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SECTION 71: STREETS

71-1 GENERAL

Street surface improvements shall include: barricades, bikeways, bridges, bollards, curb, curb & gutter, driveways, pavement, curb ramps, sidewalk, survey monuments and tunnels. These improvements shall be installed in accordance with the approved improvement plans, these Construction Standards and the latest edition of The State of California Department of Transportation Standard Specifications hereinafter referred to as the Caltrans Standard Specifications latest edition and as specified by the City Engineer. No Street shall be cut, nor any public improvement disturbed until the Developer/Contractor has obtained an encroachment permit from, and/or entered into a subdivision agreement with the City.

71-2 CONNECTION TO EXISTING IMPROVEMENTS

Connection to existing surface improvements require that the following conditions be met:

- A. Existing Stub Street Connection:** The Developer shall be responsible for removing and reconstructing a portion of the existing roadway to make a satisfactory connection, as required by the City Engineer.
- B. Street Widening:** When widening to complete a partial street along a development project, the Developer shall be responsible for saw cutting and removing a narrow strip along the outside portion of the pavement to provide a clean and stable pavement section for constructing against. The width from centerline shall be shown on the approved plans or as determined in the field, and verified by the City Engineer. PCC pavement may be placed against the existing pavement if the City's Construction Inspector determines the pavement edge is flawless. Joints for PCC pavement shall be placed along a lane line or in the center of a lane. Following construction of the adjacent curb and gutter, paving shall not commence until the City's Construction Inspector is satisfied that the cross grade between the existing pavement edge and the new gutter lip conforms to or approaches the City's required 2% cross grade. 3% is the maximum cross grade allowed on this AC pavement section unless shown on the approved plans.
- C. Sawcutting:** When sawcutting within an asphalt concrete street for trenching or other purposes, Contractor shall grind 1-1/2 inches of pavement between the lane lines (from lane stripe to lane stripe). Upon completion of the sawcutting and/or trenching work, where the sawcutting occurs between the curb and gutter and nearest lane stripe (including bike lanes), the same 1-1/2 grind shall be required. Contractor shall place a Petromat fabric or approved equal by the City and overlay from lane stripe to lane stripe, or curb to lane stripe and restripe or replace any delineators removed during the grind.

When sawcutting within a PCC street for trenching or other purposes, the work shall conform to Construction Standard Detail ST-54.

71-3 CONSTRUCTION STAKING

Construction staking shall be provided by the Developer for all surface improvements. Such staking shall provide the station and offset, as well as the cut to the nearest hundredth (0.01) of a

foot. Stakes shall be provided at a minimum of every 50 feet in tangent sections and every 25 feet in curved sections. Monuments shall have straddle ties placed.

Cut sheets for the appropriate phase of work shall be on-site and shall be furnished to the City's Construction Inspector upon request.

The engineer's surveyor shall stake the grades and location for the top and bottom of slope for all curb ramps.

71-4 INSTALLATION

A. Subgrade: Note: The geotechnical engineer shall closely monitor and test subgrade fills to assure the material meets soil R-Values identified in the street design portion of the project soils report. If R-Values differ from the soils report, structural sections shall be adjusted (including plan revisions) by the design engineer and approved by the City Engineer. Where mehrten (mehrten mudflow breccia and /or mehrten conglomerate), lava cap material, cobbles or other stable native subgrade materials are encountered upon commencement of street grading, the respective material may be substituted for processed subgrade, and/or aggregate subbase and /or aggregate base. This is conditional upon confirmation by the geotechnical and design engineers (and approval of the City Engineer) that the existing subgrade/subbase/base section thicknesses and composition will meet or exceed traffic index and R-Value requirements for the respective street. A minimum of 3 inches of Class II aggregate base shall be required on such substituted material on which to pave.

Soils testing for relative compaction shall reference ASTM D1557-78 test methods.

- 1. Subgrade for Sidewalk and Curb Ramps, Curb and Gutter, Driveways and Pavement** - Subgrade shall be processed to 95% relative compaction, minimum 6 inches plus, and shall be tested and certified by a geotechnical engineer, licensed in California. Written certification shall be provided to the City's Construction Inspector prior to the placement of minor concrete (and aggregate base or aggregate subbase for pavements). For meandering sidewalks, Class II aggregate base may be substituted for native subgrade at the Contractor's discretion and shall be processed to 95 % relative compaction.

Additionally, subgrade stability for curb, gutter and sidewalk and pavement shall be load tested by proof rolling with a loaded, minimum 3,000 gallon water truck (or equipment of equivalent weight as approved by the City's Construction Inspector) in the presence of the City's Construction Inspector, the Geotechnical Engineer and the Contractor. The proof roll test shall be repeated following corrective measures. Prior to placement of aggregate base, deflection in the subgrade shall be eliminated. Placement of aggregate base shall not commence without the approval of the City's Construction Inspector.

Where mehrten (mehrten mudflow breccia and/or mehrten conglomerate), lava cap material, cobbles or other native subgrade material not conducive to the operation of the concrete extruding machine are encountered, that material shall be removed to a depth of 6 inches below top of subgrade, and shall be replaced with native or imported soil (acceptable to the City's Construction Inspector and the geotechnical engineer) compacted as specified above.

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Aggregate base is not included in the structural section for monolithic sidewalk and Type 1 or Type 2 curb and gutter. Aggregate base may be used for meandering or otherwise detached sidewalk.

Sidewalk subgrade exposed upon removal of existing sidewalk shall remain intact unless it is determined by the City's Construction Inspector to be unstable. In this event, it shall be processed per the preceding paragraphs.

Deflecting, unstable areas shall be corrected per the recommendation of the Geotechnical Engineer and upon the approval of the City's Construction Inspector prior to placement of aggregate base, or concrete curb, gutter and sidewalk.

ORDER OF WORK: Street subgrade preparation, minor concrete placement and placement of any aggregate base or subbase for pavement within the City right-of-way shall conform to the following sequence of operations, notwithstanding Section B. below. Prior to placement of aggregate base in the City right-of-way, the contractor shall:

- a. Complete underground work outlined in Section B, below.
- b. Process and compact subgrade for curb, gutter, sidewalk and pavement, back of sidewalk to back of sidewalk.
- c. Complete construction of curb, gutter and sidewalk after approval of the subgrade by the City's Construction Inspector.
- d. In addition to Section 90-8 Protecting Concrete, the Contractor shall protect newly placed concrete finish from rainy conditions, graffiti, and weather related damage. In addition, all Contractor wheeled equipment shall not travel within 1 foot of the lip of gutter in the first 24 hours following concrete placement. Contractor's vibratory compaction equipment shall not operate within 72 hours and until all adjacent sidewalk, curb and gutter concrete has reached a minimum of 1400 psi compressive strength.
- e. Complete finish grading of subgrade for pavement, conduct proof rolling test and begin placement of aggregate subbase and/or aggregate base after approval of the finished subgrade by the City's Construction Inspector.

B. Aggregate Base and Subbase: Roadway aggregate base and subbase, lime/cement treated base and sidewalk, curb and gutter shall not be placed until the following items of construction within the City street right-of-way and Public Utility Easement (PUE) are completed:

1. Installation of underground sewer and water systems and testing or televising, and approval of same by the Development Services Construction Inspector.

Completion of testing for the presence of bacteria and the water system tie-in shall not be requirements for the approval of commencement of surface improvement construction. However, the water main tie-in shall be completed prior to paving. The Contractor shall

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schedule operations such that the curb, gutter and sidewalk pour shall not be conducted on the same day as the water tie-in.

2. Installation and mandrelling of the non-rigid underground storm drain pipe and approval of same by the City's Construction Inspector.

Installation of electric, natural gas, telephone, traffic signal (including interconnect) and cable TV, including mandrelling and testing of all conduits, installation of 4x4 markers a minimum of 2 feet high, painted red, buried at the crossing ends (if conduit ends do not extend up from finish grade). This includes all dry utility crossing and longitudinal trenches.

3. Backfill and compaction testing of all trenches related to the above and approval of same by the City's Construction Inspector.

All aggregate base and subbase (AB and ASB) shall be installed per provisions in Sections 25 and 26 of the Caltrans Standard Specifications. AB and ASB shall be compacted to 95% relative compaction. An oil seal is not required on the AB surface. If required by the City's Construction Inspector, AB and ASB shall be tested for compaction and approved by geotechnical engineer, licensed in California. It shall be proof rolled as specified in Section 71-4,A.1 above if requested by the City's Construction Inspector. Written certification of compliance to these requirements shall be provided to the City's Construction Inspector.

Aggregate base shall be installed as a base for pavement where specified on the approved plans including over lime and fly ash or cement treatment is used to stabilize the ASB.

Aggregate base in any thickness determined by the contractor may be used for meandering sidewalk wherever that sidewalk is not connected to the back of curb, or as a base for A-7 driveways outside the sidewalk at the curb returns. All aggregate base shall be compacted to 95%.

Where lone valley gutters are placed within the City pavement as in an alley, the aggregate base section for the gutter shall extend to the same depth as the aggregate base section for the adjacent asphalt concrete pavement.

Prior to paving, deflection in the compacted AB shall be eliminated. Paving shall not commence without the approval of the City's Construction Inspector.

Lime/fly ash or other stabilizers may be permitted for subbase stabilization as recommended by the geotechnical engineer and shall not be used as a substitute for structural section components. The City, following addition and processing of lime/fly ash or cement shall require mandrelling of all non-rigid and shallow rigid underground utilities at the discretion of the Development Services Construction Inspector. All utility systems shall be cleaned as appropriate. In the event a dig up and repair is required following lime/cement treatment of ASB; the entire excavation shall be backfilled with either 2-sack cement slurry to finish subgrade, or dry native material compacted and conforming to the Construction Standards to within two feet of finished subgrade and top of two feet of excavation shall be two-sack cement

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slurry. Subgrade stability for roadway and/or concrete curb, gutter & sidewalk shall be reloaded tested by proof rolling with a loaded 3,000 gallon water truck and approved by the City Construction Inspector prior to the placement of aggregate base.

C. Minor Concrete: All concrete curbs, curb & gutters, sidewalks, curb ramps, driveways, bus stop pads and turnouts shall be installed per provisions in Section 73 of the Caltrans Standard Specifications, and the Construction Standard Details ST-17 through ST-30 and ST-35 and ST-37 including the following provisions:

1. Thickness: All residential and commercial sidewalks shall be either 6” thick, or 4” thick with 4” of compacted aggregate base.

All commercial driveways, round-a-bout centers and bus turnouts shall be 8” thick, with number 4, grade 60 rebar, on 18-inch centers each way. Rebar shall be set on 3 inch concrete dobies/rebar supports at three foot maximum spacing each way. The dobies shall include wire ties. See the Construction Standard Details.

Base for commercial driveways may be processed native subgrade or 3/4–inch aggregate base compacted to 95% relative compaction.

2. Finishing: Concrete shall not be placed or finished in the rain. It shall be the Contractor’s responsibility to schedule construction operations accordingly.

All gutters shall be flow tested with water during the pour to assure proper drainage. Following concrete finishing, no water shall pond in the gutter pan.

All concrete surfaces shall be completed with a medium broom finish unless otherwise specified. A heavy broom finish is not allowed. A concrete finish not conforming to the Caltrans Standard Specifications with regard to blemishes and alignment tolerances shall be cause for rejection of the work.

No stamps advertising construction companies or other private concerns shall be placed in the concrete.

A detectable warning (truncated dome) panel shall be placed at the back of curb line, immediately behind the curb and gutter, centered in the opening to the street (regardless of slope) at every curb ramp (And shall not be sized as shown on the Case C ramp on Caltrans Revised Standard Plan RSP A88A). At minimum, the panel shall consist of a one piece, 4 foot by 3 foot panel but shall be sized according to the path of travel dimension (e.g., 5 foot by 3 foot in the case of an A-7 Driveway (ST-22)). The long dimensions of the panel shall be along the face of curb. The top, flat, dome panel surface (excluding the domes) shall be placed flush with the adjacent top of concrete surface.

Any runoff water standing behind the curb, on the panel, or concrete voids under the panel, shall be cause for replacement of the panel. See Section 71-5 (Materials).

- 3. Tool joints and score marks:** Tool joints and score marks shall be placed through the sidewalk, curb and gutter section at the following intervals for the sidewalk widths indicated. All tool joints shall be a minimum 2 inches. There shall be no expansion joint material used in the City right-of-way.

The purpose of the tool joint is to separate the aggregate and control cracking. During concrete finishing, after placement of a minimum 2 inch deep tool joint, the joint shall be redressed/finished with a 3/8 inch joint tool, per Detail ST-17.

Sidewalk Width (feet)	Deep Tool Spacing (feet)	Score Mark Spacing (feet)
4	12	4
5	10	5
6	12	6
8	12	6
10	10	n/a

A score mark shall be placed at the back of the curb for the total length of all monolithic curb, gutter and sidewalk including through curb ramps and driveways. The above intervals for perpendicular score marks in sidewalk shall also apply through curb ramps and driveways.

All barrier curb and valley gutters shall include deep tool joints at 12 foot intervals maximum.

The use of sawcutting in lieu of deep tool joints is not acceptable.

- 4. Grades:** All sidewalks (including portions through driveways and curb ramps) shall be constructed with a minimum cross grade of 1% and a maximum of 2%. Parallel to the street, the grade of the curb ramp landing shall conform to the longitudinal grade of the street.

The cross-slope of curb ramps shall be 2.0% maximum. At pedestrian street crossing without yield or stop controls and at midblock pedestrian street crossings, the cross slope shall be permitted to equal the street or highway grade. However, the designer should strive to hold the 2.0% cross slope before deciding to match the street or highway grade. In most cases, the 2.0% can be held and a detail would be needed to show the transition and the pavement/sidewalk conformance. To accomplish this, the gutter pan must be warped before additional slope, beyond the 2%, is introduced outside of the curb ramp itself (on the pavement and sidewalk). The cross slope of the curb ramp should also not exceed that of the crosswalk regardless of the roadway profile grade.

For all curb ramps the maximum of 8.33%.

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For the ramp to the lower side of the landing, (where the ramp must be shortened to achieve the minimum 7% grade), 4 feet shall be the minimum length transition allowed.

For meandering sidewalks, the maximum grade in the direction of travel shall be 5% if the street grade allows. If the longitudinal street grade exceeds 5%, the curb side of the meandering sidewalk shall parallel the grade of the back of curb, maintaining a grade of 2% from the edge of sidewalk to the back of curb. For all meandering sidewalks, a minimum cross grade of 2.0% shall be maintained from the edge of sidewalk, across the planter to the back of curb. Where curb ramp landings adjoin the back of curb, the top of curb shall be sloped up from the gutter flow line 1.0% to 2.0% to the back of landing for Type 1 and Type 2, curb and gutter (Detail ST-22).

Gutter slope from lip to flowline shall be as shown on Detail ST-17. The maximum grade shall not be greater than 5%. The minimum shall not be less than 4% for both the Type 1 or 2 curb and gutter.

The preceding slope specification conform to ADA, California Division of the State Architect, and Caltrans Standard Specification requirements. Any finished concrete not conforming to these slope specification shall be removed and replaced by and at the expense of the contractor.

5. **Monolithic sidewalk, curb and gutter:** All adjoining sidewalk, curb and gutter shall be poured monolithically.
6. **Curb and gutter installation in an existing street:** In an existing asphalt concrete street, a minimum width of 24 inches of existing asphalt concrete paving shall be removed outside the proposed gutter lip and the lip poured against a form board.

In an existing PCC street, if the City Inspector determines the pavement edge is flawless the curb and gutter may be poured against the existing pavement. For streets with bike lanes the existing pavement shall be removed to the bike lane strip and the lip poured against a form board. For streets without bike lanes a minimum width of one-half of the exiting joint spacing of existing pavement shall be removed outside the proposed gutter lip and the lip poured against the form board.

The resulting patch on all streets between the gutter lip and the existing pavement shall be 6 inches thick minimum, or the thickness of the existing pavement, whichever is greater. The pavement patch shall be placed within 2 weeks of the conclusion of the concrete curb and gutter pour.

7. **Curb Ramps, General:** See Details ST-22, ST-26, and ST-27. Other ramp configurations in the Caltrans Standard Plans may be used upon the pre-approval of the City Engineer only if site conditions prohibit use of Roseville's standard ramps.

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All grade changes at the back of walk for curb ramps shall be staked by a licensed surveyor, conforming to these Construction Standards.

Specifications for curb ramps in the Construction Standards take precedence over the Caltrans Standard Plans and Specifications. Where there are discrepancies between details shown on the approval plan sheets and the Construction Standards, the plans shall be revised to conform to the Construction Standards unless specifically approved by the City Engineer.

- 8. Epoxy Work:** Epoxy shall be liberally applied to a minimum of 95% of all existing surfaces to be connected. Epoxy shall be two-part and conform to ASTM C 881/ AASHTO M 235, see Section 71-5 (Materials).
- 9. No Sidewalk at Back of Retaining Curb:** At any curb ramp, no pedestrian surface (i.e., concrete, asphalt concrete, paving stones, etc.) adjacent to the back of sidewalk, shall be constructed within 3 feet behind the retaining curb. This area shall be finished with landscaping, cobbles or other non-pedestrian surface only. If the occasion arises wherein the City Engineer determines that placing concrete behind the retaining curb is justified, the top and face of the retaining curb shall be painted yellow.
- 10. Curb, Gutter and Sidewalk Patching:** Patch material shall conform to Section 71-5 (Materials). A professional concrete mason shall apply the patch. The patch shall be flush with the existing concrete and a similar finish shall be maintained. The City's Construction Inspector shall determine if the damage to the concrete warrants patching. Generally, any conspicuous damage shall be patched.
- 11. Dowelling New Concrete to Existing:** When pouring combinations of sidewalk or curb and gutter contiguous to existing, the existing concrete vertical face shall be doweled 3 feet on center with 16 inch long, grade 60, #4 rebar penetrating 4 inches into the existing curb, 4 inches below top of curb. The dowel hole shall be 5/8-inch diameter at a slight angle horizontally. The penetrating portion of the dowel and the entire cleaned vertical surface of the adjoining existing concrete shall be 95% coated with two-part epoxy. All abutting sidewalk shall be doweled mid-section with 2 dowels for 4 through 6 foot wide sidewalk and 3 dowels for wider sidewalk. Abutting curb and gutter ends shall 2 dowels installed, 18 inches apart, centered on the curb and gutter section. See Section 71-5 (Materials) for epoxy.

Where the street side of the meandering sidewalk meets the back of curb at less than a 90 degree angle, the return to the back of curb shall be a minimum 18 inch radius or 18 inch space shall be provided between the front face of sidewalk and the back of curb.

Replaced sections shall be removed back to score marks, expansion joints or deep tool joints; or at the discretion of the City's Construction Inspector.

If the existing edge is damaged during removal, the concrete shall be sawcut again at the City's Construction Inspector's discretion.

- 12. Sidewalk, curb and Gutter Replacement:** Where sidewalk and/or curb and gutter is being replaced, the maximum length of sidewalk that may be replaced non-monolithically (without the attached curb and gutter) is 20 feet. If more than 20 feet is damaged continuous, the total sidewalk, curb and gutter section shall be removed and replaced monolithically. Where sidewalk, curb and gutter or curb ramps and driveways with sidewalk, curb and gutter as portions thereof are replaced, all replacement shall conform to the latest Construction Standards. In the case where concrete sidewalk replacement is necessary where either the brass disc or property line score mark is removed, the developer shall be responsible to re-establishment of the surveyor's permanent marker in kind as identified on the Final Map.
- 13. Median Islands:** All new roadway median infill areas shall have basket weave pattern stamped concrete with brick red #1117 per Detail ST-37.

Existing cobble medians in retrofit areas effected by utility cuts or damage will be replaced per the following:

Cobbles set in 4 inches of pea gravel concrete. The top surface of the concrete shall be flush with the top of curb. Where cobble demolition within a median amounts to 50% of the area or more, all existing cobbles to be removed and replaced with "Ashler Slate" per Detail ST-37, and at the applicant's expense.

Cobbles shall be 4 to 6 inches in size, with 1/3 exposed above the top of curb, per Caltrans Specifications. Base for concrete may be native soil compacted to 95% or Class II, 3/4 inch aggregate base. On existing pavement, the two acceptable alternatives for base are 3/4 inch aggregate base or total depth concrete. The surface of all embedment concrete shall be above the top of curb and graded/finished to drain.

Existing Grey stamped medians in retrofit areas effected by Utility cuts will be replaced per the following: Gray stamped concrete retrofit areas effected as described above shall be replaced in-kind with, 4 inches thick "Ashler Slate" and standard color shall be basalt gray (QC Release Power Colors).

- 14. Damaged Gutter Lip:** Gutter lip damaged during the grading and rocking operation shall be patched or replaced. Any spall extending more than 1 inch into the gutter pan from the vertical face of the gutter lip shall be patched at a minimum. See Section 71-5,G.3 (Materials).
- 15. Concrete and Asphalt Concrete Saw Cutting – Sawcutting of concrete pavements shall conform to Detail ST-54.** Residual from sawcutting shall be removed by vacuum method and disposed of conforming to local environmental and State Stormwater Pollution Prevention Plan requirements. The downstream drain inlet shall be protected. In no case shall the residual be allowed to enter the storm drain system. The above-specified cleanup shall be the responsibility of the contractor.

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16. Concrete Cure: All newly placed concrete shall be cured in accordance with the provisions in Section 90-1.03B(3)(b) of the State Standard Specifications and these Construction Standards. See Section 71-5.I. (Materials) of these Standards for curing compound. Exposed surfaces of all concrete sidewalk, curb and gutter, driveways, but turnouts and curb ramps shall be coated with a pigmented curing compound immediately following surface finishing, prior to the moisture sheen disappearing from the surface. Curing compound shall be applied at a rate of 1 gallon per 150 square feet, or per the manufacturer's recommendations, whichever is greater, unless otherwise specified.

D. Asphalt Concrete Paving: All asphalt concrete (AC) shall be installed per provisions in Section 39 of the Caltrans Standard Specifications, except as amended by Section 71 (Streets), of these Construction and Design Standards.

No paving shall occur until all underground work is completed, tested, and subgrade and/or aggregate base and/or lime and fly ash or cement treated base have been accepted by the City's Construction Inspector.

1. Mix Design: The Contractor shall provide the asphalt concrete mix design to the Director of Development Services at least 10 working days prior to the start of the work on the project for review and approval. The mix design must be approved prior to commencement of work.

The asphalt concrete mix design shall indicate the following:

- a. Complete aggregate grading with the percentage of aggregate passing each sieve size per AASHTO T 27.
- b. Percent air voids for each percentage of asphalt binder used in the mix design determination per AASHTO T 269a.
- c. Stability - Per MS-2 Asphalt Mix Design Methods per Sections 3 & 8. Mix design requires Hamburg Wheel (AASHTO T 324) and Moisture Susceptibility (AASHTO T 283) once per project or every 10K tons.
- d. Maximum theoretical density for each percentage of asphalt binder used in the mix design determination per AASHTO T 209, Method A.
- e. Compacted unit weight for each percentage of asphalt binder used in the mix design determination.
- f. Percent asphalt binder recommended. (Optimum bitumen content, OBC), per AASHTO T 308, Method A.

The actual asphalt cement content may vary up to 0.5% plus/minus from the target optimum bitumen content (OBC). For Job Mix Formula, -0.3 to +0.5%.

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2. Spreading and Compaction Equipment: Per CalTrans Standards 2015 Section 39-2.01C(2) page 466, Paving equipment for spreading must be:

- a. Self-propelled
- b. Mechanical
- c. Equipped with a screed or strike-off assembly that can distribute HMA the full width of a traffic lane
- d. Equipped with a full-width compacting device
- e. Equipped with automatic screed controls and sensing devices that control the thickness, longitudinal grade, and transverse screed slope

Asphalt concrete placed in layers of 0.2-foot and greater in compacted thickness shall be spread, compacted and tested with the equipment and by the methods specified in Section 39 of the Caltrans Standards, and the below “Compacting” requirements of these Construction Standards.:

For asphalt concrete placed in layers of compacted thickness less than 0.2-foot, the layers shall be spread and compacted per the below “Compacting” requirements of these Construction Standards. The field density of compacted asphalt concrete shall be determined by a calibrated nuclear gauge.

Each paver spreading HMA must be followed by 3 rollers:

- a. One vibratory roller specifically designed to compact HMA. The roller must be capable of at least 2,500 vibrations per minute and must be equipped with amplitude and frequency controls. The roller's gross static weight must be at least 7.5 tons.
- b. One oscillating-type pneumatic-tired roller at least 4 feet wide. Pneumatic tires must be of equal size, diameter, type, and ply. The tires must be inflated to 60 psi minimum and maintained so that the air pressure does not vary more than 5 psi.
- c. One steel-tired, 2-axle tandem roller. The roller's gross static weight must be at least 7.5 tons. Each roller must have a separate operator. Rollers must be self-propelled and reversible.

3. Compacting: The entire contents of the Caltrans Standard Specifications, “Compacting” is replaced to read:

(See page 481 in CalTrans 2015 Standards.) Asphalt concrete shall be spread at a temperature of not less than 260 degrees F.

A pass shall be one movement of a roller in either direction. Coverage shall be as many passes as are necessary to cover the entire width being paved. Overlap between passes

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during any coverage, made to ensure compaction without displacement of material, and shall be considered to be part of the coverage being made and not part of a subsequent coverage. Each coverage shall be completed before subsequent coverage is started.

Rolling shall commence at the lower edge and shall progress toward the highest portion, except that when compacting layers which exceed 0.25-foot in compacted thickness, and if directed by the Inspector, rolling shall commence at the center and shall progress outwards.

Rolling shall be performed so that tearing, cracking, shoving, or displacement does not occur. Rolling must leave the completed surface compacted and smooth.

When placing asphalt concrete, large aggregate that migrated to the surface during any handwork shall be returned to the pave box, rather than scattered over the surface of the mat.

Finish rolling or final compaction shall be completed while the temperature of the mixture is at or above 150° F. A vibratory roller may be used as the finish roller provided it is operated with the vibratory unit turned off.

Upon completion of rolling operations, if ordered by the City Construction Inspector, the asphalt concrete shall be cooled by applying water.

Asphalt concrete shall be compacted to not less than 92 percent or more than 96 percent of the theoretical maximum density as determined by AASHTO T 209 Method A and shall be finished to the lines, grades, and cross section shown on the Project Plans.

The City Inspector reserves the right to gather samples for material testing at random for the hot mix asphalt (HMA) material from behind the paving machine in accordance with CTM 125 to determine the maximum theoretical density of the HMA mixture in accordance with AASHTO T 209, Method A. The theoretical maximum density results derived from the samples shall be used to determine the relative density achieved for the same 750 ton lot.

The pavement will be accepted for density on a lot basis. A lot will consist of 750 tons or portions thereof. Cores for determining the density of the compacted pavement will be taken on a lot basis. A minimum of three (3) cores shall be taken per lot. The density of each core shall be determined in accordance with AASHTO T 275. In order for a lot to be accepted for density, all core density results shall be between 92 and 96 percent. Averaging core results is not permitted.

The Contractor shall provide daily laboratory results of ASHTOO T 275 and AASHTO T 209, Method A to the City's Construction Inspector.

In-place pavement density will be determined by comparing the density of cores taken from the compacted pavement to the theoretical maximum density as determined by AASHTO T 209, Method A, and as stated in these City Standard Specifications. Pavement

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cores shall be collected using a 4 to 6 inch diameter core barrel when the pavement has cooled sufficiently to minimize disturbance to the cores at the discretion of the City's Construction Inspector. Cores shall be taken by either the developer's geotechnical engineer, as proposed at the start of construction, or the City's geotechnical consultant. No third party geotechnical engineer vendor hired by a contractor for quality control purposes shall be considered. For major backbone roadway infrastructure projects funded by community facility districts, (CFD funds), the City's quality assurance geotechnical engineering firm's laboratory testing results shall be utilized in determining acceptance.

Finish, compacted pavement height shall be 1/4-inch above and over the gutter lip, except for 6 feet at the curb ramp opening, where it shall be flush with the top surface of the gutter lip. Corrective operations for recently placed pavement more than 1/4-inch above the gutter lip may include reheat, knead and re-compact with pneumatic tired rollers, in order to bring the improvements into compliance.

The horizontal surface of AC paved against an existing AC surface shall be flush with the existing surface.

The completed surfacing shall be thoroughly compacted, smooth and free from ruts, humps, depressions or irregularities. Any ridges, indentations or other objectionable marks left in the surface of the asphalt concrete by blading or other equipment shall be eliminated by rolling or other means approved by the Inspector. The use of any equipment that leaves ridges, indentions or other objectionable marks in the asphalt concrete shall be discontinued, and the Contractor shall furnish acceptable equipment.

4. **Miscellaneous Paving Requirements:** When a straightedge 12 feet long is laid on the finished surface and parallel with the centerline, the surface shall not vary more than 0.01-feet from the lower edge of the straightedge. The transverse slope of the finished surface shall be uniform to a degree such that no depressions greater than 0.02-feet are present when tested with a straightedge 12 feet long laid in a direction transverse to the center line and extending from edge to edge of a 12 foot traffic lane.

If the finished surface of the asphalt concrete does not meet required surface tolerances, as specified above, the Contractor shall, at its own expense, bring pavement surface within tolerance by the following method:

- a. Cold plane asphalt pavement to a minimum depth of 0.15 feet from specified finish surface; (lateral limits shall be from edge of asphalt concrete to edge of asphalt concrete; longitudinal limits shall extend a minimum of 50 feet, starting from the outer edge of tolerance area and extending outward, and as directed by the Inspector). All grindings shall be removed and disposed of in accordance with Caltrans Standard Specifications.
- b. The Contractor shall apply tack coat and place an overlay of asphalt concrete in accordance with the requirements of the City Standard Specifications.

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- c. The area to which asphalt emulsion has been applied shall be closed to public traffic. Care shall be taken to avoid tracking binder material onto existing pavement surfaces beyond the limits of construction.

Pavement within 50 feet of an approach to a bridge structure or approach slab shall conform to the smoothness tolerances specified in Section 51-1.01D(3)(b)(ii), "Surface Smoothness", of the CALTRANS Standard Specifications."

The surface edges that abut the proposed asphalt concrete shall be clean and free of dirt and dust prior to placing a tack coat. Asphalt emulsion shall be used as a tack coat and/or paint binder on new pavement that is to receive a second lift that has been exposed to traffic or other sources of contaminants or on existing pavements that are to receive an asphalt concrete overlay and also along exposed edges of abutting pavement and concrete curbs and gutters. A tack coat may also be required between subsequent layers of asphalt concrete placed by the contractor when ordered by the City's Construction Inspector. Asphalt emulsion shall conform to Section 92, "Asphalt Binders", of the Caltrans Standard Specifications.

Prior to City acceptance of the improvements (Certificate of Completion), and following the 12 foot straightedge test, and any remove and replace areas with new overlay pavement, streets may be flooded to check for standing water. This procedure may be repeated prior to the expiration of the warranty period. This may be accomplished with a water truck or with rainwater. All low areas in the asphalt concrete pavement holding 0.01-foot for longitudinal and 0.02-foot for transverse depressions or more of water shall be marked by the City's Construction Inspector and milled 0.15-foot and replaced with similar material. A second water test may be necessary at the discretion of the inspector.

A micropave surface treatment or Caltrans slurry seal may be required at the City's Construction Inspector's discretion following cold planing as described above if it is determined the paving surface is sufficiently irregular, boney, discolored, or unsealed to warrant it.

The Contractor shall schedule paving operations such that at the end of each work shift, each layer of asphalt concrete is placed on all contiguous lanes and shoulders of a traveled way to be opened to public traffic

At the end of each work shift, the distance between the ends of the layers of asphalt concrete on adjacent lanes shall not be greater than 10 feet nor less than 5 feet. A drop-off of more than 0.15-foot will not be allowed at any time between adjacent lanes open to public traffic.

Additional asphalt concrete shall be placed along the transverse edge at the end of each lane and along the exposed longitudinal edges between adjacent lanes, hand raked, and compacted to form temporary conforms. Kraft paper, or other approved bond breaker, may be placed under the conform tapers to facilitate the removal of the taper when paving operations resume.

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Additional asphalt concrete surfacing material shall be placed along the edge of the surfacing at private drives, hand raked, if necessary, and compacted to form smooth tapered conforms.

Longitudinal joints in successive pavement lifts shall be offset from lift to lift a minimum of 1 foot. The surface pass seam shall be located on the lane line. Where extruded concrete curb is removed for pavement widening, Contractor shall grind 1-1/2" of pavement between the nearest lane line and the existing curb and gutter line (including bike lanes). Following placement of the asphalt concrete base lift within the widening section, and 1-1/2" below the new gutter lip, Contractor to replace Petromat fabric or approved equal in grounded area, place asphalt concrete overlay, and restripe and/or replace any delineators removed during the grind.

Prior to permanent patching in a pavement removal area, fresh cut-back (temporary pavement) in a minimum thickness of 2 inches shall be placed as a driving surface.

Whether the surface material is fog sealed or cutback or slurry, the Contractor shall be tenacious in maintaining the surface in a condition and to a grade comparable to the permanent patch. No other materials are allowed as temporary pavement. Placement of steel plates over fresh slurry may be employed per Section 21-2, I. 5 of these Standards.

The temporary surface shall be flush with the surrounding pavement and shall accommodate a smooth drive across it.

Sand and dirt shall not be allowed to accumulate on the slurry surface and adjacent street. It shall be swept daily if necessary.

Utility boxes in asphalt concrete or off-street paths shall include a 12 inch x 12 inch concrete collar of Type II minor concrete as defined in Section 71-5 and W-16 Details of these standards. The top of the collar shall either be 3 inches below the surrounding pavement or flush with the finished surface with medium broom finish. The area shall be patch-paved with asphalt concrete as with manholes, water valves and monuments in the street way.

If a bucket or tank or diesel fuel is carried on the paver for the purpose of cleaning rakes and shovels, a container of grease sweep or equivalent absorbent material shall also be carried on the paver. All diesel spills shall be promptly cleaned up.

Where multiple and grouped HMA cores have been taken from new HMA roadways for the purpose of either additional testing and/or subsurface investigation, permanent patching shall consist of: "Squaring-Up" area to 6 inches beyond outside edge of cores, mill pavement to 0.15 feet deep, place full depth HMA into core holes, then place paving fabric into milled surface, and repave these Standards. Patching limits shall be at the discretion of the City's Construction Inspector.

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5. EXISTING PAVEMENT

- a. Cut lines made on existing pavement, both longitudinally and transversely, for the placing of new structural section shall be straight and smooth.
- b. Edge grinding (Cold Planning) shall be required where existing asphalt is to be overlaid. The edge grind shall match the depth of the asphalt concrete overlay along the length of the gutter lip and abutting pavement where the asphalt concrete pavement is proposed to conform to the existing pavement.
- c. Existing pavements to be overlaid with asphalt concrete shall include the installation of pavement reinforcing fabric in accordance with CalTrans 2015 Standards section 96-1.02J , Materials of the Caltrans Standard Specifications at the discretion of the City's Construction Inspector.
- d. Existing AC surfaces to remain shall be cut in a straight line parallel to the street centerline, and the exposed edge shall be tracked with SS1H emulsion or equivalent prior to paving. For moratorium defined streets, CRAFCO Pavement Adhesive, "Qwik Seal" or approved equal shall be used per manufacturer recommendations. The exposed base material shall be graded and re-compacted per these Construction Standards prior to paving. Graded and re-compacted areas shall be approved by the City's Construction Inspector prior to paving.
- e. Where crack sealing is required: Cracks less than 1/4 inch in width shall be sealed with SS1-H asphalt emulsion and 30 grit sand. Cracks from 1/4 inch to 3/4 inch shall be sealed with CRAFCO hot melt rubber sealant or approved equal. Excess sealant shall not extend more than 1 inch outside the crack onto the pavement surface or above the finished surface of the street. Where cracks larger than 3/4 inch (or pavement alligator cracks) occur, asphaltic concrete patching may be required at the discretion of the City's Construction Inspector.
- f. Where an excavation in the public right of way is backfilled with 2 sack cement slurry per these Construction Standards, the slurry may be brought to the top of the trench until permanent patching. Where rock-saw utility trenching is necessary in the bottom lift of asphalt concrete and prior to placement of top lift of asphalt concrete, the rock saw trench shall be covered with Glasgrid product (8512, with 100X200 KN tensile strength) or approved equal, at the manufacturers recommendations prior to the placement of top lift of asphalt.
- g. If the width of existing pavement between the gutter lip and excavated patch/pave area is 3 feet or less, all existing pavement between the patch/pave area and the gutter lip shall be removed or milled 0.15 feet in depth, and patched conforming to the adjacent patch/pave area requirements.
- h. Pothole restoration shall be per Detail TB-5 of these Construction Standards. At the discretion of the Development Services Construction Inspector, the top 6 to 8 inches

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of asphalt may be replaced with concrete colored throughout with lamp black. In the event that an excessive number of potholes are in close proximity to one another, the Development Services Construction Inspector may require a grind and overlay to reestablish continuity and ride ability to the roadway surface.

E. Portland Cement Concrete Paving: All Portland Cement Concrete (PCC) pavement shall be installed per provisions in Section 40 of the Caltrans Standard Specifications, except as amended by these Construction and Design Standards.

No paving shall occur until all underground work is completed, tested, and subgrade and/or aggregate base and/or lime and fly ash or cement treated base have been accepted by the City.

Raveling shall be defined as: Progressive disintegration of the concrete pavement surface resulting in dislodged aggregate.

1. Mix Design: The Contractor shall provide a concrete mix design to the City at least 10 working days prior to the start of work on the project for review and approval. The City can provide past examples of mix designs as a template. The mix design must be approved prior to commencement of work.

The PCC pavement mix design shall indicate the following:

- a.** Mix design shall include proportions including all material weights, volumes, density (unit weight), water-cement ratio, and void content. The mix design shall specify an average compressive or flexural strength that meets or exceeds the acceptance criteria for the specified strength.
- b.** For streets and parking lot pavement the minimum allowable average strength of the concrete per ASTM C 78, or California Test Method 523, is 550 psi at 28 days age. The average must be calculated using at least three replicate specimens.
- c.** Rapid set concrete pavement shall be tested per California Test Method 524, and sampled per California Test Method 539. The rapid strength concrete must not have an opening modulus of rupture of less than 400 psi and a 3-day modulus of rupture of not less than 500 psi.
- d.** A correlation curve between flexural strength and compressive strength using the same mix design.
- e.** Certification that the mix design will meet the requirements for strength, schedule, and road opening.

2. Pre-paving Meeting: The Contractor shall schedule a pre-paving meeting prior to the submission of the Quality Management Plan to discuss the Quality Management Plan and methods of performing each item of the work. Attendees to include:

- Contractor's Project superintendent

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- Concrete paving foreman
- Foremen responsible for earthwork and pavement base
- Representatives from subcontractors for adjacent and related work
- Engineer of Record
- City Project Manager
- Testing Laboratory
- Testing staff

3. Quality Control Plan: The Contractor shall provide a Quality Control (QC) plan for concrete paving to the City for review at least 10 working days prior to the start of work on the project for review and approval. If the pavement is at least 2,000 cubic yards the contractor shall supply a Quality Control manager. The QC plan shall address the elements affecting concrete pavement quality. The QC plan shall include action and suspension limits and details of corrective actions to be taken if any process is outside those limits

4. Submittals: Contractor shall also submit the following to the City at least 10 working days prior to start of work on the project for review and approval:

- a. Construction schedule for all PCC related operations.
- b. PCC production procedures, description of batching or batching and mixing plant used, and also PCC delivery methods. List of all equipment proposed for the use to perform the placement of PCC including paving equipment and compaction equipment.

The paver and mixing equipment used must match that listed on the submittal, unless a substitution is made, which meets these specifications and is approved by the Engineer.

- c. Outline of procedures for calibrating the mixing plant, if a mobile plant is used, and monitoring materials during construction shall also be submitted.
- d. Complete paving procedures including, but not limited to, line and grade control, direction of paving operations, paving widths, jointing plan for planned longitudinal and transverse construction joints, and curing method.
 - 1. Spacing between joints shall not exceed 15 feet unless approved by City.
 - 2. Larger horizontal dimension of each slab panel shall not exceed 150 percent of smaller horizontal dimension, unless approved by the City.
 - 3. Contraction joint depth shall be 1/3 pavement thickness.
 - 4. Concrete pavement joints need to mesh with the traffic control plan and final pavement delineation. Joints shall be either coincidental with or bifurcate the final

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traffic lane lines.

- e. Certification of aggregate source.
 - f. Certification of Portland cement and supplementary cementing materials.
 - g. Certification of mixing water for PCC.
 - h. Certification of chemical admixtures for PCC.
 - i. Certification of curing compound.
 - j. Contingency plan, including but not limited to backup paving equipment and backup batching facility.
 - k. Methods of handling, storing, delivering and mixing of materials.
 - l. Operating procedures for corrective action(s) necessary to assure a tight, smooth surface on the PCC pavement, free of tears larger than 1/4" width and 1/4" depth and other surface imperfections, including surface pitting.
- 5. Construction Equipment:** PCC pavement shall be placed with approved paver or other equipment.
- a. Concrete pavement shall be spread, screeded, shaped, slip formed, and/or consolidated by one or more self-propelled machines. These machines shall perform in a manner so that the completed pavement will conform to the required cross section with a minimum amount of handwork. Consolidate the concrete with internal vibrators or other authorized method.
 - b. The equipment shall operate in a manner that will prevent segregation and produce a smooth continuous surface without tearing, pulling or shoving. The spread of the PCC shall be limited to a length that can be placed and finished within the appropriate time limit under the prevailing air temperature, wind, and climatic conditions.
 - c. The equipment shall proceed in a steady, continuous manner. Equipment speed during placement operations shall not exceed the speed necessary to ensure that minimum density requirements are met and surface distress is minimized.
- 6. Weather Limitations:** Do not place PCC pavement when the ambient temperature is below 45°F, or is expected to fall below 32°F within 48 hours of placement, unless otherwise permitted in writing by the City.

Do not place PCC pavement when the ambient temperature is above 95°F unless otherwise permitted in writing by the City.

If you plan to place PCC pavement in the above conditions, submit a plan to the City outlining procedures and methods for curing and weather protection.

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Do not place PCC pavement when the wind, heat or humidity do not allow enough time to place, properly joint, compact, edge, finish and cure before the surface dries.

7. **Condition of the Subgrade/Subbase:** Prior to PCC pavement placement, the surface of the subgrade/subbase shall be clean and free of foreign material, ponded water and frost prior to the placement of the PCC pavement mixture. The subgrade/subbase must be uniformly moist at the time of PCC placement. If sprinkling of water is required to remoisten certain areas, the method of sprinkling shall not be such that it forms mud or pools of free-standing water. Prior to placement of PCC, the subgrade/subbase shall be checked for proper density and soft or yielding areas and these areas shall be corrected per these specifications.
8. **Joints:** The jointing plan shall be consistent with the recommendations and requirements in ACI 325.12R – “Guide for Design of Jointed Concrete Pavements for Streets and Local Roads” in addition to the requirements of these Construction and Design Standards. Prior to placement of the PCC pavement, joint locations shall be marked by the contractor in the field to insure cold joints will align with the jointing plan. Following PCC placement, and before sawcutting the joints, the jointing plan shall be marked on the PCC by the contractor with a temporary marking material to demonstrate to the engineer that the sawcuts are being placed per the plan.

New joints in plastic concrete or recently hardened concrete shall align with joints in older concrete. Joints abutting curbs and other fixed concrete shall be installed within 10 degrees of perpendicular to the older concrete.

If joints are to be sealed they shall be clean and dry before joints are sealed. The Contractor shall not place joint sealant or fillers prior to 72-hours after the joint was sawcut. The Contractor shall remove all loose debris from the joints immediately prior to placing joint sealant or filler.

Expansion Joints shall be placed at intersections of concrete pavement streets.

Formation of Joints

- a. **Cold Vertical Joints:** Any planned or unplanned construction joints that do not qualify as fresh joints shall be considered cold joints and shall be treated as follows:
 1. Longitudinal and Transverse Cold Joints. Cold joints cut after two hours of placement shall be saw-cut to 1/3 depth of the PCC pavement with the rest removed by hand or mechanical equipment. Any modification or substitution of the saw cutting procedure must be demonstrated to and accepted by the Engineer. All excess material from the joint cutting shall be removed.
 2. Prior to placing fresh PCC mixture against a cold vertical joint, the joint shall be thoroughly cleaned of any loose or foreign material. The vertical joint face shall be wetted and in a moist condition immediately prior to placement of the adjacent

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lane.

3. Uneven surfaces or slopes greater than as determined for “Cold Joint Edges” shall be cut vertically for the full depth of the PCC.
 4. The top layer shall be placed so that longitudinal joints in that layer will coincide with joints in the lower layers of the pavement. Transverse joints in the top layer shall coincide with transverse joints in the lower layers of the pavement.
- b. Horizontal Cold Lift Joints:** For horizontal cold joints the surface of the lift shall be kept continuously moist and cleaned of all loose material prior to placement of the subsequent lift. The use of a cement slurry or mortar grout between lifts is required. If supplementary bonding materials are used, they shall be applied immediately prior to placement of the subsequent lift.
 - c. PCC Pavement Joints at Structures:** The joints between PCC pavement and concrete structures shall be treated as isolation vertical joints.
 - d. Control Joints:** Control joints shall be constructed in the PCC pavement to induce cracking at pre-selected locations. Early entry saws shall be utilized as soon as possible behind the rolling operation and set to manufacturer’s recommendations. Saw crack control joints to the interval specified on the plans. The depth of the crack control joints shall be equal to 1/3 of the thickness of PCC pavement. The width of the crack control joints shall be 1/8” maximum. Extend all crack control joints the entire width of paving. When sawing crack control joints, begin as soon as the PCC cuts without excessive raveling along the saw cut and finish before conditions induce uncontrolled cracking, regardless of the time or weather. Control joints shall be sprayed with curing compound immediately.
 - e. Isolation Joints:** Line the perimeter of fixed structures such as manholes, valves, trench drains, and with strips of fiberboard or other approved isolation joint material, as noted in the plan details, prior to paving. Joint filler for isolation joints must be preformed expansion joint filler for concrete (bituminous type) in compliance with ASTM D 994.
 - f. Expansion Joints:** Install expansion joints to the details, dimensions and locations shown on the jointing plan Include width, filler, sealing material, location and/or spacing recommendations in the expansion joint plan, considering thermal effects, regional climatic conditions, PCC coefficient of thermal expansion and expected daily temperature ranges at the time of placement.

9. Curing

- a. General:** Immediately after final rolling, compaction testing, and finishing use an approved curing method outlined below. Water cure or curing compound shall be applied vertically from above the pavement. Application shall not be allowed from the

side of the pavement. During this work the Contractor shall control the work such that it does not result in visible water or curing compound particulate migration. Reapply curing compound to sawcuts and disturbed areas

- b. Curing Compound:** A clear with sacrificial red dye membrane forming curing compound conforming to ASTM C 309 Type ID Class B shall be applied at a rate of 150 sf / gallon no later than one hour after completion of finishing operations on the surface and edges of RCC. This application must ensure a uniform continuous (free of uncured areas) membrane across the entire RCC pavement. If the application rate is found to be insufficient, the Contractor, with approval of the Engineer, can increase the application rate to a level which achieves a void-free surface without ponding. In case the minimum rate of application is specified otherwise by manufacturer's recommendations, the highest application rate shall govern. After the first coat dries, apply a second coat per the above specifications.
- c. Sheet Materials:** Curing paper, plastic and other sheet materials for curing RCC shall conform to ASTM C 171. The coverings shall be held securely in place and weighted to maintain a close contact with the RCC surface throughout the entire curing period. The edges of adjoining sheets shall be overlapped and held in place with sand bags, planking, pressure adhesive tape, or other City-approved method. Sheet material shall be provided and kept readily available to cover pavement less than 12 hours old if rainfall occurs.

10. Concrete Pavement Smoothness

The City accepts pavement surfaces for smoothness based on compliance with the smoothness specifications for the type of pavement surface and roadway classification specified.

For areas that require pavement smoothness determined using a 12-foot straightedge, the pavement surface must not vary from the lower edge of the straightedge by more than:

- 0.01 foot when the straightedge is laid parallel with the centerline
- 0.02 foot when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane
- 0.02 foot when the straightedge is laid within 24 feet of a pavement conform

The Engineer may order you to recalibrate your inertial profiler equipment and reprofile. If your results are inaccurate due to operator error, the Engineer may disqualify your inertial profiler operator.

The smoothness criteria are shown in Table 7-X.

Table 7-X: Concrete Pavement Roughness Acceptance Criteria

Roadway Classification	Localized Roughness	Mean Roughness Index
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	(International Roughness Index)	(per 0.1 mile section)
Alley-way	≤ 190 in/mi	≤ 95 in/mi
Minor Residential	≤ 190 in/mi	≤ 90 in/mi
Primary Residential	≤ 190 in/mi	≤ 90 in/mi
Collector Non-Residential Collector	≤ 160 in/mi	≤ 75 in/mi
Industrial	≤ 190 in/mi	≤ 90 in/mi
Minor Arterial	≤ 160 in/mi	≤ 75 in/mi
Major Arterial	≤ 160 in/mi	≤ 75 in/mi

11. Additional PCC Paving Requirements

- a. Lift Thickness:** Place PCC in lifts between 4 inches and 9 inches thick. Multiple lifts are not allowed for pavements less than 9 inches thick.
- b. Segregation:** If segregation occurs in the PCC during paving, operations shall cease until the cause is determined and corrected.
- c. Placement:** PCC placement shall be done in a pattern so that the curing water from the previous placements will not pose a runoff problem on the fresh RCC surface or on the subbase layer.
- d. Restoration After Quality Assurance Testing:** The Contractor shall fill the core holes with Portland cement concrete as directed by the Engineer. Concrete shall meet the requirements of Section 25, “Portland Cement Concrete Pavement” of the Standard Construction Specifications. Core holes are to be filled to be flush with surrounding pavement surface.

Thickness requirement shall occur after the required, if any, diamond grinding of the PCC pavement.

Removal of temporary traffic stripes shall not result in difference in pavement surface difference. If difference is visible to City Inspector, the Contractor shall treat the surface to remove the difference.

F. Roller Compacted Concrete Paving: All Roller Compacted Concrete (RCC) pavement shall be installed per provisions for PCC paving in these Construction Standards and in Section 40 of the Caltrans Standard Specifications, except as amended by these Construction and Design Standards. Attention is directed to ACI 327R-14 – “Guide to Roller Compacted Concrete Pavements” for recommendations and best practices for RCC.

- 1.** Proposed mix design(s) shall meet the following minimum strength requirements based on test results of cylinders prepared according to ASTM C1435.

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RCC shall have minimum compressive strength of 4,000 psi at 28-days or 5,000 psi at 42-days. In addition, the RCC shall have a minimum compressive strength of 3,000 psi at 3-days.

Consistency and formability of RCC shall be adequate to the methods of its production, delivery, placement and consolidation. The objective consists of proportioning RCC that contains sufficient volume of paste to coat the aggregates and fill voids between them, is able to produce the required strength and durability, constructs roads that can be open to traffic within 3 days or sooner should the RCC reach the required strength before 3 days, and makes it easy to achieve the maximum density. Contractor submits to the Engineer along with the statement of the proposed mix design data justifying the selected consistency and formability of the mix and method of its control.

2. An independent testing laboratory shall proportion RCC to meet the specified requirements for strength and Contractors requirements for consistency and formability. The laboratory shall demonstrate its compliance with the requirements of ASTM C1077. The mix design backup information shall show the moisture-density curve with associated maximum dry density, wet density and optimum moisture content, details of cementitious materials, 3-day, 7-day and 28-day, or 42-day compressive strengths, including strength gain curve for the proposed mix. The mix design shall identify the quantity and gradation of aggregates, the optimum moisture content, and the amount of Portland cement, other cementitious material(s) and the total cementitious materials required per cubic yard of the concrete. The mix design shall specify the proportions of each material (aggregate, cement, water, and admixtures) in the mix in terms of pounds per cubic yard based on saturated surface dry weights. Any changes to the mix design shall be approved by the Engineer. Should a change in material source be proposed, the Engineer must approve a new mix design.
3. Proportioning of RCC shall be performed in general compliance and in the sequence recommended by ACI 327R-16, Chapter 6 “Mixture Proportioning.”
4. **Batching, Mixing and, Transportation of RCC:**

The City shall approve the mixing plant before the Contractor begins producing RCC. The mixing plant shall follow ACI 327R-14.

The plant shall be capable of producing an RCC mixture in the proportions defined by the final approved mix design and within the specified tolerances. The capacity of the plant shall be sufficient to produce a uniform mixture at a rate compatible with the placement equipment. The minimum homogeneous production rate of any acceptable plant shall be 300 tons per hour. For batch mixers, the volume of RCC material in the mixing chamber shall not be more than the rated capacity for dry concrete mixtures. Multiple plants shall not be used to supply RCC material to the paver. The Engineer can halt operations if the plant is unable to produce the RCC mixture sufficiently in quality or quantity, until a plant meeting all requirements is obtained.

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A pugmill plant is required, it shall be a central plant with a twin shaft pugmill mixer, capable of batch or continuous mixing, equipped with synchronized metering devices and feeders to maintain the correct proportions of aggregate, cement, mineral admixture, and water.

Other types of batching and mixing equipment and configurations other than twin shaft pugmill mixers may not be used. This includes but is not limited to dry batch plants, central mix tilt drum plants, ready mix truck mixers, volumetric concrete trucks and trailers.

The mixing time shall be pre-established by uniformity studies conducted, as provided in ACI 327R-14, Section 8.2 “Roller-compacted concrete mixing plants.”

Locate the mixing plant within 30 minutes hauling time from the construction site. The supplier may request a longer hauling time not exceeding 60 minutes, provided the documentation is submitted evidencing that properties of fresh RCC are suitable and allow for convenient and proper placement and consolidation.

For RCC produced with a mobile pugmill, prior to commencement of RCC production, the Contractor shall carry out a complete and comprehensive calibration of the plant in accordance with the manufacturer's recommended practice. The strength requirements per these specifications or as directed by the Engineer. The new concrete shall be doweled into the existing RCC layer using dowel bars. Please refer to Caltrans Standard Plan P10.

5. Surface Requirements

- a. **Surface Texture:** The final surface texture after rolling and curing shall be smooth and uniform over the entire area of pavement and will reasonably match the surface condition of the test strip. The surface area shall be free of rips, bird baths, areas of loose aggregate, surface pitting, voids or indentations, pockmarks, surface tears greater than 1/4” depth and 1/4” width, check cracking, segregation or rock pockets, pumped areas, aggregate drag marks, and areas where fines have been washed away during the curing process.
- b. **Defective area Correction for Surface Texture:** Correct surface texture deficiencies using an approved grinding device, or removal and replacement.
- c. Areas with excessive smoothness and texture issues, as determined by the City when compared to the approved test section, shall be removed and replaced from joint to joint.

6. Density Requirements

- a. **In-place Wet Mat Density Determination.** Determine the In-place Wet Mat Density on pavement that is at least 24 inches from any joint in accordance with ASTM C1040 Direct Transmission mode at 75% of total RCC pavement depth for each lot of RCC pavement per Table 7-X. For pavement placement units consisting of less than one lot of RCC pavement, include the pavement with the previous or next placement unit.

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- b.** In-place Wet Joint Density Determination. Determine the In-place Wet Joint Density on joints at distance 12 inches or greater for free edge and 6 inches or greater for a confined edge accordance with ASTM C1040 Direct Transmission mode for each lot of RCC pavement per Table 7-X. For pavement placement units consisting of less than one lot of RCC pavement, include the pavement with the previous or next placement unit.
- c.** Defective Area Correction for Density. For In-place Wet Mat Density and In-place Wet Joint Density, full payment will be made for pavement based on the acceptance criteria in Table 7-X. Pavement lots that have density that is less than the required density are subject to further evaluation. Take an additional test within a 5 to 8 foot radius, of the original test (within the same placement unit). If this test is below the acceptance criteria in Table 7-X, additional roller passes shall be made across the full lane width between the last testing location that produced an acceptable reading and the paver. If the additional roller passes does not correct the problem, or causes the density to decrease, the paving operation shall be discontinued until corrections can be made to assure that the specified density can be achieved.

7. Opening to Traffic

Traffic may be allowed on the concrete pavement once the concrete has attained 3,500 psi compressive strength. The Contractor may request early traffic opening for residential light-duty vehicles when the concrete has attained a compressive strength of 2,500 psi with approval by the City. This early opening must not damage the concrete pavement.

8. Pavement Test Section

- a.** Construct a 150-foot long test section prior to starting construction. Construct the test section using the proposed mixture design, the staff that will be completing the work, and the materials and equipment that are listed in the pavement construction plan and approved by the Engineer. If the pavement placement requires more than one pass of the paver, construct the test section a minimum of two paver widths wide. If the pavement placement requires more than one lift, construct the test section to the required number of lifts. If the pavement placement requires more than one day of paving or longitudinal cold joints, construct the test section over two days and begin paving from a longitudinal cold joint on the second day. Place the test section in a location approved by the City. The test section may be incorporated into the final project pending acceptance by the City.

The City shall evaluate the following criteria from the test section:

- Adequacy of the production method and equipment to meet productivity requirements and produce uniform PCC pavement.
- Maximum density directly behind the paver prior to compaction.
- Suitability of the proposed lift thickness.

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- Sequence of primary/secondary roller passes (with and without vibration).
 - Maximum density following roller compaction.
 - Texture and surface finish acceptability.
 - Integrity of both fresh and cold joints (vertical and horizontal).
 - Compressive strength of PCC based on molded cylinders and extracted cores tested at 3-days, 7-days, and 28-days.
 - Procedures for troweling and finishing PCC surface to meet specification
 - Process for applying curing compound at appropriate rate and coverage
 - Process for installing saw cuts in pavement
- b.** Construction (Cold) Joint Edges. The Contractor shall establish the maximum angle for edges to be used in joint faces of construction (cold) joints.
- c.** If the test area does not meet acceptance requirements, the Contractor shall remove and reconstruct a new test section with corrected procedures. The contractor will be required to provide new test sections, until an acceptable, reproducible test section is achieved.

9. Joints

Formation of Joints

- a. Fresh Vertical Joints:** Fresh longitudinal joints will only be allowed under special circumstances under the approval of the Engineer. A vertical joint shall be considered a fresh joint when an adjacent RCC lane is placed within 30 minutes of the batch time of the previous lane. This time may be reduced depending on ambient conditions, as well additional precautions may be necessary to avoid excessive moisture loss at the joint such as the use of evaporation retarders, fogging, and curing mats.
1. Fresh longitudinal joints shall be constructed prior to placement of an adjacent lane by leaving the outer 24 inches of the freshly placed lane uncompacted during rolling. Then both edges of the two lanes shall be rolled together within the allowable time.
 2. Adjacent lanes shall be placed such that the new lane abuts tightly against the incomplete edge of the prior lane.
 3. The joint formed by both lanes shall be compacted by centering the roller drum over the joint and compacting both edges simultaneously.

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4. Extra passes of the roller may be required at the joint to achieve the required density.

b. Cold Vertical Joints: Any planned or unplanned construction joints that do not qualify as fresh joints shall be considered cold joints and shall be treated as follows:

1. Longitudinal and Transverse Cold Joints: Formed joints that do not meet the minimum density requirements and all unformed joints shall be cut vertically for the full depth or produced using an edging shoe. The vertical cut shall be at least 6 inches from the exposed edge and located on a joint identified on the jointing plan. Do not perform this operation any sooner than 2 hours after final compaction. Demonstrate to the Engineer that saw cutting will not cause significant edge raveling and remove all slurry and excess material from the cutting operation.

If the Contractor can demonstrate that he can construct a cold vertical joint that can meet the minimum joint density requirements using an “edge shoe,” then the use of the edge shoe in lieu of cutting a cold vertical joint is allowed. The edge shoe should be as close to vertical as possible with the maximum allowable positive edge angle being of 10 degrees from vertical.

c. Fresh Horizontal Joints. For multi-layer construction, a horizontal joint shall be considered a fresh joint when a subsequent PCC lift is placed within 30 minutes of the batch time of the previous lift. This time may be adjusted at the discretion of the City depending on use of retarders or ambient weather conditions. Fresh joints do not require special treatment other than cleaning the surface of all loose material and moistening the surface prior to placement of the subsequent lift.

10. Additional RCC Paving Requirements: Adjacent Lane Placement. All longitudinal joints must be considered a cold joint and shall be prepared in accordance with “Cold Vertical Joints” section found elsewhere in these specifications. Fresh joints will only be allowed under special circumstances at the Engineer's discretion. In that case, the adjacent paving lane shall be placed within 30 minutes and additional precautions may be necessary to avoid excessive moisture loss at the joint such as the use of set retarding admixtures, water misting, and blankets.

G. Groove and Grind Pavement: All grinding of PCC pavements shall be completed in compliance with the provisions in Section 42 of the Caltrans Standard Specifications, except as amended by these Construction and Design Standards.

Prior to diamond grinding, the pavement shall be profiled to ensure the smoothness requirements have been met. The profilograph created shall highlight areas of localized roughness. All grinding to bring the pavement into compliance with the smoothness requirements shall be completed prior to the finish diamond grinding as shown on the plans.

Holidays are areas of unintentional gaps in the grind pattern. All grinding shall result in a consistent surface finishing with no holidays in the grind pattern.

The ground surface will be tested with a 12-foot $\pm 2\text{-}1/2$ inches long straightedge laid on the pavement parallel with the centerline with its midpoint at the joint or crack. The surface shall not vary by more than 0.01-foot from the lower edge of the straightedge.

Cross-slope uniformity and positive drainage shall be maintained across the entire traveled way and shoulder. The cross-slope shall be uniform so that when tested with a 12-foot $\pm 2\text{-}1/2$ inches long straightedge placed perpendicular to the centerline, the ground pavement surface shall not vary more than $1/4$ inch from the lower edge of the straightedge.

After grinding has been completed, the pavement surface shall be profiled to verify smoothness requirements have been met. Two profiles shall be obtained in each lane approximately 3 feet from the lane lines. The average profile index shall be determined by averaging the two profiles in each lane. Additional grinding shall be performed, where necessary, to bring the ground pavement surface within the Profile Index requirements specified in Section 40-1.03, "Quality Control and Assurance," of the Standard Specifications.

H. Sound and Retaining Walls: Construction of sound and retaining walls shall conform to the approved plans. Either the Developer's geotechnical engineer or the City Construction Inspector shall inspect all sound and retaining walls shown on the approved subdivision grading or improvement plans. Inspection coverage and observation responsibility preference shall be determined at the preconstruction meeting and determined by the Developer. An anti-graffiti coating per Section 71-5 (Materials) and per the manufacturer's recommendations shall be applied to the City side of all sound and retaining walls bounding the City right-of-way or to the side/surface of sound or retaining walls facing public-owned wetlands, open spaces, or parks, at the discretion of the City's Construction Inspector.

The City's Construction Inspector shall be furnished a letter from the applying contractor certifying that the coating has been applied per the Manufacturer's recommendations, prior to the Certificate of Completion.

The top course of loose block retaining wall such as "Keystone" type shall be epoxied on. The adhesive shall conform to Section 71-5 (Materials) below.

I. Survey Monuments: All survey monuments shall be installed per Detail ST-36.

Survey monument caps shall be peened and stamped and rebar shall be set at the back of lot prior to the Certificate of Completion.

All rear lot property corners shall be marked with a $1/2$ " rebar, 12" long, and the top flush with finish grade. All lot corners at the street shall be marked with a 1" brass marker wet set or drilled and epoxied into the back of sidewalk 6" from edge, at the back of the City sidewalk or (absent of sidewalk) back of curb, whichever applies, or as indicated on the recorded parcel or final map.

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- J. Street Barricades:** All street and sidewalk barricades shall conform to Construction Standard Details ST-31, ST-32, ST-33, and ST-34, respectively. Sidewalk barricades are required at the termination of all new sidewalk improvements.
- K. Pavement Removal:** Upon demolition of concrete and asphalt concrete pavement, rubble shall be immediately removed or hauled from, and not piled in the City right-of-way. Disposal of such materials shall conform to all local ordinances and regulations of the City of Roseville and the County of Placer relation to land grading, flood plains, drainage facilities and disposal of surplus materials.
- L. Utility Boxes:** Boxes for dry utilities shall not be placed in roadway pavement, the gutter pan, in driveways or in the lower half of the ramped portion of curb ramps. Utility boxes may be placed in City sidewalk only upon the approval of the City's Construction Inspector.
- M. Slurry Seal Follow-Up:** (For surfacing over asphalt concrete pavement) Upon completion of any slurry seal, all loose, residual material shall be swept up and removed as soon as the slurried area is adequately cured to do so. The surface shall be maintained in a clean condition until such a time as raveling has stopped.
- N. Detector Loop Related Paving:** The minimum total thickness of paving within the area of detector loops is 5". The first lift shall be a minimum 3", and the second lift (covering the loops) shall be a minimum 2".

71-5 MATERIALS

- A. Aggregate Base and Subbase:** All aggregate base and subbase (AB and ASB) materials shall be Class II as specified on the approved improvement plans and shall conform to provisions in Section 26 of the Caltrans Standard Specifications.

Recycled asphalt concrete material may be used as AB or ASB provided the Contractor supplies the City written documentation and certification that the material meets the State's Class II specifications prior to placement.

- B. Minor Concrete:** All Concrete curbs, gutters, driveways, island paving, sidewalks, curb ramps, driveways, island and colored concrete, shall be constructed of minor concrete conforming to the provisions in Section 73-1.02A "Concrete Curbs and Sidewalks" of the Caltrans Standard Specifications. The cementitious material content of concrete must be a least 463 lb. /cu yd. for constructing minor concrete as listed above. The aggregate size may range from 3/8" to 1". However, if 3/8" maximum size aggregate is used, cementitious material content must be a least 505 lb. /cu yd.

All other minor concrete for extruded or slip-form curb construction, retaining wall footings, outfall structures and headwalls, utility box collars, rock wheel backfill, trash enclosure slabs and approaches, and miscellaneous footings, shall be constructed of minor concrete conforming to the provisions in Section 90-2 "Minor Concrete", of the Caltrans Standard Specifications . Cementitious material content must be a least 505 lb. /cu yd.

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For stamped median concrete color, the standard color shall be Davis Style Tile Red #1117, or Scofield Systems, Chromix C-32 Quarry Red, or as approved equal. Apply 60 pounds per 80 square feet in two hand broadcast applications. Contractor may elect to incorporate approved color into concrete mix at 30 pounds of color (integrated into the mix), per cubic yard.

- C. Asphalt Concrete:** Shall comply with the provisions of Section 39 of the Caltrans Standard Specifications and as modified herewith. The requirements provided within these provisions shall supersede State Specifications where conflicts or other disparities exist.

Asphalt binder shall be performance grade 64-10 or 64-16 paving asphalt conforming to Section 92, "Asphalt Binders," of the Caltrans Standard Specifications, unless otherwise specified.

If approved by the City Engineer, asphalt concrete for alley's residential and collector roadways shall be Type A, 1/2" Maximum Medium Gradation, conforming to the requirements of Section 39-202A "Type A Hot Mix Asphalt" of the Caltrans Standard Specifications.

Reclaimed Asphalt Pavement (RAP) up to 25% of aggregate blend may be substituted as part of the virgin aggregate for hot mixed asphalt and shall meet the State's quality specifications. RAP not permitted in OGFC or RHMA-G.

For RAP substitution of 15% or less, the grade of the virgin binder must be the specified grade of the asphalt binder for HMA. For RAP substitution greater than 15% and not exceeding 25%, the grade of the virgin binder must be modified to the specified performance grade 58-22.

For RAP substitution greater than 15% of the aggregate blend, fractionate RAP stockpiles into 2 sizes, a coarse fraction RAP retained on 3/8-inch sieve and a fine fraction RAP passing 3/8-inch sieve. For RAP substitution of 15% of the aggregate blend or less, fractionation is not required. Contractor shall comply with provisions of Section 39 of the Caltrans Standard Specifications for all RAP handling requirements.

RHMA -G (Gap graded RHMA) shall be used for the 2" top lift structural section within Arterial roadways. For rubberized hot mix asphalt, reference the 2015 Caltrans Standard Specifications (Section 39-2.03). A PG64-16 oil shall be used as recommended within the Highway Design Manual Table 632.1 based on location in California.

- D. Asphalt concrete shall be hot plant mixed and shall be furnished from the plant at a temperature not to exceed 325 degrees F.**
Portland Cement Concrete Pavement: Shall comply with the provisions of Section 40 of the Caltrans Standard Specifications and as modified herewith. The requirements provided within these provisions shall supersede State Specifications where conflicts or other disparities exist.

- 1. Cementitious Materials:** The pavement shall contain at least 450 pounds of total cementitious material per cubic yard of concrete. The actual content of cementitious material shall be established by preconstruction mix design studies. Cement shall be

Portland cement Type II, Type III, or V conforming to ASTM C150 or portland cement Type IP, IL, or IS conforming to ASTM C595.

PCC pavement may contain supplementary cementitious materials as shown in Table 7-Y.

Table 7-Y: Allowable Supplementary Cementitious Materials:

Supplementary Cementitious Material	Test Requirement	Allowable Percentage Range
Fly Ash	ASTM C618 / AASHTO M 295, Class F	15% - 35%. (ACI 232.2R)
Ground Granulated Blast-Furnace Slag (GGBFS)	ASTM C989 / AASHTO M 302, Grade 100 or 120	25% - 70%. (ACI 233R)
Metakaolin	AASHTO M 295, Class N	5% - 15%. (ACI 232.1R)
Raw or calcined natural pozzolans	AASHTO M 295, Class N	5% - 15%. (ACI 232.1R)
Silica Fume	ASTM C1240 / AASHTO M 307	5% - 12%. (ACI 234R)

- 2. Aggregates for Roller Compacted Concrete Pavement:** The quality of aggregates shall conform to ASTM C33. The aggregate portion passing the No. 40 sieve shall have a liquid limit of not more than 20, and the plasticity index of the aggregate shall not exceed five. Fines shall be non-plastic. Fines shall not be manmade sand. Coarse aggregates must be washed, prior to delivery to the job site, to remove silt and fines. Aggregates may be obtained from a single source or borrow pit, however the coarse and fine aggregate may not be blended prior to entering mixing plant. The combined aggregate shall be well-graded without gaps and conform to the following gradations as per Table 7-Z.

Table 7-Z: Sieve Size Percent passing by weight

Sieve Size	Lower & Upper Specification Limits 1/2 in Maximum	Lower & Upper Specification Limits 3/4 in Maximum
1"		100
3/4"	100	93-100
1/2"	81-100	70-95
3/8"	71-91	60-85
No. 4	49-70	40-60
No. 8	33-54	30-50
No. 16	24-40	20-40
No. 30	15-30	15-30
No. 50	10-25	10-25
No. 100	2-16	2-16
No. 200	0-8	0-8

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Aggregates shall be innocuous, not causing deleterious expansion of RCC. Test individual concrete aggregates in accordance with ASTM C1260. Maximum expansion after 14 days of exposure to the solution of NaOH shall not exceed 0.10%.

If any of individual concrete aggregates do not meet the limit specified in the above paragraph, the aggregates can be tested with the production cementing material (Portland cement and supplementary cementing material proportioned according to the mix design) per ASTM C1567. The Contractor is allowed to test either individual aggregates or their blended proportioned according to the mix design. In either case the expansion in 14 days of exposure to the solution of NaOH shall not exceed 0.10%

- 3. Chemical Admixtures for Roller Compacted Concrete:** Chemical admixtures shall conform to ASTM C 494. The contractor is allowed to use proprietary chemical admixtures improving the formability of RCC, provided the record of the previous experience certifying the beneficial use of admixtures is included with the submittal.

For moisture control in RCC, one of the following admixtures, or an approved equal, is allowed, but not required by the City. Please refer to the manufacturer's recommendations for dosage rates.

- ACEiT Plus Manufactured by ACEiT Industries
- V-MAR VSC500 Manufactured by Grace Concrete Products

For troweling, the following admixture, or approved equal, is allowed by the City. Please refer to the manufacture's recommendations for dosage rates.

- ACEiT Blue Manufactured by ACEiT Industries

- 4. Curing Compound:** Concrete curing compounds shall conform to ASTM C 309 Type ID.
- 5. Joint Sealants and Fillers:** Joint filler materials for isolation joints shall be pre-formed expansion joint filler for concrete (bituminous type) in compliance with ASTM D994.
- 6. Water:** Water used in the concrete shall conform to the requirements of ASTM C1602. It shall be clean, clear and free of acids, salts, alkalis or organic materials that may be detrimental to the quality of the concrete. Non-potable water may be considered as a source for part or all of the water, providing the mix design indicates proof that the use of such water will not have any deleterious effect on the strength and durability properties of the concrete.
- 7. Forms:** Forms shall be of steel or wood capable of resisting deformation during edge compaction and to maintain grade. Wood forms shall have a minimum nominal thickness of 2-inches. Forms shall be clean and free of warp, debris, rust, and hardened concrete. Forms shall be treated with a bond breaker prior to use.

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- E. Lime/Fly Ash or Cement Treated Subbase:** On a case-by-case basis, lime/fly ash or cement treated subbase may be an acceptable substitute for placement of compacted aggregate base material permitted use in subbase stabilization only. Prior to plan approval, the Developer shall submit to the City Engineer for review and approval, a proposal for lime/fly ash or cement treatment sections and compaction procedures, accompanied by recommendations from a California licensed, geotechnical engineer. In no case shall asphalt concrete be placed directly on lime/fly or cement treated bases or shall the recommended structural section be less than the City standard structural section from Table 7-2 in Section 7 “Streets”.
- F. Truncated Domes:** Truncated dome panels shall be of vitrified polymer composite construction, embedded type, or (surface applied for retrofit applications) manufactured by Armor Tile Tactile Systems, Buffalo, New York, ADA Solutions, N. Billerica, MA, or approved equal. The dimensions and interval of the truncated domes within the panel shall conform to Caltrans Standard Plan RNSP A88A and Division of the State Architect Accessibility Reference Manual, Figure No. 31-23A. The orientation of the dome pattern for all panels shall be parallel with the panel edges.
- G. Graffiti Coating:** Blok Guard[®] (Prosoco), Acryli-Master (Graffiti Master), GCP 1000 (Genesis Coatings Inc.), Prmakote, by Visual Pollution Technologies or approved equal, non-sacrificial type only.
- H. Epoxies, Patching Material:** Following are products specified for the indicated applications.
- 1. Bonding extruded curb to asphalt concrete pavement; bonding concrete to existing during pour; bonding the top course of loose block, sound/retaining wall:** Rezi-Weld 1000, (Supplier: Spec-West), Sealtight Rezi-Weld ER-43 Type I, (Supplier: Spec-West) or Pro-Poxy 200 (available at whitecap) should be added as it meets C881/AASHTO M-235 for old to new concrete.
 - 2. Anchor Bolts:** Seal Tight Rezi-Weld Gel Paste Unitized Cartridge Epoxy (Supplier: Spec West), Covert Operations CIA Gel 7000 (Supplier: White Cap) or Rebar SETXP (Supplier: White Cap, Home Depot), SpecPoxy 2000 by SpecChem or approved equal. Apply appropriate epoxy product to concrete and/or asphalt as recommended by manufacturer.
 - 3. Patching:** Patchcrete (Supplier: Spec-West), Emaco R350CI Repair Mortar (Supplier: White Cap), Ardex CP (Supplier: Spec-West) or approved equal.
- I. Reinforcement Bar:** Rebar shall be grade 60 steel, deformed type. Smooth bar shall not be allowed. All rebar shall be #4 unless otherwise specified on the plans.
- J. Concrete Curing Compound:** Curing compound shall conform to ASTM C-309. Type 1-D and Class B, resin base. Approved products include Burke Aqua Resin Cure (with dye), W.R. Meadows 1100- Clear Series (with dye) or approved equal.
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K. Slurry Seal: Slurry seal shall conform to Caltrans Standard Specifications, Section 37-2, “Seal Coats” and Type II Aggregate Type. A design mix shall be submitted to the Development Section for approval prior to commencing work.

L. Slurry Cement Backfill: The backfill must contain at least 188 pounds of cement per cubic yard and enough water to produce a fluid workable mix that flows and can be pumped without segregation during placement.

When authorized by the City Construction Inspector, controlled low-strength material (CLSM), per Caltrans Standard Specifications Section 19-3.02G or dry mix “popcorn” backfill may be used with pre-approval. 94 pounds of cement content to the CLSM cement backfill shall be required. A design mix shall be submitted to the City Construction Inspector for approval prior to commencing work. CLSM requires mechanical equipment effort to achieve proper consolidation. Whenever CLSM is placed within the travelled way or covered by paving or embankment materials, the CLSM must achieve a maximum indentation diameter of 3 inches when tested under ASTM D6024 before covering and opening to traffic.

M. Clean Crushed Rock: Shall consists of gravel, crushed gravel, crushed rock, reclaimed aggregate, or a combination of these. All gravel characteristics shall comply with CTM 211 and 227. The percentage composition by weight of clean crushed rock shall conform to the following gradations for the Type specified.

	Type A	Type B	Type C
	3/8” Crushed (Pea Gravel)	1/2” Crushed	3/4” Crushed
1-1/2”	-	-	-
3/4”	-	100	90-100
1/2”	100	90-100	30-60
3/8”	50-85	20-60	0-20
No. 4	20-60	0-15	0-5
No. 200	0-2	0-2	0-2