

PART 2

STREETS AND HIGHWAYS

SECTION 200

PREPARATION AND COMPACTION OF SUBGRADE

200.01 GENERAL. - Subgrade is the plane, curved, or warped surface on which subbase, base, pavement or sidewalk is to be placed. There may also be other subgrades, as that for the replacement of unsound subgrade material; the top of a layer of a material placed, considered the subgrade for the material to be placed immediately thereon; and trench subgrade.

Pavement subgrade, where untreated rock subbase is specified to be placed, will be the subgrade for such subbase.

Reference to any subgrade other than that for pavement subbase or base shall be particular and specific.

The Contractor shall do all the necessary or required shaping, grading and compacting so that the finished subgrades and graded ground within the limits of the work, will present a smooth, uniform surface and conform to the alignment, grades and contours shown on the plans and cross sections. The surfaces shall contain no local depressions that will hold water, and at intersections with undisturbed ground shall, by means of a uniform transition, conform thereto.

Areas to be paved shall be prepared to a subgrade at the proper depth below the required surface of the finished pavement. Except as otherwise specified in the Special Provisions or shown on the plans, the elevation and cross section of the subgrade shall be such that the finished roadway pavement surface will be 6 inches below the top of sidewalk curb at the gutter, and will have a crown of 1.0, 0.8, or 0.6 percent of the roadway width between sidewalk curbs, when the street grade is respectively, 0 to 3 percent, greater than 3, to 6 percent, or greater than 6 percent.

Subgrade in cut shall be compacted in accordance with the requirements therefor of Section 707.

Where compacted native material would produce unsound subgrade, such material shall be removed as specified in Section 700.10. Replacement backfill therefor, and the compaction thereof, shall be in accordance with the requirements of Sections 706 and 707.

Subgrade elevations shall not be raised or adjusted to compensate for anticipated settlement under the weight of the pavement.

Before pavement base or pavement is constructed adjacent thereto, the Contractor, unless otherwise specified or specifically allowed, shall construct the concrete curb required to replace existing concrete curb or granite curb that is not true to line or grade and payment for such work will be made under the appropriate Bid Item, if the Proposal contains such Bid Item.

The Contractor, immediately prior to placing the pavement or pavement base, shall check the subgrade for irregularities by means of a rigidly constructed, spiked template furnished by him. The spikes shall be placed at intervals not greater than 3 inches, center to center. The length and shape of the template and the protruding length of the spikes

shall be such that the points of the spikes, when the template is moved along the headers or previously constructed pavement, as applicable, will accurately delineate the crown curve of the portion of subgrade being checked.

No pavement or base material of any kind shall be placed upon any section of subgrade not approved by the Engineer.

Unless otherwise specified in the Special Provisions, not less than 200 linear feet of subgrade shall be prepared in advance of paving operations. After a section of subgrade has been approved for pavement or pavement base construction, the Contractor, by adequate barricading, shall keep the section free of equipment and all traffic, and shall repair at his sole expense damage to any prepared subgrade from any cause whatsoever.

Where necessary, the subgrade shall be properly wetted down with water immediately in advance of laying the pavement.

200.02 PAYMENT. - Preparation of subgrade shall be done as Incidental Work and payment therefor shall be included in the price or prices bid.

SECTION 201 (Blank)

SECTION 202

CONCRETE CURB

202.01 GENERAL. - The Contractor shall construct concrete curb, complete in place, including depressed curb, doweled curb, that combined with concrete parking strip, and that to replace existing concrete curb or granite curb that is defective, out of line or not at proper grade; all where, as, and to the lines and grades shown on the plans, and where directed, and including excavating, preparing the subgrade, constructing and removing forms, providing required keyways, providing the longitudinal and grouted vertical reinforcing in doweled curb, the required verifying and marking of side-sewer and Y-branch locations, providing construction joints, protecting, curing, backfilling, restoring pavement, painting, and all other Incidental Work. Unless otherwise specified, the nominal height of curb measured from gutter to top of curb shall be 6 inches.

Curb shall be depressed at automobile runways and driveways as shown on the plans. The fall across the curb at the driveways shall not be less than 3/4 of an inch. The length of the driveway depression shall be 9 feet exclusive of side slopes, except where directed by the Engineer, but shall not exceed 30 feet in length.

Existing sidewalk flags immediately adjacent to curb to be replaced, except over sidewalk basements, shall be removed to neat flag lines to facilitate construction of curb to the required lines and grades, and to insure that sidewalk will conform to such curb. After the curb has been constructed and prior to the replacement of the sidewalk, the Engineer, to achieve more appropriate conform, may order additional flags of sidewalk removed. If the Proposal contains a Bid Item for pavement excavation and for sidewalk, removal and replacement of the sidewalk will

be included for payment under such Bid Items.

Under no circumstances shall concrete curb and concrete sidewalk be constructed monolithically.

202.02 COMBINED CONCRETE CURB AND PARKING STRIP. - Concrete parking strip constructed monolithically with the curb will not be included for payment under a Bid Item for curb but will be paid for as concrete pavement. The line of demarcation for the purpose of payment shall be the intersection of the curb face with the concrete pavement at the gutter line. No additional payment will be made for monolithic construction.

202.03 SUBGRADE. - Subgrade for curb shall be prepared in accordance with the applicable requirements of Section 200, and at the level of the subgrade of the adjacent pavement or gutter. When untreated rock subbase is to be provided for the adjacent pavement, the subgrade for curb constructed prior to the laying of such subbase shall be level with the bottom of such subbase; if the subbase is constructed prior to the construction of curb then such compacted subbase shall extend to a line 18 inches behind the curb line and the surface thereof shall be the required subgrade for the curb.

202.04 FORMS. - The forms shall be smooth on the edges and on the sides against which concrete is to be placed. They shall be of sufficiently heavy material to be rigid, and shall be set securely so that the curb, when completed, shall conform accurately to the lines and grades given. No concrete shall be placed before the forms are in position for at least 50 feet ahead, or for the entire length of curb to be placed. They shall be thoroughly cleaned before each setting. All wooden forms shall be wetted before concrete is deposited against them. Except as otherwise shown on the plans, or required, the top of the curb shall be 6 inches above the adjacent gutter.

The forms shall extend to the full depth of the curb and all joints must be tight and even. On the front, the plank or metal must be of one piece to a depth of 3 inches below the gutter grade. The forms must be so set that the finished curb will be 6 inches wide on top, extend at least to the full depth of the pavement, and have a batter of 1 inch in 4 inches on the front. Conform to adjoining vertical curb shall be made with a 4-foot transition from battered to vertical face. The back face shall be vertical.

If the plans show that concrete curb shall contain keyways it shall be so constructed.

202.05 MARKING ON CURB FOR SIDE SEWERS, Y-BRANCHES AND OTHER LOCATIONS TO BE VERIFIED. - After setting the forms for concrete curb and before placing concrete, the Contractor, by exposing the top 3 inches of the redwood stake placed at the end of the side sewer in conformity with the provisions of Section 307.06, shall verify the locations of all side sewers constructed, reconstructed, or replaced, as the case may be, by him, but which are not to be placed in immediate service. If, for any reason, the stake is not found, the Contractor shall excavate and expose the pipe. The Contractor shall not cover the exposed stake or pipe, as the case may be, before the concrete work on

the curb has been fully completed, nor before being directed to do so by the Engineer.

The letter "S" shall be stamped in the top of the curb over each side sewer which is not yet in service, as required in Section 307.06.

The letter "Y" shall be stamped in the top of the curb opposite each Y-branch from which a side sewer has not been constructed, as required in Section 316.05.

202.06 CONCRETE. - The concrete shall be Class 6-3000-3/4 as specified in Section 800.11.

202.07 PLACING CONCRETE. - The concrete shall be well-spaded close to the forms, properly vibrated, tamped and consolidated so that there will be no rock pockets in either the front or back surface for the full depth of the curb.

The top of the concrete shall be so tamped that an excess of mortar will be brought to the surface.

202.08 CONSTRUCTION JOINTS. - Construction joints shall be cold joint, or shall be constructed through the curb, at each street property line, and at intervals of 15 feet along the block, and shall be placed in alignment with dummy joints in existing concrete pavement or pavement base. In curb returns, the construction joints shall be so spaced that the perimeter shall, unless otherwise specified, be divided into equal lengths of not more than 16 feet, nor less than 5 feet. The joints along the straight curb shall be perpendicular to the top and face of the curb, and those along circular curbs shall be on radial lines. The edges at the joints shall be rounded to 1/8 inch radius with the proper edging tool.

202.09 FINISHING. - The front forms shall not be removed in less than two hours nor more than six hours after placing concrete therein; the back forms shall not be removed in less than twenty-four hours after such placement. Immediately after removing the front forms, the face and top of the curb shall be floated until the surface is true, even, and of a uniform color.

The front and back edges of the top of the curb shall be rounded to a radius of approximately 3/4 inch. These edges shall be straight and to a true grade, and no lip or shoulder shall be left between the rounded edge and the forms.

Curb shall then be troweled to smooth dense surfaces, the rounded edges thereof restored, and finally the surfaces shall be given a brush finish to achieve a non-slip slightly grainy texture.

The top and face of the finished curb shall be true and straight, and the top surface of curbs shall be of uniform width, free from humps, sags, or other irregularities. When a straightedge 10 feet long is laid on the top or face of the curb, the surface shall not vary more than 0.01 foot from the edge of the straightedge, except at grade changes or curves.

202.10 PROTECTION AND CURING. - The concrete shall be cured as specified in Section 800.16.

As soon as the back forms have been removed, the back of the curb shall be backfilled and an 18-inch wide berm constructed to the full height of the curb. Where curb has been constructed on fill, or the sidewalk area is below subgrade, the berm shall be at least 3 feet wide. Such protection shall be done as Incidental Work, and shall remain in place until the sidewalk is constructed.

202.11 DOWELED CURB. - Doweled concrete curb shall be constructed on the existing pavement where and as shown on the plans or specified. It shall be secured by No. 4 reinforcing bars grouted vertically with Class "B" mortar into holes drilled into the pavement at a spacing not greater than 4 feet on centers measured along the centerline of the curb. Such bars shall be 10 inches long and the holes therefor 6 inches deep. The Contractor shall reinforce the curb longitudinally with a continuous No. 4 bar seated one inch below the top of the vertical reinforcing and tied to it with No. 14 wire.

All requirements of this Section 202, to the extent that they reasonably can apply to the construction of doweled curb, apply in every respect.

Payment for doweled curb shall include full compensation for required longitudinal and grouted vertical reinforcing bars.

202.12 REPAIR AND REPLACEMENT. - Where any curb requires repair before acceptance, the repair shall be made by removing and replacing the entire section between joints and not by refinishing the damaged portion, or resetting a displaced section. Where the plans provide for the removal of existing curb and construction of curb, and the limit of the work specified does not fall on a curb joint, the curb constructed shall join the old curb at the first curb joint beyond the said specified limit.

202.13 PAINTING. - After all other work under the contract has been completed, the face and top of 8-inch concrete curb, including 8-inch doweled curb, shall be completely and uniformly painted with one coat of white traffic lacquer, or approved equal, applied in accordance with the manufacturer's recommendations.

202.14 PAYMENT. - Concrete curb and doweled curb, satisfactorily constructed as specified, each will be paid for at the respective price bid per linear foot, measured horizontally along the curb line, including drop curb and the full curb return.

SECTION 203

COMBINED CONCRETE CURB AND GUTTER

203.01 GENERAL. - The Contractor shall construct concrete curb and gutter where, of the dimensions, and to the lines and grades shown on the plans, or where directed, complete in place, including excavating, backfilling, pavement restoration, and all other Incidental Work and in accordance with all applicable requirements of Section 202, except that, in the gutter area, the joints that are truly construction joints shall be as specified for such joints in Section 210.07 and shall be keyed, and other joints, spaced at 15-foot centers, shall be dummy joints as specified in Section 210.08.

The edge of the gutter shall be rounded with an 1/8-inch radius edging tool.

The back of the curb shall contain keyways except in drop curb sections. The longitudinal edge of the gutter shall contain keyways if shown on the plans.

Where the gutter grade is less than one percent, the concrete forming the gutter, for the entire length thereof, shall be carefully hand steel troweled for a distance of one foot out from the curb.

203.02 PAYMENT. - Combined concrete curb and gutter, satisfactorily constructed as specified, will be paid for at the price bid per linear foot, measured horizontally along the curb line, including drop curb and the full curb return.

SECTION 204

CONCRETE SIDEWALK

204.01 GENERAL. - The Contractor shall construct concrete sidewalk 3-1/2 inches thick, where and as shown on the plans or where directed, including excavating, backfilling, preparing the subgrade, constructing and removing forms, providing the specified joints and doing the required finishing, marking, protecting, curing and all other Incidental Work.

The concrete shall be Class 5.5-2500-3/4, as specified in Section 800, and shall be darkened by the addition thereto at the mixer of either:

- 1) lampblack in dry form, in accordance with the requirements of ASTM "Standard Specifications for Lampblack," Designation D 209, in the proportion of from 1/2 to 3/4 pound per cubic yard of concrete; or
- 2) an approved liquid or semi-paste black colorant intended for use integrally in concrete mixes. The proportion required, generally from 10 to 40 ounces liquid measure per cubic yard of concrete, may be affected by the colorant used. Curing in this case shall be by the pigmented curing compound method.

The proportion of lampblack or other approved colorant, to a great extent dependent on the color of the cement used in the mix, shall be

that required to properly darken the concrete to reduce glare, and shall be subject to the approval of the Engineer. The proportion in batches for adjacent sidewalk shall be identical.

Sidewalk shall in no case be constructed monolithic with curb.

The limits of sidewalk removal and construction will be specified or shown on the plans. Beyond such limits, the removal and construction of sidewalk will be included for payment under Bid Items for such work only where specifically ordered by the Engineer.

Existing sidewalk flags immediately adjacent to curb to be reset or replaced, except over sidewalk basements, shall be removed to neat flag lines to facilitate the installation of curb to the required lines and grades, and to insure that sidewalk will conform to such curb. After the curb has been installed, and prior to the replacement of the sidewalk, the Engineer, to achieve more appropriate conform, may order additional flags of sidewalk removed. If the Proposal contains Bid Items for excavation and for sidewalk, removal and replacement of sidewalk will be included for payment under such Bid Items.

204.02 SUBGRADE. - The subgrade for sidewalk shall be prepared at least $3\frac{1}{2}$ inches below the required elevation of the sidewalk surface. The Contractor shall obtain a relative compaction of not less than 90 percent for the top six inches of sidewalk subgrade.

204.03 FORMS. - Forms shall be not less than $3\frac{1}{2}$ inches in depth, clean, smooth on the upper edge and on the side against which concrete is to be placed, shall be of sufficiently heavy material and braced so as to be rigid, and shall be set so that the sidewalk, when completed, will conform accurately to the required alignment and grades. The forms shall remain in place for not less than twelve hours after the finishing has been completed.

204.04 SLOPE. - Unless otherwise specified, the finished surface of the walk shall rise $1/5$ inch per foot from curb grade to property line.

204.05 CONSTRUCTION. - Immediately before placing concrete, the forms and subgrade shall be thoroughly wetted. Immediately after the concrete has been placed it shall be thoroughly tamped so that the mortar will flush to the top, and the surface shall then be struck off with a straight edge.

All standards, street and traffic signs, parking meters, sewer trap vent frames and covers, including adjusting the length of riser therefor, oil tank filler pipe covers, and the like, that require resetting to the new sidewalk level, shall be reset by the Contractor to the proper elevations as Incidental Work.

204.06 FINISHING. - When the concrete has sufficiently set, it shall be floated to a true and uniform surface and finished with a steel trowel, after which the smooth surface shall be brushed transversely across the sidewalk with a bristle brush to produce a uniform, non-skid, texture. On grades over 10 percent a rougher surface will be required. This may be attained by lifting a wood float straight up from the surface of the concrete.

The surface shall be marked, with an $1/8$ -inch radius edging or scoring tool as applicable, into rectangles not less than 2.5 nor more than 4 feet on a side. These markings shall be made at every

construction and weakened plane joint and the intervening space marked off equally. The markings in the completed sidewalk shall be well defined.

204.07 JOINTS. - Transverse joints in sidewalk shall extend across the entire width of the walk at right angles to the curb line. They shall be provided across sidewalk at the points of beginning and end of all curb returns, at lot lines, and additionally approximately 30 feet apart. Except for the lot line requirement, joints shall be located opposite a construction joint in concrete curb.

When the entire width of sidewalk is being replaced the Contractor shall place a transverse joint therein butting each end of each group of pull boxes.

Joints may be constructed by:

- 1) placing the concrete against $\frac{1}{4}$ -inch thick expansion joint filler material suitably supported perpendicular to the subgrade; or
- 2) cutting a neat straight line to a minimum depth of 2-inches, using an approved concrete saw; or
- 3) forming a weakened plane by use of a 2-inch x 2-inch x $\frac{1}{4}$ -inch steel tee; or
- 4) use of a keyed construction or "cold" joint.

No joint filler shall be installed when methods 2); 3) or 4) are employed.

No expansion joint material shall be placed at the juncture of the sidewalk with the curb.

204.08 STREET NAMES. - On all sidewalks constructed at street intersections the names of the intersecting streets shall be impressed, opposite the crosswalk or crosswalks, as approved by the Engineer, in letters and numerals 4 inches high and $\frac{1}{2}$ -inch deep.

204.09 PROTECTION AND CURING. - The protection and curing of concrete sidewalk shall be as specified in Section 800.16.

204.10 3- $\frac{1}{2}$ -INCH CONCRETE PAVEMENT.

General. - 3- $\frac{1}{2}$ -inch concrete pavement used to pave traffic islands shall be identical to 3- $\frac{1}{2}$ -inch concrete sidewalk, except that the concrete shall not be darkened by lampblack or other colorant. Bidders shall include in the price bid for pavement all charges for the following Incidental Work.

Sand Fill. - Where islands are to be constructed over existing pavement, the Contractor shall furnish and place sand fill to subgrade for the 3- $\frac{1}{2}$ -inch concrete pavement.

Painting. - After all other work in the area has been completed, the surface of the return areas at the ends of 3- $\frac{1}{2}$ -inch concrete center islands 4 feet or less in width shall be completely and uniformly painted with one coat of white traffic lacquer, or approved equal, applied in accordance with the manufacturer's recommendations.

204.11 PAYMENT. - Concrete sidewalk and 3- $\frac{1}{2}$ -inch concrete pavement, satisfactorily constructed as specified, each will be paid for at the respective price bid per square foot, measured horizontally.

The area of curb adjoining sidewalk, and areas occupied by curb inlets will not be included in measurements of area of sidewalk.

The areas of poles, standards, other fixtures, and of boxed-out locations for manhole and other castings and facilities, regardless of ownership thereof, will not be deducted from the areas of concrete sidewalk or 3-½-inch concrete pavement for which payment will be made.

SECTION 205

AGGREGATE BASE AND SUBBASE

205.01 GENERAL. - The Contractor shall construct mineral aggregate base or subbase, unless otherwise specified, 6 inches thick after compaction, spread and compacted to the lines, grades and dimensions shown on the plans and cross sections, and where directed, including preparing the subgrade and doing the required watering, shaping, smoothing and other Incidental Work.

205.02 MATERIALS. - The aggregate shall be free from vegetable matter and other deleterious substances. Aggregate for aggregate base shall consist of material of which at least 60 percent by weight shall be crushed particles as determined by Test Method No. Calif. 205.

The percentage composition by weight of aggregate base shall conform to one of the following gradings when determined by Test Method No. Calif. 202.

Unless otherwise specified in the Special Provisions, the particle size distribution shall be in accordance with the grading specified for ¾-inch maximum size aggregate.

<u>Sieve Sizes</u>	<u>Percentage Passing</u>	
	<u>1-1/2"</u>	<u>3/4"</u>
	<u>Maximum</u>	<u>Maximum</u>
2"	100	.....
1-1/2"	90-100	.....
1" .....	.....	100
3/4"	50-85	90-100
No. 4	25-45	35-55
No. 30	10-25	10-30
No. 200	2-9	2-9

The aggregate base shall also conform to the following quality requirements:

<u>Tests</u>	<u>Test Method No. Calif.</u>	<u>Requirements</u>
Resistance (R-value)*	301	78 Min.
Sand Equivalent	217	30 Min.
Durability Index	229	35 Min.

*The R-value requirement will be waived provided the aggregate base conforms to the specified grading and durability and has a sand equivalent value of 35 or more.

The aggregate shall not be treated with lime, cement or other chemicals before the Durability Index test is performed.

Material yielding a maximum dry density of less than 112 pounds per cubic foot when tested in the laboratory in accordance with ASTM "Standard Methods of Test for Moisture-Density Relations of Soils, Using 10-lb. Rammer and 18-in. Drop," Designation D 1557, shall not be used.

Any rock, including red rock, meeting all the requirements of this Section will be acceptable. Such rock shall be plant processed at an approved processing plant.

205.03 SAMPLES AND TESTING. - At least ten working days prior to the use thereof, the Contractor shall submit to the Engineer a 120-pound sample of aggregate, graded as intended for use. This requirement shall be complied with for each aggregate and grading thereof that has not been approved. The Engineer will test the sample at no cost to the Contractor, and will determine the acceptability of the aggregate.

205.04 SPREADING. - Aggregate base material shall be delivered to the roadbed as uniform mixtures and each layer shall be spread in one operation.

At the time aggregate base is spread it shall have a moisture content sufficient to obtain the required compaction. Such moisture shall be uniformly distributed throughout the material.

The material shall be spread upon the subgrade prepared in accordance with the requirements of Section 200, by means of vehicles equipped with approved spreading devices at a uniform quantity per linear foot, which quantity will provide the required compacted thickness within the tolerances specified in Section 205.05.

Depositing and spreading shall commence at that part of the work farthest from the supply of base material and shall progress continuously without breaks, unless otherwise directed by the Engineer.

Where the required thickness is 6 inches or less, the base material may be spread and compacted in one layer. Where the required thickness is more than 6 inches, the base material shall be spread and compacted in two or more layers of approximately equal thickness, and the maximum compacted thickness of any one layer shall not exceed 6 inches. Each layer shall be spread and compacted in a similar manner.

Base material placed in areas inaccessible to the spreading equipment, may be spread in one or more layers by any means that will make possible the specified compaction and surface.

When the subgrade for aggregate base consists of cohesionless sand, and written permission is granted by the Engineer, the base material may be dumped in piles upon the subgrade and spread ahead from the dumped material.

The base material, after spreading, shall be shaped by means of a blade grader to such thickness that after watering and compacting, the completed base will conform to the required grade and cross section within the tolerances specified in Section 205.05.

Segregation of aggregate shall be avoided and the base shall be free from pockets of coarse or fine material.

205.05 COMPACTING. - Immediately following spreading, shaping and smoothing, the full width of the base material shall be watered as

ordered by the Engineer, and compacted by rolling with a minimum of two pieces of self-propelled reversible equipment. Compaction shall be as follows:

- 1) For initial rolling use a 3-wheel steel-tired roller, weighing not less than 12 tons distributed so that the rear wheels will apply to the surface being rolled not less than 325 pounds per linear inch of rear tire width. Rolling shall commence by covering completely the outer edge of the material. Subsequent passes shall lap at least 25 percent on previously rolled material.
- 2) For subsequent rollings use a pneumatic-tired roller of the oscillating type, having a width of not less than 4 feet and equipped with tires of equal size and diameter. Wobble wheel rollers will not be permitted. The tires shall be so spaced that the entire gap between adjacent tires will be covered by the tread of the following tire. The tires shall be inflated to 90 pounds per square inch minimum.
- 3) To compact all areas inaccessible to the rollers, use compressed air, or gas, powered tampers.

The foregoing equipment requirements serve as a standard of adequacy.

Subject to the condition that the Contractor shall notify the Engineer at least ten days in advance, and shall secure approval for the use of each piece of compacting equipment other than that specified, selection thereof and obtainment of the specified compaction throughout the volume of base, and the specified surface, shall be solely the responsibility of the Contractor.

If compaction is not uniform or tests show it to be inadequate, or if the surface is unsatisfactory, the Engineer may require the use of other or additional equipment.

Should low or high spots develop during rolling operations, such spots shall be smoothed out by blading with a self-propelled and pneumatic-tired motor grader having a wheelbase not less than 15 feet long and a blade not less than 10 feet long.

Aggregate base shall be watered after compaction. Water shall be applied at the rate and in the quantities ordered by the Engineer.

The relative compaction of aggregate base, determined by tests of the in place, field compacted base shall be not less than 95 percent of the maximum compaction at optimum moisture content determined by ASTM Methods of Test, Designation D 1556 and Method C of Designation D 1557. The tests will be conducted and evaluated in the laboratory by the City at no cost to the Contractor.

The surface of the finished aggregate base at any point shall not vary more than 0.05 foot above or below proper grade, and such surface shall contain no ridges, valleys or sharp breaks.

Finished base that does not conform to the foregoing requirement shall be reshaped or reworked, watered, and thoroughly recompacted to conform thereto.

The Contractor shall not allow any completed untreated rock base to be subjected to public or construction traffic, except the latter necessary to the completion of the overlying surface course.

205.06 PAYMENT. - Aggregate base, or subbase, of the specified thickness after compaction, satisfactorily constructed as specified, will

be paid for at the price bid per square foot, measured horizontally, or at the price bid per ton, as specified in the Schedule of Bid Prices.

If paid for by the square foot, aggregate base or subbase constructed adjoining curb will be measured from the face of the curb at a depth of 6 inches below the top of curb, irrespective of the actual depth.

If paid for by the square foot, the areas of poles, standards, other fixtures, and of boxed-out locations for manholes and other castings and facilities, regardless of ownership thereof, will not be deducted from the areas of aggregate base or subbase for which payment will be made.

If paid for by the ton, the weight of all water above that contained by the aggregate at optimum moisture content will be deducted from the weight to be paid for.

If paid for by the ton, all satisfactorily completed aggregate base or subbase constructed in conjunction with the setting and resetting, as the case may be, of castings and, in accordance with the requirements of Section 217, specified to be done by the Contractor, will be paid for under the Bid Item for aggregate base or subbase.

SECTION 206

CEMENT TREATED AGGREGATE BASE

206.01 GENERAL. - The Contractor shall construct cement treated aggregate base, unless otherwise specified 6 inches thick after compaction, where and to the lines and grades shown on the plans or directed, including submitting the required aggregate samples, preparing the subgrade, doing the required watering, spreading, compacting, and trimming, furnishing and applying curing seal, and doing other Incidental Work.

206.02 PORTLAND CEMENT. - Portland cement shall be in accordance with Section 800. The quantity of cement to be added to the aggregate shall be between $2\frac{1}{2}$ percent and 5 percent by weight of the dry aggregate. The actual percentage to be used shall be as required to achieve design strength.

206.03 MINERAL AGGREGATE. - Aggregate for cement treated aggregate base, immediately prior to mixing, shall conform to the following requirements:

Aggregate shall be clean and free from vegetable matter and other deleterious substances, and shall not be treated with lime, cement or other chemicals prior to being tested for Sand Equivalent value.

The aggregate, prior to mixing with cement, shall have a Sand Equivalent of not less than 30 when tested by Test Method No. Calif. 217.

Aggregate shall be of such quality that when mixed with portland cement in an amount not exceeding 5 percent by weight of the dry aggregate and compacted at optimum moisture content, the compressive strength of a sample of the compacted mixture shall not be less than 750 pounds per square inch at 7 days, when tested by Test Method No. Calif. 312 modified as follows:

- 1) Optimum moisture content of the cement treated aggregate base shall be determined using the procedures outlined in ASTM "Standard Methods of Test for Moisture-Density Relations of Soils, Using 10-lb. Rammer and 18-in. Drop," Designation D 1557.
- 2) Compaction of the test specimens shall be as outlined for Method C in ASTM Methods of Test, Designation D 1557.
- 3) Capping compound shall be sulphur instead of plaster of Paris.

The percentage composition by weight of aggregate shall conform to the following grading when determined by Test Method No. Calif. 202, modified by Test Method No. Calif. 105 when there is a difference in specific gravity of 0.2 or more between the coarse and fine portion of the aggregate or between blends of different aggregates. Coarse aggregate is material retained on the No. 4 sieve and fine aggregate is material passing the No. 4 sieve.

<u>Sieve Sizes</u>	<u>Percentage Passing</u>
1"	100
3/4"	90-100
No. 4	40- 70
No. 30	12- 40
No. 200	3- 15

206.04 MIXING. - Cement treated aggregate base shall be mixed at a central mixing plant by either batch type mixing using revolving blade or rotary drum mixers or continuous mixing. Weight or volumetric proportioning may be employed. The resulting mix shall be equal to that produced by weight proportioning and batch type mixing.

The water shall be proportioned by weight or volume and there shall be means by which the Engineer may readily verify the amount of water per batch or the rate of flow for continuous mixing. The time of the addition of water or the points at which it is introduced into the mixer, shall be as approved by the Engineer.

Cement shall be added in such a manner that it is uniformly distributed throughout the aggregates during the mixing operation.

The mixers used must be able to produce uniformly mixed batches. The charge in a batch mixer, or the rate of feed to a continuous mixer, shall not exceed that which will permit complete mixing of all the material. The materials shall be mixed for not less than thirty seconds after all the ingredients are in the mixer.

The mixer materials shall be protected by covers against moisture loss while being transported to the site.

206.05 SPREADING. - The subgrade, prepared in accordance with the requirements of Section 200, shall be moistened immediately prior to the spreading operation.

The mixing materials shall be deposited and spread with a self-propelled spreader, ready for compaction with a minimum of shaping with a motor grader. Equipment not propelled by the unloading vehicle will be considered self-propelled. The spreader shall be provided with a screed that strikes off and distributes the materials to the required width and thickness.

Depositing and spreading shall commence at that part of the work farthest from the supply of base material and shall progress continuously without breaks, unless otherwise directed by the Engineer.

If a spreader box is used, it shall at all times during the simultaneous operation thereof and receipt of materials thereby, push the vehicle that has transported the cement treated base material in a manner such that the latter exerts a downward force on the spreader box sufficient to force spreading and screeding at the proper grade with no "riding up" on the deposited material. Further, in all cases there shall be positive provision preventing the spreader box from contacting the rear wheels of the transporting vehicle during the pushing operation.

The mixed materials shall be deposited and spread in one lift if the thickness is to be not more than 6 inches, and in this case depositing in layers will not be allowed. If the thickness is to be more than 6 inches, the base shall be spread and compacted in two layers of approximately equal thickness, and the surface of the compacted material shall be kept moist until covered with the next layer.

Cement treated aggregate base placed in areas inaccessible to the spreading equipment may be spread by any means that will achieve the specified compaction and surface.

206.06 COMPACTING. - Immediately following the spreading operation, the mixed materials shall be compacted in the manner and to the degree and accuracy of surface specified in Section 205.05, except that the shifting of material by a motor grader to smooth low and high spots that develop during rolling will not be allowed, nor will any reshaping or reworking of the cement treated aggregate base, although high spots may be trimmed, provided the excess material is removed and immediately disposed of, no loose material is left on the base, and the area is again rolled.

Except for the aforementioned trimming, cement treated aggregate base, the finished surface of which is outside the specified tolerances, or which is otherwise unsatisfactory, shall be neatly cut out, immediately removed from the site and replaced with fresh material properly compacted as hereinbefore specified.

When cement treated base is spread and compacted in more than one layer, each lower layer shall be compacted to the required degree of compaction before placing the next layer.

Not more than two hours shall elapse between the time water is added to the aggregate and cement, and the time of completion of initial rolling. Not more than three hours shall elapse between the time water is added to the aggregate and cement and the time of completion of final rolling after any required trimming.

The surface of the compacted cement treated aggregate base shall be kept moist until the curing seal is applied.

The Contractor shall not allow any completed cement treated aggregate base to be subjected to public or construction traffic, except the latter necessary to the completion of the overlying surface course.

206.07 CONSTRUCTION JOINTS. - At the end of each day's construction and when cement treated base operations are delayed or stopped for more than two hours, a construction joint shall be made in the thoroughly compacted material, normal to the centerline of the

roadway. Additional material shall not be placed until the construction joint has been approved by the Engineer.

Longitudinal joints when necessary shall be constructed by cutting vertically into the existing edge for approximately 3 inches. Material cut away may be disposed of in the adjacent area to be constructed. The face of the cut joints shall be moistened in advance of placing the adjacent base.

206.08 CURING SEAL. - The complete surface of the cement treated aggregate base shall be covered with an emulsified asphalt curing seal. Emulsified asphalt shall be as specified in Section 212.06, and in accordance with the specifications for Grade SS-1 of the Asphalt Institute. Application shall be at the rate of 0.15-gallon per square yard.

The emulsion may be diluted with water up to a ratio of one to one, as required, as determined by the Engineer, for the application of a thin uniform coat. The rate of application of the originally specified emulsion, however, shall remain 0.15-gallon per square yard regardless of dilution.

The curing seal shall be applied as soon as possible, but not later than eight hours after completion of final rolling.

206.09 PAYMENT. - Cement treated aggregate base of the specified thickness after compaction, satisfactorily constructed as specified, will be paid for at the price bid per square foot, measured horizontally.

Cement treated aggregate base constructed adjoining curb will be measured from the face of curb at a depth of 6 inches below the top of curb, irrespective of the actual depth.

The areas of poles, standards, other fixtures, and of boxed-out locations for manhole and other castings and facilities, regardless of ownership thereof, will not be deducted from the areas of cement treated aggregate base for which payment will be made.

SECTION 207

CONCRETE BASE

207.01 GENERAL. - The Contractor shall construct concrete base where and as shown on the plans, 6 inches thick unless otherwise specified, including preparing subgrade, constructing and removing side forms, providing the specified joints, and calcium chloride in the mix if required or used, and doing the required finishing, protecting, curing and other Incidental Work. The concrete therefor shall be properly and uniformly distributed and thoroughly and adequately vibrated, screeded and tamped by a machine or machines, self-propelled and supported on the required side forms, or on adjacent pavement base or pavement in accordance with the hereinafter specified restrictions on such support. Vibrators independent from the self-propelled machine shall not rest on the side forms.

207.02 SUBGRADE. - The adjustment of manhole frames and other castings and the preparation of subgrade shall be as specified in

Sections 200 and 217, respectively. The Contractor shall obtain a relative compaction of not less than 95 percent for the top 6 inches of subgrade for concrete base.

207.03 SIDE FORMS. - Side forms shall be used. Wood forms shall be a minimum of 2 inch nominal thickness and shall be properly supported by blocking or other approved means so that no settlement occurs. They shall be clean, straight, of uniform section, free from defects, and shall be constructed to form parallel strips not more than 24 feet, nor less than 4 feet, wide. Side forms shall be of the required depth in one piece, and be such as to form the keyway hereinafter specified for longitudinal joints. The strips shall be constructed to coincide with vehicular traffic lanes unless otherwise specified or shown.

Where, as specified in Section 207.05, a self-propelled vibrating, screeding and tamping machine is not required, the maximum width of strip shall be reduced to 14 feet.

The forms shall be placed true to line and grade and rigidly stayed. There shall be no lateral or vertical movement of the forms while the concrete is being spread or finished.

Top surfaces of side forms shall be set to the same elevation as that of the finished concrete base. The depth of side forms shall be equal to the specified thickness of the concrete base.

After the side forms have been accurately and securely set to line and grade, the Contractor shall check the subgrade with a scratch template as specified in Section 200.01. The template shall be supported on the side forms, previously poured concrete strips, or both, as applicable, and shall be carefully drawn the full length of the subgrade to check the grade. High spots shall be cut down to grade and low spots filled and satisfactorily compacted to grade.

At least 200 feet of subgrade and side forms shall be prepared in advance of the placement of concrete. After the subgrade and side forms for any strip have been prepared and accepted, barricades shall be so placed that there will be no equipment or traffic of any kind thereon.

No adjustment shall be made in the subgrade to allow for anticipated settlement under the pavement load, and no direct or additional payment will be made for additional concrete used, or claimed to have been used, on account of such settlement.

207.04 CONCRETE. - Concrete for concrete base shall be Class 5.5-3000-1½, in accordance with the requirements of Section 800.

The Contractor, with the approval of the Engineer, may use the admixture of 2 pounds calcium chloride per sack of cement to accelerate the setting of the concrete in accordance with the provisions of Section 800.08.

207.05 PLACING CONCRETE. - The use of an approved self-propelled, mechanical, concrete vibrating, screeding and tamping machine will be required unless otherwise specified in the Special Provisions, or unless restricted space does not permit the use thereof.

Immediately before placing concrete, the subgrade shall be watered with a spray nozzle to the extent that it will not absorb any moisture from the concrete, but there shall be no standing water on the subgrade. After the subgrade has been wetted in the manner set forth

hereinbefore, the concrete shall be placed in accordance with the requirements of Section 800.14, and spread so that the vibrated, screeded and tamped base will be of the required thickness and cross section and at the required grade.

The self-propelled, mechanical, concrete vibrating, screeding and tamping machine used shall have, in addition to the spreading, screeding, and vibratory compaction action, a tamping or kneading action, and shall produce a surface satisfactory to the Engineer.

The machine may ride on adjacent existing or newly constructed pavement base or pavement. Such arrangement, however, must satisfy the Engineer, and the Contractor shall make any required correction to the surface of such base or pavement and provide required protection of the surface and of the edge thereof.

The concrete shall be evenly distributed in front of the machine to prevent unequal loads against the front cut-off screed or screeds.

The machine shall be maintained in perfect operating condition, and the screeds shall hold their crown as set.

Coordination of the forward speed of the machine and the lateral movement of the screeds must be such as to prevent ridging of the concrete surface.

The final action of the vibrating, screeding and tamping machine shall in all cases be accomplished by the use of burlap, leather or other approved type of flexible drag, attached properly to the rear of the machine. The drag shall leave the surface of the concrete ridgeless, even and uniform. Should there be any rock pockets or voids in the surface after the passage of the machine, they shall be immediately repaired by adding concrete, thoroughly working it in, and restoring the surface of the base.

The finished surface of the concrete base shall be smooth and free from texture disfigurements caused by floats or any other type of equipment or tools used to remove surface defects. Such tools may be used, but after their use a final pass must be made with the machine.

The vibrating, screeding and tamping machine shall back up and pass over the surface as many times as are necessary to establish a true and even crown and a ridgeless, even and uniform surface over the entire pavement base area.

If an approved vibrating, screeding and tamping machine is not used, all concrete placed shall be vibrated in accordance with the requirements of Section 800.14, and then tamped with a transverse tamper until the surface is dense and smooth. Should there be any rock pockets or voids in the surface after tamping, they shall be immediately repaired by adding concrete, thoroughly working it in, and retamping to restore the surface of the base.

207.06 CONSTRUCTION JOINTS.

General. - At the beginning and end of every strip not in contact with existing pavement base, at the end of each day's construction, or where the placing of concrete is interrupted for a period of one hour or more, a vertical construction joint shall be provided prior to the resumed placing of concrete. The construction joint shall be formed by finishing the base square across the strip against a header, 3 inches thick, of a width equal to the depth of the base, and shaped so that it will form a keyway as shown on the plans. The header shall conform to the correct

cross section of the base, shall be placed perpendicular to the subgrade, and its top shall be at all points at the correct elevation at the top of the base.

The concrete shall not be edged.

Prior to the resumption of work, surplus concrete on the subgrade shall be cleared away, and the header shall be removed in such a manner as to avoid damage to the edge of the concrete.

Longitudinal Joints. - Longitudinal joints between adjacent pours of concrete base, between concrete base and concrete parking strip or gutter, and between concrete base and curb, shall be keyed as shown on the plans.

The keyway shall be formed in the first of adjacent pours.

Where adjacent pours are 8-inch thick concrete base and concrete parking strip or gutter, the vertical position of the keyway and key shall be as shown on the plans.

The concrete shall not be edged.

207.07 DUMMY JOINTS.

General. - Transverse dummy joints shall be placed at 15 feet on centers, for the full width of the pavement, in alignment with the joints of adjacent concrete pours, and at right angles to the centerline of the street. Each joint shall be constructed by forming a transverse groove in the pavement base and installing therein a formed strip of joint insert, as shown on the plans.

Joint Filler Strip. - Each joint filler strip shall be an approved one-piece premolded strip at least 1-3/4 inches, and not more than 2 inches, wide, sufficiently long to extend the full width of the pavement less 1/2-inch. Splicing of a joint filler strip will not be permitted, except that where pour widths exceed 12 feet one splice will be permitted. The thickness of the strip shall not exceed 1/4-inch and shall be uniform within a variation of not more than 10 percent.

Joint filler strip shall be in accordance with the requirements of ASTM "Standard Specifications for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction," Designation D 1751.

Construction. - Following the pass of the vibrating and screeding equipment, but before the final dragging or brushing, the joint groove shall be formed by means of an iron cutter with a blade at least 3 inches in depth and 1/4-inch thick. The cutter shall have some means of controlling the depth of insertion and shall not have any horizontal surfaces, except the edge, that contact the concrete. A movable bridge supported on the forms or adjacent concrete shall be provided to assure minimum disturbance to the concrete during joint construction operations. The bridge shall be at least 2 inches clear of the concrete surface when loaded with 300 pounds at its center and supported on the forms or adjacent pavement.

The depth of the groove shall be at least equal to, and not more than 1/4-inch greater than the width of the filler strip to be used.

The steel cutter shall be cleaned after each insertion into the concrete, or the Contractor may use any means approved by the Engineer that will prevent adherence of mortar and aggregate to the

cutter and resultant disturbance of the concrete during cutting operations.

The steel cutter shall be mechanically vibrated at a rate of 3,500 vibrations per minute by use of at least one vibrator. At all times during the cutting operations, such vibrators shall be activated.

The joint filler strip shall then be placed in the groove by means of a metal installing device consisting of sheet metal backing plates with one side the full depth of the strip and the other side extending down 3/4-inch along the opposite side of the strip. The ends of the installing device shall be equipped with an adjustable gauge resting on each side form to control the depth to which the strip is placed. The installing device shall be sufficiently rigid to hold the strip in exact position, and the overall thickness shall not be greater than that necessary to install and release the strip readily.

The Engineer reserves the right to order discontinued, the use of any equipment or material which in his opinion fails to produce a satisfactory joint under the methods employed by the Contractor.

The filler strip shall be placed into the groove completely across the width of the slab, so that the top of the strip is within 1/4-inch of the adjacent concrete surface. Any strip damaged in installing, or during any work on the pavement base, shall be replaced with an undamaged strip.

The concrete shall not be edged and shall be continuous over the insert.

After pavement side forms have been removed, any concrete which has flowed around the ends of the strip shall be removed.

Expansion joints shall not be constructed in concrete base.

207.08 PROTECTION AND CURING. - Concrete base shall be protected and cured in accordance with the requirements of Section 800.16.

No equipment, or public or other traffic shall be allowed on concrete pavement base, nor shall asphalt concrete wearing surface be placed thereon until ten days after the pavement base has been placed, except that when calcium chloride is used in accordance with the requirements of Section 800.08 as an admixture to accelerate the setting of concrete base, public traffic may be allowed thereon only after at least twenty-four hours have elapsed since the completion of all placement of such concrete.

The placement of asphalt concrete wearing surface on such pavement base by use of a self-propelled spreading and finishing machine, however, will not be allowed until forty-eight hours have elapsed since the completion of the placement of the concrete.

In no case shall concrete base remain without wearing surface for more than fourteen days.

207.09 PAYMENT. - Concrete base of the specified thickness, satisfactorily constructed, complete in place as specified, will be paid for at the price bid per square foot, measured horizontally.

Concrete pavement base constructed adjoining curb will be measured from the face of curb at a depth of 6 inches below the top of curb, irrespective of the actual depth.

The areas of boxed-out locations for manhole and other castings and facilities, regardless of ownership thereof, will not be deducted from the areas of concrete pavement base for which payment will be made.

SECTION 208

ASPHALT CONCRETE BASE

208.01 GENERAL. - The Contractor shall construct asphalt concrete base, 6 inches thick unless otherwise specified, consisting of asphalt and graded mineral aggregate proportioned and mixed at a central mixing plant, and spread and compacted to the lines, grades, cross sections and thicknesses shown on the plans, or where directed, including preparing the subgrade, furnishing and applying paint binder, and doing all other necessary or required Incidental Work.

208.02 ASPHALT. - Asphalt shall be AR-4000 steam refined paving asphalt, in accordance with all current applicable requirements and specifications of the Asphalt Instituted and the Uniform Pacific Coast Specifications for Paving Asphalt. The amount thereof to be used shall be between 4 and 5.5 percent by weight of the dry mineral aggregate.

A test report shall be furnished in accordance with the requirements of Section 212.02.

208.03 AGGREGATE. - Mineral aggregate shall be in accordance with the quality requirements set forth in Section 212.03.

The combined dry mineral aggregate shall have a particle size distribution such that the percentage composition by weight, determined by test using standard sieves of square mesh wire construction, will be in accordance with the following grading requirements:

<u>Sieve Sizes</u>	<u>Percentage Passing</u>
1"	100
3/4"	95-100
3/8"	65- 80
No. 4	49- 54
No. 8	36- 40
No. 30	18- 21
No. 200	3- 8

208.04 PROPORTIONING AND MIXING. - The mineral aggregate shall be prepared and proportioned, and mixed with the asphalt, as specified in Section 212.05.

208.05 SUBGRADE. - Before placing asphalt concrete base, the subgrade shall be prepared as provided in Section 200. The Contractor shall obtain a relative compaction of not less than 95 percent for the top 6 inches of subgrade for asphalt concrete.

208.06 PAINT BINDER. - Paint binder, mixing type asphaltic emulsion, SS-1, shall be furnished and applied as specified in Section 212.06.

208.07 SPREADING EQUIPMENT AND SPREADING. - Spreading, and equipment therefor, shall be in accordance with the requirements of Sections 212.07 and 212.08, supplemented as follows: Unless the specified thickness of the base after compacting is 3 inches or less the base shall be spread and compacted in two or more courses, each in the manner specified.

No asphalt concrete base shall be spread when the temperature is below 50° Fahrenheit or when the subgrade is wet.

208.08 COMPACTION. - Immediately after the base has been spread it shall be compacted with power rollers in first-class mechanical condition. Roller sprinkler systems shall operate satisfactorily in all respects.

The Contractor shall furnish and use, for each asphalt paver furnished, a minimum of two rollers of the types and employed as follows:

- 1) Initial or breakdown rolling shall consist of one complete coverage with a steel-tired three-axle tandem, two-axle tandem or three-wheel roller, weighing not less than 12 tons, operating with a drive wheel toward the paver.
- 2) Final rolling shall follow the initial or breakdown rolling and shall consist of three complete coverages with a pneumatic-tired roller while the temperature of the mixture is at or above 150°F.

The pneumatic-tired roller shall be the oscillating type having a width of not less than 4 feet and equipped with pneumatic tires of equal size and diameter. Wobble-wheel rollers will not be permitted. The tires shall be so spaced that the gap between adjacent tires will be covered by the tread of the following tire. The tires shall be inflated to 90 pounds per square inch or such lower pressure designated by the Engineer, and maintained so that the air pressure will not vary more than 5 pounds per square inch from the designated pressure. The roller shall be so constructed that its total weight can be varied to produce an operating weight per tire of not less than 2,000 pounds. The total operating weight of the roller shall be varied as directed by the Engineer.

When the total amount of asphalt concrete base included in the contract is 1,000 tons or less, rolling may be in accordance with the following alternative requirements:

The Contractor shall furnish and use a minimum of one steel-tired 2-axle tandem roller, weighing not less than 8 tons, provided it is demonstrated to the satisfaction of the Engineer that such a roller can perform the work.

Rolling shall consist of sufficient coverages to produce a surface thoroughly compacted, smooth, and free from ruts, humps, depressions, or irregularities.

Restricted areas inaccessible to power rollers may be compacted by rolling with the wheels of a loaded truck of not less than 5 tons capacity, or by hot tampers.

208.09 PAYMENT. - Asphalt concrete base of the specified thickness, satisfactorily constructed, complete in place as specified, will be paid for at the price bid per square foot, measured horizontally, or at the price bid per ton, as specified in the Schedule of Bid Prices.

If paid for by the square foot, asphalt concrete base constructed adjoining curb will be measured from the face of the curb at a depth of 6 inches below the top of curb, irrespective of the actual depth. The areas of boxed-out locations for manholes and other castings and facilities, regardless of ownership thereof, will not be deducted from the areas of asphalt concrete base for which payment will be made.

If paid for by the ton, all satisfactorily completed asphalt concrete base constructed in conjunction with the setting and resetting, as the case may be, of castings and, in accordance with the requirements of Section 217, specified to be done by the Contractor, will be paid for under the Bid Item for asphalt concrete base.

SECTION 209

ASPHALT CONCRETE BASE - THICK LIFT

209.01 GENERAL. - The Contractor shall construct thick lift asphalt concrete base, consisting of asphalt and graded mineral aggregate proportioned and mixed at a central mixing plant, and spread and compacted in layers not exceeding 5½ inches compacted thickness to the lines, grades, cross sections and thicknesses shown on the plans, or where directed, including preparing the subgrade, and doing all other necessary or required "Incidental Work."

The Contractor shall give the Engineer 24 hours notice prior to placing asphalt concrete.

209.02 ASPHALT. - Asphalt shall be AR-4000 steam refined paving asphalt, in accordance with all current applicable requirements and specifications of the Asphalt Institute and the Uniform Pacific Coast Specifications for Paving Asphalt. The amount thereof to be used shall be between 5 and 6.5 percent by weight of the dry mineral aggregate. The exact percent to be used shall be determined by the Engineer.

A test report shall be furnished in accordance with the requirements of Section 212.02.

209.03 AGGREGATE. - Mineral aggregate shall be 3/4-inch maximum aggregate in accordance with the quality and grading requirements set forth in Section 212.03.

209.04 PROPORTIONING AND MIXING. - The mineral aggregates and asphalt binder shall be mixed at a central mixing plant. The aggregates and asphalt binder may be proportioned either by weight or by volume.

Aggregate shall be stored dried, heated and proportioned in a manner that will give a combined grading within the specified grading limits and satisfactory to the Engineer.

Drying shall continue for a sufficient time and at a sufficiently high temperature to reduce the average moisture content so that at the completion of mixing operations and also at the time of spreading the mixture, the amount of moisture in the mixture shall not exceed one percent.

The drier shall be provided with a heat indicating device in order that the temperature of the aggregate leaving the drier may be determined. The heat indicating device shall be accurate to the nearest 10°F., and shall be installed in such a manner that a fluctuation of 10°F. in the aggregate temperature will be shown by the heat indicating device within one minute.

Any evidence of segregation, degradation, or improper combining of aggregate will be cause for rejection of the asphalt concrete containing such aggregate.

Uniformity of distribution of asphalt will be determined by extraction tests in accordance with Test Methods Nos. Calif. 309 or 310. The weight of asphalt per 100 pounds of dry aggregates shall not vary by more than 5 percent above or 10 percent below the amount designated by the Engineer. This requirement shall apply to samples taken from a single batch, successive batches, at different locations in the plant, or at any location or operation designated by the Engineer.

Paving asphalt used as binder shall be added to the aggregate at a temperature of not less than 275°F., nor more than 375°F.

When paving asphalt is used as a binder, the temperature of the aggregates at the time of adding the binder shall not be less than 250°F., nor more than 325°F.

Mixing shall continue until a homogeneous mixture of uniformly distributed and properly coated aggregates of unchanging appearance is produced. In general, the time of mixing shall not be less than 30 seconds, except that the time may be reduced when in the opinion of the Engineer the sizes of aggregate are uniformly distributed and all particles are thoroughly and uniformly coated with asphalt binder.

209.05 SPREADING EQUIPMENT AND SPREADING. - Asphalt concrete base shall be placed and spread with a paving machine or other approved spreading device.

All mixture shall be spread at a temperature not less than 250°F., or as directed. The base may be spread and compacted in layers not exceeding 5½ inches compacted thickness. The first layer shall be at least 4 inches thick.

209.06 COMPACTION. - Immediately after the base has been spread it shall be compacted with power rollers in the following operating sequence:

Either (1) initial or breakdown rolling with a steel-wheeled roller, final rolling with a pneumatic-tired roller and finish rolling with a steel-wheeled roller, or (2) initial or breakdown rolling with a pneumatic-tired roller and final rolling with a steel-wheeled roller.

A minimum of ten complete rolling coverages shall be completed prior to the time the mix temperature falls below 200°F. in the center of the lift. Rolling from the center to the edge will be permitted for layers in excess of 3 inches compacted thickness.

Steel-tired roller shall be three-axle tandem, two-axle tandem or three-wheel roller weighing not less than 12 tons.

Pneumatic-tired roller shall be as follows:

- 1) for initial rolling, equipped with 9.00 x 20 tires capable of being loaded to 4,000 pounds at 80 pounds per square inch inflation pressure;
- 2) for final rolling, equipped with 8.0 x 15 tires capable of being loaded to 3,000 pounds at 80 pounds per square inch inflation pressure.

The tires of the pneumatic roller shall be treated with a parting compound or other suitable agent to prevent "pickup."

209.07 PAYMENT. - Asphalt concrete base, satisfactorily constructed, complete in place, as specified, will be paid for at the price bid per ton.

All satisfactorily completed thick lift asphalt concrete base constructed in conjunction with the setting and resetting, as the case may be, of castings and, in accordance with the requirements of Section 217, specified to be done by the Contractor, will be paid for under the Bid Item for thick lift asphalt concrete base.

SECTION 210

CONCRETE PAVEMENT

210.01 GENERAL. - The Contractor shall construct, where and as shown on the plans, concrete pavement 7 inches thick, and concrete parking strip 8 inches thick monolithic with the adjacent concrete curb, unless other thicknesses are specified, including preparing subgrade, constructing and removing side forms, providing the specified joints, and calcium chloride in the mix if required or used and doing the required finishing, protecting, curing and other Incidental Work. The concrete therefor shall be properly uniformly distributed, and thoroughly and adequately vibrated, screeded and tamped by a machine or machines, self-propelled and supported on the required side forms, or on adjacent pavement base of pavement in accordance with the hereinafter specified restrictions on such support. Use of the machine will not be required where the steepness of slope precludes the practical use thereof. Vibrators independent from the self-propelled machine shall not rest on the side forms.

Concrete pavement 3½ inches thick shall be constructed as specified in Section 204.10.

Concrete curb constructed monolithic with concrete pavement will not be included for payment under a Bid Item for concrete pavement. No additional payment will be made for monolithic construction.

Where concrete pavement gutter grade adjacent to the curb is less than one percent, the concrete forming the gutter, for the entire length thereof, shall be carefully hand steel troweled for a distance of one foot out from the curb.

210.02 SUBGRADE. - The adjustment of manhole frames and other castings and the preparation of subgrade shall be as specified in

Sections 217 and 200, respectively. The Contractor shall obtain a relative compaction of not less than 95 percent for the top 6 inches of concrete pavement subgrade.

210.03 SIDE FORMS. - Metal side forms shall be constructed in accordance with the requirements of Section 207.03, and the other provisions of such Section shall be complied with.

210.04 CONCRETE. - Concrete for concrete pavement shall be Class 5.5-3000-1½, in accordance with the requirements of Section 800, except that when construction is monolithic with curb the concrete shall be Class 6-3000-3/4.

The Contractor, with the approval of the Engineer, may use the admixture of 2 pounds calcium chloride per sack of cement to accelerate the setting of concrete in accordance with the provisions of Section 800.08, except the use of calcium chloride will not be allowed in construction monolithic with curb.

210.05 PLACING CONCRETE. - Placing concrete shall be as specified in Section 207.05.

210.06 FINISHING. - The concrete shall be finished with a rigid straight edge float, not more than 18 feet, or less than 16 feet, in length, having a smoothing surface from 8 to 10 inches in width. The straight edge float shall be operated from bridges with its length parallel to the centerline of the pavement, and shall be dragged with a combined longitudinal and transverse motion, planing off the high places and filling in depressions.

The surface shall then be floated with a light wood float of the same length as the aforementioned rigid float, but from 6 to 8 inches in width and 1/2 to one inch in thickness, and equipped with reversible handles at each end. The light wood float shall be operated from bridges with its length parallel to the centerline of the pavement, and shall be dragged transversely across the pavement with its forward edge raised slightly so the smoothing will be done by the back edge.

Immediately following the float finishing, the surface shall be brushed transversely across the pavement with a bristle brush to produce a uniform, nonskid texture. The brushes shall be maintained clean and free from encrusted mortar. Brushes that cannot be cleaned shall be discarded. The brushing shall not be done until the concrete has become slightly sticky. This will require the finishers to remain on the work for a considerable length of time after the spreading so that the concrete will have sufficiently set before being given the final finish.

The finished pavement shall be to the required grade and cross section, and shall not vary from the required surface more than 1/8-inch in 10 feet.

210.07 CONSTRUCTION JOINTS. - The location and forming of construction joints shall be in accordance with the requirements therefor specified in Section 207.06. The concrete shall in no case be edged.

Where concrete pavement base will be poured against concrete parking strip or gutter, the Contractor shall construct the required keyway in such pavement, parking strip or gutter. The longitudinal

centerline of the keyway shall be one inch below the horizontal centerline of the vertical face in which it is formed.

210.08 DUMMY JOINTS. - Transverse dummy joints shall be placed at 15 feet on centers, for the full width of the pavement, in alignment with the joints of adjacent concrete pours, and at right angles to the centerline of the street. On curves they shall be constructed on radial lines.

Dummy joints shall be as specified in Section 207.07, shall under no circumstances be edged, and shall be continuous over the insert.

Expansion joints shall not be constructed in concrete pavement.

210.09 PROTECTION AND CURING. - Concrete pavement shall be protected and cured in accordance with the requirements of Section 800.16.

No equipment, or public or other traffic shall be allowed on concrete pavement until ten days after the pavement has been placed, except that when calcium chloride is used in accordance with the requirements of Section 800.08 as an admixture to accelerate the setting of concrete, public traffic may be allowed thereon only after at least twenty-four hours have elapsed since the completion of all placement of such concrete.

210.10 PAYMENT. - Concrete pavement of the specified thickness, satisfactorily constructed, complete in place, as specified, will be paid for at the price bid per square foot of each specified thickness, measured horizontally.

Concrete pavement constructed adjoining curb will be measured from the face of curb at a depth of 6 inches below the top of curb, irrespective of the actual depth.

The areas of boxed-out locations for manhole and other castings and facilities, regardless of ownership thereof, will not be deducted from the areas of concrete pavement for which payment will be made.

SECTION 211

ASPHALT CONCRETE LEVELING COURSE

211.01 GENERAL. - The Contractor shall construct asphalt concrete leveling course, where and of the thickness necessary, to obtain the grades and cross sections shown on the plans, including cleaning existing pavement or preparing the subgrade, as the case may be, and doing all other necessary or required Incidental Work.

211.02 MATERIALS. - Asphalt concrete leveling course materials shall be in all respects in accordance with the asphalt concrete wearing surface specified in Section 212 and the Special Provisions.

211.03 CERTIFICATES OF WEIGHT. - Certificates of weight, if required, shall be furnished to the Engineer in accordance with the requirements of Section 111.02.

211.04 PAYMENT. - Asphalt concrete leveling course satisfactorily constructed complete, in place, as specified, will be paid for at the price bid per ton of asphalt concrete wearing surface.

SECTION 212

ASPHALT CONCRETE WEARING SURFACE

212.01 GENERAL. - The Contractor shall construct asphalt concrete wearing surface, 2 inches thick unless otherwise specified, consisting of asphalt and graded mineral aggregate, proportioned and mixed at a central mixing plant, and spread and compacted to the lines, grades, cross-sections and thicknesses shown on the plans, or where directed, including cleaning the area to be paved; repairing cracks, spalls and chuckholes; furnishing and installing paint binder; and doing all other necessary or required Incidental Work.

Asphalt concrete types are designated by the maximum size particle in the constituent graded aggregate. In general, use shall be as follows: 3/4" Max. on new pavement base. 1/2" Max. for resurfacing and for conform pavement, and 3/8" Max. when the total compacted thickness to be placed is less than 1-1/4 inches or where the surfacing is exclusively for pedestrian use.

Asphalt concrete specified to be used to construct asphalt concrete curb, sidewalk, ditch and dike, if the Proposal contains a Bid Item for asphalt concrete wearing surface, will be included in the quantity thereof for which payment will be made.

The Contractor shall give the Engineer 24 hours notice prior to placing asphalt concrete.

212.02 ASPHALT.

General. - Asphalt shall be AR-4000 steam refined paving asphalt, in accordance with all current applicable requirements and specifications of

the Asphalt Institute, and the Uniform Pacific Coast Specifications for Paving Asphalts. The amount thereof to be used for the three mix types, in percent by weight of the dry aggregate, shall be:

3/4" Max. and 1/2" Max	4 to 6
3/8" Max	5.5 to 6.5

Records of Delivery. - Records of delivery of asphaltic materials to the supplier, showing contract and purchase order numbers, shipment numbers, dates and quantities, and material designations, shall be available for inspection by the Engineer.

212.03 AGGREGATE.

General. - Aggregate for asphalt concrete surface course mixes shall consist of a mixture of coarse and fine aggregates, which shall be clean, hard, durable material, free from decomposed materials, vegetable matter and other deleterious substances.

Coarse aggregate is material retained on the No. 4 sieve and fine aggregate is material passing the No. 4 sieve.

The combined dry mineral aggregate shall consist of material of which at least 60 percent by weight shall be crushed particles as determined by Test Method No. Calif. 205.

Grading. - The combined dry mineral aggregate shall have a particle size distribution such that the percentage composition by weight when tested in accordance with Test Method No. Calif. 202, will be in accordance with one of the grading requirements set forth as follows:

SURFACE COURSE AGGREGATE GRADING REQUIREMENTS
Percentage Passing

<u>Sieve Sizes</u>	<u>3/4" Max</u>	<u>1/2" Max</u>	<u>3/8" Max</u>
1"	100	.....	.....
3/4"	95-100	100	.....
1/2" . . . . .	.....	95-100	100
3/8"	65- 80	75- 90	95-100
No. 4	49- 54	55- 61	73- 77
No. 8	36- 40	40- 45	58- 63
No. 30	18- 21	20- 25	29- 34
No. 200	3- 8	3- 7	3- 10

The gradings specified hereinbefore are based on materials of a uniform specific gravity. Correction of grading limits to compensate for difference in specific gravity of 0.2 or more between portions of the aggregate shall be modified by Test Method No. Calif. 105.

Minimum durability index, when tested in accordance with Test Method No. Calif. 229, shall be 50.

The combined gradings within the specified limits shall be of such uniformity that the materials during any day's run will not vary more than the following:

Maximum range in the percentage of material passing No. 4 sieve	6
Maximum range in the percentage of material passing No. 30 sieve	5

212.04 SAMPLES AND TESTING. - At least ten working days prior to the use thereof, the Contractor shall submit to the Engineer a 120-pound sample of aggregate, graded as intended for use. This requirement shall be complied with for each aggregate and grading thereof that has not been approved. The Engineer will test the sample at no cost to the Contractor, and will determine the acceptability of the aggregate.

The combined aggregate shall also conform to the following quality requirements immediately prior to mixing with asphalt binder:

<u>Tests</u>	<u>Test Method No. Calif.</u>	<u>Requirements</u>
Loss in Los Angeles rattler (after 500 revolutions)	211	50% Max.
Both Kc and Kf-Factors (obtained from Centrifuge Kerosene Equivalent Test)	303	1.7 Max.
Sand Equivalent	217	45 Min.

The combined aggregate mixed with the required percent of asphalt shall also conform to the following quality requirements:

<u>Tests</u>	<u>Test Method No. Calif.</u>	<u>Requirements</u>
Stabilometer Value *	366	35 Min.
Moisture Vapor Susceptibility (Stabilometer Value)	307	25 Min.
Swell	305	0.030" Max.

* When the 3/8" Max. aggregate grading is specified for use, the above Stabilometer Value requirement will be 30 Min.

The exact proportions of aggregate and amount of asphalt binder shall be subject to control by the Engineer and may be varied within the limits set forth in order to produce a satisfactory mix.

In general, within the grading limits, a higher content of material passing the No. 200 sieve will require an amount of asphalt binder closer to the upper limit.

During construction, samples of asphalt concrete aggregate will be collected for grading tests. If the results of grading tests are not within the requirements, the asphalt concrete represented by these tests shall be removed unless the Engineer determines that said asphalt concrete is structurally adequate and may remain in place. If this asphalt concrete is left in place, the Contractor shall pay to the City \$1.75 per ton for such asphalt concrete. The City may deduct this amount from any payments due, or that may become due, the Contractor under the contract. No single grading test shall represent more than 500 tons of asphalt concrete or one day's paving, whichever is smaller.

212.05 PROPORTIONING AND MIXING. - The mineral aggregates and asphalt binder shall be mixed at a central mixing plant. The aggregates and asphalt binder may be proportioned either by weight or by volume.

Aggregate shall be stored, dried, heated and proportioned in a manner that will give a combined grading within the specified grading limits and satisfactory to the Engineer.

Drying shall continue for a sufficient time and at a sufficiently high temperature to reduce the average moisture content so that at the completion of mixing operations and also at the time of spreading the mixture, the amount of moisture in the mixture shall not exceed one percent.

The drier shall be provided with a heat indicating device in order that the temperature of the aggregate leaving the drier may be determined. The heat indicating device shall be accurate to the nearest 10°F., and shall be installed in such a manner that a fluctuation of 10°F. in the aggregate temperature will be shown by the heat indicating device within one minute.

Any evidence of segregation, degradation, or improper combining of aggregate will be cause for rejection of the asphalt concrete containing such aggregate.

Uniformity of distribution of asphalt will be determined by extraction tests in accordance with Test Methods No. Calif. 309 or 310. The pounds of asphalt per 100 pounds of dry aggregates shall not vary by more than 5 percent above or 10 percent below the amount designated by the Engineer. This requirement shall apply to samples taken from a single batch, successive batches, at different locations in the plant, or at any location or operation designated by the Engineer.

Paving asphalt used as binder shall be added to the aggregate at a temperature of not less than 275°F., nor more than 375°F.

When paving asphalt is used as a binder, the temperature of the aggregates at the time of adding the binder shall not be less than 250°F., nor more than 325°F.

Mixing shall continue until a homogeneous mixture of uniformly distributed and properly coated aggregates of unchanging appearance is produced. In general, the time of mixing shall not be less than 30 seconds, except that the time may be reduced when in the opinion of the Engineer the sizes of aggregate are uniformly distributed and all particles are thoroughly and uniformly coated with asphalt binder.

212.06 PAINT BINDER.

General. - Paint binder shall be applied to all surfaces on or against which an asphalt concrete course is to be laid, except a preceding asphaltic course of the same pavement laid within the preceding 24 hours, or except temporary pavement.

Paint binder shall be emulsified asphalt Type SS-1 in accordance with the Asphalt Institute Specifications.

Before applying paint binder the Contractor shall remove all loose particles, sand, dust, and other foreign materials by power brooming with an approved street sweeping machine.

Large cracks, spalls and chuckholes, particularly reflective cracks occurring in the existing asphaltic surface over the joints of concrete

roadway base, shall be thoroughly cleaned and repaired with asphalt slurry mixture or other asphaltic materials as directed by the Engineer.

The repair shall be done at least 24 hours before the paving, unless otherwise directed by the Engineer.

A sample of the slurry mixture or asphaltic materials shall be submitted to the Engineer for approval three working days prior to the repair.

Applying. - Paint binder shall be applied at the rate of 0.05 to 0.10 gallons per square yard by means of a vehicle-mounted pressure-operated, sprayer-type distributor which shall operate at a continuous, even pressure of not less than 20 pounds per square inch.

Paint binder shall not be applied during cold or rainy weather.

Emulsified asphalt or paving asphalt, as applicable, shall be applied at temperatures suitable for uniform and effective binder coat.

Should, from any cause, an excess of paint binder be applied, that excess shall be immediately removed. Paint binder shall be applied by spraying, and not in any other manner.

Paint binder shall be applied to all vertical surfaces of pavements, curbs, gutters, and manhole and catchbasin frames against which asphalt concrete materials are to be placed.

Curbs, sidewalks, and gutters shall be protected from paint binder. Any emulsified asphalt sprayed on adjoining improvements shall be immediately cleaned off.

212.07 SPREADING EQUIPMENT. - Asphalt paving machines shall be self-propelled mechanical spreading and finishing equipment, provided with a screed or strike-off assembly capable of distributing the material to not less than the full width of a traffic lane. Screed action shall include any cutting, crowding or other practical action which is effective on the mixture without tearing, shoving or gouging, and which produces a surface texture of uniform appearance. The screed shall be adjustable to the required section and thickness. The paving machine shall be provided with either a full width roller or tamper or other suitable compacting devices. Paving machines that leave ridges, indentations or other marks in the surface that cannot be eliminated by rolling or prevented by adjustment in operation shall not be used.

The asphalt paving machine shall operate independently of the vehicle being unloaded or shall be capable of propelling the vehicle being unloaded in a satisfactory manner and, if necessary, the load of the haul vehicle shall be limited to that which will insure satisfactory spreading. While being unloaded, the haul vehicle shall be in contact with the machine at all times and the brakes on the haul vehicle shall not be depended upon to obtain contact between the vehicle and the machine. The use of a paving machine is mandatory for the construction of more than 800 square feet of wearing surface unless the use thereof is physically impossible.

212.08 SPREADING. - Before placing and spreading asphalt concrete wearing surface the Contractor shall remove all loose particles, sand, dust and other foreign materials by power brooming, by an approved street sweeping machine.

All mixtures, except open graded mixtures shall be spread at a temperature of not less than 225°F. and all initial rolling or tamping shall be performed when the temperature of the mixture is such that the sum of the air temperature plus the temperature of the mixture is between 300°F. and 375°F. Open graded mixture shall be spread at a temperature not less than 200°F. and not more than 250°F., unless a higher temperature is directed by the Engineer.

The Contractor shall always furnish and always use tarpaulins to cover all loads.

Open graded mixtures shall be placed only when the atmospheric temperature is above 60°F. and all other mixtures shall be placed only when the atmospheric temperature is above 40°F.

All layers shall be spread with an asphalt paving machine as specified in Section 212.07. Asphalt paving machines shall be operated in such a manner as to insure continuous and uniform movement thereof. Segregation shall be avoided and the surfacing shall be free from pockets of coarse or fine material.

Before placing asphalt concrete wearing surface adjacent to cold transverse construction joints, such joints shall be trimmed to a vertical face in a neat line. The location of the proposed joint shall be tested with a 10-foot straightedge and cut back so that when the straightedge is laid on the finished surface parallel with the centerline of the street, the surface shall in no place vary from the lower edge of the straightedge more than 1/8-inch.

Before placing asphalt concrete adjacent to any existing asphalt concrete, the face of the existing asphalt concrete shall be trimmed to a vertical face in a neat line.

Where asphalt concrete wearing surface is placed adjacent to a Portland cement concrete gutter or parking strip, the asphalt concrete wearing surface shall be so spread that its surface, after compaction, will be approximately 1/4-inch above the surface of the adjacent concrete.

The maximum depth of wearing surface which may be spread and rolled in one course shall not exceed a compacted thickness of 2 inches. Where such thickness exceeds 2 inches, it shall be spread and rolled in courses each not to exceed a compacted thickness of 1-1/2 inches unless otherwise specified in the Special Provisions.

The completed mixture shall be deposited at a uniform quantity per linear foot, which quantity will provide the required compacted thickness without resorting to spotting, picking-up or otherwise shifting the mixture.

Longitudinal joints in the top course shall correspond with the edges of proposed traffic lanes.

At locations where the asphalt concrete is to be placed over areas inaccessible to the specified spreading and rolling equipment, the asphalt concrete shall be spread by handwork to obtain the specified results and shall be thoroughly compacted to the lines, grades and cross sections by means of pneumatic tampers, or by other methods that will produce the same degree of compaction as pneumatic tampers.

212.09 COMPACTION. - Immediately after the wearing surface has been spread it shall be compacted with power rollers in first-class mechanical condition. Roller sprinkler systems shall operate satisfactorily in all respects.

After the first pass of the roller, any low or grainy spots shall be broken up and more material worked in to insure a surface of uniform texture and maximum density.

The Contractor shall furnish and use, for each asphalt paver furnished, a minimum of three rollers, of the types, and employed as follows:

- 1) Initial or breakdown rolling shall consist of one complete coverage with a steel-tired three-axle tandem, two-axle tandem, or three-wheel roller, weighing not less than 12 tons, operating with the drive wheel toward the paver.
- 2) Intermediate rolling shall follow the initial or breakdown rolling and shall consist of three complete coverages with a pneumatic-tired roller while the temperature of the mixture is at or above 150°F.

The pneumatic-tired roller shall be the oscillating type having a width of not less than 4 feet and equipped with pneumatic tires of equal size and diameter. Wobble-wheel rollers will not be permitted. The tires shall be so spaced that the gap between adjacent tires will be covered by the tread of the following tire. The tires shall be inflated to 90 pounds per square inch or such lower pressure designated by the Engineer, and maintained so that the air pressure will not vary more than 5 pounds per square inch from the designated pressure. The roller shall be so constructed that its total weight can be varied to produce an operating weight per tire of not less than 2,000 pounds. The total operating weight of the roller shall be varied as directed by the Engineer.

- 3) Final rolling shall immediately follow intermediate rolling and shall consist of sufficient coverages with a steel-tired two-axle tandem roller, weighing not less than 8 tons, to produce a surface thoroughly compacted, smooth, and free from ruts, humps, depressions, or irregularities.

When the total amount of asphalt concrete wearing surface included in the contract is 1,000 tons or less, rolling may be in accordance with the following alternative requirements:

- 1) The Contractor shall furnish and use a minimum of one steel-tired 2-axle tandem roller, weighing not less than 8 tons, provided it is demonstrated to the satisfaction of the Engineer that such roller can perform the work.
- 2) Rolling shall consist of sufficient coverages to produce a surface thoroughly compacted, smooth, and free from ruts, humps, depressions, or irregularities.

Areas inaccessible to power rollers shall be compacted with hot tampers.

The finished surface of the pavement shall be true to grade and cross section, free from high spots, depressions, or grainy spots, and shall show a uniform distribution of aggregate. A straightedge 10 feet long laid on the finished surface parallel to the centerline of the pavement shall disclose no more than the following irregularities per lane-mile in the pavement:

<u>Irregularity Range</u>	<u>Maximum Allowable Irregularities per Lane Mile</u>
3/16 inch to 1/4 inch	200 irregularities
1/4 inch to 5/16 inch	100 irregularities
5/16 inch or greater	0 irregularity

In addition, the above criteria shall be used as a basis for calculating the maximum allowable amount of irregularities for each block throughout the project limits. The maximum allowable amount of irregularities per lane-block shall be calculated by multiplying the maximum allowable number of irregularities per lane-mile by the length of the block in feet and dividing by 5,280 feet.

The City shall have the option of requiring correction of pavement irregularities in excess of the maximum allowable or a reduction of payment due the Contractor based on the official rolling-straightedge report. The reduction of payment shall be as follows:

<u>Irregularity Range</u>	<u>Payment Reduction Per Each Excess Irregularity</u>
3/16 inch to 1/4 inch.....	\$ 10.00
1/4 inch to 5/16 inch.....	\$ 50.00
5/16 inch or greater.....	\$100.00

The Contractor shall transport the City-furnished straightedge from Room 62, City Hall, San Francisco, or other place of storage, to the site of the work and return said equipment to the place of storage when the need therefor has ended.

The City will perform the rolling-straightedge operation at no cost to the Contractor.

The Contractor shall furnish the Engineer with all necessary, or required, labor and equipment, other than 10-foot rolling straightedge, to complete the inspection of the finished pavement.

212.10 CONFORM AREAS. - Conforms shall, where possible, be made along straight or regular lines carefully located to assure a smooth surface and proper crown.

All edges of existing pavement along a trench or butt conform shall be painted with paint binder before depositing asphalt concrete. In areas of the standard butt conform a wedge shaped course, as shown on the plans, shall be laid prior to 4 p.m. of the same day the wearing surface is removed. The new wearing surface shall be placed with the finishing machine within two days of the placing of the wedge.

The asphalt concrete wearing surface shall be spread evenly at the trench or butt conform, to a thickness of at least 1/4-inch above the existing pavement to insure proper rolling and compaction. After the first pass of the roller all low or grainy spots shall be broken up with a hot rake and more material worked in to bring the surface up to the proper level and insure uniform texture and maximum density.

Other conform consisting of asphalt concrete wearing surface placed on areas prepared with paint binder shall be used as a variable

thickness pavement course to adjust the surface of existing pavement to the surface of new pavement, or where shown on the plans or directed by the Engineer.

The limit of the paint binder on the existing pavement shall parallel, and shall project 6 inches beyond, the conform line. The conform pavement shall be raked back to a depth of 1/4-inch to 3/8-inch before rolling.

Particular care shall be taken in the work adjacent to the conform line, where the conform pavement is to be less than 1 inch thick. The existing surface shall be well cleaned and the paint binder properly applied. Very hot hand irons shall be used to smooth the edge of the conform, soften the existing surface and insure a good bond between the new and old materials.

If the Proposal contains a Bid Item for asphalt concrete wearing surface, that used in conform areas will be included in the quantity thereof for which payment will be made.

212.11 CASTINGS. - Temporary and permanent asphalt concrete wearing surface constructed in conjunction with setting or resetting, as the case may be, of castings, will not be included for payment under a Bid Item for asphalt concrete wearing surface, but shall be constructed as work incidental to the setting or resetting of castings.

212.12 CERTIFICATES OF WEIGHT. - Certificates of weight for asphalt concrete wearing surface shall be furnished to the Engineer in accordance with the requirements of Section 111.02.

212.13 PAYMENT. - Asphalt concrete wearing surface satisfactorily constructed, in place, as specified, will be paid for at the price bid per ton.

Asphalt concrete wearing surface constructed over and around areas of excavation required under the contract, for sewer, drainage, AWSS, electrical and other facilities, where the proposal contains a per ton Bid Item therefor, will be paid for under such Bid Item, regardless of whether such sewers and other facilities are within, or are outside of, the limits for the construction of asphalt concrete wearing surface shown on the plans.

SECTION 213

SEAL COAT

213.01 GENERAL. - The Contractor shall construct, including doing all necessary or required Incidental Work, emulsified asphalt seal coat on roadway or other surfaces shown on the plans, or where directed, and in accordance with the requirements set forth herein.

The seal coat shall consist of two applications of emulsified asphalt and screenings as follows:

<u>Size of Screenings</u>	<u>Rate of Application Per Square Yard</u>	
	<u>Screenings (Pounds)</u>	<u>Emulsified Asphalt (Gallons)</u>
1st Application 1/2" to No. 4	25	0.30
2nd Application 1/4" to No. 10	15	0.15

213.02 MATERIALS. - Emulsified asphalt shall be type RS-2, conforming to the provisions of the Asphalt Institute Specifications. A test report, if requested by the Engineer, shall be furnished in accordance with the requirements of Section 212.02.

Screenings shall consist of broken stone, crushed gravel, or both, shall be hard, tough, durable and sound, and shall be in accordance with the quality requirements set forth in Section 212.03. At least 90 percent by weight of the screenings shall consist of crushed particles as determined by Test Method No. Calif. 205.

Screenings shall be clean, free from deleterious materials, and shall be graded as follows:

<u>Sieve Size</u>	<u>Percentage by Weight Passing Sieves</u>	
	<u>1/2" to No. 4</u>	<u>1/4" to No. 10</u>
3/4".....	100	---
1/2".....	90-100	---
3/8".....	50-80	100
No. 4.....	0-15	60-85
No. 8.....	0-5	0-25
No. 16.....	---	0-5
No. 30.....	---	0-3
No. 200.....	0-2	0-2

Screenings shall also conform to the following quality requirements:

<u>Tests</u>	<u>Test Method No. Calif.</u>	<u>Requirements</u>
Loss in Los Angeles Rattler (after 100 revolutions)	211	10% Max.
Loss in Los Angeles Rattler (after 500 revolutions)	211	40% Max.
Film Stripping	302	25% Max.
Cleanness value	227	80 Min.

213.03 SURFACE PREPARATION. - Immediately before applying the emulsified asphalt, the surface to be sealed shall be cleaned of all dirt and loose material.

When seal coats are to be applied to rock base or other untreated material, a prime coat of the type specified in the Special Provisions shall be applied to the material in place at a rate of from 0.20 to 0.33 gallon per square yard, as specified.

213.04 APPLYING EMULSIFIED ASPHALT. - Emulsified asphalt shall be applied by means of a vehicle-mounted, pressure-operated, sprayer-type distributor which shall operate at a continuous, even pressure of not less than 20 pounds per square inch at a specified rate of application. The distributor shall be equipped with an accurate pressure gauge that can be easily read by a person walking alongside the distributor vehicle.

The distributor system shall be capable of being operated at any width of application less than the maximum width by shutting off individual sprayer nozzles.

In order to secure uniform distribution, the flow of emulsified asphalt shall be halted before the rate of flow decreases due to depletion of the emulsion supply tank. After the supply tank has been refilled, the specified application rate shall be attained at the sprayer nozzles before resuming application.

Emulsified asphalt shall not be applied during cold or rainy weather. No more emulsified asphalt shall be applied to the surface than can be immediately covered with screenings and rolled the same day.

213.05 DISTRIBUTING, SPREADING AND ROLLING SCREENINGS. - Screenings shall be evenly distributed, immediately following the preceding application of emulsified asphalt, by means of approved spreading devices attached to the rear of the haul vehicles. The haul vehicles shall back up while distributing the screenings so that the wheels will not come in direct contact with the emulsified asphalt. Following each application, the distributed screenings shall be carefully spread and trued up with a suitable blade or a drag broom, or other approved equipment, and all high or low spots shall be corrected by the removal or addition of screenings, as applicable. Each application of screenings shall be rolled, with a power roller weighing not less than 6 tons, until a smooth dense even surface has been obtained.

213.06 PAYMENT. - Seal coat, satisfactorily constructed, complete in place, as specified, will be paid for at the price bid per square yard, measured horizontally.

No deduction will be made from the quantity to be paid for on account of castings, or boxed-out areas therefor, which exist within the limits of the seal coat.

SECTION 214

PLANING EXISTING ASPHALT CONCRETE SURFACES

214.01 GENERAL. - The Contractor, at each area to be planed, shall furnish, operate on existing asphalt concrete pavement, supply with fuel, maintain, pay all labor costs in connection with, and remove from the site as his property upon conclusion of use thereof, one or more power-driven road surface cold planer machines, satisfactorily remove all planed material, and do Incidental Work.

The exact locations to be planed, within or adjacent to the areas shown on the plans or specified in the Special-Provisions and except as hereinafter specified the number and depth of cuts, and other factors affecting the work depending on the type of asphalt concrete paving, will be determined in the field by the Engineer and will be subject to possible minor changes as the work progresses.

The asphalt concrete wearing surface shall be constructed in any one block no later than seven days after the cold planing work has been completed, unless otherwise specified in the Special Provisions.

214.02 COLD PLANER MACHINE. - The machine shall be of a make and design that has operated successfully on work comparable with that proposed to be done under the contract, and shall be operated by an experienced operator.

The machine shall be self-propelled; and shall be equipped with a dust suppression system, a sensing skis device or profile control system to regulate the cutting drum (any device or system which must utilize the curb for control will not be permitted), and a minimum 42-inch wide cutting drum, which can be adjusted laterally for slope and depth, with replacable carbide tip cutting teeth placed in stagger-laced pattern. The machine shall be so designed that the operator, thereof, can observe the cutting drum's operation or as an option, the machine can be equipped with a remote control unit to allow a secondary operator at ground level to control the cutting drum's operation.

The machine shall be capable of operating at speeds from 0- to 125-feet per minute and cutting depths from 0- to 2-inches through the surface material, without producing fumes or smoke, gouging, shoving, or tearing the pavement, to a predetermined grade in one pass for a continuous and smooth surface finish.

The machine to be used under the contract shall be manufacturer equipped. The number of rows, or columns, of cutting teeth and tooth-spacing of the cutting drum shall be installed and maintained per manufacturer's specifications. A machine with wobble cutting drum will not be permitted.

The type and size of the machine shall be subject to the approval of the Engineer.

214.03 CONDUCT OF THE WORK. - Cuts made with a cold planer machine shall be of the width, depths, and to the alignment shown on the plans or specified, and shall result in a uniform surface conforming to the required cross section.

The juncture of cold planed and unplaned areas shall be neat and uniform.

The material planed from the street surface will be the property of the Contractor and shall be immediately removed by him from the site of the work at his own expense. Any planed material which is deposited on any concrete parking lane shall be immediately removed therefrom by brooming. The removal crew shall follow within 50 feet of the planer unless otherwise directed by the Engineer.

The Contractor shall provide one power broom and one front-end loader for each planing machine to be used in the project. Further, the Contractor shall provide a minimum of one laborer for each front-end loader to work along side of said loader whenever subject loader is operating. If the Contractor elects to, or is specifically required by the Special Provisions to perform holiday, weekend or night planing work, he shall provide one each additional broom and front-end loader as emergency back-up equipment. For example, if there are two planing machines in operation there shall be three power brooms and three front-end loaders available. Said power brooms and front-end loaders shall be on the jobsite and their working order satisfactorily demonstrated no later than 9:00 A.M. of the last weekday prior to the holiday or weekend that planing work is to be performed.

Planing operations shall not be carried out at any time where, in the opinion of the Engineer, weather conditions do not permit efficient operation.

Cold planer operation, in general, will consist of, and for payment will be divided into work of, one or more of the following types:

- 1) Operation of the cold planer machine adjacent to the curb, for a 1 inch cut, on a linear foot basis. If underlying concrete, brick or cobblestone pavement base is exposed before the shown or specified depth of curb is attained, the planing shall be terminated. The quantity to be paid for on this basis shall be that, not including as footage any additional passes of the machine, required to make a cut 7-foot wide, a minimum of 1-inch deep at the curb, and wedge-shaped in section.
- 2) Operation of the cold planer machine adjacent to the curb, for a 3/4 inch cut, on a linear foot basis. The quantity to be paid for on this basis shall be that, not including as footage any additional passes of the machine, required to make a cut 7-foot wide, a minimum of 3/4-inch deep at the curb, and wedge-shaped in section.
- 3) Operation of the cold planer machine adjacent to the concrete parking lane or gutter, for a 1/2-inch cut, on a linear foot basis. The quantity to be paid for on this basis shall be that, not including as footage any additional passes of the machine, required to make a cut 7-foot wide, a minimum of 1/2-inch deep at the parking lane or gutter, and wedge-shaped in section. Asphaltic pavement which has crawled over existing concrete parking lanes and gutters shall be removed as Incidental Work.
- 4) Operation of the cold planer machine adjacent to the street railway tracks, for a 1/2-inch cut, on a linear foot basis. The quantity to be paid for on this basis shall be that, not including as footage any additional passes of the machine, required to make a cut 7-foot wide, a minimum of 1/2-inch deep on the track side, and wedge-shaped in section.

- 5) Operation of the cold planer machine in conform areas, for a 1 inch cut, on a linear foot basis. The quantity to be paid for on this basis shall be that, not including as footage any additional passes of the machine, required to make a cut 7-foot wide, a minimum of 1 inch deep, and wedge-shaped in section.
- 6) Operation of the cold planer machine adjacent to curb, concrete parking lane or concrete gutter, tracks, or other conform areas, 1½-inch cut or other specified cut of full-depth rectangular shape in section, on a square foot basis. The quantity to be paid for on this basis shall be that, not including as footage any additional passes of the machine to obtain the required depth of cut.
- 7) Directed operation on an hourly basis. The time for which payment will be made on this basis, will be the aggregate of the periods during which the machine is actually cold planing.

Conforms and conforms around castings which are deeper than 1-inch shall be immediately ramped with cold-mix asphalt concrete as Incidental Work, all to the satisfaction of the Engineer.

All hand work of asphalt concrete removal around inlets and other castings in the planing area, areas adjacent to curbs, gutters, concrete parking strips and all conform lines will be done as Incidental Work.

No payment will be made for time required for refueling or for moving the machine between areas to be planed, and such refueling and movement will be considered Incidental Work.

As the work progresses, the Engineer may designate other areas to be cold planed. The additional locations, number and depth of cuts, the extent to which cold planing shall be done and the appropriate basis of operation in these areas will be determined by the Engineer.

214.04 PAYMENT. - Planing existing asphalt concrete surfaces, satisfactorily done as specified, will be paid for at the appropriate following unit bid prices:

- 1) adjacent to the curb, at the price bid per linear foot, per inch of depth of cuts;
- 2) adjacent to the curb, at the price bid per linear foot, per ¾-inch of depth of cut;
- 3) adjacent to the concrete parking lane or concrete gutter, at the price bid per linear foot, per ½-inch of depth of cut;
- 4) adjacent to the street railway tracks at the price bid per linear foot, per ½-inch of depth of cut;
- 5) in conform areas, at the price bid per linear foot, per 1 inch of depth of cut;
- 6) adjacent to curb; concrete parking lane or concrete gutter; tracks; or conforms, at the price bid per square foot, per 1½-inch or other specified depth of cut;
- 7) at the price bid per hour of directed operation.

SECTION 215

RAISED TRAFFIC BARS

215.01 GENERAL. - The Contractor shall fabricate and install raised traffic bars of the dimensions shown, complete in place, and shall clean and place adhesive on the pavement in preparation therefor, all where shown on the plans or directed, and shall do all Incidental Work. The bars shall be of Class 6-3000-3/4 concrete, except with a maximum slump of 3 inches, made with white Portland cement, and may be precast, cast in place, or extruded, at the option of the Contractor. Approved substitute aggregate materials may be used.

215.02 TESTING. - When required by the Engineer raised bars will be tested in the City's laboratory at no cost to the Contractor. After curing, each bar shall be capable of supporting a minimum load of 400 pounds when tested as a simple beam with the base in tension on roller supports at 20-inch centers and loaded at midspan through a saddle one inch wide shaped to conform to the contour of the bar. The load shall be applied at a uniform rate or in increments not in excess of 50 pounds.

215.03 INSTALLATION. - Raised bars shall be placed, cast or extruded, on the finished pavement with an adhesive consisting of polyvinyl acetate emulsion, asphaltic emulsion, or approved equal. If asphaltic emulsion is used, no clay or similar substances shall be used in its manufacture as emulsifying or stabilizing agents. The adhesive shall be of a consistency suitable for heavy trowel application at atmospheric temperature. It shall develop a tenacious bond on setting. Before placing the adhesive, the surface of the pavement shall be cleaned free of dust, loose material or oil. The adhesive shall be applied in such quantity that a firm, uniform bearing is obtained throughout the area of contact. Excess adhesive shall be squeezed from under the bar and the excess shall be removed. When bars are placed over a joint or crack, an open joint shall be made through the bars.

At the conclusion of all other work in the area, the bars shall be painted with one coat of white traffic lacquer, or approved equal, applied in accordance with the manufacturer's recommendations. Adequate precautions shall be taken, and, upon completion of the painting, adjacent and other pavements shall have on them no paint or discoloration caused thereby.

215.04 PAYMENT. - Raised traffic bars, satisfactorily fabricated and installed as specified, will be paid for at the price bid per linear foot of adhered bar, measured horizontally along the longitudinal centerline thereof.

SECTION 216

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SECTION 217

ADJUSTMENT OF MANHOLE FRAMES AND OTHER CASTINGS

217.01 GENERAL. - In order to insure a true, smooth pavement wearing surface, all frames and castings of manholes, catchbasins, curb inlets, vaults, valves, handholes, monuments, and other installations in the street and sidewalk area, hereinafter referred to as "castings," shall be reset accurately to the final finished pavement surface. Resetting includes extending or shortening the cones, barrels or risers of such structures as required for the proper adjustment of the castings. The work to be done by the Contractor and the "Owner," respectively, in connection with the required removal and resetting of such castings and the paving work relative thereto, shall be in accordance with the requirements hereinafter specified. The term "Owner," as used in this Section, means an owner of utilities as defined in Section 104.

In the case of castings owned by the Department of Public Works, Department of Electricity, Police Department, Fire Department, and of the Auxiliary Water Supply System, the Contractor shall perform all necessary work in connection therewith, including the work herein specified to be performed by the Owner. All such castings shall be reset to finished pavement grade, and the subsequent repaving adjacent to the castings shall be completed, not later than 7 calendar days after the surrounding wearing surface has been constructed unless otherwise specified in the Special Provisions.

The Contractor shall restore pavement around each casting after such casting has been properly reset to new pavement grade. If the pavement around such castings is not restored by the Contractor within twenty-four hours, the Contractor shall provide temporary bridging over each of the casting cut-out areas with a steel plate, approved by the Engineer, ramped to the adjacent pavement and secured against any movement. The bridging, including material and work related to, shall be done at the Contractor's sole expense.

The Contractor may enter into a private agreement with the Owner to do work that is the responsibility of the Owner, provided that such work will be done at no cost to the City.

217.02 CONSTRUCTION OR RECONSTRUCTION OF PAVEMENT. - Where pavement, or pavement base and wearing surface, is to be constructed, or if existing, is to be removed and reconstructed, the Contractor shall construct a box around each casting. The box shall be 5 feet square around sewer and vault manholes and proportionately dimensioned for other castings. The construction of pavement shall be temporarily omitted within the confines of the boxes. The Owner of each casting will then remove his castings, after which the Contractor shall carefully cover the openings in the exposed structures with planks not less than 2 inches thick and shall fill the boxed-out areas with a temporary pavement consisting of at least 4 inches of graded rock and 1 inch of asphalt concrete wearing surface.

After the pavement surrounding the boxes has been constructed, the Owners of the castings will remove the boxes and the temporary pavement from within them and will reset the castings to conform

accurately with the finished pavement surface. Resetting will be done in a workmanlike manner using Class 6-3000-3/4 concrete, bricks set in Class "B" mortar, or rings or other approved devices.

After each casting has been satisfactorily reset to the finished pavement surface, the Owner will place, and compact, asphalt concrete in the entire boxed-out area around the casting to within 1½ inches of finished pavement grade, upon which he will construct asphalt concrete wearing surface to finished pavement grade.

217.03 RESURFACING--OVER AND IN PLACE OF EXISTING WEARING SURFACE. - Where resurfacing is to be done and asphalt concrete wearing surface is to be constructed over existing pavement wearing surface regardless of type, the Contractor shall construct the wearing surface continuously over all castings, except valve castings. It will be the responsibility of the Owners of the castings so covered to reference them in advance in such manner that they may later be located readily. The Contractor may construct the wearing surface continuously over valve castings provided that he uncovers the valve castings immediately after constructing the wearing surface.

After the resurfacing has been completed, the Owner will cut through the pavement around each casting and reset the casting to conform accurately with the finished pavement surface. Resetting the castings and subsequent repaving in the cut out areas will be done by the Owner in the manner specified hereinbefore.

Where castings exist in an area from which existing wearing surface is to be wholly or partially removed, and the final grade is to be lowered, the Owner shall cut through the pavement and remove each casting. The Contractor shall then provide the planking and a satisfactory temporary riding surface over the openings as specified in Section 217.02, except that the box will not be required.

After the wearing surface surrounding an opening has been constructed, the Owner will remove the temporary pavement from within the cut out area, reset the casting, and repave as hereinbefore specified.

Pavement in cut-out areas around adjusted castings shall be constructed with 1½ inches of asphalt concrete wearing surface on 8 inches of concrete base.

217.04 ALTERNATIVE METHODS. - The Owners and the Contractor may agree to any modification of, or alternative to, the hereinbefore specified methods of resetting castings, provided that application for the use of such modification or alternative is made in writing to, and is approved by, the Engineer.

217.05 PAYMENT. - Adjustment of existing City-owned manhole frames and covers and other existing street castings, satisfactorily done complete in place, as specified, including the pavement in cut-out areas around such castings, will be paid for under the appropriate Bid Item, at the respective price bid for a set consisting of a frame and either a cover or a grating.

City-owned means Governmentally-owned as opposed to non-Governmentally-owned as defined in Section 104.

If the Proposal contains pavement or pavement base Bid Items, no deduction will be made in the pay quantities thereof because of the presence of, or the adjustment of, castings.

SECTION 218

REDWOOD HEADERS

218.01 GENERAL. - The Contractor shall construct "Heart Structural" grade redwood headers 2 inches thick and of a width equal to the thickness of the pavement or walk which they are to be bound, complete in place, including supporting stakes, scabs, wood preservative treatment, nailing, and Incidental Work. The headers shall be placed on edge, and securely nailed inside of supporting stakes driven into the subgrade. They shall be set so as to conform to the finished surface of the pavement. The supporting stakes shall be "Heart Structural" grade redwood set with their sawed tops conforming with the surface of the finished pavement or walk, of such size and number as may be necessary to rigidly support the headers in place during the construction operations. The headers shall have squared top edges and squared butt joints against the stakes, and shall be held in place with at least 2 galvanized nails of the necessary length in each stake, except at butt joints where not less than 4 shall be used. In sandy or loose soil, or wherever necessary to hold headers to proper line and grade, the joints in the headers shall be reinforced with a 1-inch x 6-inch x 18-inch redwood scab, securely nailed.

Headers shall be placed where indicated on the plans, and along the unprotected edges of all pavements and sidewalks, except concrete sidewalks at property lines, even though not called for on the plans.

After being cut to length, the headers, stakes and scabs shall receive on-the-job treatment with a 5 percent solution of the pentachlorophenol preservative specified in Section 415.06. Preservatives containing arsenic or creosote will not be permitted.

218.02 PAYMENT. - Redwood headers, satisfactorily constructed as specified, will be paid for at the price bid per linear foot, measured horizontally along the line thereof.

SECTION 219

CORRUGATED METAL GUARD RAILING

219.01 GENERAL. - The Contractor shall construct corrugated metal guard railing consisting of galvanized, straight and precurved corrugated metal railing elements and flared terminal sections mounted on treated timber posts, all complete in place, with hardware, and shall do all related Incidental Work. The railing shall be constructed true to the lines and grades therefor designated on the plans and in accordance with the directions of the manufacturer, and after erection shall be cleaned and painted.

219.02 MATERIALS. - Timber posts shall be S4S, 8 inches x 8 inches x 4 feet 8 inches, No. 1 stress grade or better Douglas fir free of boxed heart, chamfered as shown on the plans or specified, and in accordance with the requirements of Section 414.01. The posts shall be pressure treated with pentachlorophenol in accordance with the requirements of Section 415.06 after being surfaced, chamfered and cut to length. The minimum retention of preservative shall be that specified for ground contact.

The steel plate forming the corrugated rail element shall be rolled from steel from which a 2-inch test specimen shall elongate not less than 12 percent.

The plate shall be shaped into a beam not less than 12 inches wide and with two corrugations not less than 3 inches deep. The plate shall not be less than 12 gauge, subject to standard mill tolerances for gauge. The manufacturing tolerance for width and depth shall be minus 1/8-inch and the edges of the rail shall be smooth after fabrication.

The rail shall develop a minimum tensile strength of 50,000 pounds for the rail element and joints. A section of rail freely supported at each end, on 12-foot centers, shall support a concentrated load at the center of 1,400 pounds with a maximum deflection of 4 inches.

The ends of each length of railing shall be fitted with a section, also of 12-gauge metal, extending at least 18 inches beyond the center of the end post, and so formed that its end shall be at least 7 inches back of the face of the rail.

Along curvilinear alignments, guard rail elements used shall be shop precurved to radii of curvature such that deviation from the alignment shown on the plans will not at any point exceed 2 inches.

Straight elements may be used where the radius of curvature or the alignment is greater than 110 feet.

The hardware for the guard rail shall consist of:

- 1) at each rail to rail splice, eight 5/8-inch x 1¼-inch oval shoulder button head splice bolts with nuts and washers;
- 2) at each rail to terminal section splice, four 5/8-inch x 1¼-inch oval shoulder button head splice bolts, and nuts; and
- 3) at each splice, for fastening to timber post, one 5/8-inch x 10½-inch oval shoulder button head post bolt with nuts and washers.

219.03 GALVANIZING. - All guard rail elements, terminal sections, and hardware shall be hot-dip galvanized in accordance with the applicable requirements of Section 807; however, the guard rail elements and terminal sections may be galvanized either before or after fabrication, the total of the weights of the two galvanizing coatings, one on each side of any sheet, element, or section, shall not be less than 2.0 ounces per square foot, and such galvanizing shall be in accordance with the requirements of ASTM "Standard Specification for General Requirements for Delivery of Zinc-Coated (Galvanized) Iron or Steel Sheets, Coils, and Cut Lengths Coated by the Hot-Dip Method," Designation A 525.

219.04 CONSTRUCTION. - The height of the guard rail and of the posts above ground shall be as shown on the plans. Posts shall be placed at equal intervals, not to exceed 12 feet 6 inches, measured horizontally between center lines of adjacent posts.

A post shall be installed at each rail splice and at each terminal section splice.

All posts shall be installed vertically.

After the posts are set, the space around them shall be filled with selected earth free from rock. Fill material shall be placed in layers approximately 4 inches thick, and each layer shall be thoroughly watered and tamped in place to hold the posts securely in position.

All metalwork shall be fabricated in the shop, and no punching, cutting, or welding will be permitted in the field. Metal railing shall be installed in accordance with the directions of the manufacturer of the particular railing.

The railing shall be installed in smooth curves and transitions with no abrupt changes in alignment.

The guard railing in the final position shall be rigid and without any loose joints or connections.

Any rail element dented, bent, broken, warped or otherwise damaged, shall be immediately and satisfactorily repaired or replaced, as applicable, by the Contractor at his sole expense.

Ends of guard railing facing the direction of traffic flow shall be flared and buried in concrete.

219.05 PAINTING. - After erection, corrugated metal guard railing shall be painted in accordance with the requirements of Section 809.

Galvanized surfaces shall not be brushed with copper sulphate solution. The Contractor shall, however, exercise special care to remove, with solvent, all grease or oil film from galvanized surfaces to be painted.

All surfaces of the rail, including the end sections and all hardware, shall be painted with one coat of an approved galvanized metal primer which shall be allowed to dry thoroughly. Two coats of an approved white enamel shall then be applied to all the above primed surfaces.

Timber posts shall be painted with one coat of an approved wood primer and two coats of an approved fast-drying white finish paint for wood, and at least 4 inches of post painted with all coats shall be below the ground surface.

All exposed surfaces of corrugated metal guard railing that become soiled or damaged before acceptance of the work shall be cleaned or repainted at the Contractor's expense.

219.06 PAYMENT. - Corrugated metal guard railing, satisfactorily constructed as specified, will be paid for at the price bid per linear foot measured along the face of straight and precurved corrugated metal elements between extreme ends of each section of railing including terminal sections thereof as constructed.

SECTION 220

CERTAIN PAVEMENT, EXCAVATION, EARTHWORK AND PAVEMENT CONSTRUCTION EXCLUDED FROM PAY QUANTITIES

Pavement excavation, earthwork, and the construction of sidewalk, curb, gutter, parking strip, pavement base and pavement, within the limits shown or specified therefor, will be paid for under the respective Bid Items therefor. Such work, necessary or required as a result of constructing, installing, relocating or removing, structures, and water, sewer, drainage, landscaping, lighting, traffic control, fire alarm, AWSS, and other facilities and appurtenances, and outside the limits within which excavation and construction or pavement elements are shown or specified to be paid for under Bid Items, will not be paid for but shall be done as Incidental Work.

Asphalt concrete wearing surface required to be constructed, if the Proposal contains a per ton Bid Item therefor, will be paid for whether or not the construction thereof is within the limits shown on the plans for the construction of asphalt concrete wearing surface.

Except as otherwise specified in the Special Provisions, asphalt-topped roadway pavement damaged or removed by the Contractor, and not specified for removal as part of the contract, shall be restored with 8-inch thick concrete base and 1½-inch thick asphalt concrete wearing surface at the Contractor's expense.

Concrete roadway pavement (non-asphalt-topped) damaged or removed by the Contractor, and not specified for removal as part of the contract, shall be restored with 8-inch thick concrete pavement at the Contractor's expense.

Existing gutter, parking strip, curb and sidewalk, damaged or removed by the Contractor, and not specified for removal as part of the contract, shall be restored to match the existing in design and material at the Contractor's expense. Damaged or removed sidewalk shall be restored to existing flag lines to match the adjacent existing sidewalk in design and material.

SECTION 221

PAVEMENT REINFORCING FABRIC

221.01 GENERAL. - The Contractor shall furnish and place pavement reinforcing fabric on existing pavement to be resurfaced or between layers of asphalt concrete complete, in place, including all necessary or required Incidental Work, where and as shown on the plans or where directed by the Engineer.

Pavement reinforcing fabrics shall be furnished in protective covers capable of protecting the fabric from ultraviolet rays, abrasion, and water.

221.02 PLACING REINFORCING FABRIC. - Before placing the pavement reinforcing fabric, a binder of paving asphalt shall be applied to the surface to receive the pavement reinforcing fabric at the rate of 0.25-gallon per square yard of surface covered. The binder shall be applied to a width equal to the width of the fabric mat plus 3 inches on each side.

The fabric shall be stretched, aligned, and placed with no wrinkles that lap. The test for lapping shall be made by gathering together the fabric in a wrinkle. If the height of the doubled portion of extra fabric is 1/2 inch or more, the fabric shall be cut to remove the wrinkle, then lapped in the direction of paving. Lap in excess of 2 inches shall be removed.

Pavement reinforcing fabric shall not be placed in areas of conform tapers where the thickness of the overlying asphalt concrete is 1 inch or less.

If manual laydown methods are used, the fabric shall be unrolled, stretched, aligned, and placed in increments of approximately 30 feet.

Adjacent borders of the fabric shall be lapped 2 to 4 inches. The preceding roll shall lap 2 to 4 inches over the following roll in the direction of paving at ends of rolls or at any break. At fabric overlays, both the tack coat and the fabric shall overlap the previously placed fabric by the same amount.

Seating of the fabric with rolling equipment after placing will be permitted. Turning of the paving machine and other vehicles shall be gradual and kept to a minimum to avoid damage.

A small quantity of asphalt concrete, to be determined by the Engineer, may be spread over the fabric immediately in advance of placing asphalt concrete surfacing in order to prevent fabric from being picked up by construction equipment.

Public traffic shall not be allowed on the bare reinforcing fabric; except that public cross traffic shall be allowed to cross the fabric, under traffic control, after the Contractor has placed a small quantity of asphalt concrete over the fabric.

Care shall be taken to avoid tracking binder material onto the pavement reinforcing fabric or distorting the fabric during seating of the fabric with rolling equipment. If necessary, exposed binder material shall be covered lightly with sand.

221.03 FABRIC. - Pavement reinforcing fabric shall be manufactured from polyester, polypropylene, or polypropylene-nylon material. The fabric shall be nonwoven, and shall conform to the following:

Weight, ounces per square yard	
ASTM Designation: D 1910.....	3.0 to 8.0
Grab tensile strength (1-inch grip), pounds, min.	
ASTM Designation: D 1117.....	90
Elongation at break, percent, min.	
ASTM Designation: D 1117.....	40
Fabric thickness, mils.	
ASTM Designation: D 461.....	12 to 100

A Certificate of Compliance shall be furnished with each lot of fabric delivered to the work and the lot so certified shall be clearly identified in the certificate. The certificate shall be signed by the manufacturer of the fabric and shall state that the fabric involved complies in all respects with the requirements of the specifications.

Fabric used on the basis of a Certificate of Compliance may be sampled and tested at any time. Fabric used on the basis of a Certificate of Compliance shall not relieve the Contractor of responsibility for incorporating fabric in the work which conforms to the requirements of the plans and specifications, and any such fabric not conforming to such requirements will be subject to rejection whether in place or not.

The City reserves the right to refuse to permit the use of fabric on the basis of a Certificate of Compliance. The form of the Certificate of Compliance and its disposition shall be as directed by the Engineer.

221.04 PAYMENT. - Pavement reinforcing fabric, satisfactorily furnished and placed as specified, including all necessary or required Incidental Work, will be paid for at the price bid per square yard of actual area covered.

END PART 2