans accompanying the proposal are intended to modify, and shall take precedence over the standard specifications and standard plans. All work shall be done in conformity with the plans and specifications or as may be directed by the City Engineer from time to time. During the progress of the work, the City Engineer may furnish additional plans and may make such alterations of the original plans as he may deem necessary, and the contractor shall, upon receiving notice of such additional plans or alterations, obtain a copy of the same and cause the work to be prosecuted in conformity therewith.

SUPERINTENDENCE

All improvements shall be made under the superintendence of the City Engineer, and any orders or directions given by him shall be respected and immediately and strictly obeyed by the contractor or any overseer or foreman in charge of the work. It is hereby understood that wherever the term "Engineer" or "City Engineer" is mentioned in these specifications, it shall mean himself or any representative duly appointed by him.

PAYMENT.

Payment for all work specified herein will be made at the respective rates bid for the items listed on the proposal, and such payment shall be in full compensation for all labor and material necessary or incidental to the completed work.

MATERIALS OF CONSTRUCTION

Wherever the following materials are mentioned in these specifications the requirements here set forth shall apply unless otherwise especially specified.

SAND

Sand shall be coarse, sharp and thoroughly washed until free from loam, clay, vegetable or earthy matter. The particles to range uniformly from fine to coarse and the sand will be rejected if more than five (5) per cent fails to pass a ¼" mesh, and if more than thirty-three (33) per cent passes a No. 30 sieve. Sand used for paving cushion shall pass a No. 20 sieve and be retained on a No. 100. Sand used for mortar shall all pass a No. 10 sieve and not more than eight (8%) per cent. shall pass a No. 50 sieve.

GRAVEL

Gravel must be washed until free from all foreign matter except sand, and shall range uniformly in size from ¼ inch to 1½ inch in diameter for concrete backing against granite curbs, reinforced concrete walls, stairways, gutters, sewer support in quicksand, foundation or walls for manholes, flush tanks, catch basins and gate chambers, and any other construction not otherwise particularly mentioned, and from ¼

inch to 2½ inches for gravity type retaining walls and base for pavements. For concrete curbing and concrete posts the sizes shall range uniformly between ¼ inch and 1 inch.

Gravel which shows an excess of either fine or coarse sizes will be rejected.

CEMENT

The cement shall be a true Portland cement, dry and free from lumps or foreign material, and of a brand whose usage has proven it to possess the proper qualifications and uniformity for the work intended. It must be delivered on the work in original packages in good condition, properly labeled and showing where made.

It must be protected from rain and dampness and delivered on the work in advance in such quantity as to afford the Engineer ample time and opportunity to conduct tests.

A bag of cement shall contain ninety-four (94) pounds of cement net, a barrel consisting of four (4) bags will be considered as measuring three and one-half (3½) cubic feet.

Fineness.—Passing No. 200 sieve, not less than 85 per cent.

Set.—Initial set in not less than one (1) hour. Hard set in not less than two (2) hours or more than ten (10) hours.

Briquettes made of one (1) part of cement and three (3) parts of Standard Ottawa Sand by weight, after one (1) day in moist air and seven (7) days in clear water shall show a tensile strength of not less than 200 pounds per square inch and after one (1) day in moist air and twenty-seven (27) days immersion, not less than 300 pounds per square inch.

Pats about three (3″) inches by four (4″) inches across by one-half (½″) inch thick in the center and tapering to a thin edge should be made upon a clean glass plate about four (4″) inches square, from cement paste of normal consistency. This pat is exposed in any convenient way in an atmosphere of steam, above boiling water in a loosely closed vessel for five (5) hours and at the end of that time should remain firm and hard and show no signs of cracking, distortion or disintegration.

In addition to the tests above specified, all cement will be subject to such other tests as may be necessary to determine whether or not the cement possesses the proper qualities for the particular work for which it is intended. Should there be discovered, at any time, any characteristics in any cement being used, that are objectionable in this work, or should any cement fail to make good concrete or mortar, its further use will be prohibited, regardless of the fact that it has satisfactorily withstood the tests hereinbefore specified.

CONCRETE

Unless otherwise specified, concrete shall be composed of one (1) part of cement, three (3) parts of sand and six (6) parts of gravel.

Concrete shall be mixed by a batch mixer of a type approved by the City Engineer and which admits of the accurate measuring of materials; the amount of water and the number of revolutions of the mixer as well as the speed thereof shall be as directed by the City Engineer. In lieu of machinery the concrete may be mixed by hand as follows: Contractor must provide a tight plateform containing 324 square feet, built of evenly laid plank, upon this a correct proportion of gravel shall be spread evenly, and in no case more than eight (8) inches deep. All materials for concrete must be measured accurately in properly sized boxes. Measuring with shovels or other approximation will not be allowed. In a separate box the correct proportion of sand and cement is to be mixed dry until the whole mass is one, even color. The gravel shall

then be wetted, the mixture of dry sand and cement then being evenly spread over it. The mass shall be turned with shovels not less than three (3) times, and more if it is necessary, in the judgment of the City Engineer, to secure a perfect mixture of mortar and gravel. In addition to the thorough wetting of the stones, if, in the judgment of the City Engineer it will be necessary, sufficient water shall be added to the mass to enable the material to become thoroughly incorporated, and the process of mixing to be continued until the surface of each stone is well covered with mortar. Concrete must be placed immediately after mixing. Wherever concrete is mixed by hand, the cement sacks must not be emptied upon the sand until the City Engineer has had the opportunity to check the count and give his approval. Concrete shall not be hauled in carts a greater distance than three hundred (300) feet before depositing same.

REINFORCING STEEL

Steel for concrete reinforcement bars must be of a deformed type approved by the City Engineer, rolled from billets made by the open hearth process.

The ultimate tensile strength shall not be less than 70,000 pounds per square inch and a yield point of not less than 33,000 pounds per square inch. The minimum percentage of elongation in eight (8) inches shall be 1,250,000÷tensile strength per square inch. The bending test will be performed upon cold specimens and must not show fractures for bars less than ¾ of an inch in thickness, when bent through 180° around a diameter equal to the thickness, and for bars ¾ of an inch and larger when bent through 180° around a diameter equal to twice the thickness.

CASTINGS

All iron castings, except watermains and watermain specials must be made from a superior quality of gray iron, tough and of even grain, remelted in the cupola or air furnace. The tensile strength shall not be less than 18,000 pounds per square inch. Test bars of the metal are to be made when required, having a cross section of three (3) inches by one-half (½) inch. The test for transverse breaking will be performed upon a bar laid flat, upon supports eighteen (18) inches apart. Loaded at the center, the breaking load shall not be less than 1,000 pounds with a total deflection of not less than three-tenths (3-10) of an inch before breaking.

All castings are to conform to the shape and dimensions shown upon detail drawings furnished by the City Engineer. They will be rejected if not free from sand or blow holes or defects of any kind, and also if more than five (5) per cent short of the calculated weights indicated upon the plans.

No plugging of defects will be permitted.

Castings must be wire-brushed until clean and dipped into a bath of hot asphaltum for at least twenty (20) minutes. When permitted by the City Engineer, castings may be painted with three (3) coats of Smith's Durable Metal Coating or some other approved composition.

BRICK AND BRICK BLOCKS

Class "A,"—Brick for pavements, gutters and sewer inverts shall have the following dimensions from which a variation of not more than five (5) per cent will be permitted:

Length, 8½ inches.
Height, 4 inches.
Width, 2⅜ inches.
Exposed edges to be rounded to a radius of ¼ inch.

Special shapes and dimensions to be furnished where shown upon the plan. Dimensions of blocks are as shown in the details herein.

Four (4) lugs, each projecting ⅛ of an inch, shall appear upon one vertical face of each brick, except where intended for other use than in pavements.

Brick shall be straight, thoroughly annealed, free from checks and fire cracks, and when broken, the fracture shall be smooth and straight. The texture of the fracture must show uniform vitrification throughout and not be granular or show any marked lamination.

The maximum permissible absorption for this class shall be three (3) per cent after 72 hours immersion, the test in water to be performed upon thoroughly dried, cold, broken specimens.

Bricks will be rejected which contain lime or other soluble substances in such amounts as to cause spalling or pitting of the surface after three (3) days immersion in water followed by three (3) days exposure to the air.

Crushing Strength for 2-inch cubes made from a sample brick to be not less than 12,000 pounds per square inch.

Specific Gravity not less than 2¼.

The rattler test will be performed in a cast iron drum 24 inches in diameter, upon whole bricks either singly or in lots and the losses shall not exceed the following:

15% after 600 revolutions at 30 per minute.
25% after 2000 revolutions at 30 per minute.
35% after 4000 revolutions at 30 per minute.

The City Engineer may apply such other tests as he may deem necessary to fully determine the merits of the offered material, and the failure of any shipment or pile or bricks or blocks to satisfactorily withstand any of these tests shall justify the rejection and removal of the entire lot.

Class "B."—Brick in this class shall conform generally with the requirements for Class "A", except that the tests stated for abrasion by rattler do not apply and the maximum permissible absorption for 24 hours immersion in water shall be six (6) per cent., this test to be conducted as for Class "A".

Class "C."—This class includes "Cull Pavers" when not unduly warped, and brick made from clay, if sound, hard and evenly burned, free from large lumps or pebbles over ⅜ of an inch in diameter. Badly warped or fire checked and clinkered brick will be rejected.

The maximum permissible absorption after 24 hours immersion in water is ten (10) per cent., this test to be conducted as for Class "A."

LUMBER

All lumber used in this improvement must be sound, live, yellow fir, free from loose, large or rotten knots, wind-shakes, pitch seams or other imperfections which may impair its strength or durability. The City Engineer shall be the sole judge of the amount of sap which may be allowed. All dressed lumber shall not exceed or vary more than one-fourth (¼) of an inch less than the specified dimension, and all rough lumber not vary more than one-eighth (⅛) of an inch from the specified dimension. All lumber shall meet the requirements as specified in this paragraph unless more particularly specified elsewhere.

EXPANSION JOINTS

Wherever in the Standard Plans and Specifications provisions are made for expansion joints, a bituminous material

which shall be acceptable to the City Engineer shall be used. It must be a thoroughly waterproof bituminous substance having the following characteristics:

(1) It shall adhere firmly and tenaciously to concrete, granite, etc., when applied to the air dry surfaces at a temperature of 300° F.
(2) It shall be elastic and pliable at all temperatures between 0° F. and 150° F.
(3) Its melting point must be at 150° F. or higher.
(4) It must not be sticky at 120° F.
(5) It must not be brittle at or above 0° F.
(6) It must not be affected by water or by alternate exposure to air and water.
(7) It must not contain any water.
(8) It must be of such a composition as to withstand heating to 400° F. without injury.
(9) Standard methods of analysis, as employed in the City Engineer's Testing Laboratory, shall be used in determining the acceptability of materials offered.
(10) Its flow point must be 130° F. or higher.

GRADING

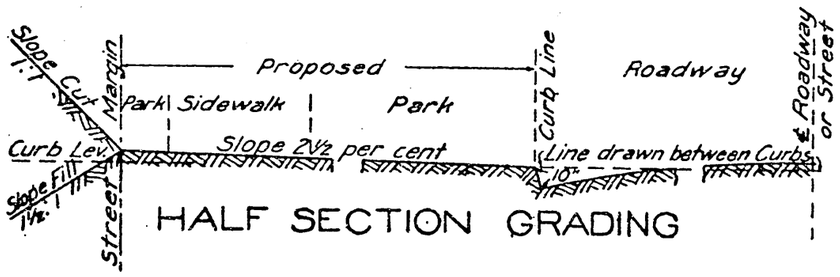
CLEARING AND GRUBBING

The district to be cleared and grubbed will include: 1st: The area covered by the improvement under contract; 2nd: The area of any approaches to be made to the improvement; and 3rd: All areas where waste material is to be deposited. All roots, stumps, trees, logs, brush, old sidewalks, planking, sills, cross-walks, curbs, gutters, box drains, bulkheads and any other lumber; all material subject to shrinkage or decay; and any other debris encountered on any portion of the work, shall be piled and burned or otherwise disposed of as the City Engineer may direct; provided, that no debris of any kind whatever shall be deposited in any waters surrounding the City, or in any street or alley, or upon any private property except by written consent of the owner of the same. All boulders encountered during the progress of the work shall be removed and disposed of to the satisfaction of the City Engineer.

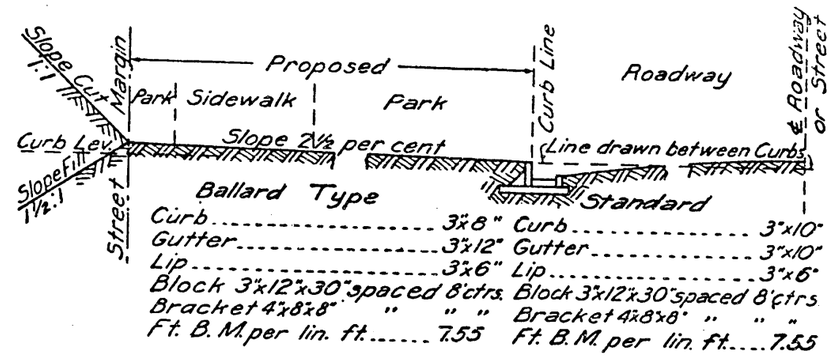
Where wood sidewalks have been constructed by order of the Board of Public Works within one (1) year prior to the date of the resolution declaring the intention of the City Council to order the improvement under contract, such walks shall be carefully taken up and neatly piled by the contractor, and the lumber therein shall become the property of the owner of the abutting property.

Any wood cross-walks, curbs, gutters and other lumber which may be of use for planking streets, shall be removed in such manner as to sustain as little damage as possible, and carefully piled and guarded until used. Any old lumber not used in connection with the improvement under contract, and which in the judgment of the Superintendent of Streets shall be deemed to be of use to the Street Department of The City of Seattle, shall be set aside by the contractor in suitable piles and removed by said Department.

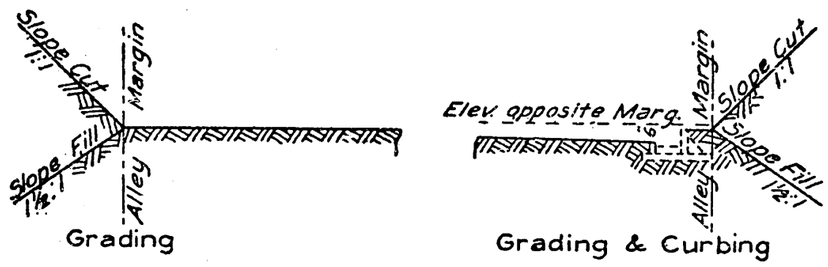
In removing any bulkheads or retaining walls, special care shall be taken to sustain any existing sidewalks or other structures. Where necessary to adjust any existing improvement, such as wood or concrete sidewalks, planking or paving, to the new improvement, such work shall be taken up as directed by the City Engineer and relaid. In such cases, however, the cost of taking up such existing improvement shall be included in the prices bid for relaying or replacing the same.



HALF SECTION GRADING



HALF SECTION GRADING & CURBING



HALF SECTION OF ALLEY

Width of Roadways in feet	18	25	36	44	58	68
Center Height in feet above line joining opposite curbs	0.1	0.25	0.4	0.6	0.7	0.9

CROWN OF ROADWAY

The work of clearing and grubbing shall be commenced only at such place or places as the City Engineer may direct, and shall be extended only over such area at one time as the City Engineer may designate.

The contractor shall not burn old lumber in the street which contains spikes and nails.

On grading contracts, the district to be cleared and grubbed shall include also the area covered by all slopes, whether in excavation or embankment, extending beyond the margins of the streets. All stumps that stand on the line of the street or on the line of the slope of any excavation or embankment, shall be entirely removed. All fences adjoining any excavation or embankment, which will be liable to fall or be buried, shall be carefully removed and placed upon the adjoining property. After the excavation or embankment has been completed, these fences shall be re-built by the contractor, upon the property lines.

On paving contracts, any lumber or other debris which may be found within one (1) foot of the sub-grade or of the present surface of the street where such surface is below sub-grade, shall be removed and burned or otherwise disposed of.

EARTHWORK

Under this head is included all excavations and embankments required for the formation of the sub-grade, making approaches to abutting streets and alleys, and all other excavation or embankment connected with or incident to the completion of the work. The preparation, surfacing and seeding of all slopes and parks is included as grading.

Excavation.—All material shall be removed from the excavations by some method to be approved by the City Engineer, and shall be deposited in the embankments. In case any material shall slide into the excavations during the progress of the work, the same must be removed at the contract price. No extra payment will be allowed therefor. All side slopes shall be made at the inclination shown on the plans or as may be directed by the City Engineer. They shall be dressed to straight lines and plane surfaces, except where otherwise directed. All material from excavations in excess of the amount required to complete the embankments within the local improvement district under contract, shall be deposited in adjoining streets and alleys or upon other public property, as may be directed by the City Engineer. The remaining waste material shall be deposited upon such private property as may be assessed for the cost of the improvement under contract, the owners of which have filed with the City Engineer an application for such waste material. All such applications made prior to the opening of bids, have been attached to the plans for the improvement. In addition to the applications made prior to the opening of bids, the contractor will be required to comply with all requests made subsequently, provided the earth has not been already removed from the excavation. The contractor must not remove any material from the district until he has ascertained that no more material is required by the property owners within the local improvement district. In all cases where material is wasted, whether on public or private property, the contractor shall not be required to haul material a greater distance than 600 feet.

The contractor shall not deposit earth on private property without the written consent of the owner thereof. Should he do so, he shall remove the same immediately upon the order of the City Engineer without reimbursement therefor.

All solid or loose rock or boulders encountered in the progress of the work, shall be removed and disposed of by the contractor to the satisfaction of the City Engineer.

All material remaining after the requirements set forth herein have been met, shall be disposed of by the contractor.

Embankment.—The contractor shall furnish all material required for embankments not found on the improvement. All borrow pits shall be cleared and grubbed in such manner as to prevent any material specified under "Clearing and Grubbing" from being deposited in the embankment. No payment will be made for the clearing and grubbing of borrow pits, nor for any loose or solid rock found therein. The clearing and grubbing shall be kept at least 200 feet in advance of the embankments, and no embankment shall be commenced until the clearing and grubbing has been inspected and approved by the City Engineer. All embankments shall be made of such width and with such side slopes as may be shown on the plans or as may, in the judgment of the City Engineer, be required to maintain solid and permanent sidewalks and roadways. The contractor must use

his own judgment as to the amount of shrinkage or settlement of the underlying ground to be provided for. Where required by the City Engineer, the slopes of all embankments shall be dressed as specified above for excavations.

Whenever, in the judgment of the City Engineer, the original ground under any embankment is too soft or otherwise unsuitable to remain in the street, the contractor shall excavate the same to such a depth as may be directed, and dispose of such material outside of the limits of any public streets or alleys. All material so removed will be classified and paid for as "Earthwork."

Grading for Concrete Sidewalks.—All excavation for concrete sidewalks shall be made in accordance with the foregoing specifications. All fills under such walks shall be made of suitable material, spread in layers not exceeding one foot in thickness. Each layer shall be thoroughly flushed with water and tamped and rolled until a hard, unyielding surface is obtained.

Where no bid is taken for earthwork the price bid for concrete walks will include the preparation of the sub-grade, the necessary resurfacing of parks and roadway as specified under "Surfacing" in the Standard Specifications.

In all cases, whether a bid is taken for earthwork or not, no allowance will be made for the 4-inch sub-grade, whether in excavation or embankment.

Sub-Grading for Paving.—After the surface of the street has been cleared and grubbed as specified herein, any lumber, drains, dead pipes or other material not suitable for the foundation and which may be found more than one foot below the sub-grade of the street, shall be removed by the contractor by trenching or otherwise, as may be directed by the City Engineer.

The City Engineer shall be the sole judge as to what shall constitute unsuitable or improper materials to remain in the sub-foundation, and in order to ascertain the presence of unsuitable materials he may cause to be dug, holes or trenches of such dimensions and lengths and in such directions and to such depths as he may deem necessary. If sinking spots develop, the City Engineer may require the same to be excavated to such depth as may be necessary to investigate and determine the cause of such sinking and the necessary remedy therefor, and such remedy they may require to be used. Such excavations, unless otherwise ordered, shall be refilled with suitable earth or material, the same to be done in layers and thoroughly tamped or water settled. The amount of earth so removed shall be paid for at the rate bid for sub-grading. No other payments whatsoever will be made on the above work.

After the ground has been cleared as specified above, it shall be excavated or filled, as may be required. All embankments shall be made of suitable material, spread in layers not exceeding one foot in thickness. The contractor shall furnish all material for embankment not found within the district covered by this contract. Embankment slopes shall be dressed to a uniform line and shall have such inclinations as the City Engineer may direct. The ground shall be water settled where directed, and when in suitable condition, each layer shall be thoroughly rolled and compacted by the use of a steam roller weighing not less than ten tons. The rolling shall continue until all settlement ceases. As it proceeds, all spots or sections settling below sub-grade, shall be brought up by filling in of suitable material. This material shall then be water settled and re-rolled. This process shall be continued until a hard and uniform surface has been obtained, conforming to the grade and cross-section required.

Any portion of the surface of the sub-grade which may be

inaccessible with the steam roller shall be thoroughly tamped, to the satisfaction of the City Engineer, with a rammer ten (10) inches in diameter, weighing not less than forty (40) pounds. When rolling, as herein specified, is done with the steam roller belonging to the City of Seattle, the contractor will be required to pay for its use on this work at the following rates to-wit: One dollar and fifty cents ($1.50) per hour for each and every hour the roller is in use, and in no case will less than four (4) hours in succession be charged at one time to the contractor for its use. The engineer's salary will be paid by the city, the cost of the fuel will be paid by the Local Improvement District. The engineer in charge of said steam roller will be at all times under the direction of the City Engineer. The number of hours the roller has been in use will be charged to the contractor, as returned by the City Engineer.

Sub-Grading for Planking.—Under this head is included all the excavation or embankment necessary to bring the portion of the roadway required to be planked to the necessary subgrade, also such excavation or embankment as may be necessary for approaches or to make the proper grade upon which to construct any sidewalks included in the contract. The contractor will be required to find his own borrow pits for all earth required to be furnished in excess of the excavation within reasonable limits of the improvement. No objectionable earth will be permitted.

Payment for "Sub-Grading for Planking" will be included in the price bid for "Lumber".

Surfacing.—All earth roadways shall be dressed to a smooth and uniform surface, curving uniformly from gutter to gutter. All rock or stones greater than two inches in diameter shall be removed from the street. Whenever the material found in cuttings is unsuitable to form a good roadbed, or where deemed necessary by the City Engineer, the same shall be excavated to such a depth as the City Engineer may direct, and the same shall be refilled with such material as the City Engineer may designate, to a true grade and surface, and all material removed from such excavations shall be classified and paid for as that in other cuttings, for this improvement. All parking strips shall be filled and carefully raked to a smooth and even surface.

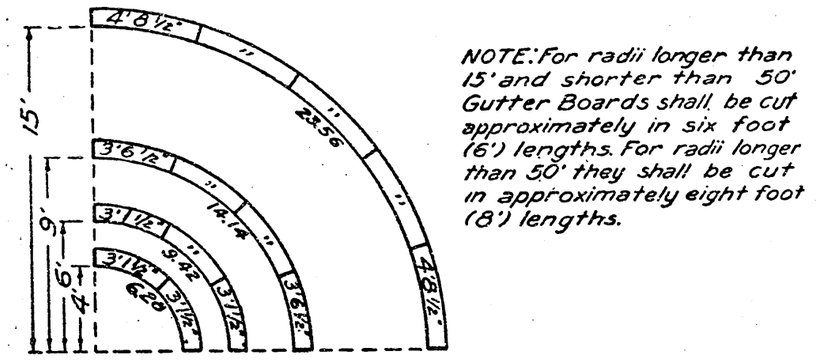
Resurfacing Streets.—Where curbs and gutters or sidewalks are constructed on a street which has been previously graded, the contractor shall resurface the roadway, slopes and parking strips in accordance with the foregoing specifications for "Surfacing."

All slopes between the sidewalks and the property shall be carefully re-dressed to smooth and even surfaces.

Maintenance.—The contractor will be required to maintain the improvement in good condition for the period of thirty (30) days from the date of acceptance, and will receive no compensation therefor beyond the amount of the final estimate.

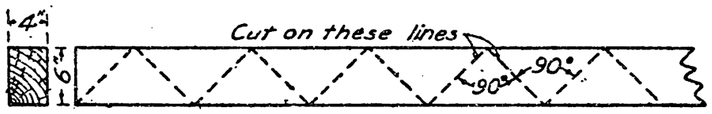
Measurement.—All excavations and embankments required will be carefully and accurately cross-sectioned, and the cubical contents computed by the method of averaging end areas.

Payment.—All earthwork will be paid for at the rate bid per cubic yard. The price paid per cubic yard shall include the cost of excavating and removing all material from excavations and depositing the same in embankments, whether on the street or on private property. It shall also include the shaping and dressing of slopes, whether in excavation or embankment, the raking and dressing of all parking strips and slopes, the removal of all solid or loose rock or boulders

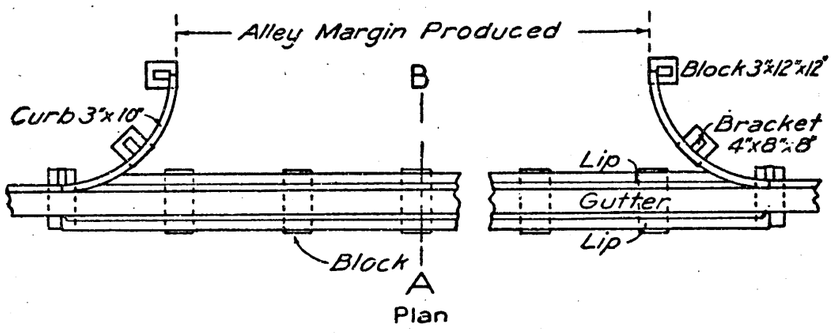


NOTE: For radii longer than 15' and shorter than 50' Gutter Boards shall be cut approximately in six foot (6') lengths. For radii longer than 50' they shall be cut in approximately eight foot (8') lengths.

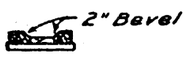
METHOD OF CUTTING GUTTER BOARDS



METHOD OF CUTTING BRACKETS



Gutter ..... 3"x10"
Lips ..... 6"x6"
Block 3"x12"x26"-4' C. to C



Section A-B

ALLEY GUTTER AND RETURNS

encountered during the progress of the work, all water settling, rolling and tamping of embankments or sub-grades, and all other labor or material necessary for the completed work. Where the excavation exceeds the embankment, payment will be made for excavation only. Where the embankment exceeds the excavation, payment will be made for embankment only, and no allowance will be made for shrinkage or settlement of the underlying ground.

EXTRA EXCAVATION

Extra excavation shall include all excavation not shown on the profiles and any excavation ordered by the City Engineer not otherwise covered by these specifications. In case it is necessary to abandon any work requiring excavation, the cost of which was included in the price bid for another item, the amount of such excavation will be paid for as "Extra Excavation."

Payment for extra excavation shall include all back-filling, water settling or tamping.

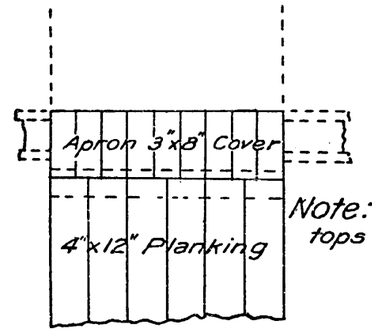
WOOD CURBS AND GUTTERS

Curbs, gutters and lips to be of lengths 16, 24 and 32 feet, and they shall rest on sound fir blocks of the dimensions shown, placed not more than eight feet center to center, and under every joint, and solidly bedded in the ground. They shall be sized one side and both edges. The gutters to be spiked to each block with two 60-penny wire nails and the curbs and lips to the gutters with 60-penny wire nails, every two feet, driven horizontally. Curbs, gutters and lips must be laid breaking joints. Angle blocks shall be nailed with two 16-penny wire nails at each end. All breaks in grades to be carefully rounded by vertical curves.

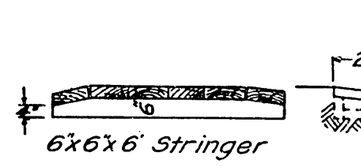
Measurement.—The length of all curbs and gutters will be measured on the face of the curb.

Wood Curbs and Gutters Adjusted.—Where directed, existing curbs and gutters shall be adjusted to grade by blocking up or by taking up and relaying, using such old lumber as may be suitable.

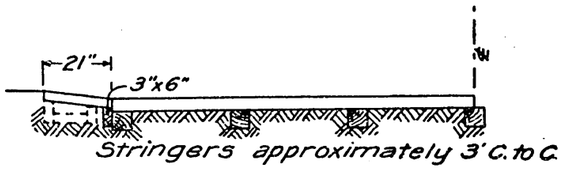
Payment will be made for any lumber relaid at rate bid for old lumber.



NOTE: Apron to be let into Curb so that tops of Curb and Apron will be flush



Section of 6' Cross Walk



Longitudinal Section of Apron and Cross Walk

Width of Roadways	18	22	25	27	30	32	36	40	42	46	50
Length of Crosswalk	15	19	22	24	27	29	33	37	39	43	47
No. of Stringers	7	7	9	9	11	11	13	13	15	15	17
Feet B. M. 6' Wide	567	663	771	819	927	975	1107	1203	1287	1383	1515

Crosswalks Bill of Material Including Aprons

WOOD APRON AND CROSSWALK

CROSS-WALKS

Covering planks of cross-walks shall be uniformly four inches thick and twelve inches wide, and shall be spiked to the stringers with two 7-inch wire nails in each plank at each stringer. The stringers shall be shaped accurately

to the dimensions shown on the plans, and shall be solidly bedded in the ground. Aprons shall be made from planks three inches by eight inches wide.

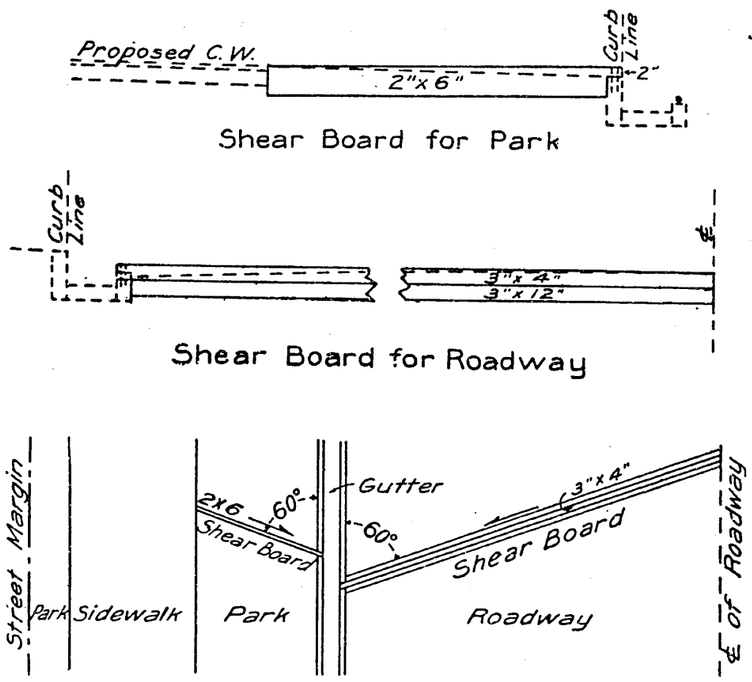
Payment for cross-walks will include all excavation necessary to properly construct the cross-walk.

REBUILDING CROSS-WALKS

In rebuilding cross-walks only such of the old lumber shall be used as is, in the opinion of the City Engineer, suitable. Any new lumber required will be paid for as new cross-walk lumber. The method of construction shall be the same as for new cross-walks.

SHEAR BOARDS

Shear boards shall be well fitted and securely spiked to the gutter lip and shall be well bedded in the ground.



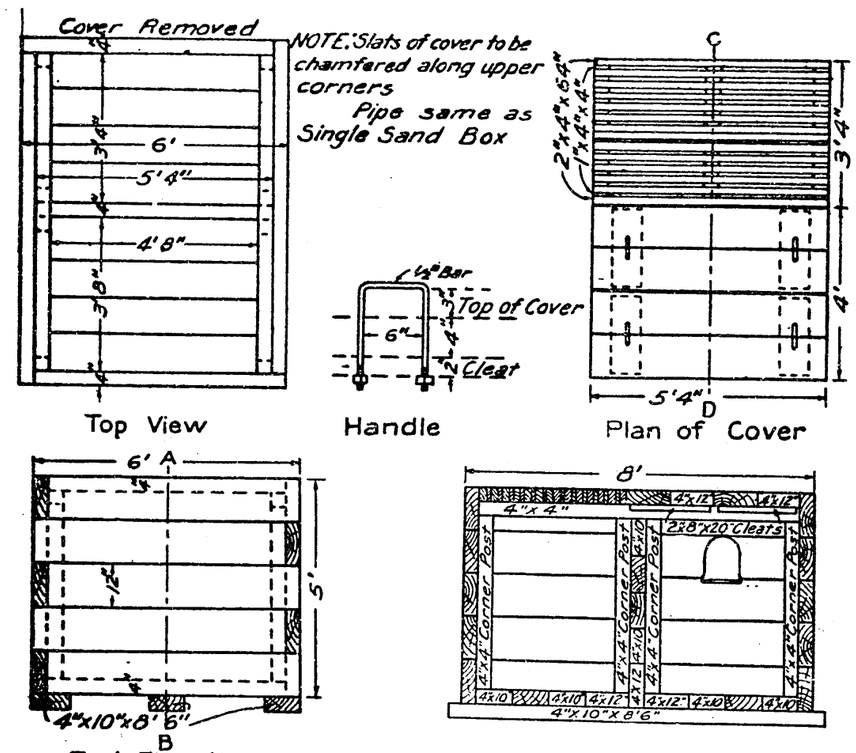
SHEAR BOARDS

SAND BOXES

They shall be built as shown in the detail plans and well nailed together with 60-penny wire nails. The outlet pipe shall consist of a quarter bend special of the same inside diameter required for connection to main sewer, neatly fitted into the box with the spigot end inside, proper connection between hubs outside being made by a short section of pipe. Inlet boxes and ditches leading thereto to be constructed for each box as shown in the plan. Connection to the main sewer shall be made with eight (8) inch sewer pipe, unless otherwise shown. The lumber shall be sized on two edges.

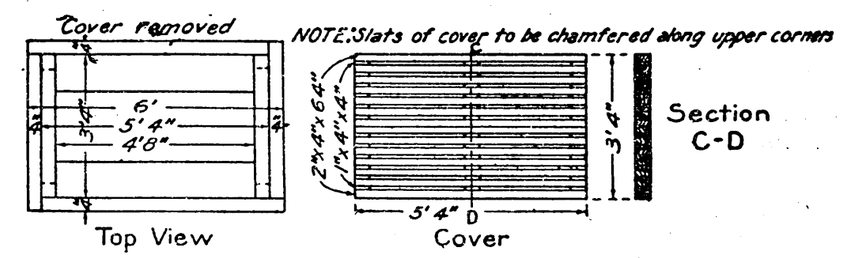
Payment.—Sand boxes will be paid for at the price bid respectively for Single Sand Box and Double Sand Box, as listed on the proposal, which will include all labor and materials for the box, inlets, ditches and connection to the

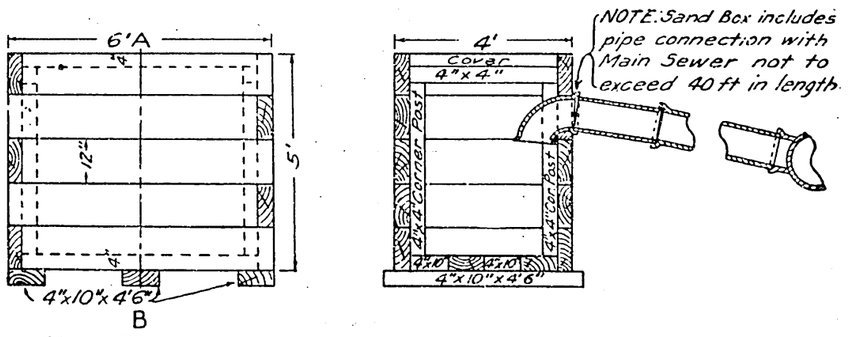
main sewer, provided, said connection to be not over forty (40) feet in length; 50 cents per foot will be allowed for all extra pipe used beyond the 40-foot connection.



1074 ft B.M for 5 ft. depth
117 " " " per foot

DOUBLE SAND BOX



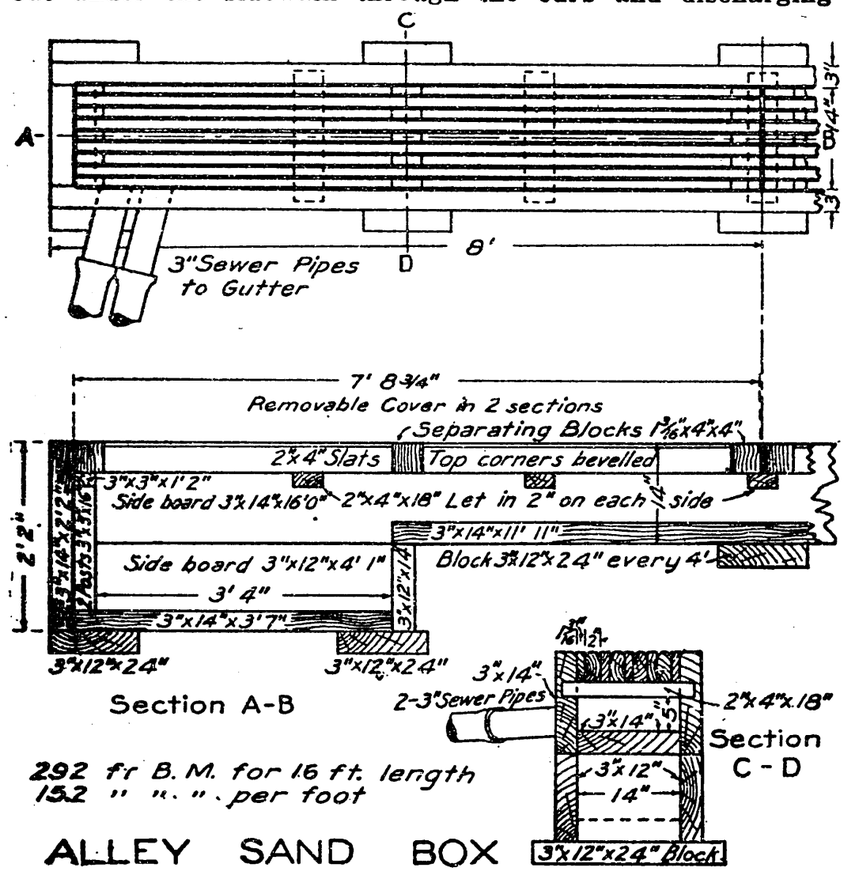


574 ft. B.M. for 5 ft depth
80 " " " per foot

SINGLE SAND BOX

ALLEY SAND BOXES

The outlet consists of two three (3) inch sewer pipes, securely fastened through the sides of the box, and leading out under the sidewalk through the curb and discharging



into the gutter. Lumber to be sized on two edges. The curb shall be bored to admit pipes, and the box well nailed together with 60-penny wire nails.

Payment for alley sand box will include all three (3) inch sewer pipe, and the cost of replacing any material necessary in the prosecution of the work.

SAND CATCHER

The box shall be constructed so as to give a neat and snug fit to curb and gutter. The lumber for the box to be sized on one side and two edges.

Payment for sand catchers will include all labor and material necessary to build and fit the same to the gutters, including the iron grating. The curb and gutter to which the box is attached will be paid for as such.

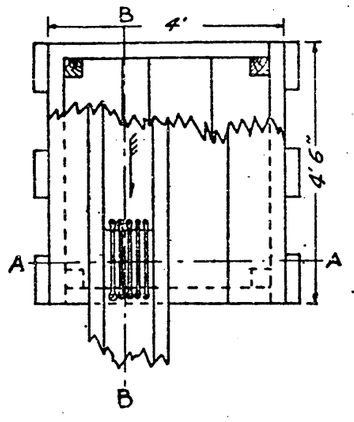
SEWER PIPE DRAINS

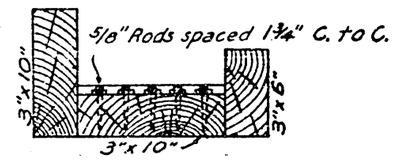
Sewer pipe for drains shall be of same quality as specified under "Sewers". The pipe shall be laid to a straight line and grade solidly bedded in the ground. All joints to be filled with cement mortar, mixed one part cement to three parts sand. They shall be provided with such inlets as may be directed.

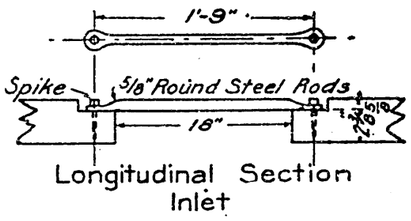
ROCK POCKETS

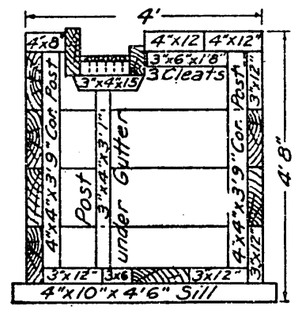
The rock may vary in size from three (3) to six (6) inches.

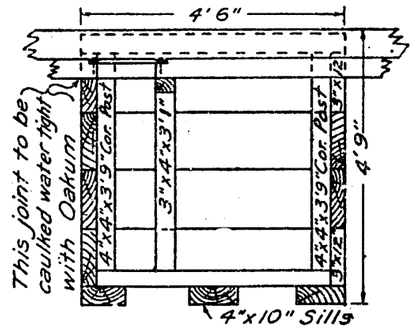
Payment will include all excavation and back-filling necessary. Rock will be paid for per cubic yard in place and pipe will be paid for per linear foot in place.











Lumber (not including curb, gutter, etc.) 343 ft. B.M.
Steel ..... 9.1 lbs.

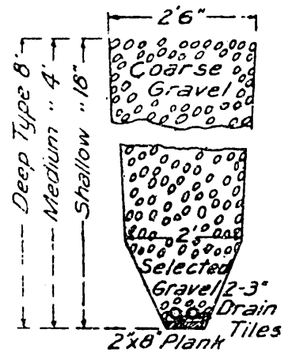
Bill of Material

SAND CATCHER

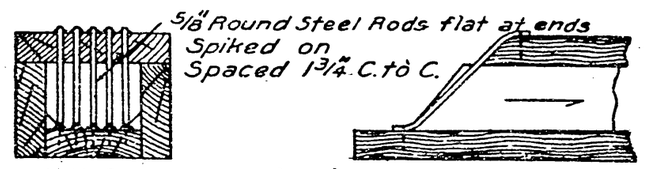
SUB-DRAINS

The trench shall be excavated to the depth required on a true grade to be given by the City Engineer, and two three (3") inch tile drains laid on a 2"x8" plank. Small selected gravel up to one and one-half inches in diameter shall cover over to a height of one and one-half feet above the plank, Coarse gravel up to four inches in diameter, then laid to the height required.

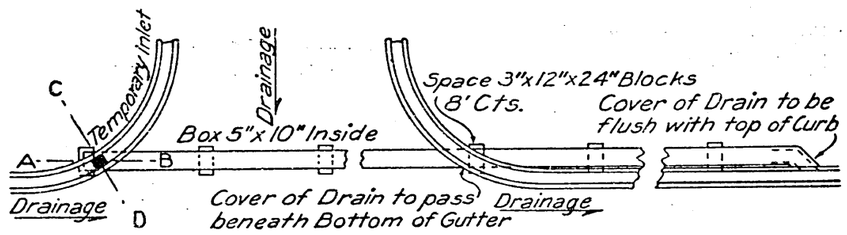
Payment will include excavating, plank, tile, gravel, etc.

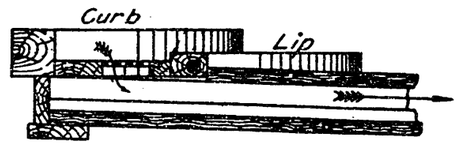


SUB DRAINS



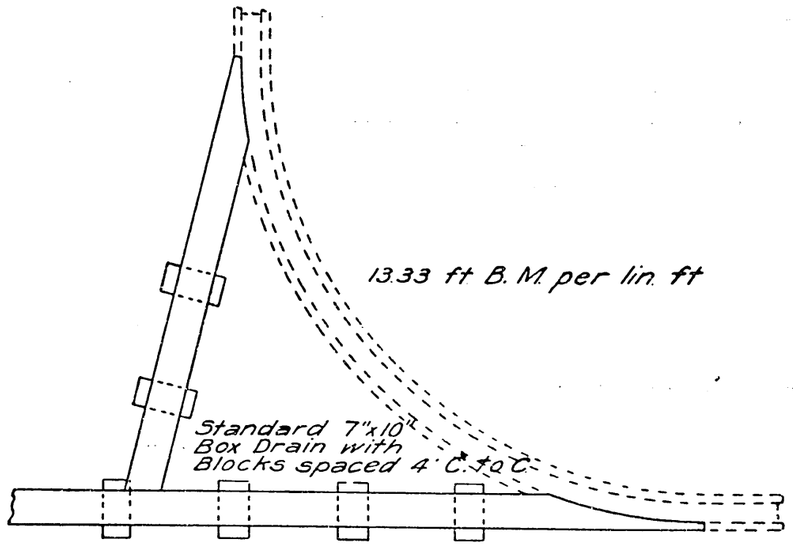
BOX DRAIN SCREEN



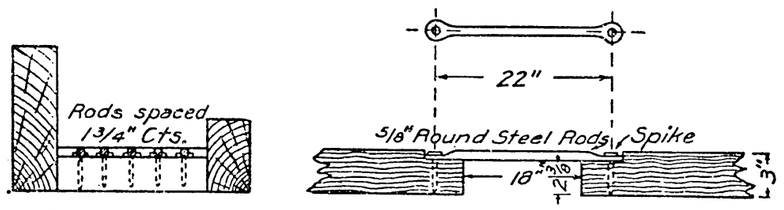


Section

SPECIAL BOX DRAIN



BOX DRAIN AT STREET INTERSECTION



Section C-D Longitudinal Section

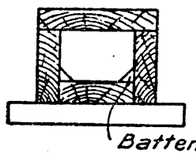
TEMPORARY INLET

BOX DRAINS

All lumber for box drains to be dressed on one side and two edges except the three-cornered strips nailed to the bottom of the box which must be dressed on all sides. The box shall be well nailed together with 60-penny wire nails.

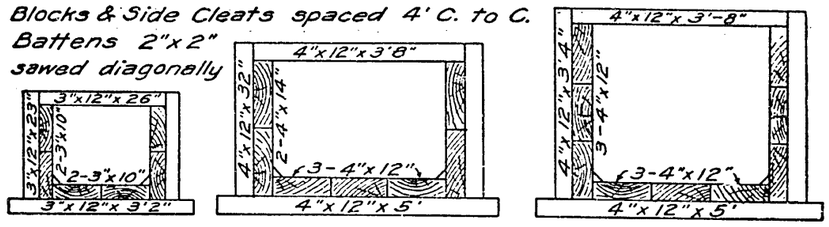
A box drain screen shall be constructed at the upper end of all box drains in fills. The ends of all rods to be flattened out so as to lay evenly on timbers and not be less than one-fourth (¼) inch in thickness. They shall be drilled to take a 10-penny nail. Payment for box drain screens will be included in the price bid for box drain lumber.

The construction of **temporary inlets** includes all labor and material necessary to connect the gutter with the box drain and also provide and set a grating. Payment for temporary inlets will be included in the price bid for Box Drains.



Size Inside	Cover	Sides	Bottom	Blocks	Ft. B.M. per lin. ft.
5"x 10"	3"x16"	3"x 8"	3"x 10"	3"x12"x24"	11.58
7"x 10"	3"x16"	3"x10"	3"x 10"	3"x12"x24"	12.58
9"x 10"	3"x16"	3"x12"	3"x 10"	3"x12"x24"	13.58
9"x 12"	3"x18"	3"x12"	3"x 12"	3"x12"x24"	14.58
11"x 12"	3"x18"	3"x14"	3"x 12"	3"x12"x24"	15.58

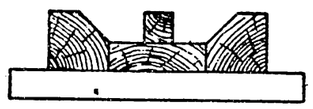
Battens 2"x2" Sawed diagonally. Blocks spaced 8' C. to C.



17"x20 24"x36" 32"x36"

27.1' B.M. per lin.ft. 56' B.M. per lin ft. 62.7' B.M. per lin.ft.

BOX DRAIN SECTIONS & BILL OF MATERIAL



Section

Gutter.....3"x10"
Lips.....6"x6"
Center Strip.....3"x3"
Block 3"x12"x30" every 8 feet

10.19 Ft. B.M. per lin. ft.

OPEN DRAIN

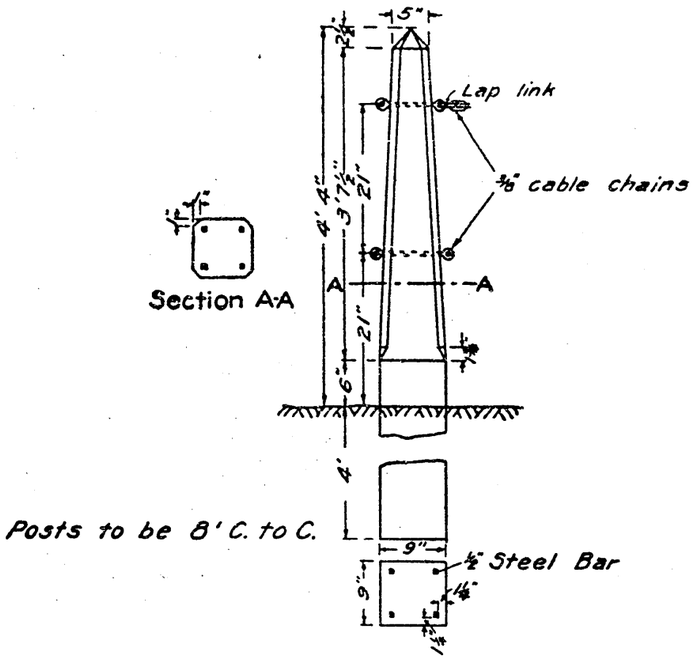
REINFORCED CONCRETE POSTS AND CHAINS

The concrete for the posts to be composed of one (1) part Portland cement, two (2) parts sand and four (4) parts of gravel and given a brush finish with a coat of neat cement grout.

The posts shall be allowed to season twenty (20) days after moulding before being placed in position. They shall be firmly tamped into place.

Galvanized iron chains conforming approximately to the dimensions on the plans shall be stretched between posts with a sag of four (4) inches.

Concrete posts will be paid for at the price bid per post, which includes the steel for reinforcement and the chain fastenings. The chains will be paid for at the rate bid per pound in place.



CHAIN FENCE WITH CONCRETE POST

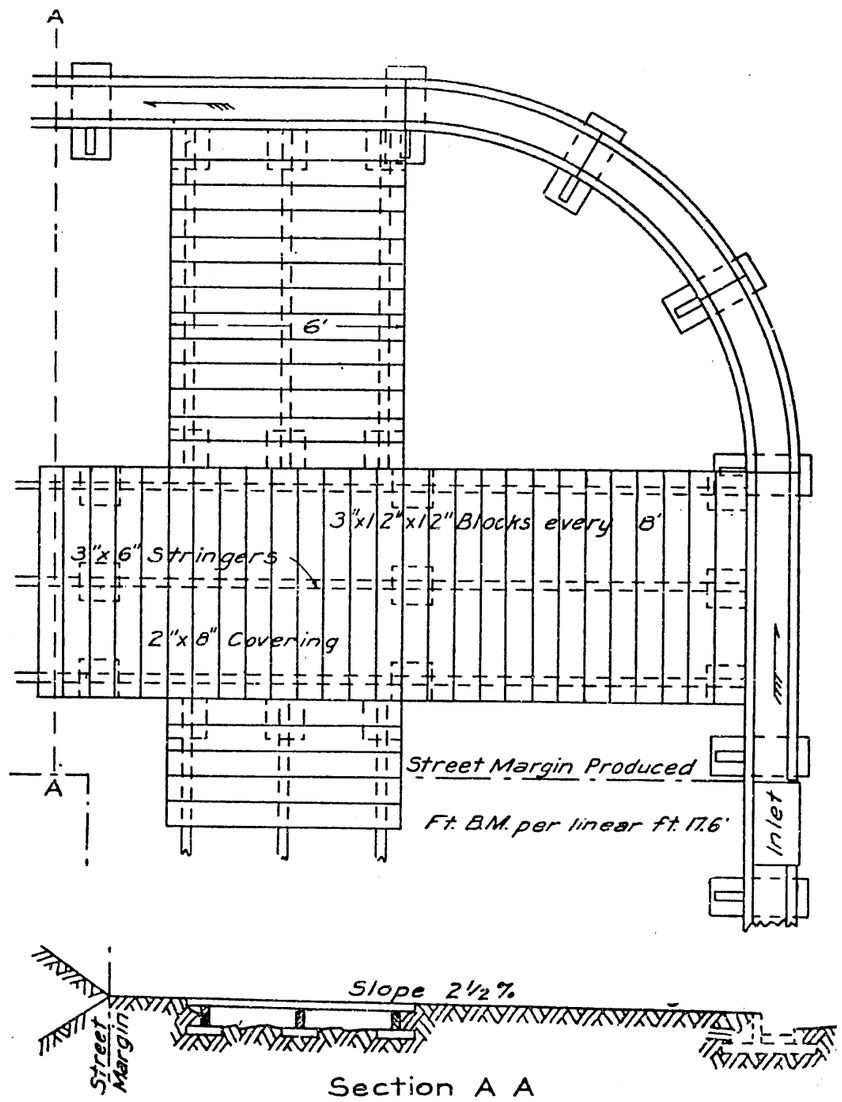
SIDEWALKS

TEMPORARY WOOD WALKS

Where directed by the City Engineer, temporary wood walks shall be constructed of 2"x 12" fir planks laid lengthwise with the rough side up and firmly nailed with 20-penny wire nails to 2"x12" blocks laid crosswise every eight (8) feet and properly bedded in the ground. On grades over 10%, or as required by the City Engineer, triangular battens 1½"x1½"x2" shall be nailed to the planks 15 inches apart with four 10-penny wire nails to each batten.

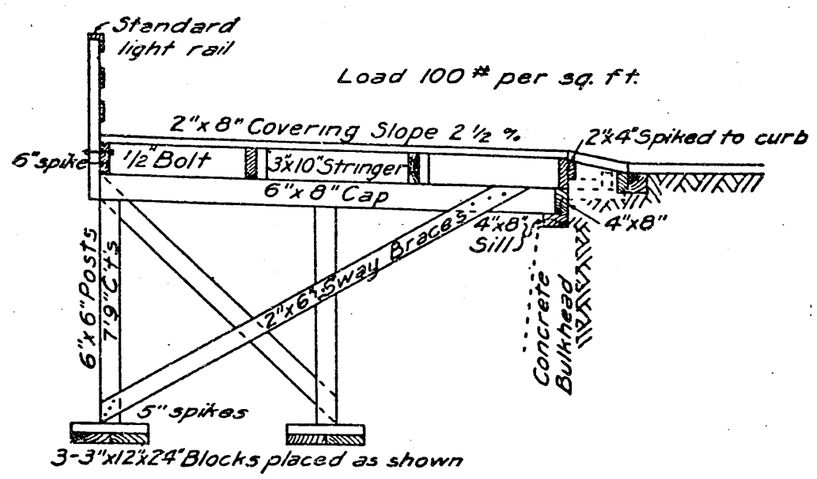
WOOD SIDEWALKS

The covering planks of sidewalks are to be surfaced on one side, two (2) inches thick and uniformly eight (8) inches wide, sawed square at both ends and placed on a true line, both on inner and outer edges of walk. They shall be spiked

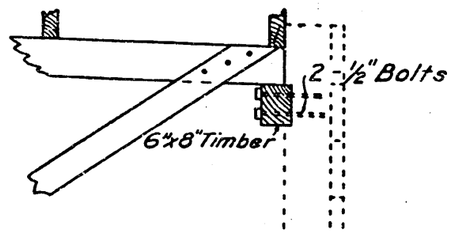


Section A A
6 Ft. Sidewalk, Curb and Gutter
WOOD WALKS

to the stringers by two (2) 20-penny wire nails to each plank at each bearing. Stringers to be in lengths of 16, 24 or 32 feet, and shall rest on solid fir blocks, placed not more than eight feet center to center, and under every joint, all solidly bedded. The stringers must be toenailed to each block with two 30-penny wire nails.



Section of Sidewalk on Posts



Cap Support on Wood Bulkhead

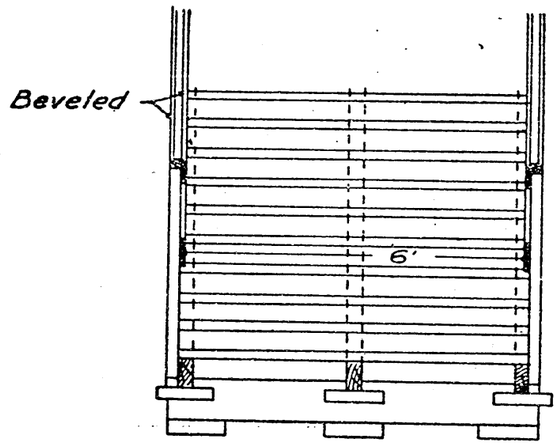
WOOD SIDEWALKS RELAID

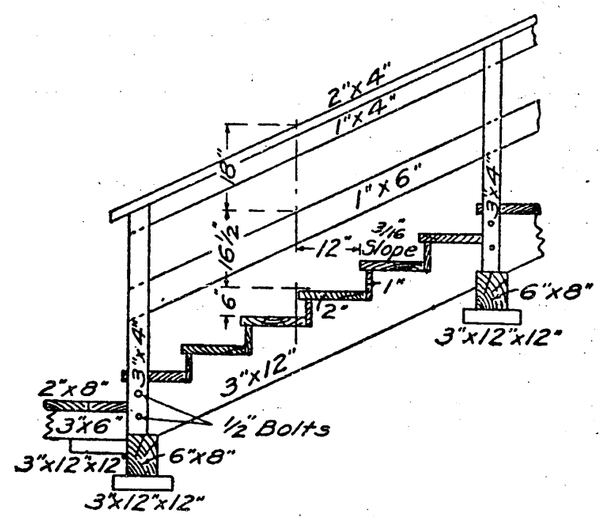
The existing wood walks are to be relaid in accordance with the standard plans and specifications for wood walks, using such of the old lumber as in the opinion of the City Engineer is suitable. The contractor shall pile and protect all lumber to be relaid and will be held responsible for the safe keeping of the same until it is used. The remaining part of the old walks to be piled, burned or disposed of as directed by the City Engineer. Any new lumber required will be paid for as such.

Payment will include the handling of all lumber as above specified.

WOOD STAIRWAY

The blocks shall be well bedded in the ground to the proper elevation so that the finished structure will be on grade. The stringers to be toenailed to the sills with four 30-penny wire nails at each bearing. The stepping shall be nailed with three 20-penny wire nails to each stringer and the risers with two 10-penny wire nails at each stringer. Railing when in position to be painted with two coats of





WOOD STAIRWAY

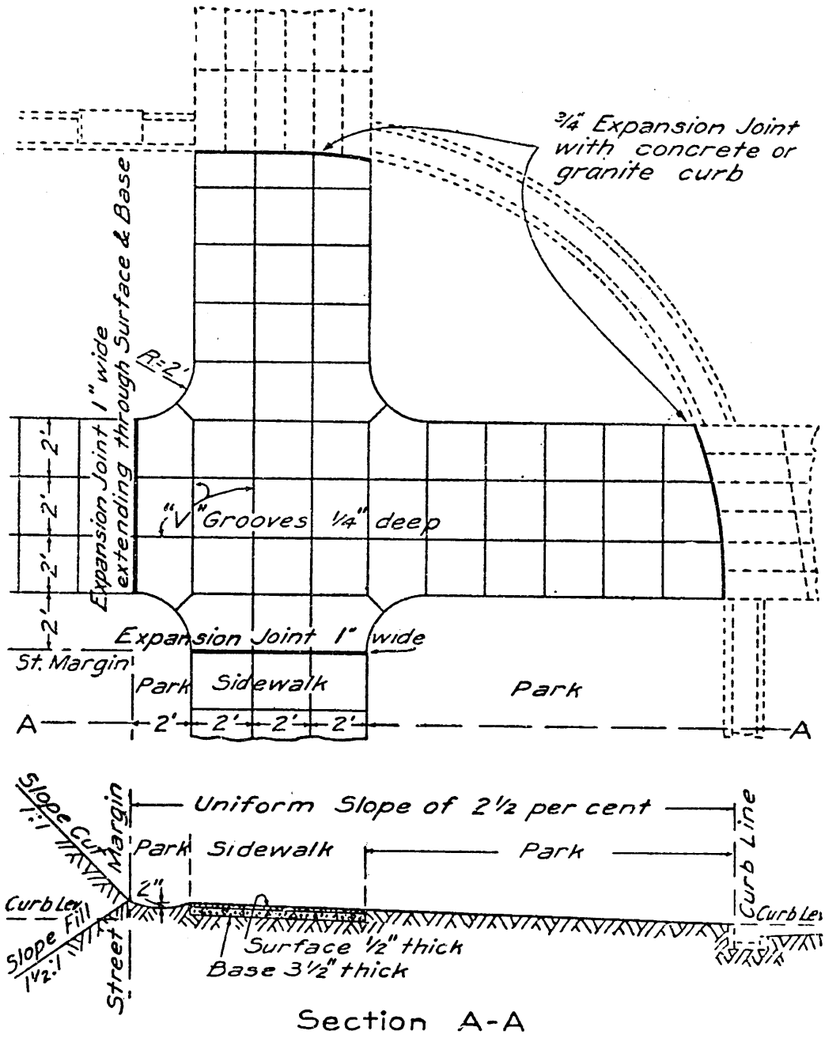
mineral paint mixed with linseed oil, of a color approved by the City Engineer.

CONCRETE SIDEWALKS

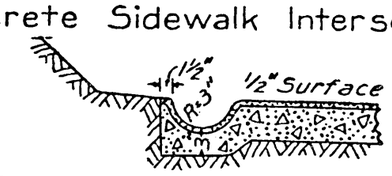
Concrete walks must conform accurately to the lines and grades given, and constructed as follows:

The sub-grade shall be excavated to a depth of about four (4) inches below the finished grade and thoroughly settled and compressed by wetting and tamping. To obtain proper sub-grade a template shod with iron and showing a rigid four (4") inch gauge will be required. No template provided with adjustable attachments of any kind will be permitted on the work. If any filling is necessary, it must be done in the manner hereinbefore specified for embankment under grading.

The contractor to provide forms of such shape and dimensions as may be required, made of surfaced lumber, and shall be thoroughly wetted before placing the concrete. The cost of furnishing and setting forms must be included in the price bid for concrete sidewalks. After the forms are set accurately to the grades given, the foundation shall be



Section A-A
Concrete Sidewalk Intersection



Section of Gutter with Concrete Walk

CONCRETE WALKS

brought to the exact sub-grade required and well wetted and smoothed down just before placing concrete.

Concrete sidewalks consist of two courses: First, a bottom course of concrete three and one-half (3½) inches thick, composed of one part Portland cement, three parts sand and six parts gravel or broken stone; second, a finishing or wearing course of cement mortar one-half (½) inch thick, composed of one part cement to one and one-half parts sand.

The concrete shall be spread upon the prepared sub-grade as soon as mixed in a layer of such depth that after having been thoroughly compacted with iron-shod rammers, seven inches square, and weighing not less than twenty pounds, it shall not be less than three and one-half (3½) inches thick,

and the upper surface shall be parallel with and not less than one-half (½) inch below the proposed surface of the completed walk. To insure this the concrete must be struck with a gauge shod with a steel plate not less than one-eighth (⅛) inch in thickness. The concrete shall be thoroughly tamped or rammed until water appears on the surface. A batch of concrete made with two barrels of cement shall not make more than 200 square feet of concrete base under walk, and not less than one barrel of cement shall be used for every 56 square feet of finished sidewalk.

When the bottom course is completed, and before the concrete has begun to set, the finishing or wearing course must be laid. The correct proportion of sand and cement to be thoroughly mixed dry until of one uniform color, and sufficient water added to make a mortar of proper consistency. The mortar is to be colored by adding lampblack at the rate of about three-quarters (¾) of a pound to one barrel of cement. The lampblack shall be thoroughly mixed with the cement mortar in such a manner as to produce a uniform and even shade satisfactory to the City Engineer. Special care must be taken to thoroughly trowel down the mortar in order to secure a perfect bond with the concrete base. It shall then be carefully smoothed to a uniform surface, which must not be disturbed after the first setting takes place.

"V"-shaped grooves one-quarter of an inch in depth shall then be made with a suitable tool, dividing the walk into blocks two feet square. On grades steeper than four per cent. the cement coating shall be roughened by finishing with brush, or in such manner as the City Engineer may direct.

At such points as may be directed by the City Engineer, and which shall be approximately sixty (60) feet apart, all concrete sidewalks shall have a joint, extending entirely through the concrete base and wearing surface. This joint is to be made with an iron bar three-eighths inch in thickness at bottom edge and five-eighths inch in thickness at top edge. After removing joint bar, the open joint shall be covered by a strip of wood 1 in. x 4 in. firmly nailed to the forms. There shall be an expansion joint three-fourths (¾) of an inch in width at all places in the street intersection where the concrete sidewalk joins the concrete or granite curb. An expansion joint one (1) inch in width shall be provided at all street margins. When forms are removed this joint shall be carefully cleaned and immediately filled to within one-half inch of the surface with hot expansion joint material.

When the sidewalk is completed it shall be covered with such material as may be directed and kept moist by sprinkling for at least one week. The sprinkling shall be done as often as may be necessary to keep the sidewalk constantly moist.

All concrete shall be laid in short sections and immediately covered with the wearing surface. Retempering of concrete or mortar will not be permitted. All mortar or concrete that has begun to set before ramming is completed shall be removed from the work. Any concrete or mortar that fails to show proper bond, or that fails to set after, in the opinion of the City Engineer, it has been allowed sufficient time, shall be taken up and replaced by the contractor at his own expense with new concrete or mortar of proper quality.

Concrete shall not be mixed nor deposited when the temperature is below forty (40) degrees Fahrenheit, unless special precautions are taken to avoid the use of materials con-

taining frost and the work protected in a manner satisfactory to the City Engineer until the concrete has thoroughly hardened.

The contractor will be required to stamp his name in letters one and one-half inches high and one-quarter of an inch deep, twice in each block on each side of street.

All walks or driveways connecting with private entrances, or any extra work connected with or incidental to the complete performance of this contract must be executed by the contractor in a neat and workmanlike manner, in accordance with these specifications or the special directions of the City Engineer in each case.

After the walks have been completed and the forms and stakes removed, the slopes and parks shall be surfaced and smoothed to conform to the lines indicated on the plan. All parks shall be sowed with white clover seed of good quality, using one pound of seed for each three hundred (300) square feet.

Before the final acceptance of the work all concrete sidewalks will be carefully inspected and sounded for defects, and any hollow or otherwise defective blocks must be cut out and replaced by the contractor at his own expense. Relaying of top course only will not be permitted.

Broken or cracked squares shall be entirely removed. No patching will be permitted.

No concrete sidewalk shall be constructed upon any embankment unless the City Engineer considers the same sufficiently settled to afford a stable foundation.

Measurement of concrete sidewalks will be on the slope.

Payment. When no bid is taken for earthwork the price bid for concrete walks will include the preparation of the subgrade, the necessary resurfacing of parks and roadway as specified under "Surfacing" in the Standard Specifications.

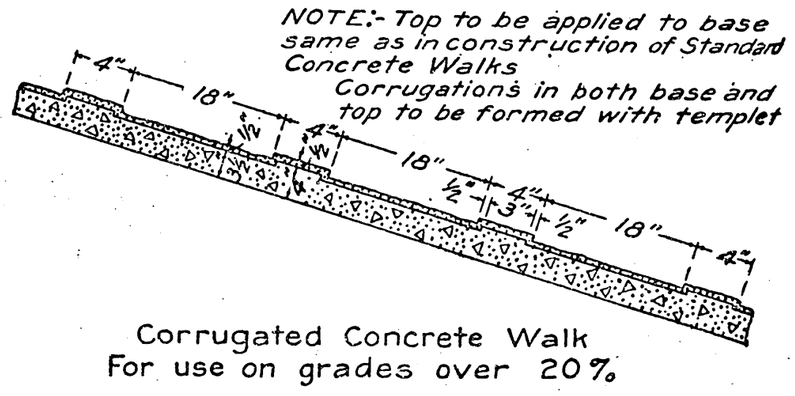
CONCRETE SIDEWALKS REPLACED

The plans and specifications for new concrete sidewalks shall apply in all respects.

Payment will include the removal of the old concrete walk.

CORRUGATED CONCRETE SIDEWALKS

Materials and methods of construction are the same as specified for concrete sidewalks, except that corrugations in



Corrugated Concrete Walk
For use on grades over 20%

base and top shall be formed with a templet as shown in detail on plans.

CONCRETE STAIRWAYS

The concrete and cement mortar shall be composed of materials of the same quality, mixed in the same proportions and in the same manner as specified for "Concrete Sidewalks." The cement mortar facing, three quarters (¾) inch thick, for the stair risers, treads and coping, to be composed of one part cement and one and one-half (1½) parts sand. Special care must be taken to secure a thorough bond between the cement mortar facing and the concrete base. The contractor will be required to replace, to the satisfaction of the City Engineer, all hollow or otherwise defective steps. The treads of all steps shall have a slope of three-sixteenths (3-16) of an inch in order to secure drainage.

On each side of the steps and along the sides of landings, where so indicated on the plans, or where directed by the City Engineer, there shall be constructed a coping or parapet wall and concrete gutter of the dimensions and designs shown on the detail plan. They are to be built in the same manner as specified for concrete steps. Concrete stairways shall be reinforced as shown on plans. The rods extending through the steps to be hooked or bent around those in the coping. All forms shall be sized lumber.

Concrete landings will be classed as concrete sidewalks, and will be paid for at the rate bid for concrete sidewalks, and include the steel.

Concrete coping and parapet will be paid for as such.

Measurement for stairs will be taken across the step from inside to inside of coping. Measurement of coping will be on the slope.

Payment will include the furnishing and placing the steel rods, step armor and forms.

CONCRETE GUTTERS

The materials for the concrete base and the cement wearing surface are as specified herein for "Concrete Sidewalks". When the concrete gutter is attached to the concrete stairways the steel rods are to extend into the gutter as shown on the standard plan for concrete stairways.

Measurement for concrete gutters will be on the slope.

GALVANIZED IRON RAILING

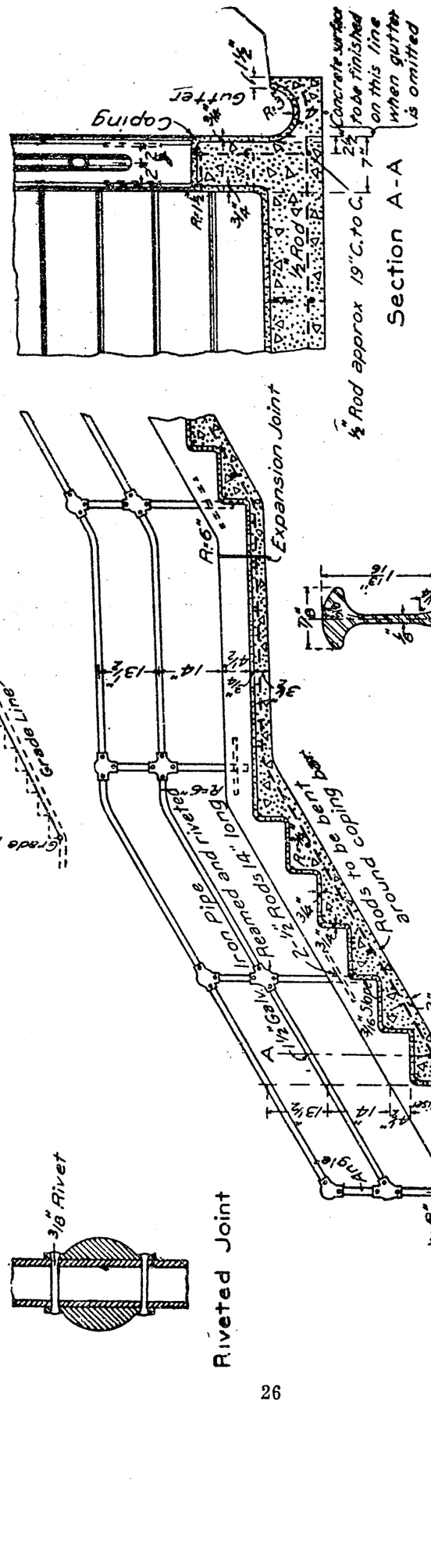
The upright posts shall be securely set in the concrete so that the entire railing shall be thoroughly rigid and firm. The pipe must be well galvanized and all fittings of the best quality of malleable iron. When in place, the railing shall be painted with two coats of aluminum paint.

Measurement will be on the slope.

THREE INCH TILE DRAINS.

Three inch tile drains are to be constructed back of the sidewalks when directed. The plank to be laid to a true grade and the trench carefully filled to the top with screened gravel, small stones or other material approved by the City Engineer.

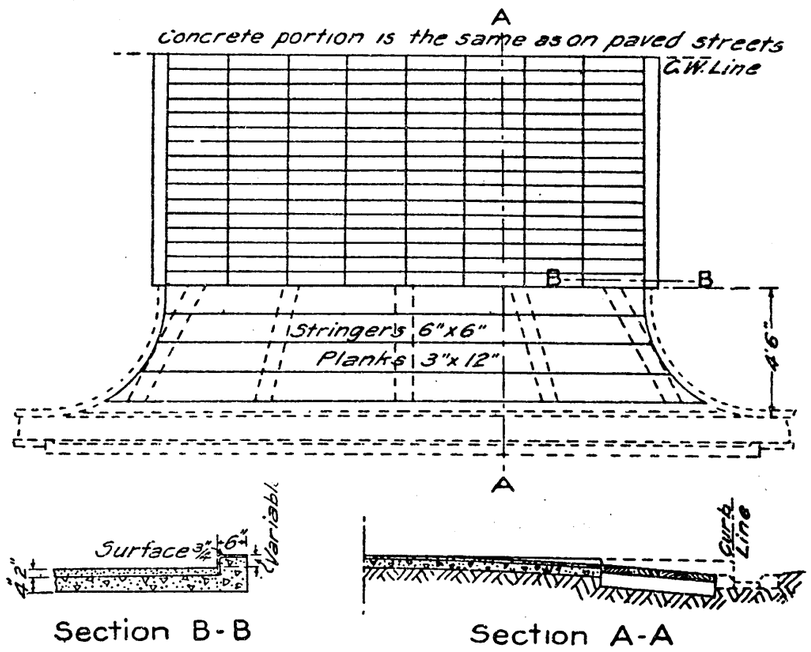
Payment for three-inch tile drains will include the gravel pocket.



CONCRETE STAIRWAYS

CONCRETE ALLEY CROSSINGS

Alley crossings will be constructed where shown on plan or where directed by the City Engineer. The concrete base shall be not less than four (4) inches thick, and the wearing surface not less than two (2") thick. Both base and top to be composed and laid down and specified for concrete walks with the surface roughened as directed by the City Engineer. The six-inch strips along the sides of the alley crossing shall be classified and paid for as concrete alley crossings.

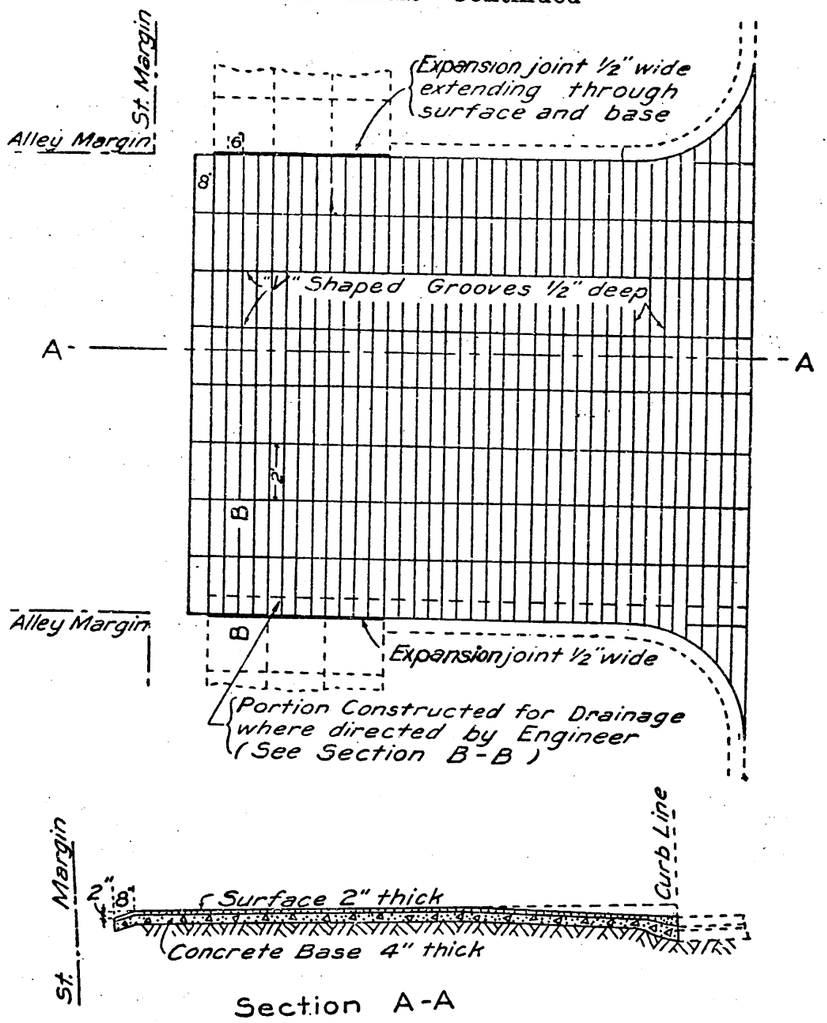


CONCRETE ALLEY CROSSING
For Unpaved Streets

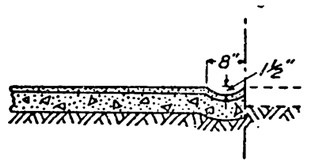
THREE INCH SEWER PIPE

Three (3) inch sewer pipe shall be laid under the concrete sidewalks, extended across the parking strip and through holes to be bored through the curb. No cutting of the curb will be allowed. The pipe must be salt glazed, vitrified sewer pipe of quality conforming to the standard specifications of the City of Seattle. It shall be laid with cement mortar joints, the mortar to be composed of one part Portland cement to two parts clean sand. It shall be laid close to the concrete and shall be solidly bedded in the ground. The connection to the gutter; the extension of the three (3") inch sewer pipe out through the concrete curb, when necessary; or the construction of a coarse gravel inlet must all be done in accordance with the standard plans.

Payment for three-inch sewer pipe will include gravel pocket, boring or extending through curb.

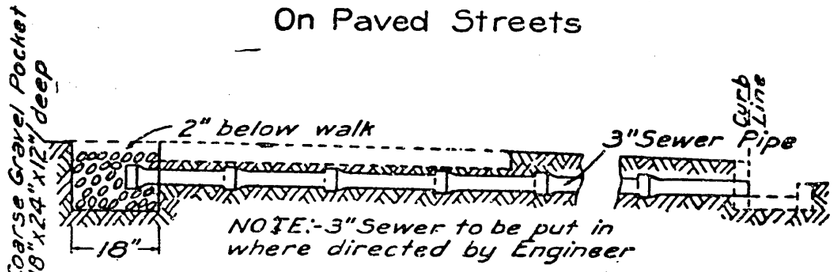


Section A-A

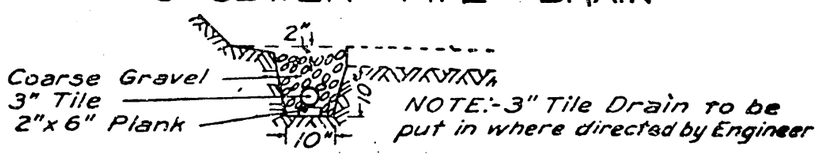


Section B-B

CONCRETE ALLEY CROSSING
On Paved Streets



3" SEWER PIPE DRAIN

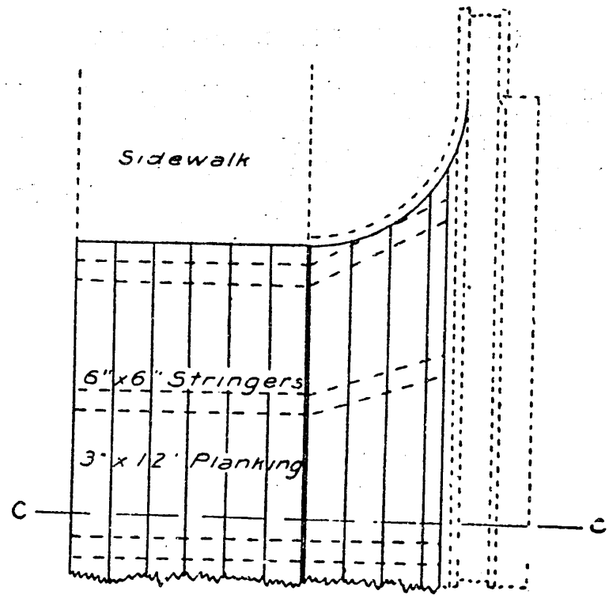


3" TILE DRAIN

WOOD ALLEY CROSSINGS.

Wood alley crossings shall be constructed in accordance with the specifications for planking.

The ends of planking must be tightly fitted against the curb. Ends butting into the alley returns to be cut circular to give tight joints. The planking shall be well nailed with 60-penny wire nails.

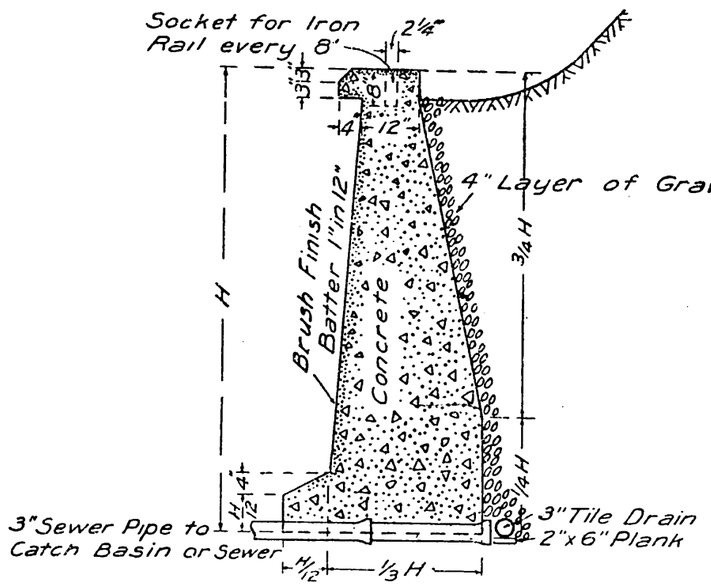


Section C-C
WOOD ALLEY CROSSING

RETAINING WALLS

CONCRETE RETAINING WALLS

Foundation.—The foundation for any retaining wall is to be excavated to the depth called for on the plan, or to such depth as the City Engineer may determine is necessary to insure a proper footing. Where the location of the wall comes on soil which, in the opinion of the City Engineer, is not firm enough to insure its safety, piling or other suitable



RETAINING WALL

form of sub-foundation must be placed, as the City Engineer will direct. The foundation pits shall at all times be kept dry and free from water by pumping or otherwise as may be directed. Where permanent drainage of the foundation, or other than that shown on the plan is necessary, a suitable tile or sewer pipe drain are to be laid and connected with the sewer or suitable outlet.

Forms.—Forms for retaining walls to be constructed in accordance with the details given on the plan, or where no details are given, in a manner satisfactory to the City Engineer. They must be constructed of sound merchantable lumber thoroughly braced and stayed, so as to produce the finished surfaces true to line and grade, and free from wind or warp or objectionable depressions and projections. Lum-

ber used to be evenly sized and free from knot holes or other imperfections effecting the finished work. Where monolithic construction is required, particular care must be taken to construct the forms of sufficient strength to prevent bulging.

All grooves, joints, mouldings, pilasters, panels and copings shall be formed true to line and dimension. Particular care to be exercised in constructing the forms for copings or other projecting parts of the wall or parapet that the same may be released and allowed to settle slightly after the concrete has partially set in order to prevent the expansion of the form from lifting or cracking the concrete at such projecting portions.

All forms to be so constructed that in stripping them from the finished work, the edges of mouldings, etc., will not be defaced.

Concrete.—The concrete used in retaining walls is to be mixed in the proportions of one (1) part Portland Cement, three (3) parts sand and six (6) parts gravel. The proportions of cement to the total aggregate used will be invariable but the relative proportion of sand to gravel may be varied by the Engineer from time to time.

The concrete shall be deposited uniformly in layers but shall not be deposited in any part of the wall faster than it can be properly handled and spread into place. Depositing the material from a height into place, without properly remixing and spreading the same will not be permited. Unless otherwise directed, the concrete must be mixed wet enough to readily spread and fill the forms but it shall not be mixed so wet that there is any tendency to wash the gravel free from the grout coating. All concrete must be thoroughly spaded as soon as deposited. The face of the wall is to be formed by spading back the gravel therefrom in such a manner as to leave a smooth cement finish. Before any concrete is deposited on top of a previous day's work, the latter shall be made rough by picking or chipping. All loose material and cement scum, or laitance, must be thoroughly removed, the surface washed clean and then grouted with neat cement. The scum, or laitance, to be removed before the concrete has set hard.

All walls shall be constructed as monoliths, where practical, that is, any section of a wall shall be deposited in one continuous operation, including the final finish at the top. Where monolithic construction is impractical, for the purpose of keeping each successive step of the work together, a recess six (6) inches deep and of a width equal to one-third the width of the wall shall be left at the end of each day's work for the entire length of such work in all walls where the cross-section is two (2) feet or more in thickness. In thinner walls, the contractor will be required to furnish and set steel dowel pins not less than three-quarters (¾) of an inch square and two (2) feet long at intervals of not less than three (3) feet for the entire length of each day's work where the same is not brought to the finished height.

In all walls the forms, mouldings, etc., along the finished sides must be kept cleaned of any dry mortar or concrete which may mar the finished appearance.

Joints.—Joints are to be made in all walls as indicated on the plan or as directed by the City Engineer. Where joints are required the wall shall be built in alternate sections. In the ends of each completed section a recess shall be provided, four (4) inches deep and of a width equal to one-third

(1-3) the thickness of the wall, but not exceeding 1 foot, for the purpose of keying the sections of the wall together, or, steel dowel pins ¾ of an inch square and two (2) feet long can be set at intervals of two (2) feet, as may be directed.

Before the intermediate sections are built the ends of the alternate sections must be coated with one coat of expansion joint material and four (4) layers of No. 2 tarred roofing felt, each layer of roofing felt being coated with pitch or asphalt as laid.

At the finished face of the wall, the joint shall end in a "V" shaped groove two (2) inches wide and one (1) inch deep unless otherwise shown on the plan.

Finish.—As soon as the forms are stripped, the surface of the wall shall be gone over with a chipping hammer and all projections brought down to an even surface. All wires must be snipped to the surface of the wall and all holes, projections or rough spots pointed up with a mortar composed of one part cement to two parts sand. Care shall be taken in removing the forms that edges, moulding, etc., are not damaged. The entire surface shall be wetted and then given a brush finish with a coat of cement grout composed of one part plaster of paris and three parts cement mixed with water to a consistency of thick cream or with a thin coat of neat cement grout, as the City Engineer directs.

Waterproofing.—The back of the wall is to be coated with tar pitch, asphalt or other approved substance. Unless otherwise directed such waterproofing will consist of two coats of the substance selected. The waterproofing must be applied hot and only on a dry surface.

Gravel.—A layer of coarse gravel not less than 4 inches in thickness shall be placed at the back of the wall for its entire height and will be paid for per cubic yard in place.

Tile Drain.—A tile drain of the size called for on the plan is to be placed at the back of the wall at the bottom and connected to the sewer where shown in the plan.

Backfilling.—The backfilling behind retaining walls is not to be made until the walls have been allowed to set two weeks or longer. The filling to be made in layers not exceeding one foot in thickness and thoroughly rammed. Filling in with loose earth and puddling the same will not be permitted except by express permission of the City Engineer.

Measurements.—The quantities of materials to be paid for in concrete retaining walls shall be the actual quantities in the completed work, the volumes to be determined by the prismoidal formula.

Payment for plain concrete retaining walls will include all necessary excavating, concrete, dowel pins, joints, backfilling, finishing the surface, mouldings, and the furnishing, placing and removing of all necessary forms.

Piling for sub-foundation work, gravel, waterproofing, tile drain and sewer pipe will be paid for at the rates bid for the same.

In case no bid is taken for reinforcing steel, six cents a pound will be paid for any used.

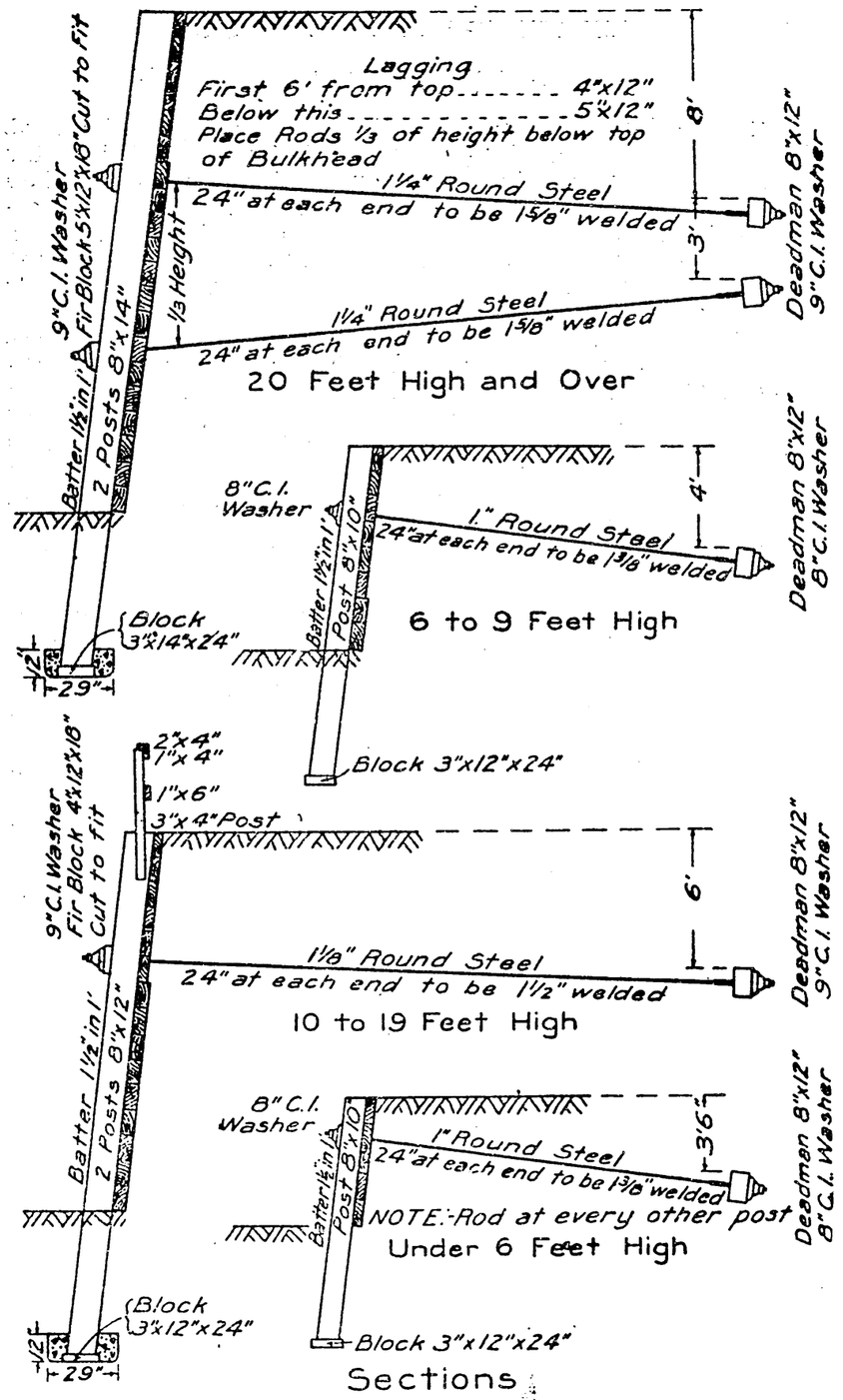
Payment.—Payment for reinforcing steel will be in full for furnishing, bending, fitting and placing the same in the work as called for on the plan. The measurement of steel will be for the length called for on the plan or as the City Engineer may direct to be placed in the completed work.

WOODEN BULKHEADS

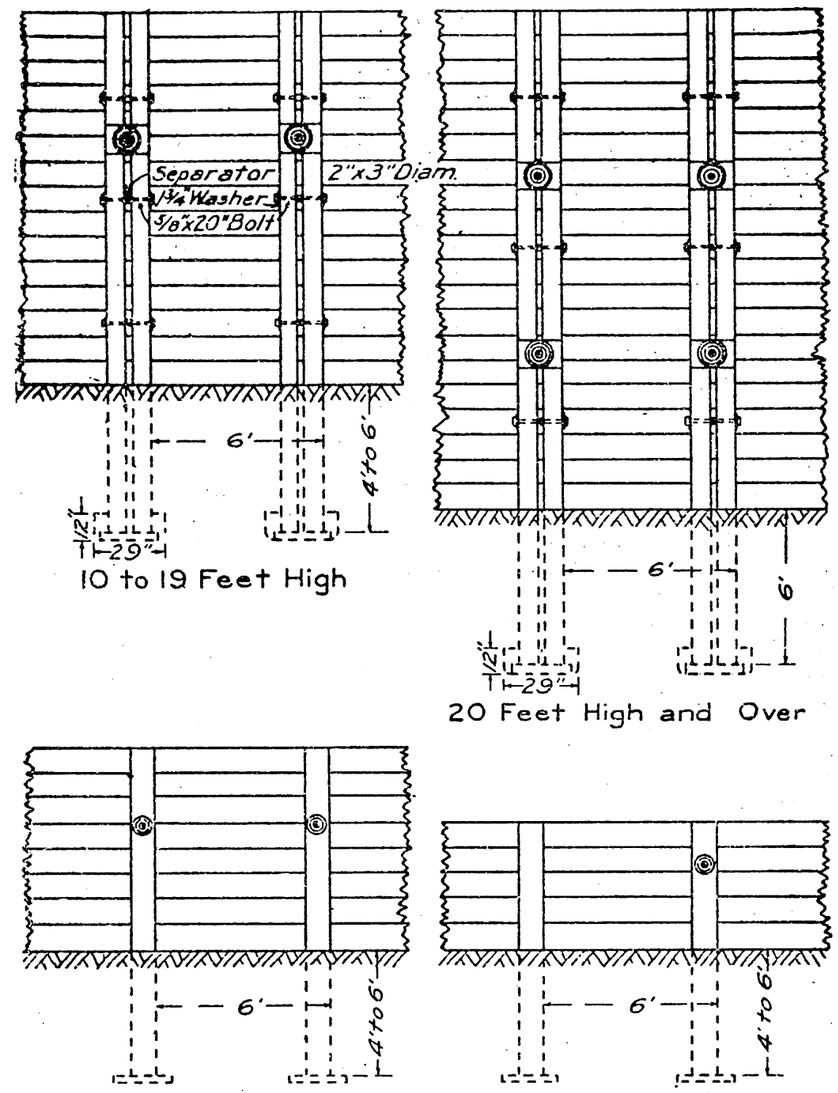
Lumber.—Lumber must be well fitted, bedded and nailed. Posts shall be set on blocks, laid in holes excavated to the depth as shown on the plans, or as directed by the City Engineer. In refilling such holes, the earth must be thoroughly tamped. "Deadmen" shall be bedded to the depth shown. No excavations, such as trenches for "deadmen" and holes for posts and other unexposed work in bulkheads are to be filled or covered until the same have been fully inspected. Lumber not exposed, except ends of timbers (unless otherwise specified) shall be painted with two (2) coats of "Carbolineum Avenarius" or some other preparation approved by the City Engineer. The lagging must be well nailed to the posts using 8″ wire nails for four (4) inch and nine 9″ wire nails for five (5) inch lagging, using two (2) nails to each bearing. Where directed by the City Engineer, concrete of standard mixture is to be placed at the foot of posts. Payment for concrete will be as listed on the proposal.

Payment for bulkhead lumber will include the cost of digging and refilling of post holes and painting of the lumber.

Iron.—Rods used in bulkheads are to be of a good quality of steel and of the dimensions shown on the plans, with threads at each end eight (8) inches in length. Rods shall have welded ends two (2) feet long, thee-eighths (⅜) inch larger than main rod. Each rod to be provided with the standard size nuts and washers, all to be thoroughly painted with two coats of "P. & B." or other preparation approved by the City Engineer. Blocks of the dimensions shown on the plans shall be used under each washer and will be included in the measurement of lumber used.



WOOD BULKHEAD



Elevations

Material	Size Inches	Wt per ft. in Pounds	Wt. of each in Pounds	Material	Size Inches	Wt per ft. in Pounds	Wt. of each in Pounds
Rods	1	2.67		Nuts	1 3/8		2.5
"	1 1/8	3.38		"	1 1/2		3.2
"	1 1/4	4.17		"	1 5/8		4.0
"	1 3/8	5.05		C.I. Washer	8		9.0
"	1 1/2	6.01		" "	9		11.0
"	1 5/8	7.05		" "	10		14.0
Separators	2x3 Dia.		3.7	W.I. Washer	1 3/4		0.1
Bolts	5/8x20		2.0				

Unit Weights

Height	Ft. B.M. per ft. Length	Pounds Steel per ft. Length	Length of Rods	Height	Ft. B.M. per Ft. Length	Pounds Steel per Ft. Length	Length of Rods
4	33.9	6.0	15	15	134.8	22.2	22.5
5	40.1	6.0	15	16	142.4	23.0	24.0
6	46.3	12.0	15	17	150.1	23.9	25.5
7	52.4	12.0	15	18	157.8	24.8	27.0
8	58.6	12.0	15	19	165.4	25.6	28.5
9	64.7	12.0	15	20	193.6	58.7	30.0
10	96.4	18.0	15	21	201.7	60.8	31.5
11	104.1	18.8	16.5	22	209.8	62.9	33.0
12	111.8	19.7	18.0	23	217.9	65.0	34.5
13	119.4	20.5	19.5	24	226.0	67.0	36.0
14	127.1	21.4	21.0	25	234.1	69.0	37.5

Bill of Material

WOOD BULKHEAD

SEWERS

On ungraded streets the profiles refer to center line ground elevations. On graded streets the profiles refer to mean curb grades. The bidder must estimate for himself the distance of the existing ground above the mean curb.

All cuts in pavements for trench openings must be made at least six inches wider on each side than the width of the trench at the top.

In all cases the contractor shall maintain the roadway over the sewer constructed for a period of thirty (30) days after the acceptance of the sewer by the Board of Public Works, and in no case will the contractor be released until the roadway has been leveled or surfaced to the satisfaction of the City Engineer.

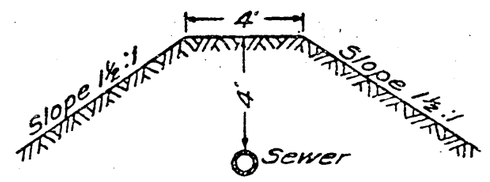
Where necessary to cut through the existing planking or pavement the same shall be removed in such manner as to permit the backfill being thoroughly compacted by tamping with sufficient water to make the earth pack before any planking or pavement is relaid. Where the cutting of existing pavements is necessary all back filling and repaving shall be done in accordance with paragraph 28, General Stipulations. The payment for replacing planking or paving so removed to be included in the prices bid for sewer work. The contractor shall furnish all help necessary as well as tools, candles and other articles required for the proper candling of the sewers, payment for which will be included in the price bid for sewers.

PIPE SEWERS

Quality of Pipe.—All pipe and specials used in constructing this sewer shall be of the best quality, salt-glazed, vitrified clay sewer pipe. Both body and bell of pipe, fifteen (15) inches or less inside diameter to be of standard thickness; pipe over fifteen (15) inches inside diameter to have a thickness not less than one-twelfth (1-12) the inside diameter. They shall be sound and well-burned throughout their thickness, impervious to moisture, with a clear ring, smooth and well-glazed on interior and exterior surfaces, free from cracks, flaws, blisters, fire-checks or other imperfections, and warranted to stand a compressive stress between flat faces, of three thousand (3,000) pounds. Any pipe or special which varies between any two diameters more than three (3) per cent. or which betrays in any manner a want of thorough vitrification, or the use of improper or insufficient materials or methods in its manufacture will be rejected. The Board of Public Works and the City Engineer constitute the only judges as to quality of pipe.

Alignment and Grades.—The alignment and grade of the sewer will be indicated upon cross sills or timbers, four (4) inches by eight (8) inches by ten (10) feet long, except where sewers are 18 inches in diameter or less, sills or timbers may be four inches by eight inches by eight feet in length, bedded at intervals from twenty-five (25) to thirty (30) feet, at right angles to the line of the sewer. These timbers to be furnished and solidly bedded by the contractor. The line will be given, and the cut to the invert of the sewer will be marked on these timbers. A marker board must be nailed to each timber by the contractor, so that a line drawn from the top of one marker to the other will indicate true line and true grade, the invert being known depth below and parallel with said line. The contractor must provide a suitable plumb bob and rod to project this line accurately to the bottom of the trench, the rod used for measuring depths

to have an iron shoe projecting accurately at right angles to the rod a distance of about five (5) inches.



SEWER SECTION IN FILL

Trenching.—The ground is to be excavated to the required depth and width, principally in open trench. The completed trench shall be kept not less than thirty (30) feet ahead of the pipe layers. The trenches shall be at least six (6) inches wider on both sides, or a total width of twelve (12) inches more, than the exterior diameter of the pipe. If rock is excavated it must be removed to a depth of four (4) inches below the bottom of the bell and the trench refilled with sand well tamped.

The contractor must furnish all necessary machinery for the work and shall pump, bail or otherwise remove any water which may be found or which may accumulate in the trenches, and perform all work necessary to keep them clear of water while the foundations and the masonry are being constructed or the pipe laid.

When necessary the side of the trench must be braced and rendered secure, and either open or close sheathing used, to the satisfaction of the City Engineer. The cost of all such sheathing to be included in the price per linear foot for the completed sewer, and no extra payment beyond such price will be allowed.

All sewer pipe over 24″ in diameter shall be laid in open trench.

Tunneling.—Where the smaller sizes of pipe are used and the trench is ten (10) feet or more in depth, tunneling may be resorted to. Open trenches between tunnels shall not be less than eight (8) feet in length, the tunnels in no place to be more than twelve (12) feet long. Tunnels must be at least two (2) feet higher than the diameter of the sewer, but in no case less than four (4) feet high and two (2) feet wide.

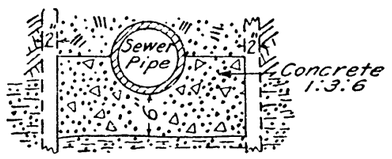
Pipe Laying.—Before being laid the pipe and specials must be carefully inspected for defects, and those not meeting the foregoing specifications will be rejected. The accepted pipe shall then be fitted together, matched and marked, before being lowered into the trench, and must be laid as marked. The pipe must be so laid in the trench that after the sewer is completed the interior surface thereof will conform accurately to the grades and alignment given by the City Engineer. All adjustment to line and grade must be done by scraping away or filling in the earth under the body of the pipe and not by blocking or wedging up. Great care must be exercised that the pipe has a full, solid bearing along its entire length. Before laying the interior of the bell must be carefully wiped clean and the lower part well covered with cement mortar before the insertion of the spigot end. Special care to be taken that the annular space at the sides and bottom, as well as the top of the joint, is well filled with mortar, which must be thoroughly worked in.

The cement mortar for filling the joints to be composed of one (1) part cement and two (2) parts sand.

Mortar shall be thoroughly mixed just before being used and any mortar which has begun to set shall be thrown away.

As soon as each join of pipe has been properly placed and jointed, the spaces between the pipe and sides of the trench shall be carefully filled with sand or fine earth and well rammed under and around the pipe. Sufficient filling and tamping to be done to hold the pipe firmly in position. The joint must be checked for line and grade before the next succeeding joint is placed.

Running water shall at all times be kept from the joints



SEWER SUPPORT IN QUICKSAND

for at least twelve (12) hours after completion, and if at any time it be the judgment of the City Engineer that it is necessary to do so, he may require the joint to be caulked with oakum soaked in neat mortar before being cemented.

Where quicksand is encountered, the pipe will be bedded in concrete, as shown in detail on the plans, and paid for at the rate bid for the same per cubic yard; such payment to be in full for furnishing and placing in position all material required.

Wyes will be placed at the positions shown upon the plan or as directed by the City Engineer, an earthenware stopper to be used to close the open end. The inclination given each wye, unless otherwise directed by the City Engineer, will be about thirty (30) degrees above the horizon.

The interior of the pipes shall be carefully cleaned from dirt, cement and superfluous material of every description. Each joint to be carefully scraped as the work progresses, or, when directed by the City Engineer, a wad made of a sack filled with hay, large enough to fill the pipe and attached to a rod or cord, shall be kept in pipes eighteen (18) inches or less inside diameter, and drawn forward as the work proceeds, care being taken not to loosen the joints.

Back Filling.—Back filling must follow close after the pipe laying, and in no case more than 200 feet in the rear, unless special permission is obtained from the City Engineer. The earth to be filled in and well rammed in layers, not exceeding one foot in thickness, up to the surface of the street, and in no case shall the number of men filling exceed the number of men ramming. Special care must be taken not to disturb the pipe in filling or ramming the first layer. Walking on the pipe will not be allowed until at least nine (9) inches of earth has been placed upon it. In lieu of ramming, the backfill may be thoroughly flushed or water settled.

Payment will include furnishing, laying of pipe and specials, the removal of existing sewers, all connections to existing sewers, the adjustment of inverts to existing manholes, as shown on the plan and as directed by the City Engineer, earth excavation, sheathing, pumping, back fiilling, restoring the street surface, hauling away surplus earth and material, and all other work and material required by these specifications or necessary to give a finished result.

BRICK SEWERS

Brick.—Brick for inverts shall be class "A" and those for arches, of class "B". When shown on the plans the brick for inverts and for arches are to be wedge-shaped.

Brick Laying.—All brick must be thoroughly wetted immediately before being used. They shall be laid in straight courses, parallel with the axis of the sewer, with "push" joints to thoroughly fill every joint with mortar. The mortar to be composed of one (1) part Portland cement and two (2) parts of sand. Joints must be of a uniform thickness as nearly as possible and not exceeding three-eighths (⅜) of one (1) inch. On the inside of the invert the joint shall not exceed one-eighth (⅛) of one (1) inch in thickness and on the sides and on the invert they shall be struck when laid. The upper arch shall be built upon strongly made centers. The crown of the arch shall be thoroughly keyed with stretchers. The centers must not be withdrawn until the mortar is well set. The exterior surface of the upper arch is to be covered with a coat of mortar, not less than three-eighths (⅜) of one (1) inch in thickness. All brick work to be thoroughly bonded. The unfinished ends of all sewers shall be racked back in courses. No "toothing" will be allowed. Slants, of the diameter shown on the plans, to be furnished by the contractor and set where directed at an angle of 45° to the main sewer in a neat and workmanlike manner, to the satisfaction of the City Engineer. Each slant shall be provided with an earthenware stopper.

Back Filling.—The trenches shall be backfilled after the masonry has becomc thoroughly set and hardened and special care must be taken in filling around the sides and to a depth of one (1) foot over the top of the pipe. The earth for this portion of the sewer shall be deposited and thoroughly rammed in layers not exceeding six (6) inches in thickness. In no case are the number of men filling to exceed the number ramming. After the fill has been brought to a depth of one (1) foot over the top of the outside arch, the remainder of the trench may be filled in the ordinary way and thoroughly water settled.

Measurements of each size of pipe or brick sewers constructed will be made on the slope from center to center of manholes.

Payment will include the slants, excavating, sheathing, pumping, back-filling, and all other labor and material necessary for the finished work.

SIDE SEWERS

Side sewers shall be constructed in accordance with the Standard Plans and Specifications for sewers, with the top of side sewer connections at the curb line not more than one (1) foot above the main sewer unless otherwise directed by the City Engineer.

All ends of the side sewers must be marked by a No. 12 galvanized iron wire fastened to the end of the pipe and extending vertically to within six (6) inches of the surface. The end of the wire at the surface shall have a brass tag about 1½"x3" stamped with the word "SEWER" in letters about one-quarter of an inch in height attached to it. Where no parking strip exists between the curb and the concrete walk the letters SS shall be cut or stamped into the top of the concrete walk, directly over the end of the side sewer marker. When the concrete curb is constructed on an improvement calling for side sewers, the top of the curb shall be stamped with the letters S. S.

The end of the side sewer next to the curb must be laid

in open trench and all side sewers shall terminate with wyes at the curb line, pointing up grade. Back filling in the trench or tunnel will not be permitted until the work has been inspected and passed upon by the City Engineer.

Existing side sewers shall be relaid when necessary in the manner provided above for side sewers.

Payment for side sewer markers, marking the concrete walk or curbs and for wyes at the curb line will be included in the price bid per lineal foot for side sewers.

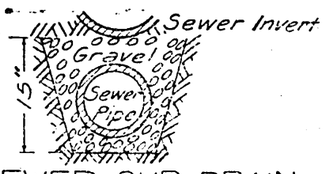
WOODEN BOX SEWERS

All lumber for sides and bottom shall be sized on one side and two edges. The box shall be laid to a true and even grade, well nailed together, practically water tight, with 60d wire nails.

Payment for wooden box sewers will include all excavation.

SUB-DRAINS UNDER SEWER.

A sub-drain shall be constructed of sewer pipe of the size indicated, laid with open joints, and surrounded with gravel. At suitable intervals sumps may be constructed if proper provisions are made to prevent sand and other material from



SEWER SUB DRAIN

running and undermining the adjacent masonry. After the completion of the work, these openings must be filled with concrete or brick work surfaced and finished in the same manner as in the main sewer.

Payment will include all pipe, gravel, and necessary excavation.

MANHOLES

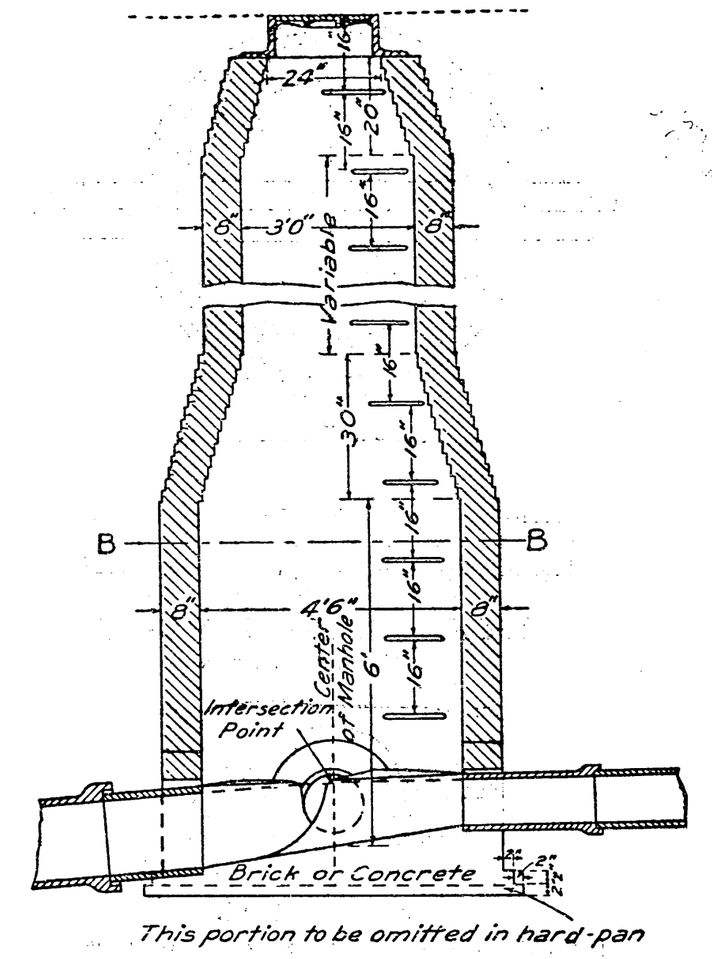
Manholes can be constructed of class "C" brick, concrete or concrete blocks.

The excavations for all manholes and flush tanks shall be sufficient to leave six (6) inches in the clear between their outer surfaces and the bank or timber used to support it. Brick must be wetted just before being used and laid with shove joints, the mortar to be composed of one (1) part Portland cement and three (3) parts sand, and special care shall be taken to see that all joints are well filled. The covers of manholes are to be brought accurately to the grade given. The channels in manholes shall conform accurately to the sewer grade. In the case of pipe sewers, split pipe shall be used for the inverts to these channels where possible. Where a curve or some other condition prevents this, the channel shall be formed of bricks on edge, set in mortar. Brick channels shall be lined with cement mortar, one-quarter (¼) inch thick, mixed one part cement to one part sand, exactly semicircular and of the diameters of the pipes which they connect, tapering uniformly if these be of different sizes.

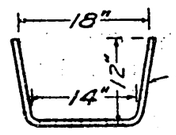
Manholes shall be provided with a cast iron ring and cover, in accordance with the details shown.

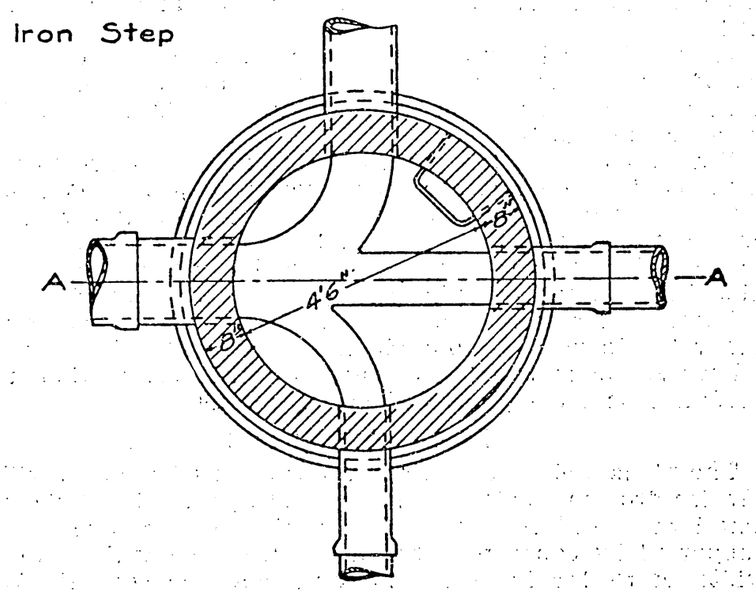
All manhole, catch basin, flush tanks or other covers to chambers beneath sidewalk or pavement shall have an even bearing all around on the frame.

Concrete for base or footing to be composed of one (1) part Portland cement, two (2) parts sand and five (5) parts gravel or broken stone.



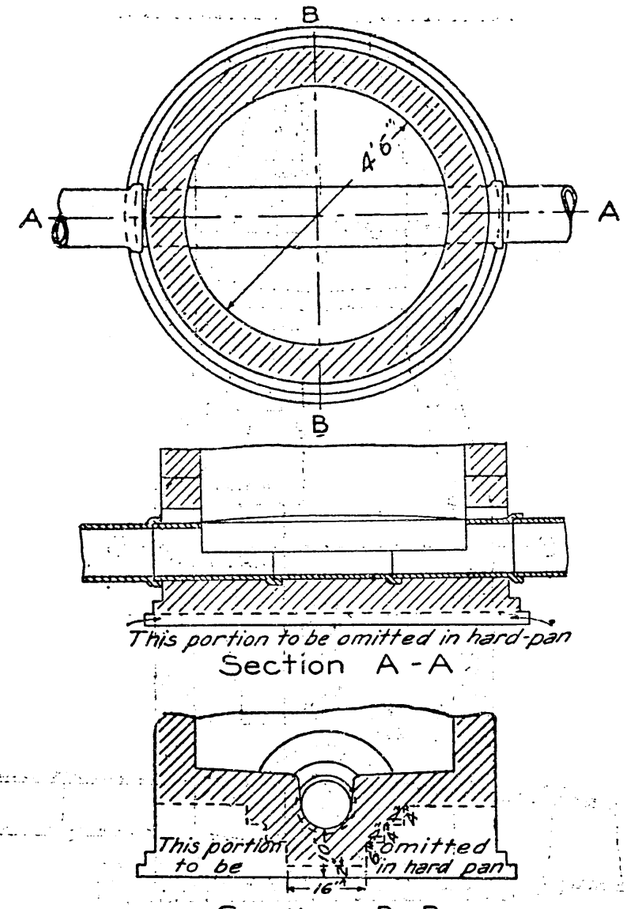
Section A-A





Section B-B

BRICK MANHOLE



BOTTOM OF MANHOLE SHOWING MODIFIED FORM

Where the foundation is in hardpan, the City Engineer may order the modified form of manholes, as indicated by dotted lines on the plan, involving a less amount of excavation and of brick work. A deduction of five dollars ($5.00) from the price bid will be made for each manhole so modified.

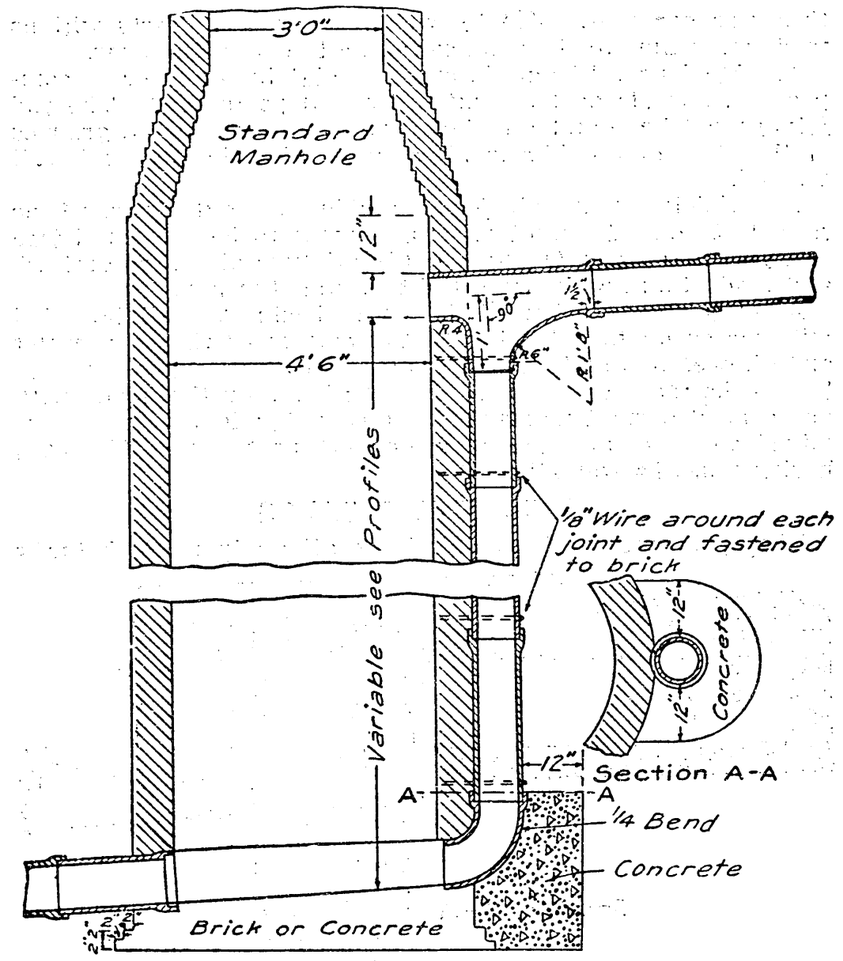
All manholes in ungraded streets must be built to the proposed street grade shown on the plan, and also extended to the surface of the ground as hereinafter provided. (See "Manhole Extensions.")

Where shown on the plan, existing manholes are to be readjusted in such manner as to permit a proper connection for the new sewer, in accordance with the details given. **The** cost of such work, including all labor and material required, to be included in the price bid per linear foot for the completed sewer, and no extra payment will be allowed therefor.

Payment for manholes whether built of brick, concrete or concrete blocks shall include the adjustment of inverts and all work and material necessary for their completion in accordance with the plans and specifications.

DROP MANHOLES

The plans and specifications for standard **Manholes** will apply for drop manholes except as more particularly shown in detail on Standard Plan. The vertical sewer pipe shall be supported by concrete surrounding the pipe with a uniform width of twelve inches. The pipe shall be securely bound



Section

DROP MANHOLE

to the manhole by one-eighth (⅛) inch wire fastened around the pipe and carried through the wall. Where the two spigot ends of the horizontal sewer pipe meet they shall be united by a cement collar of ample size and strength to firmly hold the pipe.

Special care must be taken to hand tamp thoroughly around the vertical pipe.

Payment will include furnishing and placing the vertical sewer pipe above described, concrete blocking, wire, etc. **The** horizontal pipe will be paid for as pipe sewer.

CONCRETE BLOCK MANHOLES AND CATCH BASINS

The contractor has the option of constructing the walls of the manholes and catch basins of concrete blocks if he so desires. The concrete for the blocks shall be composed of one (1) part cement, two and a half (2½) parts sand and five (5) parts gravel. All cement, sand and gravel used to be of the same quality as specified for these materials in the Standard Specifications, and shall be mixed in a manner satisfactory to the City Engineer. Blocks shall be not less than eight (8) inches thick and allowed to set thirty (30) days before bing used. When thoroughly dried and immersed in water for twenty-four hours the blocks shall not absorb more

than five per cent. (5%) by weight of water. Tests will be made from time to time as desired by the City Engineer.

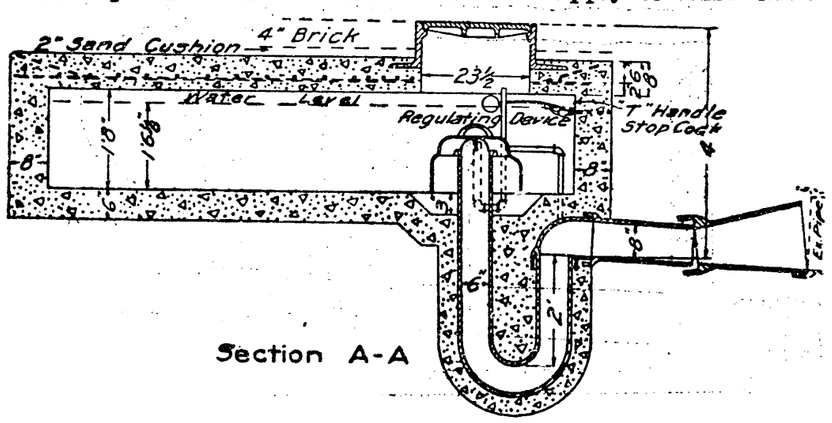
The blocks shall be set in one-half (½) inch of mortar composed of one (1) part cement to two (2) parts sand. The end joints must be completely filled with mortar and the grooves at the ends of the blocks filled flush with the top and well tamped.

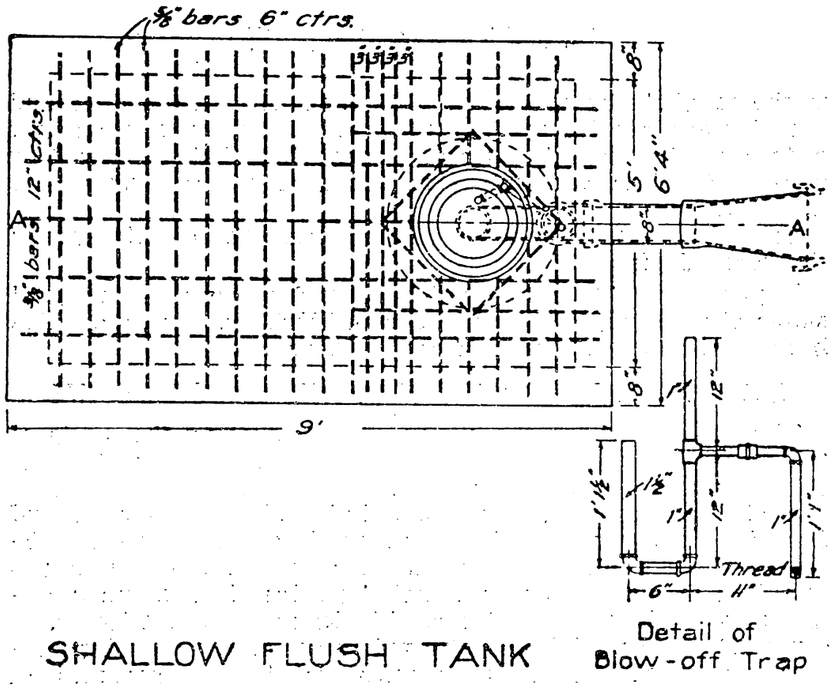
For Catch Basins all joints inside and outside shall be trowel struck. All inlet pipes and traps to be cemented into place with the one (1) to two (2) mixture above prescribed, and made thoroughly watertight around the same.

After the completion of the catch basin it shall be filled with water up to a level with the bottom of the trap outlet and allowed to stand for eight hours. If any leakage develops it must be remedied by plastering the basin on the inside with one coat of cement mortar one-quarter (¼) inch in thickness mixed one (1) part cement to one (1) part sand. All catch basins must be watertight.

BRICK FLUSH TANKS

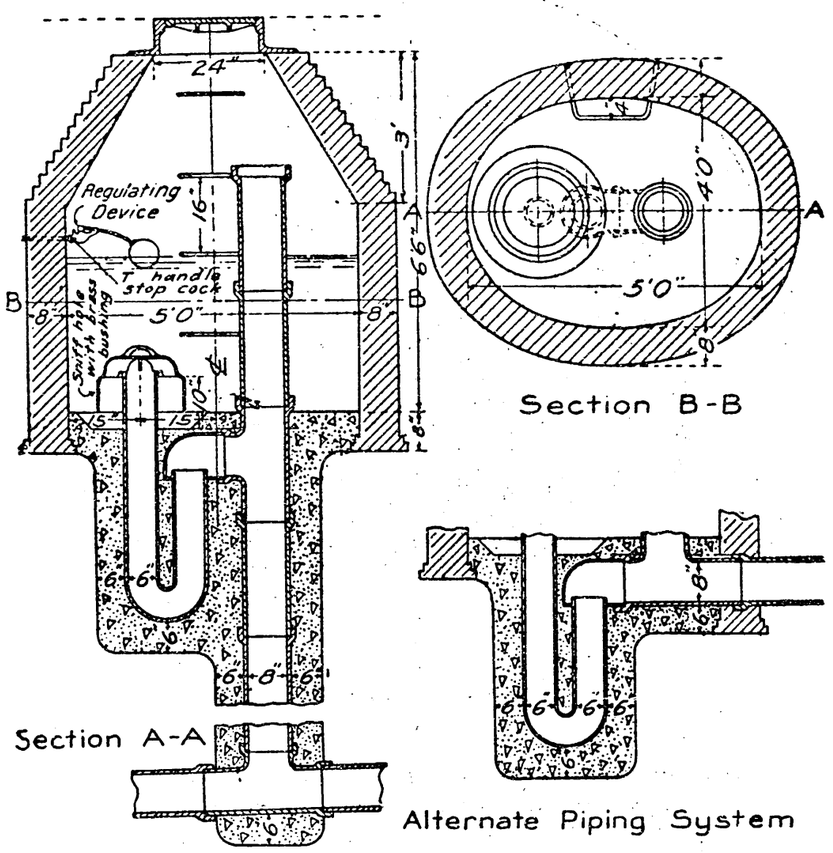
The specifications for manholes shall apply to flush tanks





SHALLOW FLUSH TANK

Detail of Blow-off Trap

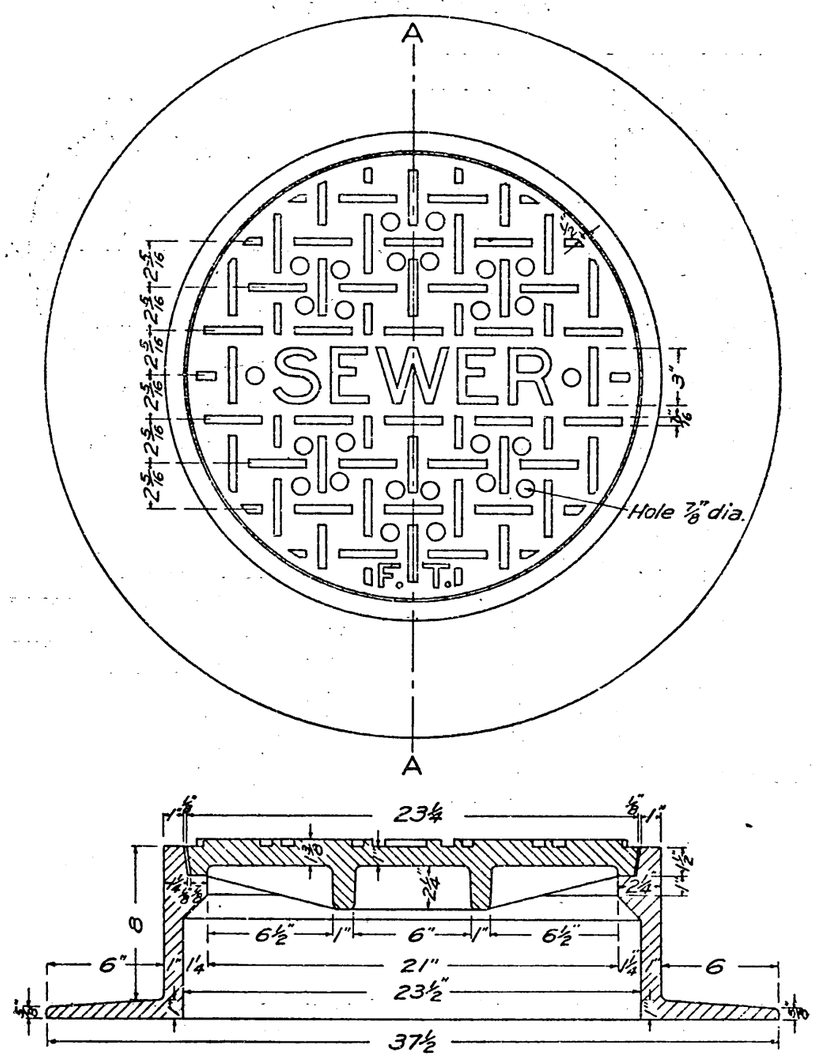


FLUSH TANK

in regard to masonry and general requirements for castings, except that concrete blocks will not be permitted.

Flush tanks shall be plastered on the inside with a coat of cement mortar one-quarter (¼) inch in thickness, mixed one part cement to one part sand. Flushing apparatus to conform to the detail plans. Other designs of flush tanks may be used, provided that detail plans thereof have been submitted to the City Engineer and approved by him. Flush tanks shall be connected to the nearest watermain by a one-half (½) inch galvanized iron pipe. The tap will be furnished by the City Water Department and the contractor shall deposit with said department the sum of eight ($8.00) dollars in payment therefor. The contractor must furnish and place in position a regulating device of a pattern approved by the City Engineer. Where there is no existing watermain, the contractor shall furnish and place in position the regulating device, together with sufficient length of one-half (½) inch galvanized iron pipe to project not less than two (2) feet beyond the tank. He will also be required to deposit with the City Water Department the sum of eight ($8.00) dollars to cover the cost of making the connection when the watermain is laid. A one-half (½) inch rough "T" handle stop cock with nipple for attaching regulating device shall be furnished and set in place. The sniff-hole must be provided with suitable brass bushing.

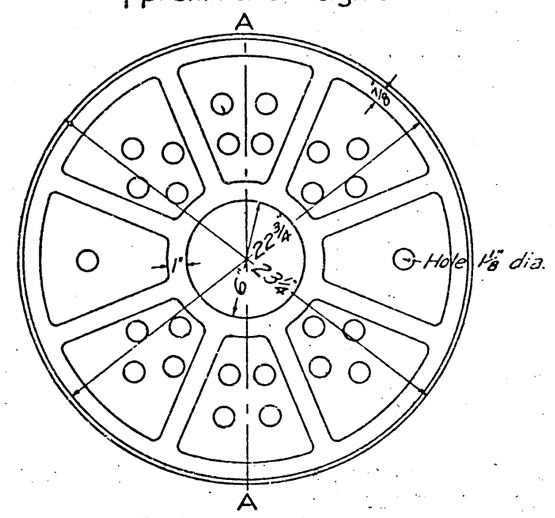
Payment for flush tanks will include the price paid the City Water Department for the tap and the connection to the water main.



Section A-A

Ring	345 lbs.
Cover	153 "
Total	498 "

Approximate Weights



Bottom View

COVER FOR FLUSH TANK

BRICK CATCH BASINS AND INLETS

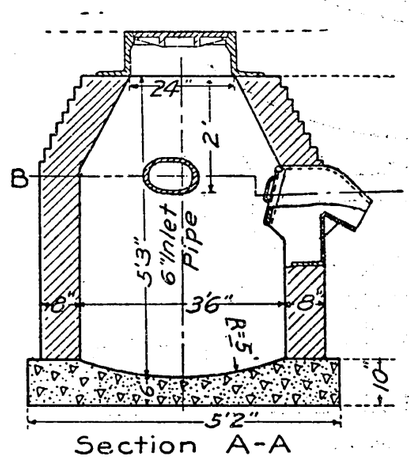
Brick used shall be class C. Catch basins are to be plastered on the inside with a coating of cement mortar, one quarter (¼) of an inch in thickness, mixed one (1) part Portland cement, and one (1) part sand. The brick, brick laying and mortar to correspond to that specified for brick manholes.

The connection made from the catch basin to the sewer is to be located to meet the requirements of the Public Utilities Department of Seattle, as shown by the plans adopted by the Board of Public Works, and on file at the City Engineer's Office.

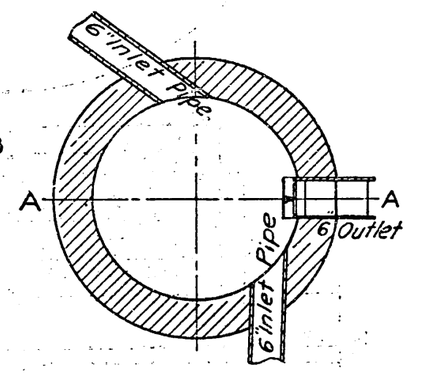
After catch basin connections are made, contractor must in the presence of a representative of the Street and Sewer Department, "rod" all inlet and outlet pipes. Any connections that cannot be successfully rodded shall be removed, and new connections made.

All catch basins to be provided with cast iron frames, covers, inlet gratings and outlet traps as shown on standard plans.

Small pieces of curbs, gutters and lips necessary to piece out shall be included in the price bid for catch basins.

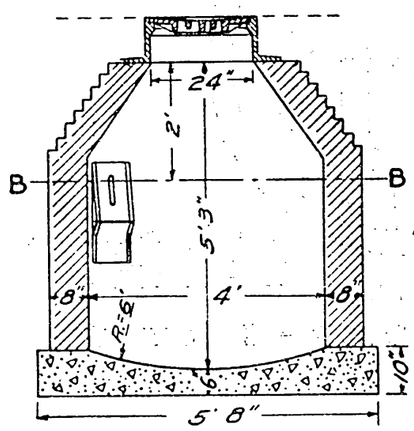


Section A-A

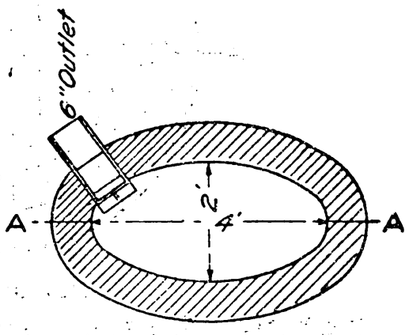


Section B-B

CATCH BASIN

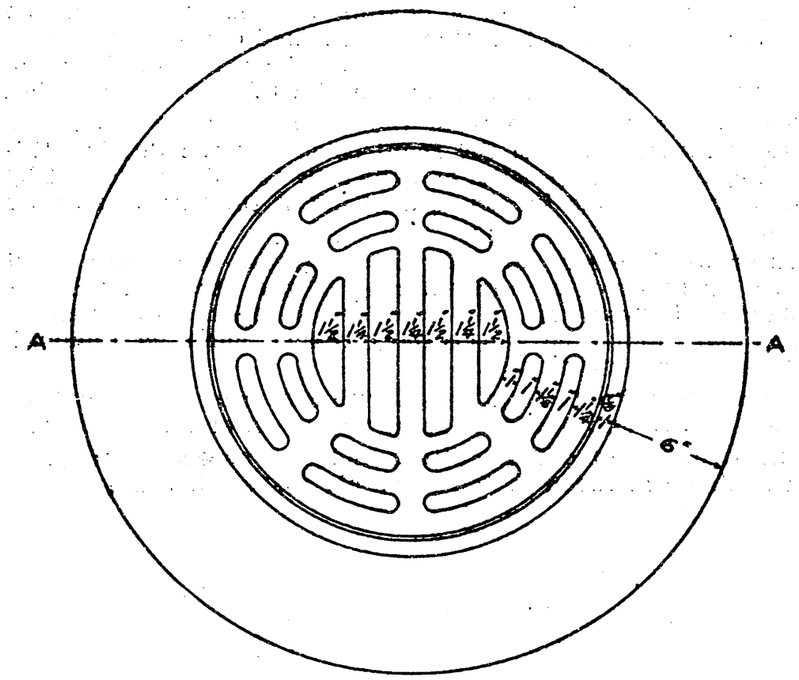


Section A-A

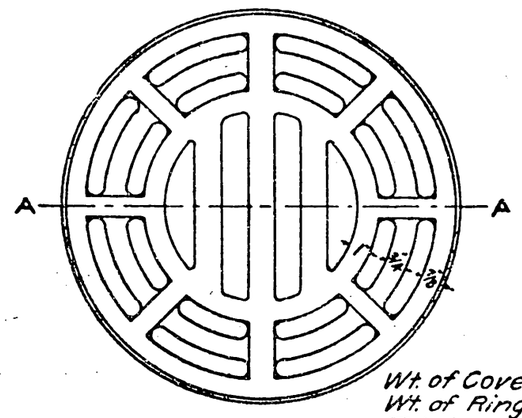


Section B-B

ELLIPTICAL CATCH BASIN



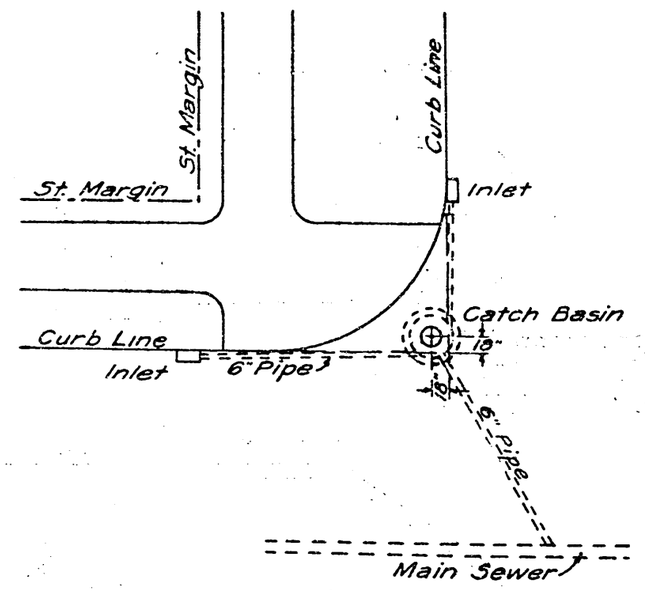
Section A-A



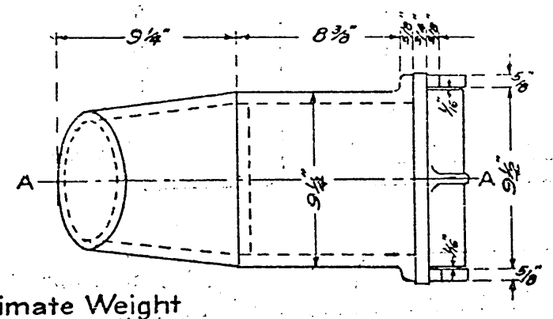
Bottom View

Wt. of Cover..93 lbs.
Wt. of Ring..321 "
Total.....414 "

CATCH BASIN COVER - INLET TOP

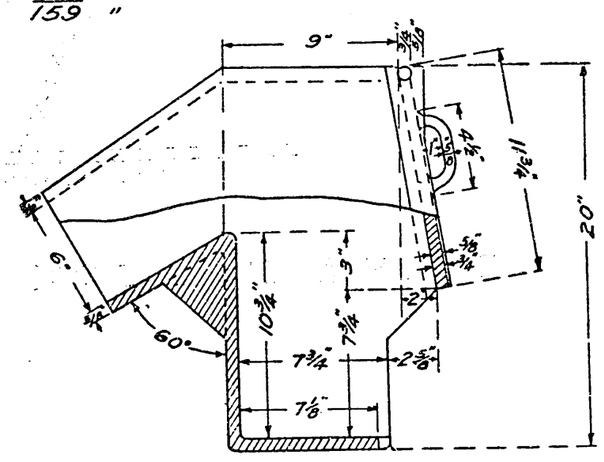


CATCH BASIN LOCATION

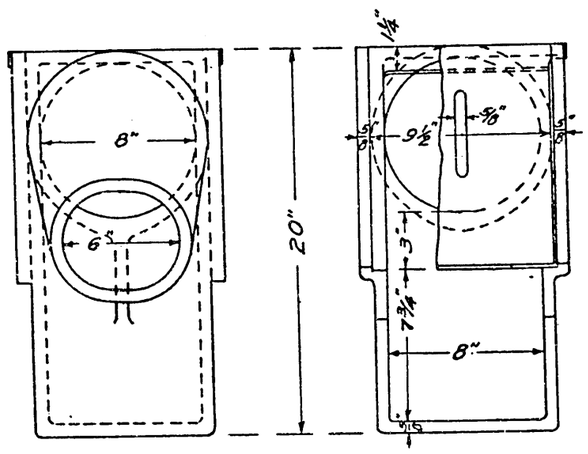


Approximate Weight

Trap	145 lbs.
Door	14 "
Total	159 "



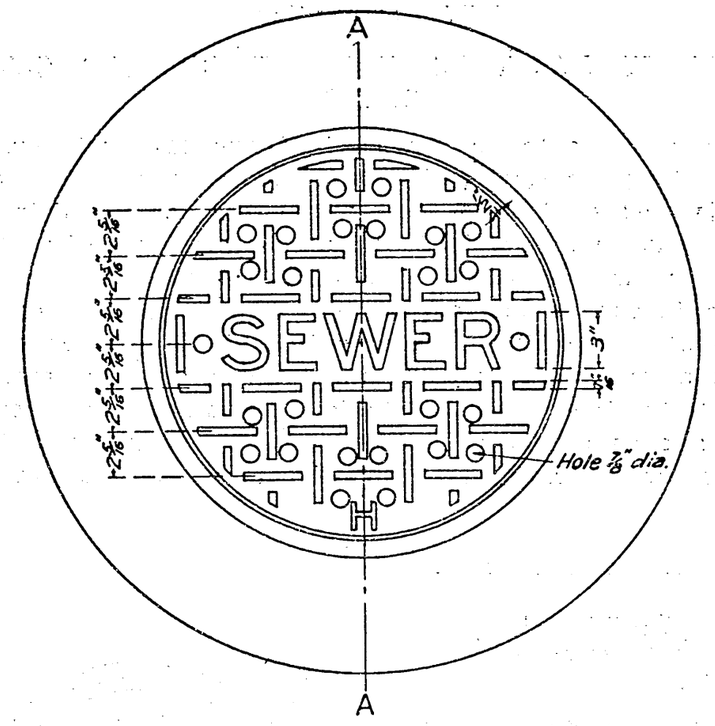
Side View and Section A – A

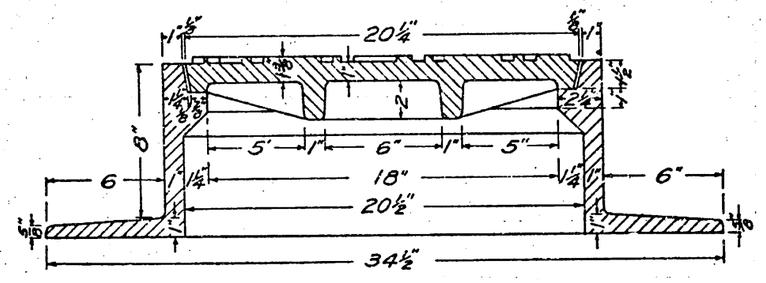


Back View
6" Outlet

Front View

CATCH BASIN TRAP

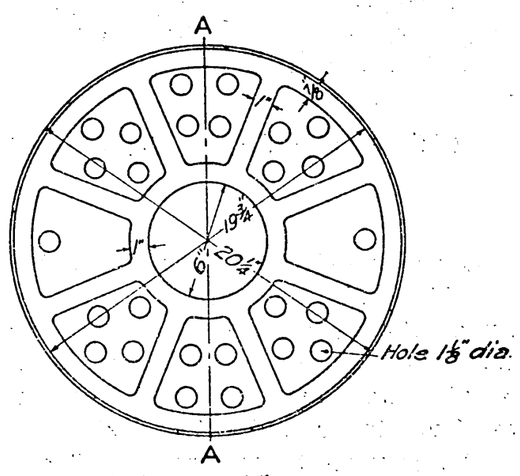




Section A-A

Ring	321 lbs.
Cover	116 "
Total	437 "

Approximate Weights

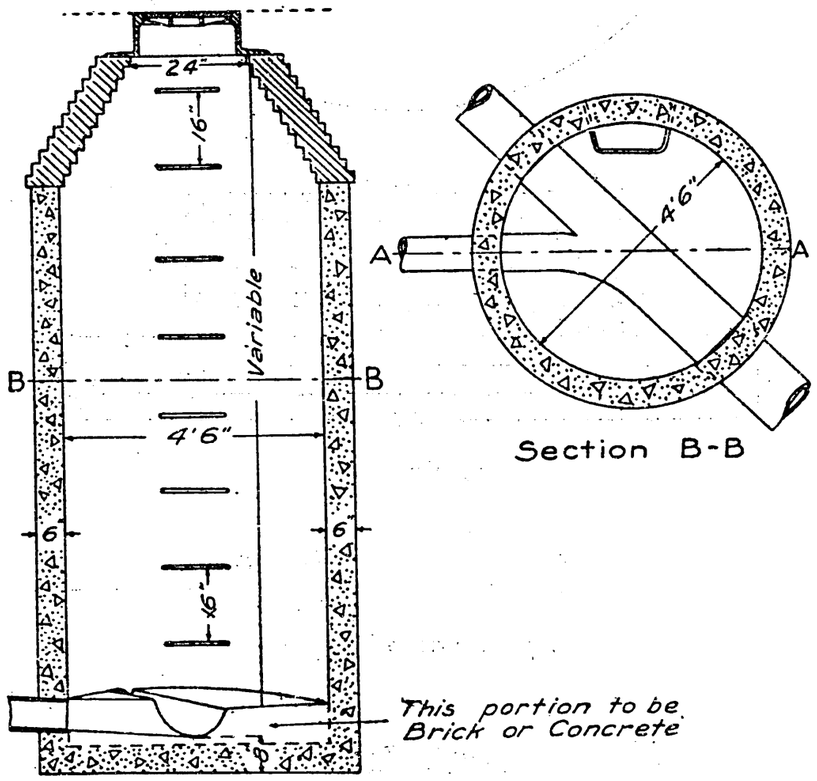


Bottom View

COVER FOR CATCH BASIN & MANHOLE

CONCRETE MANHOLES, FLUSH TANKS AND CATCH BASINS

The concrete to be composed of one (1) part cement, three (3) parts sand and five (5) parts gravel. The materials used shall be of the same quality and mixed in the same manner as specified under concrete sidewalks. The concrete must be mixed wet, poured or shoveled into the forms in such a manner as to prevent separation of the materials. It shall be spaded sufficiently to produce dense concrete, free from air bubbles and having a smooth surface next to the inner form, and be laid continuously in order to form a monolithic mass. All forms must be water-tight. The contractor to provide all forms necessary to construct the

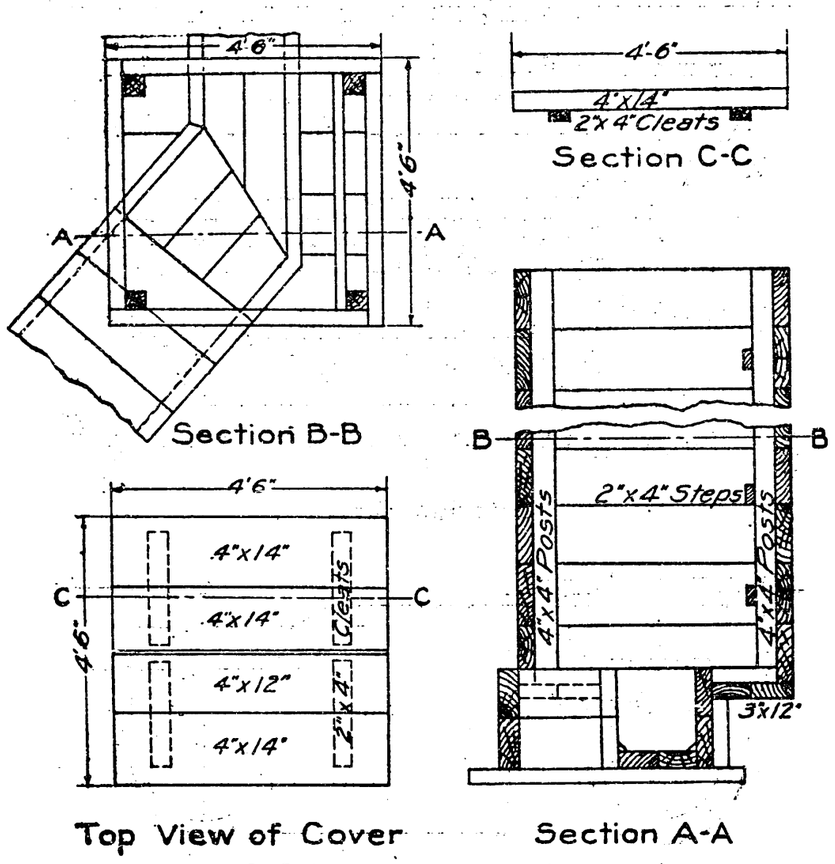


CONCRETE MANHOLE

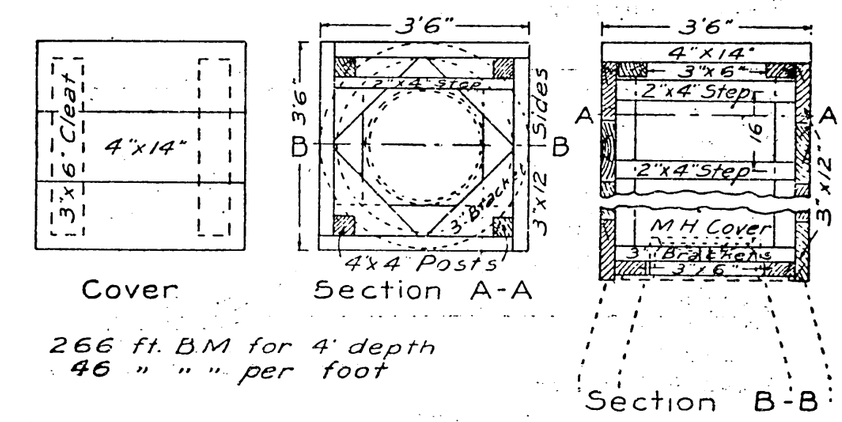
manhole the shape and dimensions given. No filling in around the work will be allowed until the concrete has thoroughly set. Any additional work necessary to construct concrete manholes, flush tanks or catch basins shall be made in accordance with standard plans and specifications for brick manholes, flush tanks and catch basins. The catch basins and flush tanks must be watertight. The necks to be constructed of class C brick, as shown on the detail plan.

WOOD MANHOLES

The lumber for the sides and bottom must be sized on both edges. The box to be well nailed together with 60d wire nails.



WOOD MANHOLE

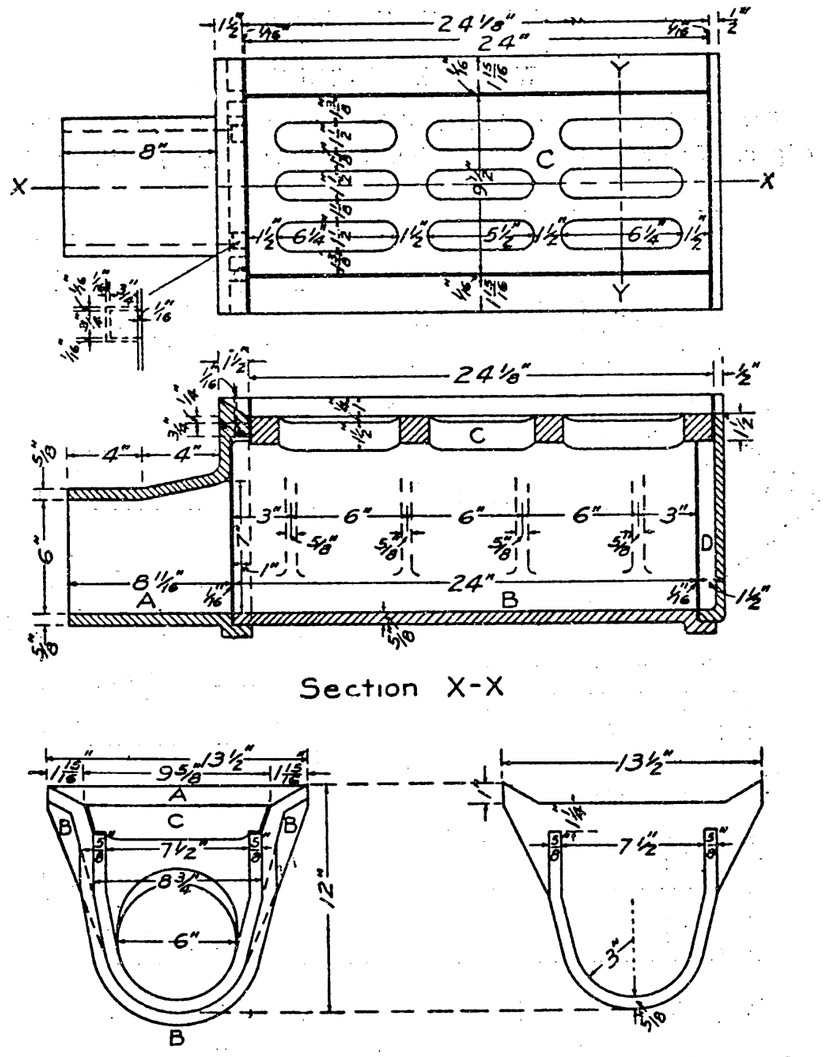


266 ft. B.M for 4' depth
46 " " " per foot

WOOD EXTENSION TO MANHOLE

WOOD MANHOLE EXTENSIONS

In ungraded streets all manholes shall be extended from the proposed street grade to the surface of the ground, as shown on the plan or as directed by the City Engineer, by constructing an extension of wood, which is to be built in all respects in accordance with the detail plans therefor. All edges shall be square.



INLET

REBUILDING MANHOLES, CATCH BASINS, GATE CHAMBERS AND FLUSH TANKS; REBUILDING THEIR TOPS AND ADJUSTING THEIR COVERS

Where shown on the plan or as directed by the City Engineer, the existing manholes, catch basins, gate chambers or flush tanks are to be rebuilt to the new grade, either by tearing down or building up, or both. The contractor can use such of the old material as is suitable and must furnish all new material necessary to construct the manhole, catch basin, gate chamber or flush tank to meet all requirements of the Standard Specifications and Plans of the City of Seattle. Where the change is three brick in height or less, the work will be classified and paid for at the rate bid for "Adjusting M. H., etc., covers." Where the change is more than three brick in height, but does not involve the entire reconstruction of the manhole, catch basin, gate chamber or flush tank, then the work will be classified and paid for at the price bid per lineal foot for "Rebuilding M. H., etc., Tops." Measurement will be taken from top to bottom of new brick work. Where the entire reconstruction of the manhole, catch basin, gate chamber or flush tank is made, the work will be classified and paid for at the price bid each for "Rebuilding manholes, catch basins, gate chambers or flush tanks." The payment made on any of the above items will be in full for all labor and material in the completed work.

MOVING CATCH BASINS

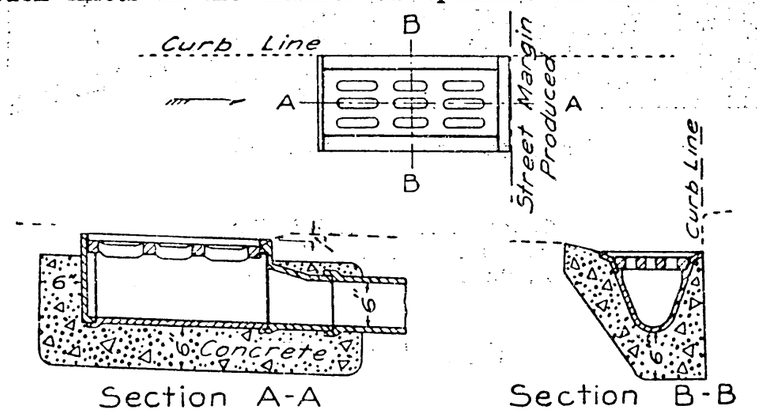
The existing catch basins shall be moved to the position shown. The contractor to furnish all material and make the necessary standard connections and do all required excavating.

INLETS

Inlets shall be set in a neat and workmanlike manner, conforming to the existing curb and gutter, unless otherwise directed by the City Engineer. They must be well bedded in concrete as shown in detail on the plans. When set in pavement, the highest point of the "U" shall be set one (1) inch below the surface of the pavement, care to be taken that the pavement is brought down in order to lead all water quickly into the inlet. The connection from the inlet to the catch basin, whether the inlet is new or existing, shall be made in a straight line and no bends whatever will be allowed, and shall successfully admit of "rodding." The concrete around the inlets to be 1:3:6.

MOVING INLETS

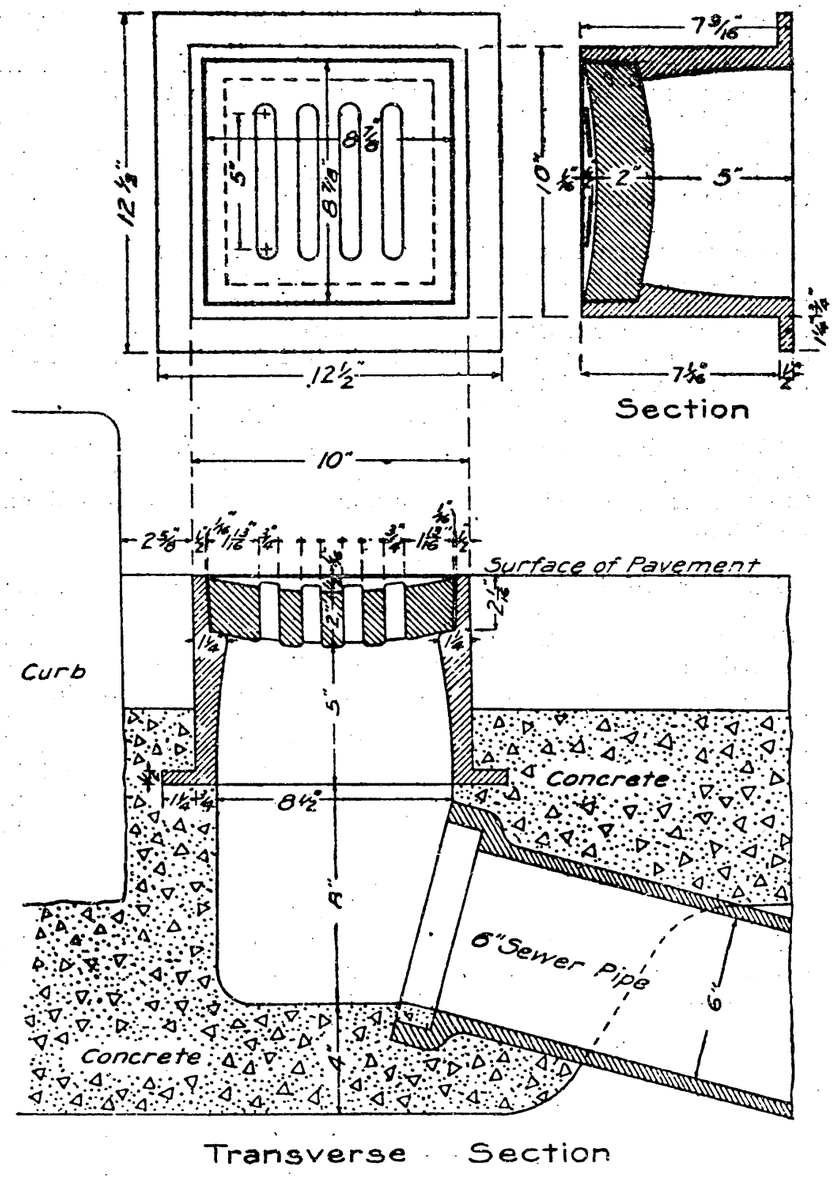
Existing inlets shall be moved to the new positions. The contractor to furnish all new material required and to reset such inlets in the manner as specified for new work.



INLET LOCATION

CURB INLETS

Curb inlets must be set in a neat and workmanlike manner, conforming to the existing curb and gutter unless otherwise directed by the City Engineer. They shall be bedded, as shown in detail on plan, in concrete composed of one part Portland cement, three parts sand and six parts gravel or broken stone. The connection from the inlet to the catch basin to be made in a straight line, and no bends whatever will be allowed.



Cover..... 33 lbs.
Frame..... 65 "
Total..... 98 "

CURB INLET

WATER MAINS

CAST IRON PIPE

Description of Pipes.—The pipes shall be made with hub and spigot joints, and conform accurately to the dimensions given in Tables Nos. 1 and 2 of the Standard Specifications of the American Waterworks Association adopted May 12, 1908. They must be straight and be true circles in section, with their inner and outer surfaces concentric, and of the specified dimensions in outside diameter. The minimum allowable length is 12 feet, exclusive of socket.

Pipes with thickness and weight intermediate between the classes in Table No. 2 shall be made of the same outside diameter as the next heavier class. Pipes with thickness and weight less than shown by Table No. 2 to be made of the same outside diameter as the Class A pipe; and pipes with thickness and weight more than shown by Table No. 2 shall be made of the same outside diameter as the Class D pipe.

All pipes having the same outside diameter shall have the same inside diameter at both ends. The inside diameter of the lighter pipes of each standard outside diameter shall be gradually increased for a distance of about 6 inches from each end of the pipe so as to obtain the required standard thickness and weight for each size and class of pipe.

For pipes of each size from 4-inch to 24-inch inclusive, there shall be two standards of outside diameter, and for pipes from 30-inch to 60-inch inclusive, there shall be four standards of outside diameter, as shown by Table No. 1.

For pipes 4-inch to 12-inch inclusive, one class of special castings shall be furnished, made from Class D pattern. Those having spigot ends shall have outside diameters of spigot ends midway between the two standards of outside diameter as shown by Table No. 1, and be tapered back for a distance of 6 inches.

For pipes from 14-inch to 24-inch inclusive, two classes of special castings shall be furnished; Class B special castings with Classes A and B pipes, and Class D special castings with Classes C and D pipes; the former to have cast on them the letters "AB" and the latter "CD." For pipes 30-inch to 60-inch inclusive, four classes of special castings shall be furnished, one for each class of pipe, and have cast on them the letter of the class to which they belong.

TABLE OF WEIGHTS AND DIMENSIONS

Nominal Inside Diameter of Pipe in Inches	Class	Head in Feet	Thickness of Pipe in Inches	Depth of Lead Joint in Inches	Approximate Weight of Lead in Pounds per Joint	Diameter of Sockets		Depth of Sockets		Actual Outside Diameter of Pipe in Inches	Weight of Pipe in Pounds per 12 Feet Length
						Pipe Inches	Special Casting Inches	Pipe Inches	Special Casting Inches		
4	A	100	.42	2.25	9.00	5.60	5.70	3.50	4.00	4.80	240
4	B	200	.45	2.25		5.80	5.70	3.50	4.00	5.00	260
4	C	300	.48	2.25		5.80	5.70	3.50	4.00	5.00	280
4	D	400	.52	2.25		5.80	5.70	3.50	4.00	5.00	300
6	A	100	.44	2.25	12.00	7.70	7.80	3.50	4.00	6.90	370
6	B	200	.48	2.25		7.90	7.80	3.50	4.00	7.10	400
6	C	300	.51	2.25		7.90	7.80	3.50	4.00	7.10	430
6	D	400	.55	2.25		7.90	7.80	3.50	4.00	7.10	460
8	A	100	.46	2.25	15.00	9.85	10.00	4.00	4.00	9.05	515
8	B	200	.51	2.25		9.85	10.00	4.00	4.00	9.05	570
8	C	300	.56	2.25		10.10	10.00	4.00	4.00	9.30	625
8	D	400	.60	2.25		10.10	10.00	4.00	4.00	9.30	670
10	A	100	.50	2.25	18.00	11.90	12.10	4.00	4.00	11.10	685
10	B	200	.57	2.25		11.90	12.10	4.00	4.00	11.10	765
10	C	300	.62	2.25		12.20	12.10	4.00	4.00	11.40	850
10	D	400	.68	2.25		12.20	12.10	4.00	4.00	11.40	920
12	A	100	.54	2.25	22.00	14.00	14.20	4.00	4.00	13.20	870
12	B	200	.62	2.25		14.00	14.20	4.00	4.00	13.20	985
12	C	300	.68	2.25		14.30	14.20	4.00	4.00	13.50	1100
12	D	400	.75	2.25		14.30	14.20	4.00	4.00	13.50	1200
16	A	100	.60	2.75	42.00	18.40	18.40	4.00	4.00	17.40	1300
16	B	200	.70	2.75		18.40	18.40	4.00	4.00	17.40	1500
16	C	300	.80	2.75		18.80	18.80	4.00	4.00	17.80	1725
16	D	400	.89	2.75		18.80	18.80	4.00	4.00	17.80	1900
20	A	100	.67	2.75	51.00	22.60	22.60	4.00	4.00	21.60	1800
20	B	200	.80	2.75		22.60	22.60	4.00	4.00	21.60	2100
20	C	300	.92	2.75		23.06	23.06	4.00	4.00	22.06	2500
20	D	400	1.03	2.75		23.06	23.06	4.00	4.00	22.06	2750
24	A	100	.76	2.75	61.00	26.80	26.80	4.00	4.00	25.80	2450
24	B	200	.89	2.75		26.80	26.80	4.00	4.00	25.80	2800
24	C	300	1.04	2.75		27.32	27.32	4.00	4.00	26.32	3350
24	D	400	1.16	2.75		27.32	27.32	4.00	4.00	26.32	3680
30	A	100	.88	2.75	75.00	32.74	32.74	4.50	4.50	31.74	3500
30	B	200	1.03	2.75		33.00	33.00	4.50	4.50	32.00	4000
30	C	300	1.20	2.75		33.40	33.40	4.50	4.50	32.40	4800
30	D	400	1.37	2.75		33.74	33.74	4.50	4.50	32.74	5400

Allowable Variation in Diameter of Pipes and Sockets.—Especial care must be taken to have the sockets of the required size. The sockets and spigots will be tested by circular gauges, and no pipe will be received which is defective in joint room, from any cause. The diameters of the sockets and the outside diameters of the spigot ends of the pipes shall not vary from the standard dimensions by more than .06 of an inch for pipes 16 inches or less in diameter; .08 of an inch for 18-inch, 20-inch and 24-inch pipes; .10 of an inch for 30-inch, 36-inch and 42-inch pipes; .12 of an inch for 48-inch, and .15 of an inch for 54-inch and 60-inch pipes.

Allowable Variation in Thickness.—For pipes whose standard thickness is less than 1 inch, the thickness of metal in the body of the pipe shall not be more than .08 of an inch less than the standard thickness, and for pipes whose standard thickness is 1 inch or more, the variation shall not exceed .10 of an inch, except that for spaces not exceeding 8 inches in length in any direction, variations from the standard thickness of .02 of an inch in excess of the allowance above given will be permitted.

For special castings of standard patterns a variation of 50 per cent. greater than allowed for straight pipes will be permitted.

Defective Spigots May Be Cut.—Defective spigot ends on pipes 12 inches or more in diameter may be cut off in a lathe and a half-round wrought-iron band shrunk into a groove cut in the end of the pipe. Not more than 12 per cent. of the total number of accepted pipes of each size shall be cut and banded, no pipe to be banded which is less than 11 feet in length, exclusive of the stocket.

In case the length of a pipe differs from 12 feet, the standard weight of the pipe given in Table No. 2 is to be modified in accordance therewith.

Special Castings.—All special castings shall be made in accordance with the Standard Specifications of the American Waterworks Association adopted May 12, 1908, unless special details for same are furnished.

The diameters of the sockets and the external diameters of the spigot ends of the special castings shall not vary from the standard dimensions by more than .12 of an inch for castings 16 inches or less in diameter; .15 of an inch for 18-inch, 20-inch and 24-inch; .20 of an inch for 30-inch, 36-inch and 42-inch, and .24 of an inch for 48-inch, 54-inch and 60-inch.

When plugs are used they shall be furnished with yokes, put on in a manner satisfactory to the City Engineer. All plugs except those used in hydrant tees are to be tapped and provided with a four-inch screw plug, the latter to be coated with steam-fitters' cement before being inserted.

The drilling and size of bolts for all flanged fittings unless otherwise noted on the drawings must conform to the standard drilling given in the tables adopted in August, 1894, and supplemented in 1901 by the American Society of Mechanical Engineers and the Master Steam and Hot Water Fitters' Association.

TABLE OF FLANGE DRILLINGS

Note.—These dimensions are good for all pressures up to and including 200 pounds per square inch. Diameters of bolt holes are to be ⅛ inch larger than diameter of bolts. Bolts to have hexagon heads and nuts. All flanges to be plain face and machined.

Inside Diameter of Pipe in Inches	Diameter of Flange in in Inches	Thickness of Flange in in Inches	Diameter of Bolt Circle in Inches	Number of Bolts	Diameter of Bolts in Inches	Length of Bolts in Inches
4	9	11/16	7½	8	⅝	2¾
5	10	11/16	8½	8	¾	3
6	11	1	9½	8	¾	3
8	13½	1⅛	11¾	8	¾	3½
10	16	1 3/16	14¼	12	⅞	3¾
12	19	1¼	17	12	⅞	3¾
16	23½	1 5/16	21¼	16	1	4½
20	27½	1 11/16	25	20	1⅛	5
24	32	1⅞	29½	20	1¼	5½
30	38¾	2⅛	36	28	1⅜	6¼
36	45¾	2⅜	42¾	32	1⅜	6½
42	52¾	2⅝	49½	36	1½	7¼

Payment for special castings will be made as noted under payment for cast iron pipe. In case any special castings are required which are not included in the original bill of material they will be paid for as bid per pound in place. In the case of flanged special castings such payments will include all necessary gaskets, bolts and machine work.

Marking.—Every pipe and special casting shall have distinctly cast upon it the initials of the maker's name. When cast especially to order, each pipe larger than 4-inch may also have cast upon it figures showing the year in which it was cast and a number signifying the order in point of time in which it was cast, the figures denoting the year being above and the number below, thus:

1913	1913	1913
1	2	3

The letters and figures shall be cast on the outside and be not less than 2 inches in length and ⅛ of an inch in relief for pipes 8 inches in diameter and larger. For smaller sizes of pipes the letters may be 1 inch in length. The weight and the class letter shall be conspicuously painted in white on the inside of each pipe and special casting after the coating has become hard.

Allowable Percentage of Variation in Weight.—No pipe will be accepted the weight of which is less than the standard weight by more than 5 per cent. for pipes 16 inches or less in diameter, and 4 per cent. for pipes more than 16 inches in diameter, and no excess above the standard weight of more than the given percentage for the several sizes will be paid for.

No special casting will be accepted the weight of which is less than the specified weight by more than 10 per cent. for pipes 12 inches or less in diameter, and 8 per cent. for larger sizes, except that curves, Y pieces and breeches pipe may be 12 per cent. below the standard weight, and when castings are paid for by the pound no excess above the standard weight of more than the above percentages for the several sizes will be paid for.

Quality of Iron.—All pipes and special castings shall be made of cast iron of good quality, and of such character as will make the metal of the castings strong, tough and of even grain, and soft enough to satisfactorily admit of drilling and cutting. The metal must be made without any admixture of cinder iron or other inferior metal, and shall be remelted in a cupola or air furnace.

The City Engineer reserves the right to make and break three bars from each heat or run of metal, and the test shall be based upon the average results of the three bars. Should the dimensions of the three bars differ from those given below, a proper allowance therefor will be made in the results of the tests.

Tests of Material.—Specimen bars of the metal used, each being twenty-six inches long by two inches wide and one inch thick, shall be made without charge as often as the engineer may direct, and in default of definite instructions, the contractor will be required to make and test at least one bar from each heat or run of metal. The bars when placed flatwise upon supports twenty-four inches apart, and loaded in the center, shall support a load of 2,000 pounds, and show a deflection of not less than .30 of an inch before breaking; or, if preferred, tensile bars shall be made which will show a breaking point of not less than 20,000 pounds per square inch.

Casting of Pipe.—The straight pipes shall be cast in dry sand molds in a vertical position, with the hub end down.

The pipes must not be stripped or taken from the pit while showing color of heat, but shall be left in the flasks for a sufficient length of time to prevent unequal contraction by subsequent exposure.

Quality of Castings.—The pipes and special castings shall be smooth, free from scales, lumps, blisters, sand holes and defects of every nature which unfit them for the use for which they are intended. No plugging or filling will be allowed.

Cleaning and Inspection.—All pipes and special castings must be thoroughly cleaned and subjected to a careful hammer inspection and not coated unless entirely clean and free from rust, and approved in these respects by the engineer immediately before being dipped.

Coating.—Every pipe and special casting must be coated inside and out with coal-tar pitch varnish, the varnish to be made from coal tar. To this material sufficient oil shall be added to make a smooth coating, tough and tenacious when cold, and not brittle or with any tendency to scale off.

Each casting shall be heated to a temperature of 300° F. immediately before it is dipped and shall possess not less than this temperature at the time it is put in the vat. The ovens in which the pipes are heated shall be so arranged that all portions of the pipe shall be heated to an even temperature. Each casting shall remain in the bath at least five minutes.

The varnish shall be heated to a temperature of 300° F. (or less if the engineer shall so order) and shall be maintained at this temperature during the time the casting is immersed.

Fresh pitch and oil shall be added when necessary to keep the mixture at the proper consistency and the vat shall be emptied of its contents and refilled with fresh pitch when deemed necessary by the engineer. After being coated the pipe shall be carefully drained of the surplus varnish. Any pipe or special casting that is to be recoated shall first be thoroughly scraped and cleansed.

Hydrostatic Test.—When the coating has become hard, the straight pipes shall be subjected to a proof by hydrostatic pressure and if required by the engineer, they must also be subjected to a hammer test under this pressure.

The pressure to which the different sizes and classes of pipes shall be subjected are as follows:

	20-inch Diameter and Larger Pounds per square inch	Less than 20-inch Diameter Pounds per square inch
Class A pipe	150	300
Class B pipe	200	300
Class C pipe	250	300
Class D pipe	300	300

Weighing.—The pipes and special castings shall be weighed for payment after the application of the coal-tar pitch varnish. If desired by the engineer, the special castings shall be weighed after their delivery, the weights so ascertained to be used in the final settlement.

Castings to Be Delivered Sound and Perfect.—All the pipes and other castings must be delivered in all respects sound and conformable to these specifications. The inspection will

not relieve the contractor of any of his obligations in this respect, and any defective pipes or other castings which may have passed at the works or elsewhere shall be at all times liable to rejection when discovered. Care must be taken in handling the pipes not to injure the coating, and no pipes or other material of any kind shall be placed in the pipes during transportation or at any time after they have received the coating.

Lead.—All lead used for caulking of watermain joints and for any other purpose shall be piglead of quality equal to that commercially known as Selby lead. It must show on analysis not less than 99½ per cent of metallic lead.

Oakum.—The oakum to be used on all watermain work must be of fine, long, uniform fibre and equal in quality to that commercially known as U. S. Navy Oakum.

Alignments and Grades.—Alignments and grades will be given from hubs driven into the ground parallel with the line of pipe. In graded streets grades may be taken, when directed, from the existing curbs. The top of the pipe shall be at the following depths below the curb elevations, measured to the barrel of the pipe:

For six (6) inch and eight (8) inch pipe, thirty-five (35) inches; for ten (10) inch pipe, forty (40) inches; for twelve (12) inch pipe, forty-three (43) inches; and for all larger sizes up to thirty (30) inch pipe, inclusive, thirty-six (36) inches. Where one side of street is higher than the other, due allowance shall be made to secure proper cover.

In ungraded streets the pipe shall be laid in conformity with the grades shown on the profile, and no allowance will be made for extra excavation beyond the price bid per linear foot of pipe in place. The pipe must conform accurately to the alignment and grades given.

Gate valves, hydrants, standard specials and special castings shall be set as shown on the plan, or as directed by the City Engineer.

Trenching.—Trenches for the pipe shall be opened in accordance with the lines and grades given, and in such order as may be directed. They must be of sufficient width to give convenient access to the pipes for caulking the joints and packing the earth under and about the pipes. Wherever water occurs in the bottom of the trench it shall be sufficiently drawn off, at contractor's expense, to obtain a firm basis for the pipes, and to admit of the caulking being properly performed.

Wherever the pipe is to be laid on a fill, such fills shall be made of proper material and of such dimensions as to be not less than eighteen inches in depth over the top of the pipe, and four feet in width on top of the fill, with proper side slopes. The fills must be properly compacted by tamping or otherwise, as may be directed by the City Engineer, before laying the pipe. The cost of such filling to be included in the price bid per linear foot for the pipe complete. Any culverts or box drains which may be necessary through fills are to be constructed in accordance with the details shown on the plans, or the direction of the City Engineer. Such work will be paid for at the prices bid therefor as stated on the bid blanks for this improvement.

All parts of stumps that are within four (4) feet of the pipe must be totally removed. Boulders or rocks must be removed to the width of the trench before the water main is laid, the cost of such removal to be included in the price per linear foot of water main laid.

Wherever paving, macadam, planking, etc., have to be disturbed to permit the contractor to lay the pipe, the con-

tractor shall remove it and place it in as good condition as when disturbed. The relaying of all paving shall be subject to the provisions of Ordinances Nos. 17313 and 25150. The cost of relaying all paving, macadam, planking, etc., to be included in the price bid per foot of pipe laid in place.

Laying Pipe.—After the trenches are completed to the required depth, the spigots of the pipe shall be so adjusted as to give uniform space all around, and if any pipe does not allow sufficient space it must be replaced by one of the proper dimensions. The joint shall at all times be not less in thickness and depth than shown in the foregoing table of weights and dimensions. Gaskets of clean, sound hemp yarn or oakum braided or twisted and tightly drawn, must be used to pack these joints.

Jointing.—Before running the lead, the joints shall be carefully wiped out to make them clean and dry. The joint must be run full at one pouring, and the melting pot shall be kept within fifty (50) feet of the joint about to be poured. The joint shall be caulked by competent mechanics; the caulking to be faithfully executed and in such manner as to secure a tight joint without over-straining the iron of the hub. The lead, after being caulked, to be flush with the face of the socket. The bell hole shall be perfectly free from water while joint is being prepared.

The pipes and all other castings must be carefully swept out and cleaned, as they are laid, of any earth or rubbish which may have found place inside during or before the operation of laying. Every open end of a pipe shall be plugged before leaving the work for the night.

Whenever it is discovered that a lead joint is less in depth than required by these specifications, the contractor will be required, at his own expense, to drill, cut out, or otherwise remove the lead from any or all joints desired, until the City Engineer is satisfied that all shallow joints have been discovered. All joints deficient in lead depth must then be cleared of lead and yarning, re-yarned the depth required by these specifications, leaded and caulked as required; all at the contractor's expense.

Back Filling.—In refilling the trenches, the earth filled into the bottom of the trench, under and to the top of the pipes and other castings, shall be free from stones and carefully packed and well rammed with proper tools for the purpose. Special care must be taken in ramming not to injure the coating of the pipe.

Care shall be taken to give the pipe a solid bearing throughout its entire length. The earth filling above the pipes to be sufficiently packed and rammed to prevent after settlement, and the material used shall be free from large stones. The trenches shall, in all cases, be refilled with the material furnished by their excavation, provided that it be of proper quality. In lieu of ramming, the trenches may be thoroughly water settled.

The City Water Department will charge the contractor for city water used in settling earth at the rate of $1.40 for every 100 cubic yards of material water settled. The contractor will be required to furnish all hose and other implements necessary for said water settling. The City Inspector in charge of the work will be authorized to open and close the hydrants without cost to the contractor, provided that any damages resulting to the city hydrants while in use for the purpose of water settling will be repaired by the City Water Department, and the cost of said repairs will be deducted in the contractor's final estimate. Any hose, pipe or other utilities belonging the the City Water Department,

and any labor furnished by the City Water Department in connection with the water setting, will be charged to the contractor in the final estimate.

Field Tests.—As soon as any section of pipe between any two gate valves is laid or when directed by the City Engineer, the same shall be tested by hydraulic pressure. The pressure shall be brought up to three hundred (300) pounds per square inch for four (4) inch, six (6) inch and eight (8) inch pipes; two hundred seventy-five (275) pounds per square inch for ten (10) inch pipe; two hundred fifty (250) pounds per square inch for twelve (12) inch pipe; two hundred twenty-five (225) pounds per square inch for sixteen (16) inch pipe; and two hundred (200) pounds per square inch for all larger sizes, and while under this pressure each pipe shall be thoroughly hammer tested from end to end. Any pipe which exhibits any defects must be taken out and replaced by a sound pipe. All pumps, gauges and other appliances used in making this test shall be furnished by the contractor, but the City reserves the right to test and approve all gauges used. If, after any portion of the trench is refilled and before the final release of contract, any defects appear, the contractor must, at his own expense, re-excavate such portion in order to make good said defects.

Measurements.—Measurements for the estimate of pipe will be taken along the top of the pipe in a vertical plane passing through its axis; including all gate valves and standard specials, but omitting all special castings.

Payment for cast iron pipe will be in full for furnishing and laying the pipe, and all special castings shown on the plans, and shall also include all trenching, jointing, backfilling, restoring the street surface, relaying of paving or planking, and all other material and labor necessary for the completed work. In case any such special castings as shown on the plan are omitted in the work, a corresponding reduction will be made from the estimate. Any excavation above that shown on the profiles or specified above, under "Alignment and Grades," which may be ordered by the City Engineer, will be paid for at the rate bid for "Extra Excavation" per cubic yard.

GALVANIZED IRON PIPE

The pipe shall be standard size, guaranteed wrought iron pipe, galvanized, full weight, and equivalent in quality in every respect to the pipe manufactured by A. M. Byers & Co., Pittsburg. All pipe above 1¼ inch internal diameter must be lap welded. All pipe less than and including 1¼ inch inside diameter may be butt welded. No steel pipe will be accepted. The weights must not vary more than 5 per cent. from the weights given in the following table:

For	½	in. inside diam., wt. per ft.	.84 lbs.
For	¾	in. inside diam., wt. per ft.	1.12 lbs.
For	1	in. inside diam., wt. per ft.	1.67 lbs.
For	2	in. inside diam., wt per ft.	3.66 lbs.
For	2½	in. inside diam., wt. per ft.	5.77 lbs.
For	3	in. inside diam., wt. per ft.	7.54 lbs.
For	3½	in. inside diam., wt. per ft.	9.05 lbs.
For	4	in. inside diam., wt. per ft.	10.72 lbs.

Connections shall be made to the main pipe line by means of a standard water pipe clamp with threaded outlet. When possible connection is to be made to the main line at a tapped plug. All threads of screw connections are to be unbroken and cut full depth. Before connections are made threads must be well covered with steamfitters' cement. The pipe

is to be laid with a cover of not less than two (2) feet. All galvanized iron pipe when laid shall be tested by hydraulic pressure to 300 lbs. per square inch.

Payment for galvanized iron pipe will include all trenching and filling, necessary bushings, clamps, fittings and all labor necessary to place in position.

GATE VALVES

All gate valves shall be iron-bodied, bronze-mounted, two-faced, wedge valves of some standard make.

If the contractor proposes to use a make or type of some make not already approved by the City Engineer, a sample, and if required, detail plans of such valves must be submitted to the City Engineer for approval. Such approval, however, will in no way release the contractor from obligations prescribed by these specifications for any defects in construction of mechanism or materials.

Valves and seat rings shall be of composition metal, and valve stems of phosphor bronze, of some approved proportions. All valves must satisfactorily stand a pressure of 300 pounds per square inch, both when closed and open, and the contractor will be required to furnish a certificate of such test for each valve used. All valves, except by-pass valves, shall stand erect unless otherwise shown. By-pass valves shall lie on their sides. All valves must be provided with a nut for a wrench and shall open by turning to the left, and have an arrow indicating the direction of opening.

All gate valves having a larger diameter than fourteen (14) inches, shall be provided with a bevel gear and from two (2) to four (4) inch by-pass, according to the diameter used.

After gate valves are delivered on the ground but before being placed in the line they must be cleaned and thoroughly painted with P. & B. paint.

Payment for gate valves will include the cost of the valves, together with all material and labor necessary for setting in place.

DISTRICT GATE VALVES

At any point of the system where two services come together a district valve is placed to connect or disconnect said services by opening or closing the valve.

District valves must be provided with a shackle consisting of a chain and a steel socket fitting over the operating nut. The chain must have links so shaped that a lock may be inserted between any two. This shackle when locked in place must prevent the placing and operating with a gate key.

BRICK VALVE CHAMBERS

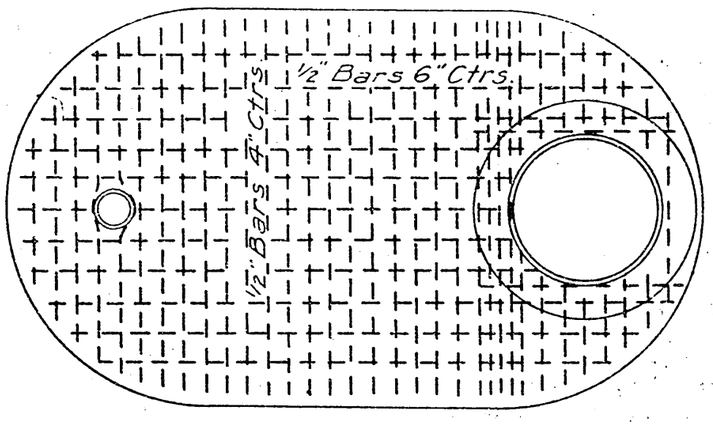
Where shown on the plans, or where directed by the City Engineer, gate valves shall be enclosed in brick chambers provided with a cast iron frame and cover, as shown on standard detail plans.

When directed by the City Engineer, valve chambers are to be connected to the sewer, or other suitable outlet, by a four-inch sewer pipe drain, the labor and material for which shall conform in all respects to the standard city specifications for pipe sewers.

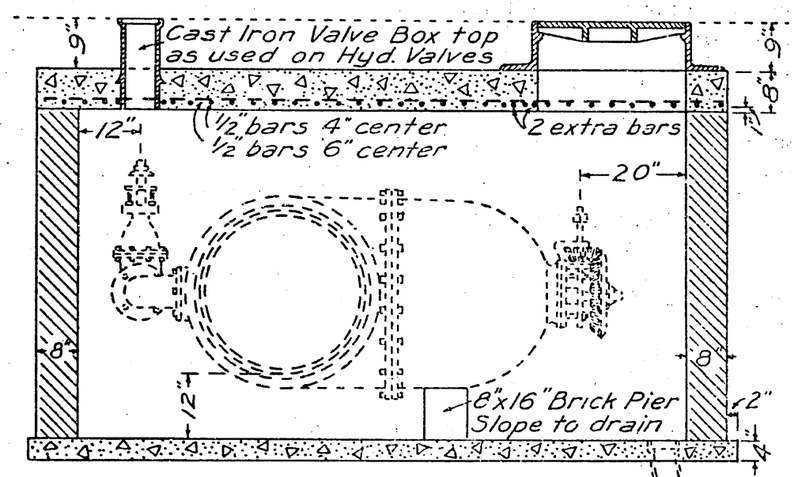
The brick used shall be of Class C, and laid in Portland cement mortar, mixed three (3) parts by volume of clean sand to one (1) part by volume of cement.

The concrete to be used in the base and cover is specified elsewhere in these specifications under the heading "Concrete."

(Continued on page 70)

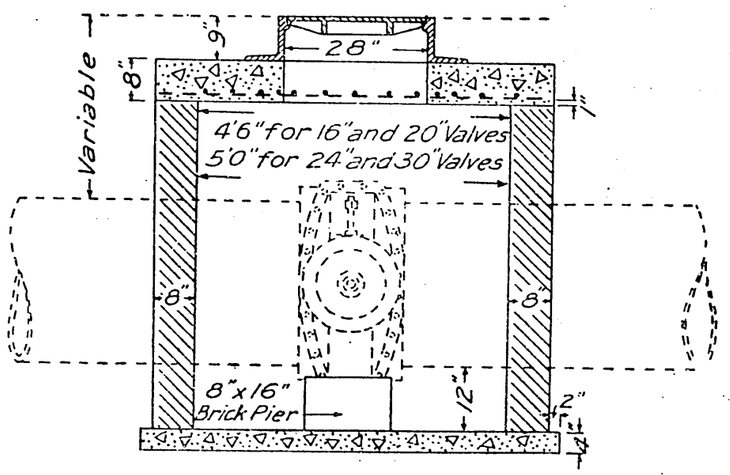


Top View



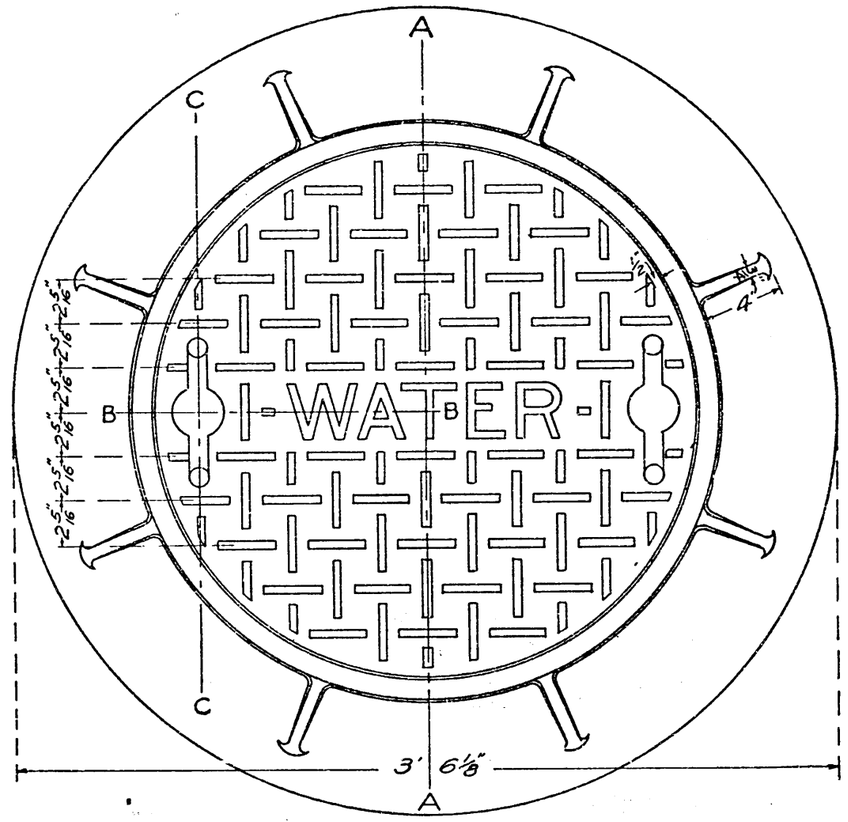
4" Sewer Pipe to Sewer not included with chamber

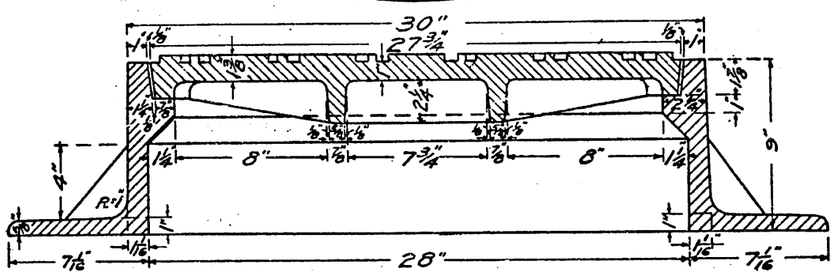
Longitudinal Section

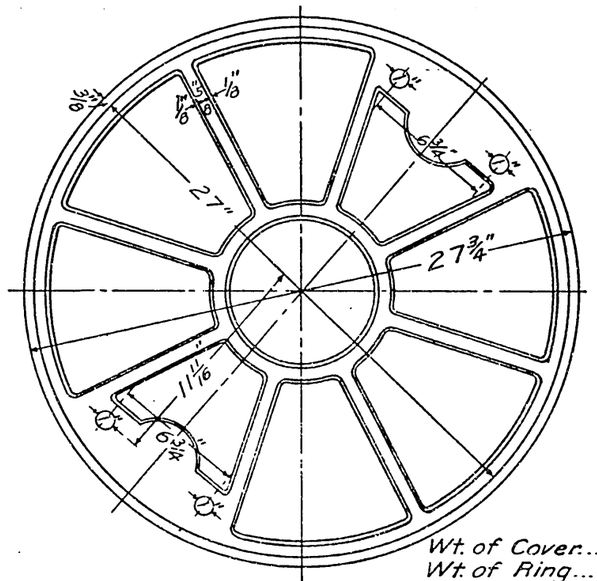


Cross Section

LARGE BRICK VALVE CHAMBER



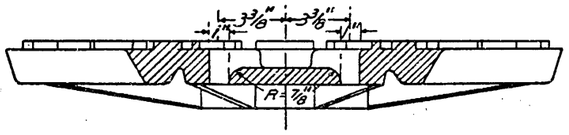




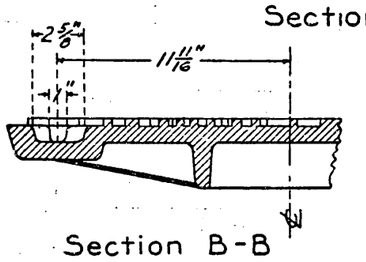
Wt. of Cover...217 lb
Wt. of Ring....440 "
Total.....657 "

Bottom View

VALVE CHAMBER COVER (LARGE)



Section C-C



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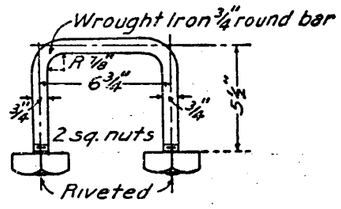
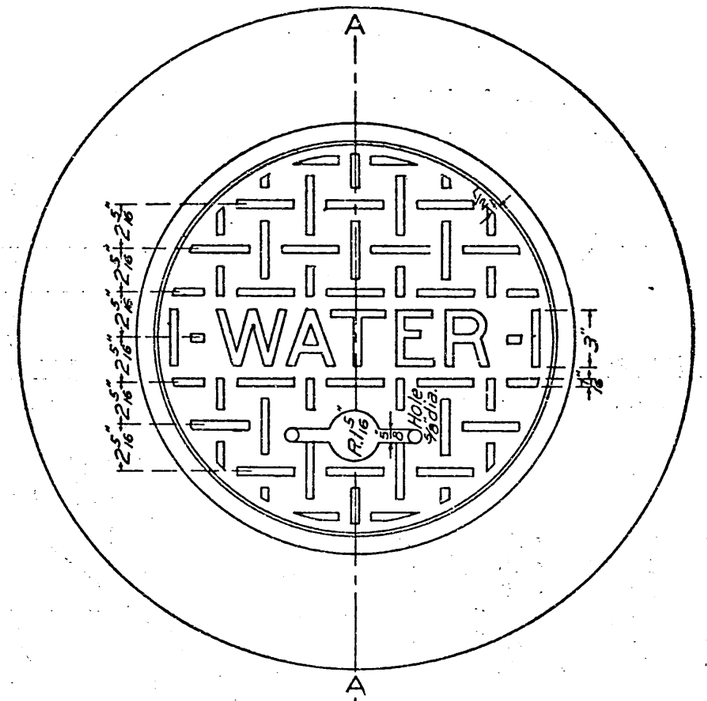
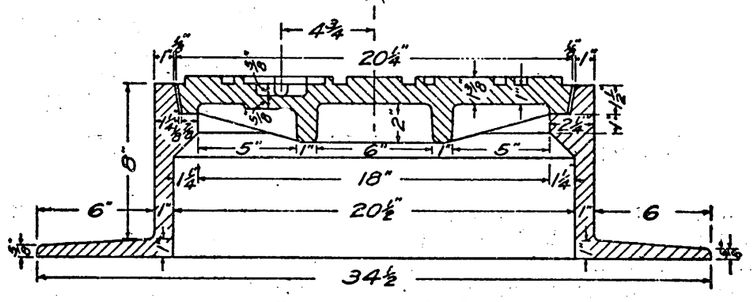


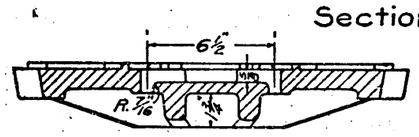
Handle

VALVE CHAMBER COVER (LARGE)

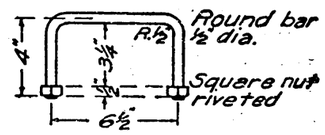




Section A-A



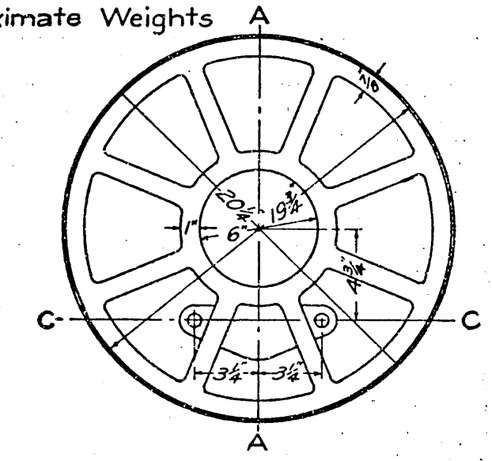
Section C-C



Cover Handle

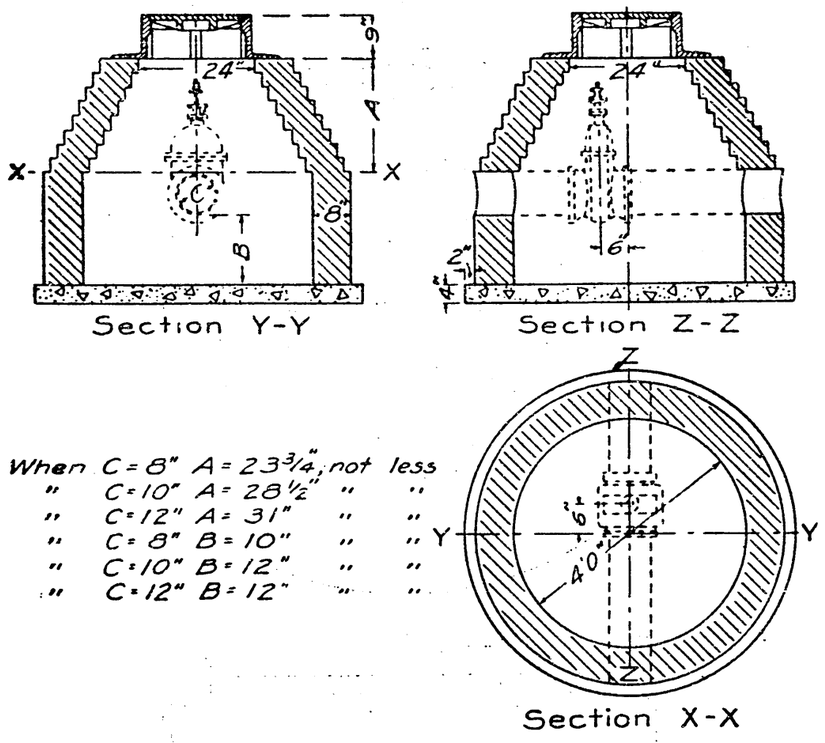
Ring	321 lbs.
Cover	122 "
Total	443 "

Approximate Weights



Bottom View

STANDARD VALVE CHAMBER COVER



STANDARD BRICK VALVE CHAMBER

Cast iron covers shall be provided of design and size as shown in the detail drawings, and also as designated in the bill of material. They shall conform in quality of material, coating, marking and all other respects to special castings as specified elsewhere in these specifications under the heading of "Special Castings."

Payment.—Valve chambers with reinforced concrete covers will be designated as large valve chambers, and will be paid for at the rate bid for "Large Brick Valve Chambers." Other valve chambers will be designated as standard brick valve chambers, and will be paid for at the rate bid for "Standard Brick Valve Chambers."

The price will not include the four-inch sewer pipe drain, which will be paid for at the rate bid per linear foot in place for "Four-inch Sewer Pipe Drains."

CONCRETE BLOCK VALVE CHAMBERS

The contractor has the option of constructing the walls of valve chambers of concrete blocks if he so desires. The concrete for the blocks shall be composed of one (1) part cement, two and a half (2½) parts sand and five (5) parts gravel. All cement, sand and gravel used to be of the same quality as specified for these materials under "Concrete Sidewalks," mixed in a manner satisfactory to the City Engineer. Blocks shall set thirty (30) days before being used. All blocks used on the cylindrical portion of the chamber must be at least six (6) inches thick on radial lines. No conical blocks for drawing in the top will be allowed, thicker vertically than two and one-half (2½) inches, unless they form the conical surface without any offset and in such cases the radial dimensions must be at least six (6) inches. If blocks not thicker than two and one-half (2½) inches are used, the radial dimensions must be eight (8) inches and in such cases the conical portion of the chamber may be formed by offsetting the suc-

cessive layers as in the case of brick valve chambers. Where pipes pass through the walls the blocks must be cored out to the proper diameters. When thoroughly dried and immersed in water for twenty-four hours, the blocks shall not absorb more than five (5) per cent. by weight of water. Tests will be made from time to time as desired by the City Engineer.

The blocks shall be set in one-half (½) inch of mortar composed of one (1) part cement to two (2) parts sand. The end joints to be completely filled with mortar and the grooves at the ends of the blocks filled flush with the top and well tamped.

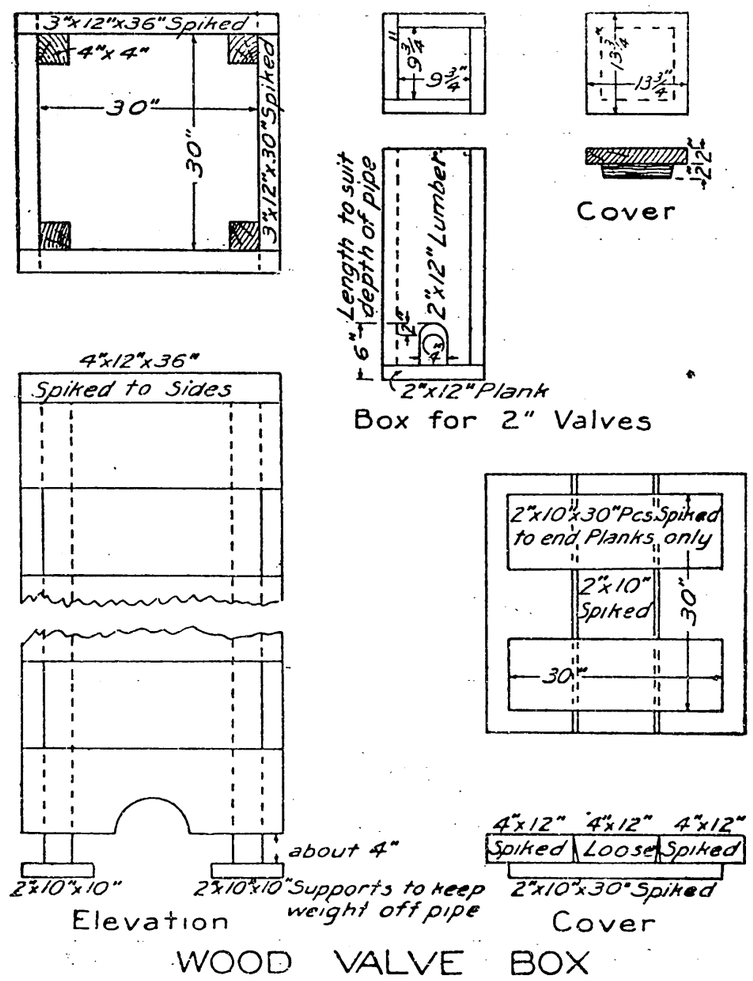
Payment for concrete valve chambers will be made at the same price bid for "Large Brick Valve Chambers" and "Standard Brick Valve Chambers" respectively.

CAST IRON VALVE BOXES

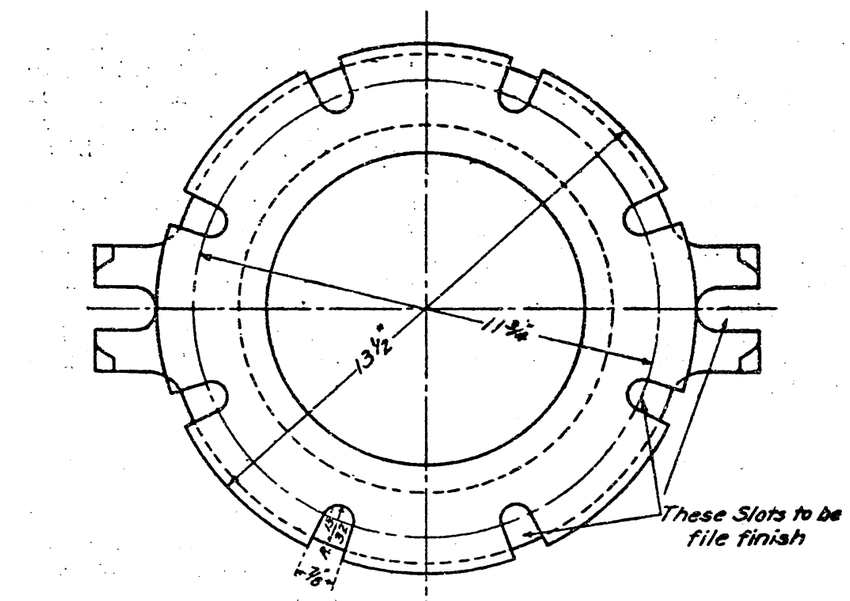
All gate valves, except where they are enclosed in brick chambers or wooden boxes, must be protected by an adjustable cast iron valve box, provided with a suitable cover and of a design satisfactory to the City Engineer. All valve boxes shall be coated as specified above for cast iron pipe.

WOODEN VALVE BOXES

Where shown on the plans, or where directed by the City Engineer, gate valves, including district gate valves, shall be protected by a wooden box, constructed of three (3) inch lumber and made in conformity with the standard drawings, unless otherwise shown on the plans.

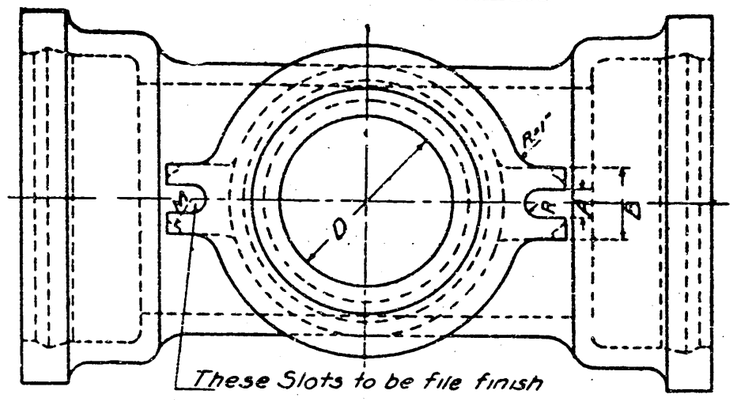


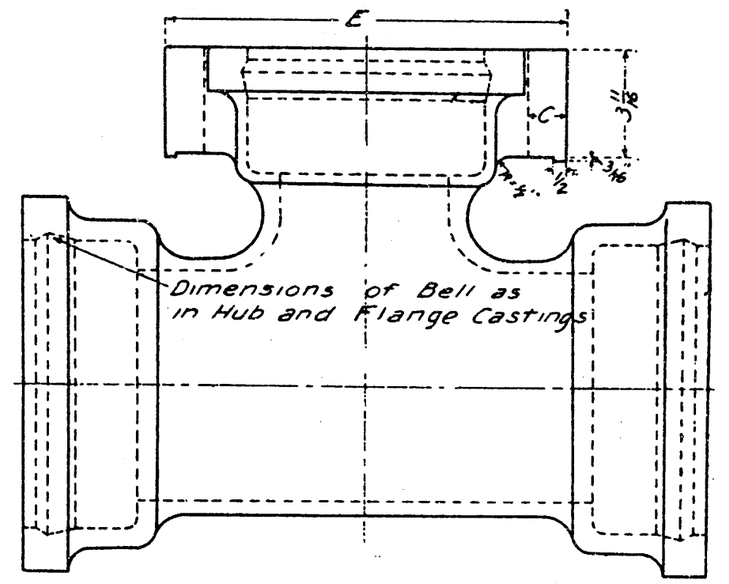
WOOD VALVE BOX



Approximate Weight 100 lbs.

8" HUB AND FLANGE CASTING





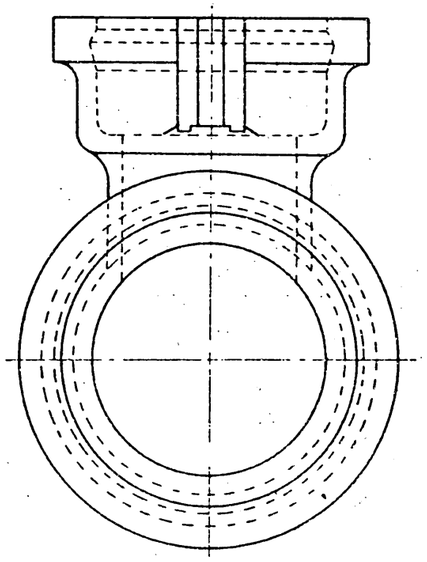
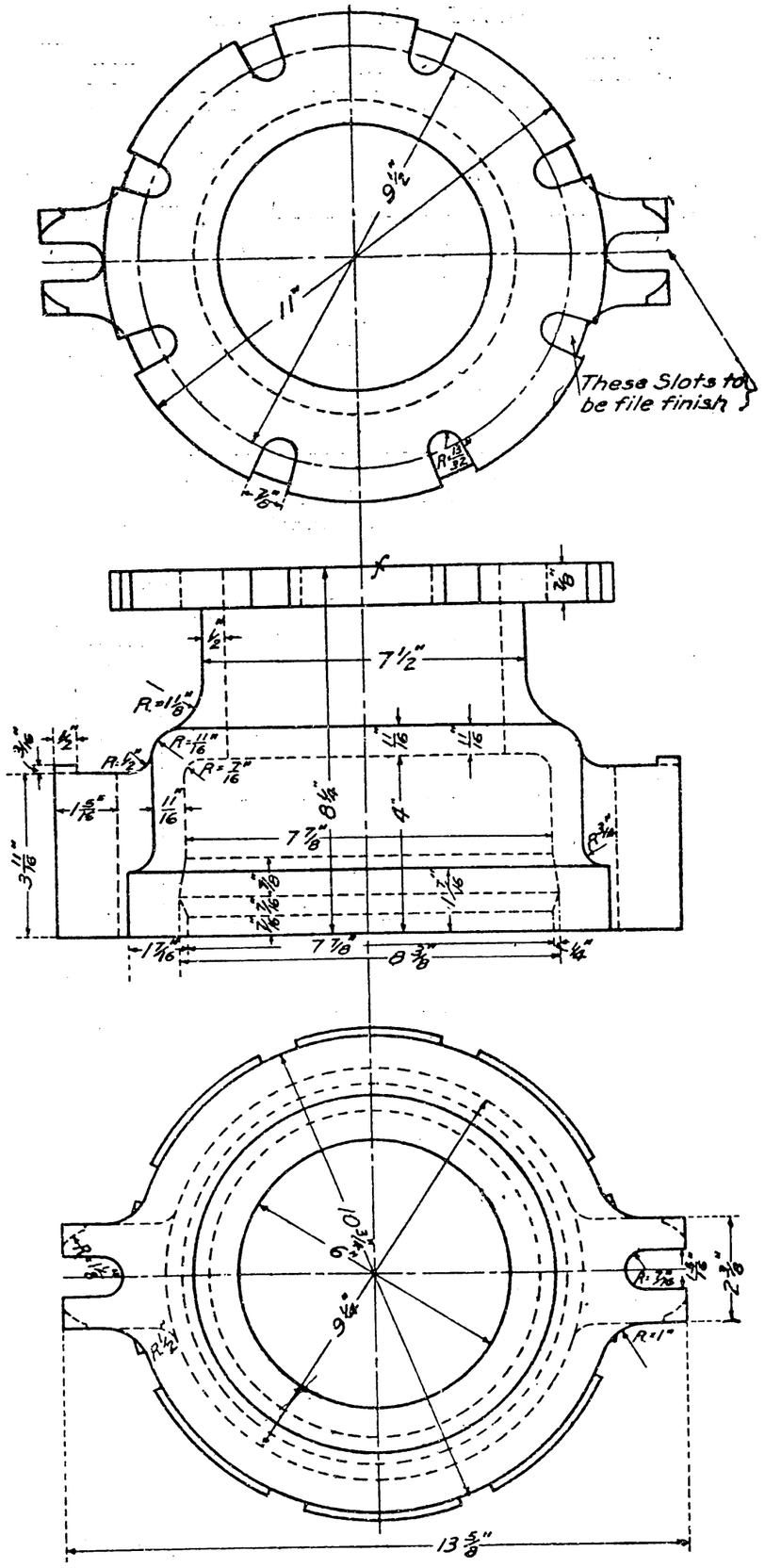


Table of Dimensions for Lugs on Hydrant Tees

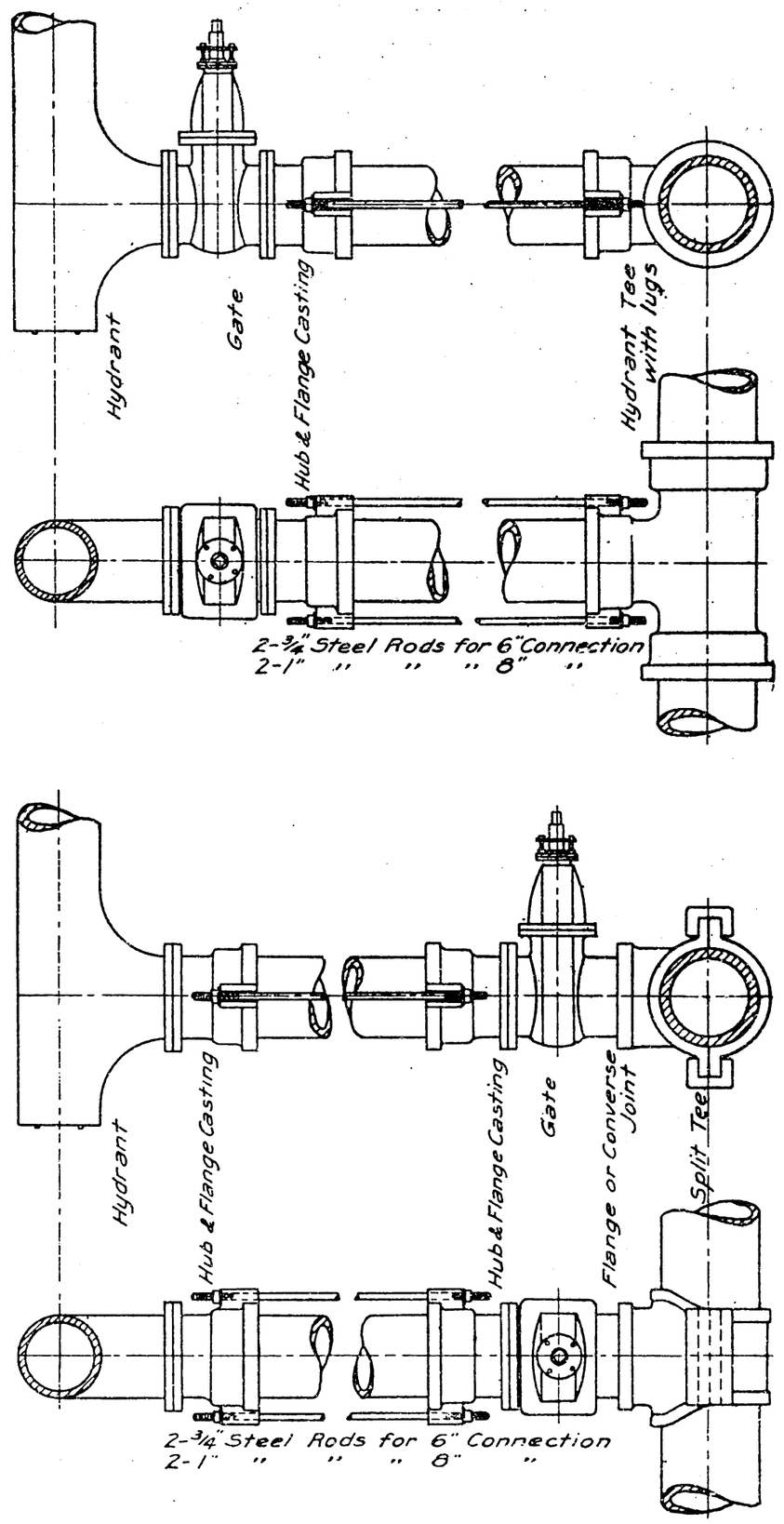
Diameter of Outlet	A	B	C	D	E	R	M
6"	1 3/16	2 3/8	1 5/16	6"	13 5/8	7/16	1 1/8
8"	1 3/16	3 3/16	1 9/16	8"	16 1/2	9/16	1 3/8

LUGS WITH 6" OR 8" OUTLET



Approximate Weight 70 lbs.

6" HUB AND FLANGE CASTING



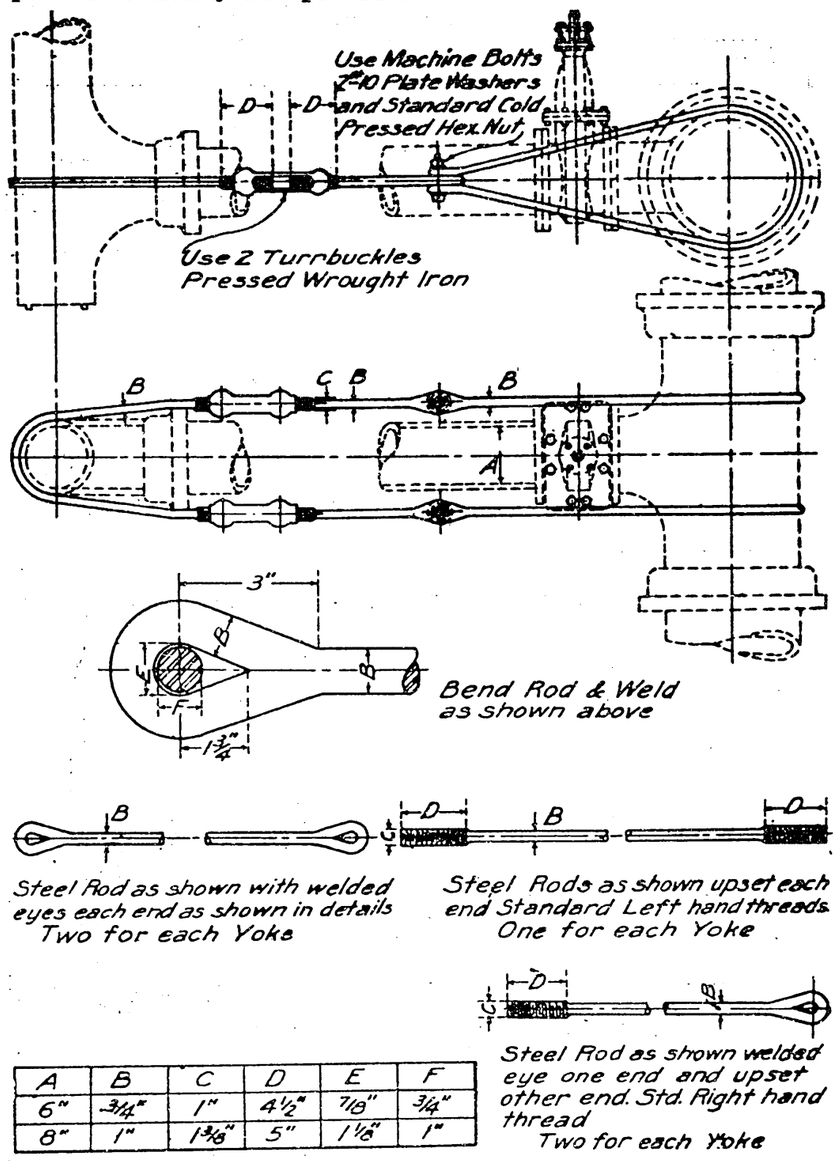
ARRANGEMENT OF HYDRANT AND AUXILIARY GATE

HYDRANTS

Hydrants shall be located as shown on plans.

If the contractor proposes to use a make or type of some make not already approved by the Board of Public Works, a sample, and, if required, detail plans of such hydrants must be submitted to the Board of Public Works for approval. Such approval, however, will in no may release the contractor from obligations prescribed by these specifications for any defects in construction of mechanism or materials.

All hydrants must have bronze mountings, and be so arranged that all working parts can be removed without digging around or disturbing the barrel. They shall be set in a bed of broken stone or coarse gravel. Hydrants shall be connected to the main with a section of cast iron pipe, which must conform both in material and laying to the requirements of these specifications for main pipe. Each branch is to be provided near the hydrant with an auxiliary gate valve placed vertically and provided with a suitable cast iron valve



A	B	C	D	E	F
6"	3¼"	1"	4½"	7/8"	¾"
8"	1"	1⅜"	5"	1⅛"	1"

HYDRANT SHACKLE

box. This gate valve shall conform to the foregoing specifications. All hydrants and auxiliary gate valves must have flanged ends. All flanges which are designed to be tight under water pressure are to be machine finished to a true surface. Hydrants having such flanges made by casting against a plate will be rejected. Hydrants must have a waste orifice for draining, so located and designed that when all hose and steamer ports are closed and the main valve is slightly opened, water will be forced through the waste orifice under pressure. The waste orifice shall have a suitable threaded connection for attaching a drain pipe.

When hydrants cannot be connected to drains at the time of setting, the threaded waste orifice must be so placed on the hydrant barrel that future connection can be made without disturbing the hydrant. If screw nipples or other fittings are necessary to accomplish this end no extra pay will be allowed for the same, but will be included under the price bid for hydrants.

The cast iron tees for hydrant connections are to have lugs cast on the outlet for the insertion of rods to tie the hydrant to the main. A cast iron hub and flange connection, made in accordance with standard drawings, is to be bolted on to each auxiliary hydrant gate valve. Hydrants are to be shackled to the main pipe by two iron rods attached at one end to lugs cast on the outlet tee in the main pipe and at the other end to lugs cast on the hub and flange connection mentioned in the paragraph last above. The price of these rods, together with all nuts necessary to attach them, will be included in the price bid for pipe for hydrant connections. These rods shall be painted with two coats of P. & B. paint.

The dimensions and details shall be as follows:

	Standard Size	Large Size
Inside diameter of cast iron pipe hydrant connection	6 inches	8 inches
Inside diameter of stand pipe, not less than	7 inches	9 inches
Length rom bottom of hydrant connection to sidewalk ring:		
For pipes 6 and 8 inch diameter	3½ feet	3½ feet
For pipes 10 inch diameter	4 feet	4 feet
For pipes 12 inch diameter	4½ feet	4½ feet
For pipes 16 and 20 inch diameter	4 feet	4 feet
For pipes 24 and 30 inch diameter	4½ feet	4½ feet
Diameter of valve opening not less than	5 inches	6¼ inches
Size of auxiliary gate valve	6 inches	8 inches
Number and size of hose nozzles	2-2½ inches	3-2½ inches
Number and size of steamer nozzles	1-4 inches	1-4 inches
Size of valve nut	5 sided and as per template	
Number of nozzle threads per inch Outside diameter of threads—hose nozzles Outside diameter of threads—steamer nozzles	Per sample furnished by City Engineer.	
Diameter of shackle rods	¾ inch	1 inch

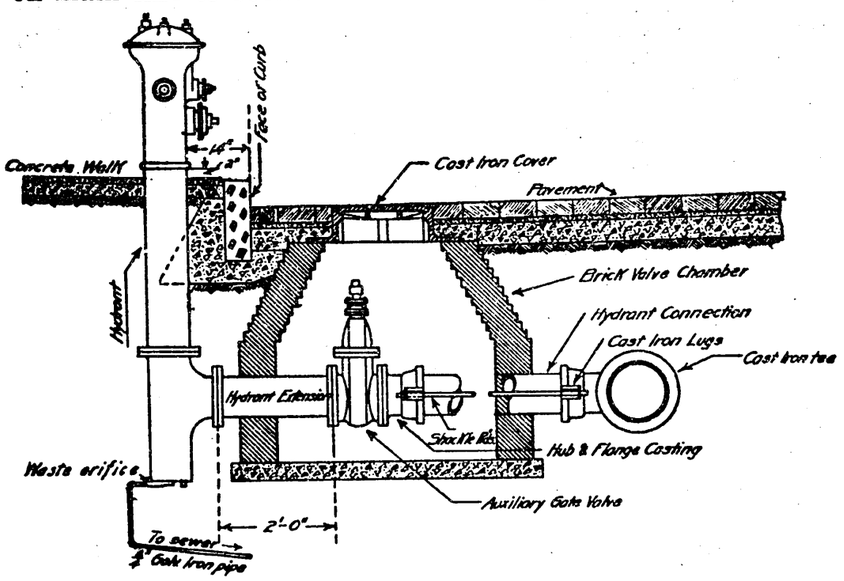
The auxiliary gate valve and that portion of hydrants below the surface of the ground shall be thoroughly repainted with "P. & B." paint or some other preparation approved by the City Engineer. The portion above the ground shall be repainted with two coats of dark green. The paint above the ground to be applied after the hydrants are set and tested.

Hydrants must be provided with an independent valve for each hose nozzle. All hydrants shall open by turning to the left and must be able to stand a pressure of 300 pounds when the hydrant valve is closed, and of 300 pounds when the valve is open.

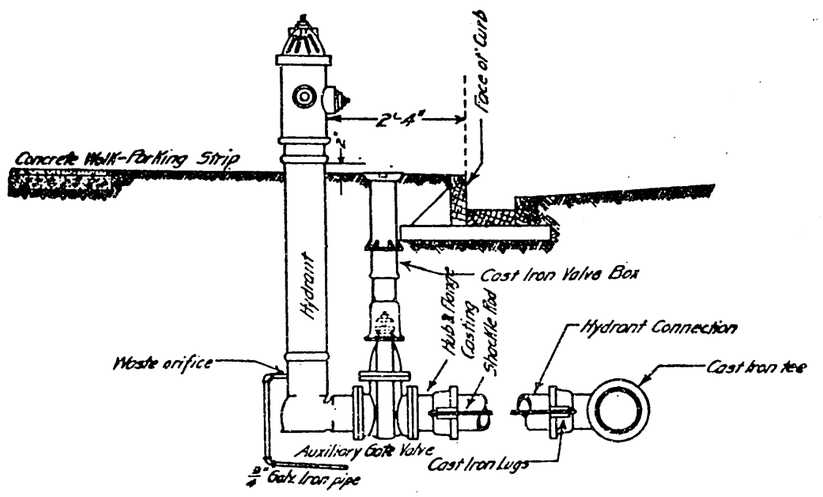
Payment for hydrants will be complete in place, including the auxiliary gate valve and cast iron valve box, the hub and flange casting, all bolts, nuts and gaskets, laying, jointing, and setting thereof in place, including all excavation and refilling, and all other materials and labor necessary.

When the auxiliary gate valve is provided with a brick chamber, in place of the cast iron valve box, the sum of $4.00 will be deducted from the bid price of each hydrant.

Hydrant Connections.—"Hydrant connections" will be paid for at the rate bid therefor per linear foot, and such payment shall be in full for furnishing, laying, jointing, and all other material and labor necessary for the completed result. "Hydrant connections" to be measured from socket of tee on main line to socket of hub and flange casting at hydrant.



METHOD OF SETTING HYDRANTS
BUSINESS DISTRICT



METHOD OF SETTING HYDRANTS
RESIDENCE DISTRICT

RESETTING EXISTING HYDRANTS

Where shown on the plans or when directed by the City Engineer existing hydrants are to be reset.

In resetting hydrants the location of the hydrant tee is not changed, the hydrant, however, may be adjusted to conform to a new street grade or to a change in width of roadway.

The work shall conform in all respects to the specifications for setting hydrants as mentioned elsewhere in these specifications. Where existing hydrants are blocked to the main line the same method must be used in resetting unless it is found necessary in the judgment of the City Engineer to shackle them, in which case some approved form of shackling to the main line with iron rods will be used.

Payment for resetting of hydrants includes all labor and material necessary to place and connect the hydrant in its new position, but does not include new shackle rods or new pipe for hydrant connections, which will be paid for at the rate bid for "Shackle Rods" and "Hydrant Connections," as mentioned elsewhere in these specifications.

Moving Existing Hydrants.—Where shown on the plans or when directed by the City Engineer existing hydrants are to be moved. In moving hydrants the location of the hydrant tee in the line is changed. The work to conform in all respects to the specifications for setting hydrants as mentioned elsewhere herein. Where existing hydrants are blocked to the main line, the same method will be used in moving unless it is found necessary in the judgment of the City Engineer to shackle them, in which case some approved form of shackling to the main line with iron rods may be used.

Payment for moving of hydrants includes all labor and material necessary to place and connect the hydrant in its new position but does not include new shackle rods or new pipe for hydrant connections, which will be paid for at the rate bid for "Shackle Rods" and "Hydrant Connections" as mentioned elsewhere in these specifications.

Reconnecting Existing Hydrants.—Where shown on the plans or when directed by the City Engineer existing hydrants are to be reconnected. In reconnecting hydrants the present position of the hydrant remains undisturbed, but the present hydrant connection must be connected to the hydrant tee in the new line.

Payment for reconnecting hydrants includes adjustment of hydrant connections, furnishing and cutting extra length of hydrant connections, lengthening existing shackle rods and all other labor and material necessary to connect the hydrant to the new line, but does not include new shackle rods, which will be paid for at the rate bid for "Shackle Rods."

HYDRANT DRAINS

When ordered by the City Engineer, waste orifices of hydrants are to be connected to the sewer or other outlet, by galvanized wrought iron pipe of size as called for. It is to conform in all respects to the requirements for "Galvanized Iron Pipe," as specified elsewhere in these specifications.

Payment for hydrant drains will be in full for furnishing and laying the pipe, including all trenching, back-filling, fittings and all labor necessary to place in position.

HYDRANT EXTENSIONS

All two-flanged extensions, such as vertical extensions in the barrel of hydrants, or horizontal extensions between the hydrant and auxiliary gate valve, shall conform in quality of material, coating, marking and all other respects to special castings as specified elsewhere in these specifications under the heading of "Standard Specials" or "Special Castings." In all cases the contractor must see that the drilling in flanges of extensions will fit the drilling in the flanges of hydrant barrels or gate valves, as the case may be, and in no case will the city be responsible for any error in these drillings. The length of the vertical extensions will be determined after the hydrant is in place.

Payment.—Where conditions demand longer hydrants than those specified, vertical extensions will be paid for per pound in place, including all machine work, extension of hydrant rods, bolts, nuts, washers and gaskets. Lengthening of hydrants to specified lengths with vertical hydrant extensions will not be allowed except by permission from the City Engineer and in such cases no extra payment will be allowed for vertical extensions, but they will be included in the price bid for "Hydrants."

STEEL PIPE

Chemical and Physical Properties.—Steel must be made by the open-hearth process. For the purposes of this specification it shall be divided into three classes, namely, steel for plates, steel for rivets, and steel for castings, which must conform to the following limits in chemical and physical properties:

	Steel for Plates	Steel for Rivets	Steel for Castings
Phosphorus shall not exceed	0.04%	0.04%	0.05%
Sulphur shall not exceed	0.04%	0.04%	0.05%
Carbon shall not exceed	0.20%	0.20%	.....
Manganese shall not exceed	0.50%	0.50%	.....
Ultimate tensile strength, pounds per square inch	52000–62000	45000–55000	60000–65000
Yield point in pounds per square inch shall not be less than	½ ultimate tensile strength	½ ultimate tensile strength	½ ultimate tensile strength
Elongation, when measured longitudinally, shall not be less than	26% in 8 in.	28% in 8 in.	18% in 2 in.
When measured transversely, shall not be less than	22% in 8 in.	.....	.....
Reduction of area shall not be less than	50%	50%	30%
Cold bend without fracture	180° flat	180° flat	90° about diameter of 3 times thickness
Quench bend without fracture			
Character of fracture	Silky	Silky	Silky or fine granular

For plates more than ¾ inch in thickness a deduction of one (1) shall be made from the specified percentage of elongation for each ⅛ inch in thickness above ¾ inch. For plates less than 5-16 inch in thickness a deduction of 2½ shall be made from the specified percentage of elongation for each 1-16 inch in thickness below 5-16 inch. The standard tensile test specimen of 8 inch gauged length, as shown in figure one, herewith, shall be used to determine the physical properties of steel for plates as above specified. The bending test specimens must be cut lengthwise and crosswise from the sheets. Rivet rounds shall be tested of

Figure 1

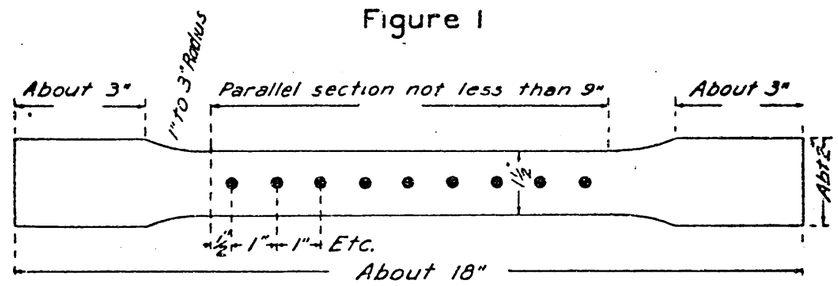
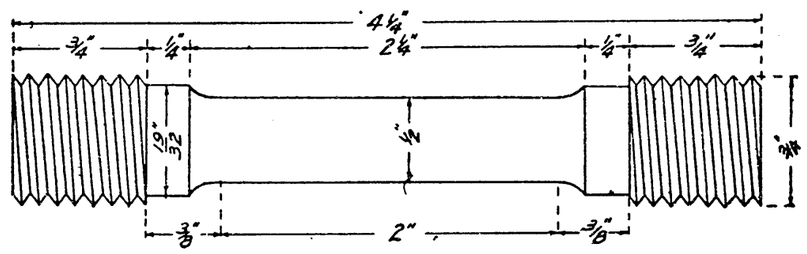


Figure 2



full size as rolled. Test specimens for steel castings to be of the form shown in figure two, herewith, cut cold from the sink heads of one or more castings from each melt, or from coupons cast for the purpose.

Steel for Lock Bars.—The steel for lock bars to be such as experience has shown to be adapted to the work intended; it shall be equal in quality to the steel specified for rivets and will be subjected to the same tests. It shall be of a quality which will stand cold rolling and working.

Punching Tests.—The specimens for punching tests must be one and three-quarters (1¾) inches wide and not less than ten (10) inches long; a row of not less than eight holes, ¾ inch in diameter, spaced 1¼ inches between centers, to be punched while the plate is cold, without causing any cracks.

Drifting Tests.—Specimens for drifting tests must be three (3) inches wide and not less than five (5) inches long; not less than two holes, ¾ inch in diameter, spaced to two inches between centers, and 1½ inches from the edges, shall be punched and then enlarged cold by blows from a sledge hammer upon a drifting pin, until said holes are at least 1¼ inches in diameter, without causing any cracks.

Additional Tests.—The plates must also admit of cold hammering, and of scarfing to a fine edge at the laps without cracking. The test pieces must furthermore stand quenching, forging and other tests as may suffice to exhibit fully the temper, soundness and fitness for use of the material. The failure of said test specimens when taken at random, as aforesaid, from the finished product of any heat or melt, to conform with any or all of the above stipulated requirements, will be sufficient cause for the rejection of the entire product of such heat or melt.

Perfect Plates.—The plates must be free from laminations, cinders, and any other surface defects. They shall be fully up to the required thickness at the edges, and any plates which are found to be more than five (5) per cent. short of the required thickness at any point will be rejected. Not over five (5) per cent. of the plates shall be short of the full re-

quired thickness at any point. The plates must be rolled flat and sheared with bevel edges as accurately as possible, and in all respects be in good merchantable condition.

Rejection.—Failure of specimens to fully and satisfactorily conform with the requirements of these specifications when subjected to the tensile, punching, bending, drifting, chemical and other tests required, or to any of said tests, shall be followed by the rejection of the entire heat or melt from which the samples were obtained. Should any sheet or plate show defect during the process of punching, bending and riveting, for manufacture into pipes, it shall be rejected, notwithstanding the test pieces from the heat or melt from which said plates were manufactured may have been previously satisfactorily tested.

Protection of Metal.—All plates and rivets must be kept free from rust, and under cover from the time of their manufacture until the pipe is dipped and coated. At the place of manufacture the plates must be loaded under cover upon suitable covered cars, satisfactory to the City Engineer or his authorized representative. They must at no time be exposed to the weather or to moisture and shall be delivered under cover at the pipe shop. In case of accidental rust, either during transportation or the process of manufacture, the rust must be removed from the plate at once by brushing with stiff brush and scrubbing them with diluted acid, followed by mopping or brushing with a saturated solution of soda or other suitable alkali to remove the acid. This must be continued until the rust has been removed. The alkali must then be washed off and the plates be thoroughly dried.

Manufacture of Pipe.—The pipe is to be riveted, or lock bar. It shall be manufactured of plates of the thickness given on the plans, and of full specified internal diameter at the small end of the sections. Each section of pipe as shipped shall be approximately thirty feet in length except where shorter sections are necessary in order to produce the proper angles or curves in grade or alignment. Longitudinal seams in riveted pipe must be double riveted in plates ⅜ inch and less in thickness, in plates over ⅜ inch in thickness they shall be triple riveted, all circular seams are to be single riveted.

Shop Riveting.—The spacing and the dimensions of rivets shall be as shown in the following table:

Thickness of plate, inches	Diameter of pipe, inches	Diameter of rivets, inches	Longitudinal Seam			Number of rivets, circular seams	Distance of rivets from edge of plate, inches	Maximum head in feet	Shop test pressure pounds per sq. inch
			Pitch of rivets, inches	Distance between rows, inches	No. of rows				
1/4	42	5/8	2 1/16	1 9/16	2	68	1 1/16	262	175
1/4	36	5/8	2 1/16	1 9/16	2	56	1 1/16	306	200
1/4	32	5/8	2 1/16	1 9/16	2	52	1 1/16	345	225
1/4	30	5/8	2 1/16	1 9/16	2	48	1 1/16	367	250
1/4	24	5/8	2 1/16	1 9/16	2	40	1 1/16	459	300
1/4	20	5/8	2 1/16	1 9/16	2	32	1 1/16	550	350
5/16	42	3/4	2 7/16	1 7/8	2	56	1 1/4	320	200
5/16	36	3/4	2 7/16	1 7/8	2	48	1 1/4	373	250
5/16	32	3/4	2 7/16	1 7/8	2	44	1 1/4	420	275
5/16	30	3/4	2 7/16	1 7/8	2	40	1 1/4	448	300
3/8	42	7/8	2 3/4	2 1/4	2	52	1 7/16	387	250
3/8	36	7/8	2 3/4	2 1/4	2	44	1 7/16	450	300
7/16	42	7/8	3 5/16	2	3	52	1 7/16	485	325

Allowable tension in plates, 14,000 lbs. per square inch, net section; allowable shear in rivets, 8,000 lbs. per square inch; allowable bearing of rivets, 16,000 lbs. per square inch.

Shop riveting must be done with hot rivets by steam, compressed air, or hydraulic machinery, capable of exerting a slow pressure sufficient for the formation of perfect rivet heads. The rivet holes must be punched from the side of the plate which is to be placed in contact with another, and all burrs caused by the punch on the lower side of the plate must be removed by countersinking.

Drifting.—No excessive drifting will be allowed to force rivet holes to coincide at any seam or lap, and all plates will be rejected in which the said holes cannot be made to receive a rivet of the specified diameter with such slight drifting or reaming as will not, in the opinion of the City Engineer, materially reduce the strength of the plate.

Formation of Angles and Curves.—Where angles and curves occur in the alignment and grade of the pipe line, the plates must be cut and punched to the required lines for forming a slight oblique angle at the circular seams, of as many courses as may be needed to produce the given total deflection, or curvature, in each locality. Copies of shop sheets to be furnished the City Engineer before manufacture of pipe.

Caulking.—As soon as riveted, the pipe shall be properly caulked, both inside and outside, in a workmanlike manner, by the most approved pneumatic machines; all caulking to be done by round-nosed caulking tools, no split caulking being allowed.

Hydrostatic Test.—Each section of pipe after completion, and before coating, shall be subjected to a hydrostatic pressure equal to one and one-half (1½) times its allowable working pressure. The pipe must, during said test, be absolutely free from leaks or fractures.

Cleaning.—Before the pipe sections are coated, they shall be thoroughly cleaned by the sandblast or other equally efficient means, so as to show in all parts the color of the metal.

Coating.—Immediately after being cleaned, and before any discoloration due to rusting has begun, the pipe shall be carefully inspected, and upon approval by the City Engineer, or his authorized inspector, must be coated by dipping vertically, in what is known as the "Pioneer Mineral Rubber Pipe Coating," or the "Sarco Mineral Rubber Pipe Coating," at a temperature of 400 degrees F., the pipe having been heated to the same temperature as the asphalt bath. The pipe, on being removed from the bath, shall present a thoroughly smooth and even surface, both on the inside and outside.

Manholes.—Wherever shown on the profile, the contractor shall place manholes on the steel pipe, with covers, gaskets and bolts, complete. The openings for said manholes shall be elliptical, having fourteen (14) and sixteen (15) inches, diameter, respectively. The joints between the cover and the frame must, in all cases, be made water-tight by facing the abutting surfaces and inserting a suitable gasket of sheet copper or lead.

Air Valves.—Air valves four (4) inches in diameter shall be placed on the pipe at points on the line as indicated on the profile. The valves are to be of the pattern known as the "Crispin Automatic Air and Vacuum Valve," or some other approved model, with one-half (½) inch bibb. Cast steel branches having flanges to conform to the circumference of the pipe at one end, and the other end fit the flanges of the valve, shall be used for attaching them to the pipe. Between the air valves and the casting on the pipe,

there shall be placed a four (4) inch double-flanged gate valve.

Transportation.—The pipes and specials, on completion at the shop, shall be transported to the line of ditch, being carefully loaded on cars, wagons or trucks with skids and blocking and protected from chafing by chains or ropes, with rubber packing or other soft and yielding material

Pipes shall be properly supported by struts or otherwise to protect joints from injury due to vibrations while in transit.

When the coating has been rubbed off any portion of the pipe, it shall be replaced by "Pioneer Mineral Rubber Field Coating," or "Sarco Mineral Rubber Field Coating," or such other material as may be approved by the City Engineer. All damage or indentation of the pipes, before or during the laying in the ditch, must be repaired to the satisfaction of the City Engineer or the pipe will be rejected. Before laying of pipe in the ditch, the coating inside and outside must be carefully examined and repaired, when injured, in the manner above specified. The ends of each length must then, for a distance of three (3) inches, be carefully scraped inside and outside, and the coating entirely removed to insure a perfect contact of the metal.

Field Riveting.—All field rivets, for connecting lengths of pipe, attaching specials, etc., shall be air driven, from the outside of the pipe. Tools for "holding on" shall be operated by compressed air and be applied inside the pipe. All field joints are to be caulked as specified under "Caulking" above. As soon as each joint is caulked it must be cleaned and thoroughly painted with the field coating.

As the work on the pipe progresses, it will be examined by the City Engineer and under his direction the pipe shall be thoroughly cleaned, and all sacks, caulking tools, stones, and other debris accumulated during construction, must be removed. All defective caulking must be remedied, imperfect rivets replaced, and the coating renewed where found necessary.

Field Tests.—After the pipe has been laid in the trench, it must be plugged at the ends and tested with hydrostatic pressure in convenient sections of such length as the City Engineer may direct, to fifty pounds per square inch in excess of the pressure to which it will be subject under the natural working conditions when in operation. In no case shall the test pressure be less than 150 pounds per square inch. Caulking must be continued until the pipe is tight at this pressure.

The contractor must find his own ways and means of furnishing water and appliances and material for testing, and the caps, plugs, etc., necessary for closing all openings in the pipe and branches. The closing of said openings shall in all cases be absolutely tight to prevent filling the trench with water. Should any pipe, special or appurtenance, break in making said test, they must be replaced by the contractor at his own expense.

Trenching and Backfilling.—The requirements specified under "Trenching" and "Backfilling" for Cast Iron Pipe shall be held to cover the same operations for Steel Pipe.

Bidding Formalities.—Bids on the pipe shall include the cost of supplying the materials as specified, free from all charges, and must include the cost of delivering all materials along the line of the trench, excavating the trench, backfilling, putting in place, making all connections and supplying materials therefor, digging all joint holes, and in every way putting the pressure pipe into proper shape for permanent use, and into the finished condition contemplated by the plans and specifications.

ADJUSTMENT OF WATER MAINS

Where shown on the plan, or where ordered by the City Engineer, the existing water mains are to be adjusted to the finished grade of the streets. Water mains to be adjusted for grade shall be raised or lowered in such a manner and by such means as will not interfere with the supply of water to consumers who are connected therewith. Mains are to be lowered, or raised, without turning the water out of same, except in special cases where written permission of the City Water Department is obtained. As soon as the main is adjusted to grade, and before it is covered with earth, and while it is full of water under full service pressure, it shall be carefully tested for leaks by the City. Leaks to be carefully stopped in a workmanlike manner.

The contractor shall give twenty-four hours' notice to the City Engineer's Office and to the City Water Department before he commences to adjust any section of water mains, and he must not proceed with the work until he has been notified by each department that he may do so. The City Water Department will furnish a man who will be authorized to close and open gate valves and service cocks, and in no case shall the contractor open or close gate valves or service cocks.

Water mains to be adjusted will be paid for at the rate bid therefor per linear foot, and the price so bid shall include the cost of making any adjustments as shown on the plans for this improvement, all excavation, labor, supervision, testing, the furnishing of all necessary blocking and other material necessary to secure the finished result; and also the adjustment of all gate valves and valve boxes and other appurtenances, except hydrants.

Should the City Engineer order any additional adjustments of water mains, the same will be paid for per linear foot at the rate bid for "Additional Adjustment of Water Mains for each six inches of depth," and the bid price shall be in full for any additional adjustment caused by change of grade or other cause. In estimating this additional adjustment, the average difference between the final position of the pipe and the position as shown on the plan will be taken. If the average adjustment for any section is six (6) inches or less, the actual number of linear feet in the section will be allowed for; if the average adjustment is one (1) foot or less, but more than six (6) inches, twice the actual number of linear feet in the section will be allowed for, etc.

In all work connected with the adjustment of water mains, the quality of work and material shall conform to the City of Seattle standard specifications.

The Board of Public Works reserves the right to have the City Water Department adjust all water mains, hydrants, etc., or to require the contractor to make such adjustments at the rate bid therefor.

Should the Board of Public Works direct that the Water Department adjust any water main or hydrant, then the contractor shall pay into the City Treasurer, to the credit of the Water Fund, such a sum of money as is equal to the actual cost of the work performed by the Water Department. The contractor will in that case be allowed such amount on his final estimate.

Wherever by reason of any grading, regrading, paving or other improvement work it is made necessary to lay new mains, to adjust, renew, take up, relay or make any changes in or additions to any existing watermains or services, or to

provide temporary water service to the inhabitants of the improvement district during the progress of the work, all material and work furnished by the City Water Department shall be charged to the contractor, and the amount so charged shall be paid into the City Treasury to the credit of the Water Fund. The amount so paid by the contractor will be returned to him in the estimates.

Miscellaneous Items

Inspection of Manufacture.—The City Engineer or his representatives shall have the right at all times to inspect the methods and materials used in the manufacture of cast iron pipe, steel pipe, special castings, valves, hydrants or any other articles entering into the construction of watermains.

The contractor must furnish free of charge all necessary appliances to the City Engineer for the proper performance of his duty in carrying out the requirements of these specifications.

Connections to Existing Mains.—All connections of water mains in use will be made by the City Water Department. Any crosses or other special required to be inserted in any main already in use shall be furnished by the contractor and set by the City Water Department. The contractor must furnish the specials, as shown on the plans, and all other material required, and shall make all necessary excavations at his own expense. The labor of cutting and inserting the special will be performed by the City Water Department. The contractor shall give at least twenty-four hours' notice when the service of the Water Department is required.

The City Water Department will charge the contractor for this labor, and the amount so charged shall be paid into the City Treasury, to the credit of the Water Fund. The amount so paid by the contractor will be returned to him in the estimates.

Service Connections.—As soon as the section satisfactorily stands the required test, the Water Department will make any service connections or changes of connection required. The contractor will leave open the section of trench until such connections have been made, except at street crossings and where back-filling is specially directed by the City Engineer.

For the purpose of supplying consumers with water, it is understood and agreed that the City of Seattle shall have the right, at such time, or times, and at such place or places, as the Superintendent of Water Department may elect, during the progress of the improvement, to attach corporation cocks to the main or mains to be constructed hereunder, and the attaching of any such corporation cock or cocks shall not be construed as an acceptance by the City of Seattle of any part of the work to be performed under this contract.

Removal of Old Pipe.—The contractor will be required to give proper care and protection, during construction, to any water pipes or mains in use.

As soon as service connections have been made all the old pipe will be taken up and removed by the Water Department. When the old pipe does not come in the same trench as the new pipe the entire work of digging up, taking out and removing such old pipe and back-filling will be performed by the Water Department. When it does come in the same trench all excavation and back filling shall be performed by the contractor, when directed by the City Engineer.

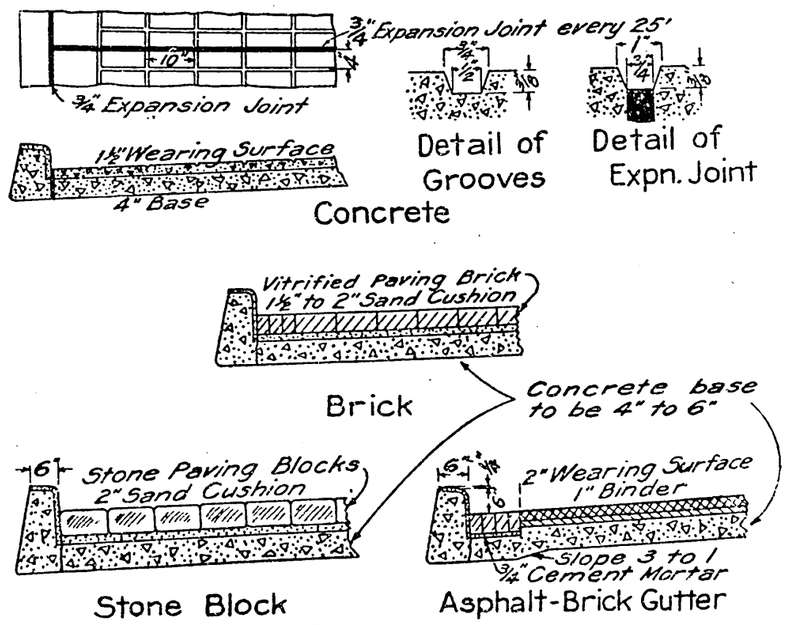
Maintenance of Roadway.—After the trenches have been flushed and before the final release of the contract, the street surface shall be restored and any surplus earth removed. In all cases the contractor shall maintain the roadway over the water main constructed for a period of thirty (30) days after the acceptance of the water main by the Board of Public Works, and in no case will the thirty (30) per cent. of the total amount of the contract reserved for thirty (30) days under the provisions fo the City Charter be paid to the contractor until the roadway has been leveled or surfaced to the satisfaction of the City Engineer.

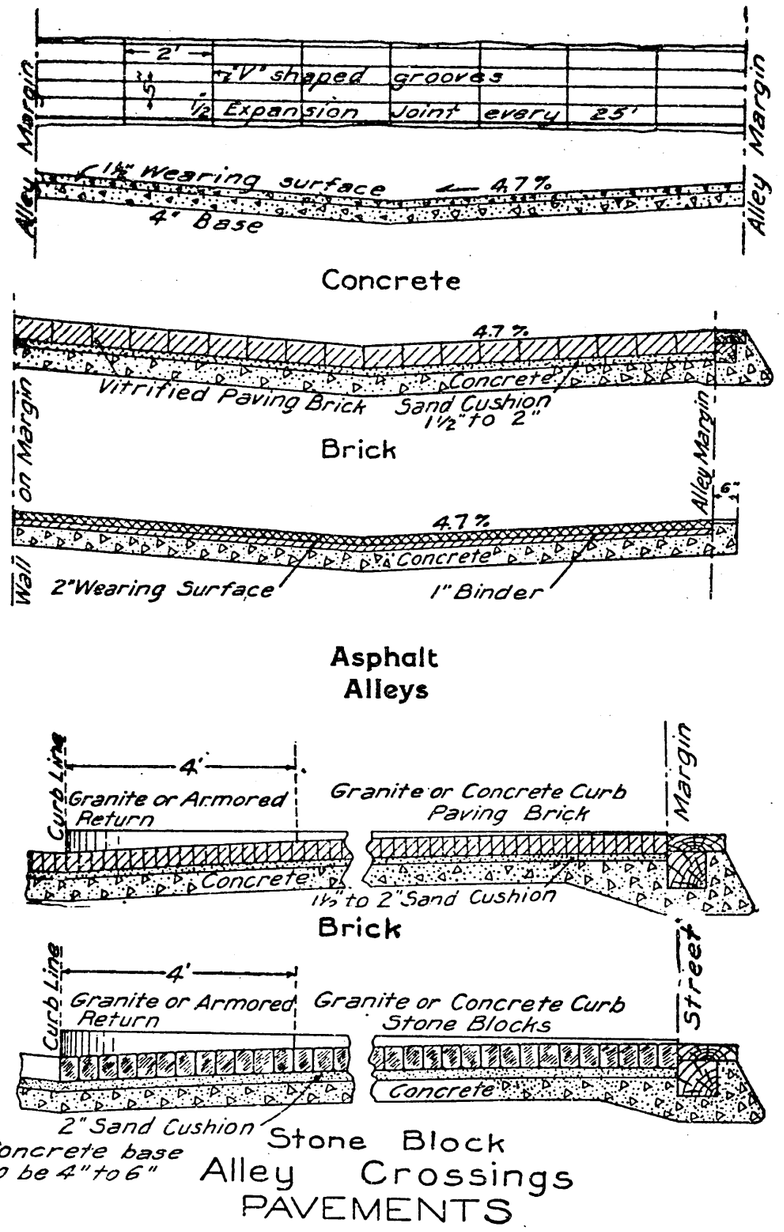
PAVING

CONCRETE BASE

The concrete base for pavements shall be composed of one part Portland cement, four parts sand and seven parts gravel (1:4:7) by measure and shall be from four inches to six inches thick as called for on plan of improvement. The concrete may be mixed by a machine of the batch type approved by the City Engineer, and which admits of the accurate measurement of the sand and gravel. The amount of water used, together with the number of revolutions per batch, as well as the speed of the machine shall be as directed by the City Engineer.

All concrete must be carefully deposited in such manner as to disturb the sub-grading as little as possible. In hot and dry weather, the ground shall be thoroughly sprinkled before the concrete is laid. In wet weather, the sub-grade is to be protected by planking, and all turning of carts or wheel-barrows shall be done on the planking. No tearing up of the sub-grading or turning of the carts on the same will be permitted. Contractor shall furnish all necessary templates. Three hundred feet is the maximum length of haul permitted by carts.





An allowance will be made on the monthly estimates for concrete base laid but not covered with pavement as follows:

4-inch base, 50 cts. per sq. yd.
5-inch base, 65 cts. per sq. yd.
6-inch base, 80 cts. per sq. yd.

These allowances will be withdrawn as soon as the base is covered.

Grade stakes shall be furnished by the contractor and set by the Engineer during the progress of the work when deemed necessary by him. These stakes must be maintained in place by the contractor until ordered removed by the Engineer, after which the holes shall be filled with cement mortar or concrete, and tamped flush with the surrounding surface.

On car line streets where the street car portion is not laid until after the roadway the contractor will be required to place one (1") inch wood stops of proper depth along the

right of way. In case the lumber is left in place payment will be made for same at the rate bid for new lumber, if removed prior to the completion of the contract payment will be included in the price bid for completed pavement.

Concrete base must be allowed to set at least six (6) days undisturbed, and during this period shall be thoroughly wetted as often as may be directed by the City Engineer.

Payment for concrete base will be included in the price bid for pavement.

ADDITIONAL BASE

Whenever necessary the concrete base shall be laid the extra thickness designated by the City Engineer, complying with all requirements specified above for concrete base.

Payment for additional concrete base will be at the rate bid per square yard for each extra one (1) inch in thickness.

GRANITE OR SANDSTONE BLOCK PAVEMENT

The blocks shall be of a durable, sound and uniform quality. The stone shall be of the same quality as to hardness, color and grain. No out-crop, soft, brittle or laminated stone will be accepted.

Size of blocks shall be not less than three and one-half (3½) or more than four (4) inches thick; not less than five (5) or more than five and one-half (5½) inches deep, and from eight (8) to twelve (12) inches long. The surface of the blocks to have parallel and rectangular sides and ends and so prepared that when in place and resting against the adjoining stone, the joints in their widest part will not exceed one-half (½) inch in width.

Stones are to be split or broken with top surface hammer-cut or axed off smooth; sides and ends being dressed, when necessary, to secure the one-half (½) inch joints as specified.

Upon the concrete base is spread a layer of clean, dry coarse-screened bedding sand, and on this sand the blocks are to be laid in straight and even courses of uniform depth at right angles with the line of the street, unless otherwise directed by the City Engineer; with close joints, longitudinal joints broken by a lap of at least three (3) inches; sufficient sand being used to bring the blocks to grade and form for the finished roadway. After they have been thoroughly rammed as hereinafter provided, they shall be carefully fitted around all catch basins, manholes, inlets and other openings. No piece smaller than one-half (½) a block to be used. All blocks not uniform in width, or improperly laid, shall be taken out and proper ones set in their places. The blocks are then to be thorough rammed to the satisfaction of the City Engineer to a firm, unyielding bed, the surface parallel to the grade and crown required. Blocks broken in process of ramming shall be removed and replaced by sound blocks thoroughly tamped. Rammers used in compacting the blocks shall be of size and make as specified by the City Engineer. No ramming is to be done within fifteen (15) feet of the face of the paving that is being laid.

After the surface has been thoroughly compacted, it shall be swept clean and the remaining portion of the joints and spaces between the blocks filled with two coats of cement grout in the manner as provided for under Brick Paving. Grout mixing boxes shall be used as provided for under Brick Paving.

BRICK PAVEMENT

Brick pavement shall consist of: 1st. A concrete base of the thickness specified. 2nd. A sand cushion; and 3rd. A surface of class A vitrified brick.

Brick Laying.—When delivered, the brick shall be piled in tiers on the wagon and carefully removed therefrom by hand, and piled on boards or other suitable platform to protect them from the dirt. No dirty brick will be permitted in the pavement, nor will dumping of brick from the wagon be allowed. The brick must be carried from the piles to the brick layers, in clamps or pallets, by hand. No wheeling of bricks in barrows, over those already laid, will be permitted. They shall be sorted and culled at the piles before delivery to the brick layers. Care must be taken to use brick of approximately the same size and degree of hardness in the same locality.

The brick shall be carefully laid upon the sand cushion, each course breaking joints and the courses laid to true lines. They must be laid with the best surface exposed. No bats or broken brick will be allowed in any part of the work except at the end of the courses, where nothing less than a half brick shall be used. The brick shall be carefully fitted around all covers or castings belonging to the sewer, water or lighting systems or other public utilities, which may be found within the line of the improvement. The surface of all such covers or castings shall be brought to true grade and and must be flush with the surface of the surrounding pavement when finished. The brick must be laid in rows transversely to the roadway, except that there shall be four longitudinal rows next to the curb on grades less than 3%. At the street intersections the brick shall be laid as directed by the Engineer. In alleys, when the grade does not exceed one (1%) per cent., four courses of brick shall be laid longitudinally along the valley. After being set, each row to be barred or driven together end on so as to make the smallest possible end joint, and said rows shall be barred or driven together sidewise, every fifth course, to a perfectly straight line. The course must be kept straight within a maximum variation of not over two (2) inches. Any variation greater than this to be remedied by taking up as many courses as may be necessary, and relaying the same.

After laying, and before rolling, the brick will be inspected, and all soft, spalled or badly shaped brick must be removed and replaced. Any brick showing kiln marks may be turned over, provided the reverse surface be smooth. In replacing brick, care shall be taken to adjust the sand cushion to bring the surface even with surrounding brick. The City Engineer may cause the pavement to be sprinkled with water by the contractor, and any soft brick which show up under this test must be removed and replaced with brick of a suitable degree of hardness. Special care shall be taken at all times previous to grouting to keep the pavement free from sand, dirt or other debris which will fill up the joints.

In case the surface of the concrete, for any reason, will not permit the laying of the sand cushions within these limits, it shall be cut down if too high, provided the thickness is sufficient; or brought up, if low, by addition of mortar or concrete carefully spread and tamped.

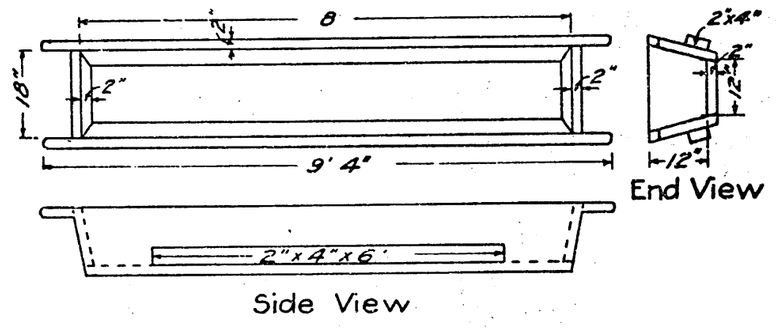
The brick shall then be rolled with a steam roller weighing not less than 125 pounds to the inch tread nor more than 198 pounds to the inch tread, until brought to a perfectly smooth and even surface. The rolling shall commence near the curb at a very slow pace and continue back and forth until the center of the pavement is reached; then the roller

shall pass to the opposite curb and repeat the operation. After the first longitudinal rolling, the pavement shall be rolled transversely at an angle of forty-five degrees (45°) to the curb, and this transverse rolling repeated in the opposite direction.

If, during the progress of construction or after the completion of the pavement, any soft, fractured, spalled or otherwise defective or objectionable brick are detected they shall be taken out and replaced by acceptable material.

These conditions regarding the brick used in the pavement will be rigidly enforced during the entire time specified for maintenance by the contractor.

An expansion joint one (1″) inch wide shall be provided next to the curb and also transversely across the entire width of the roadway at the margins of the streets and at intervals of about one hundred (100) feet through the block or as directed by the City Engineer. These joints shall be filled with cast pieces of expansion joint material of the required dimensions and laid as the work progresses.



GROUT BOX

Grout Filler.—After all defective brick have been removed and after the brick have been properly rolled and brought to a true and even surface, conforming to the grade and crown required, the pavement shall be thoroughly swept clean. The brick shall then be sprinkled with water and the joints filled with Portland Cement Grout, composed of one part of Portland cement and two parts of clean, fine sand. The use of course sand suitable for concrete will not be permitted. It shall be as nearly dry as possible before admixture with the cement and mixed in batches not larger than one sack of cement and double the amount of sand. The materials shall be placed in a proper box and mixed dry until the mass assumes an even and unbroken color; then sufficient water shall be added to form a liquid mixture of the consistency of thin cream and which will flow easily to the bottom of the joints. From the time the water is applied until the last drop is removed and placed in the pavement, it must be kept in constant motion by stirring to the bottom. The mixture shall be removed from the box to the surface of the street with scoop shovels and be stirred constantly in the box while the same is being emptied. The box shall be of the dimensions shown on the plan. The grout shall be thoroughly broomed into the joints from the moment it is applied to the pavement. One box shall be provided for every fifteen feet of width in the street, or major fraction thereof.

The work of filling must be carried forward in a uniform line until fifty or sixty feet in length has been covered, when the crew shall be turned back and cover the same space in a similar manner, except that the grout shall be mixed slightly

thicker in consistency than the first coat. If the grout thickens at any point, it shall be gently sprinkled with water from a can fitted with a rose sprinkler. Within one-half to three-quarters of an hour after the last coat has been applied, the whole surface must be slightly **sprinkled,** and all surplus mixture left on the top of the bricks, swept into the joints, bringing them up flush and full.

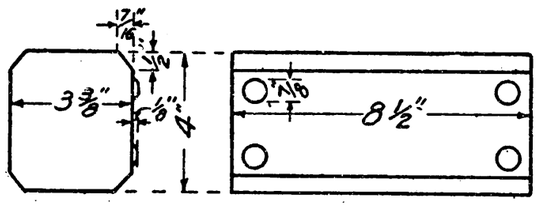
Instead of mixing the grout in boxes, as herein provided, any mechanical device which keeps the grout in constant motion and distributes it evenly on the pavement may be used, subject to the approval of the City Engineer. After the joints have been filled flush with the top of the brick and the initial set has taken place, a coating of one-half (½) inch of sand must be spread over the whole surface and if necessary kept damp by sprinkling for not less than three (3) days.

Before acceptance, the pavement shall be thoroughly cleaned and washed.

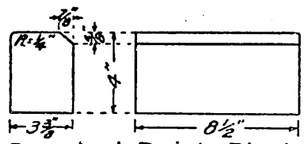
Payment.—Payment for brick pavement will include concrete base, sand cushion, brick, filling joints and sand coating, and all other labor and materials required by these specifications.

BRICK BLOCK PAVEMENT

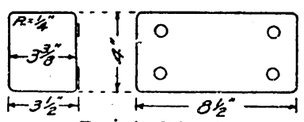
The specifications herein for brick paving apply for brick block paving except as to dimensions. The cement grout



Double Bevel Brick Block



Beveled Brick Block



Brick Block

VITRIFIED BRICK BLOCK

filler is not to be kept higher than the bottom of the bevel of the brick.

BRICK GUTTERS

All brick used shall be class A. Whenever the roadway pavement is asphalt or stone blocks, the brick gutters adjacent to same shall be laid in a bed of cement mortar three-fourths (¾) of an inch in thickness, mixed one (1) part Portland cement to five (5) parts sand. Whenever the roadway pavement is brick, the brick gutters shall be laid on a sand cushion similar to that used for the brick pavement in the roadway. After being laid and thoroughly wetted to the satisfaction of the City Engineer, the brick must be carefully tamped and brought to a smooth and even surface, conforming to the grade and crown. All joints to be completely filled with Portland cement grout as specified under "Brick Pavement."

Measurement will be the same as for other paving.

ASPHALT PAVEMENT

Asphalt Pavement Shall Consist of: 1st, a layer of concrete of the thickness specified; 2nd, a binder course one (1) inch in thickness, and 3rd, a wearing course two (2) inches in thickness.

Refined Asphalt.—The asphalt employed in the preparation of the asphaltic cement for use in the asphalt paving mixture shall have been in use in the paving industry for at least five (5) years. It shall be so refined as to be in every respect uniform, of a character recognized as being suitable for asphaltic paving cement; must have been freed as far as possible from all foreign and organic matter and volatile oil, and at least 98.5 per cent. sol. in cold carbon disulphide, and must not contain more than two (2) per cent. of free carbon or soot. The penetration of this refined asphalt shall be 45° Dow or higher. When twenty (20) grammes are placed in an oven at a temperature of 325 degrees Fahrenheit, for a period of five (5) consecutive hours, the loss must not be greater than 3 per cent. by weight and the penetration of the residue not be less than 50 per cent. of that of original sample, these tests to be made under conditions and by methods employed in City Engineer's Testing Laboratory. The bitumen contained therein must be of a cementitious character, suitable to make, on proper admixture with the flux, a durable and satisfactory asphaltic paving cement, and shall be in all respects satisfactory to the City Engineer.

Satisfactory proof must be furnished that the asphalt proposed to be used has been in successful use as a paving material for at least five years.

Flux.—The oils used in the manufacture of the asphaltic cement to be a petroleum from which the lighter oils have been removed by distillation. It shall be freed from coke and other impurities, and have a specific gravity of 9 degrees to 12.9 degrees Baume and fire test of 450 degrees Fahrenheit, and not contain more than ten (10) per cent. of paraffine.

The flux or petroleum substitute should be a residue from the distillation of California or other suitable petroleum, with steam agitation at a temperature not to exceed 620 degrees Fahrenheit.

It shall have the following characteristics:

1. Soluble in carbon bi-sulphide to the extent of 99 per cent., and in 88 degrees naphtha to the extent of 90 per cent.

2. Free from water, and shall not flash below 450 degrees Fahrenheit, in a New York State oil tester, and with a density of not less than .98 or 12.9 degrees Baume, or more than 1.050 or 9.3 degrees Baume at 25 degrees Centigrade when referred to water at the same temperature.

3. It shall not volatize more than 5 per cent. of oil when heated for seven hours at 325 degrees Fahrenheit according to method employed by the City Engineer's laboratory.

4. The residue from heating the oil in the same way to 400 degrees Fahrenheit for seven hours must be a soft flux, not hard enough to give a penetration of less than 130 degrees Dow Penetration Machine.

5. Not yielding more than 6 per cent. fixed carbon on ignition.

6. Under the microscopes, beneath a cover glass, it shall appear free from insoluble or suspended matter.

Filler.—The filler to be powdered mineral matter of such a degree of fineness that the whole of it will pass a 50-mesh screen, and at least 66 per cent. shall pass a 200-mesh screen.

Asphaltic Cement.—The refined asphalt and flux of a character corresponding to that described in the foregoing paragraphs, shall be combined as follows for the preparation of asphaltic cement:

To the melted asphalt of a temperature of not over 350 degrees Fahrenheit the flux, after being heated to about 200 degrees Fahrenheit, is to be added in such proportions as to produce an asphaltic cement having a consistency as indicated by the Dow Penetration Machine of about 65 degrees at a standard temperature of 77 degrees Fahrenheit.

While the oil or flux is being added, agitation shall be maintained by means of an air blast or live steam, and shall be continued until the asphaltic cement is homogeneous.

The agitation shall be maintained for at least three (3) hours before attempting to use in pavement mixture, during which time the temperature shall be maintained at from 300 degrees to 325 degrees Fahrenheit.

Should the finished cement not prove of proper consistency, it must be modified by the addition of further oil or melted asphalt, as may be necessary. The asphaltic cement while in use to be thoroughly agitated.

For every lot or shipment of asphalt or asphaltic flux used upon this contract, the contractor shall furnish a statement giving the selling agent or company, the refinery that refined the asphalt or prepared the flux, the field or locality from which the crude asphalt or flux was obtained, and a refining report of tests or penetration of each lot or run, with numbers corresponding to a batch or lot number plainly stenciled on each barrel or container. This report to be delivered to the department laboratory at the earliest possible date to allow sufficient time for sampling and making of tests as herein mentioned to verify refinery report and determine the suitability of the material offered before it will be accepted for use on this work.

Before beginning the operation of the plant, the City Engineer will assign, at the expense of the improvement district in which the asphalt is to be laid, a man skilled in the testing and mixing of asphalt paving mixtures, whose duty it shall be to supervise the testing, preparation and mixing of the various ingredients that enter into the making of a first-class asphalt paving mixture, and a part of whose duty it will be to see that none but competent men be employed in the various departments about the plant.

To facilitate the necessary test, and to provide for proper control of the plant work, the contractor will be required to provide a room convenient to the plant and well protected from dust and atmospheric changes (provided with telephone connections with the City Engineer's office), of approximately 150 square feet floor area and at least 9 feet from floor to ceiling, and provided with city water, gas, etc., and in which is provided a closet large enough for the penetration work, and in which closet the temperature can be raised to 77° Fahrenheit inside of thirty (30) minutes and maintained at that temperature constantly for a period of at least four (4) hours during such variation of weather and temperature as will occur when asphalt pavements are permitted to be put down.

This room shall be properly fitted up with the following testing apparatus for taking the penetration of and testing asphalt paving mixtures:

One apparatus, either of the Dow or New York Testing Laboratory Penetrometer Type, and a clock or pendulum for accurately measuring seconds.

At least two sets of standard 8-inch brass-bound sieves, from 10 to 200 mesh to the linear inch inclusive, as follows:

10 mesh to the linear inch
20 mesh to the linear inch
30 mesh to the linear inch
40 mesh to the linear inch
50 mesh to the linear inch
80 mesh to the linear inch
100 mesh to the linear inch
200 mesh to the linear inch

These sieves to be in nests of eight, with tight covers and dust pan, all to be approved by the City Engineer.

A suitable balance or scale of about one and one-half or two pounds capacity must be provided with the sieves for quickly and accurately weighing the percentage of the different sand residues remaining or passing the different mesh sieves.

Two Baume hydrometers shall be provided for liquids lighter than water, with a suitable hydrometer jar, two thermometers, Fahrenheit scale for measuring ordinary room temperatures, 6 asphalt thermometers with metal case of the type in use for taking temperatures of asphalt mixtures on the street and with a range of from about 200 degrees Fahrenheit to 400 degrees Fahrenheit, 12 thermometers with a range of from 1 degree Fahrenheit to 600 degrees Fahrenheit, 50 quart size Mason fruit jars, with screw top, for bringing samples of liquid flux to the Engineer's laboratory, 500 seamless tin boxes with covers, of about 2-ounce capacity, for penetration and other samples, 1 roll (about 40 pounds) of good manila wrapping paper, of the kind used for making patent stain test, 100 sample bags of about one pound capacity for taking miscellaneous samples. All thermometers must be of standard manufacture and shall check within five (5) degrees Fahrenheit when compared with the standard thermometers maintained by the City Engineer.

All of the above apparatus and supplies to be subject to the approval of the City Engineer. As the conditions may vary under which asphalt pavements are used, and the ingredients used may change from time to time, other tests may be prescribed by the City Engineer; the apparatus for which must be furnished by the contractor free of cost to the City, upon the written request of the City Engineer.

Each melting kettle must be provided with some efficient means of agitation, to be approved by the City Engineer.

The following quantities of paving materials must be in the yard, tested and accepted before work is begun:

(1) 200 cu. yds. of sand.
(2) 100 cu. yds. of binder material.
(3) 200 tons of refined asphalt.
(4) 20 tons of asphalt flux or residuum oil.
(5) 10 tons of inorganic dust.

At the time of signing the contract, the contractor will be required to designate the plant or plants which he expects to use in the preparation of the asphalt mixture for this particular contract, and after the Engineer's Office has certified as to the acceptability of the plant or plants for the work in question, a change will not be allowed except upon the written permission of the City Engineer.

There must be installed in the plant and yards such contrivances and machinery as will insure the operation of the plant with the least amount of dust, noise, smoke and nuisance to the surrounding community; there must be installed, convenient for the use of the plant employees, a satisfactory sanitary closet; and the yard and plant must be provided with hose, water plugs and fire extinguishing apparatus

so as to reduce the fire risk to the plant and neighboring buildings to the least amount possible under the circumstances; and it shall be the duty of the contractor at all times to so maintain the plant or plants that he is operating in a clean, sanitary manner, and to produce the least amount of nuisance and procure the least amount of fire risk to the surrounding property, and to proceed at once to remedy such defects upon the written request of the City Engineer.

Before acceptance of the plant, a thorough inspection of all equipment and machinery will be made by the City Engineer, and certificate must be obtained from him showing that the testing room is satisfactory and that it contains the required apparatus. Any defects appearing after such certificate has been issued and permission given to proceed with the work must be immediately removed and if not removed, the permission to use the plant will be revoked.

Samples of asphaltic cement and of all materials used in its manufacture shall be supplied to the City Engineer in suitable tin boxes or cans, when required, and he shall have access to all branches of the work at any time.

Binder.—The binder course consists of suitable, clean, broken stone, passing a one (1) inch screen, not less than five per cent. nor more than ten per cent. of which shall pass a No. 10 screen; to this shall be added not more than twenty per cent. of fine gravel that will pass a three-quarter (¾) inch ring; to this shall be added not less than five per cent nor more than fifteen per cent. of clean suitable sand. The stone shall be heated by passing through revolving heaters to a temperature not exceeding 300 degrees Fahrenheit, and then thoroughly mixed by machinery with asphaltic cement of suitable temperature and consistency and in such proportions that the resulting binder will have life and gloss without an excess of asphaltic cement. Should the binder appear dull from overheating or lack of cement, it will be rejected.

The binder mixture, prepared as above, shall be hauled to the street when heated, and carefully spread upon the foundation (which has been thoroughly swept clean), with hot iron rakes and shovels to such depth that after having received its final compression it will be at least one inch thick, it shall then be rolled immediately with a steam roller of not less than 198 pounds to the inch tread. Rolling to be continued while the binder is in a hot plastic condition.

Such portions of the binder as it may be impossible to roll shall be thoroughly rammed with hot iron tampers.

Should the binder show rich patches after rolling, it must be removed and replaced with suitable material.

The upper surface of the binder course shall be made exactly parallel with the surface of the finished pavement, and the whole course when finished must be compact and particles bound firmly together.

Paint Coat: To be used only when particularly specified.

Upon the surface of the foundation of the Portland cement concrete a paint course shall be applied to bind or tie the surface course to the foundation. For this purpose, the surface of the cement concrete shall be well rammed so that mortar will come to the top. It must be made so smooth that no depression will exist of a depth of more than three-eighths (⅜) of an inch. The paint for this use to consist of 62° B. naphtha and any satisfactory asphalt cement free from mineral matter, and of such a consistency as will allow the penetration at 77 degrees Fahrenheit of a No. 2 needle weighted with 100 grams of not more than three (3) millimeters, and not less than two (2). The asphalt cement to be dissolved while soft and warm, in the naphtha in such proportions that

the resulting paint will give a glossy surface after evaporation of the latter, but at the same time can be applied so as to form as thin a coating as possible. The proportions will vary, depending upon the temperature at which the paint is made, but shall be about 240 pounds of asphalt cement to fifty gallons, or one barrel, of naphtha.

The concrete foundation must be carefully swept and thoroughly cleaned of all foreign matter. The paint coat shall only be applied to it when the latter is absolutely dry and free from the slightest dampness, otherwise it will not adhere. It must be used in such quantity that fifty (50) gallons will cover from 350 to 400 square yards of the concrete surface.

No more of the surface of the foundation shall be painted than can be covered with asphalt surface mixture within a few hours after the application. Under no circumstances shall the paint coat be allowed to become dirty, nor shall the surface mixture be applied more than five hours after the painting has been done.

Owing to the inflammability of naphtha, the paint must be prepared at a distance from all fire or flame and applied to the surface of the concrete with the same precautions.

Wearing Surface.—Upon the binder course, prepared and laid as above specified, and thoroughly swept free from rubbish, shall be laid an asphalt wearing surface, composed of asphaltic cement, prepared as above specified, sand, finely powdered mineral matter, mixed in such proportions as will produce a tough, compact and durable pavement; but in no case shall the percentage of the bitumen in the wearing surface, soluble in carbon bi-sulphide, be less than twelve (12) per cent.

The sand and the asphaltic cement must be heated separately by means of suitable apparatus to about 300 degrees Fahrenheit, and never above 350 degrees Fahrenheit. Special care must be taken that the sand is heated uniformly throughout. While cold, the finely powdered mineral matter, shall be thoroughly mixed with heated sand, in the necessary proportions, the combined sand and finely powdered mineral matter then mixed with the asphaltic cement at the required temperature, in the proper proportions, and by suitable apparatus, to effect a thoroughly homogeneous composition.

The wearing surface, prepared as indicated above, shall be delivered on the work in suitable trucks or dump wagons, at a temperature, regardless of the length of haul or temperature of the air, of not less than 275 degrees Fahrenheit, nor more than 350 degrees Fahrenheit. The contractor will be required to make such provisions for transportation as will secure this condition.

It shall immediately be spread over the binder course with hot shovels and rakes having teeth three and one-half (3½) inches long in such manner as to give a uniform and regular grade, and to such depth that after having received its final compression it will have a net thickness of not less than two (2) inches.

The contractor will be required to furnish a template of a pattern approved by the City Engineer for smoothing the surface of the asphalt top after raking. The template shall allow for at least ¾ inch compression in the final surface.

After having been spread, the mixture shall be compressed with hot hand rollers weighing at least two hundred and fifty pounds to the foot width of roller or be rolled with a steam roller weighing not more than 125 pounds to the inch tread, after which a small amount of Portland cement is to be swept over it. This must be followed by a roller of not less than 230 pounds per inch tread, the rolling to be continued as long

as it makes any impression on the surface, but in no case for less than five hours for each thousand square yards of pavement.

All portions of the pavement surface not accessible to the roller to be compressed by tamping and smoothed with hot irons.

Special care shall be taken to thoroughly tamp the hot asphalt mixture around any projecting manhole or catch basin covers.

Special care must also be taken to prevent the iron rakes, shovels, tampers, rollers, etc., from becoming overheated.

The resulting pavement must show a close-grained, even and smooth surface, true to grade and cross-section, and free from all hollows or inequalities.

No binder or wearing surface shall be laid in rainy weather, or unless the surface of the concrete or binder is dry.

Asphalt Alleys—The surface of the asphalt pavement for a width of one (1) foot on each side of the center line of the alley shall be painted with asphaltic cement and ironed in with hot irons.

Payment for this work is to be included in the price bid for asphalt pavement.

Asphalt Gutters.—On all streets in this district where asphalt is used for gutters a strip not less than eighteen (18) inches in width along the gutter line shall be painted with a coat of hot asphaltic cement, and ironed in with hot irons.

Measurements will be the same as for other pavement.

Payment for same will be included in price bid for "Asphalt Pavement."

General Requirements.—Whatsoever the character of the asphalt used, or the method of manipulation and laying, the pavement shall conform to the following requirements:

The pavement, when laid down, shall be dense, fine grained, hard and durable, of smooth and even surface, and free from any depressions or unevenness showing more than three-eighths (⅜) inch under a four (4) foot straight edge. It shall contain no water nor any appreciable amount of light oils, nor matter volatile at a temperature of 250 degrees Fahrenheit.

The mineral matter shall be graded within the following limits:

All must pass a No. 8 screen.
From 0% to 2% shall be retained on a No. 10 screen.
From 1% to 5% shall be retained on a No. 20 screen.
From 3% to 8% shall be retained on a No. 30 screen.
From 5% to 13% shall be retained on a No. 40 screen.
From 7% to 17% shall be retained on a No. 50 screen.
From 20% to 36% shall be retained on a No. 80 screen.
From 8% to 16% shall be retained on a No. 100 screen.
From 10% to 15% shall be retained on a No. 200 screen.
From 10% to 15% shall pass a No. 200 screen.

The proportions, and physical and chemical properties, of the oil and asphalt and the asphaltic cement, sand, and finely powdered mineral matter in the wearing surface, shall be such as to produce the above described results, and shall be in all respects satisfactory to the City Engineer.

All exposed surfaces of castings must be cleaned and then painted with one coat of hot asphalt. All exposed surfaces of gutters and curbs that come in contact with asphalt pavement to be painted one coat of hot asphalt, special care being taken in painting curbs not to paint above the top of the gutter. Payment for this work will be included in the price bid for asphalt pavement.

None but skilled workmen shall be employed in mixing and laying the asphalt pavement.

Payment.—Payment will include placing all materials, including the concrete base paint coat or binder course, wearing surface and all other labor and materials required by the plans and specifications.

STONE ALLEY CROSSINGS

Stone Alley Crossings including the concrete base shall conform in all respects to the foregoing specifications for stone pavements.

BRICK ALLEY CROSSINGS

Brick Alley Crossings, including concrete base shall conform in all respects to the foregoing specifications for brick pavements.

Measurement will be the same as for other pavement.

CONCRETE GUTTERS

The materials for the concrete base and the cement wearing surface to be as specified herein for "Concrete Sidewalks." When concrete gutter is attached to concrete stairways, the steel rods shall extend into the gutter as shown on the standard plan for concrete stairways.

Measurement will be on the slope.

CONCRETE PAVEMENT

Pavement.—The concrete pavement consists of a course of concrete base four (4) inches thick, and a wearing surface one and one-half (1½) inches thick.

The concrete for the base consists of one (1) part Portland cement, three (3) parts of sand and six (6) parts of gravel by measure (1 barrel cement=3½ cu. ft. by measure). The concrete shall conform to and be mixed in accordance with standard specifications. The upper surface to be parallel to and one and one-half (1½) inches below the finished surface of the pavement. The base shall be brought to a true crown and grade by the use of a template approved by the City Engineer, the wearing course to be laid immediately after the base and before the base has begun to set.

The wearing course shall be composed of one (1) part of Portland cement to one-half (½) part sand and one (1) part pea gravel. The pea gravel not to be larger than ¼ inch in its greatest diameter, clean, and free from sand.

The finished surface shall be worked with wooden floats until it has an even surface and then roughened in a manner satisfactory to the City Engineer. It shall be marked and grooved into 4x10 inch blocks. The grooves to be ⅜ inch deep, ½ inch wide at the bottom and ¾ of an inch wide at the top.

After the concrete is laid it must be covered and protected and kept sufficiently wet to the satisfaction of the City Engineer for at least seven days and be kept free from traffic for a period of fourteen (14) days.

The pavement shall be laid in sections with ¾ inch expansion joints every twenty-five (25) feet of its length and shall be filled with cast pieces of expansion joint material.

There shall be a longitudinal ¾ inch expansion joint along the curb.

Payment.—Payment for Concrete Pavement will be at the rate bid per square yard, which is in full for the labor and material in the completed work including the one and one-half (1½) inch wearing surface and the four (4) inch base and expansion joints.

PAVEMENT RELAID

Whenever it is necessary to take up and relay pavements in order to adjust the crown or grade of the old pavement to meet that of the new, the City Engineer may order the work done. The existing pavement shall be taken up where necessary and the bricks or stone blocks to be carefully cleaned and piled. In case the adjustment can be made to the satisfaction of the City Engineer without the removal of the base, additional thickness of concrete may be ordered as required. The sand cushion shall then be spread and the brick or blocks replaced in accordance with standard Specifications for new work.

Payment will be made at the rate bid for "Pavement Relaid on Existing Base" or "Pavement Relaid on New Base," as the case may be, which shall be in full for all labor and material in the completed work.

PAVEMENT REPLACED

Whenever it is necessary to replace existing pavement with other or similar material, the existing pavement shall be removed, including the concrete base if necessary. If not necessary, such additions shall be made to it in the way of building up as are required. The new material shall then be laid in accordance with the Standard Specifications.

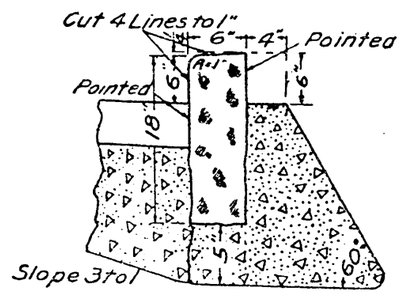
Payment will be at the rate bid for "Pavement Replaced on Existing Base" and "Pavement Replaced on New Base," as the case may be, which shall be in full for all labor and material in the completed work.

Measurements.—All pavement will be determined by horizontal measurement but no allowance will be made for curvature of cross-section.

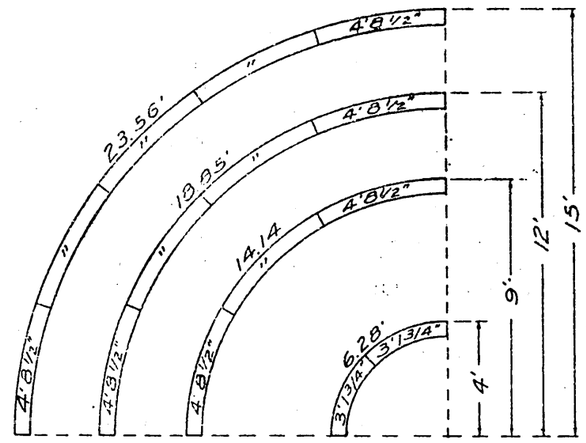
Traffic.—All traffic of any kind, except on planks, shall be rigidly prohibited on completed pavement for ten (10) days after the grout is filled in or until in the opinion of the City Engineer the pavement has become thoroughly set.

GRANITE CURBING

Curb stones shall be made from the best quality of granite and of the dimensions shown on the plans. For straight curbing, blocks less than four (4) feet in length will not be accepted. Stones for the curved corners to be of the length shown on the plans. The top surface and the outside face down to the surface of the gutter shall be line work, having four cuts to the inch. The face of the stones for a distance of five (5) inches below the surface of the gutter, and the back of the stone for a distance of four (4) inches below the top of the curb, must be uniformly pointed to an even surface. The bottom of all curbs shall have a true setting bed, so that the curbs will have a uniform depth throughout. The remaining portions of the stones to be uniform, true to line and free from depressions. All cut surfaces to be true and out of wind. The top of all curb stones shall be cut with a slope of one-quarter (¼) of an inch in six inches. The top angle of the street side shall be cut to a curve having a radius of one inch. The ends of all stones must be square and make joints not exceeding one-quarter (¼) of an inch in width. All curbing to be thoroughly clean and free from dirt when set. The contractor shall put in an expansion joint one (1) inch wide at each margin of the street and alley and



Granite

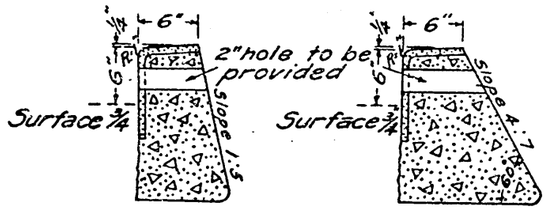


GRANITE RETURNS

at intervals not exceeding one hundred and fifty (150) feet. These joints to be filled with cast pieces of expansion joint material. Trenches for curbs shall be carefully excavated at least five (5) inches below the bottom of the stone, and be wide enough to receive the concrete footing and backing shown on the plans. The concrete at the face of the stone must be brought up and made continuous with the concrete in the pavement foundation. The amount of concrete back of the curb stone in all cases to be not less than that shown on the standard plan and of the same proportions as the base for pavements.

CONCRETE CURBING

The concrete to be composed of one part Portland cement, three parts sand and five parts gravel (1:3:5). The lumber for forms shall be dressed on the edges and on the side next the concrete and be set securely so that the curbing, when completed, will conform accurately to line and grade. After the concrete has been deposited, it must be spaded back from the face of the form to a depth of not less than eight (8) inches and to a width of not less than three-fourths (¾) of an inch at the top. The space thus formed shall be filled with Portland cement mortar, mixed one part cement to one and one-half parts of sand. The concrete and mortar shall then be thoroughly spaded and tamped. The top layer, three-fourths (¾) of an inch in thickness, consisting of a coat of cement mortar mixed as specified above, shall be applied immediately and thoroughly trowelel down to a smooth and uniform finish, special care being taken to secure a perfect bond with the concrete.



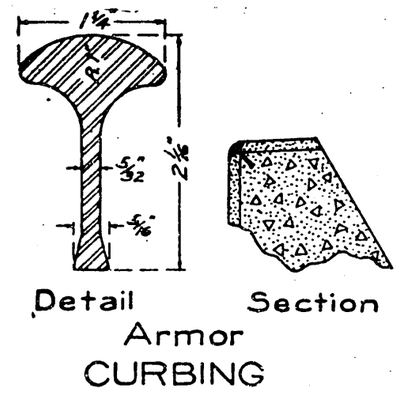
After the forms have been removed, any defects on the top of the curbing must be corrected. Any faults or interstices shall be filled with cement mortar and smoothed so that the top and face of the curbing, for a depth of eight (8) inches, is free from defects. The contractor must protect the curbing from all damage from traffic and the weather. In hot, dry weather, the curbing must be kept moist by sprinkling as often as the City Engineer directs.

The contractor shall put in an expansion joint one (1) inch wide at each margin of the street and alley and at intervals not exceeding one hundred and fifty (150) feet. These joints to be filled with cast pieces of expansion joint material.

Payment.—Payment for concrete curbing will include the expansion joint and the 2" weep holes.

ARMORED CONCRETE CURBING

Armored concrete curbing shall be constructed in precisely the same manner as specified for Concrete Curbing, except that proper provision must be made for the insertion of the armor. The armor consists of a galvanized steel bar known as the Wainwright bar or any other bar of a pattern approved



by the City Engineer. This armor shall be accurately placed on the edge of the curbing and must connect smoothly with the top and sides. It shall extend not less than three feet beyond the point of curve on all curves, including alley returns. The extension beyond the point of curvature shall not be a separate piece of armor. After the bar is set, the cement mortar top while still soft to be thoroughly troweled and smoothed.

Measurement.—All curbing will be measured along the curb line.

REPLACING CONCRETE SIDEWALKS

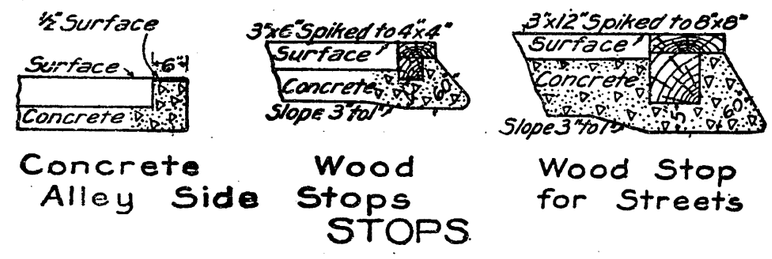
Where directed by the City Engineer, the existing concrete sidewalks shall be repaired or extended in accordance with the standard specifications of the City of Seattle for concrete sidewalks.

REPAIRING WOOD SIDEWALKS

Where directed by the City Engineer any existing wooden sidewalks shall be carefully taken up and the lumber therein piled and protected until used. After the completion of the curbing, the sidewalks are to be rebuilt, using such old lumber as may be directed with such additional new lumber as may be required. All lumber to be laid as provided in the standard specifications of the City of Seattle for Wooden Sidewalks.

WOOD STOPS

Wooden stops shall be placed along the edge of the pavement where the same is not otherwise protected and consist of a continuous sound fir timber solidly bedded in concrete as shown by drawings, on which is spiked a continuous plank



three (3) inches by twelve (12) inches. After the setting of the concrete, the earth surrounding such stops must be properly surfaced and tamped to the level of the general surface.

WOOD ALLEY SIDE STOP

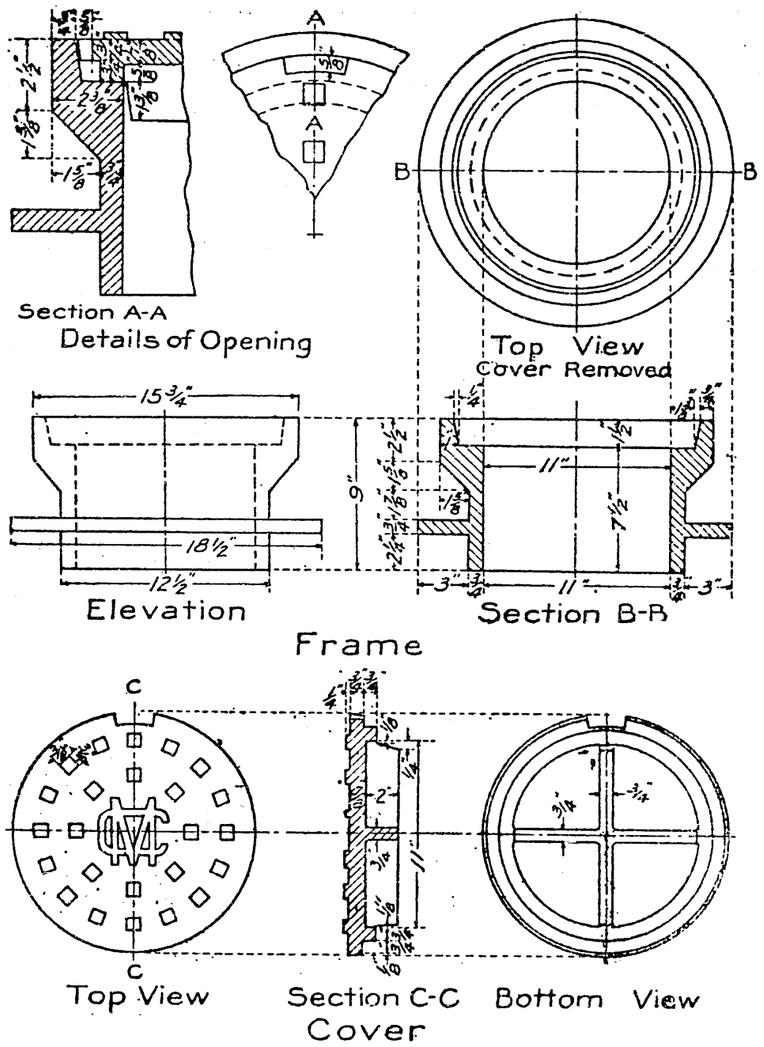
The timber shall be solidly bedded in concrete and after the concrete sets, the earth adjoining the stops to be properly surfaced and tamped to a level of the general surface.

CONCRETE ALLEY SIDE STOP

The proportions are the same as for the concrete base except that the facing shall be one (1) part Portland cement and one and one-half (1½) parts sand.

MONUMENT CASES

The material conforms to the general requirements of these standard specifications for cast iron. The City Engineer will set the monuments but the contractor must furnish the concrete in which the same is set. Payment for which will be included in the price bid for monument cases.



MONUMENT CASE

ADJUSTMENT OF CAST IRON VALVE BOXES

Payment for adjusting cast iron valve boxes will be included in the price bid for pavement.

ADJUSTMENT OF MANHOLE, CATCH BASIN, ETC., COVERS

Manhole, catch basin, or similar covers, shall be adjusted to the proper grade in the manner as specified for setting covers in new work. Care must be taken that they are set to the grade and contour of the street in which they are placed, and that the pavement is brought up flush with the covers.

ADJUSTING INLETS

Existing inlets shall be adjusted to the proper elevation. The contractor to furnish all new material required and reset such inlets in the same manner as specified for new work.

SUB-DRAINS—(Paving)

When all clearing and grubbing, excavating, rolling, etc., has been done to the satisfaction of the City Engineer,

trenches for tile drains shall be dug where necessary. The excavations shall be made to a true line at least three (3) inches below the bottom of the tile pipe. Gravel or broken stone are then to be spread so as to form a bed for the pipe. The pipe shall be hard-burned tile drain without sockets, laid on a true grade line as given by the engineer, and connected to the inlet provided for it in the catch basin wall or to such other pipe or outlet as the City Engineer may direct. The trench will then be filled with screened gravel to the surface, care being taken to have at least three (3) inches of gravel surrounding the pipe.

Payment will include the cost of making the connection to any pipe or catch basin.

See Gravel Base for plan.

OLD LUMBER RELAID

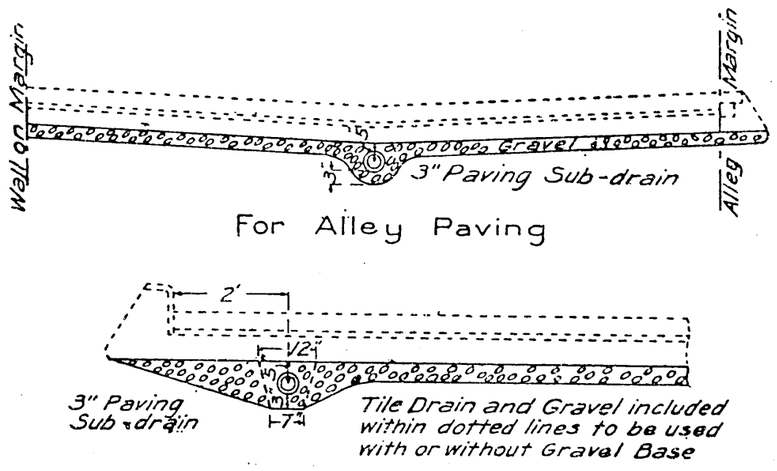
The surface of all connecting streets, roadways or walks, which by reason of this improvement fails to conform to the general surface of the finished improvement, shall be made to conform to such finished surface by filling with suitable material or by excavating, as the same may require, and all which by reason of this improvement fail to conform to the planking brought to grade and adjusted to form a continuous surface, to the satisfaction of the City Engineer. Such adjacent streets as may be designated by the City Engineer shall be planked with the lumber taken from the existing planking, curbs, gutters and crosswalks, which had been piled as directed under "Clearing and Grubbing."

GRAVEL SUB-BASE

Gravel shall be laid as directed by the City Engineer. It must be screened and free from dirt and soil. The stones to range in size between one-quarter (¼) of an inch and three (3) inches.

SIDEWALK REPAIRING—OLD LUMBER—NEW LUMBER

Whenever the present wooden sidewalks extend to the line of the proposed curb, such sidewalks, or such portions thereof as may be necessary, shall be taken up and the lumber care-



GRAVEL BASE

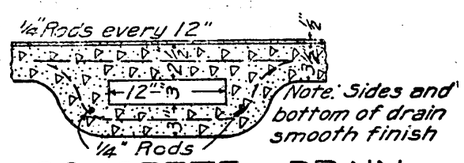
fully piled. Immediately after the setting of the curb the sidewalks shall be rebuilt, using all old lumber which the City Engineer may consider suitable to remain in the structure, with the addition of such new lumber as may be necessary.

Where directed by the City Engineer, existing wooden sidewalks and landings are to be extended to the new curbs. The covering planks shall be two (2) inches by eight (8) inches, dressed on the upper side. All lumber to be cut, fitted and nailed as provided in the standard specifications for wooden sidewalks.

The work of repairing, reconstructing, or extending, sidewalks will be paid for per M. ft. BM. of lumber in the finished structure, as hereinbefore stated, and bids shall be submitted for old and for new lumber.

CONCRETE ALLEY DRAINS

The outlet ends of these drains shall be neatly chiselled openings through the curb. The flow line and sides of the drains to be smoothly finished.



CONCRETE DRAIN

A standard inlet shall be set in the manner hereinbefore provided in these specifications and connected to this drain.

Payment will include furnishing and setting inlet, and making connections to drain, all concrete work, chiselling curb, steel and relaying concrete walks.

RELAYING OLD PLANKING

The existing planking shall be relaid in accordance with the standard plans and specifications for new planking, using such of the old lumber as in the opinion of the City Engineer is suitable. The contractor will be required to pile up and protect all lumber to be relaid and will be held responsible for the safe keeping of the same. The lumber not to be relaid to be disposed of as directed by the City Engineer.

Payment will include all handling of the old lumber.

EXTRA BINDER

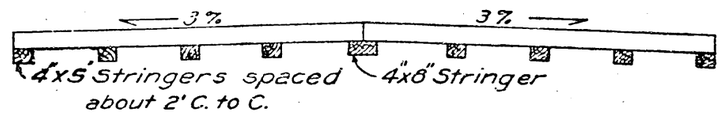
Extra binder corresponds to the standard specifications of the City of Seattle in all respects for binder as specified under asphalt pavement, except as to thickness, which will be as shown on the improvement plan, or as designated by the City Engineer.

COAL FOR STEAM ROLLER

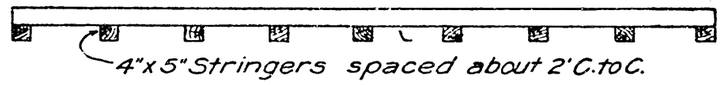
The contractor shall furnish coal of a good quality for steam generating purposes for the operation of the city's steam roller if the same is used on this improvement.

PLANKING

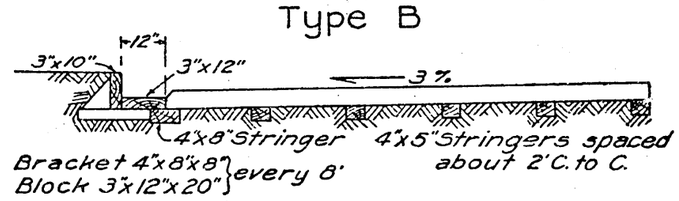
Clearing and Grubbing. See page 5.
Sub-Grading. See page 9.



Section of Planking
Type A



Section of Planking
Type B



Section of Planking
Type C

PLANKING OR REPLANKING

The stringers to be of the sizes and spaced as indicated on the plan, solidly bedded in the prepared sub-grade so that their upper surface is uniformly the thickness of the planking below the grade prescribed for the finished surface except where otherwise specially directed by the Engineer. The earth must be thoroughly tamped under and around all stringers. In case of muddy or springy sub-grade the contractor shall furnish and lay suitable material such as cinders, to secure dry tamping.

The planks or pieces shall be sized on one side and of dimensions shown on the plan, except as hereinafter specified or shown on the plan at certain points where pieces of varying widths will be required. The lumber for planking must be of uniform thickness, and laid with that side of the lumber cut nearest the heart of the tree, downward; provided that in case pieces with approximately square sections are specified instead of planks, such pieces shall be laid with the grain of the wood vertical. Where planks are specified, each plank shall be nailed to the stringer with wire nails of sufficient length to give at least four (4") inches penetration into the stringer, arranged two (2) nails over the stringers at the ends of each plank, and one nail at each intervening stringer "staggered."

All curb and gutter boards shown on the plan, with all necessary blocking and spiking, shall be furnished and laid in accordance with specifications for "Curbs and Gutters." The planking to be shaped and fitted to the gutters and the edges bevelled.

At certain points in the district shown on plan where corners are to be turned or planking fitted to curves of the street railway portion, the planking shall be laid by the use of fan shaped pieces.

The contractor will be required to make all the necessary adjustments to existing cross-walks, planking, curbs and gutters, manhole, catch-basin and similar covers, in a neat and finished manner. Payment for which will be included in the price bid for lumber.

"Planking" will be interpreted to mean the construction of a plank roadway on a street not previously so improved, and "Replanking" to mean the replacing of wornout planking with new lumber.

Measurements for planking or replanking shall be taken on the slope.

Payment for planking or replanking shall include the cost of sub-grading as specified under "Grading."

TIMBER TRESTLES

PILING

The contractor must furnish, drive and cap all piles necessary to sustain the roadway, in accordance with detail plans or as directed by the City Engineer.

Bents are to be driven fifteen (15) feet six (6) inches between centers, and the position of each bent will be located by the City Engineer.

All piles shall be fir, winter cut, straight and sound in every particular, free from large knots or other imperfections, and not less than nine (9) inches or more than fourteen (14) inches in diameter at the smaller end, or less than fourteen (14) inches at cut-off. All dimensions will be measured under the bark. They shall taper uniformly from end to end. Second growth piles cannot be used.

All piles must be driven true and plumb at the points indicated, and until they will not penetrate more than two (2) inches under a fifteen (15) foot fall of thirty-five hundred (3500) pound hammer, and under no condition shall a pile have less than four-foot penetration. They shall be cut off at the elevations given by the City Engineer, cut-offs being on a true line in order to give the caps a firm bearing. The tops of all piles to be neatly chamfered so as not to project beyond the edge of the caps. All points of contact between timbers, such as tops of piles and posts and bearings of caps on piles and all stringers and caps, must be thoroughly coated on both faces with hot Carbolineum Avernarius, hot creosote, or some other equally efficient preparation approved by the City Engineer.

Payment will be made for piling at the rate bid per linear foot of pile in completed structure, measurement to be made from point to cut-off, and shall include the furnishing, driving and cutting off of same as above specified. No payment will be allowed for that portion of the pile above the cut-off.

CREOSOTED PILING

Watersoaked.—The piling to be treated must be Douglas fir, conforming to the City of Seattle's specifications for this class of material, the cubical contents of each stick being determined to the satisfaction of the City Engineer of Seattle.

Each cylinder charge must be made up of piles which have been in water as nearly as possible the same length of time; and at the time of treating must be sound, free from worm holes, limnoria, and barnacles.

After the piles are placed in the cylinder, they must be immersed in creosote oil of a temperature ranging between 160° and 170° F., and kept covered during the entire boiling period under at least four inches of oil at the shallowest place. The engineer on duty must from time to time during the boiling satisfy himself by bleeding the cylinder, that such is the case.

After filling the cylinder with oil, steam must be regulated through the heating coils so that the temperature within the cylinder is kept gradually rising as fast as the condensation will permit until 220° F. is reached; after which the steam pressure must only be such as to maintain a regular and constant temperature within the cylinder with 220° as the minimum and 225° F. the maximum, until such time as the amount of condensation per cubic foot per hour collecting in the hot well of the condenser shows the interior of the wood to be thoroughly dry, when the steam pressure in the coils should be released, and the cylinder filled up with creosote oil from the storage or working tank, of a temperature ranging between 160° and 170° F., then pump pressure applied until the gauge shows 5 lbs. pressure in the cylinder (this to insure the fact of the cylinder being actually full), after which the connection between storage tank and cylinder should be closed and the connection between measuring tank and cylinder opened. Additional pressure must then be applied until the piling has taken the proper amount of oil, forced in under such conditions as will insure its complete retention in the wood after drip is over, and figured at the weight of the dry oil per gallon at 165° F., the cylinder doors may then be opened provided the temperature within is reduced below 200° F.

After treatment, the piling must be free from all heat checks, water bursts, and other defects due to inferior treatment which would impair usefulness or durability for the purposes intended. Piles when bored midway between the ends must show no moisture in to the center, and the borings beyond the oil penetration must retain their natural elasticity and strength. The penetration of black oil midway between the ends, for a 10 lb. treatment should be at least three-quarters of an inch in piles up to 40 ft. in length; 1 to 1¼ inches for piles between 40 and 70 ft. in length; and 1¼ to 1½ inches for piles 70 ft. and over; with a correspondingly greater depth for an increased quantity of oil.

Green or Freshly Cut and Seasoned Piling.—Green, or freshly cut piles delivered at the treating plant on cars, or any which have not been lying in the water, must be treated in the manner prescribed for green or freshly sawed material.

Thoroughly seasoned piles must be treated in the manner prescribed for thoroughly seasoned sawed material.

No piling in these two classes to be mixed together and treated in the same charge.

Fir Sawed Material.—Seasoned, and green or freshly sawed material must not be mixed together and treated in same charge, and none should be treated which is not at the time free from rot, and in proper condition for use after treatment so far as splits or breaks are concerned; if any such is received from the mills it should not be treated unless the Inspector directs it to be done.

Square timber must not be treated in the same charge with planking, nor ties with planking, and sufficient one inch strips must be placed between each tier, with from one-half to one

inch space left between each piece, so that the oil can have free access to all surfaces.

After the material is placed in the cylinder, it must be immersed in creosoted oil of a temperature ranging between 160° and 170° F. and kept covered during the entire boiling or heating period under at least 4 inches of oil in the shallowest place; the engineer on duty must from time to time during the boiling, satisfy himself by bleeding the cylinder that such is the case.

In the case of green or freshly sawed material, steam must thereafter be regulated through the heating coils so that the temperature within the cylinder is kept gradually rising as fast as the condensation will permit until 202° F. is reached, with 215° F. as the maximum; after which the steam pressure must only be such as to maintain a regular and constant temperature within the cylinder between these figures, until such time as the amount of condensation per cubic foot per hour collecting in the hot well of the condenser shows the interior of the wood to be thoroughly dry, when steam pressure in the coils should be released.

In the case of thoroughly seasoned material, the temperature of the oil in the cylinder must be allowed to rise slowly and steadily until 190° F. is reached, with 192° F. as the maximum; and kept between these figures until such time (dependent upon the dimensions), as the interior of the wood shall have become sufficiently warmed up to enable it to take the required amount of oil, when the steam pressure in the coils should be released.

The cylinder should then (in each case) be filled up with creosote oil from the storage or working tank, of a temperature ranging between 160° and 170° F.; and pressure from the pump applied until the gauge shows 5 lbs. pressure in the cylinder, to insure the fact of the cylinder being actually full, after which the connection between storage tank and cylinder should be closed, and the connection between measuring tank and cylinder opened. Additional pressure must then be applied slowly and steadily until the material has taken the proper amount of oil, forced in under such conditions as will insure its complete retention in the wood after the drip is over, and figured at the weight of the dry oil per gallon at 165°F.; the cylinder doors may then be opened, provided the temperature within is below 200° F.

After treatment, the material must be free from all heat checks, water bursts and other defects due to inferior treatment, which would impair usefulness or durability for the purposes intended. The penetration of black oil midway between the ends for a 10 lb. treatment should be at least ¾ of an inch deep on dimension timber, and on planking at least ½ inch deep, with a correspondingly greater depth for an increased quantity of oil.

General Conditions.—All material shall be treated to the entire satisfaction of the inspector of the City of Seattle, he being allowed full access at all times to the facilities used in the treatment while it is in progress; but the fact of an inspector being at the plant shall not relieve the Treating Company's officials from the responsibility of seeing that the treatment of all material is properly and carefully done, with the agreed penetration of oil in each case, based on the contract amount.

Before the cylinder charge is disposed of, the depth and character of the penetration must be ascertained by boring one or more auger holes after the wood has cooled, in as

many pieces of each class of material as may be necessary for the purpose; and such pieces as are not found to be fully treated in accordance herewith must be returned to the cylinder with a subsequent charge for further treatment without extra cost therefor; should more than 10% of the total number of pieces treated be found defective, the entire charge must be so returned. No material must be removed from the treating yard until all auger holes are tightly plugged with creosoted plugs.

The intent of these specifications is that the wood, when it comes out of the cylinder and after all drip is over, shall contain the full weight of oil to the cubic foot, forced in at such pressure and under such conditions, as to enable the wood cells, and fiber to retain it permanently; but as there is more or less rebound of oil out of the wood after pressure is released, a checking up of the oil on hand against the total contract absorption of the various charges shall be made each twenty-four hours, timber and piling being kept separately; and if any difference is found to exist, a co-efficient shall be established and used until the next checking shows the necessity for a different one.

The pressure gauges and thermometers must be compared and tested at frequent intervals with standard test appliances kept on hand for that purpose, and all differences corrected.

Competent and experienced engineers shall be in charge of the treatment night and day, and required to make frequent examinations of the temperature during the boiling, especially when a maximum heat is being applied; the thermometers being located so that they will correctly reflect heat conditions within the cylinders, and at the same time be convenient to get out. In handling material after treatment, sharp dog or cant hooks must not be used in any way whereby the full protection of the treatment is likely to be lessened; where it may be necessary, as in the case of piling they must be used within the spaces two feet from the large end and six feet from the point. Any material broken or otherwise damaged in treatment or by careless handling, while in the Treating Company's care until delivered to its destination as per contract, will be rejected and the Treating Company must submit new pieces therefor.

The oil must be pure dead oil of coal tar without adulteration, with a specific gravity of 1.04 to 1.10 at a temperature of 60° F.; it must be perfectly liquid at 100° F.; and remain so on cooling down to 90° F. The distillation must be conducted under the Von Schrenk or American method as published in Bulletin No. 65 of the American Railway Engineering and Maintenance of Way Association, and of the dry oil, the boiling points shall be: Up to 210° C. not more than 5%, and between 210° C. and 235° C. not more than 30% shall distill over, while at 355° C. at least 90% shall distill over. As a different method of distillation is used abroad, sufficient allowance must be made in these percentages, in case the oil is imported, so as to bring it within the specified limits when analyzed by the above method.

Before the first treatment begins, the Treating Company must furnish a gallon sample of the oil proposed to be used hereunder, same to be sent to the City Chemist for analysis; and in case a different oil is thereafter used, a new sample must be sent as above for further examination.

In addition to the method of treatment designated in the preceding specifications, the following method, known as the

steaming process, will be acceptable: Material to be treated, having been placed in the retorts, shall—

1. Be steamed with live steam at 90 lbs. pressure per square inch for a period of not more than seven hours for material saturated with water, or not more than five hours for green unseasoned stock. For thoroughly seasoned material little steaming is required.

2. Steam having been exhausted to atmospheric pressure a vacuum of 20 to 26 inches shall be created and maintained for a period of eight hours or until the water ceases to rise in the condenser, indicating that no more moisture is coming from the timber.

3. The retorts are then to be filled with oil as specified above at a temperature of not less than 190 degrees Fahr. and the pressure raised gradually to 100 lbs. and maintained until the following results have been obtained:

Three (3) pounds of oil per superficial foot must be injected and the pile or timber when bored at any place shall show a penetration of oil of at least one (1) inch. After treatment the pile must be free from all heat checks, water bursts and other defects due to inferior treatment which would impair the usefulness or durability for the purposes intended.

SUPERSTRUCTURE

Posts.—Where posts are to be used instead of piling they shall be of the dimensions and construction as shown on the plans.

Caps shall be placed upon piles in such manner as to give a true line to the ends thereof, and be drift-bolted to each pile with drift bolts three-quarters (¾) inch by twenty-two (22) inches, countersunk at least one (1″) inch and the hole filled with hot pitch or asphalt.

Stringers shall be furnished and laid on bents, dimensioned and spaced as shown on plans. Each stringer must be at least thirty-two (32) feet in length, and be laid upon caps so as to make lap joints alternating upon succeeding caps, except the outer stringers, which shall have butt joints. All stringers must be toe-nailed to the caps with forty (40) penny wire nails, two to each cap.

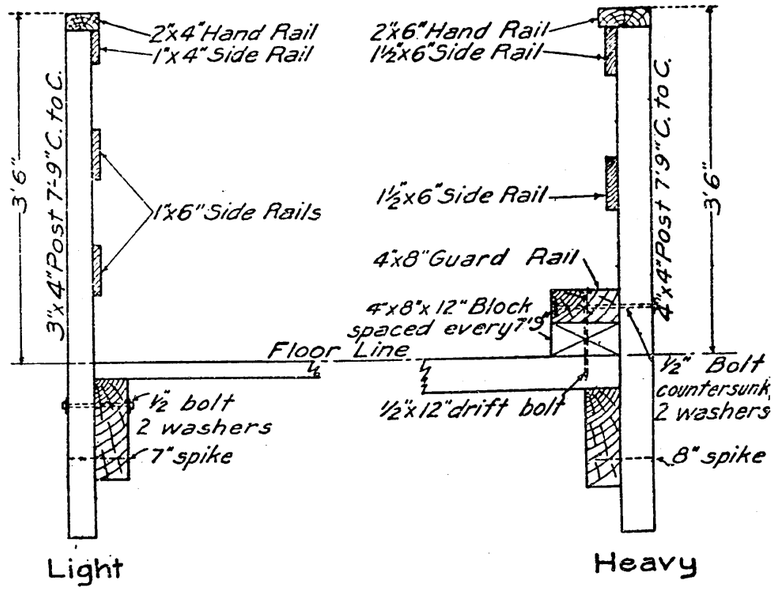
Planking to be sized on one side and laid close. Each plank shall be nailed to the stringers with nine (9) inch wire nails, arranged two (2) nails in the stringer at the end of each plank and one nail at each intervening stringer, staggered.

Sidewalks to be constructed as hereinbefore specified.

Payment will be made for lumber in the completed structure only and will include all nails, spikes and drift-bolts.

RAILING

The lumber used for railings shall be sized four sides and be painted with two coats of mineral paint mixed with linseed oil and in all cases the price paid per linear foot of railings shall include all material and labor, such as lumber, nails, spikes, excavating for posts, cutting, fitting and painting; all work to be done as directed and to the satisfaction of the City Engineer.



WOOD RAILING

TEMPORARY PLANKING AND TEMPORARY PLANKING RELAID

When planking is to be laid more than once on an improvement, it will be classified and paid for as temporary planking. It shall be laid in conformity with the Standard Plans and Specifications for new planking except that one spike for each stringer will be satisfactory. When this planking is ordered removed by the City Engineer to another part of the improvement, the contractor will then take up and transport the planking and the stringers, relaying the same in accordance with the above specifications for temporary planking, unless this is known to be the last location, in which case the nailing shall be in accordance with the Standard Specifications.

Payment for temporary planking will include all labor and material necessary for the first laying. Subsequent layings will be paid for each as "Temporary Planking Relaid" which shall include all work and material involved in moving the planking from one location to the other.

GENERAL STIPULATIONS

It will be further expressly agreed between the parties to the contract for this improvement that the contract is made subject to the following conditions and stipulations:

1st. **Contractor's Responsibilities.** The contractor is required to furnish all necessary labor and materials, and to fully complete the work in accordance with the plans and specifications, and to the satisfaction of the City Engineer, for the prices bid. Bidders must examine and judge for themselves as to the location of the proposed work, the nature of the excavation to be made, and the work to be done. It is understood that the whole of the work to be performed under the contract for this improvement is to be done at the contractor's risk, and he is to assume the responsibility and risk of all damages to the work or to property on the line of said work which may be occasioned by floods, backwater, caving of the street, settling of the foundation of buildings, or for any cause whatever. The contractor shall have charge of and be responsible for the entire con-

tract until its completion and acceptance. He shall also be liable for any defects which may appear on his work before the final payment specified herein. The fact that an inspector was always present during the progress of any improvement does not relieve the contractor from responsibility for any defects discovered after the completion of the work.

2nd. **Begin Work.** The contractor shall commence the work at such points as the City Engineer may direct, and shall conform to his directions as to the order of time in which the different parts of the work shall be done.

3rd. **Directions—To Whom Given.** Whenever the contractor is not present on the work, orders will be given to the superintendent or overseer who may have immediate charge thereof, and shall by them be received and strictly obeyed. If any person employed on the work shall refuse or neglect to obey the directions of the City Engineer or Board of Public Works in anything relating to the work, or shall appear to be incompetent, disorderly or unfaithful, he shall, upon the requisition of the engineer be at once discharged, and not again employed upon any part of the work.

4th. **Protection of the Work.** The contractor will be required to observe all City Ordinances in relation to obstructing streets, keeping open passage ways and protecting the same where exposed, maintaining signals, and to obey all laws and ordinances controlling or limiting those engaged on the works. The said contractor expressly stipulates and agrees to erect and maintain good and sufficient guards, barricades and signals at all unsafe places on the works and to indemnify and save harmless the City of Seattle from all suits and actions, of every name and description brought against the City for, or on account of, any injuries or damages received or sustained by any party or parties by reason of the failure of said contractor to erect or maintain such guards, barricades, or signals, or by or in consequence of any negligence of said contractor or his or their agents or employes, in carrying on said work, or by or on account of any act or omission of said contractor in the performance of said work; and it is agreed by the contractor that so much of the money which shall be due to him under and by virtue of the contract for this improvement as shall be considered necessary by the Board of Public Works, may be retained by The City of Seattle until all suits or claims for damages as aforesaid shall have been settled, and evidence to that effect is furnished to the satisfaction of said Board of Public Works in addition to the percentage reserved as otherwise herein provided.

5th. **Disputes—How Settled.** To prevent all disputes and litigation it is further agreed by the contractor that the City Engineer shall in all cases determine the amount of work to be paid for under the contract for this improvement, and his estimates and decisions shall be final and conclusive, subject to the approval of the Board of Public Works.

6th. **Changes of Plans.** The City Engineer or Board of Public Works shall have the right to make changes in the location, construction, form, dimensions, grades and alignments, Y's, manholes, catch basins, ducts, cables, and other connections and constructions, and make any variations in the quantity of the work to be done, as exhibited in the schedule of prices or bid for said work, and to entirely exclude any of the items of work relating to said quantities at any time, either before the commencement of the work, or during the progress, without thereby altering or invalidating any of the prices herein named; should such action diminish the amount of work that would otherwise be done, no claim shall be made for damages on the ground of loss of anticipated profits on work so dispensed with; and should

such action be taken after the commencement of any particular piece of work, and result thereby in extra cost to the contractor, the City Engineer shall estimate the amount to be allowed therefor which he shall consider fair and equitable, and his decision shall be final and conclusive.

7th. **Unnecessary Occupation of Streets.** The contractor shall not be allowed to dig up or occupy with material any more of the street than is absolutely necessary for the prosecution of the work.

8th. **Engineers—When Wanted.** The contractor shall give forty-eight hours' notice, in writing, when he shall require the services of the Engineer for laying out any portion of the work. He shall dig all stake holes necessary to give grades. He shall furnish and keep on the work, at all times, a spirit-level and straight-edge, of such form and size as directed by the Engineer. He shall furnish new lumber for stakes, all under direction of the Engineer, and shall carefully preserve all stakes when set. In case any stakes have to be replaced by the Engineer, the contractor shall be charged the expense thereof, and the same be deducted from his estimates.

9th. **Monuments Not to be Disturbed.** The contractor shall not disturb any monuments or stakes found on the line of the improvements until ordered by the Engineer. A penalty of twenty-five ($25.00) dollars will be imposed for each monument disturbed without orders, and the amount deducted from the estimates.

10th. **Provide for Flow of Water Courses, Etc.** The contractor shall provide for the flow of all water courses, sewers or drains, intercepted during the progress of the work, and replace the same in as good condition as he found them, or shall make such final provisions for them into the sewer, or otherwise, as the Engineer shall direct. The use of any portion of the sewers shall not be construed as the acceptance of them by the Board of Public Works.

The contractor shall not obstruct the gutter of any street, but shall use all proper measures to provide for the free passage of surface water along the gutters.

11th. **Protection to Public Utilities Owned by City.** The contractor shall support and protect by timbers or otherwise, all water or sewer pipes, conduits, poles, wires or other apparatus owned by The City of Seattle which may be in any way affected by the work, and do everything necessary to support, sustain and protect the same, over, along or across said street. In case any of said water or sewer pipes, wires, poles or apparatus shall be damaged, they shall be repaired by the authorities having control of the same, and the expense of such repair shall be deducted from the amount due the contractor on his final estimate.

12th. **Damage to Existing Improvements.** All damage done to existing improvements during the progress of the work on this improvement shall be repaired by the contractor under the directions of the City Engineer, using for such repairs materials conforming to the requirements of the standard specifications of the City of Seattle for the various items used. If the contractor fails to furnish the necessary labor and materials for such repairs when ordered, the City Engineer may cause said necessary labor and materials for such repairs to be furnished by other parties and the cost thereof shall be deducted from such money as may be due to the contractor by reason of work performed or materials furnished for any part of this improvement. No payment will be made for this work.

13th. **Forfeiture of Contract.** It is further especially agreed that if at any time the City Engineer is of the opinion that the work is unnecessarily delayed, and will not be finished within the prescribed time, he shall notify the contractor, in writing, to that effect. And if the said contractor

shall not, within five days thereafter, take such measures as will, in the judgment of said Engineer, insure the satisfactory completion of the work, the Board of Public Works may then notify the said contractor to discontinue all work under the contract for this improvement; and it is hereby agreed that the said contractor shall immediately respect such notice and stop work and cease to have any rights to the possession of the grounds. The Board of Public Works may thereupon employ such force as they may deem advisable to complete the work, and charge the expense of all labor and materials necessary for such completion to the said contractor, and the expense so charged shall be deducted and paid by the City of Seattle out of such moneys as may be then due, or may afterward become due, to the said contractor under and by virtue of the contract for this improvement, and in case such expense is less than the sum which would have been payable under such contract if the same had been fulfilled by the said contractor, then said contractor shall be entitled to receive the difference; and in case such expense is greater the said contractor shall pay to the City the amount of such excess so due.

If the said contractor shall assign the contract for this improvement or abandon the work thereon, or shall neglect or refuse to comply with the instructions of the City Engineer relative thereto, or shall in any manner fail to comply with any of the specifications or stipulations herein contained, or with the requirements of the Charter, or Ordinances of the City, the Board of Public Works shall have the right to annul and cancel said contract, and to relet the work or any part thereof, and such annulment shall not entitle the said contractor to any claim for damages on account thereof, nor shall it affect the right of the City to recover damages which may arise from such failure.

14th. **Claim for Extras.** No claim for any extras under this contract will be considered by the Board of Public Works or City Engineer unless the same shall have been submitted previous to the final acceptance of the work and the passage of the final estimate. In case any extra work is required for which a price has not been included in the contract for this improvement, the same shall not be begun until a price therefor shall have been agreed upon, in writing, by the contractor and the City Engineer. If, for any reason, the said extra work cannot be performed at an agreed price, it will be paid for at the actual cost of all superintendence, labor and material required, together with ten per cent. additional for labor and material, and shall include payments under workmen's liability law.

15th. **Provision for Water and Gas Connections.** The City of Seattle reserves the right to construct any sewer or sewers, or to lay any water mains, or to grant permits to the interested parties to lay gas mains, steam pipes, conduits, etc., or to build up and adjust or construct any manholes, or catch basins, or to reset or renew any frames or covers for manholes, catch basins, water or gas stop-cocks or gates or to grant permits for private connections with sewer, water or gas pipes, at any time during the progress of the work and the contractor shall not interfere with or place any impediment in the way of any person or persons who may be engaged in doing such work as has been mentioned. The Board of Public Works reserves the right to suspend the work on any part of this improvement at any time during the construction of the same for the purpose above stated, or if said work interferes with other improvements. In any such case the contractor shall not be entitled to any damages, either for the digging up of the street or for the delay, but he shall be allowed and paid for any material or labor made necessary on his part, such reasonable sum (to be determined at

contract rates) as may be agreed upon between him and the City Engineer, and the time specified for the completion of his contract shall be extended as many days as he was thus delayed.

16th. **Payment of Wages.** The said contractor agrees to pay the wages of all persons and for assistance of every kind employed upon or about said work, and for all materials purchased therefor, and The City of Seattle may withhold any and all payments under this contract until satisfied that such wages, assistance and materials have been fully paid for.

17th. **Assignment of Contract.** The contract for this improvement shall take effect and be in force only upon its approval by the Board of Public Works of The City of Seattle, and shall be assigned only with the written consent of said Board, endorsed thereon. No assignment that may be made shall release the contractor therefor or his sureties, from any liabilities arising under said contract.

18th. **Hours of Labor.** And it is further agreed that said work shall be performed in workdays of not more than eight hours each, except in cases of extraordinary emergency; and that this contract may be canceled by the Board of Public Works in case such work is not performed in accordance with the provisions of this contract above specified, and no case of extraordinary emergency shall be construed to exist in any case where other labor can be found to take the place of labor which has already been employed for eight hours in any calendar day.

19th. **Excavated Material.** The material excavated from trenches shall be laid compactly on the sides of the trench and kept trimmed up so as to be of as little inconvenience as possible to the traveling public and to adjoining tenants.

20th. **Trenches Kept Free from Water.** The contractor shall keep all the trenches free from water during the progress of the work. No pipe or masonry shall be laid in water.

21st. **Protection of Private Property.** The contractor shall, at his own expense, shore up, protect and make good, as may be necessary, all buildings, walls, fences or other property injured, or liable to be injured, during the progress of the work; and the contractor will be held responsible for all damage which may happen to neighboring property or the street, or any improvements whatsoever, from neglect of this precaution, or from any other cause connected with the prosecution of the work.

22nd. **Fees and Royalties.** All fees, or royalties for any patented invention, article or arrangement, that may be used upon, or be in any manner connected with the work, or any part thereof, connected with these specifications, shall be included in the price mentioned in the proposals, and the contractor shall protect and hold the City harmless against any and all demands for such fees or royalties. Before the final payment is made on the contract the contractor must furnish acceptable proof of proper and satisfactory release from all such claims.

23rd. **Charges for Water.** The City Water Department will charge the contractor for city water used in settling earth at the rate of one dollar and forty cents ($1.40) for every one hundred (100) cubic yards of material water-settled, and fifty (50) cents for one hundred (100) square yards of paving, concrete walks or other concrete work (six inch base or less).

24th. **Injunctions.** It is agreed that if the contractor for this improvement, or The City of Seattle, shall be unable to complete any portion or portions thereof by reason of court proceedings enjoining the construction or completion of any portion or portions thereof and it shall, in the discretion of the City Engineer, be impracticable to construct or complete any other portion or portions thereof, then, and in any such case, the contractor shall waive any and all claim or claims

for damages by reason of such inability to construct such portion or portions of said improvement, and the City Engineer shall have the right to report such improvement, as completed, file his final estimate thereon as provided for in the full completion of other local improvements in The City of Seattle, and such contractor shall agree to accept in full payment of such improvement, and as a cancellation of his contract therefor a sum of money for his labor performed, and materials furnished in strict accordance with his bid for such contract, on the basis of the work actually performed or materials and labor actually furnished in said work to the date of stopping thereof. Should the court proceedings allow the work to be resumed prior to the issuance of the notice of completion on said work by the City Engineer, then the contractor on being ordered by the City Engineer shall proceed with the work immediately, carrying out the contract in full according to all original intents or modifications of the court, as the case may be, at the prices as specified in the original contract, and no extra payment will be allowed said contractor for change in price of material or labor or for any other reason whatsoever. Whatever time elapses after the contractor has been ordered to stop on the work and his being ordered to proceed again will not be considered as a part of the time allowed on the contract.

25th. **No Material to be Piled on Pavements.** Contractors shall not pile material on any asphalt pavement without first covering the asphalt with planks or in a manner satisfactory to the City Engineer and all material shall be compactly placed.

26th. **Inspection of Materials.** All materials shall be subject to inspection by the Engineer or his inspector, who will select samples in such numbers and quantities as he may deem necessary and subject the same to such tests as may be necessary to determine their qualities as herein specified, and he will accept or reject the materials in accordance with the results of such trials. Such tests may be repeated upon the arrival of different shipments, as frequently as may be necessary to insure the acceptance of only such materials as shall comply with the provisions of the plans and specifications to the satisfaction of the City Engineer. All materials rejected by the City Engineer or his inspector shall be removed from the premises and adjacent surroundings by the contractor within twenty-four (24) hours after he has been notified of their rejection. If this condition is not implicitly complied with, the City Engineer reserves the right of causing such rejected materials to be removed by other parties, the cost of such removal to be deducted from any money then due or which may become due to the contractor.

27th. **Quality of Material and Labor.** Any material necessary for the construction of any part of the improvement not specified herein shall be of good quality. All workmen employed shall be skilled in the performance of the special work to which they are assigned and whenever in the judgment of the City Engineer any workman is deemed unskilful, incompetent or disobedient, he shall be at once discharged and not again employed on any portion of the work.

28th. **Removing and Repairing Pavements.** Whenever it is necessary to remove or repair any pavement the work shall be done to meet the requirements of Ordinances 16081, 17313 and 25150 of the City of Seattle. This work is under the supervision of the Department of Streets and Sewers.

The foregoing Standard Specifications of the City of Seattle were examined and approved by the Board of Public Works June 27, 1913.

L. B. YOUNGS, Chairman.

Attest: C. B. BAGLEY, Secretary.

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