

existing grades, grading slopes as shown on the plans, removal and/or relocation/resetting of all private facilities/improvements from the public right-of-way, removal of concrete blocks, removal of existing retaining wall and required excavation to construct new retaining wall, and repair or relocate existing irrigation system, shall be considered as included in the contract price paid per lump sum for Clearing and Grubbing and no additional compensation will be allowed therefor.

## 17 WATERING

### **Add to Section 17-2.01 General:**

Develop water supply shall conform to the provisions of Section 17 of the Standard Specifications and these Special Provisions.

Attention is directed to the requirements of Section 14-9.03, "Dust Control," of the Standard Specifications and Section 32, "Dust Abatement," in the General Conditions.

#### Payment:

Full compensation for developing water supply and furnishing watering equipment shall be considered as included in the lump sum price paid for develop water supply and no additional compensation will be allowed therefor.

## 19 EARTHWORK

### **Add to Section 19-2.01 General:**

#### **Roadway Excavation**

Roadway Excavation shall conform to the provisions of Section 19 "Earthwork" of the Standard Specifications and these Special Provisions.

At road connections and at limits of asphalt paving, existing pavement shall be header cut as directed by the Engineer. Full compensation for furnishing all labor, tools and doing all the work necessary including grinding, and sawcutting shall be considered as included in the contract prices paid per ton for the various asphalt concrete items and no additional compensation will be allowed therefor.

Existing pavement including any base material shall be cut back to neat lines and removed as shown on the plans or as directed by the Engineer. Excess material will become the property of the Contractor and will be disposed of as provided in Section 00-1.12, Disposal Of Excess Excavation Or Materials, of these Special Provisions.

Pavement and base material removal will be considered as roadway excavation for payment purposes.

#### **Relative Compaction**

Relative compaction shall conform to the provisions of Section 19-5.03B, "Relative Compaction (95 Percent)" of the Standard Specifications, these Special Provisions and/or as directed by the Engineer.

Whenever relative compaction is specified to be determined by Test Method No. Calif. 216, the in place density may be determined by Test Method No. Calif. 231. The in place density required by Test Method No. Calif. 312 may be determined by Test Method No. 231. The wet weight or dry weight basis and English Units of Measurement may be used at the option of the Materials Engineer.

Payment:

The unit price paid per cubic yard for Roadway Excavation shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all work involved including hauling, excavation and compaction, sawcutting as shown on the plans, removal of existing pavement and base, as directed by the Engineer and no additional compensation will be allowed therefor.

## DIVISION V SURFACINGS AND PAVEMENTS

AA

### 39 HOT MIX ASPHALT

Replace section 39-1 General with the following

#### 39-1.01 Hot Mix Asphalt

This work includes producing and placing hot mix asphalt (HMA) **Type A**. Comply with the specifications for HMA under Section 39, "Hot Mix Asphalt" of the Standard Specifications and these Special Provisions. All other requirements of Section 39 shall apply unless otherwise modified or replaced in these Special Provisions.

The type of hot mix asphalt will be shown on the plans or specified in the Special Provisions.

#### 39-1.01(1a) Material

#### 39-1.01(1a.1) Asphalts

Asphalt shall conform to the provisions in this Section, "Asphalts." Section 92, "Asphalts" of the Standard Specifications shall not apply.

Asphalt shall consist of refined petroleum or a mixture of refined liquid asphalt and refined solid asphalt, prepared from crude petroleum. Asphalt shall be:

1. Free from residues caused by the artificial distillation of coal, coal tar, or paraffin;
2. Free from water;
3. Homogeneous.

The Contractor shall furnish asphalt in conformance with the State of California Department of Transportation's "Certification Program for Suppliers of Asphalt". The Department maintains the program requirements, procedures, and a list of approved suppliers at <http://www.dot.ca.gov/hq/esc/Translab/fpmcoc.htm> or the State of California Department of Transportation's METS web site.

The Contractor shall ensure the safe transportation, storage, use, and disposal of asphalt.

The Contractor shall prevent the formation of carbonized particles caused by overheating asphalt during manufacturing or construction.

The grade for asphalt binder shall be **PG 64-10**.

### 39-1.01(1a.2) Performance Grades

Performance graded (PG) asphalt binder [and PG polymer modified asphalt binder] shall conform to the following table[s]:

<b>Performance Graded Asphalt Binder</b>				
Property	AASHTO Test Method	Specification Grade		
		PG 64-10	PG 64-16	PG 70-10
Original Binder				
Flash Point, Minimum °C	T48	230	230	230
Solubility, Minimum % <sup>b</sup>	T44	99	99	99
Viscosity at 135 °C, Maximum, Pa·s	T316	3.0	3.0	3.0
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum $G^*/\sin(\delta)$ , kPa	T315	64 1.00	64 1.00	70 1.00
RTFO Test <sup>e</sup> , Mass Loss, Maximum, %	T240	1.00	1.00	1.00
RTFO Test Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum $G^*/\sin(\delta)$ , kPa	T315	64 2.20	64 2.20	70 2.20
Ductility at 25 °C Minimum, cm	T51	75	75	75
PAV <sup>f</sup> Aging, Test Temperature, °C	R28	100	100	110
RTFO Test and PAV Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum $G^*/\sin(\delta)$ , kPa	T315	31 <sup>d</sup> 5000	28 <sup>d</sup> 5000	34 <sup>d</sup> 5000
Creep Stiffness, Test Temperature, °C Maximum S-value, Mpa Minimum M-value	T313	0 300 0.300	-6 300 0.300	0 300 0.300

**Notes:**

- a. Not used.
- b. The Engineer will waive this specification if the supplier is a Quality Supplier as defined by Department's "Certification Program for Suppliers of Asphalt".
- c. The Engineer will waive this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- d. Test the sample at 3 °C higher if it fails at the specified test temperature.  $G^*/\sin(\delta)$  shall remain 5000 kPa maximum.
- e. "RTFO Test" means the asphaltic residue obtained using the Rolling Thin Film Oven Test, AASHTO Test Method T240 or ASTM Designation: D2827.
- f. "PAV" means Pressurized Aging Vessel.

**Performance Graded Polymer Modified Asphalt Binder<sup>a</sup>**

Property	AASHTO Test Method	Specification Grade		
		PG 58-34 PM	PG 64-28 PM	PG 76-22 PM
Original Binder				
Flash Point, Minimum °C	T 48	230	230	230
Solubility, Minimum % <sup>b</sup>	T 44 <sup>c</sup>	98.5	98.5	98.5
Viscosity at 135°C, <sup>d</sup> Maximum, Pa·s	T 316	3.0	3.0	3.0
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	58 1.00	64 1.00	76 1.00
RTFO Test, Mass Loss, Maximum, %	T 240	1.00	1.00	1.00
RTFO Test Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Minimum G*/sin(delta), kPa	T 315	58 2.20	64 2.20	76 2.20
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum (delta), %	T 315	Note e 80	Note e 80	Note e 80
Elastic Recovery <sup>f</sup> , Test Temp., °C Minimum recovery, %	T 301	25 75	25 75	25 65
PAV <sup>g</sup> Aging, Temperature, °C	R 28	100	100	110
RTFO Test and PAV Aged Binder				
Dynamic Shear, Test Temp. at 10 rad/s, °C Maximum G*·sin(delta), kPa	T 315	16 5000	22 5000	31 5000
Creep Stiffness, Test Temperature, °C Maximum S-value, MPa Minimum M-value	T 313	-24 300 0.300	-18 300 0.300	-12 300 0.300

**Notes:**

- a. Do not modify PG Polymer Modifier using acid modification.
- b. The Engineer waives this specification if the supplier is a Quality Supplier as defined by the Department's "Certification Program for Suppliers of Asphalt".
- c. The Department allows ASTM D5546 instead of AASHTO T44.
- d. The Engineer waives this specification if the supplier certifies the asphalt binder can be adequately pumped and mixed at temperatures meeting applicable safety standards.
- e. Test temperature is the temperature at which G\*/sin(delta) is 2.2 kPa. A graph of log G\*/sin(delta) plotted against temperature may be used to determine the test temperature when G\*/sin(delta) is 2.2 Kpa. A graph of (delta) versus temperature may be used to determine delta at the temperature when G\*/sin(delta) is 2.2 kPa. The Engineer also accepts direct measurement of (delta) at the temperature when G\*/sin(delta) is 2.2 kPa.
- f. Test without a force ductility clamp may be performed.
- g. "PAV" means Pressurized Aging Vessel.]

**39-1.01(1a.3) Aggregate**

Aggregates shall be clean and free from decomposed materials, organic material, and other deleterious substances. Coarse aggregate is material retained on the No. 4 sieve and fine aggregate is material passing the No. 4 sieve. Supplemental fine aggregate is added fine material passing the No. 30 sieve including, but not limited to, cement and stored fines from dust collectors.

The aggregate grading of the different types of hot mix asphalt shall conform to the following, unless otherwise specified on the plans:

HMA Type	Grading
A	[3/4-inch and/or 1/2-inch]

The combined aggregate and quality characteristics for the [¾-inch and ½-inch] aggregate[s] for use in HMA Type A, prior to addition of asphalt binder, shall conform to the requirements of Section 39-1.02E, "Aggregate" of the Standard Specifications.

The aggregate shall conform to the following quality requirements prior to the addition of asphalt binder.

Quality Characteristic	Test Method	Requirement
Percent of crushed particles <sup>a</sup> Coarse aggregate (% min.) Two fractured faces	CT 205	95
Fine aggregate (Passing No. 4 sieve and retained on No. 8 sieve.) (% min) One fractured face		90
Los Angeles Rattler (% Max.) <sup>a</sup> Loss at 100 rev.	CT 211	12
Loss at 500 rev.		40
Sand equivalent <sup>a, b</sup> (min.)	CT 217	47
Fine aggregate angularity (% min.) <sup>a</sup>	CT 234	45
Flat and elongated particles (% max. by weight @ 5:1.) <sup>a</sup>	CT 235	10

Note:

<sup>a</sup> Combine aggregate in the JMF proportions.

<sup>b</sup> Reported value must be the average of 3 tests from a single sample.]

**39-1.01(1b) Construction**

**39-1.01(1b.1) Lift Thickness**

Hot mix asphalt shall be spread and compacted in the number of layers of the thicknesses indicated in the following table:

Total Thickness Shown on Plans <sup>a</sup>	Minimum No. of Layers	Top Layer Thickness (ft)		Next Lower Layer Thickness (ft)		All Other Lower Layer Thickness (ft)	
		Min.	Max.	Min.	Max.	Min.	Max.
0.24-foot or less	1	-	-	-	-	-	-
0.25-foot	2 <sup>b</sup>	0.12	0.13	0.12	0.13	-	-
0.26 - 0.46 foot	2	0.12	0.21	0.14	0.25	-	-
0.47-foot or more	3 or more	0.15	0.21	0.15	0.25	0.17	0.25

<sup>a</sup> When pavement reinforcing mat is shown to be placed between layers of asphalt concrete, the thickness of asphalt concrete above the pavement reinforcing mat shall be considered to be the "Total Thickness Shown on Plans."

<sup>b</sup> One layer of 0.25 foot thick may be placed as approved by the Engineer. When the Traffic Index specified is 5.5 or below, two layers shall be placed.

### 39-1.01(1b.2) Reclaimed Asphalt Pavement

The use of reclaimed asphalt pavement (RAP) in HMA production shall comply to Section 39-1.02F, "Reclaimed Asphalt Pavement" of the Standard Specifications, and this Section. Use of RAP in HMA Type C will not be allowed unless otherwise approved by the Engineer.

### 39-1.01(1c) HMA Mix Design

The HMA mix design shall conform to Section 39-1.03B, "Hot Mix Asphalt Mix Design" of the Standard Specifications and the provisions of this Section, "HMA Mix Design." The mix design process consists of performing California Test 367 and laboratory procedures in combinations of aggregate gradations and asphalt binder contents to determine the optimum binder content (OBC) and HMA mixture qualities. The results become the proposed job mix formula (JMF).

The Contractor shall submit records of aggregate quality and mix design data. Test data shall be within one year from the last test performed.

The Contractor shall submit the HMA mix design using the "COUNTY OF RIVERSIDE TRANSPORTATION DEPARTMENT, CONTRACTOR JOB MIX FORMULA PROPOSAL" form to present the JMF. Formats other than the referenced form will not be accepted.

The final HMA mix design shall be signed and stamped by a Civil Engineer registered in the State of California.

The HMA mix design for Type A shall comply with the following requirements:

### HMA Type A Mix Design Requirements

Quality characteristic	Test method	HMA type
		A
Air void content (%)	California Test 367	4.0
Voids in mineral aggregate (% min.) 1/2" grading 3/4" grading	California Test 367	14.0 13.0
Voids filled with asphalt (%) 1/2" grading 3/4" grading	California Test 367	65.0–75.0 65.0–75.0
Dust proportion 1/2" and 3/4" gradings	California Test 367	0.6–1.3
Stabilometer value (min.) <sup>b</sup> 1/2" and 3/4" gradings	California Test 366	37

<sup>a</sup> Not used.

<sup>b</sup> California Test 304, Part 2.13.

<sup>c</sup> Not used.

#### 39-1.01(1c.1) Sampling

The Contractor or the Contractor's representative shall provide a sampling device in the asphalt feed line connecting the plant storage tanks to the asphalt weighing system or spray bar. The sampling device shall be accessible between 24 and 30 inches above the platform. The Contractor shall provide a receptacle for flushing the sampling device.

The sampling device shall include a valve:

1. With a diameter between 1/2 and 3/4 inches;
2. Manufactured in a manner that a one-quart sample may be taken slowly at any time during plant operations;
3. Maintained in good condition.

The Contractor shall replace failed valves.

In the presence of the Engineer, the Contractor shall take 2 one-quart samples per operating day. The Contractor shall provide round friction top containers with one-quart capacity for storing samples.

#### 39-1.01(1c.2) Prime Coat

Liquid asphalt for prime coat shall conform to the provisions in Section 93, "Liquid Asphalts" of the Standard Specifications and shall be **Grade SC-70**. Prime coat shall be applied only to those areas designated by the Engineer. The application rate shall be 0.20 gallon per square yard of surface covered. The exact rate and number of applications will be determined by the Engineer.

#### 39-1.01(1c.3) Tack Coat

Asphaltic emulsion for paint binder (tack coat) shall conform to the provisions in Section 94, "Asphaltic Emulsion" of the Standard Specifications for the rapid-setting or slow-setting type and grade approved by the Engineer. **Grade SS1h** shall be used if not otherwise specified. Tack coat shall be applied to all vertical surfaces of existing pavement, curbs, gutters, and construction joints in the surfacing against which additional material is to be placed, to a pavement to be surfaced, and to other surfaces designated in the Special Provisions. The application rate shall be from 0.02 to 0.10 gallon per square yard of surface covered. The exact rate and number of applications will be determined by the Engineer.

#### 39-1.01(1c.4) Control of Materials

All proposed materials for use in HMA shall be furnished in conformance with the provisions of Section 6, "Control of Materials" of the Standard Specifications and this Section. All materials to be used in producing the hot mix asphalt shall be supplied from a single source for each material unless approved by the Engineer. Materials to be used in HMA will be subject to inspection and tests by the Engineer. The Contractor shall furnish without charge sample of materials as may be required.

The Contractor shall furnish the Engineer a list of the Contractor's sources of materials and the locations at which those materials will be available for inspection. The Contractor shall assure that the Engineer has free access or entry at all times to the material or production of the material to be inspected, sampled, and tested. It is understood that the inspections and tests made at any point shall, in no way, be considered as a guaranty of acceptance of the material nor continued acceptance of the material presumed to be similar to that upon which inspections and tests have been made, and that inspection and testing performed by the Engineer shall not relieve the Contractor of responsibility for quality control.

All materials which the Engineer has determined defective or do not conform to the requirements of the plans and specifications will be rejected whether in place or not. Under the provisions of this Section, the Engineer will have authority to cause the removal and replacement of rejected material and to deduct the cost thereof from any moneys due or to become due the Contractor.

### **39-1.01(1c.5) Utility Covers**

Except as otherwise provided herein, the Contractor shall adjust to finish grade any valve covers encountered within the project limits, as required, for those utility valves that are provided with slip cans and are adjustable without the replacement of part or the removal of concrete collars. In cases where the owning utility company insists upon upgrades in the standards, or when additional parts or the removal of concrete collars are required for the adjustment, said adjustment will be the responsibility of the owning utility company.

The Contractor shall lower manholes and valves when and as necessary for the protection of the traveling public during construction, and shall coordinate all work on said facilities with the owning utility companies. Final adjustment to grade will be the responsibility of the owning utility company, except as provided herein.

### **39-1.01(1c.6) Placing HMA**

Asphalt paving equipment shall be in conformance with the provisions of Section 39-1.10, "Spreading and Compacting Equipment" of the Standard Specifications. Spreading and Compacting shall be in accordance with this Section and the provisions in Section 39-1.11, "Transporting, Spreading, and Compacting" of the Standard Specifications, except QC/QA construction process and rubberized HMA do not apply.

When placing asphalt concrete to the lines and grades established by the Engineer, the automatic controls shall control the longitudinal grade and transverse slope of the screed. Grade and slope references shall be furnished, installed, and maintained by the Contractor. Should the Contractor elect to use a ski device, the minimum length of the ski device shall be 30 feet. The ski device shall be a rigid one piece unit and the entire length shall be utilized in activating the sensor.

When placing the initial mat of asphalt concrete on existing pavement, the end of the screed nearest the centerline shall be controlled by a sensor activated by a ski device not less than 30 feet. The end of the screed farthest from centerline shall be controlled by an automatic transverse slope device set to reproduce the cross slope designated by the Engineer, by a sensor activated by a similar ski device or as directed by the Engineer.

When paving contiguously with previously placed mats, the end of the screed adjacent to the previously placed mat shall be controlled by a sensor that responds to the grade of the previously placed mat and will reproduce the grade in the new mat within a 0.12 inch tolerance. The end of the screed farthest from the previously placed mat shall be controlled in the same way it was controlled when placing the initial mat.

Should the methods and equipment furnished by the Contractor fail to produce a layer of asphalt concrete conforming to the provisions, including straightedge tolerance, of Section 39-1.11, "Transporting, Spreading, and Compacting" of the Standard Specifications or elsewhere in these Special Provisions, the paving operations shall be discontinued and the Contractor shall modify the equipment or methods, or furnish substitute equipment.



Should the automatic screed controls fail to operate properly during a day's work, the Contractor may manually control the spreading equipment for the remainder of that day. However, the equipment shall be corrected or replaced with alternative automatically controlled equipment conforming to the provisions in this section before starting another day's work.

**39-1.01(1c.7) Construction Process of HMA**

The HMA construction process shall comply with the provisions of Section 39 of the Standard Specification, the provisions of these Special Provisions, and shall include one or more of the following.

1. Standard
2. Method

Standard

When the total HMA is more than 3,000 tons, the Standard construction process shall be followed as specified in Section 39-2, "Standard Construction Process" of the Standard Specification and the following:

When the total paved HMA thickness is at least 0.15 foot and the individual layer is more than 0.15 foot, the Contractor shall determine the in-place density and relative compaction of HMA pavement in accordance with the procedures of California Test 375. The Contractor shall use California Test 308, Method A, in determining in-place density of each density core instead of using the nuclear gauge in Part 4, "Determining In-Place Density by the Nuclear Density Device." The Contractor shall use California Test 309 to determine the maximum theoretical density instead of calculating test maximum density in Part 5, "Determining Test Maximum Density" and shall be at the frequency specified for Test Maximum Density under California Test 375, Part 5D. Relative compaction is required for HMA Type A and shall be reported at various pave thicknesses as listed in the following table:

**HMA Relative Compaction Requirements**

HMA Type	Minimum Pave Thickness (ft)	Relative Compaction (%)
A (1/2-inch)	0.15	91-97
A (3/4-inch)	0.15	91-97

The Contractor shall perform quality control sampling and testing at the specified frequency for the quality characteristics shown in the following table:

Quality characteristic	Test method	Minimum sampling and testing frequency	HMA type	
			A	C
Aggregate gradation <sup>a</sup>	California Test 202	1 per 750 tons and any remaining part	JMF ± Tolerance <sup>b</sup>	JMF ± Tolerance <sup>b</sup>
Sand equivalent (min) <sup>c</sup>	California Test 217		47	47
Asphalt binder content (%)	California Test 379 or 382		JMF ± 0.45	JMF ± 0.45
HMA moisture content (% max)	California Test 226 or 370	1 per 1,500 tons but not less than 1 per paving day	1.0	1.0
Percent of maximum theoretical density (%) <sup>d,e</sup>	QC plan	1 per day's production (min.)	91–97	91–97
Stabilometer value (min) <sup>c,f</sup> No. 4 and 3/8" gradings 1/2" 3/4" 1" gradings	California Test 366	One per 1,500 tons or 2 per 5 business days, whichever is greater	30	30
			37	37
Air void content (%) <sup>c,g</sup>	California Test 367		4 ± 2	5 ± 2
Aggregate moisture content at continuous mixing plants and RAP moisture content at continuous mixing plants and batch mixing plants <sup>h</sup>	California Test 226 or 370	2 per day during production	--	--
Percent of crushed particles coarse aggregate (% min) One fractured face Two fractured faces Fine aggregate (% min) (Passing no. 4 sieve and retained on no. 8 sieve.) One fractured face	California Test 205	As designated in the QC plan. At least once per project.	90	90
			75	95
Los Angeles Rattler (% max) Loss at 100 rev. Loss at 500 rev.	California Test 211		70	90
			12	12
Flat and elongated particles (% max by weight @ 5:1)	California Test 235		45	40
			Report only	10
Fine aggregate angularity (% min)	California Test 234		45	45
Voids filled with asphalt (%) <sup>i</sup> 1/2" grading 3/4" grading 1" grading	California Test 367	As designated in the QC plan. At least once per project.	65.0–75.0	60.0–70.0
			65.0–75.0	
Voids in mineral aggregate (% min) <sup>i</sup> 1/2" grading 3/4" grading 1" grading	California Test 367		14.0	13.0
			13.0	
Dust proportion <sup>i</sup> 1/2" and 3/4" gradings 1" grading	California Test 367		0.6–1.3	0.6–1.3
Smoothness	Section 39-1.12	--	12-foot straight-edge, must grind, and Pl <sub>0</sub>	12-foot straight-edge, must grind, and Pl <sub>0</sub>

<sup>a</sup> Determine combined aggregate gradation containing RAP under California Test 367.

<sup>b</sup> The tolerances must comply with the allowable tolerances in section 39-1.02E.

<sup>c</sup> Report the average of 3 tests from a single split sample.

<sup>d</sup> Required for HMA Type A and Type C if the specified paved thickness is at least 0.15 foot.

<sup>e</sup> Determine maximum theoretical density (California Test 309) at the frequency specified for Test Maximum Density under California Test 375, Part 5.D.

<sup>f</sup> California Test 304, Part 2.13.

<sup>g</sup> Determine the bulk specific gravity of each lab-compacted briquette under California Test 308, Method A, and theoretical maximum specific gravity under California Test 309.

<sup>h</sup> For adjusting the plant controller at the HMA plant.

<sup>i</sup> Report only if the adjustment for the asphalt binder content TV is less than or equal to ±0.3 percent from OBC value.

<sup>j</sup> Not Used.

Failures and corrected actions for quality control testing shall be as described in Section 39-2.02B, "Quality Control Testing."

When the total paved HMA thickness is at least 0.15 foot and the individual layer is less than or equal to 0.15 foot, the Contractor shall determine the percent of maximum theoretical density from density cores taken from the final layer measured at the full depth of the total paved HMA thickness.

#### Method

When the total HMA is less than 3,000 tons and the total paved HMA thickness is less than 0.15 foot, the Method construction process shall be followed as specified in Section 39-3, "Method Construction Process" of the Standard Specification and the following:

The requirements for HMA Type C using the Method process shall be similar to the requirements for HMA Type A as specified in Section 39-3, "Method Construction Process" of the Standard Specification.

#### **39-1.01(1c.8) HMA Acceptance and Payment Factor**

The Engineer shall sample for acceptance testing and test for quality characteristics as specified in Section 39-2.03A, "Testing." Acceptance of placed HMA shall be based on a single defined lot of HMA. A lot is defined as having 1,000 tons of paved HMA, except if a quantity of HMA paved at day's end is greater than 500 tons, this quantity of paved HMA shall be considered a lot. If a quantity of HMA paved at day's end is less than 500 tons, this quantity of HMA shall be included in the previous lot's test result for payment evaluation.

For percent of maximum theoretical density, the Engineer shall determine a deduction for each lot's test result outside the specifications using the following reduced payment factors:

**Reduced Payment Factors for Percent of Maximum Theoretical Density**

HMA Type A and C percent of maximum theoretical density	Reduced payment factor	HMA Type A and C percent of maximum theoretical density	Reduced payment factor
91.0	0.0000	97.0	0.0000
90.9	0.0125	97.1	0.0125
90.8	0.0250	97.2	0.0250
90.7	0.0375	97.3	0.0375
90.6	0.0500	97.4	0.0500
90.5	0.0625	97.5	0.0625
90.4	0.0750	97.6	0.0750
90.3	0.0875	97.7	0.0875
90.2	0.1000	97.8	0.1000
90.1	0.1125	97.9	0.1125
90.0	0.1250	98.0	0.1250
89.9	0.1375	98.1	0.1375
89.8	0.1500	98.2	0.1500
89.7	0.1625	98.3	0.1625
89.6	0.1750	98.4	0.1750
89.5	0.1875	98.5	0.1875
89.4	0.2000	98.6	0.2000
89.3	0.2125	98.7	0.2125
89.2	0.2250	98.8	0.2250
89.1	0.2375	98.9	0.2375
89.0	0.2500	99.0	0.2500
< 89.0	Remove and replace	> 99.0	Remove and replace

**39-1.01(1c.9) Density Cores**

The Engineer shall test density cores to determine the percent of maximum theoretical density of the paved HMA. For Standard construction process projects, 4- or 6-inch diameter density cores shall be taken by the Contractor from each 500 tons of HMA production.

The Engineer shall determine the percent of maximum theoretical density from the average density of 3 density cores taken by the Contractor from every 500 tons of production or part thereof divided by the maximum theoretical density. The location of the density cores shall be randomly selected by the Engineer and shall be performed in the Engineer's presence. Density holes shall be backfilled and compacted with material approved by the Engineer. Density cores shall be marked with the density core's location and layer number and shall be placed in a protective container. If a density core is damaged, it shall be replaced and re-cored within 1 foot longitudinally from the original density core.

**39-1.01(1c.10) Straightedge**

The straightedge for smoothness determination on the top layer of HMA pavement shall conform to the tolerance specified in Section 39-1.12B, "Straightedge" of the Standard Specifications.

**39-1.01(1c.11) Profilograph**

In addition to the straightedge provisions in Section 39-1.12B, "Straightedge" of the Standard Specifications, HMA concrete pavement shall conform to the surface tolerances specified in this Section, "Profilograph."

When directed by the Engineer, the uppermost layer of asphalt concrete surfacing shall be profiled in the presence of the Engineer using a California Profilograph or equivalent in conformance with California Test 526, Section 39-1.12C, "Profilograph" of the Standard Specifications, and as specified in these Special Provisions.

The California Profilograph or equivalent will not be required for the following areas of the pavement surface but shall conform to the straightedge requirements in Section 39-1.12B, "Straightedge" of the Standard Specifications:

1. Pavement with a total thickness less than 0.24 foot;
2. Pavement on horizontal curves with a centerline curve radius of less than 1,000 feet and the pavement within the superelevation transition on those curves;
3. Pavement placed in a single lift when required by the Special Provisions;
4. Pavement with extensive grade or cross slope correction which does not receive advance leveling operations in conformance with the provisions in Section 39-6.02, "Spreading" of the Standard Specifications;
5. Pavement for ramps and connectors with steep grades and high rates of superelevation, as determined by the Engineer;
6. Shoulders and miscellaneous areas.

The Contractor shall conform to California Test 526, except a zero (null) blanking band shall be used for determining the Profile Index. Prior to beginning profiles, the profilograph shall be calibrated in the presence of the Engineer. Two profiles shall be obtained within each traffic lane, 3 feet from and parallel with the edges of the lane.

Pavements profiled shall conform to the following Profile Index requirements:

1. Pavement on tangent alignment and pavement on horizontal curves having a centerline curve radius of 2,000 feet or more shall have a Profile Index of 0.16 foot or less for each 330 feet section profiled;
2. Pavement on horizontal curves having a centerline curve radius of 1,000 feet or more but less than 2,000 feet, including the pavement within the superelevation transition of these curves, shall have a Profile Index of 0.32 foot or less for each 330 feet section profile;
3. Pavement within any 330 feet section, containing high point areas with deviations in excess of 0.025 foot in a length of 25 feet or less, when tested in conformance with the requirements in California Test 526, shall be corrected by the Contractor regardless of the Profile Index.

The Contractor shall complete initial runs of the profilograph prior to opening the pavement to public traffic. If initial profiles cannot be made prior to opening the pavement to public traffic, the initial runs of the profilograph shall be made the next day that traffic control is permitted for the area to be profiled.

Areas of the top surface of the uppermost layer of asphalt concrete pavement that do not meet the specified surface tolerances shall be brought within tolerance by abrasive grinding.

Abrasive grinding shall be performed to reduce individual deviations in excess of 0.025 foot, and to reduce the Profile Index of the pavement to be within the specified tolerance. Areas which have been subjected to abrasive grinding shall receive a seal coat. Deviations in excess of 0.025 foot which cannot be brought into specified tolerance by abrasive grinding shall be corrected by either (1) removal and replacement or (2) placing an overlay of asphalt concrete. The corrective method for each area shall be selected by the Contractor and shall be approved by the Engineer prior to beginning the corrective work. Replacement or overlay pavement not meeting the specified tolerances shall be corrected by the methods specified above. Corrective work shall be at the Contractor's expense. The Contractor shall run profilograms on the areas that have received abrasive grinding or corrective work until the final profilograms indicate the Profile Index of the area is within the specified tolerance.

When abrasive grinding is used to bring the top surface of the uppermost layer of asphalt concrete surfacing within the specified surface tolerances, additional abrasive grinding shall be performed as necessary to extend the area ground in each lateral direction so that the lateral limits of grinding are at a constant offset from, and parallel with, the nearest lane line or pavement edge, and in each longitudinal direction so that the grinding begins

and ends at lines normal to the pavement centerline, within a ground area. Ground areas shall be neat rectangular areas of uniform surface appearance.

The original of the final profilograms that indicate the pavement surface is within the Profile Index specified shall become the property of the County and shall be delivered to the Engineer prior to acceptance of the contract.

**39-1.01(1d) Payment**

The contract bid price paid per ton for Hot Mix Asphalt (HMA) for the type shown in bid proposal shall include full compensation for furnishing all labor, tools, materials, equipment, and incidentals, and for doing all the work involved including the sampling and testing of HMA quality characteristics, sampling and testing of density cores, and furnishing and applying asphaltic emulsion (paint binder/tack coat).

At road connections and at limits of asphalt paving, existing pavement shall be header cut as shown on the plans or as directed by the Engineer. Full compensation for furnishing all labor, tools and doing all the work necessary including grinding, and sawcutting shall be considered as included in the contract prices paid per ton for the various asphalt concrete items and no additional compensation will be allowed therefor.

The adjustment of frames, valve covers, grates, manholes, including initial lowering of valves and manholes when required, shall be considered as included in the contract price paid for hot mix asphalt.

**DIVISION VI STRUCTURES**

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**51 CONCRETE STRUCTURES**

**Add to Section 51-1.01 General:**

**Minor Concrete Structures**

Minor concrete structures shall conform to the applicable portions of Section 51, 52, 75 and 90 of the Standard Specifications and in accordance with the manufacturer’s recommendation.

Minor concrete structures for this project shall consist of:

- Block Retaining Wall per Cross Section A-A’ on sheet L-1 of the plans

Compensation for the removal of existing retaining wall and required excavation to construct new retaining wall shall be considered as included in the contract price paid per lump sum for Clearing and Grubbing.

The retaining wall blocks shall be “**AB Collection, Classic Cut Stone**” by **Allan Block**, or close approximation as approved by the Engineer.

Name	Setback	Coverage	Weight	Approximate Dimensions
AB Stones	12°	1 sq. ft approximately	75 lbs.	8 in. H x 12 in. D x 18 in. L

This listed product is intended as a guideline, and products from alternate manufacturers will be accepted provided that the product provides a pattern of the size and texture that is a close approximation to the guideline product.

Construction of retaining wall shall be in accordance with the manufacturer’s recommendation.

### **Base Preparation**

Excavate the area by removing all surface vegetation and organic materials from the area. **Organic materials cannot be used as backfill material.**

Excavate behind the wall to accommodate the design length of the reinforcement geogrid.

Dig a base trench 24-inches wide the length of the wall. The depth of the trench will be 6-inches plus an additional 1 inch for each 1-foot of wall height for the amount of buried block that is needed.

Foundation soil at the bottom of the base trench must be firm and solid. Compact the top 1.5 feet of the trench soil to at least 90 percent relative compaction.

### **Base Material**

Place a minimum of 6-inches of clean coarse gravel (wall rock) in the base trench and rake smooth. Compact the wall rock making a minimum of two passes with a plate compactor. Check the entire length for level, and adjust as needed.

A drain pipe is required as shown on the plans. The pipe shall be 4" diameter perforated PVC drainage pipe with 1% gradient to drain. Vent the drain pipe to a lower elevation on the site.

### **Install Base Course**

Begin the base course at the lowest wall elevation. Check and adjust each block for level and alignment as it is installed. Check the blocks for level frequently from side-to-side and front-to-back. Verify the proper position of all the blocks.

### **Backfilling and Compaction**

Fill the hollow cores of the base course and 12-inches behind the block with wall rock to the height of the block.

Use infill or approved on-site soils to backfill behind the wall rock in lifts of no more than 8-inches. Use a plate compactor to consolidate the wall rock directly behind the block then compact in a path parallel to the wall, working from the back of the block to the back of the excavated area.

Every course after the first course requires compaction starting on the block.

### **Install Reinforcement**

Reinforcement Grid must be bi-axial. Reinforcement Grid must be installed running from the front of the block to the back of the excavated area.

Reinforcement Grid must have a minimum width of 3-feet.

Two layers of reinforcement grid are required for this Retaining Wall.

Once the base course is complete, begin installing the first layer of Reinforcement Grid. Begin by placing the edge of the geogrid against the back of the raised front lip and rolling it out along the wall. Refer to the plans for exact location.

Pull on the back of the geogrid to remove any slack. If necessary, stake it in place. Never drive or compact directly on the geogrid.

### **Additional Courses**

Stack the next course of blocks so that the vertical seams are offset from the blocks below by at least 1/4 the length of the block. Check each block for level and alignment and make adjustments as needed. Fill the hollow cores and 12-inches behind the block with wall rock to the height of the block. Use infill or approved on-site soils to backfill behind the wall rock in lifts of no more than 8-inches.

From the 2nd course and above use a plate compactor to compact directly on the blocks as well as the area behind the blocks. Compact the backfill in lifts of 8-inches or less.

On the last course, fill behind the blocks with organic soils in place of infill or approved on-site soils.

Excess material resulting from the retaining wall construction shall be disposed of as provided in Section 00-1.12 , 'Disposal Of Excess Excavation Or Materials', of these Special Provisions.

#### **Add to Section 51-1.04 Payment:**

##### **51-1.04 PAYMENT**

Compensation for the removal of existing retaining wall and required excavation to construct new retaining wall shall be considered as included in the contract price paid per lump sum for Clearing and Grubbing.

The contract price paid per linear foot for Retaining Wall (Masonry Wall) will not be adjusted if the constructed height of said minor structure, including revisions by Engineer, is within  $\pm 0.5$  foot of the vertical dimension shown on the plans.

Payment for all work involved in the construction of minor structure will be per linear foot for Retaining Wall (Masonry Wall) and shall include full compensation for furnishing all labor, materials, tools and equipment, and doing all work involved in the complete structure, including the construction of gutter depression, structure excavation and backfill, furnishing and placing reinforcement, and no further allowances shall be allowed.

## **56 SIGNS**

#### **Add to Section 56-4 General:**

##### **ROADSIDE SIGN - ONE POST:**

The Contractor shall furnish and install roadside signs at the locations shown on the plans or as directed by the Engineer, in conformance to the provisions in Section 56-4 "Roadside Signs," of the State Standard Specifications, Palm Desert Standard Drawings, and these Special Provisions.

All Signs shall be installed on new square perforated steel tube posts in accordance with County Standard No. 1222.

Street name signs shall be furnished and installed in conformance with County Standard No. 1221 as shown on the plans, as specified in these Special Provisions and as directed by the Resident Engineer.

All roadway signs shall have retroreflective sheeting. Except as stated below, the retro-reflectivity for all roadway signs, both temporary and permanent installations, shall meet or exceed ASTM Standard D 4956 Type III (3M Co. High Intensity Grade or approved equal). The retroreflectivity for R1-1 ("STOP") signs and W3-1 (Stop Ahead) signs shall meet ASTM Standard D 4956 Type IX (3M Co. Diamond Grade or approved equal).

##### **Payment:**



The contract unit price paid per each for Roadside Sign - One Post, including street name signs, shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals and for doing all the work including all necessary concrete excavation and backfill as specified in the Standard Specifications.

## **DIVISION VIII MISCELLANEOUS CONSTRUCTION**

AA

### **73 CONCRETE CURBS AND SIDEWALKS**

#### **Add to Section 73-1.01 General:**

#### **73-1.01 GENERAL**

Minor Concrete Structures to be constructed are:

Curb Ramps per Riverside County Standard No. 403, Sidewalk per Riverside County Standard No. 401, Cross-Gutters and Spandrels per Riverside County Standard No. 209 , Curb and Gutter per Riverside County Standard No. 200, and Retaining Curb at back of Ramp per Cross Section B-B' on sheet L-1 of the plans .

These minor concrete structures shall be constructed in accordance with the County Road Improvement Standards and Specifications or as directed by the Engineer and in conformance with Section 51, 73 and 90 of Standard Specifications, except as modified.

Class 2 concrete shall be used for concrete cross-gutters and spandrels.  
Class 3 concrete shall be used for any other minor concrete structure.

#### **73-1.03 CONSTRUCTION**

#### **Add to Section 73-1.03B Subgrade Preparation:**

Preparation of subgrade for the concrete structures shall be done in conformance with the requirements of Section 73-1.03B Subgrade Preparation of the Standard Specifications.

Excess material resulting from the excavation of the subgrade shall be disposed of as provided in Section 00-1.12, 'Disposal Of Excess Excavation Or Materials', of these Special Provisions.

Full compensation for the removal of existing minor concrete structures (Curb Ramps, Sidewalk, Cross-Gutters and Spandrels, Curb and Gutter) shall be considered as included in the contract bid prices for such minor concrete structures.

The Contractor is responsible for meeting requirements of American with Disabilities Act (ADA).

Construction of Curb Ramps, Sidewalk, Cross-Gutters and Spandrels, Curb and Gutter, and Retaining Curb shall include, but not be limited to, the following:

- 1) Removal and disposal of existing Curb Ramps, Sidewalk, Cross-Gutters and Spandrels, Curb and Gutter and existing soil and aggregate as required;
- 2) Establishing grades, and assuring that all grades are met;
- 3) Performing all grading and compaction – including all required aggregate import, as directed by the Engineer and in accordance with County Standards;

- 4) Construction of new Curb Ramps, Sidewalk, Cross-Gutters and Spandrels, Curb and Gutter, and Retaining Curb ;
- 5) All scoring/grooving and required saw cutting;
- 6) Repair of existing asphalt and PCC surfacing;
- 7) Installing 1/2" wide expansion joints;
- 8) All landscaping, and related work, to return the area adjacent to the Curb Ramps, Sidewalk, Curb and Gutter, and Retaining Curb to its original condition and to conform the area to the new improvements;

At a minimum, the area from the BCR to ECR shall meet all required ADA standards. Therefore, to conform to existing conditions and/or to achieve the required four-foot level area (maximum of 2.0% crossfall) at the top portion of the curb ramp, it may be necessary to extend the work beyond the BCR/ECR in certain instances.

The area behind and along the sidewalk and curb return shall be filled and compacted with native or select material and graded to match and provide a smooth transition from the back of sidewalk and curb return to the satisfaction of the Engineer.

**Replace Section 73-1.04 Payment:**

Payment:

The contract unit bid price paid per each for Curb Ramps; per linear foot for Curb and Gutter, and Retaining Curb; and per square foot for Sidewalk, and Cross-Gutter and Spandrel shall include full compensation for furnishing all labor, equipment, materials and tools, and incidentals, and for doing all the work involved in the concrete structures construction including the grading and the removal of any obstacles within the areas of proposed minor concrete structures, and the furnishing and placing of expansion joints.

**DIVISION IX TRAFFIC CONTROL FACILITIES**

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**84 TRAFFIC STRIPES AND PAVEMENT MARKINGS**

**84-2 THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS**

**Add to Section 84-2.01 General:**

**THERMOPLASTIC TRAFFIC STRIPES AND PAVEMENT MARKINGS**

Thermoplastic traffic stripes and pavement markings shall conform to the provisions in Sections 84-1, "General," and 84-2, "Thermoplastic Traffic Stripes and Pavement Markings," of the Standard Specifications and these Special Provisions.

Newly painted pavement markings shall be protected from damage by public traffic or other causes until the paint is thoroughly dry. Any newly painted traffic striping which are damaged as a result of the construction, including wheel markings by public traffic and the construction equipment, shall be repainted by the Contractor and any associated removals shall be performed as called for in these Special Provisions.

Payment:

The contract price paid per square foot for Thermoplastic Pavement Marking shall include full compensation for furnishing all labor, materials, tools, equipment, incidentals and no additional compensation will be allowed therefor.

### **84-3 PAINTED TRAFFIC STRIPES AND PAVEMENT MARKINGS**

#### **Add to Section 84-3.01 General:**

#### **PAINT TRAFFIC STRIPE (2 COAT)**

Painting traffic stripe shall conform to the provisions in Sections 84-1, "General", 84-3, "Painted Traffic Stripes and Pavement Markings" and 84-3.03, "Construction" of the Standard Specifications and these Special Provisions.

Traffic striping shall be applied in two coats with airless equipment and shall be performed with a roadliner truck mounted striping machine. Where the configuration or location of a traffic stripe is such that the use of a roadliner truck mounted striping machine is unsuitable, traffic striping and glass spheres may be applied by other methods and equipment approved by the Engineer.

Newly painted traffic striping shall be protected from damage by public traffic or other causes until the paint is thoroughly dry. Any newly painted traffic striping which are damaged as a result of the construction, including wheel markings by public traffic and the construction equipment, shall be repainted by the Contractor and any associated removals shall be performed as called for in these Special Provisions.

#### **Payment:**

The contract price paid per linear foot for Paint Traffic Stripe (2 Coats) shall include full compensation for furnishing all labor, materials, tools, equipment, incidentals, and for doing all the work involved in painting traffic stripe (regardless of the number, widths, and types of individual stripes involved in each traffic stripe) including any necessary cat tracks, dribble lines any layout work, complete in place as shown on the plans, as specified in the Standard Specifications and these Special Provisions, as directed by the Engineer, and no additional compensation will be allowed therefor.

### **85 PAVEMENT MARKERS**

#### **Add to Section 85-1.01 General:**

#### **RETROFLECTIVE PAVEMENT MARKERS:**

Pavement markers shall conform to the provisions of Section 85, "Pavement Markers," and Section 85-1.02C "Retroreflective Pavement Markers" of Standard Specifications and these Special Provisions.

Certificates of compliance shall be furnished for pavement markers as specified in Section 6-3.05 "Certificates of Compliance" of the Standard Specifications.

Reflective pavement markers shall comply with the specific intensity requirements for reflectance after abrading the lens surface in accordance with the "Steel Wool Abrasion Procedure," specified for pavement markers placed in pavement recesses in Section 85-1.02C, "Retroreflective Pavement Markers", of the Standard Specifications.

The bituminous adhesive used to install the markers shall be a hot melt bituminous adhesive asphaltic material with homogeneously mixed mineral filler and shall conform to the requirements specified in Section 85-1.03B, "Hot Melt Bituminous Adhesives," of the Standard Specifications.

Reflective pavement markers shall be installed at locations as established by the applicable Caltrans striping detail noted on the approved striping Plan, which includes, but is not limited to temporary painted line(s), new striping or existing striping. There shall be one marker for each location. All work necessary to establish satisfactory locations for markers shall be performed by the Contractor.

Existing reflective pavement markers that do not conform to the approved Plan shall be removed by the Contractor.

Reflective pavement markers shall be of the prismatic reflector type (3M model white RP290w and yellow RPM 2912y or equal) as outlined in Section 85-1.02C, "Retroreflective Pavement Markers" of the Standard Specifications.

Payment:

Full compensation for reflective pavement markers shall be considered as included in the contract price paid per each for Pavement Marker (Retroreflective) and shall include full compensation for furnishing all labor, materials, tools, equipment and incidentals, and for doing all the work involved in installing pavement markers complete, in place, as shown on the Plans, as specified in the Standard Specifications and these Special Provisions or as directed by the Engineer.

Section 9-1.06B, "Increases of More Than 25 Percent", of the Standard Specifications will not apply to Pavement Markers (Retroreflective). No adjustment to the contract unit bid price will be allowed for any excess of over 25 percent of the estimated quantity for Pavement Markers (Reflective).

## 86 ELECTRICAL SYSTEMS

Add to section 86-1:

### TRAFFIC SIGNAL AND HIGHWAY LIGHTING SYSTEM

#### A. General

Furnishing and installing traffic signal and highway lighting systems, and payment shall conform to the provisions in Section 86, "Electrical Systems", of the latest edition Standard Specifications, amendments to the Standard Specifications, and these Special Provisions.

#### B. Start of Work

Location where signalization and highway lighting work is to be performed:

	Location	Area
1.	Serfas Club Drive and Monterey Peninsula Drive	Corona

#### C. County Furnished Equipment

County furnished equipment shall conform to the provisions in Section 6-2.03, "Department-Furnished Material", of the Standard Specifications and these Special Provisions and hereinafter known as County Furnished equipment and Materials.

The County of Riverside will furnish the following equipment and materials to the Contractor for installation:

1. Signal and Lighting Standards and Anchor Bolts
2. 10' Galvanized Steel IISNS Mast Arms

The Contractor shall pick up County furnished equipment and materials from the following location(s), or as directed by the Engineer, and transport them to the project site(s):

Traffic Signal Shop  
Riverside County Transportation Department  
McKenzie Highway Operations Center  
2950 Washington Street  
Riverside, California 92504  
Telephone (951) 955-6894

Any County furnished equipment that is damaged after the Contractor has taken possession of the items shall be repaired to the satisfaction of the Engineer. If the damaged equipment is considered irreparable, it must be replaced meeting the requirements stated in the Standard Specifications and these special provisions at the Contractor's cost.

#### D. Equipment Orders

The Contractor shall furnish all equipments and materials specified in the plans and these special provisions that are not furnished by the County. All equipment shall be new and purchased by the Contractor for this project only.

### **Submittals and issuance of Notice to Proceed**

Within twenty one (21) calendar days after the award of the contract, the Contractor shall submit equipment and materials submittals to the Engineer for review and approval. The Contractor shall allow fourteen (14) calendar days for the Engineer to review the equipment and materials submittals. If revisions are required as determined by the Engineer, the Contractor shall revise and resubmit the equipment and materials submittals within seven (7) calendar days of receipt of the Engineer's comments and shall allow seven (7) working days for the Engineer to review the revisions. Once the submittals are approved by the Engineer, the Contractor must order equipment and materials and then submit a copy of each vendor Equipment and Material Purchase Order within (7) calendar days to the Engineer.

The Contractor must have copies of approved Equipment and Material submittal(s) and Purchase Order(s) prior to the coordination and issuance of the Notice to Proceed. Delay in equipment delivery shall not be considered as justification for the suspension of the construction contract.

### **Additional Liquidated Damages**

In addition to the liquidated damages set forth in Special Provision section "Liquidated Damages" of these contract documents, the Contractor shall pay to the County of Riverside the sum of \$800.00 per day for each and every calendar day delay in receiving all of the below listed equipment furnished by the Contractor, onto the job site or the Contractor's storage facility, and available for installation, within sixty (60) calendar days of the contract award date:

1. Traffic Signal Controller Assemblies
2. Service Equipment Enclosures
3. Traffic Signal and Pedestrian Signal heads
4. LED Modules
5. Edge Lit LED Internally Illuminated Street Name Signs and mounting brackets

### **E. Equipment List and Drawings**

Equipment list and drawings shall conform to the provisions in Section 86-1.04, "Equipment List and Drawings", of the Standard Specifications and these Special Provisions.

The Contractor shall furnish four complete cabinet wiring diagrams for each furnished controller assembly, battery backup system, video detection system, and emergency vehicle preemption system. The cabinet wiring diagram shall include an approximately 6 inches x 8 inches or larger schematic drawing of the project intersection on a separate 8 1/2" x 11" sheet of paper, which shall include the following information, at a minimum:

1. North arrow
2. Street names
3. Pavement delineation and markings
4. Signal poles
5. Traffic signal heads with phase designations
6. Pedestrian signal heads with phase designations
7. Loop detectors with input file designations

### **F. Warranties, Guaranties, Instruction Sheets, and Manuals**

Warranties, guaranties and instruction sheets shall conform to these Special Provisions.

1. LED modules shall have five (5) years of manufacturer warranty.
2. Battery Backup System (BBS) shall have five (5) years of manufacturer warranty. The first three (3) years shall be termed the "Advanced Replacement Program". Under this program, the manufacturer will send out a replacement within two business days of the call notifying them of an issue. The replacement unit may be either a new unit or a re-manufactured unit that is up to the latest revision. The last two years of the warranty will be factory-repair warranty for parts and labor on the BBS.

3. Video Detection System shall have three (3) years of manufacturer warranty. During the warranty period, technical support from factory-certified personnel or factory-certified installers shall be available via telephone within four (4) hours of the time when a service call is made.
4. Edge Lit LED internally illuminated street name sign shall have two (2) year of manufacturer warranty.
5. All other equipment and systems shall have at least one (1) year of manufacturer warranty.

Furnish the manufacturer's standard written warranty pertaining to defects in materials and workmanship for all equipment, and two (2) sets of user, operation, and maintenance manuals, written in English, on all equipments and components for the traffic signal and highway lighting system to the Engineer.

#### **G. Foundations**

Foundations shall conform to the provisions in Section 51, "Concrete Structures", and Section 86-2.03, "Foundations", of the Standard Specifications and these Special Provisions.

Portland cement concrete shall conform to Section 90-2, "Minor Concrete", of the Standard Specifications and shall be Class 3 except pole foundations shall be Class 2.

Construct Type 332 controller cabinet foundation per Standard Plans ES-3C.

Vibrate all foundation concrete to eliminate air pockets.

#### **H. Standards, Poles, Steel Pedestals and Posts**

Standards, poles, steel pedestals, and posts shall conform to the provisions in Section 86-2.04, "Standards, Poles, Steel Pedestals and Posts", of the Standard Specifications and these Special Provisions.

Type 1A pole material shall be spun aluminum unless otherwise specified.

Poles installed at the near-right approach of each intersection shall be banded conforming to the strap and saddle method per Standard Plans RS4 for the emergency installation of stop signs.

Signal mast arms shall be installed in accordance with the "Signal Arm Connection Details" of the Standard Plans unless otherwise specified.

Internally Illuminated Street Name Sign (IISNS) mast arm shall be 10-foot long galvanized steel pole in accordance with County Standard No. 1200. The IISNS mast arm shall be constructed to prevent deformation or failure when subjected to 100 mph wind loads while carrying a 10' long and 2' height Edge-Lit LED IISNS.

If required by the serving electric utility, and confirmed by the Engineer, State Certified Electric Workers shall be utilized for the installation of standards, steel pedestals, and posts in accordance with State of California High Voltage Safety Orders.

#### **I. Conduits**

Conduit shall conform to the provisions in Section 86-2.05, "Conduit", of the Standard Specifications and these Special Provisions.

Conduits shall be Type 3, Schedule 80 Polyvinyl Chloride (PVC) conforming to UL Publication 651 requirements for Rigid Non-Metallic Conduit, for underground installation only.

Conduit depth shall not exceed 60 inches below finish grade.

Conduit size shall be 2 inches minimum unless otherwise specified. New conduit shall not pass through foundations or standards.

Conduit bends shall be factory bends. Bend radius for signal interconnect conduits shall be 3 feet minimum.

A pull rope and a bare #12 AWG wire shall be installed in conduits intended for future use.

Bell bushings are required for all conduit ends. The ends of conduits terminating in pull boxes and controller cabinets shall be sealed with sealing compound approved by the Engineer after conductors have been installed.

Conduits shall be installed via jacking or drilling method per Section 86-2.05C, "Installation", of the Standard Specifications.

### ***Trenching Installation***

The Engineer shall approve trenching installation on a case-by-case basis where conduit cannot be installed by jacking or drilling. Jacking or Drilling shall be attempted a minimum of three times prior to requesting trenching installation.

If ordered by the Engineer, all pavements shall be cut to a depth of 3 inches with an abrasive type saw or with a rock cutting excavator specifically designed for this purpose. Cuts shall be neat and true with no shatter surface outside the removal area.

Trench shall be 2 inches wider than the outside diameter of the conduit being installed however not exceeding 6 inches in total width. The conduit shall be placed in the bottom of the trench. Conduit depth shall be at a minimum of 30 inches below finished grade, with a minimum of 26 inches cover over the conduit.

The trench shall be backfilled with two-sack slurry to the finish grade before final paving. Prior to final paving, grind pavement centered along the length of the trench a minimum width of 3 feet and depth of 0.10 feet, and excavate backfilled to a depth of 0.30 feet below the final pavement surface. Final paving with commercial Type A ½" PG64-10 asphalt concrete.

If directed by the Engineer, the two-sack slurry backfill can be installed to a depth of 0.30 feet below the final pavement surface and cured for a minimum of two days prior to final paving if the trench area is not open to traffic.

## **J. Pull Boxes**

Pull boxes shall conform to the provisions in Section 86-2.06, "Pull Boxes", of the Standard Specifications and these Special Provisions.

Traffic pull boxes shall conform to the provisions in Section 86-2.06, "Traffic Pull Boxes", of the Standard Specifications and these Special Provisions.

Pull boxes shall have a "Fibrelyte" or equivalent cover and bolt down design. Cover shall have a non-skid surface.

Pull box covers shall be marked in accordance with Standard Plans ES-8 without the word "CALTRANS" unless the project is on State of California right of way.

Pull boxes shall be placed with their tops flush with surrounding finish grade or as directed by the Engineer.

Pull boxes shall be installed behind the curb or as shown on the plans and shall be spaced at no more than 500 feet intervals. The Engineer shall determine the exact locations.

Pull boxes installed in unimproved areas, locations not protected by concrete curb and gutter, shall be traffic pull box and marked with Type L markers.



**K. Conductors, Cables and Wiring**

Conductors and Cables shall conform to the provisions in Section 86-2.08, "Conductors and Cables", of the Standard Specifications and these Special Provisions.

Wiring shall conform to the provisions in Section 86-2.09, "Wiring", of the Standard Specifications and these Special Provisions.

Specific cabling and wiring requirements for various systems or components shall be in accordance with the Special Provisions entitled to each herein.

Signal cable shall be installed continuously without splicing from the controller cabinet to each traffic signal pole. Traffic signal conductors, multiple circuit conductors, and signal cable conductors shall not be spliced unless otherwise shown

All outer cable jacket for 12 conductor cable shall be removed from the traffic signal standard hand hole to the terminal block located at the side mount traffic signal head.

Where splice is required, Type C or Type T splice shall be used and insulated as shown in the Standard Plans, ES-13A.

Where splice is required, "Liquid Electrical Tape" or equivalent in black color shall be used to provide a watertight electrical insulating coating with "Method B" as shown in the Standard Plans, ES-13A.

Minimum luminaire wiring shall be No. 10 AWG, including wiring within poles and mast arms.

**L. Signal Interconnect Cable**

Signal Interconnect Cable shall conform to the provisions in Section 86-2.08E, "Signal Interconnect Cable (SIC)" of the Standard Specifications and these special provisions.

SIC shall be 6-pair, No. 20 AWG cable unless specified otherwise.

Submit a sample of the proposed SIC to the Engineer for approval prior to installation.

SIC shall be pulled without splices in between traffic signal controller cabinets. Provide 6 feet of slack in each pull box, 20 feet of slack inside the pull box adjacent to the controller cabinet, and 3 feet of slack inside the controller cabinet.

Solder each end of SIC conductor to a terminal lug using the hot iron method and connect them to the terminal block inside the controller cabinet in the following order:

<b>Terminal Block Number</b>	<b>SIC Conductor Color Coding (County)</b>	<b>SIC Conductor Color Coding (Caltrans)</b>
1	White (White / Blue pair)	White (Black / White pair)
2	Blue (White / Blue pair)	Black (Black / White pair)
3	White (White / Orange pair)	Red (Black / Red pair)
4	Orange (White / Orange pair)	Black (Black / Red pair)
5	White (White / Green pair)	Brown (Black / Brown pair)
6	Green (White / Green pair)	Black (Black / Brown pair)

7	White (White / Brown pair)	Blue (Black / Blue pair)
8	Brown (White / Brown pair)	Black (Black / Blue pair)
9	White (White / Slate pair)	Green (Black / Green pair)
10	Slate (White / Slate pair)	Black (Black / Green pair)
11	Red (Red / Blue pair)	Yellow (Black / Yellow pair)
12	Blue (Red / Blue pair)	Black (Black / Yellow pair)

**M. Bonding and Grounding**

Bonding and grounding shall conform to the provisions in Section 86-2.10, "Bonding and Grounding", of the Standard Specifications and these Special Provisions.

Grounding jumper shall be attached by a 3/16 inch or larger brass bolt in the signal standard or controller pedestal and shall be run to the conduit, ground rod or bonding wire in the adjacent pull box.

Grounding jumper shall be visible after cap has been poured on foundation.

For equipment grounding jumper a No. 8 bare copper wire shall run continuously in all circuits except a No. 12 bare copper wire shall run continuously in conduits that contain only signal interconnect cable and/or loop detector cable.

**N. Service**

Service shall conform to the provisions in Section 86-2.11, "Service", of the Standard Specifications and these Special Provisions.

Service equipment enclosure shall be Type III-CF, as shown on the Standard Plans, ES-2F, and shall conform to the following:

1. 120 / 240 volt, 2 meter service unless otherwise shown on the plans.
2. Circuit breakers required:
  - 2 - 100 Amp 2 pole (signal main and lighting main)
  - 1 - 30 Amp 1 pole (luminaires)
  - 1 - 30 Amp 1 pole (signals)
  - 1 - 20 Amp 1 pole (illuminated street name signs)
  - 1 - 15 Amp 1 pole (luminaire photoelectric control)
  - 1 - 15 Amp 1 pole (street name sign photoelectric control)
  - 1 - 20 Amp 1 pole (for each beacon, if applicable)
3. Cabinet shall be fabricated from aluminum sheeting and finish shall be anodic coating in accordance with Section 86-3.04A "Cabinet Construction".
4. Circuit breakers shall be marked with identifying labels for each circuit breaker.

Type V photoelectric control contactor and test switch assembly shall be installed in the service cabinet. Photoelectric control contactors shall be as follows:

1. Luminaires - 60 Amp electrically held contact
2. Street name signs - 30 Amp electrically held contact

A GFCI outlet shall be installed on the interior side of service cabinet door.

Photo Electric Control assembly shall be installed within the circuit breaker compartment of the service equipment enclosure, and accessible to the Engineer after installation of electrical meters.

Direct burial service conductors are not allowed.

The Contractor shall be responsible for contacting the power company, arranging and providing for the electrical service connection, and ensuring that adequate notice is provided to the serving electric company in advance of need. *The County of Riverside will pay all electric company fees required.*

The service equipment enclosure shall be a minimum of 15 feet from the controller cabinet, and a minimum of 10 feet from all utility poles, unless otherwise directed by the Engineer.

### ***Service Identification***

The service address shall be shown on the front upper panel of the service equipment enclosure, and the meters shall be labeled "LS3" (lighting meter) and "TC1" (signal meter) by lettering applied to the exterior of the enclosure in accordance with these special provisions, or as directed by the Engineer.

Lettering markings shall be black with a two-inch minimum size in block letter form. Markings shall be applied to a brushed aluminum, stainless steel, or other non-corroding metallic plate, as approved by the Engineer. Plate shall be white in color. All paint and markings shall conform in all respects to Federal Specification TT-E-489, latest revision, Class A, Air Drying. Said plate shall be affixed in a permanent manner by riveting or with stainless steel bolts and nuts. Bolts shall be peened after tightening. All materials used for affixing address plate shall be non-corroding. The Engineer shall approve all alternate materials and methods prior to installation.

### **O. Testing**

Testing and Field Testing shall conform to the provisions in Section 86-2.14, "Testing", of the Standard Specifications and these Special Provisions.

Specific testing requirements for various systems and components shall be in accordance with the Special Provisions entitled to each herein.

The complete controller assembly and Battery Backup System shall be delivered to the following location or location as directed by the Engineer for testing:

Traffic Signal Shop  
Riverside County Transportation Department  
McKenzie Highway Operations Center  
2950 Washington Street  
Riverside, California 92504  
Telephone (951) 955-6894

A minimum of 15 working days for operational testing and adjustment is required. An additional 15 working days period shall be allowed for retesting should the equipment fail.

The conflict monitor unit shall be tested in the field before signal turn on.

### **P. Advanced Traffic Controller**

Vendor will provide an advanced traffic signal controller. The vendor will furnish and install a McCain ATC eX controller or City Traffic Engineer's approved equal. If at any period during the controller warranty period City staff cannot successfully re-load the controller's software or program timing parameters, the vendor will be responsible for the exchange or repair of that controller. McCain ATC eX controller or approved equal shall

include full operation of a typical eight phase intersection and full communication via an interconnected Ethernet, serial or wireless communication infrastructure to the City of Corona's current central control software. Communication shall include full live traffic signal status, full upload and download of traffic signal controller's timing parameters, live operational and alarm alerts, and the ability to download the controller's operational logs. The ATC eX controller or approved equal shall be programmed with the latest approved firmware version of the Omni eX software or approved equal from the manufacturer. The McCain ATC eX controller or approved equal shall contain an Ethernet, serial, and USB ports for use when communicating with the controller for programming timing parameters or firmware upgrades. The data entry keypads shall contain 4 directional arrows, numbers 0 through 9, letters A through F, ESC, ENT, NEXT, "\*", "+", "-", YES and NO keys similar to a 2070 style controller.

**Q. Controller Assembly**

Controller assembly shall conform to the provisions in Section 86-3, "Controller Assemblies", of the Standard Specifications and these Special Provisions.

Controller assembly shall be McCain ATC eX 2070 controller assembly.

The controller shall be capable of being rack mounted into a Standard 332 cabinet. The ATC eX 2070 controller shall connect to the cabinet via the C1 connector. The c1 connector will be wired for a standard 170E controller and fit the appropriate pin configurations. The ATC eX 2070 controller shall contain a 2070-ATC CPU Module, 2070-2E Field I/O Module, 2070-3B LCD/Front Panel Module with an 8x40 character display, and a 3x4 and a 4x4 data entry keypads, and a 2070-4A Power Supply.

The controller unit and controller cabinet shall be manufactured and furnished by the same manufacturer to form a complete functional controller system capable of providing the traffic signal operation specified. All traffic control equipment to be furnished shall be listed on the California Department of Transportation Qualified Products List.

The controller unit and controller cabinet manufacturer or supplier shall perform operational and functional testing of the supplied controller assembly and additional supplied equipment in accordance with the State of California Department of Transportation's Transportation Electrical Equipment specifications (TEES), and a Certificate of Compliance shall be issued for each successfully tested controller assembly and additional supplied equipment.

Modify traffic signal controller assembly if necessary and provide any necessary auxiliary equipment and cabling to achieve the intended traffic signal operation as shown on the plans. The Contractor shall make all field wiring connections to the terminal blocks inside the controller cabinet.

A technician who is qualified to work on the controller assembly from the controller manufacturer or their representative shall install the program module and program the signal controller in accordance with the Engineer provided signal timing sheets, and to be present when the equipment is turned on.

**R. Vehicle Signal Assemblies**

Vehicle signal assemblies and auxiliary equipment shall conform to the provisions in Section 86-4, "Traffic Signal Faces and Fittings", of the Standard Specifications and these Special Provisions.

Signal sections, backplates, visors and signal mounting assemblies shall be the metal type and shall be made from the same manufacturer. The section assemblies shall be uniform in appearance and alignment.

Backplates shall be louvered. Visors shall be the "tunnel" type. Top opening of signal sections shall be sealed with neoprene gaskets.

Vehicle signal indications shall be 12-inch diameter Light Emitting Diode (LED) modules in accordance with the following:

1. All circular LED modules shall comply with Institute of Transportation Engineers (ITE) Vehicle Traffic Control Signal Heads (VETCH) - LED Circular Supplement, Adopted June 27, 2005.
2. All arrow LED modules shall comply with ITE VETCH - LED Vehicle Arrow Traffic Signal Supplement, Adopted July 1, 2007.
3. All modules shall fit in existing signal housings without the use of special tools.
4. All modules shall be certified in the Intertek LED Traffic Signal Modules Certification Program and be labeled with the ETL Verified Label as follows:



5. Luminous intensity requirements of the VTCSH must be met across the entire temperature range from - 40°C to + 74°C, (-40°F to +165°F).
6. The following cable colors shall be used for the AC power leads on all modules: white for common, red for the red module line, yellow for the yellow module line, and brown for the green module line.
7. The AC power leads shall exit the module via a rubber grommet strain relief, and shall be terminated with quick connect terminals with spade tab adapters. The leads shall be separate at the point at which they leave the module.
8. All external wiring used in the module shall be anti-capillary type cable to prevent the wicking of moisture to the interior of the module.
9. All power supplies shall be coated for additional moisture and thermal protection.
10. The module shall have an incandescent, non-pixelated appearance when illuminated.
11. Nominal power usage is measured at 25°C, 120 VAC. For the 8 inch modules, it shall not exceed 8 watts for Red, 10 watts for Yellow, and 8 watts for Green modules. For the 12 inch modules, it shall not exceed 8 watts for Red, 13 watts for Yellow, and 10 watts for Green modules. For the arrows, it shall not exceed 8 watts for Red, 13 watts for Yellow, and 8 watts for Green modules.
12. All modules shall use LEDs that have been manufactured with materials that have industry acceptance as being suitable for uses in outdoor applications. At no time is the use of LEDs that utilize AlGaAs technology acceptable.
13. The external lens shall have a smooth outer surface to prevent the buildup of dirt and dust and shall be designed to minimize the potential for sun phantom signals.
14. The circular LED module lens material must be tinted . A tinted transparent film or coating is not permitted.
15. A module shall be sealed against dust and moisture intrusion, including rain and blowing rain per Mil-Std-810F Method 506.4, Procedure 1.
16. Arrow modules shall be clearly marked with the phrase "Suitable for mounting in any orientation".
17. Modules shall be repaired or replaced if the module fails to function as intended due to workmanship or material defects within warranty period.

18. Modules shall be repaired or replaced if the module exhibit luminous intensities less than the minimum specified values within 60 months of the date of delivery.
19. The Manufacturer shall clearly disclose the country in which the factory of module origin is located, the name of the company or organization that owns the factory including all of its parent companies and/or organizations, and their respective country of corporate citizenship.

**S. Pedestrian Signal Assemblies**

Pedestrian signals assemblies shall conform to the provisions in Section 86-4.03, "Pedestrian Signal Faces", of the Standard Specifications and these Special Provisions.

Pedestrian Signal Mounting Assemblies and Pedestrian Signal Housings shall be made from the same manufacturer and the section assemblies shall be uniform in appearance and alignment.

Pedestrian signals shall be provided with a polycarbonate egg crate or Z-crate screen.

Pedestrian signals shall be equipped with light emitting diode countdown pedestrian module in accordance to the following:

1. It shall comply with ITE specification: Pedestrian Traffic Control Signal Indications (PTCSI) Part 2: LED Pedestrian Traffic Signal Modules, Adopted March 19, 2004.
2. All modules shall fit in existing signal housings without the use of special tools.
3. All modules shall be certified in the Intertek LED Traffic Signal Modules Certification Program and be labeled with the ETL Verified Label as follows:



The PTCSI does not cover the countdown features of countdown pedestrian signal LED modules. The countdown features shall incorporate the following:

1. Fully compliant to NEMA TS-1, NEMA TS-2, Type 170, and Type 2070 traffic signal controller specifications.
2. The countdown portion of the pedestrian (ped) module shall have a high off-state input impedance so as not to provide a load indication to conflict monitors and interfere with the monitoring of the pedestrian signal. The input impedance of the countdown circuitry shall maintain a voltage reading above 25 VAC to the conflict monitor for up to four units connected on the same channel.
3. The countdown drive circuitry shall not be damaged when subjected to defective load switches providing a half wave signal input.
4. The countdown ped module shall have an internal conflict monitor circuit preventing any possible conflicts between the Hand, Person, and Countdown signal indications. It shall be impossible for the display to countdown during a solid Hand indication.
5. Per CA MUTCD Manual section 4E.07: "The countdown pedestrian signal shall display the number of seconds remaining until the termination of the pedestrian change interval. Countdown displays shall not be used during the walk interval or during the red clearance interval of a concurrent vehicular phase".

6. The countdown ped module shall have a micro-processor capable of recording its own time when connected to a traffic controller. It shall be capable of displaying the digits 0 through 99.
7. When power is first applied or restored to the ped module, the countdown display will be blank during the initial cycle while it records the countdown time using the walk (person) and don't walk (flashing hand) signal indications. The normal hand and person icons shall be displayed during this cycle.
8. The countdown ped module shall continuously monitor the traffic controller for any changes to the pedestrian phase time and re-program itself automatically if needed.
9. The countdown ped module shall register the time for the walk and clearance intervals individually and shall begin counting down at the beginning of the pedestrian clearance interval. The digits shall not flash during the countdown.
10. When the flashing hand becomes solid, the ped module shall display 0 for one second and then blank-out. The display shall remain dark until the beginning of the next countdown.
11. In the event of a pre-emption, the countdown ped module shall skip the remaining time, reach 0 at the same time as the flashing Hand becomes solid, and remain dark until the next cycle.
12. In the cycle following preemption call, the signal shall display the correct time and not be affected by the reduced previous cycle. The countdown shall remain synchronized with the signal indications and always reach 0 at the same time as the flashing Hand becomes solid.
13. If a pedestrian button is activated during the clearance interval, some controllers can change to a second walk cycle without a don't walk phase. The countdown module shall also be capable of consecutive walk cycles. The display digits will be blank during the second walk and countdown properly during the second flashing hand.
14. The countdown ped module shall not display an erroneous or conflicting time when subjected to defective load switches. Should there be a short power interruption during the ped clearance interval or if voltage is applied to both the hand and person simultaneously the display will go to "0" then blank.
15. The countdown ped module shall have accessible dip-switches for the user selectable options. The unit shall have a removable plug on the rear allowing easy access to control the user selectable functions. The countdown is disabled when all the switches are in the "ON" position. The unit shall be shipped from the factory with the specified default setting.
16. Switch 1 – Blank Cycle Following a Timing Change – Factory default is "OFF". When this switch is "OFF" the unit will allow the time to be displayed normally during the cycle following a truncated timing such as a preemption call. The countdown shall be capable of displaying the correct time and not affected by the previous reduced cycle. The unit will require 2 consecutive reduced cycles of identical value to validate and record a new time setting. If the timing is extended, the unit will record it immediately. In the "ON" position when a change in timing is detected the unit will blank out during the following cycle while the new cycle time is measured and recorded if confirmed.
17. Switch 2 – Disables Auto-sync Mode- Factory default setting is "OFF". When this switch is in the "OFF" position the auto-sync is enabled. When the clearance interval begins and the initial flash of the hand is not in sync with the walk signal the unit will measure the offset and reduce the duration of the first second by the value of the offset. This will ensure the countdown reached zero at the same time as the flashing hand becomes solid. In the "ON" position there is no time correction when the flashing hand is in offset with the walk signal. The duration of the first second will not be reduced and the hand will appear solid shortly before the countdown reaches zero.
18. Switch 3 – Countdown Starts with Flashing Hand Signal – Factory default setting is "ON". When this switch is "ON" the countdown begins when the hand signal is turned on. With this switch "ON" and the auto-sync mode enabled a short power interruption will have no effect on the countdown display. With switch 3 in the "OFF" position the countdown begins when the walk signal is turned off. This eliminates the effect of an offset hand signal. When switch 3 is in the "OFF" position the auto-sync switch 2 has no

effect on the countdown. In this mode if the power to the walk signal is interrupted, the unit will interpret this as the start of the clearance interval and will display the countdown time for 2 seconds before the operation is cancelled. The countdown will resume with the normal ending of the walk signal.

19. Switch 4 – Stores Time Value in Memory, Immediate. Restart. - Factory default setting is “OFF”. When this switch is in the “OFF” position and power is removed from the unit, the time value stored in the unit is erased. The unit will need to run a dark cycle before it can display the countdown again. In the “ON” position the countdown timing is stored in memory. Following a power interruption, the unit will restart with the stored value and not remain dark during the learning cycle. If the value is different after restart, it will be recorded and displayed correctly at the following cycle.
20. Switch 5 – All LEDs “ON”, Test Mode – Factory default setting is “OFF”. With this switch in the “ON” position all LEDs are turned on simultaneously. With both switches 4 and 5 in the “ON” position the LED test mode will also scan the 7 individual segments of both digits.
21. The countdown shall be disabled when all switches are placed in the “ON” position.
22. Nominal power usage for Ped Modules at 25°C (77°F), 120 VAC input shall not exceed the values shown in Table 1.

**Table 1 -- Nominal Power of Pedestrian Signals**

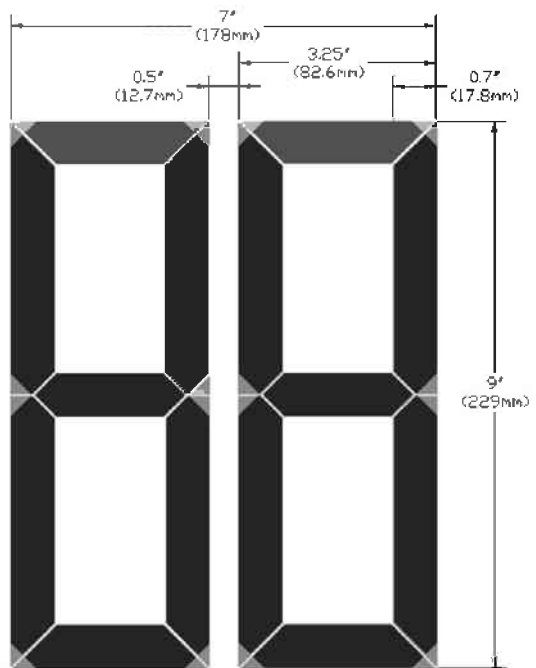
Size	Description	Wattage @ 25°C		
		Hand	Person	Countdown <sup>1</sup>
16"x18"	Side by Side Hand & Person	8	7	N/A
16"x18"	Hand & Person Overlay with Countdown	9	9	8

<sup>1</sup> Wattage for the countdown is measured when the digits 18 are displayed.

23. All wiring shall meet the requirements of Section 13.02 of the VTCSH standard. Secured, color coded, 600V, 18 AWG jacketed wires, 1 meter (39 in) in length, conforming to the NFPA 70, National Electrical Code, and rated for service at +105°C, shall be provided.
24. The following color scheme shall be used for the ped module’s AC power leads: Orange for the upraised hand, Blue for the walking person, and White for common. The countdown portion of the LED ped module shall be internally wired to the hand and walking person power.
25. The AC power leads shall exit the ped module via a rubber grommited strain relief, and shall be terminated with insulated female quick connect terminals with spade / tab adapters. The leads shall be separate at the point at which they leave the ped module.
26. All external wiring utilized in the ped modules shall be anti-capillary type wire to prevent the wicking of moisture to the interior of the ped module.
27. The Hand and Person Icons shall utilize separate power supplies. On countdown products, the countdown ped module must have its own power supply but may take the incoming AC power from the hand / person AC signal lines. All power supplies shall be located inside the ped module.
28. All power supplies shall be conformally coated for additional protection.
29. Off State Voltage Decay: When the hand or person icon is switched from the On state to the Off state the terminal voltage shall decay to a value less than 10 VAC RMS in less than 100 milliseconds when driven by a maximum allowed load switch leakage current of 10 milliamps peak (7.1 milliamps AC).



30. For a minimum period of 60 months, measured at 80 to 135 VAC RMS and over the ambient temperatures of -40°C to +74°C (-40°F to +165°F), the minimum maintained luminance values for the ped modules, when measured normal to the plane of the icon surface, shall not be less than:
- Walking Person, White: 2,200 cd/m<sup>2</sup>
  - Upraised Hand, Portland Orange: 1,400 cd/m<sup>2</sup>
  - Countdown Digits, Portland Orange: 1,400 cd/m<sup>2</sup>
31. The external lens shall have a textured outer surface to reduce glare.
32. Icons that are printed on the lens shall be on the interior surfaces in order to prevent scratching and abrasion to the icons.
33. All icons and numbers shall have a uniform incandescent non-pixelated appearance.
34. All exposed components of a ped module shall be suitable for prolonged exposure to the environment, without appreciable degradation that would interfere with function or appearance. As a minimum, selected materials shall be rated for service for a period of a minimum of 60 months in a south-facing Arizona Desert installation.
35. All LEDs used to illuminate the ped module shall use material that has industry acceptance for use in outdoor applications. At no time is the use of LEDs that utilize AlGaAs technology acceptable.
36. The countdown display shall consist of two 7 segment digits as shown below. All countdown display digits shall be 9 inches in height for use in all size crosswalks in compliance with MUTCD recommendations.



**Figure 2: Countdown Display**

37. Ped modules shall be repaired or replaced if the ped module fails to function as intended due to workmanship or material defects within warranty period.
38. Ped modules shall be repaired or replaced if the ped module exhibit luminous intensities less than the minimum specified values within 60 months of the date of delivery.
39. The manufacturer shall clearly disclose the country in which the factory of ped module origin is located, the name of the company or organization that owns the factory including all of its parent companies and organizations, and their respective country of corporate citizenship.

**T. Pedestrian, Bicycle and Equestrian Push Buttons**

Pedestrian, bicycle, and equestrian push buttons shall conform to the provisions in Section 86-5.02, "Pedestrian Push Button Assemblies", of the Standard Specifications and these Special Provisions.

Push button assembly shall be Type B per Standard Plans ES-5C.

Push button housing shall be die-cast or permanent mold cast aluminum powder coated frame with stainless steel inserts and sign screws.

Push button sign shall be white powder coat base with black heat cured ink. Right and left arrow signs shall be doubled sided.

Push button shall be Polara Engineering, Inc. model BDLM2-Y or approved equal.

Push button shall utilize solid-state Piezo switch technology, pressure activated, two-tone audible, visual LED confirmation of actuation and shall be ADA compliant.

The equestrian push buttons (EPB) shall be installed at 6 feet above finish grade or as directed by the Engineer. The Engineer shall approve the EPB placement on each pole prior to installation.

**U. Detectors**

Detectors shall conform to the provisions in Section 86-5, "Detectors", of the Standard Specifications and these Special Provisions.

Delay timers shall delay calls only during display of the associated red or yellow indications. If a vehicle departs the area of detection prior to expiration of the assigned delay period, the timer shall reset and no call shall be placed upon the controller. During display of the associated green indication, detectors shall operate in the present mode and calls shall not be delayed.

**Video Detection**

The contractor shall furnish and install video detection cameras (VDC), video detection processors (VDP), extension modules (EM), access module (AM), an industry standard 3-button USB mouse, a drawer mounted 17 inch LCD monitor, surge suppressors, and all necessary cabling and auxiliary equipment to make the video detection systems fully functional for the intended operation. The Contractor shall furnish an advanced lens adjustment module (LAM), a spare VDC, a spare EM, and a spare VDP to the Engineer.

All equipment supplied shall come from and qualified by the VDP supplier to ensure proper system operation.

The VDC shall attach to the top of luminaire mast arm using mounting bracket provided by manufacturer, or the backside of signal mast arm using Pelco Astrobrac with 6' extension or approved equal. The Engineer shall approve the final camera placements.

The video detection systems shall be installed by supplier factory certified installers per recommended method provided in the supplier's installation manuals. Proof of factory certification shall be provided.

Video Detection Zones:

Placement of detection zones shall be done by using the supplied USB mouse connected to the VDP. Detection zones are drawn on the video image from the video camera displayed on a video monitor using the menu and graphical interface built into the VDP. The menu shall facilitate placement of detection zones and setting of zone parameters or to view system parameters.

Detection zone setup shall not require site-specific information such as latitude, longitude, date and time to be entered into the system. No separate computer shall be required to program the detection zones.

Each detection zone shall be user definable in size and shape to suit the site and the desired vehicle detection region. A detection zone shall be approximately the width and length of one car.

A single detection zone shall be able to replace multiple inductive loops and the detection zones shall be OR'ed as the default or may be AND'ed together to indicate vehicle presence on a single phase of traffic movement.

The VDP shall provide a minimum of 24 channels of vehicle presence detection/detection zones per camera through a standard detector rack edge connector and one or more EMs.

The Video Detection System shall be in compliance with California State Assembly Bill 1581. The system will be able to discriminate between bicycles and automobiles and be able to send bicycle and vehicle actuations from the same lanes to different detection outputs. Additionally the system shall allow an extension time for bicycles that will not apply to vehicular traffic.

Functional Capabilities:

System must have a single point access to multiple rack-mounted video detection units. The access device shall provide interface capabilities to enable multiple rack-mounted video detection processors to be locally and remotely accessed from a single point via one set of user interface devices.

The camera shall be able to transmit the composite video signal, with minimal signal degradation, up to 1000 feet under ideal conditions.

The EM shall be plugged into the appropriate slot in the detector rack to avoid the need of rewiring the detector rack. The extension module shall be connected to the VDP by an 8-wire cable with modular connectors.

The EM and VDP communications shall be accommodated by methods using differential signals to reject electrically coupled noise. The EM shall be available in both 2 and 4 channel configurations programmable from the VDP.

The VDP shall have video input in NTSC composite video format and shall be digitized and analyzed in real time.

The VDP shall have a nine-pin RS232 port that is multi-drop compatible for communications with an external computer. The VDP shall be able to accept new detector patterns from and send its detection patterns to an external computer through this RS-232 port. A Windows™ based software designed for local or remote connection for uploading and downloading data, and providing video capture, real-time detection indication and detection zone modification capability shall be provided with the system.

The VDP shall store up to three different detection zone patterns within the VDP memory. The VDP's memory shall be non-volatile to prevent data loss during power outages. The VDP shall continue to operate (e.g. detect vehicles) using the existing zone configurations even when the operator is defining/modifying a zone pattern. The new zone configuration shall not go into effect until the operator saves the configuration. Each configuration can be uniquely labeled for identification and the current configuration letter is displayed on the monitor. The selection of the detection zone pattern for current use shall be done through a local menu selection or remote computer via RS-232 port. It shall be possible to activate a detection zone pattern for a camera from VDP memory and have that detection zone pattern displayed within 1 second of activation.

The VDP shall provide dynamic zone reconfiguration to enable normal detector operation of existing channels except the one where a zone is being added or modified during the setup process. The VDP shall output a constant call on any detection channel corresponding to a zone being modified.

The VDP shall detect vehicles in real time as they travel across each detector zone.

The VDP shall output a constant call for each enabled detector output channel if a loss of video signal occurs. The VDP shall output a constant call during the background learning period. The background learning period shall be not more than three minutes.

The VDP shall be capable of detecting a low-visibility condition automatically, such as fog, and place all defined detection zones in a constant call mode. The VDP shall automatically revert to normal detection mode when the low-visibility condition no longer exists. A user-selected output shall be active during the low-visibility condition that can be used to modify the controller operation if connected to the appropriate controller input modifier(s).

Detection shall be at least 98% accurate in good weather conditions and at least 96% accurate under adverse weather conditions (rain, snow, or fog). Detection accuracy is dependent upon site geometry; camera placement, camera quality and detection zone location, and these accuracy levels do not include allowances for occlusion or poor video due to camera location or quality.

Detection zone outputs shall be configurable to allow the selection of presence, pulse, extend, and delay outputs. Timing parameters of pulse, extend, and delay outputs shall be user definable between 0.1 to 25.0 seconds.

Up to six detection zones shall be capable to count the number of vehicles detected. The count value shall be internally stored for later retrieval through the RS-232 port. The data collection interval shall be user definable in periods of 5, 15, 30 or 60 minutes.

System software shall

- Utilize a dual redundant hybrid tracking algorithm to enhance vehicle presence detection and data collection.
- Include a moving shadow and occlusion rejection algorithm that is activated by selection of a drop down menu tab.
- Include a menu selectable zone type labeled "Bike" that is specifically designed to detect bicycles.
- Include a virtual QWERTY keyboard that is present when performing any labeling functions for the detection zones and cameras.
- Include the ability to copy completed zones with one mouse click, drag and drop single zones, rows of zones together and entire detection configurations.

#### VDP & EM Hardware:

The VDP and EM shall be specifically designed to mount in a standard NEMA TS-1, TS-2, 2070 ATC, 170 type detector rack, using the edge connector to obtain power and provide contact closure outputs. No adapters shall be required to mount the VDP or EM in a standard detector rack. Detector rack rewiring shall not be required or shall be minimized.

Both VDP and EM shall operate in a temperature range from -34°C to +74°C and a humidity range from 0% RH to 95% RH, non-condensing.

Both VDP and EM shall be powered by 12 or 24 volts DC. These modules shall automatically compensate for the different input voltages.

Both VDP and EM shall include detector output pin out compatibility with industry standard detector racks.

Both VDP and EM shall have a detector test switch on the front panel to allow the user to place calls on each channel. The test switch shall be able to place either a constant call or a momentary call depending on the position of the switch.

The VDP power consumption shall not exceed 300 milliamps at 24 VDC. The EM power consumption shall not exceed 120 milliamps at 24 VDC.

The VDP shall utilize flash memory technology to enable the loading of modified or enhanced software through the RS232 port without modifying the VDP hardware.

The VDP shall include the following on the front panel:

- A multi-drop compatible RS232 port, a 9-pin "D" subminiature connector, for serial communications with a remote computer.
- Detection indication such as LED for each channel of detection that display detector outputs in real time when the system is operational.
- One or two BNC video input connection suitable for RS170 video inputs as required. The video input shall include a switch selectable 75-ohm or high impedance termination to allow camera video to be routed to other devices, as well as input to the VDP for vehicle detection. Video must be inputted via a BNC connector on the front face of the processor. RCA type connectors/jacks for video input are not allowed. Video shall not be routed via the edge connectors of the processor.
- One BNC video output providing real time video output that can be routed to other devices. A RCA type connector/jack for video output is not allowed.

Video Detection Camera:

The camera shall be housed in a weather-tight sealed enclosure consists of the following:

1. The enclosure shall be made of 6061 anodized aluminum.
2. The enclosure shall be field rotatable to allow proper alignment between the camera and the traveled road surface.
3. The enclosure shall be equipped with a sunshield. The sunshield shall include a provision for water diversion to prevent water from flowing in the camera's field of view. The camera enclosure with sunshield shall be less than 6" diameter, less than 18" long, and shall weigh less than 6 pounds when the camera and lens are mounted inside the enclosure.
4. The enclosure shall be design so that the pan, tilt and rotation of the camera assembly can be accomplished independently without affecting the other settings.
5. The enclosure shall include a proportionally controlled Indium Tin Oxide heater design that maximizes heat transfer to the lens. The output power of the heater shall vary with temperature, to assure proper operation of the lens functions at low temperatures and prevent moisture condensation on the optical faceplate of the enclosure.
6. The glass face on the front of the enclosure shall have:
  - a. An anti-reflective coating to minimize light and image reflections.
  - b. A special coating to minimize the buildup of environmental debris such as dirt and water.

The camera shall produce a useable video image of the bodies of vehicles under all roadway lighting conditions, regardless of time of day. The minimum range of scene luminance over which the camera shall produce a useable video image shall be the minimum range from nighttime to daytime, but not less than the range 1.0 lux to 10,000 lux.

The imager luminance signal to noise ratio shall be more than 50 dB. In harsh backlit conditions, vehicles can be detected flawlessly with >100dB of dynamic range.

The camera shall be digital signal processor based and shall use a CCD sensing element and shall output color video with resolution of not less than 540 TV lines. The CCD imager shall have a minimum effective area of 811(h) x 508(v) pixels.

The camera shall include an electronic shutter control based upon average scene luminance and shall be equipped with an auto-iris lens that operates in tandem with the electronic shutter.

The camera shall utilize automatic white balance.

The camera shall include a variable focal length lens with variable focus that can be adjusted, without opening up the camera housing, to suit the site geometry by means of a portable interface device designed for that purpose and manufactured by the detection system supplier.

The horizontal field of view shall be adjustable from 5.4 to 50.7 degrees. This camera configuration may be used for the majority of detection approaches in order to minimize the setup time and spares required by the user. The lens shall have a 27x zoom.

The lens shall also have an auto-focus feature with a manual override to facilitate ease of setup.

The camera shall incorporate the use of preset positioning that store zoom and focus positioning information. The camera shall have the capability to recall the previously stored preset upon application of power.

The camera electronics shall include automatic gain control to produce a satisfactory image at night.

When mounted outdoors in the enclosure, the camera shall operate satisfactorily in a temperature range from -34 °C to +60 °C and a humidity range from 0% RH to 100% RH. Measurement of satisfactory video shall be based upon VDP system operation.

The camera shall be powered by 120-240 VAC 50/60 Hz. Power consumption shall be 30 watts or less under all conditions.

The camera shall view approaching vehicles at a distance not to exceed 350 feet for reliable detection (height to distance ratio of 1:10). Camera placement and field of view shall be unobstructed and as noted in the installation documentation provided by the supplier.

There shall be at least 2 options for camera set up, diagnostic testing, and viewing video when it is mounted on mast arm or pole using lens adjustment module supplied by the VDP supplier:

1. Connected directly to the camera.
2. Connected to the coaxial cable from the cabinet.

The video signal shall be fully isolated from the camera enclosure and power  
Cable terminations at the camera for video and power shall not require crimping tools.

No BNC or other connector shall be used for the coaxial video cable termination at the camera.

The power connection at the camera shall use connector terminations that only require the use of wire strippers and a standard screwdriver. No special crimping tools or other types of terminations shall be used.

A weather-proof protective cover shall be provided shall be provided to protect all terminations at the camera. No special tooling shall be required to remove or install the protective cap.

#### Cabling and Cable Connections:

The coaxial cable to be used between the camera and the VDP in the traffic cabinet shall be Belden 8281. The coax cable shall be a continuous unbroken run from the camera to the VDP. This cable shall be suitable for installation in conduit or overhead with appropriate span wire. A BNC plug connector shall be used at the cabinet end. The coaxial video cable shall be stripped and terminated at the camera and cabinet per manufacturers' instructions (no BNC or other connector shall be used at the camera). The coaxial cable, BNC connector used at the cabinet termination, and crimping tool shall be approved by the supplier of the video detection system and the manufacturer's instructions must be followed to ensure proper connection.

The power cable shall be three 16 AWG conductor cable with a minimum outside diameter of 0.325 inch and a maximum diameter of 0.490 inch. The power cable shall be terminated at the camera per manufacturers' instructions and shall only require standard wire strippers and a screw driver for installation (no special connectors or crimping tools shall be used for installation). The cabling shall comply with the National Electric Code, as well as local electrical codes. Cameras shall not acquire power from the luminaire.

A Din Rail mounted AC power panel assembly shall be supplied by the video detection manufacturer that will include a minimum of one convenience receptacle, four camera chassis ground connections, four camera AC neutral (AC-) connections, four 2 amp camera circuit breakers for hot (AC+) connections, and one AC source connection for Line, Neutral and Ground wires. A Din Rail video surge suppression protection panel assembly shall also be supplied by the video detection manufacture. One panel shall accommodate up to six EDCO surge suppressors. This equipment shall be installed, including termination of all necessary wiring, per the video detection manufacturer requirements for the intended use.

Maintenance and Support:

The supplier shall maintain an adequate inventory of parts to support maintenance and repair of the system. These parts shall be available for delivery within 30 days of placement of an acceptable order at the supplier's then current pricing and terms of sale for said parts.

The supplier shall maintain an ongoing program of technical support for the access unit and video detection system. This technical support shall be available via telephone, or via personnel sent to the installation site upon placement of an acceptable order at the supplier's then current pricing and terms of sale for on-site technical support services.

Installation or training support shall be provided by factory-authorized representative.

All product documentation shall be written in the English language.

**V. LED Luminaires**

Luminaires shall conform to the provisions in Section 86-6, "Lighting", of the Standard Specifications and these Special Provisions.

Luminaires shall conform to the following Standards and Special Provisions:

Standards

- ANSI/NFPA 70, National Electrical Code
- FCC 47 CFR Part 15, Code Of Federal Regulations (CFR) testing standard for electronic equipment
- IEEE C62.41, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- IESNA LM-79, Electrical and Photometric Measurements of Solid-State Lighting Products
- IESNA LM-80, Approved Method for Measuring Lumen Maintenance of LED Light Sources
- IESNA TM-15, Luminaire Classification System for Outdoor Luminaires
- NEMA SSL 3-2010, High-Power White LED Binning for General Illumination
- UL1598, Standard for Safety of Luminaires

Led Luminaires

Material and specifications for each luminaire are as follows:

- Luminaire shall be Navion LED, model NVN-AE-03-E-U-T3-10K-U-AP or approved equal.
- Each luminaire shall consist of an assembly that utilizes LEDs as the light source. The complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).

- Each luminaire shall be rated for a minimum operational life of 60,000 hours at an average operating time of 11.5 hours per night at 40°C (104°F).
- The rated operating temperature range shall be -40°C (-40°F) to +40°C (104°F).
- Each luminaire is capable of operating above 50°C (122°F), but not expected to comply with photometric requirements at elevated temperatures.
- Photometry must be compliant with IESNA LM-79.
- Each luminaire shall meet all parameters of this specification throughout the minimum operational life when operated at the average nighttime temperature.
- The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
- Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
- Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires in wet locations.

### Technical Requirements

#### 1. Electrical

- a. Luminaire shall have a minimum efficacy of 70 lumens per watt and shall consume no more than 160 watts. The luminaire shall not consume power in the off state.
- b. Operation Voltage: The luminaire shall operate from a 60 HZ  $\pm$ 3 HZ AC line over a voltage ranging from 108 VAC to 305 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
- c. Power Factor: The luminaire shall have a power factor of 0.9 or greater.
- d. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent.
- e. Surge Suppression: The luminaire on-board circuitry shall include surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD protects the luminaire from damage and failure for common (Line-to-Ground) and differential (Line-to-Line) mode transient peak currents up to 10 kA (minimum). SPD conforms to UL 1449. SPD performance has been tested per procedures in ANSI/IEEE C62.41-2:2002 category C high exposure and ANSI C136.2 10kV BIL. The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
- f. Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
- g. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.

#### 2. Photometric Requirements

- a. Optical Assemblies: LEDs shall be provided with discreet over optical elements to provide an IESNA Type III distribution. Additional distributions for glare control shall be utilized when direct source must be mitigated. Mitigation must take place without external shielding elements. Optical assemblies shall have a minimum efficiency of 85% regardless of distribution type. All LEDs and optical assemblies shall be mounted parallel to the ground. All LEDs shall provide the same optical pattern such that catastrophic failures of individual LEDs will not constitute a loss in the distribution pattern.
- b. No more than 3% of the total luminaire lumens shall be in the 80° to 90° range and no lumens will be emitted above 90°. BUG rating shall not exceed B2-U0-G3.
- c. Light Color/Quality: The luminaire shall have a correlated color temperature (CCT) of 4,000K +/- 275K. The color rendition index (CRI) shall be greater than 70.
- d. 75% or more of the total luminaire lumens shall be to the street side of the luminaire.



- e. The optical assembly of the luminaire shall be protected against dust and moisture intrusion per the requirements of IP-66 (minimum) to protect all optical components.
- f. Luminaire manufacturer shall provide the LED manufacturers LM-80 report.
  - LM-80 report shall be at a drive current of 1000mA or less
  - LM-80 report shall be a minimum of 10,000 hours
  - LM-80 report shall show lumen depreciation of 1% or less for all LED case temperatures on the report including 55°C, 85°C, 105°C

### 3. Thermal Management

- a. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
- b. The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
- c. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
- d. The luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
- e. The heat sink material shall be aluminum.

### 4. Physical and Mechanical Requirements

- a. Thermally conductive extruded aluminum heat sinks shall be secured to a clear anodized extruded aluminum door frame with a cast aluminum end cap for optimum cooling. The cast aluminum electrical compartment shall be separate from the LED array to ensure cooler operating temperatures of the driver. Access to the electrical compartment shall be tool-less by use of stainless steel latches. Driver and surge module shall be secured to the swing down door which can easily be removed and exchanged without the use of tools by separating a quick disconnect electrical connection. Housing shall be designed to prevent the buildup of water on the top of the housing. Each optical assembly shall be field rotatable and shall have "street side" and "house side" cast into the optics to indicate beam pattern. Each optic shall be electrically connected with a quick disconnect plug and secured to the housing with four stainless steel screws.
- b. Luminaire shall include cast in pipe stops, leveling steps and a four bolt mounting system capable of accommodating 1¼" to 2" ID pipe (1 5/8" to 2 3/8" OD).
- c. The maximum weight of the luminaire shall be 30 lbs and the maximum effective projected area shall not exceed 1.4 sq ft.
- d. The housing shall meet the requirements for NEMA/UL wet location, be UL listed and gray in color with a flat or semi-gloss sheen.
- e. Luminaire options to include a NEMA photocontrol receptacle and dimming driver.
- f. The power supply shall be contained inside the luminaire and a minimum IP rating of IP-65.
- g. The assembly and manufacturing process for the LED luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration. Luminaire shall withstand vibration, meeting ANSI C136.31 American Standard for Roadway and Area Lighting Equipment – Luminaire Vibration for normal and bridge operation (3G minimum).

### 5. Materials

- a. Housing and door frame shall be aluminum with a nominal 2.5 mil thick paint finish able to withstand a 3000 hour salt spray test as specified in ASTM Designation: B117. Housing shall have a minimum IP rating of IP-65.
- b. Each refractor or lens shall be made from UV inhibited high impact optical grade material and be resistant to scratching.

- c. All aluminum used in housing and brackets shall be a marine grade alloy with less than 2% copper. All exposed aluminum shall be anodized.
- d. Polymeric materials (if used) of enclosures containing either the power supply or electronic components of the luminaire shall be made of UL94VO flame retardant materials. The len(s) of the luminaire are excluded from this requirement.
- e. Paint or powder coating of the housing shall conform to the requirement of the Caltrans Standard Specifications.

#### Identification

Each LED luminaire shall have the manufacture's name, trademark, model number, serial number, date of manufacture (month-year), and lot number as identification permanently marked inside each unit and the outside of each packaging box.

The operation characteristics such as rated voltage and rated power in watts and Volt-Ampere shall be permanently marked inside each LED luminaire unit.

#### Quality Assurance

LED luminaire manufacturer shall provide 5-year warranty on LED luminaires that includes LEDs, housing, drivers and finish.

LED luminaire manufacturer shall not use IESNA LM-80 data to predict luminaire lifetime and shall demonstrate a suitable testing program incorporating high heat, high humidity and thermal shock test regimens to ensure system reliability and to substantiate lifetime claims.

Electrical and light technical properties shall be recorded for each LED luminaire during manufacture. This should include lumen output, CCT, and CRI at a minimum. Each luminaire shall utilize a unique serial numbering scheme. Technical properties must be made available for a minimum of 5 years after the date of manufacture.

Luminaires shall be fully assembled and individually electrically tested prior to shipment.

#### Submittals

Product data submitted for approvals shall include, but not limited to materials, finishes, photometric performance, photometric layouts, dimensional information and LM-79 report for each luminaire conducted by National Voluntary Laboratory Accreditation Program (NVLAP), accredited photometric laboratory.

#### Delivery, Storage and Handling

Deliver luminaires and components carefully to avoid breakage, bending and scoring finishes. Do not install damaged equipment.

Store luminaires and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

Each luminaire shall be furnished without the photoelectric unit receptacle.

Each luminaire shall have a 5-amp inline fuse installed inside the standard's hand hole.

**W. Internally Illuminated Street Name Signs**

Internally illuminated street name signs (IISNS) shall conform to the provisions in Section 86-6.09, "Internally Illuminated Street Name Signs", of the Standard Specifications and these Special Provisions.

The sign fixture, panels, and mounting assemblies shall be designed and constructed to prevent deformation, warp or failure when subjected to a minimum of 100 mph wind loads, as set forth in the latest AASHTO publication, "Standard Specifications for Structural Supports of Highway Signs, Luminaires, and Traffic Signals", and amendments thereto. The IISNS manufacturer shall submit a certificate of compliance conforming to the provisions in Section 6-3.05E, "Certificates of Compliance", with each lot of IISNSs delivered.

The IISNS shall be double-faced Edge-lit LED sign with white translucent high-performance ASTM Type XI reflective border, arrows, and lettering using 12" uppercase and 9" lowercase Clearview Series 5-W fonts. The background shall be green match color no. 14109 of FED-STD-595.

The standard IISNS height shall be 2' and length shall be 6', 8' or 10' attached to the 10 feet IISNS mast arm with Pelco No. SE-5015 mast arm sign bracket and Pelco No. SP-5668-L safety cable, or approved equal, per County Standard No. 1200.

**X. Emergency Vehicle Preemption System**

Furnish and install complete and functioning emergency vehicle preemption (EVP) system as intended per plans, the manufacturer, and these special provisions.

The EVP system shall consist of the following equipments or components:

- Optical detector for each approach, as shown on the plans
- Rack-mounted 4-channel phase selectors for 8-phase operation
- Detector cable

The Contractor shall furnish the following spare EVP equipments or components:

- One (1) rack-mounted 4-channel phase selector
- One (1) optical detector

The EVP system shall be designed to prevent simultaneous pre-emption by two or more emergency vehicles on separate approaches to the intersection.

The Engineer shall approve EVP sequence of operation prior to timing and turn-on of each respective traffic signal.

At locations where optical detectors are not to be installed, EVP cable shall be installed for future use. The following also apply:

1. EVP cable shall be installed, without splices, between the controller cabinet and each mast arm traffic signal pole.
2. EVP cable shall be connected to the EVP rack terminals within the controller cabinet.
3. Each mast arm EVP detector mounting shall be drilled and tapped in its ultimate location. In lieu of the detector, install approved water tight UL listed electrical box. EVP cable shall be installed to terminate within the mast arm mounted electrical box. Excess cable shall be coiled within the electrical box sufficient for future installation of the EVP system.

***Optical Detector***

The optical detector shall be mounted on the indicated signal mast arm per County Standard No. 1202.

Each optical detector shall be waterproof unit capable of receiving optical energy from dual directions and have an adjustable turret configuration. The reception angle for each optical detector unit shall be a minimum of eight (8) degrees in all directions about the aiming axis of the unit.

Dual detectors shall utilize only one optical cable per detector.

Internal circuitry shall be solid state and electrical power shall be provide by the associated discrimination module.

Each optical detector unit shall have a minimum of a 3/4 inch NPT opening used for mounting and for bringing the connecting cable into the terminal block located within the assembly. The housing shall be provided with weep holes to permit drainage of condensed moisture.

Each optical detector shall be installed, wired, and aimed as specified by the manufacturer.

### ***Cable***

Optical detector cable shall meet the requirements of IPCEA-S-61-402/NEMA WC 5, Section 7.4, 600 V Control cable, 75 degrees C, Type B, and the following:

1. The cable shall contain 3 conductors, each of which shall be AWG# 20 (7 x 28) stranded, tinned copper. Insulation of individual conductors shall be color-coded: 1-Yellow, 1-Orange, and 1-Blue.
2. The shield shall be either tinned copper braid or aluminized polyester film with a nominal 20% overlap. When film is used, an AWG# 20 (7 x 28) stranded, tinned, bare drain wire shall be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
3. The jacket shall be marked as required by IPCEA/NEMA.

The cable run between each detector and the Traffic Controller cabinet shall be continuous without splices.

### ***Phase Selector***

Each phase selector shall be compatible and usable with a Model 170E or 2070 controller unit, and shall be mounted in the input file of a Model 332 or Model 333 JP controller cabinet.

Each phase selector shall be capable of operating at least two or more channels, each of which shall provide and independent output for each separate input.

Phase Selector shall be a four-channel, dual priority, Multimode encoded signal device designed for use with both infrared and GPS emitters and optical detectors.

Phase Selectors and Optical detectors shall me manufactured by a single manufacturer

Phase Selector shall recognize and discriminate among three distinct frequency rates via high priority, low priority and probe priority infrared and GPS signals.

Phase selector shall further discriminate among 254 agency ID's, 15 classes of vehicle identification codes and 10,000 individual vehicle codes per class, for more than 38 million total per priority level.

Phase selector shall be capable of operating unlimited intersections and directions.

Phase selector shall have on the front panel, USB, serial and Ethernet capabilities

Phase selector shall be capable of accepting infrared signals from LED and or strobe technologies

Phase selector shall store the following records:

Intersection name  
Date and time of activity  
Vehicle class and code of activating vehicle  
Activating vehicle's ID number  
Agency ID  
Channel called  
Priority of the activity  
Final green activity displayed at end of call  
Time spent in the final greens  
Duration of the activity  
Turn signal status  
Relative priority level  
Capability to playback up to the last 250 seconds of the 100 most recent calls

Each phase selector, when used with its associated optical detectors, shall perform as a minimum, the following:

1. Receive Class I and Class II signals.
2. Decode the signals based on optical frequency, at 9.639 Hz + or -0.119 Hz for Class I signals and 14.035 Hz + or -0.255 Hz for Class II signals.
3. Establish the validity of received signals based on optical frequency and length of time received. A signal shall be considered valid only when received for more than 0.50 second. No combination of Class I signals shall be recognized as a Class II signal regardless of the number of signals being received, up to a maximum of 10 signals. Once a valid signal has been recognized, the effect shall be held by the module, in the event of temporary loss of signal for a minimum period of 4.0 seconds.
4. Provide an output for each channel that will result in a "low" or grounded condition of the appropriate input of a Model 170 controller unit. For a Class I signal, the output shall be a 6.25 Hz + or - 0.1 %, rectangular waveform with a 50 % duty cycle. For Class II signal, the output shall be steady.

Each phase selector shall receive power from the controller cabinet at either 12 VDC or 120 VAC.

Auxiliary inputs for each channel may enter each module through a front panel connector or by a parallel hook-up of the associated detector cables at the input location.

The phase selector shall provide an optically isolated output for each channel to the Model 170 controller unit. All outputs signals shall comply with NEMA signal level definitions and shall be compatible with the Model 170 controller assemblies' inputs.

Each phase selector shall be provided with means of preventing transients received by the detector from affecting the Model 170 controller assembly.

Each phase selector shall have a single connector board and shall occupy one slot of the input file. The front panel of each phase selector module shall have a handle to facilitate withdrawal and have the following controls and functions for each channel:

1. Range adjustments for both class I and Class II signals.
2. A 3-position, center off, momentary contact switch, one position (down) labeled for test operation of Class I signals, and one position (up) labeled for test operation of Class II signals.
3. A "signal" indication and a "call" indication each for Class I and for Class II signals. The "signal" indications denote that a signal, which is not valid, has been received; a "call" indication denotes a steady, valid signal has been received. These 2 indications may be accomplished with a single indication lamp.

In addition, the front panel shall be provided with additional connectors or ports used to perform other functions as specified by the manufacturer.

### **Cabinet Wiring**

Wiring for a Model 332 cabinet shall conform to the following:

1. Slots 12 and 13 of input file "J" shall be wired to accept either a 2 channel or a 4 channel module.
2. Field wiring for the primary detectors, except the 24 VDC power, shall terminate on either terminal block TB-9 in the controller cabinet or on the rear of input file "J", depending on cabinet configuration. Where TB-9 is used, position assignments shall be as follows:
  - a. TB-9 – 1 = Not Used
  - b. TB-9 – 2 = + 24 VDC Out (Orange)
  - c. TB-9 – 3 = + 24 VDC Out (Orange)
  - d. TB-9 – 4 = EVA Detector (Yellow)
  - e. TB-9 – 5 = EVC Detector (Yellow)
  - f. TB-9 – 6 = DC Common Out (Blue)
  - g. TB-9 – 7 = EVB Detector (Yellow)
  - h. TB-9 – 8 = EVD Detector (Yellow)
  - i. TB-9 – 9 = DC Common Out (Blue)

Assuming TB9 – 2 and TB9 – 3 are unused on the "J" File, move wires on J11-J & J11-K (Twisted Pair) to J12-E & J13-E, respectively.

Field wiring for auxiliary detectors may terminate on terminal board TB-0 (If unused) in the controller cabinet. Use manufactures recommended wiring for these connections.

### **System Operation**

The contractor shall demonstrate that the components of each system are compatible and will perform satisfactorily as a system. Satisfactorily performance shall be determined using the following test procedure during the functional test period:

1. Each system to be used for testing shall consist of an optical detector, an optical detector cable and a phase selector module.
2. The phase selector shall be installed in the proper input file slot of the Model 332 or 333 controller cabinet assembly.
3. Two tests shall be conducted; one using a Class I signal emitter and a distance of 1000 feet between the emitter and the detector, the other using a Class II signal emitter and a distance of 1800 feet between the emitter and the detector. Range adjustments on the phase selector shall be set to "Maximum" for each test.
4. During the tests of the Class I and Class II emitters, the proper response from the Model 170E and 2070 controller unit during the "ON" interval and there shall be no improper operation of the Model 170E or 2070 controller unit or the monitor during the "OFF" interval.

Arrange for a technician from the EVP manufacturer, to be present for the first day of the traffic signal and lighting function test to insure proper installation and functioning of the EVP equipment.

Arrange for a technician from the controller assembly manufacturer to perform any controller modifications required for the installation, or operation, of the EVP equipment.

**Y. Battery Backup System**

This special provision establishes the minimum requirements for a battery backup system (BBS) that shall provide power to a traffic signal system in the event of a power failure or interruption.

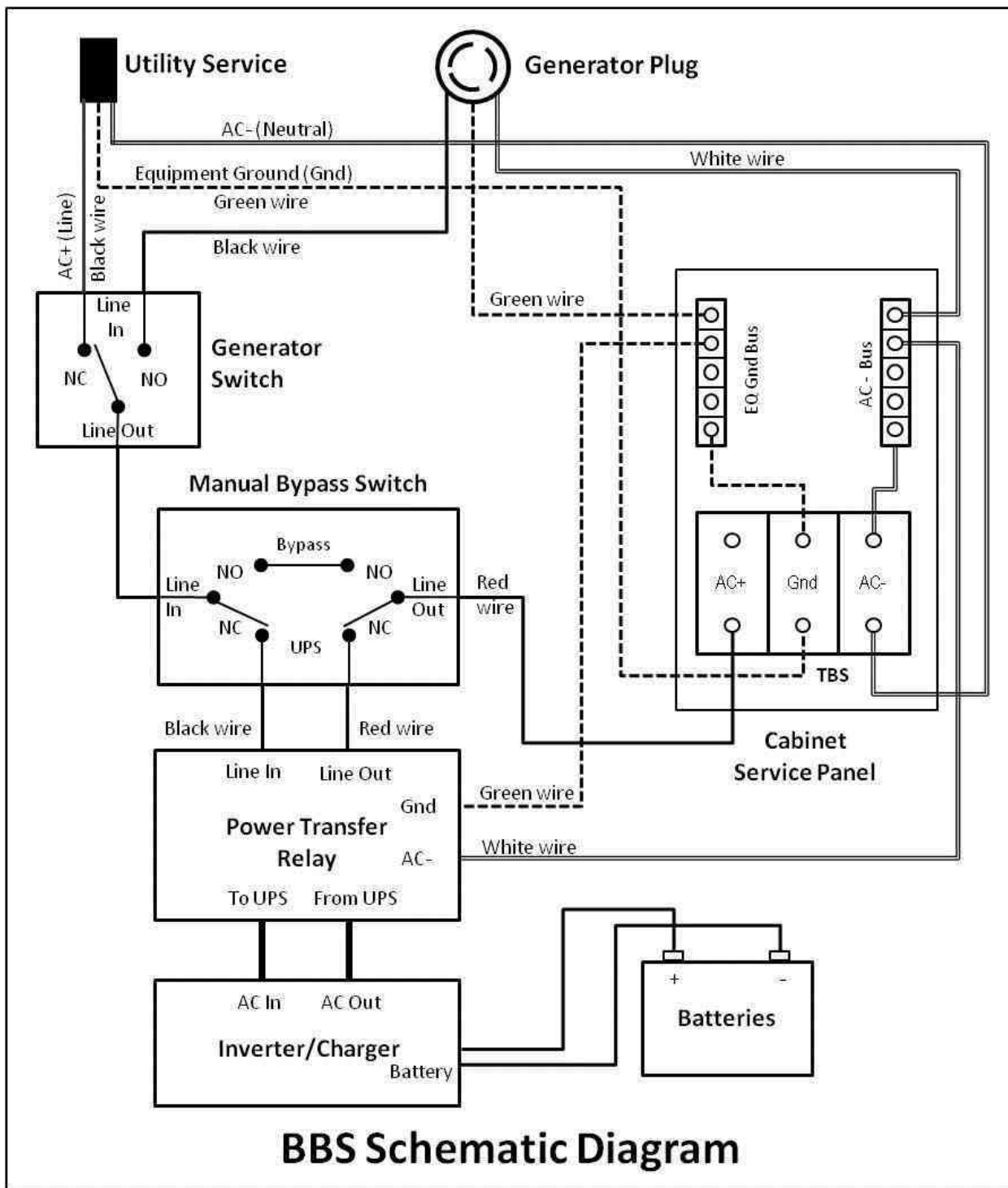
The BBS shall be designed for outdoor applications, in accordance with the current edition of Chapter 1, Section 8 requirements of Transportation Electrical Equipment Specifications (TEES).

The BBS batteries shall be external to the traffic signal controller cabinet as specified under “External Battery Cabinet Option” herein unless specified otherwise.

BBS cabinet shall be listed on the current Caltrans pre-qualified product list. The BBS shall include, but not limited to the following:

- cabinet,
- utility line/generator switch,
- inverter/charger,
- power transfer relay,
- a separate manually operated non-electronic bypass switch,
- batteries,
- all necessary hardware, shelving, and interconnect wiring.

The following figure shows BBS components interconnecting with each other and the controller cabinet to ensure interchangeability between all BBS manufacturers.



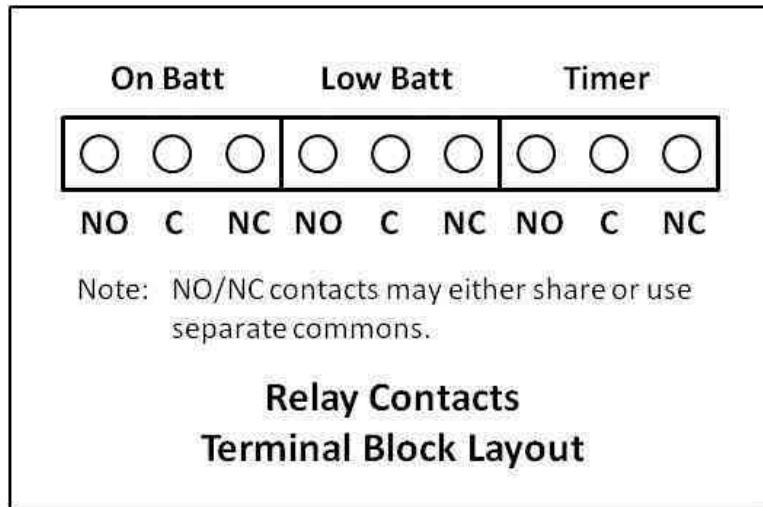
### Operation

The BBS shall provide a minimum two (2) hours of full run-time operation for an intersection equipped with all LED traffic signal indications (minimum 1100W active output capacity, with 80% minimum inverter efficiency) and 2 (2) hours of flashing operation.

The maximum transfer time allowed, from disruption of normal utility line voltage to stabilized inverter line voltage from batteries, shall be 65 milliseconds. The same maximum allowable transfer time shall also apply when switching from inverter line voltage to utility line voltage.



The BBS shall provide the user with six (6)-sets of fully programmable normally open (NO) and normally closed (NC) single-pole double-throw (SPDT) dry relay contact closures, available on a panel-mounted terminal block, rated at a minimum 120V/1A, and labeled so as to identify each contact. See below figure for typical configuration.



The first set of NO and NC contact closures shall be energized whenever the unit switches to battery power. Contact shall be labeled or marked “On Batt”.

The second set of NO and NC contact closures shall be energized whenever the battery approaches approximately 40% of remaining useful capacity. Contact shall be labeled or marked “Low Batt”.

The third set of NO and NC contact closures shall be energized two hours after the unit switches to battery power. Contact shall be labeled or marked “Timer”.

The six programmable NO and NC contact closures shall be independently configured to activate under any of the following conditions: On Battery, Low Battery, Timer, Alarm, or Fault.

Operating temperature for inverter/charger, power transfer relay and manual bypass switch shall be –37 °C to +74 °C.

Both the Power Transfer Relay and Manual Bypass Switch shall be rated at 240VAC/30 amps, minimum.

The BBS shall use a temperature-compensated battery charging system. The charging system shall compensate over a range of 2.5 – 4.0 mV/ °C per cell.

The temperature sensor shall be external to the inverter/charger unit. The temperature sensor shall come with 10’ of wire.

Batteries shall not be recharged when battery temperature exceeds 50 °C ± 3 °C.

BBS shall bypass the utility line power whenever the utility line voltage is outside of the following voltage range: 100VAC to 130VAC (± 2VAC).

When utilizing battery power, the BBS output voltage shall be between 110 VAC and 125 VAC, pure sine wave output, ≤ 3% THD, 60Hz ± 3Hz.

BBS shall be compatible with NEMA and Model 332 and 333JP Cabinets, and Model 170, 390 & 2070 Controllers and cabinet components for full time operation.

In cases of low (below 100VAC) or absent utility line power, when the utility line power has been restored at above 105 VAC  $\pm$  2 VAC for more than 30 seconds, the BBS shall transfer from battery backed inverter mode back to utility line mode.

In cases of high utility line power (above 130VAC), when the utility line power has been restored at below 125VAC  $\pm$  2 VAC for more than 30 seconds, the BBS shall transfer from battery backed inverter mode back to utility line mode.

The BBS shall have an automatic tap to step up or step down the output voltage by 10 percent. The resulting output voltages shall remain within the above prescribed voltage range: 100VAC to 130VAC. This capability will extend BBS range for operating on input AC and not reverting to battery power.

BBS shall be equipped to prevent a malfunction feedback to the cabinet or from feeding back to the utility service.

In the event of inverter/charger failure, battery failure or complete battery discharge, the power transfer relay shall revert to the NC (and de-energized) state, where utility line power is connected to the cabinet.

Recharge time for the battery, from “protective low-cutoff” to 80% or more of full battery charge capacity, shall not exceed twenty (20) hours.

### ***Mounting / Configuration***

Generator Switch, Inverter/Charger, Power Transfer Relay and manually operated Bypass Switch shall fit inside a typical fully equipped traffic signal controller cabinet.

Mounting method inside the 332 and 333JP cabinet shall be shelf-mount, rack-mount or combination of either. Available rack space for front-mounted inside the 332 and 333JP cabinet is 3U or approximately 6 inches.

All interconnect wiring provided between Generator Switch, Inverter/Charger, Power Transfer Relay, Bypass Switch and Cabinet Terminal Service Block shall be no less than 9 feet of UL Style 1015 CSA TEW with the following characteristics:

- AWG Rating: 10 AWG
- Stranding: 105 strands of 10 AWG tinned copper
- Rating: 600 V, 105 °C, PVC Insulation

Relay contact wiring provided for each set of NO/NC relay contact closure terminals shall be 9 feet of UL Style 1015 CSA TEW 18 AWG wire, same ratings as above, except 16 strands of 18 WG tinned copper.

All necessary hardware for mounting (shelf angles, rack, etc) shall be included in the **contract price paid** for the BBS, and no additional compensation will be allowed therefor.

### ***Internal mounted battery option***

(Allowed only if requested on the plans)

The controller cabinet shall be equipped with a generator twist lock flanged inlet receptable, manual transfer switch and bypass switch.

The twist lock flanged inlet receptacle shall be Hubbell 2615, NEMA L5-30P Twist Lock Flanged Male Inlet Rated for 30A/125VAC or approved equal. Receptacle shall be mounted flush to the cabinet in a weatherproof lift cover plate made of impact-resistant thermoplastic and gray in color.

The bypass switch shall transfer the load, including the UPS to the twist lock inlet receptacle. The manual transfer switch shall be wired to prevent any back feed to the utility service. Both the bypass switch and

manual transfer switch shall be rack mounted independently in the controller cabinet meeting industry standards.

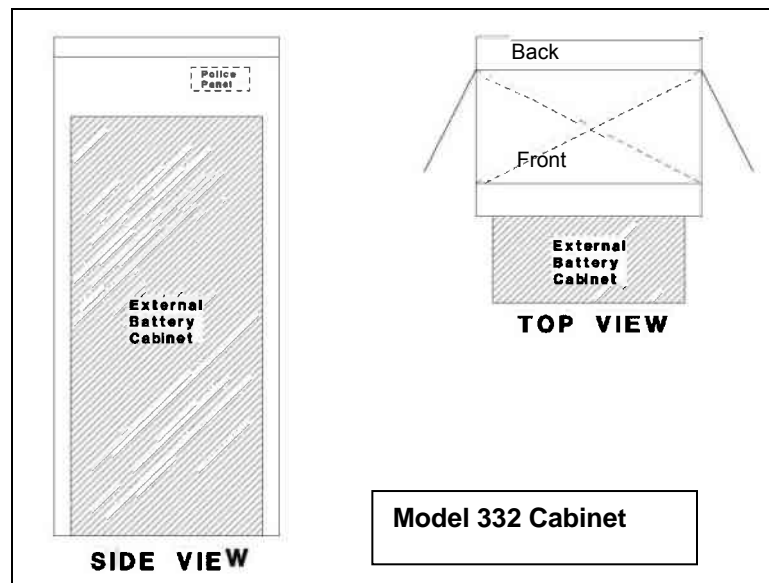
Batteries shall be mounted on swing-tray mounted below the controller shelf. A minimum of six (6) bolts/fasteners shall be used to secure swing-trays to the 332 Cabinet standard EIA 19" rack. All bolts/fasteners and washers shall meet the following requirements:

- Screw type: Pan Head Phillips machine screw
- Size and Thread pitch: 10-32
- Material: 18-8 stainless steel (Type 316 stainless steel is acceptable as an alternate)
- Washer: Use one 18-8 stainless steel flat washer under the head of each 10-32 screw; lock washers are unnecessary provided that the screws are properly tightened.

Number of screws per swivel bracket: minimum six (6) screws per swivel bracket. Screws are to be spaced evenly along bracket, with one screw near each end. Batteries may be shelf mounted in area behind controller so long as shelf and batteries do not interfere with controller unit and C1 plug.

### ***External battery cabinet option***

Batteries shall be housed in an external cabinet mounted to the side of the controller cabinet as shown in the following figure or as directed by the Engineer with a minimum of eight (8) bolts:



If BBS is installed at the back of controller cabinet, the modification shall include a minimum of 36 inches wide concrete walkway access to the BBS without encroaching outside the right-of-way. BBS shall be installed at the front of the controller cabinet (in locations where the back of the controller cabinet has limited ROW or conflicting structures and facilities and other obstructions), the BBS cabinet shall not cover the police panel. The BBS cabinet shall also not hinder the access ramp's compliance with ADA requirements.

Four shelves shall be provided within the battery cabinet. There shall be a minimum of 12 inches clearance between shelves. Each shelf shall be a minimum of 9" X 25", and capable of supporting a minimum of 125 lbs. Batteries shall be mounted on individual shelves.

The external battery cabinet shall be NEMA 3R rated in accordance to Section 2-Housings of the Chapter 7 of TEES, for the construction of the cabinet and anodic coating finish.

The external battery cabinet shall be ventilated through the use of louvered vents, filter, and one thermostatically controlled fan in accordance to Section 2-Housings of the Chapter 7 of TEES.

External battery cabinet fan shall be AC operated from the same line output of the Manual Bypass Switch that supplies power to the controller cabinet.

The external battery cabinet shall have a door opening to the entire cabinet. The door shall be attached to the cabinet through the use of a continuous stainless steel piano hinge or four, two-bolts per leaf, hinges in accordance to Section 2-Housings of the Chapter 7 of TEES. The door shall use a three-point, roller locking mechanism and standard #2 key lock to lock the door. The door shall have a stainless steel handle.

The external cabinet shall be equipped with a generator twist lock flanged inlet receptacle, manual transfer switch and bypass switch.

The twist lock flanged inlet receptacle shall be Hubbell 2615, NEMA L5-30P, Twist Lock Flanged Male Inlet Rated for 30A/125V or approved equal. Receptacle shall be mounted flush to the cabinet in a weatherproof lift cover plate made of impact-resistant thermoplastic and gray in color.

The bypass switch shall transfer the load, including the UPS to the twist lock inlet receptacle. The manual transfer switch shall be wired to prevent any back feed to the utility service. Both the bypass switch and manual transfer switch shall be rack mounted independently in BBS cabinet meeting industry standards.

The BBS with external battery cabinet shall come with all bolts, conduits and bushings, gaskets, shelves, and hardware needed for mounting.

### ***Maintenance, Displays, Controls and Diagnostics***

The BBS shall include a 2 line by 40 character LCD display to indicate current battery charge status, input/output voltages, time and settings of various conditions. The same parameters shall be available via RS232 or USB interfaces on the face of the BBS.

The BBS shall have lightning surge protection compliant with IEEE/ANSI C.62.41.

The BBS shall be capable of accepting firmware upgrades of the non-volatile, read-only memory via serial port communications. The updates shall be accomplished by uploading the software to the BBS over the RS232 serial port located on the face of the BBS.

The BBS shall be equipped with an integral system to prevent battery from destructive discharge and overcharge.

The BBS shall be capable of performing a SELF-TEST, locally from the BBS front panel LCD, or remotely via RS232 or USB interface. The duration of the SELF-TEST shall be programmable in 1-minute increments from 1 minute to 255 minutes.

The BBS and batteries shall be easily replaced with all needed hardware and shall not require any special tools for installation.

The BBS shall include a re-settable inverter event counter to indicate the number of times the BBS was activated and the total number of hours the unit has operated on battery power, accessible via the LCD screen or remotely via RS232 or USB.

The BBS shall be equipped with an event log that stores for a minimum the last 100 events. The events shall be time and date stamped. The event log shall be retrievable vial RS232, USB or from the BBS LCD screen. The event log shall be display and print out in plain English when output the RS232 or USB ports.

## **Battery System**

Individual battery shall be 12V, rated 105 amp-hour for 20 hours @ 77°F to 1.70 VPC, deep cycle, sealed prismatic lead-calcium based Absorbed Glass Mat/ Valve Regulated Lead Acid (AGM/VRLA) battery and shall be easily replaced and commercially available off the shelf.

The manufacturer shall certify batteries to operate over a temperature range of – 25 °C to +74 °C.

The batteries shall be provided with appropriate interconnect wiring and corrosion-resistant mounting trays and/or brackets appropriate for the cabinet into which they will be installed.

Batteries shall indicate maximum recharge data and recharging cycles.

Furnish four (4) batteries for the BBS.

## **Battery Harness**

Battery interconnect wiring shall be via two-part modular harness:

- Part I shall be equipped with red (+) and black (-) cabling that can be permanently connected to the positive and negative posts of each battery. Each red and black pair shall be terminated into a Molex, polarized – keyed battery cable connector or equivalent. The length of the harness between batteries shall be a minimum of 12 inches.
- Part II shall be equipped with the mating Power Pole style connector for the batteries and a single, insulated Power Pole style connection to the inverter/charger unit. Harness shall be fully insulated and constructed to allow batteries to be quickly and easily connected in any order to ensure proper polarity and circuit configuration. The length of the battery interconnect harness shall be a minimum of 60 inches from the Inverter/Charger plug to the first battery in the string.

Power Pole connectors may be either one-piece or two-piece. If a two-piece connector is used, a locking pin shall be used to prevent the connectors from separating.

All battery interconnect harness wiring shall be UL Style 1015 CSA TEW or Welding Style Cable or equivalent, all of proper gauge with respect to design current and with sufficient strand count for flexibility and ease of handling.

Battery terminals shall be covered and insulated with molded boots to prevent accidental shorting.

## **BBS Quality Assurance**

Each Battery Backup System (BBS) shall be manufactured in accordance with a manufacturer Quality Assurance (QA) program. The QA program shall include two Quality Assurance procedures:

1. Design QA - The manufacturer, or an independent testing lab hired by the manufacturer, shall perform Design Qualification Testing on new BBS system(s) offered, and when any major design change has been implemented on an existing design. A major design change is defined as any modification - material, electrical, physical, or theoretical, that changes any performance characteristics of the system, or results in a different circuit configuration. Where a dispute arises in determining if a system is a new design or if the system has had a major design change, the County will make the final determination if Design Qualification Testing is required prior to production consideration.
2. Production QA - The Production QA shall include statistically controlled routine tests to ensure minimum performance levels of BBS units built to meet this specification and a documented process of how problems are to be resolved.

QA process and test results documentation shall be kept on file for a minimum period of seven years.

Battery Backup System designs not satisfying Design QA Testing and Production QA Testing requirements shall not be labeled, advertised, or sold as conforming to this specification.

A technician whom is qualified to work on the battery backup system and employed by the battery backup system manufacturer or the manufacturer authorized distributor, shall be present at the time the equipment is turned on.

It shall be the responsibility of the Contractor to implement and fund any traffic signal controller assembly modifications required to achieve the traffic signal operation as shown on the construction plans and as required in the Special Provisions.

**Z. Payment Method**

See Signal and Lighting subsection N, "Service" for payment of all electric company fees required.

The contract price paid per **Lump Sum** for Signal and Lighting shall include full compensation for furnishing all labor, materials, tools, equipment, modify controller assembly, foundations, pole and mast arm mounted regulatory signs, documents, programming, testing, potholing required for utility verification prior to all conduit installation and incidents and for doing all the work specified herein, elsewhere in these Special Provisions, and plans including the complete installation of an operational traffic signal and lighting system and no additional compensation shall be allowed therefor.

# **APPENDIX A**

## **AQMD RECOMMENDATIONS**

# Dust Abatement Attachments

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**AQMD SIGNAGE RECOMMENDATIONS****November, 2001**

Plan holder shall post signage at specified locations on the subject property in accordance with the standards specified below. The exception to the standards is that all letters shall be 4 inches high, with the names and telephone numbers of appropriate contacts and services in bold print, as indicated in the standards. These signs shall also include the SCAQMD toll free complaint line 1-800-CUT-SMOG (1-800-288-7664) and the telephone number for the Environmental Observer. These signs shall be posted within 50 feet of the curb on all four (4) corners of the subject property.

For each Dust Control Plan aggregating less than, or equal to, ten (10) acres:

1. The applicant shall install a sign on such property which is visible to the public that meets the following requirements:
  - (a) Such sign shall measure at least four (4) feet wide by four (4) feet high and conform to the specifications in 1 (a) below.

For each Dust Control Plan aggregating over ten (10) acres:

2. The applicant shall install a sign on such property which is visible to the public that meets the following requirements:
  - (a) Such sign shall measure at least eight (8) feet wide by four (4) feet high and conform to the specifications in 1 (b) below.

**THE SIGN SHALL CONFORM TO THE FOLLOWING REQUIREMENTS:**

1. **The sign boards shall be constructed with materials capable of withstanding the environment in which they are placed.**

(a) For 4' x 4' signs, the District recommends the following:

- I. 3/4" A/C laminated plywood board
- II. Two 4" x 4" posts
- III. The posts should be attached to the edges of the plywood board with at least 2 carriage bolts on each post.
- IV. The front surface of the sign board should be painted in the contrasting color of a white background with black lettering.

(b) For 4' x 8' signs, the District recommends the following:

- I. 1" A/C laminated plywood board
- II. Two 5" x 6" posts
- III. The posts should be attached to the 4' edges of the plywood board with at least 2 carriage bolts on each post.
- IV. The front surface of the sign board should be painted in the contrasting color of a white background with black lettering.

**2. The sign board shall be installed and maintained in a condition such that members of the public can easily view, access, and read the sign at all times until the expiration date of the Dust Control plan.**

(a) For 4' x 4' signs, the District recommends the following:

- I. The lower edge of the sign board should be mounted at least 2' above the existing ground surface to facilitate ease of viewing.
- II. The posts should be set in a hole at least 3' deep with concrete footings to preclude downing by high winds.
- III. On the construction site, the sign should be positioned such that nothing obstructs the public's view from the primary street access point.
- IV. For construction projects that are developed in phases, the sign should be moved to the area that is under active construction.
- V. In situations where all phases of the construction project are completed on a property prior to expiration of the Dust Control Plan, a written request for cancellation of the Dust Control Plan must be submitted to the Engineer.

(b) For 4' x 8' signs, the District recommends the following:

- I. The lower edge of the sign board should be mounted at least 2' above the existing ground surface to facilitate ease of viewing.
- II. The posts should be set in a hole at least 4' deep with concrete footings to preclude downing by high winds.
- III. On the construction site, the sign should be positioned such that nothing obstructs the public's view from the primary street access point.
- IV. For construction projects that are developed in phases, the sign should be moved to the area that is under active construction.
- V. In situations where all phases of the construction project are completed on a property prior to expiration of the Dust Control Plan, a written request for cancellation of the Dust Control Plan must be submitted to the Engineer.

**3. The sign board shall contain the following information:**

- (a) Project Name
- (b) Name of Prime Contractor
- (c) Phone Number of Contractor's Employee Responsible for Dust Control Matters
- (d) County designated phone number (to be provided by the Engineer)
- (e) South Coast Air Quality Management District Phone Number

**4. The sign board shall be designed to the following alpha and numeric text dimensions (sign boards written in longhand are unacceptable).**

(a) For a permittee subject to the 4' x 4' sign requirement, the District provides the following example: (as modified by the County of Riverside for use on County Public Works projects)

1" UPPERCASE Letters →	PROJECT NAME:		3 ½ " Title Case Bold Letters ←
1" UPPERCASE Letters →	CONTRACTOR		3 ½ " Title Case Bold Letters ←
1" Title Case Letters →	Contractor's Dust Control Phone #		3" Bold Numbers ←
1" Title Case Letters →	County of Riverside Phone #		3" Bold Numbers ←
1" Title Case Letters →	Phone Number:	<b>SCAQMD 1-800-CUT-SMOG</b>	3 ½ " Bold Numbers ←

"Title Case" means the first letter of a word is capitalized and subsequent letters are lower case.

AQMD Recommendations

(b) For a permittee subject to the 4' x 8' sign requirement, the District provides the following example: (as modified by the County of Riverside)

2" UPPERCASE Letters	PROJECT NAME:		4" Title Case Bold Letters
2" UPPERCASE Letters	CONTRACTOR		4" Title Case Bold Letters
2" Title Case Letters	Contractor's Dust Control Phone #		4" Bold Numbers
2" Title Case Letters	County of Riverside Phone #	909-	4" Bold Numbers
2" Title Case Letters	Phone Number:	SCAQMD 1-800-CUT-SMOG	4 1/2" Bold Numbers
2" Title Case Letters	COUNTY OF RIVERSIDE TRANSPORTATION DEPARTMENT		

Section 1

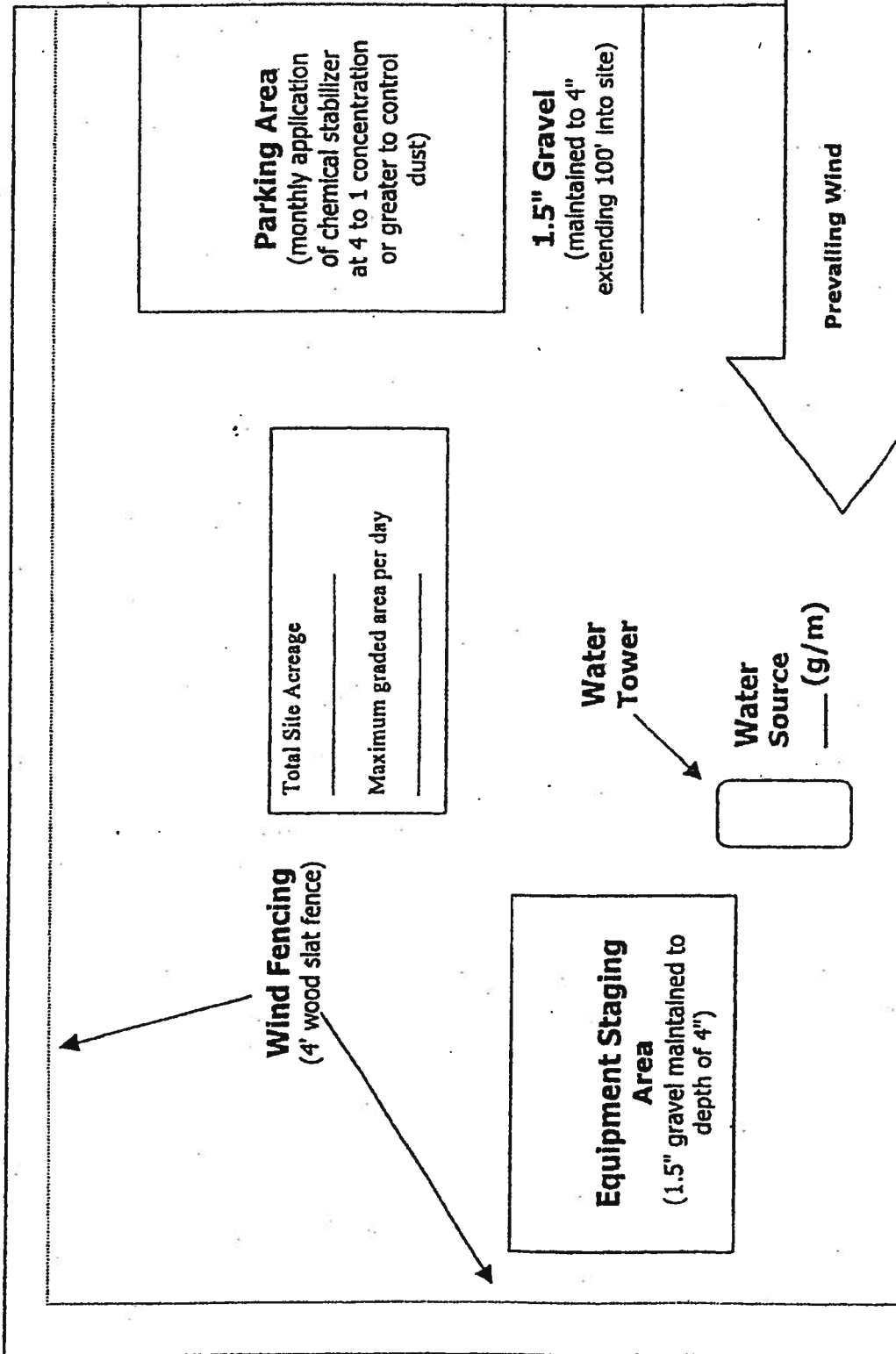
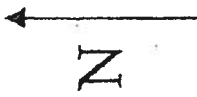
Simplified Sample Site Plan

Distance and location of nearest:

Residence \_\_\_\_\_

Business \_\_\_\_\_

Existing Residential



Existing Residential  
Site Access  
CMD Recommendations

Remember...  
**DUST CONTROL IS REQUIRED 24 HOURS A DAY, 7 DAYS A WEEK,  
REGARDLESS OF CONSTRUCTION STATUS**

### Plan Review Checklist Clearing/Grubbing/Mass Grading Phase

If feasible, use grading permit conditions to break the project into phases so that only a portion of the site is disturbed at any given time to ensure control of fugitive dust. This technique is critical for project sites with greater than 100 acres.

Prior to initiating activity, pre-water site through use of portable irrigation lines. At least 72 hours of pre-watering is recommended for each area prior to initiating earth-movement. Require the Applicant to specify water source and available flow rate (g/m).

Water applied continuously to all disturbed portions of the site by means of water truck/water pull as necessary to maintain sufficient visible moisture on the soil surface. For reference, one 2,000 gallon water truck can treat approximately 4 acres of active construction per hour. Also, for cut and fill activities, one 10,000 gallon water pull is estimated to be necessary for each 7,000 cubic yards of daily earth-movement. Multiple 4,000-gallon water trucks may be used in place of one 10,000-gallon water pull. Touch and visual contrast are reasonably good indicators of soil moisture. Surface areas that are dry to the touch and appear lighter-colored require the application of additional water to prevent visible or fugitive dust. Require the Applicant to specify the number of watering vehicles available for dust control during mass grading and during off-hours as well as availability of back-up water trucks if the site experiences dust control problems.

Water towers are necessary for projects with more than 10 acres of active construction. Without a water tower, it can take up to 30 minutes to fill a 2,000 gallon water truck. Also, multiple water towers are necessary for projects that use water pulls as filling one 10,000 gallon water pull can drain a water tower which takes up to 40 minutes to refill.

Wind fencing is necessary between the site and nearby residences or businesses. Off-site upwind fencing and on-site wind fencing for larger projects can also keep blowsand from being deposited onto the site or traveling through the site.

A perimeter watering system consisting of portable irrigation equipment may be an effective mitigation system to protect surrounding residences and businesses. The portable watering system may be used in place of or in conjunction with watering trucks. The local jurisdiction may also be provided access to this equipment.

Remember...

**DUST CONTROL IS REQUIRED 24 HOURS A DAY, 7 DAYS A WEEK,  
REGARDLESS OF CONSTRUCTION STATUS**

Construction site accesses are to be improved with 1.5" gravel maintained to a depth of 4" , at least 20' wide, and extending 100 feet into the site. If the project site is not balanced, a wheel washing system and/or ribbed steel plates should be placed in the roadway before the vehicle enters the graveled area to clean the tires and prevent trackout.

Equipment staging areas are to be treated with 1.5" gravel maintained to a depth of 4".

Employee parking areas are to be covered with 1.5" gravel maintained to a depth of 4" or treated with chemical dust suppressants at a 4 to 1 ratio on at least a monthly basis to prevent fugitive dust.

Chemical dust suppressants are to be mixed at a ratio of 20 to 1 and applied to all disturbed surfaces that are proposed to remain inactive for a period of at least 10 consecutive days. These products are effective in preventing and controlling dust. Recordkeeping is necessary to demonstrate compliance.

All project sites greater than 100 acres shall monitor daily wind speeds and AQMD forecasted wind events (call 1.800.CUT.SMOG, press one for air quality information, and then press five for Coachella Valley wind forecasts). Operators shall maintain these records for review by any local code enforcement officer or AQMD inspector.

An environmental observer whose primary duty is to oversee dust control at the site is to be used for construction projects greater than 100 acres and/or sites with more than 50 acres of active construction. The environmental observer is tasked with monitoring dust abatement measures and authorized to deploy additional water trucks and other dust control actions (i.e., wind fencing, street sweepers, chemical dust suppressants, etc.) as necessary to prevent or control fugitive dust.

Other (specify): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Remember...**  
**DUST CONTROL IS REQUIRED 24 HOURS A DAY, 7 DAYS A WEEK,**  
**REGARDLESS OF CONSTRUCTION STATUS**

**Plan Review Checklist  
Finish Grading Phase**

- Water applied continuously to all disturbed portions of the site by means of water truck/water pull as necessary to maintain sufficient visible moisture on the soil surface. For reference, one 2,000 gallon water truck can treat approximately 4 acres of active construction per hour. Also, for cut and fill activities, one 10,000 gallon water pull is estimated to be necessary for each 7,000 cubic yards of daily earth-movement. Multiple 4,000-gallon water trucks may be used in place of a 10,000-gallon water pull. Touch and visual contrast are reasonably good indicators of soil moisture. Surface areas that are dry to the touch and appear lighter-colored require the application of additional water to prevent visible or fugitive dust. Require the Applicant to specify the number of watering vehicles available for dust control during finish grading and during off-hours as well as availability of back-up water trucks if the site experiences dust control problems.
- Water towers are necessary for projects with more than 10 acres of active construction. Without a water tower, it can take up to 30 minutes to fill a 2,000 gallon water truck. Also, multiple water towers are necessary for projects that use water pulls as filling one 10,000 gallon water pull can drain a water tower which takes up to 40 minutes to refill.
- Wind fencing is necessary between the site and nearby residences or businesses to reduce fugitive dust. Off-site upwind fencing and on-site wind fencing for larger projects can also keep blowsand from being deposited onto the site or traveling through a site.
- Chemical dust suppressants are to be applied at a concentration of at least 10 to 1 to finish graded areas once final elevations have been reached. For areas that will remain inactive for longer periods, vegetation can be a cost-effective alternative to chemical stabilization. Wind fencing or other obstructions can keep the stabilized area free from future disturbances.
- Construction site access(es) are to be improved with 1.5" gravel maintained to a depth of at least 4" with a minimum width of at least 20', extending 100 feet into the project site.
- Equipment staging areas are to be treated with 1.5" gravel maintained to a depth of 4".
- Internal roadway networks are to be treated with chemical dust suppressants at a minimum rate of at least 4 to 1 and retreated on a monthly basis once final roadway elevations have been reached.
- Employee parking areas are to be treated with chemical dust suppressants at a mix ratio of at least 4 to 1 and retreated on at least a monthly basis or covered with 1.5" gravel maintained to a depth of 4" to prevent fugitive dust.
- Other (specify): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Remember...  
DUST CONTROL IS REQUIRED 24 HOURS A DAY, 7 DAYS A WEEK,  
REGARDLESS OF CONSTRUCTION STATUS**



### Plan Review Checklist Construction Phase

Water applied continuously to all disturbed portions of the site by means of water truck/water pull is necessary to maintain sufficient visible moisture on the soil surface. For reference, one 2,000 gallon water truck can treat approximately 4 acres of active construction per hour. Touch and visual contrast are reasonably good indicators of soil moisture. Surface areas that are dry to the touch and appear lighter-colored require the application of additional water to prevent visible or fugitive dust. Require the Applicant to specify the number of watering vehicles available for dust control during the construction phase and during off-hours as well as availability of back-up water trucks if the site experiences dust control problems.

Wind fencing is necessary between the site and nearby residences or businesses. Off-site upwind fencing and on-site wind fencing for larger projects can also keep blowsand from being deposited onto the site or traveling through the site. Block walls, if part of the final project, can replace wind fencing during the construction phase.

Chemical dust suppressants are to be applied at a concentration of at least 20 to 1 to finish graded areas once final elevations have been reached. For areas that will remain inactive for longer periods, vegetation can be a cost-effective alternative to chemical stabilization. Wind fencing or other obstructions can keep the stabilized area free from future disturbances.

Construction site accesses are to be improved with 1.5" gravel, maintained to a depth of 4", with a width of at least 20', extending 100' into the project site. Paving internal roadways can substitute for gravel.

Internal roadway networks are to be paved as early as feasible in the construction phase. Street sweeping of internal and/or external access roads will likely be required to control entrained road dust.

Employee parking areas are to be treated with chemical dust suppressants at a mix ratio of no less than 4 to 1 and retreated on a monthly basis, or more frequently if fugitive dust is observed. If internal roadway is complete, employees are to be instructed to park on paved roads.

Other (specify): \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Remember...**  
**DUST CONTROL IS REQUIRED 24 HOURS A DAY, 7 DAYS A WEEK,**  
**REGARDLESS OF CONSTRUCTION STATUS**

**RULE 403 IMPLEMENTATION HANDBOOK**

---

**REASONABLY AVAILABLE CONTROL MEASURES**

Paragraph (d)(3) of Rule 403 allows activities outside the South Coast Air Basin (see Figure 2-1) to implement reasonably available control measures in lieu of best available control measures. Additionally, as specified by subparagraph (f)(3)(D) of Rule 403, any person seeking approval of a fugitive dust emissions control plan for projects outside the South Coast Air Basin must demonstrate to the satisfaction of the District that the given activity is employing all reasonably available fugitive dust control measures.

The District has prepared the attached listing of reasonably available fugitive dust control measures for a variety of source categories. This list is based on the U.S. Environmental Protection Agency's reference document entitled, "Control of Open Fugitive Dust Sources," Midwest Research Institute, September 1988.

The District encourages the use of those dust control measures that minimize the use of potable water. When water is needed, reclaimed water should be utilized to the greatest extent feasible.

**REASONABLY AVAILABLE CONTROL MEASURES**

The left column contains a listing of the sources of fugitive dust which are intended for emission control under District Rule 403, and a listing of control measures and high-wind measures. The right column contains a description of the reasonably available fugitive dust control measures for each of the sources.

Source: (1) Land Clearing/Earth-Moving

CONTROL MEASURES

(A) Watering

DESCRIPTION

- (1) Application of water by means of trucks, hoses and/or sprinklers prior to conducting any land clearing. This will increase the moisture content of the soils; thereby increasing its stability.
- (2) Pre-application of water to depths of proposed cuts.
- (3) Once the land clearing/earth moving activities are complete, a second application of water can generate a thin crust that stabilizes the disturbed surface area provided that it is not disturbed. (Security fencing can be used to prevent unwanted future disturbances of sites where a surface crust has been created).

(B) Chemical stabilizers

- (1) Only effective in areas which are not subject to daily disturbances.
- (2) Vendors can supply information on product application and required concentrations to meet the specifications established by the Rule.

(C) Wind fencing

- (1) Three- to five-foot barriers with 50% or less porosity located adjacent to roadways or urban areas can be effective in reducing the amount of windblown material leaving a site.
- (2) Would likely be used in conjunction with other measures (e.g., watering, chemical stabilization, etc.) to ensure that visible emissions do not cross a property line.

(D) Cover haul vehicles

- (1) Entire surface area of hauled earth should be covered once vehicle is full.

(E) Bedliners in haul vehicles

- (1) When feasible, use in bottom-dumping haul vehicles.

HIGH WIND MEASURE

- (a) Cease all active operations; or
- (b) Apply water within 15 minutes to any soil surface which is being moved or otherwise disturbed.

Source: (2) Unpaved Roads

**CONTROL MEASURES**

**DESCRIPTION**

- (F) Paving
  - (1) Requires street sweeping/cleaning if subject to material accumulation.
- (G) Chemical stabilization
  - (1) Vendors can supply information as to application methods and concentrations to meet the specifications established by the Rule
  - (2) Not recommended for high volume or heavy equipment traffic use.
- (H) Watering
  - (1) In sufficient quantities to keep surface moist.
  - (2) Required application frequency will vary according to soil type, weather conditions, and vehicular use.
- (I) Reduce speed limits
  - (1) 15 mile per hour maximum. May need to be used in conjunction with watering or chemical stabilization to prevent visible emissions from crossing the property line.
- (J) Reduce vehicular trips
  - (1) Access restriction or redirecting traffic to reduce vehicle trips by a minimum of 60 percent.
- (K) Gravel
  - (1) Gravel maintained to a depth of four inches can be an effective measure.
  - (2) Should only be used in areas where paving, chemical stabilization or frequent watering is not feasible.

**HIGH WIND MEASURE**

- (c) Apply a chemical stabilizer (to meet the specifications established by the Rule) prior to wind events; or
- (d) Apply water once each hour; or
- (e) Stop all vehicular traffic.

Source: (3) Storage Piles

CONTROL MEASURES

DESCRIPTION

- (L) Wind sheltering
  - (1) Enclose in silos.
  - (2) Install three-sided barriers equal to height of material, with no more than 50 percent porosity.
- (M) Watering
  - (1) Application methods include: spray bars, hoses and water trucks.
  - (2) Frequency of application will vary on site-specific conditions.
- (N) Chemical stabilizers
  - (1) Best for use on storage piles subject to infrequent disturbances.
- (O) Altering load-in/load-out procedures
  - (1) Confine load-in/load-out procedures to leeward (downwind) side of the material.
  - (2) May need to be used in conjunction with wind sheltering to prevent visible emissions from crossing the property line.
- (P) Coverings
  - (1) Tarps, plastic, or other material can be used as a temporary covering.
  - (2) When used, these should be anchored to prevent wind from removing coverings.

HIGH WIND MEASURE

- (f) Apply chemical stabilizers (to meet the specifications established by the Rule) prior to wind events; or
- (g) Apply water once per hour; or
- (h) Install temporary covers.

Source: (4) Paved Road Track-Out

**CONTROL MEASURES**

**DESCRIPTION**

- |                                |  |
|--------------------------------|--|
| (Q) Chemical stabilization     | (1) Most effective when used on areas where active operations have ceased.                 |
|                                | (2) Vendors can supply information on methods for application and required concentrations. |
| (R) Sweep/clean roadways       | (1) Either sweeping or water flushing may be used.   |
| (S) Cover haul vehicles        | (1) Entire surface area should be covered once vehicle is full.                            |
| (T) Bedliners in haul vehicles | (1) When feasible, use in bottom dumping vehicles.   |
| (U) Site access improvement    | (1) Pave internal roadway system.  |
|                                | (2) Most important segment, last 100 yards from the connection with paved public roads     |

**HIGH WIND MEASURE**

- (i) Cover all haul vehicles; and
- (j) Clean streets with water flushing, unless prohibited by the Regional Water Quality Control Board.

Source: (S) Disturbed Surface Areas/ Inactive Construction Sites

CONTROL MEASURES

DESCRIPTION

- (Q) Chemical stabilization
  - (1) Most effective when used on areas where active operations have ceased.
  - (2) Vendors can supply information on methods for application and required concentrations.
- (R) Watering
  - (1) Requires frequent applications unless a surface crust can be developed.
- (S) Wind fencing
  - (1) Three- to five-foot barriers with 50% or less porosity adjacent to roadways or urban areas can be effective in reducing the amount of wind blown material leaving a site.
- (T) Vegetation
  - (1) Establish as quickly as possible when active operations have ceased.
  - (2) Use of drought tolerant, native vegetation is encouraged.

HIGH WIND MEASURES

- (k) Apply chemical stabilizers (to meet the specifications established by the Rule); or
- (l) Apply water to all disturbed surface areas 3 times per day.

**RULE 403 IMPLEMENTATION HANDBOOK**

---

**BEST AVAILABLE CONTROL MEASURES**

Rule 403, paragraph (d)(2) requires active operations [defined in Rule 403, paragraph (c)(1)] within the South Coast Air Basin (see Figure 2-1) to implement at least one best available control measure for each fugitive dust source type on site. Additionally, as specified by subparagraph (f)(3)(D) of Rule 403, any person seeking approval of a fugitive dust emissions control plan for projects within the South Coast Air Basin must demonstrate to the satisfaction of the AQMD that the given activity is employing all best available fugitive dust control measures.

The AQMD has prepared the attached listing of best available fugitive dust control measures for a variety of source categories. This list is based on the U.S. Environmental Protection Agency's reference document entitled, "Fugitive Dust Background Document and Technical Information Document for Best Available Control Measures," Office of Air and Radiation, September 1992.

The AQMD encourages the use of those dust control measures that minimize the use of potable water. When water is needed, reclaimed water should be utilized to the greatest extent feasible.



**RULE 403 IMPLEMENTATION HANDBOOK**

**BEST AVAILABLE CONTROL MEASURES**

The left column contains a listing of the sources of fugitive dust which are intended for emission control under District Rule 403 and a listing of control measures and high-wind measures. The right column contains a description of the best available fugitive dust control measures for each of the sources.

Source: (1) Land Clearing/Earth-Moving

**CONTROL MEASURES**

**DESCRIPTION**

- |                                |   |
|--------------------------------|---|
| (A) Watering (pre-grading)     | (1) Application of water by means of trucks, hoses and/or sprinklers prior to conducting any land clearing. This will increase the moisture content of the soils; thereby increasing its stability.<br>(2) Pre-application of water to depths of proposed cuts. |
| (A-1) Watering (post-grading)  | (1) In active earth-moving areas water should be applied at sufficient frequency and quantity to prevent visible emissions from extending more than 100 feet from the point of origin.  |
| (A-2) Pre-grading planning     | (1) Grade each phase separately, timed to coincide with construction phase; or<br>(2) Grade entire project, but apply chemical stabilizers or ground cover to graded areas where construction phase begins more than 60 days after grading phase ends.          |
| (B) Chemical stabilizers       | (1) Only effective in areas which are not subject to daily disturbances.<br>(2) Vendors can supply information on product application and required concentrations to meet the specifications established by the Rule.   |
| (C) Wind fencing               | (1) Three- to five-foot barriers with 50% or less porosity located adjacent to roadways or urban areas can be effective in reducing the amount of windblown material leaving a site. Must be implemented in conjunction with either measure (A-1) or (B).       |
| (D) Cover haul vehicles        | (1) Entire surface area of hauled earth should be covered once vehicle is full.   |
| (E) Bedliners in haul vehicles | (1) When feasible, use in bottom-dumping haul vehicles.   |

**HIGH WIND MEASURE**

- (a) Cease all active operations; or
- (b) Apply water within 15 minutes to any soil surface which is being moved or otherwise disturbed.

# RULE 403 IMPLEMENTATION HANDBOOK

Source: (2) Unpaved Roads

## CONTROL MEASURES

### DESCRIPTION

- |                            |   |
|----------------------------|---|
| (F) Paving                 | (1) Requires street sweeping/cleaning if subject to material accumulation.  |
| (G) Chemical stabilization | (1) Vendors can supply information as to application methods and concentrations to meet the specifications established by the Rule<br>(2) Not recommended for high volume or heavy equipment traffic use. |
| (H) Watering               | (1) In sufficient quantities to keep surface moist.<br>(2) Required application frequency will vary according to soil type, weather conditions, and vehicular use.  |
| (I) Reduce speed limits    | (1) 15 mile per hour maximum. May need to be used in conjunction with watering or chemical stabilization to prevent visible emissions from crossing the property line.                                    |
| (J) Reduce vehicular trips | (1) Access restriction or redirecting traffic to reduce vehicle trips by a minimum of 60 percent.   |
| (K) Gravel                 | (1) Gravel maintained to a depth of four inches can be an effective measure.<br>(2) Should only be used in areas where paving, chemical stabilization or frequent watering is not feasible.               |

## HIGH WIND MEASURE

- (a) Apply a chemical stabilizer (to meet the specifications established by the Rule ) prior to wind events; or
- (b) Apply water once each hour; or
- (c) Stop all vehicular traffic.

**RULE 403 IMPLEMENTATION HANDBOOK**

**Source:** (3) Storage Piles

**CONTROL MEASURES**

**DESCRIPTION**

- |  |  |
|--|--|
| (L) Wind sheltering                      | (1) Enclose in silos.<br>(2) Install three-sided barriers equal to height of material, with no more than 50 percent porosity.                                  |
| (M) Watering                             | (1) Application methods include: spray bars, hoses and water trucks.<br>(2) Frequency of application will vary on site-specific conditions.                    |
| (N) Chemical stabilizers                 | (1) Best for use on storage piles subject to infrequent disturbances.  |
| (O) Altering load-in/load-out procedures | (1) Confine load-in/load-out procedures to leeward (downwind) side of the material.<br>Must be used in conjunction with either measure (L), (M), (N), or (P).  |
| (P) Coverings                            | (1) Tarps, plastic, or other material can be used as a temporary covering.<br>(2) When used, these should be anchored to prevent wind from removing coverings. |

**HIGH WIND MEASURE**

- (a) Apply chemical stabilizers (to meet the specifications established by the Rule) prior to wind events; or
- (b) Apply water once per hour; or
- (c) Install temporary covers.

**RULE 403 IMPLEMENTATION HANDBOOK**

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Source: (4) Paved Road Track-Out

CONTROL MEASURES

DESCRIPTION

Compliance with District Rule 403.

Paragraph (d)(5).

January 1999

**RULE 403 IMPLEMENTATION HANDBOOK**

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**Source:** (S) Disturbed Surface Areas/ Inactive Construction Sites

**CONTROL MEASURES**

**DESCRIPTION**

- (Q) Chemical stabilization
  - (1) Most effective when used on areas where active operations have ceased.
  - (2) Vendors can supply information on methods for application and required concentrations.
- (R) Watering
  - (1) Requires frequent applications unless a surface crust can be developed.
- (S) Wind fencing
  - (1) Three- to five-foot barriers with 50% or less porosity adjacent to roadways or urban areas can be effective in reducing the amount of wind blown material leaving a site. Must be used in conjunction with either measure (Q), (R), or (T).
- (T) Vegetation
  - (1) Establish as quickly as possible when active operations have ceased.\*

**HIGH WIND MEASURES**

- (a) Apply chemical stabilizers (to meet the specifications established by the Rule); or
- (b) Apply water to all disturbed surface areas 3 times per day.

---

\* Use of drought tolerant, native vegetation is encouraged.

TABLE 1

## BEST [REASONABLY]\* AVAILABLE CONTROL MEASURES FOR HIGH WIND CONDITIONS

<b>FUGITIVE DUST SOURCE CATEGORY</b>	<b><u>CONTROL MEASURES</u></b>
<b>Earth-moving</b>	(1A) Cease all active operations; OR (2A) Apply water to soil not more than 15 minutes prior to moving such soil.
<b>Disturbed surface areas</b>	(0B) On the last day of active operations prior to a weekend, holiday, or any other period when active operations will not occur for not more than four consecutive days: apply water with a mixture of chemical stabilizer diluted to not less than 1/20 of the concentration required to maintain a stabilized surface for a period of six months; OR (1B) Apply chemical stabilizers prior to wind event; OR (2B) Apply water to all unstabilized disturbed areas 3 times per day. If there is any evidence of wind driven fugitive dust, watering frequency is increased to a minimum of four times per day; OR (3B) Take the actions specified in Table 2, Item (3c); OR (4B) Utilize any combination of control actions (1B), (2B), and (3B) such that, in total, these actions apply to all disturbed surface areas.
<b>Unpaved roads</b>	(1C) Apply chemical stabilizers prior to wind event; OR (2C) Apply water twice [once] per hour during active operation; OR (3C) Stop all vehicular traffic.
<b>Open storage piles</b>	(1D) Apply water twice [once] per hour; OR (2D) Install temporary coverings.
<b>Paved road track-out</b>	(1E) Cover all haul vehicles; OR (2E) Comply with the vehicle freeboard requirements of Section 23114 of the California Vehicle Code for both public and private roads.
<b>All Categories</b>	(1F) Any other control measures approved by the Executive Officer and the U.S. EPA as equivalent to the methods specified in Table 1 may be used.

\* Measures in [brackets] are reasonably available control measures and only apply to sources not within the South Coast Air Basin.

January 1999

**TABLE 2**  
**DUST CONTROL ACTIONS FOR EXEMPTION FROM PARAGRAPH (d)(4)\***

<b><u>FUGITIVE DUST SOURCE CATEGORY</u></b>	<b><u>CONTROL ACTIONS</u></b>
<b>Earth-moving (except construction cutting and filling areas, and mining operations)</b>	<p>(1a) Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D-2216, or other equivalent method approved by the Executive Officer, the California Air Resources Board, and the U.S. EPA. Two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations each subsequent four-hour period of active operations; OR</p> <p>(1a-1) For any earth-moving which is more than 100 feet from all property lines, conduct watering as necessary to prevent visible dust emissions from exceeding 100 feet in length in any direction.</p>
<b>Earth-moving: Construction fill areas:</b>	<p>(1b) Maintain soil moisture content at a minimum of 12 percent, as determined by ASTM method D-2216, or other equivalent method approved by the Executive Officer, the California Air Resources Board, and the U.S. EPA. For areas which have an optimum moisture content for compaction of less than 12 percent, as determined by ASTM Method 1557 or other equivalent method approved by the Executive Officer and the California Air Resources Board and the U.S. EPA, complete the compaction process as expeditiously as possible after achieving at least 70 percent of the optimum soil moisture content. Two soil moisture evaluations must be conducted during the first three hours of active operations during a calendar day, and two such evaluations during each subsequent four-hour period of active operations.</p>

\* Measures in [brackets] are reasonably available control measures and only apply to sources not within the South Coast Air Basin.

TABLE 2 (Continued)\*

<b><u>FUGITIVE DUST SOURCE CATEGORY</u></b>	<b><u>CONTROL ACTIONS</u></b>
<b>Earth-moving: Construction cut areas and mining operations:</b>	(1c) Conduct watering as necessary to prevent visible emissions from extending more than 100 feet beyond the active cut or mining area unless the area is inaccessible to watering vehicles due to slope conditions or other safety factors.
<b>Disturbed surface areas (except completed grading areas)</b>	(2a/b) Apply dust suppression in sufficient quantity and frequency to maintain a stabilized surface. Any areas which cannot be stabilized, as evidenced by wind driven fugitive dust must have an application of water at least twice per day to at least 80 [70] percent of the unstabilized area.
<b>Disturbed surface areas: Completed grading areas</b>	(2c) Apply chemical stabilizers within five working days of grading completion; OR  (2d) Take actions (3a) or (3c) specified for inactive disturbed surface areas.
<b>Inactive disturbed surface areas</b>	(3a) Apply water to at least 80 [70] percent of all inactive disturbed surface areas on a daily basis when there is evidence of wind driven fugitive dust, excluding any areas which are inaccessible to watering vehicles due to excessive slope or other safety conditions; OR  (3b) Apply dust suppressants in sufficient quantity and frequency to maintain a stabilized surface; OR  (3c) Establish a vegetative ground cover within 21 [30] days after active operations have ceased. Ground cover must be of sufficient density to expose less than 30 percent of unstabilized ground within 90 days of planting, and at all times thereafter; OR  (3d) Utilize any combination of control actions (3a), (3b), and (3c) such that, in total, these actions apply to all inactive disturbed surface areas.

\* Measures in [brackets] are reasonably available control measures and only apply to sources not within the South Coast Air Basin.



TABLE 2 (Continued)

<u>FUGITIVE DUST SOURCE CATEGORY</u>	<u>CONTROL ACTIONS</u>
<b>Unpaved Roads</b>	(4a) Water all roads used for any vehicular traffic at least once per every two hours of active operations [3 times per normal 8 hour work day]; OR (4b) Water all roads used for any vehicular traffic once daily and restrict vehicle speeds to 15 miles per hour; OR (4c) Apply a chemical stabilizer to all unpaved road surfaces in sufficient quantity and frequency to maintain a stabilized surface.
<b>Open storage piles</b>	(5a) Apply chemical stabilizers; OR (5b) Apply water to at least 80 [70] percent of the surface area of all open storage piles on a daily basis when there is evidence of wind driven fugitive dust; OR (5c) Install temporary coverings; OR (5d) Install a three-sided enclosure with walls with no more than 50 percent porosity which extend, at a minimum, to the top of the pile.
<b><u>All Categories</u></b>	(6a) Any other control measures approved by the Executive Officer and the U.S. EPA as equivalent to the methods specified in Table 2 may be used.

\* Measures in [brackets] are reasonably available control measures and only apply to sources not within the South Coast Air Basin.

January 1999

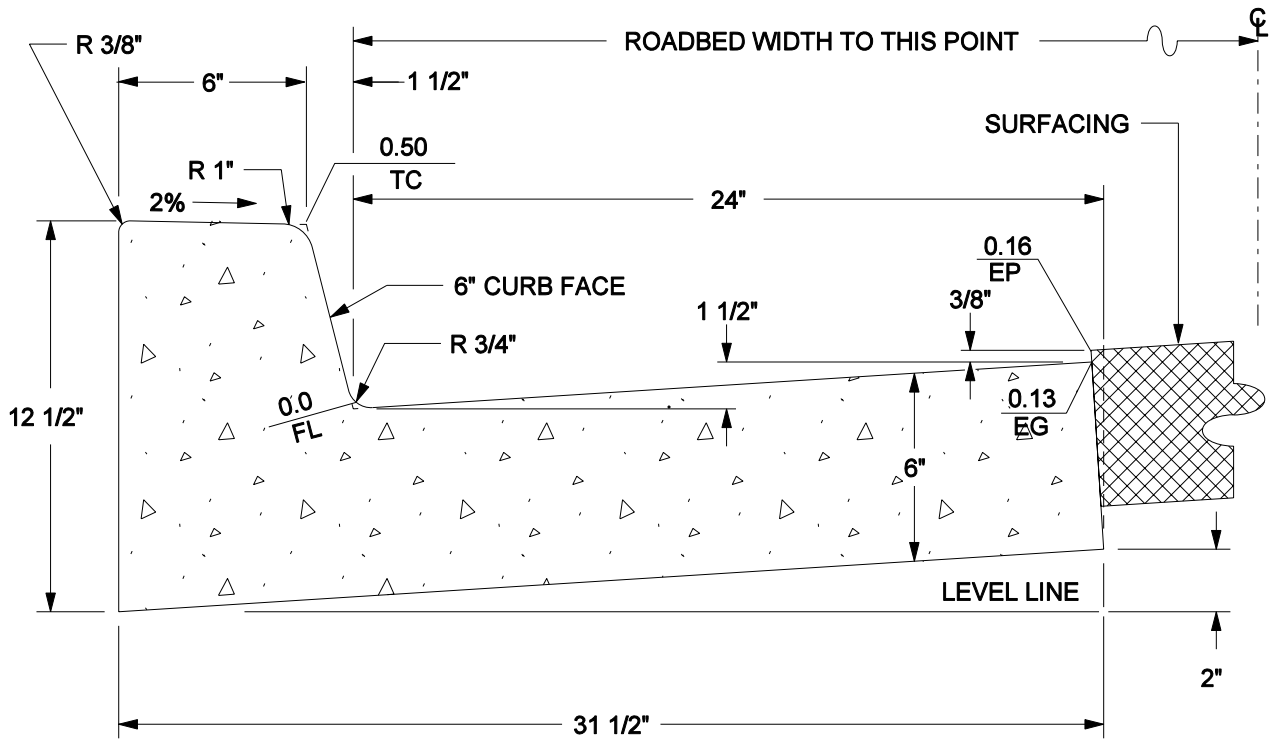
AQMD Recommendations  
**TABLE 3**  
**TRACK-OUT CONTROL OPTIONS**  
**PARAGRAPH (d)(5)(B)**

CONTROL OPTIONS

(1)	Pave or apply chemical stabilization at sufficient concentration and frequency to maintain a stabilized surface starting from the point of intersection with the public paved surface, and extending for a centerline distance of at least 100 feet and a width of at least 20 feet.
(2)	Pave from the point of intersection with the public paved road surface, and extending for a centerline distance of at least 25 feet and a width of at least 20 feet, and install a track-out control device immediately adjacent to the paved surface such that exiting vehicles do not travel on any unpaved road surface after passing through the track-out control device.
(3)	Any other control measures approved by the Executive Officer and the U.S. EPA as equivalent to the methods specified in Table 3 may be used.

# **APPENDIX B**

## **REFERENCE DRAWINGS**



CLASS "B" CONCRETE

1.601 CU. FT. / L.F.

1 CU. YD. = 16.86 L.F.

ABBREVIATIONS:

TC = TOP OF CURB

FL = FLOWLINE

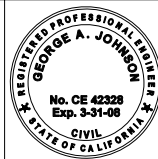
EG = EDGE OF GUTTER

EP = EDGE OF PAVEMENT

APPROVED BY:

*George A. Johnson*  
 DIRECTOR OF TRANSPORTATION  
 GEORGE A. JOHNSON, RCE 42328

DATE: 05/01/07

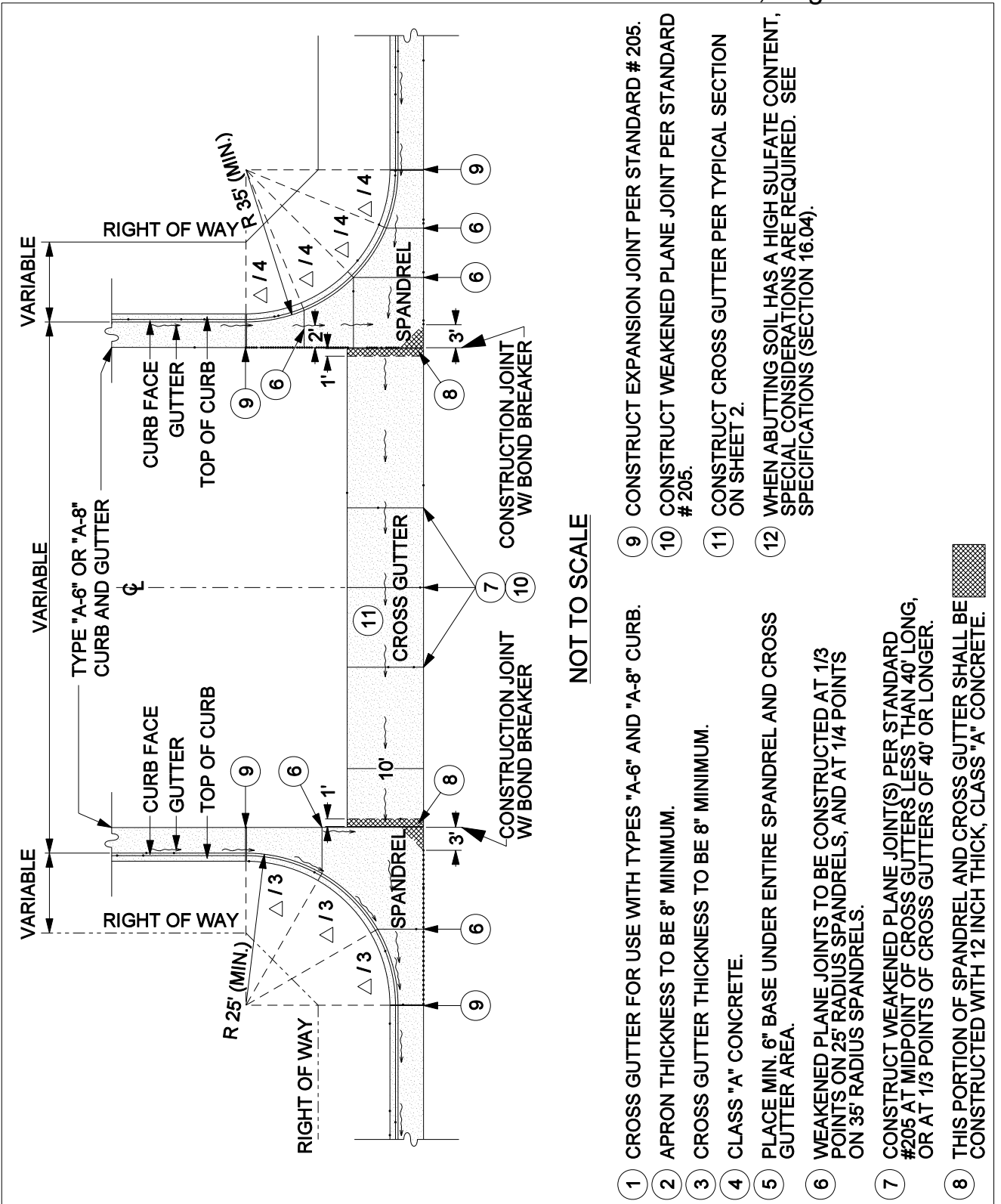


COUNTY OF RIVERSIDE

**TYPE A-6 CURB**

STANDARD NO. 200

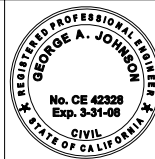
REVISIONS		REV.	BY:	APR'D	DATE	REV.	BY:	APR'D	DATE
8-71, 9-88		1				4			
2-90, 11-04		2				5			
		3				6			



APPROVED BY:

*George A. Johnson*  
 DIRECTOR OF TRANSPORTATION  
 GEORGE A. JOHNSON, RCE 42328

DATE: 05/01/07



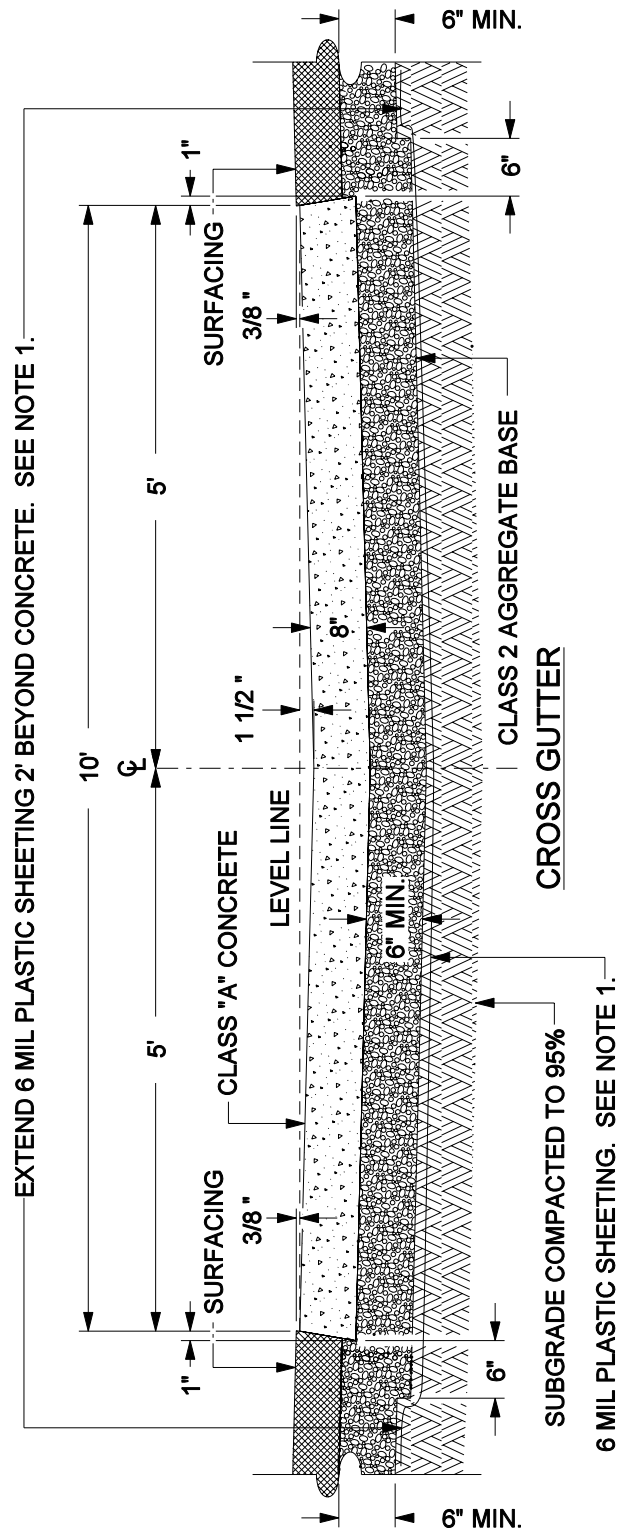
COUNTY OF RIVERSIDE

**CROSS GUTTER  
 (LAYOUT)**

STANDARD NO. 209 (1 OF 2)

REVISIONS		REV.	BY:	APR'D	DATE	REV.	BY:	APR'D	DATE
11-77, 8-82		1				4			
9-88, 2-90		2				5			
11-04		3				6			

- 1 CROSS GUTTER FOR USE WITH TYPES "A-6" AND "A-8" CURB.
- 2 APRON THICKNESS TO BE 8" MINIMUM.
- 3 CROSS GUTTER THICKNESS TO BE 8" MINIMUM.
- 4 CLASS "A" CONCRETE.
- 5 PLACE MIN. 6" BASE UNDER ENTIRE SPANDREL AND CROSS GUTTER AREA.
- 6 WEAKENED PLANE JOINTS TO BE CONSTRUCTED AT 1/3 POINTS ON 25' RADIUS SPANDRELS, AND AT 1/4 POINTS ON 35' RADIUS SPANDRELS.
- 7 CONSTRUCT WEAKENED PLANE JOINT(S) PER STANDARD #205 AT MIDPOINT OF CROSS GUTTERS LESS THAN 40' LONG, OR AT 1/3 POINTS OF CROSS GUTTERS OF 40' OR LONGER.
- 8 THIS PORTION OF SPANDREL AND CROSS GUTTER SHALL BE CONSTRUCTED WITH 12 INCH THICK, CLASS "A" CONCRETE.
- 9 CONSTRUCT EXPANSION JOINT PER STANDARD # 205.
- 10 CONSTRUCT WEAKENED PLANE JOINT PER STANDARD # 205.
- 11 CONSTRUCT CROSS GUTTER PER TYPICAL SECTION ON SHEET 2.
- 12 WHEN ABUTTING SOIL HAS A HIGH SULFATE CONTENT, SPECIAL CONSIDERATIONS ARE REQUIRED. SEE SPECIFICATIONS (SECTION 16.04).



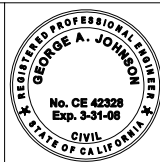
NOT TO SCALE

**NOTE**  
 1. WHEN ABUTTING SOIL HAS A HIGH SULFATE CONTENT, SPECIAL CONSIDERATIONS ARE REQUIRED. SEE SPECIFICATIONS (SECTION 16.04).

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*George A. Johnson*  
 DIRECTOR OF TRANSPORTATION  
 GEORGE A. JOHNSON, RCE 42328

DATE: 05/01/07

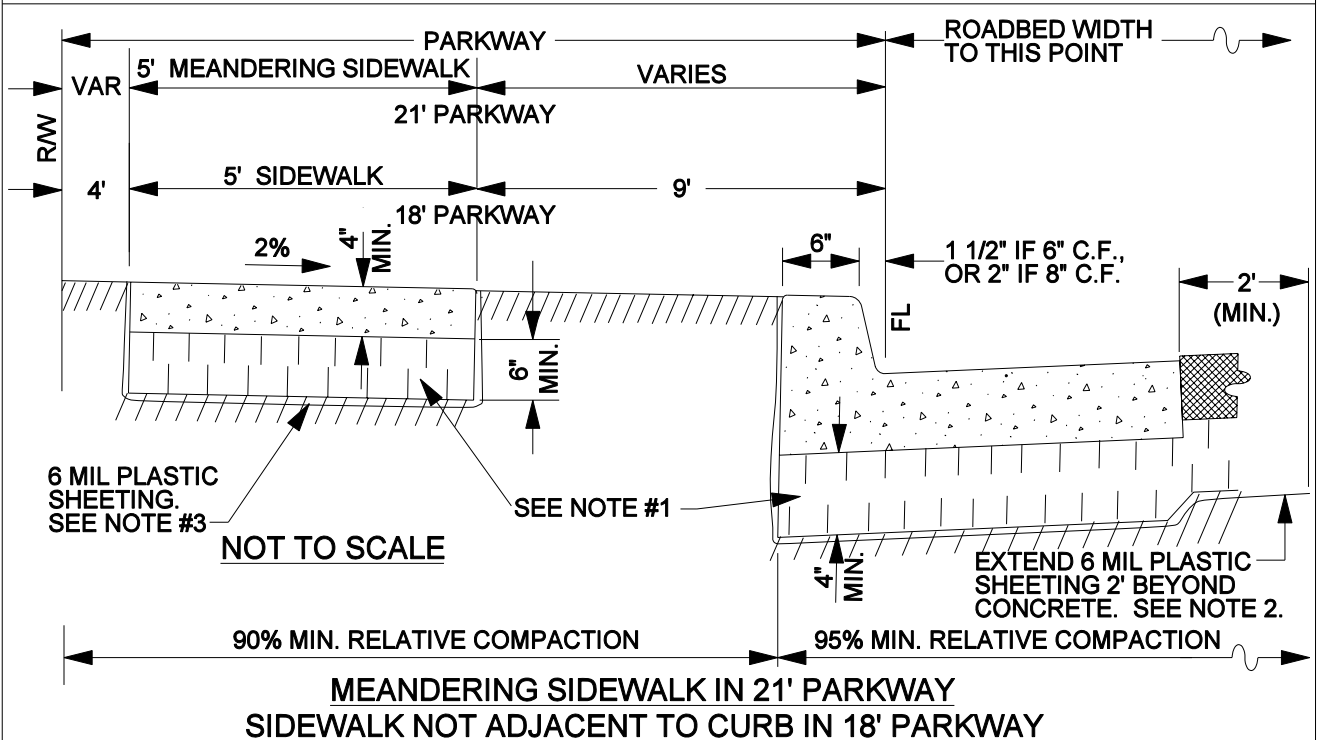
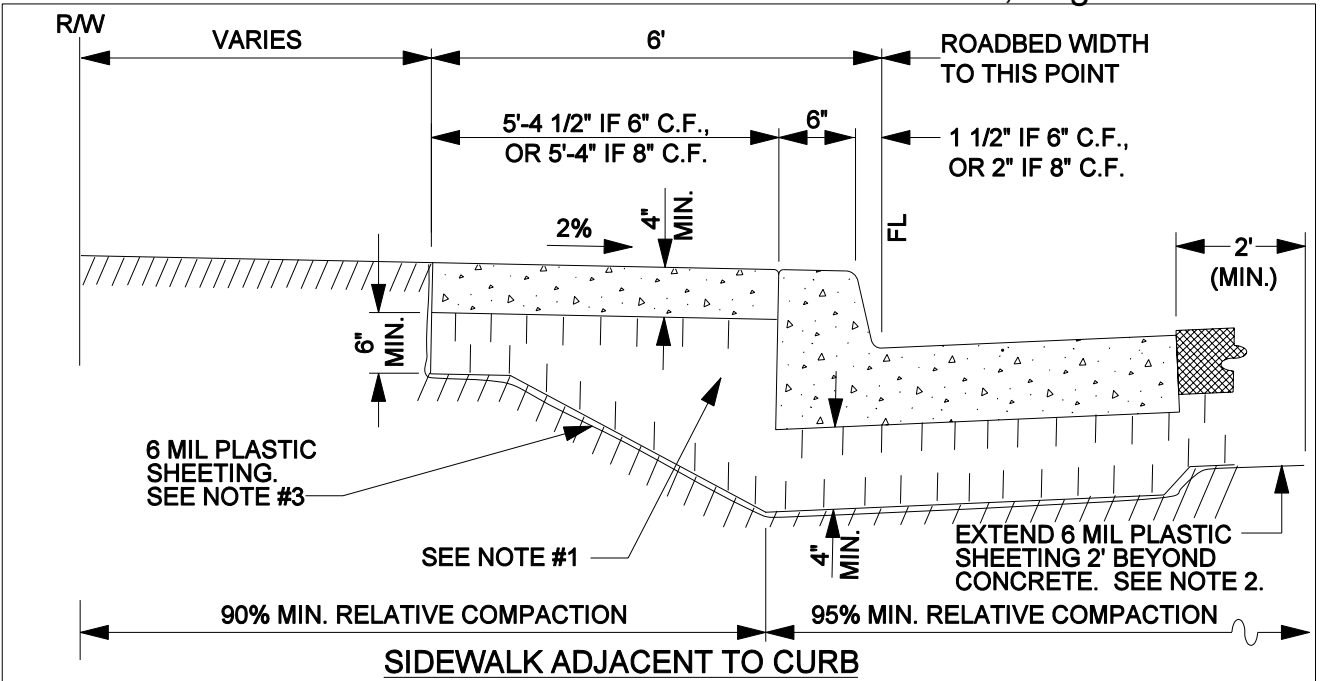


COUNTY OF RIVERSIDE

**CROSS GUTTER  
 (TYPICAL SECTION)**

REVISIONS		REV.	BY:	APR'D	DATE	REV.	BY:	APR'D	DATE
8-71, 9-88		1				4			
2-90, 12-97		2				5			
11-04		3				6			

STANDARD NO. 209 (2 OF 2)



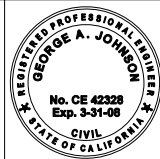
**NOTE:**

1. AGGREGATE BASE OR APPROVED SELECT MATERIAL WHEN SOILS REPORT INDICATES PRESENCE OF EXPANSIVE SOIL CONDITIONS.
2. ALL CONSTRUCTION SHALL BE CLASS "B" CONCRETE.
3. WHEN ABUTTING SOIL HAS A HIGH SULFATE CONTENT, SPECIAL CONSIDERATIONS ARE REQUIRED. SEE SPECIFICATIONS (SECTION 16.04).

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*George A. Johnson*  
 DIRECTOR OF TRANSPORTATION  
 GEORGE A. JOHNSON, RCE 42328

DATE: 05/01/07

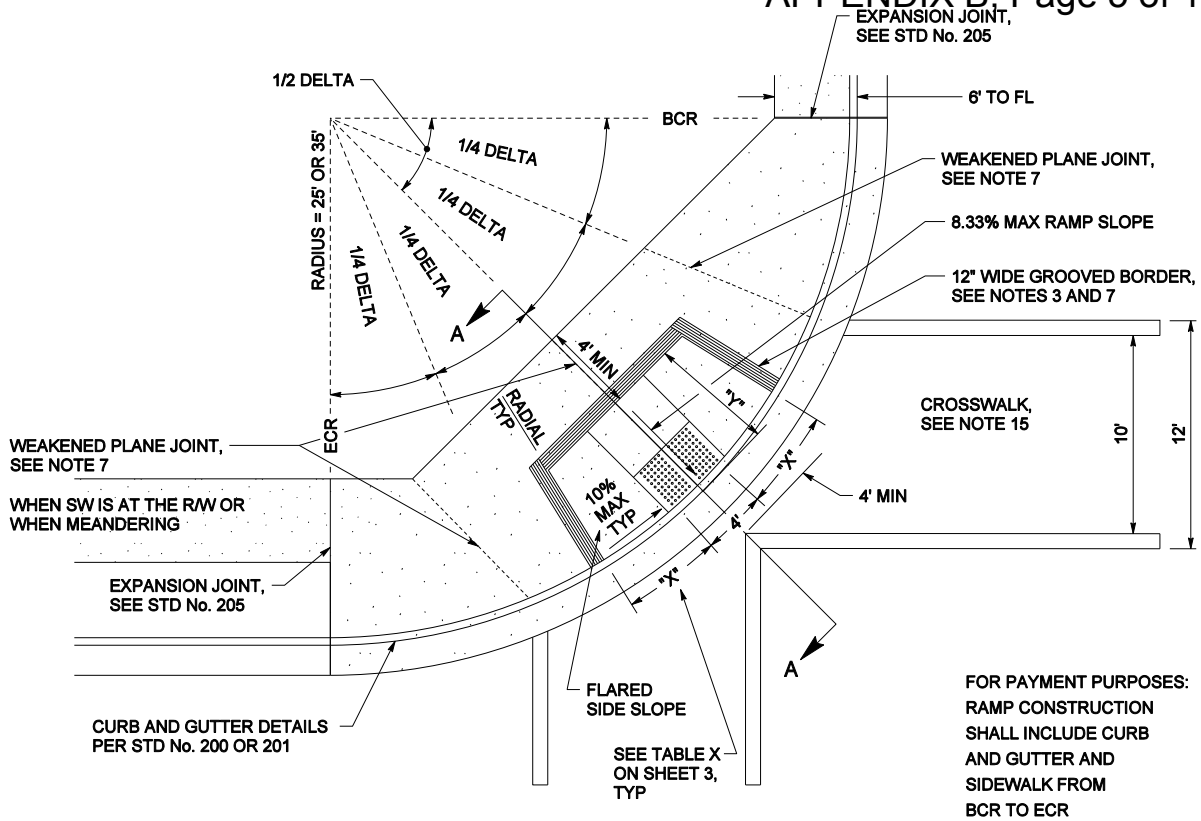


COUNTY OF RIVERSIDE

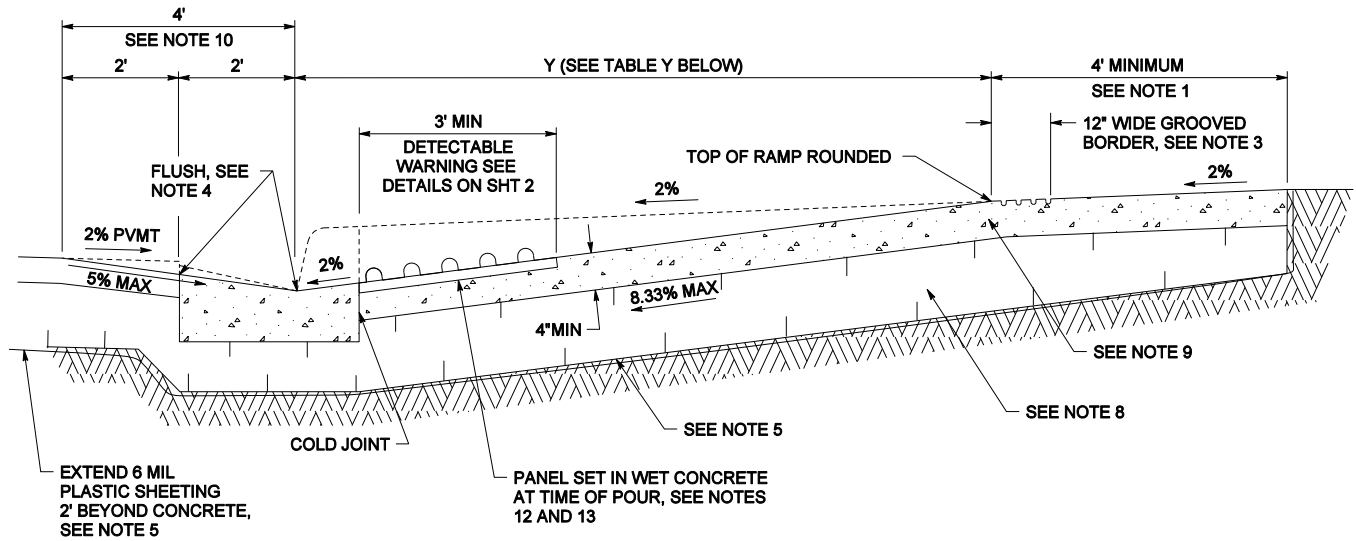
**SIDEWALK AND CURB**

REVISIONS	REV.	BY:	APR'D	DATE	REV.	BY:	APR'D	DATE
8-71, 11-77	1				4			
8-82, 9-88	2				5			
4-90, 11-04	3				6			

STANDARD NO. 401



FOR PAYMENT PURPOSES:  
RAMP CONSTRUCTION  
SHALL INCLUDE CURB  
AND GUTTER AND  
SIDEWALK FROM  
BCR TO ECR



SECTION A-A

TABLE Y

CF	Y
6"	7.90'
8"	10.53'

$$Y = \frac{\text{CURB FACE (FT)}}{6.33\%}$$

FOR NOTES SEE SHEET 7 OF 7  
SEE NOTE 16 FOR CONSTRUCTION TOLERANCES

APPROVED BY:

DATE: 11/15/04

DIRECTOR OF TRANSPORTATION  
JUAN C. PEREZ, RCE 49568

DATE



COUNTY OF RIVERSIDE

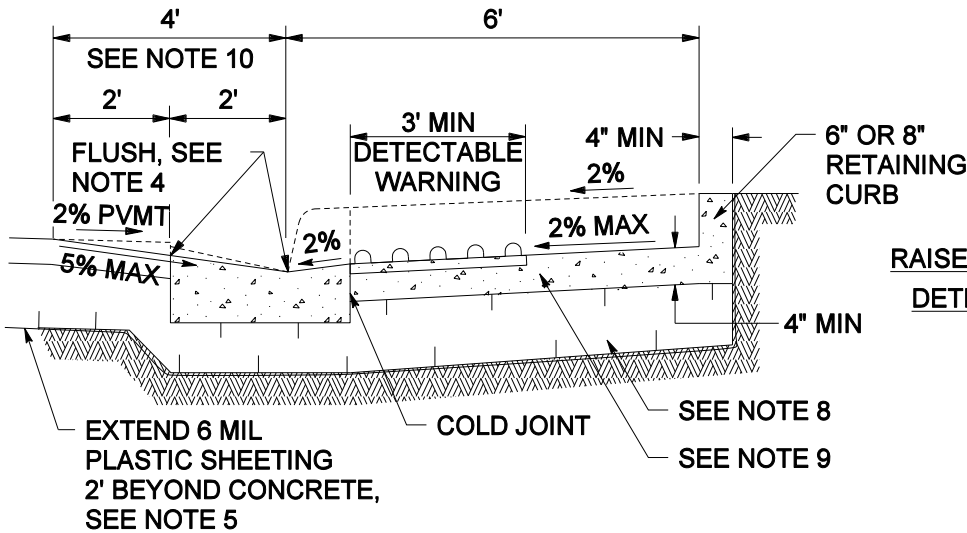
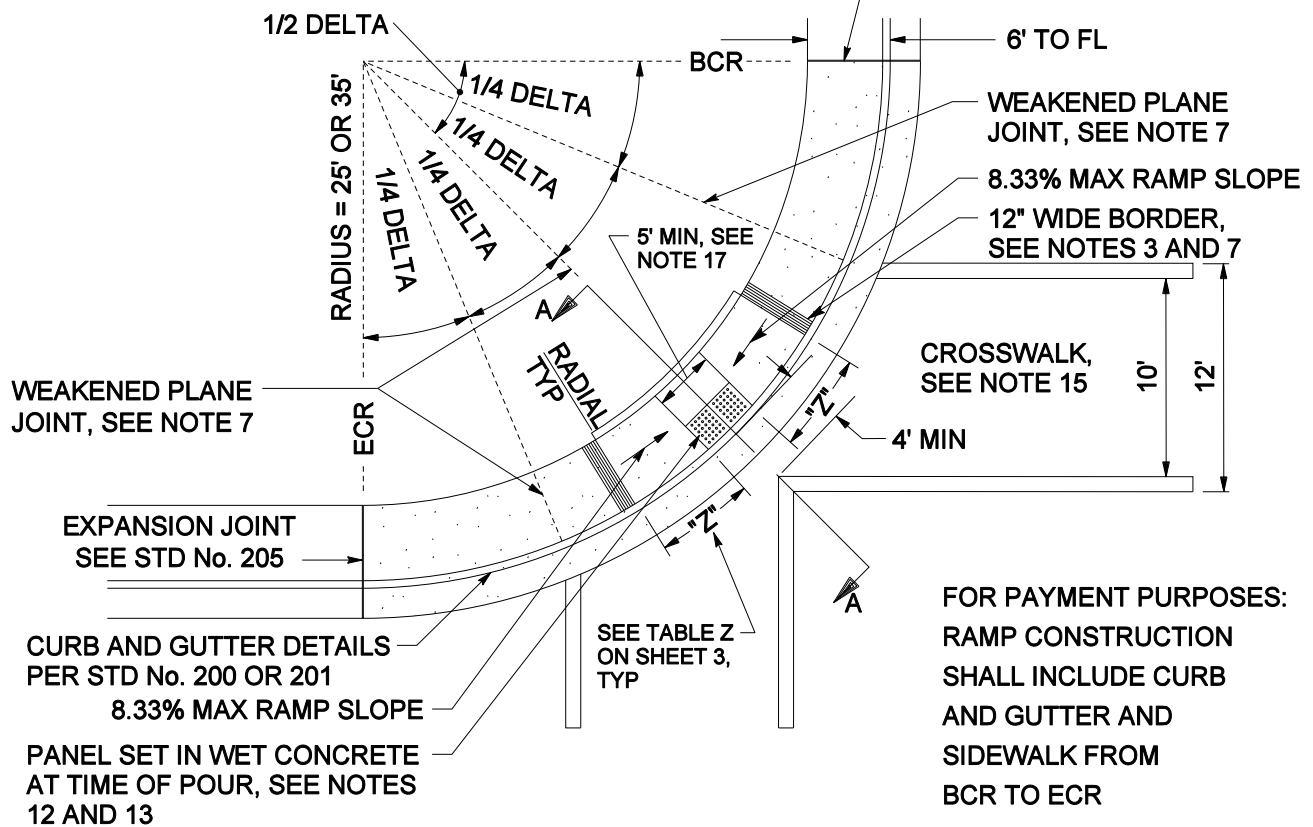
**CURB RAMP  
CASE A**

NO SCALE

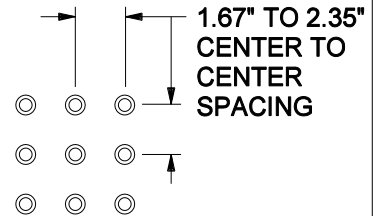
STANDARD No. 403 (1 OF 7)

REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
8-77, 5-80	1	JK	JP	08-05-10				
10-81, 6-82	2							
9-88, 2-90	3							

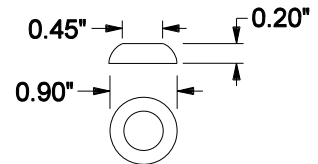




SECTION A-A



RAISED TRUNCATED DOME PATTERN  
DETECTABLE WARNING SURFACE  
SEE NOTES 12 & 13



RAISED TRUNCATED DOME  
SEE NOTE 11

FOR NOTES SEE SHEET 7 OF 7  
SEE NOTE 16 FOR CONSTRUCTION TOLERANCES

APPROVED BY:

DATE: 11/15/04

DIRECTOR OF TRANSPORTATION  
JUAN C. PEREZ, RCE 49568

DATE



COUNTY OF RIVERSIDE

**CURB RAMP  
CASE B**

NO SCALE

STANDARD No. 403 (2 OF 7)

REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
8-77, 5-80	1	JK	JP	08-05-10				
10-81, 6-82	2							
9-88, 2-90	3							

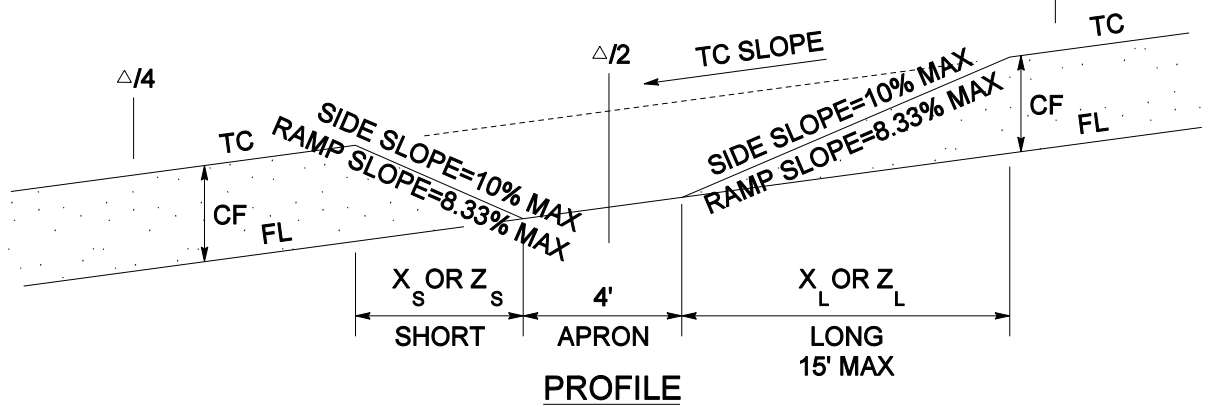


TABLE X - CASE A FLARED SIDE SLOPES

CF (IN)	RADIUS (FT)	SIDE SLOPE	X	TC GRADE (ALONG CURB RETURN)					
				1%	2%	3%	4%	5%	6%
6"	35'	10%	X <sub>S</sub>	4.6	4.2	3.9	3.6	3.4	3.2
			X <sub>L</sub>	5.6	6.3	7.2	8.4	10.0	12.5
8"	35'	10%	X <sub>S</sub>	6.1	5.6	5.2	4.8	4.5	4.2
			X <sub>L</sub>	7.5	8.4	9.6	11.2	13.4	15.0*

TABLE Z - CASE B AND C RAMP SLOPES

CF (IN)	RADIUS (FT)	RAMP SLOPE	Y	TC SLOPE (ALONG CURB RETURN)					
				1%	2%	3%	4%	5%	6%
6"	35'	8.33%	Y <sub>S</sub>	5.4	4.8	4.4	4.1	3.8	3.5
			Y <sub>L</sub>	6.8	7.9	9.4	11.5	15.0*	15.0*
8"	35'	8.33%	Y <sub>S</sub>	7.1	6.4	5.9	5.4	5.0	4.6
			Y <sub>L</sub>	9.1	10.5	12.5	15.0*	15.0*	15.0*

\* NOTE: MAXIMUM ADA SLOPES HAVE BEEN EXCEEDED. ENGINEER IS REQUIRED TO FILE A DESIGN EXCEPTION FOR TECHNICAL INFEASIBILITY.

TO CALCULATE "X" DIMENSION:

SHORT SIDE (DOWN SLOPE):  

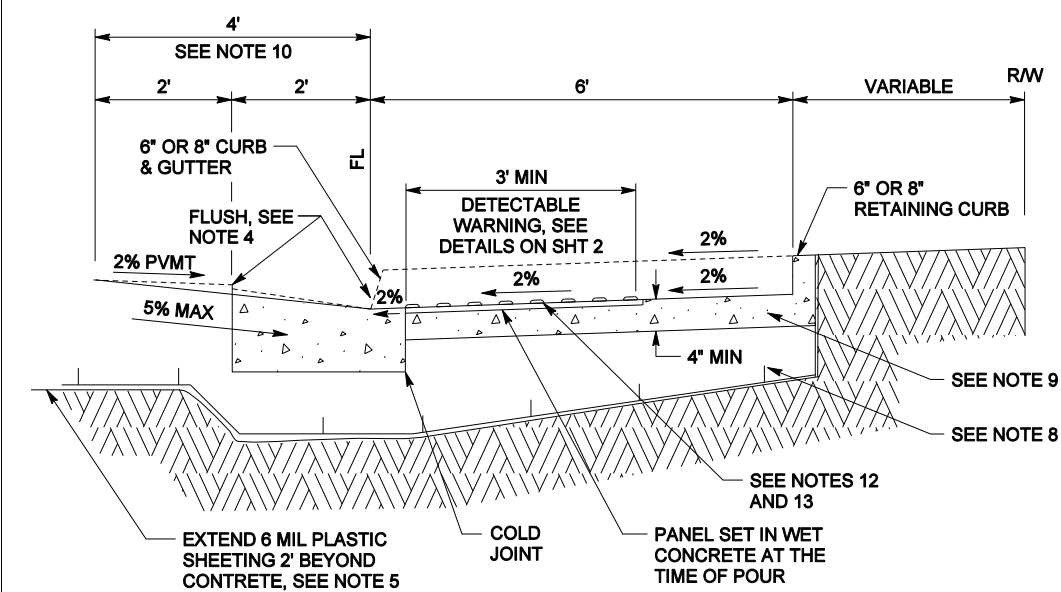
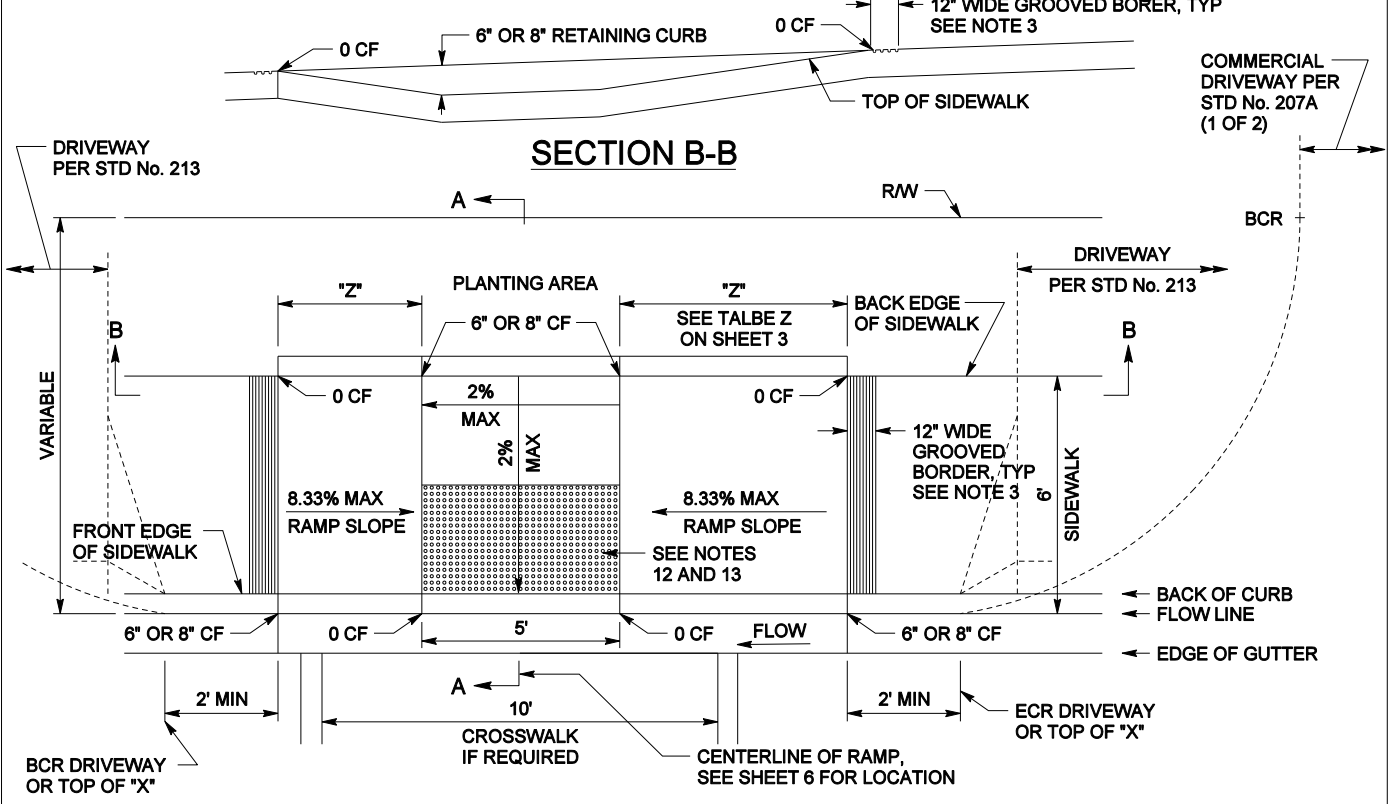
$$X_S \text{ OR } Y_S \text{ (FT)} = \frac{\text{CURB FACE (FT)}}{\text{SIDE OR RAMP SLOPE} + \text{TC SLOPE}}$$
 LONG SIDE (UP SLOPE):  

$$X_L \text{ OR } Y_L \text{ (FT)} = \frac{\text{CURB FACE (FT)}}{\text{SIDE OR RAMP SLOPE} - \text{TC SLOPE}}$$

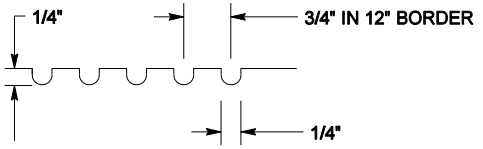
ENGINEER TO SHOW X<sub>S</sub>, X<sub>L</sub>, Y<sub>S</sub>, AND Y<sub>L</sub> ON IMPROVEMENT PLANS

SEE NOTE 16 FOR CONSTRUCTION TOLERANCES

APPROVED BY:		DATE: 11/15/04				COUNTY OF RIVERSIDE	
DIRECTOR OF TRANSPORTATION JUAN C. PEREZ, RCE 49568		DATE				<b>CURB RAMP PROFILE</b>	
REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	DATE
8-77, 5-80	11-04	1	JK	JP	08-05-10		
10-81, 6-82		2					
9-88, 2-90		3					
NO SCALE							STANDARD No. 403 (3 OF 7)



SECTION A-A



GROOVING DETAIL

FOR NOTES SEE SHEET 7 OF 7  
SEE NOTE 16 FOR CONSTRUCTION TOLERANCES

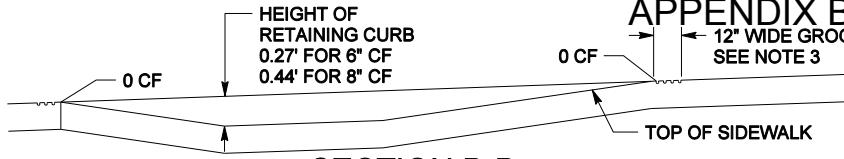
APPROVED BY: \_\_\_\_\_ DATE: 00/00/00  
DIRECTOR OF TRANSPORTATION \_\_\_\_\_ DATE  
JUAN C. PEREZ, RCE 49568



COUNTY OF RIVERSIDE  
**CURB RAMP-CASE C**  
**"T" INTERSECTION**  
**WITH SIDEWALK AT CURB**  
NO SCALE

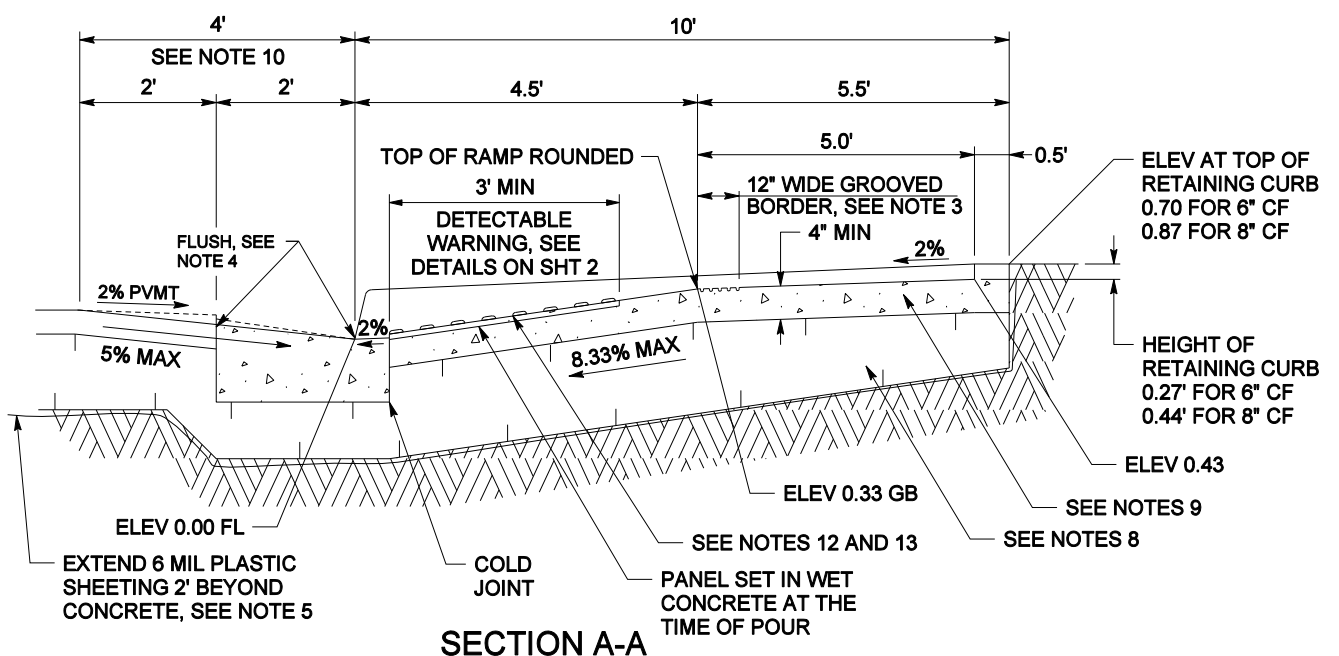
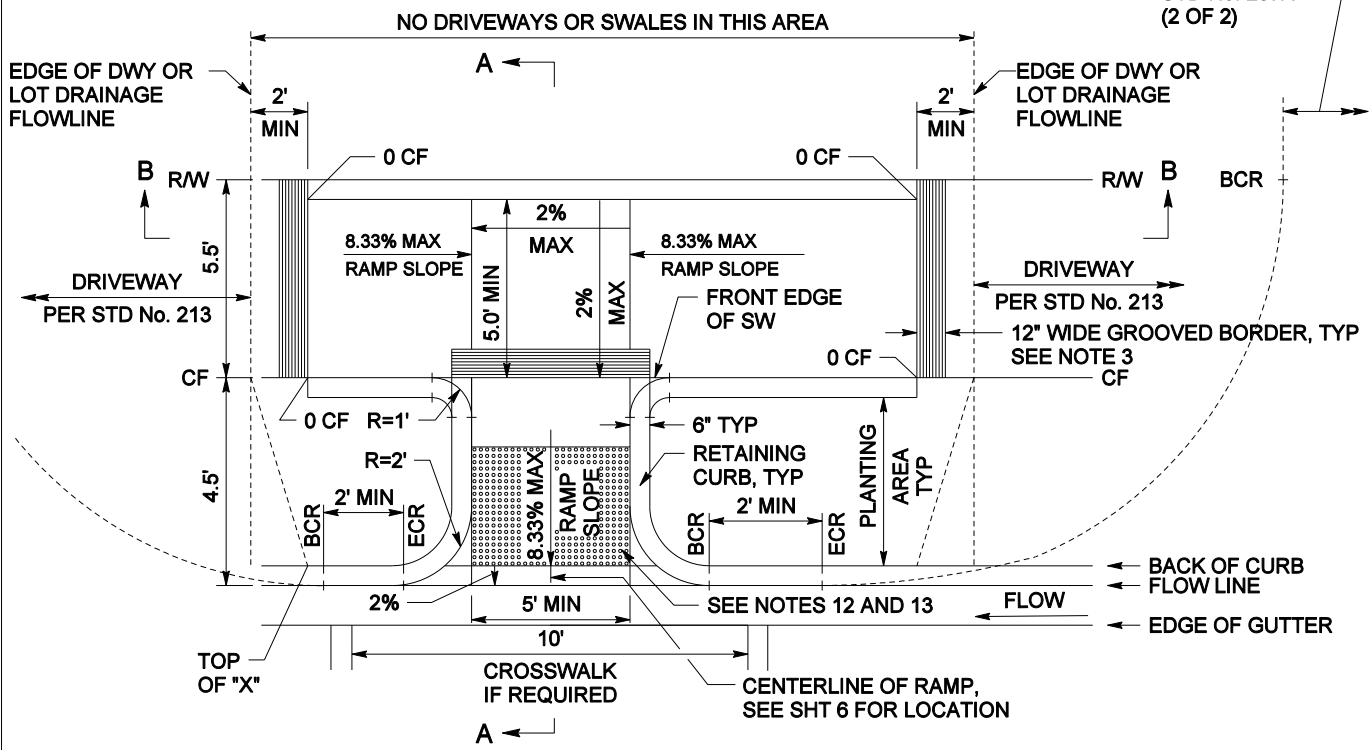
REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
	1	JK	JP	08-05-10				
	2							
	3							

STANDARD No. 403 (4 OF 7)



SECTION B-B

COMMERCIAL DRIVEWAY PER STD No. 207A (2 OF 2)



SECTION A-A

FOR NOTES SEE SHEET 7 OF 7  
SEE NOTE 16 FOR CONSTRUCTION TOLERANCES

APPROVED BY: \_\_\_\_\_ DATE: 00/00/00  
DIRECTOR OF TRANSPORTATION \_\_\_\_\_ DATE  
JUAN C. PEREZ, RCE 49568

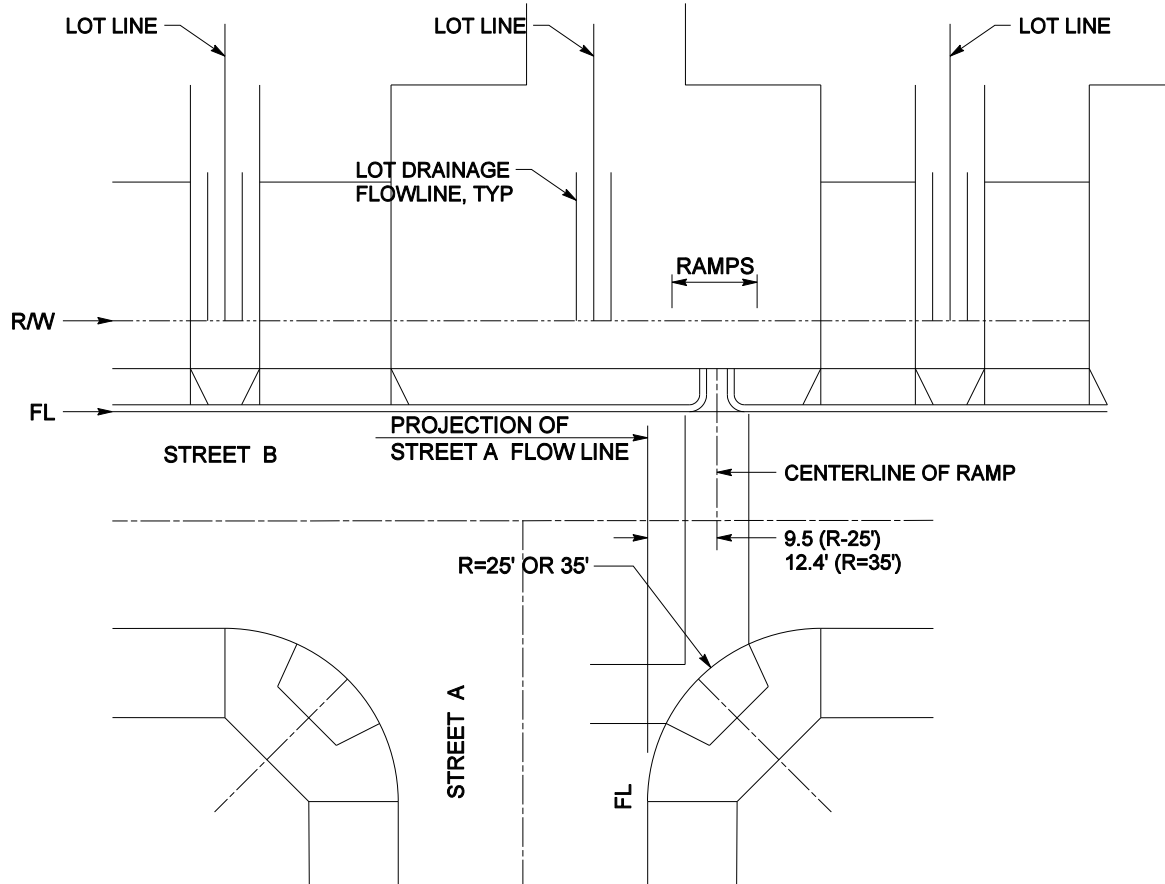


COUNTY OF RIVERSIDE  
**CURB RAMP-CASE D**  
**"T" INTERSECTION**  
**WITH SIDEWALK AT R/W**  
NO SCALE

REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
	1	JK	JP	08-05-10				
	2							
	3							

STANDARD No. 403 (5 OF 7)

DRIVEWAYS TO BE LOCATED TO NOT CONFLICT WITH REQUIRED RAMP LOCATION. SEE STD No. 403, SHEET 4 AND 5 OF COUNTY ORDINANCE No. 461. AVOID LOCATING DRIVEWAYS WITHIN INTERSECTION.



RAMP LOCATION AT "T" INTERSECTION (RIGHT TURN SIDE OF STREET A)

CASES C AND D

APPROVED BY:

DIRECTOR OF TRANSPORTATION  
JUAN C. PEREZ, RCE 49568

DATE



COUNTY OF RIVERSIDE


**CURB RAMP  
LOCATION AT  
"T" INTERSECTIONS**  
NO SCALE

STANDARD No. 403 (6 OF 7)

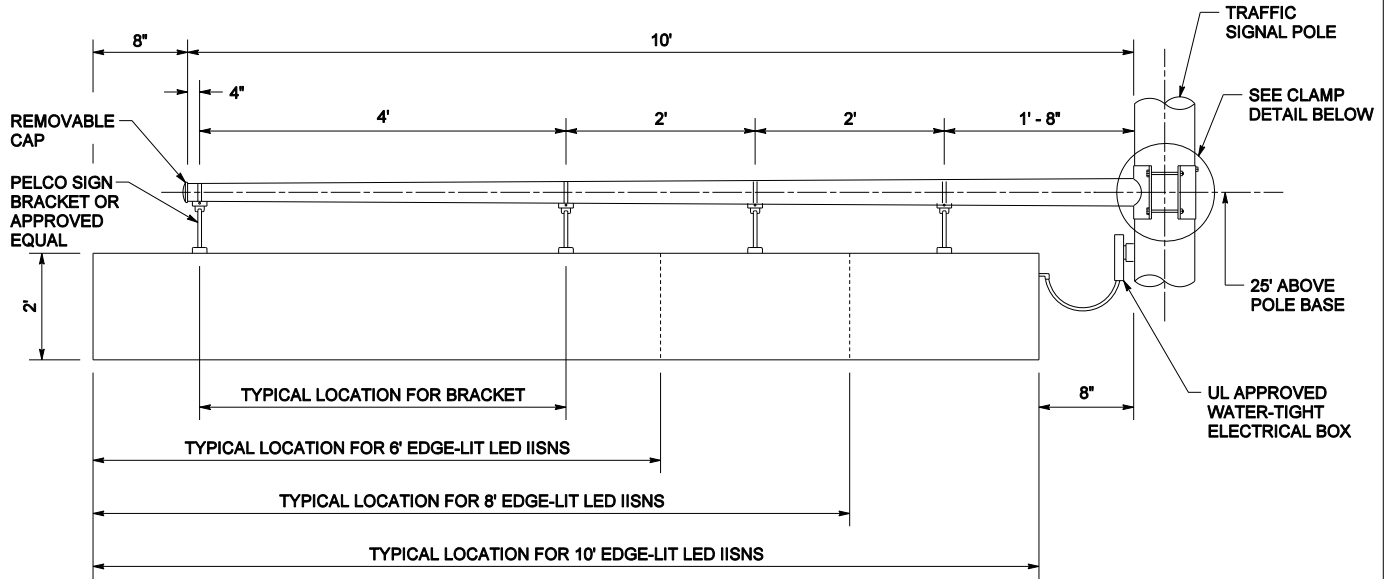
REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
	1	JK	JC	08-05-10				
	2							
	3							

**NOTES:**

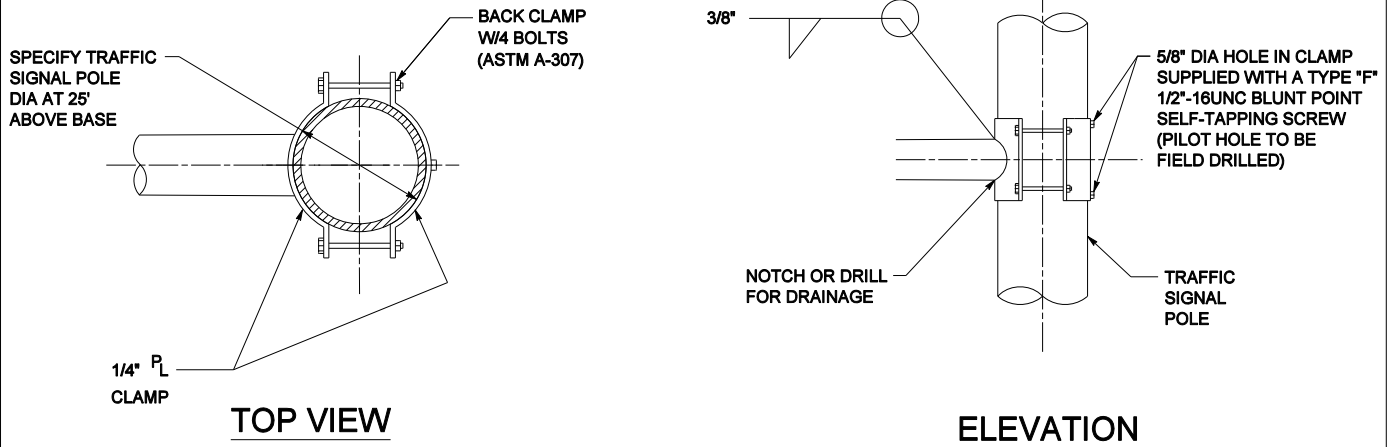
1. IF DISTANCE FROM CURB TO BACK OF SIDEWALK IS TOO SHORT TO ACCOMMODATE RAMP AND 4' LANDING, THEN USE THE CASE"B" RAMP.
2. THE MINIMUM SIDEWALK WIDTH IS 5' FROM BACK OF CURB TO FACE OF RETAINING CURB.
3. THE RAMP SHALL HAVE A 12" WIDE BORDER WITH GROOVES 1/4" WIDE AND 1/4" DEEP APPROXIMATELY 3/4" ON CENTER. PLACED ON THE LEVEL SIDEWALK (NOT ON THE RAMP). SEE GROOVING DETAIL ON SHEET 4.
4. TRANSITIONS FROM RAMPS TO WALKS, GUTTERS, OR STREETS SHALL BE FLUSH AND FREE OF ABRUPT CHANGES.
5. WHEN ABUTTING SOIL HAS A HIGH SULFATE CONTENT, SPECIAL CONSIDERATIONS ARE REQUIRED. SEE SPECIFICATIONS (SECTION 16.04).
6. FLARED SIDE SLOPE VARIES UNIFORMLY FROM A MAXIMUM OF 10% AT CURB TO CONFORM WITH LONGITUDINAL SIDEWALK SLOPE ADJACENT TO THE TOP OF THE RAMP.
7. CONSTRUCT WEAKENED PLANE JOINTS AT 1/4 DELTAS WHEN RADIUS EQUALS 35' AND AT INSIDE EDGE OF GROOVED BORDER WHEN RADIUS EQUALS 25'.
8. IF EXPANSIVE SOIL IS ENCOUNTERED, THEN RAMP SHALL BE CONSTRUCTED OVER CLASS 2 AGGREGATE MATERIAL.
9. CONCRETE SHALL BE CLASS B.
10. MAXIMUM SLOPES OF ADJOINING GUTTERS: THE ROAD SURFACE AND GUTTER SURFACE SHALL NOT EXCEED 5% WITHIN 4' OF THE CURB RAMP.
11. DETECTABLE WARNING SURFACES ARE REQUIRED ON ALL CURB RAMPS THAT ENTER INTO A VEHICULAR TRAVEL WAY.
12. CURB RAMPS SHALL HAVE A YELLOW DETECTABLE WARNING SURFACE THAT EXTENDS THE FULL WIDTH AND 3'-0" DEPTH OF THE RAMP. DETECTABLE WARNING SURFACES SHALL CONSIST OF A PANEL SET INTO WET CONCRETE AND CONFORM TO THE DETAILS ON THIS STANDARD. NO BOLT DOWN OR GLUE DOWN ALLOWED FOR NEW RAMP CONSTRUCTION.
13. THE EDGE OF THE DETECTABLE WARNING SURFACE NEAREST THE STREET SHALL BE BETWEEN 6" AND 8" FROM THE GUTTER FLOWLINE.
14. UTILITY PULL BOXES, MANHOLES, VAULTS AND ALL OTHER UTILITY FACILITIES ARE NOT TO BE LOCATED WITHIN THE BOUNDARIES OF THE CURB RAMP. EXISTING STRUCTURE TO BE RELOCATED OR ADJUSTED TO GRADE BY THE OWNER PRIOR TO, OR IN CONJUNCTION WITH, CURB RAMP CONSTRUCTION.
15. CROSSWALK STRIPING ONLY IF SHOWN ON IMPROVEMENT PLANS. CROSSWALK STRIPING, WHEN CALLED FOR, PER STD No. 403 (1 OF 7).
16. TO MEET AMERICAN WITH DISABILITIES ACT STANDARDS, MAXIMUM STATED SLOPES ARE ABSOLUTE AND NO CONSTRUCTION TOLERANCES WILL BE ALLOWED TO INCREASE THE SLOPES.
17. FOR CASE B, THE LEVEL LANDING AT THE BOTTOM OF THE RAMPS SHALL BE 5' WIDE. EXISTING CASE B LANDINGS THAT ARE 4' WIDE ARE ACCEPTABLE.

APPROVED BY:					DATE: 11/15/04					COUNTY OF RIVERSIDE					
DIRECTOR OF TRANSPORTATION JUAN C. PEREZ, RCE 49568					DATE					 <b>CURB RAMP CONSTRUCTION NOTES</b>					
REVISIONS		REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE	NO SCALE					
8-77, 5-80		11-04	1	JK	JP	08-05-10					STANDARD No. 403 (7 OF 7)				
10-81, 6-82			2												
9-88, 2-90			3												

NOTE:  
SIGN LOCATION MAY VARY DEPENDING  
ON HEIGHT OF SIGNAL MAST ARM.



**IISNS STRAIGHT ARM MOUNTING**



**CLAMP DETAIL**

APPROVED BY:

DIRECTOR OF TRANSPORTATION  
JUAN C. PEREZ, RCE 49568

DATE



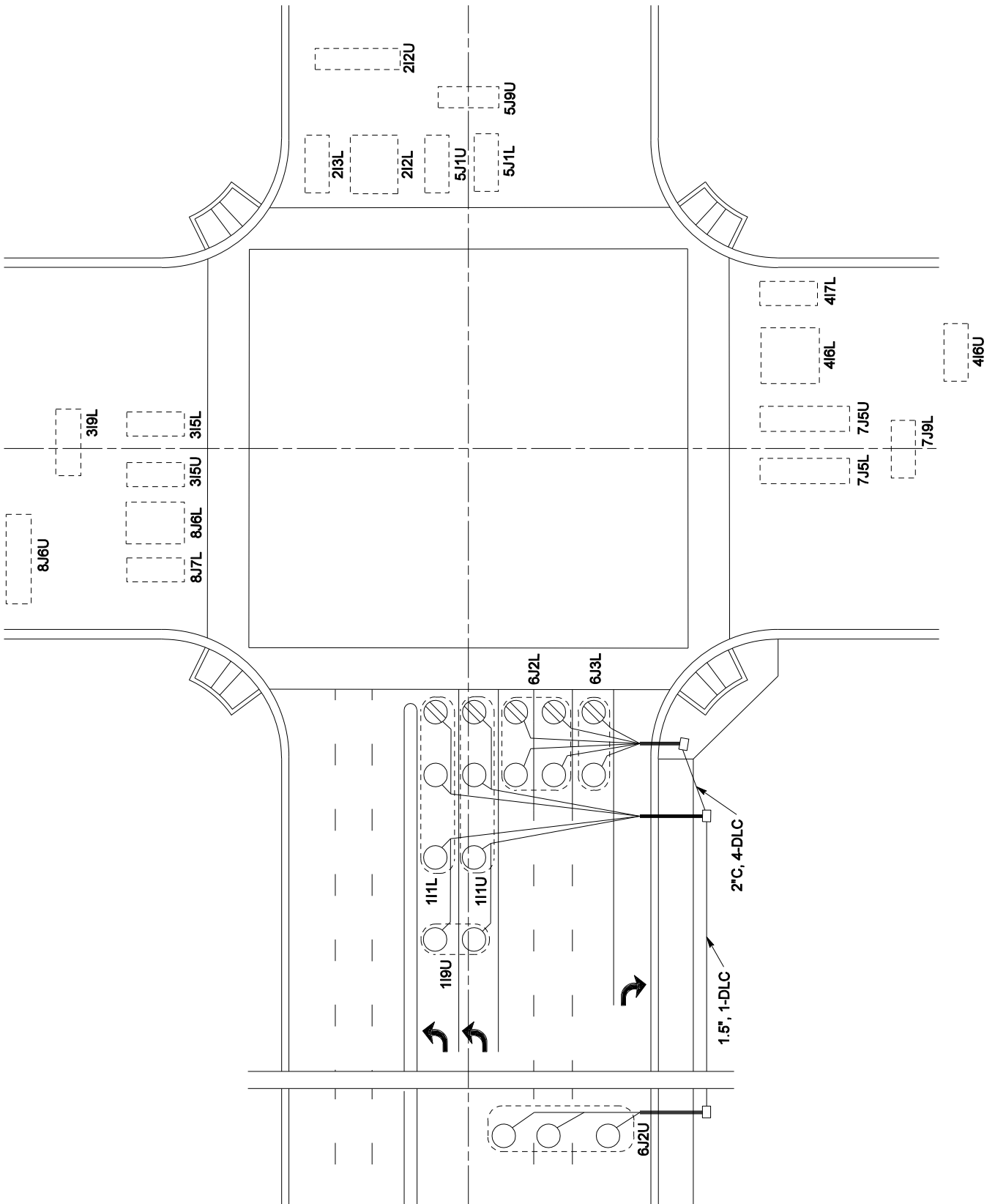
COUNTY OF RIVERSIDE

**IISNS STRAIGHT ARM**

NO SCALE

STANDARD No. 1200

REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
	1	JK	JP	08-05-10				
	2							
	3							



APPROVED BY:

DIRECTOR OF TRANSPORTATION  
 JUAN C. PEREZ, RCE 49568

DATE



COUNTY OF RIVERSIDE

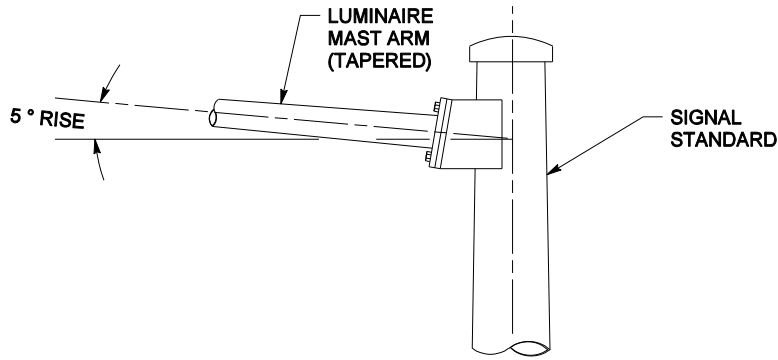
**CASE "A"  
 DETECTION INPUT**

NO SCALE

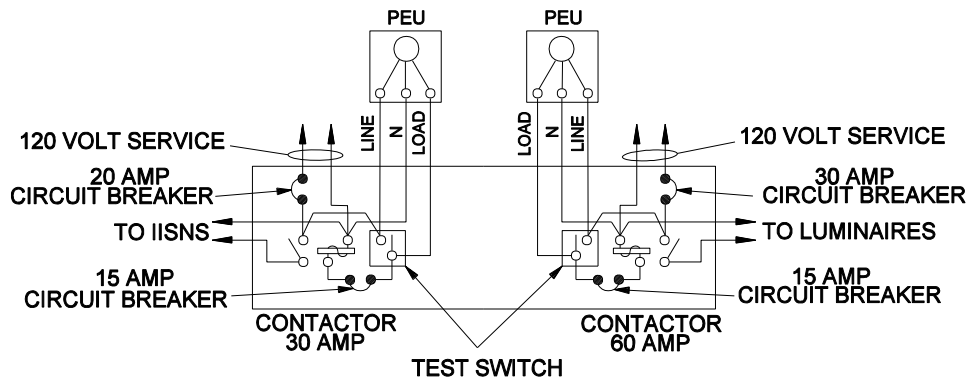
STANDARD No. 1202

REVISIONS				REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
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				2				5			
				3				6			

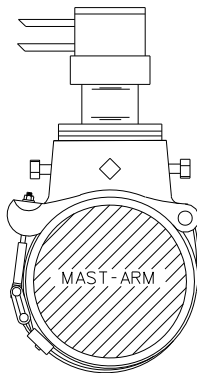




**STRAIGHT LUMINAIRE MAST ARM DETAIL**



**DUAL PEC WIRING DIAGRAM**



**MOUNTING CLAMP FOR OPTICAL DETECTOR**

APPROVED BY:

DIRECTOR OF TRANSPORTATION  
JUAN C. PEREZ, RCE 49568

DATE



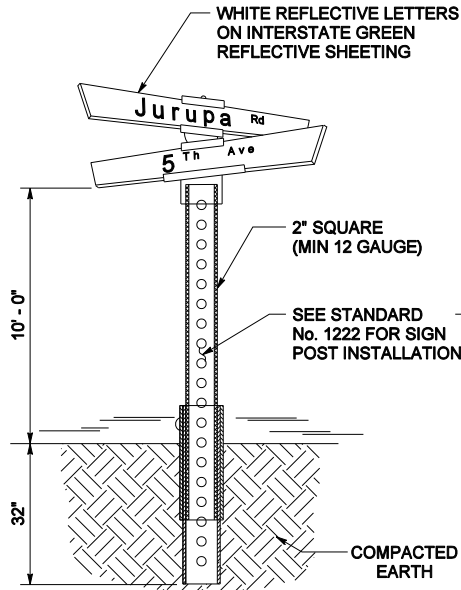
COUNTY OF RIVERSIDE

**TRAFFIC SIGNAL  
DETAIL SHEET**

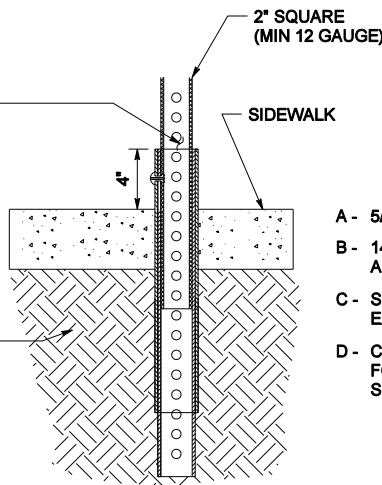
NO SCALE

STANDARD No. 1207

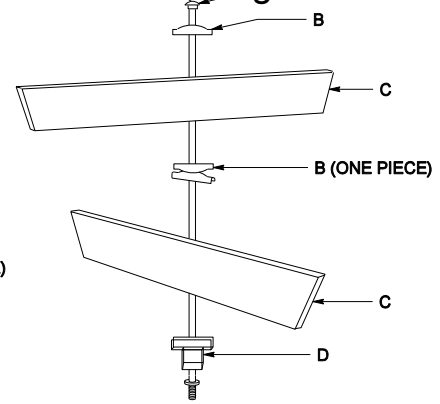
REVISIONS		REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
		1	JK	JP	08-05-10	4			
		2				5			
		3				6			



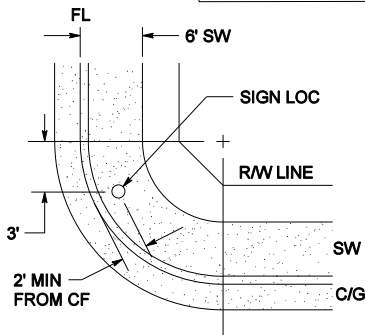
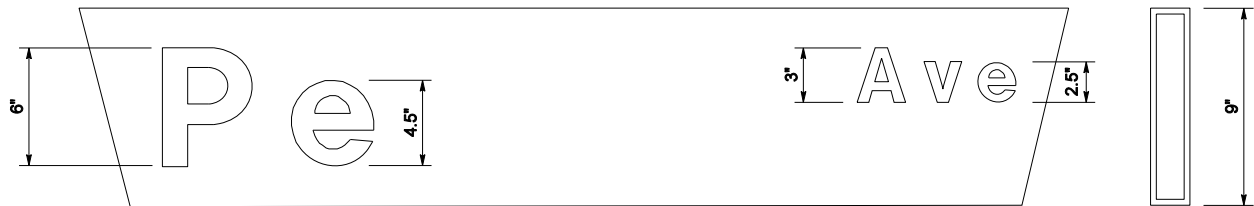
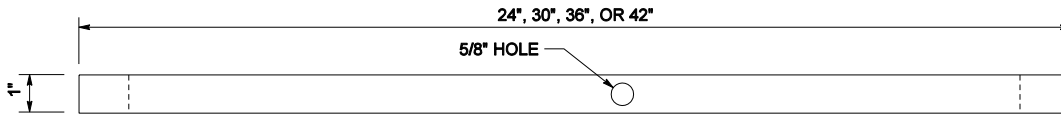
**DIRT LOCATION**



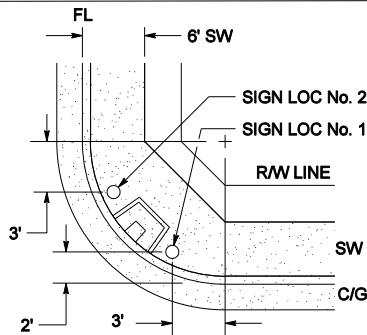
**SIDEWALK LOCATION**



- A - 5/8" X 28" CADMIUM PLATED CARRIAGE BOLT
- B - 14 GAUGE TOP AND CROSS SADDLE OF ANODIZED ALUMINUM
- C - SIGN PLATES (ANODIZED ALUMINUM EXTRUSION OF 6063 T-4 ALLOY MATERIAL)
- D - CAST ANODIZED ALUMINUM POST WITH FOUR 3/8" ALLEN HEAD STAINLESS STEEL SET SCREWS



**INSIDE OF KNUCKLE**



SIGN LOC No. 1 - FOR RESIDENTIAL STREETS WITHIN A TRACT  
SIGN LOC No. 2 - ALL OTHER STREETS

**INTERSECTION**

**SIGN INSTALLATION DETAILS**

**NOTE:**

ONE COMPLETE NAME SIGN UNIT IS REQUIRED AT EACH INTERSECTION WHEN PAVED WIDTHS OR CURBED WIDTHS OF ALL INTERSECTING STREETS ARE 60 FEET OR LESS. AT INTERSECTIONS WITH AN ULTIMATE PAVED WIDTH OR CURBED WIDTH GREATER THAN 60 FEET, USE STANDARD 1220.

APPROVED BY:

DIRECTOR OF TRANSPORTATION  
JUAN C. PEREZ, RCE 49568

DATE



COUNTY OF RIVERSIDE

**STREET NAME SIGN**

(CURB TO CURB WIDTH LESS THAN OR EQUAL TO 60')

NO SCALE

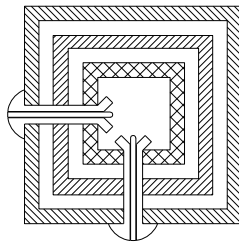
STANDARD No. 1221

REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
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	2							
	3							

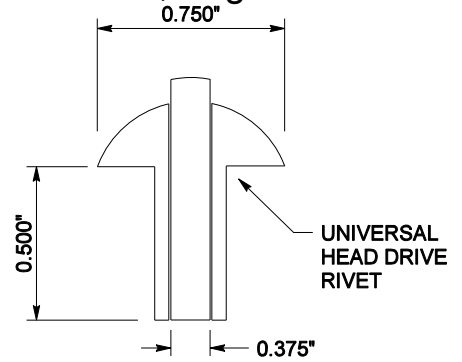
RIVET LOCATIONS  
SEE NOTE 6 ON  
SHEET 2 OF 2

DIRECTION OF  
TRAFFIC FLOW

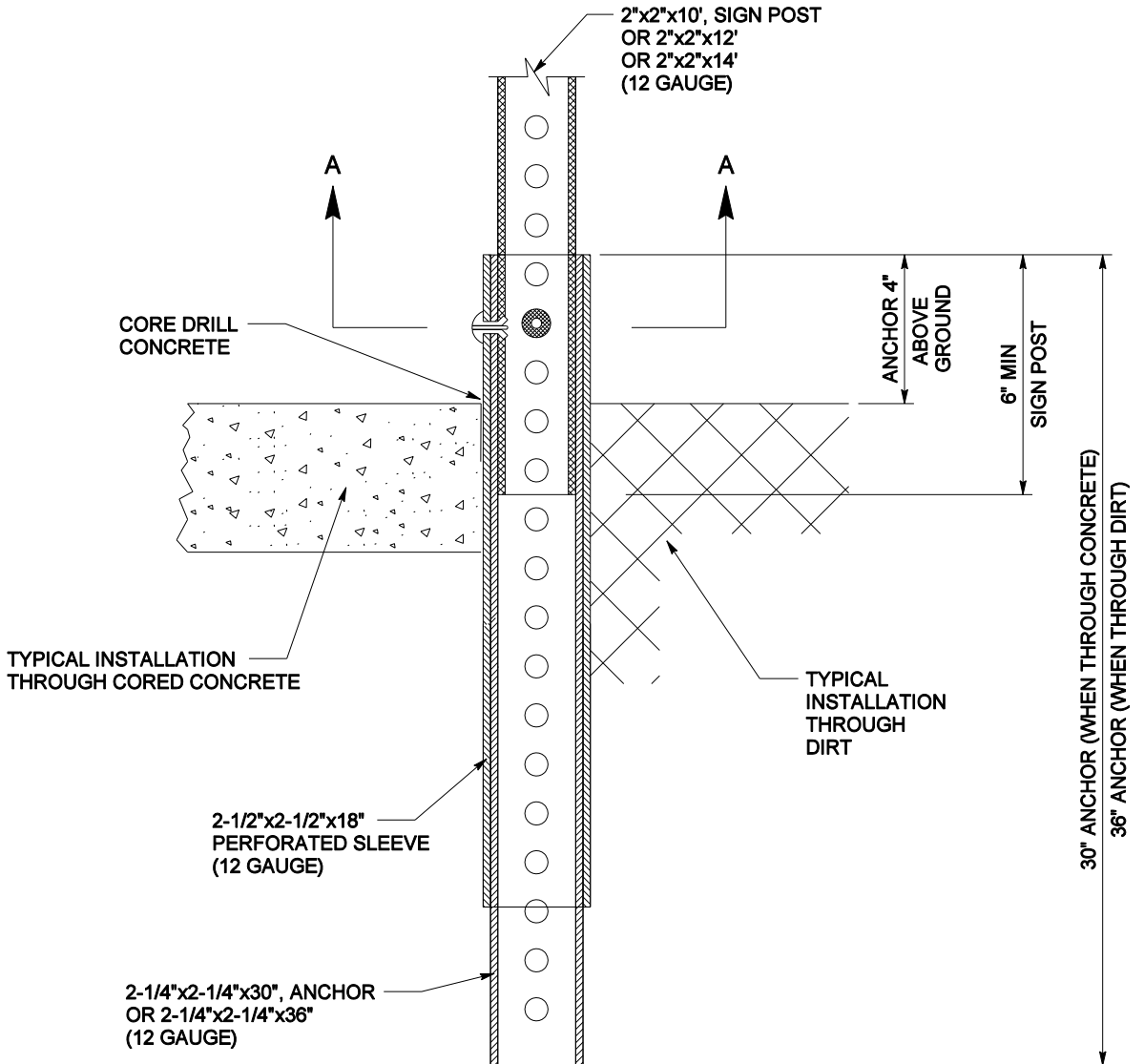
STREET SIDE  
OF POST



SECTION "A-A"



RIVET DETAIL



APPROVED BY:

DIRECTOR OF TRANSPORTATION  
JUAN C. PEREZ, RCE 495668

DATE



COUNTY OF RIVERSIDE

**SIGN POST  
INSTALLATION**


NO SCALE

STANDARD No. 1222 (1 of 2)

REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE
	1	JK	JP	08-05-10				
	2							
	3							

**NOTES:**

1. SQUARE PERFORATED STEEL TUBE POST WITH TWO PIECE ANCHOR AND SLEEVE, "TELESPAR", SHALL BE USED FOR ALL TRAFFIC CONTROL AND INFORMATIONAL SIGNS WITHIN ROAD RIGHT-OF-WAY.
2. THE NUMBER OF POSTS REQUIRED FOR SIGN INSTALLATION SHALL BE DETERMINED BY THE AREA OF THE SIGN OR COMBINATION OF SIGNS TO BE INSTALLED. A SINGLE POST SHALL BE USED WHERE BOTH THE LENGTH AND WIDTH ARE 48" OR LESS. DOUBLE POSTS SHALL BE USED WHERE EITHER THE LENGTH OR WIDTH EXCEEDS 48".
3. THE 2 PIECE ANCHOR AND SLEEVE ASSEMBLY SHALL CONSIST OF A 2 1/4" SQUARE BY 30" (THROUGH SIDEWALK) OR 36" (THROUGH SOIL) ANCHOR WITH A 2 1/2" SQUARE BY 18" SLEEVE. ALL SLEEVES AND ANCHORS SHALL BE 12 GAUGE.
4. THE ANCHOR AND SLEEVE ASSEMBLIES SHALL BE DRIVEN SIMULTANEOUSLY UNTIL ONLY 4" REMAINS ABOVE GROUND LEVEL.
5. ALL DIRT SHALL BE REMOVED FROM THE INSIDE TOP 6" MINIMUM OF THE ANCHOR ASSEMBLY TO ALLOW FOR THE INSTALLATION OF THE SIGN POST.
6. INSTALL 2" SQUARE SIGN POST MINIMUM 6" INTO THE ANCHOR ASSEMBLY AND SECURE IN PLACE WITH TWO 3/8" DRIVE RIVETS AS SHOWN. THE RIVETS SHALL BE INSTALLED ON THE SIDE FACING TRAFFIC FLOW AND THE SIDE OF APPROACHING TRAFFIC AS SHOWN IN ORDER TO ACHIEVE THE MAXIMUM BREAK-AWAY EFFECT.
7. INSTALLATION ACCORDING TO THESE REQUIREMENTS IS ESSENTIAL TO MAINTAIN BREAK-AWAY CHARACTERISTICS OF THE POST SYSTEM.
8. SEE STANDARD No. 1220 AND 1221 FOR PLACEMENT OF SIGN POST.
9. ALL ANCHOR ASSEMBLIES SHALL BE CORE DRILLED THROUGH CONCRETE AND ASPHALT.
10. ALL SIGNS ATTACHED TO PERFORATED POSTS SHALL HAVE ZINC COATED OR STAINLESS STEEL WASHERS BEHIND THE RIVET THAT ARE LARGER THAN THE HEAD OF THE RIVET.
11. ALL REGULATORY, WARNING AND GUIDE SIGNS INSTALLED SHALL BE 0.080 INCHES IN THICKNESS.
12. ALL SIGNS 36" OR LARGER SHALL BE INSTALLED WITH BACK BRACES (2" RISE) SPECIFICALLY DESIGNED FOR 2" SQUARE PERFORATED POSTS.
13. IN SOME INSTANCES CONCRETE FOUNDATION MAY BE REQUIRED TO ENSURE PROPER STABILITY, THIS OPTION IS TO BE USED AT THE DISCRETION OF THE ENGINEER OR ONSITE INSPECTOR.

APPROVED BY:  _____ DIRECTOR OF TRANSPORTATION JUAN C. PEREZ, RCE 49568										COUNTY OF RIVERSIDE					<b>SIGN POST INSTALLATION NOTES</b>				
					DATE														
REVISIONS	REV	BY:	APR'D	DATE	REV	BY:	APR'D	DATE	NO SCALE  STANDARD No. 1222 (2 of 2)										
	1	JK	JP	08-05-10															
	2																		
	3																		