

Contract C20004

# US 101/BLOSSOM HILL ROAD INTERCHANGE IMPROVEMENT

Volume 2

Technical Specifications

Issued for Bid  
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The special provisions contained herein have been prepared by or under the direction of the following Registered Engineer.

HIGHWAY

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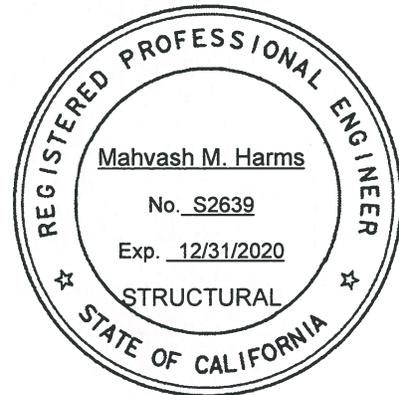
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PLANTING AND IRRIGATION



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LICENSED LANDSCAPE ARCHITECT



## STANDARD PLANS LIST

The standard plan sheets applicable to this Contract include those listed below. The applicable revised standard plans (RSPs) listed below are included in the project plans.

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manner that locking and unlocking the door is satisfactorily convenient. Installation of additional hardware to protect the lock or use of multiple padlocks on a door will not be permitted. However, additional hardware to receive the padlock will be acceptable. The Contractor must furnish the number of keys to the office as directed by the Engineer. VTA will maintain a list of all VTA personnel who are given keys.

Windows must be hinged or sliding and have a minimum area of 5 sf each. Windows must be provided with satisfactory locks, screens and security bars. Windows, including windows in the doors, must be provided with shades, blinds, or other approved coverings.

The field office must have heating and air-conditioning equipment capable of maintaining a uniform temperature between 68°F and 80°F (20°C and 26°C).

The field office must have a minimum 100 amp, 120/240 volt electrical service, must have sufficient receptacles to satisfactorily accommodate all required electrical equipment without the use of extension cords or splitters and must be provided with satisfactory office type lighting.

A field office trailer must be securely supported by adequate blocking. The blocking must provide a foundation to prevent settlement. The trailer must be secured to the ground with a trailer tie down system that is in accordance with all state and local requirements. Each trailer must be furnished with steps meeting IOSHA/OSHA requirements at each doorway.

#### **Field Office Equipment and Supplies**

The following minimum equipment and supplies must be furnished for trailer as specified.

	Qty
Toilet Facilities	Yes
Drinking Water	Yes
Fire Extinguishers	2
First-Aid Kit	1
Bloodborne Pathogen Kit	1
Smoke Detector	2
Carbon monoxide Detector	1
File Cabinet Drawers	12
Office Desks & Office Chairs	4
Folding Office Tables	2
Chairs	12
Drafting Tables	1
Drafting Stools	1
Waste Paper Baskets	6
Cleaning Supplies	Yes
Paper Shredder	1
Microwave Oven	1
Refrigerator/Freezer	1

The office and the equipment must be furnished in a condition satisfactory to the VTA.

Adequate quantities of basic hygiene and office cleaning supplies must be provided. These supplies must include, but are not limited to, hand soap, hand sanitizer, paper towels, toilet paper, window cleaner, all-surface cleaner, toilet disinfectant, toilet brush and a toilet plunger.

Potable drinking water with both hot and cold water capabilities must be furnished. Drinking cups and paper towels must be provided.

Fire extinguishers must be five-pound, Class ABC or higher rated and must be maintained in a fully charged and operable condition and must meet all IOSHA/OSHA requirements. First-aid kits must meet the requirements of ANSI Z308.1 current at the time of letting.

Office desktops must be at least 48 in. wide and 25 in. deep. All desks must contain at least two drawers, one of which must be provided with a lock.

Folding office tables must be a minimum size of 30 in. x 60 in. Office chairs must be height adjustable and equipped with castors.

The microwave oven must have a minimum 1.0 cu ft capacity with a minimum 1100 watts and must have digital controls.

The refrigerator/freezer must have a minimum combined capacity of 12 cu ft.

The field office and all equipment and supplies must be maintained and replenished in a satisfactory manner during the term of the contract or until released by the Engineer. If the field office or required equipment and supplies are not maintained by the Contractor, the Engineer may withhold partial payments until the field office is operational to the Department's satisfaction.

#### **Field Office Internet Service**

The Contractor must provide broadband internet service for the field office. Broadband internet service shall be capable of a minimum average upload speed of 350Kbps unless otherwise approved by the Engineer.

#### **Field Office Machines**

The Contractor must provide a fully operational copier, printer, and document scanner for the VTA's exclusive use in the field office in accordance with the minimum requirements listed herein.

In lieu of separate copier, printer, scanner and fax machines, the Contractor may provide an all-in-one unit that meets all the requirements for any combination of the individual machines being provided. Separate machines must be provided for those machine functions that are not included in an all-in-one type machine.

#### **Copier**

The copier must be a dry ink copier capable of using plain paper and of making full size, black and white copies of letter, legal and ledger US paper size original documents. The copier must be capable of reducing and increasing copy sizes. The copier must have a self-feeding paper tray, an automatic document feeder and be capable of producing at least 12 copies per minute.

#### **Printer**

The printer must be a laser printer compatible with the Bluetooth wireless connectivity for use by VTA in the field office. The printer must be capable of printing single-sided, color, black and white letter and legal US paper size documents at a rate of 20 pages per minute and capable of automatic duplex printing.

#### **Document Scanner**

The document scanner must be compatible with the computer system provided by the Contractor for use by VTA in the field office. The scanner must be capable of scanning letter and legal size documents and must have an automatic document feeder and be capable of 600 dpi black and white resolution.

#### **Miscellaneous Office Machine Requirements**

The Contractor must provide letter, legal and ledger size paper, ink cartridges and toner as required by the Engineer for the operation of each piece of equipment provided.

If any office machine becomes defective, inoperable, damaged, or stolen, that machine must be repaired or replaced within five business days after the Contractor is notified by the Engineer. If any of the office machines are not maintained by the Contractor as required, the Engineer may withhold partial payments until the machine is operational to the VTA's satisfaction.





ABSORB 350 (TL-2)	BARRIER SYSTEMS, INC. 180 RIVER ROAD RIO VISTA, CA 94571 TELEPHONE: (888) 800-3691	STATEWIDE SAFETY & SIGNS, INC. 130 GROBRIC COURT FAIRFIELD, CA 94533 TELEPHONE: (707) 864-9956
SENTRY Longitudinal Energy Dissipater (SLED) End Treatment (TL-2)	TRAFFIX DEVICES, INC. 160 AVENIDA LA PATA SAN CLEMENTE, CA 92673 TELEPHONE: (949) 361-5663	--

**12-3.13C Construction**

Install TACC under the manufacturer's instructions.

Attach a Type R or Type P marker panel to the front of TACC when the closest point of the TACC is within 12 feet of the traveled way. Firmly fasten the marker panel to TACC with commercial quality hardware or by other authorized method.

Keep at least 2 spare TACCs on hand and use them to immediately:

1. Repair damaged TACC
2. Replace TACC damaged beyond repair

If the damage is not caused by your operations, repair or replacement of TACC is change order work.

Maintain TACCs in place at each location.

Remove TACCs when no longer required.

Dispose of the unused spare TACCs or their parts.

**12-3.13D Payment**

If the Engineer orders a lateral move of TACC and the repositioning is not shown, the lateral move is change order work and the TACC is not measured in the new position.

VTA does not include spare TACCs in the count of TACCs installed.

**Replace section 12-3.37 with:**

**12-3.37 PORTABLE VEHICLE SPEED FEEDBACK SIGNS**

**12-3.37A General**

**12-3.37A(1) Summary**

Section 12-3.37 includes specifications for placing portable vehicle speed feedback signs.

**12-3.37A(2) Definitions**

Not Used

**12-3.37A(3) Submittals**

If requested, submit a certificate of compliance for each portable vehicle speed feedback sign.

#### **12-3.37A(4) Quality Assurance**

Each portable vehicle speed feedback sign must comply with section 87-14.01D(2).

#### **12-3.37B Materials**

Each portable vehicle speed feedback sign must comply with section 87-14.02 and be trailer mounted.

The portable vehicle speed feedback sign must be a self-contained unit that can be delivered to the job site and placed into immediate operation. The sign unit must be unaffected by unauthorized mobile-radio transmissions.

The trailer must be equipped so that it can be leveled and plumbed.

A minimum of 3 feet of retroreflective material must be permanently affixed on all 4 sides of the trailer. The retroreflective material need not be continuous but must be visible on the same plane.

The LED character display must remain blank when the detected vehicle speed is 10 miles or less than the pre-set speed.

#### **12-3.37C Construction**

Install the portable vehicle speed feedback sign under the manufacturer's instructions.

Place sign as far from the traveled way as practicable where it is legible to approaching traffic without encroaching on the traveled way. Where the vertical roadway curvature restricts the sight distance of approaching traffic, place the sign on or before the crest of the curvature where it is most visible to the approaching traffic. Where the horizontal roadway curvature restricts the sight distance of approaching traffic, place the sign at or before the curve where it is most visible to approaching traffic. Where practicable, place the sign behind guardrail or Type K temporary railing.

When placed outside of a lane closure, make a taper consisting of 9 traffic cones placed 25 feet apart to delineate the location of a sign except where the sign is placed behind guardrail or Type K temporary railing.

When placed within a lane closure, place the sign after the buffer zone and in advance of the work area.

Keep the sign clean to provide maximum visibility.

Configure the portable vehicle speed feedback sign system to detect only traffic in the approach direction of travel.

Operate the sign under the manufacturer's instructions

Perform the portable vehicle speed feedback sign system test under section 87-14.01D(2).

After initial placement, move the sign from location to location as required.

When a sign is not in use, move the sign to an area at least 15 feet from the edge of the traveled way or remove it from the job site away from traffic.

#### **12-3.37D Payment**

Not Used

Replace the table in the definition of *designated holidays* in section 12-4.02A(2) with:

**Designated Holidays**

Holiday	Date observed
New Year's Day	January 1st
Washington's Birthday	3rd Monday in February
Memorial Day	Last Monday in May
Independence Day	July 4th
Labor Day	1st Monday in September
Veterans Day	November 11th
Thanksgiving Day	4th Thursday in November
Christmas Day	December 25th

**Add to section 12-4.02A(2):**

- special days:** The third Monday in January
- The Friday, Saturday and Sunday following Thanksgiving
  - The 7 days before and after December 25th

**Add between the 1st and 2nd paragraphs of section 12-4.02A(3)(c):**

Submit a contingency plan for each of the following activities:

- Activity requiring a complete closure of ramps
- Activity requiring closure of freeway lanes
- Falsework erection or removal, including adjustments
- Bridge demolition
- Roadway excavations or trenching encroaching on the traveled way not protected by Type K railing

**Add to the end of section 12-4.02C(1):**

Keep the full width of the traveled way open to traffic when no active construction activities are occurring in the traveled way or within 6 feet of the traveled way.

Keep the full width of the ramp traveled way open for use by traffic on designated holidays and special days.

For each 10-minute interval or fraction thereof past the time specified to open the closure, the amount for liquidated damages per interval shown in the table below is deducted. Liquidated damages are limited to 5 percent of the total bid per occurrence. Liquidated damages are not assessed if the Engineer orders the closure to remain in place beyond the scheduled pickup time.

Type of facility	Route	Direction or segment	Period	Liquidated damages/interval
Mainline			1st half hour	\$3,200/10 minutes
			2nd half hour	\$4,800/10 minutes
			2nd hour and beyond	\$6,400/10 minutes
Ramp			1st half hour	\$1000/10 minutes
			2nd half hour	\$1000/10 minutes
			2nd hour and beyond	\$1000/10 minutes

**Add to the list in the 1st paragraph of section 12-4.02C(3)(a):**

3. Work is on the traveled way but within 6 feet of the adjacent traffic lane

**Add to the end of section 12-4.02C(3)(a):**

If you use an impact attenuator vehicle as a shadow vehicle, you are not required to close the adjacent traffic lane for the following activities:

1. Grinding
- 2.. Installing loop detectors

If work vehicles or equipment are parked on the shoulder within 6 feet of a traffic lane of a freeway or expressway, close the shoulder area as shown.

**Replace *Reserved* in section 12-4.02C(3)(b) with:**

You may close Route 101 to traffic at 1 location in each direction of travel at a time as shown on charts no. H1 – H2.

A complete freeway or expressway closure is allowed for the following activities:

1. Falsework erection and removal
2. Bridge removal (partial)

Erect and remove falsework at 1 location and at 1 span at a time. During falsework erection and removal, detour the traffic in the lanes over which falsework is being erected or removed.

**Replace *Reserved* in section 12-4.02C(3)(f) with:**

Closure restrictions for designated holidays and special days are shown in the following table:

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<b>Lane Closure Restrictions For Designated Holidays And Special Days</b>											
Thu	Fri	Sat	Sun	Mon	Tues	Wed	Thu	Fri	Sat	Sun	Mon
x	<b>H</b> xx	xx	xx								
	<b>SD</b> xx										
x	xx	<b>H</b> xx	xx								
		<b>SD</b> xx									
	x	xx	<b>H</b> xx	xx							
			<b>SD</b> xx								
	x	xx	xx	<b>H</b> xx	xxx						
	x	xx	xx	<b>SD</b> xx	xxx						
				x	<b>H</b> xx						
				x	<b>SD</b> xx						
					x	<b>H</b> xx					
						<b>SD</b> xx					
						x	<b>H</b> xx	xx	xx	xx	
							<b>SD</b> xx				
<b>Legend:</b>											
	Refer to lane requirement charts.										
x	The full width of the traveled way must be open for use by traffic after 4 AM.										
xx	The full width of the traveled way must be open for use by traffic.										
xxx	The full width of the traveled way must be open for use by traffic until 1 AM.										
<b>H</b>	Designated holiday										
<b>SD</b>	Special day										

**Replace Reserved in section 12-4.02C(3)(g) with:**

Freeway lane closures must comply with the requirements shown in the following chart:

<b>Chart No. G1 Freeway Lane Requirements</b>																									
County: Santa Clara							Route/Direction: 101/NB							Post Mile: R28.609											
Closure limits: NB Route 101 at Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu	1	1	1	1	2						S	S	S	3	S	S					3	3	2	2	1
Fri	1	1	1	1	2						S	S	S	S	S	S					S	3	3	2	2
Sat	1	1	1	1	1	2	3	S	S	S	S	S	S	S	S	S	S	S	S	S	S	3	3	2	2
Sun	1	1	1	1	1	1	1	2	2	3	S	S	S	S	S	S	S	S	S	S	S	3	3	2	1

Legend:

1	Provide at least 1 through freeway lane open in the direction of travel.
2	Provide at least 2 adjacent through freeway lanes open in the direction of travel.
3	Provide at least 3 adjacent through freeway lanes open in the direction of travel.
S	Shoulder closure is allowed (right / left).

REMARKS:

<b>Chart No. G2 Freeway Lane Requirements</b>																									
County: Santa Clara							Route/Direction: 101/SB							Post Mile: R28.609											
Closure limits: SB Route 101 at Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu	1	1	1	1	1						S	3	S	S	S						S	3	3	2	2
Fri	1	1	1	1	1						S	S	S	S							S	S	3	3	2
Sat	2	1	1	1	1	1	2	3	3	S	S	S					S	S	S	3	3	3	3	2	
Sun	2	1	1	1	1	1	1	2	2	3	S	S	S	S	S	S	S	S	S	S	S	3	3	2	2
<b>Legend:</b>																									
1 Provide at least 1 through freeway lane open in the direction of travel.																									
2 Provide at least 2 adjacent through freeway lanes open in the direction of travel.																									
3 Provide at least 3 adjacent through freeway lanes open in the direction of travel.																									
S Shoulder closure is allowed (right / left).																									
REMARKS:																									

**Replace *Reserved* in section 12-4.02C(3)(h) with:**

Comply with the requirements for the complete freeway closure shown in the following chart:

<b>Chart No. H1 Complete Freeway Closure Hours</b>																									
County: Santa Clara					Route/Direction: 101/NB										Post Mile: R28.609										
Closure limits: NB Route 101 Complete Closure at Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu	C	C	C	C																					
Fri	C	C	C	C																					
Sat	C	C	C	C	C																				
Sun	C	C	C	C	C	C	C																		
Legend:																									
<input type="checkbox"/> C Freeway may be closed completely.																									
<input type="checkbox"/> No complete closure is allowed.																									
REMARKS: See CS-2 for detour.																									

<b>Chart No. H2 Complete Freeway Closure Hours</b>																									
County: Santa Clara					Route/Direction: 101/SB										Post Mile: R28.609										
Closure limits: SB Route 101 Complete Closure at Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu	C	C	C	C	C																				
Fri	C	C	C	C	C																				
Sat		C	C	C	C																				
Sun		C	C	C	C	C																			
Legend:																									
<input type="checkbox"/> C Freeway may be closed completely.																									
<input type="checkbox"/> No complete closure is allowed.																									
REMARKS: See CS-4 for detour. For use only after temporary signal is installed in Stage 1, Phase 1.																									

**Replace Reserved in section 12-4.02C(3)(j) with:**

Comply with the requirements for the complete ramp closure hours/ramp lane requirements shown in the following charts:

<b>Chart No. J1</b>																									
<b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																									
County: Santa Clara							Route/Direction: 101/NB							Post Mile: R28.19											
Closure limits: NB Off-Ramp to Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon–Thu	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Fri	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Sat	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Sun	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Legend:																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> Ramp may be closed completely.																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> Shoulder closure is allowed (right/left).																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div>																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div>																									
REMARKS: See CS-6 for detour.																									

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<b>Chart No. J2</b>																									
<b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																									
County: Santa Clara							Route/Direction: 101/SB							Post Mile: R28.44											
Closure limits: SB On-Ramp to Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon–Thu	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Fri	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Sat	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Sun	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
<b>Legend:</b>																									
_____																									
<input type="checkbox"/> C Ramp may be closed completely.																									
<input type="checkbox"/> S Shoulder closure is allowed (right/left).																									
_____																									
<input type="checkbox"/>																									
REMARKS: See CS-11 for detour.																									

<b>Chart No. J3</b>																									
<b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																									
County: Santa Clara							Route/Direction: 101/NB							Post Mile: R28.5											
Closure limits: NB Loop On-Ramp from EB Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon–Thu	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Fri	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S					S	S	S	S	C	
Sat	C	C	C	C	C	C	S	S	S											S	S	S	S	C	
Sun	C	C	C	C	C	C	S	S	S	S		S					S	S	S	S	S	S	C	C	
<b>Legend:</b>																									
_____																									
<input type="checkbox"/> C Ramp may be closed completely.																									
<input type="checkbox"/> S Shoulder closure is allowed (right/left).																									
_____																									
<input type="checkbox"/>																									
REMARKS: See CS-2 and CS-3 for detour.																									

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<b>Chart No. J4</b>																									
<b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																									
County: Santa Clara							Route/Direction: 101/SB							Post Mile: R28.67											
Closure limits: SB Loop On-Ramp from WB Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon–Thu	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Fri	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Sat	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
Sun	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C	
<b>Legend:</b>																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> Ramp may be closed completely.																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> Shoulder closure is allowed (right/left).																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div>																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div>																									
REMARKS: See CS-9 for detour.																									

<b>Chart No. J5</b>																									
<b>Complete Ramp Closure Hours/Ramp Lane Requirements</b>																									
County: Santa Clara							Route/Direction: 101/NB							Post Mile: R28.79											
Closure limits: NB On-Ramp from WB Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon–Thu	C	C	C	C	C						S	S	S	S	S	S					S	S	S	C	C
Fri	C	C	C	C	C						S	S	S	S	S	S					S	S	S	C	C
Sat	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C
Sun	C	C	C	C	C	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	C	C
<b>Legend:</b>																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> Ramp may be closed completely.																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div> Shoulder closure is allowed (right/left).																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div>																									
<div style="border: 1px solid black; width: 20px; height: 10px; display: inline-block; margin-right: 5px;"></div>																									
REMARKS: See CS-10 for detour.																									

<b>Chart No. J6 Complete Ramp Closure Hours/Ramp Lane Requirements</b>																									
County: Santa Clara							Route/Direction: 101/SB							Post Mile: R28.91											
Closure limits: SB On-Ramp from WB Blossom Hill Road																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon–Thu	C	C	C	C	C	S	S																S	S	S
Fri	C	C	C	C	C	S	S																	S	S
Sat	C	C	C	C	C	C	C	S	S															S	S
Sun	C	C	C	C	C	C	C	S	S	S													S	S	C
<b>Legend:</b>																									
<div style="border: 1px solid black; padding: 2px; display: inline-block; width: 15px; height: 15px; margin-right: 5px;"></div> Ramp may be closed completely.																									
<div style="border: 1px solid black; padding: 2px; display: inline-block; width: 15px; height: 15px; margin-right: 5px;"></div> Shoulder closure is allowed (right/left).																									
<div style="border: 1px solid black; padding: 2px; display: inline-block; width: 15px; height: 15px; margin-right: 5px;"></div>																									
<div style="border: 1px solid black; padding: 2px; display: inline-block; width: 15px; height: 15px; margin-right: 5px;"></div>																									
REMARKS: See CS-5 for detour.																									

**Replace *Reserved* in section 12-4.02C(3)(m) with:**

Comply with the requirements for a city street lane requirements and hours of work shown in the following chart:

<b>Chart No. M1 City Street Lane Requirements and Hours of Work</b>																									
Location: Santa Clara													Direction: Blossom Hill Road EB												
Closure limits: At Route 101 Interchange																									
Hou	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon–Thu	1	1	1	1	1																				
Fri	1	1	1	1	1																				
Sat																									
Sun																									
<b>Legend:</b>																									
<div style="border: 1px solid black; padding: 2px; display: inline-block; width: 15px; height: 15px; margin-right: 5px;"></div> Provide at least 1 city street lane open in the direction of travel.																									
REMARKS:																									

<b>Chart No. M2 City Street Lane Requirements and Hours of Work</b>																									
Location: Santa Clara										Direction: Blossom Hill Road WB															
Closure limits: At Route 101 Interchange																									
Hou	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu	1	1	1	1	1	1																			
Fri	1	1	1	1	1	1																			
Sat																									
Sun																									
Legend:																									
1   Provide at least 1 city street lane open in the direction of travel.																									
REMARKS:																									

<b>Chart No. M3 Complete City Street Closure Hours</b>																									
Location: Santa Clara										Direction: Blossom Hill Road EB															
Closure limits: At Route 101 Interchange																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu	C	C	C	C	C																				
Fri	C	C	C	C	C																				
Sat	C	C	C	C	C	C																			
Sun	C	C	C	C	C	C	C	C																	
Legend:																									
C   Street may be closed.																									
REMARKS: See CS-2 and CS-4 for detours.																									

<b>Chart No. M4 Complete City Street Closure Hours</b>																									
Location: Santa Clara										Direction: Blossom Hill Road WB															
Closure limits: At Route 101 Interchange																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu	C	C	C	C	C																				
Fri	C	C	C	C	C																				
Sat	C	C	C	C	C	C																			
Sun	C	C	C	C	C	C	C																		
Legend: C   Street may be closed.																									
REMARKS: See CS-2 and CS-4 for detours.																									

<b>Chart No. M5 City Street Lane Requirements and Hours of Work</b>																									
Location: Santa Clara										Direction: Coyote Road NB															
Closure limits: At Route 101 Interchange																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu											1	1	1	1	1	1									
Fri											1	1	1	1	1	1									
Sat																									
Sun																									
Legend: 1   Provide at least 1 city street lane open in the direction of travel.																									
REMARKS:																									

<b>Chart No. M6</b>																									
<b>City Street Lane Requirements and Hours of Work</b>																									
Location: Santa Clara										Direction: Coyote Road SB															
Closure limits: At Route 101 Interchange																									
Hour	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Mon– Thu											1	1	1	1	1	1									
Fri											1	1	1	1	1	1									
Sat																									
Sun																									
<b>Legend:</b>																									
1   Provide at least 1 city street lane open in the direction of travel.																									
<b>REMARKS:</b>																									

**Add to the end of the 1st paragraph of section 12-4.02C(7)(a):**

except you may use a moving closure during traffic striping and pavement marker placement using a bituminous adhesive. Do not use a moving lane closure when grinding for recessed striping and recessed markers.

**Add to the end of section 12-4.02C(7)(a):**

Do not use an impact attenuator vehicle to place, remove, or place and remove components of a stationary traffic control system on a freeway or ramps where the useable shoulder width is less than 8' feet within 300 feet of the start of and through the taper as shown.

Except where prohibited, use an impact attenuator vehicle:

1. To follow behind equipment and workers who are placing and removing components of a closure. Operate the flashing arrow sign in the arrow or caution mode during this activity, whichever applies. Follow at a distance that prevents intrusion into the work space from passing traffic.
2. As a shadow vehicle in a moving lane closure.

After placing components of a stationary traffic control system, you may place the impact attenuator vehicle in advance of the work area or at another authorized location to protect traffic and workers.

**Add to the end of section 12-4.02C(7)(b):**

Except for one-way-reversing traffic-control lane closures, the maximum length of the work area inside a closure is 2 miles.

**Add to the end of section 12-4.02C(8)(a):**

**Replaced *Reserved* in section 12-4.03 with:**

**12-4.03A General**

Section 12-4.03 includes specifications for providing falsework openings.

**12-4.03B Materials**

Not Used

**12-4.03C Construction**

At each location where falsework is constructed over a street or route shown in the following table, provide openings through the bridge falsework. The type, minimum width, height, and number of openings at each location, and the location and maximum spacing of the falsework lighting if required for each opening, must comply with the requirements shown in the following table. The width of vehicular openings is the clear width between temporary railings or other protective work.

SB Route 101 at Blossom Hill Road OC (Bridge No. 37-0348)  
Structure identification  
(e.g., street no., street name, route no.)

	Number	Width (feet)	Height (feet)
Vehicle openings	1	44	15.0
Pedestrian openings	N/A	N/A	N/A
	Location	Spacing <sup>a</sup> (feet)	
Falsework pavement lighting	R	40	
	L	40	
	C	40 staggered ½ spacing	

NOTE:

R = Right side of traffic

L = Left side of traffic

C = Centered overhead

<sup>a</sup>Spacing is the maximum distance from center to center between fixtures.

SB Loop On-Ramp to Route 101 at Blossom Hill Road OC (Bridge No. 37-0348)  
Structure identification  
(e.g., street no., street name, route no.)

	Number	Width (feet)	Height (feet)
Vehicle openings	1	12	15.0
Pedestrian openings	N/A	N/A	N/A
	Location	Spacing <sup>a</sup> (feet)	
Falsework pavement lighting	R	30	

NOTE:

R = Right side of traffic

L = Left side of traffic

C = Centered overhead

<sup>a</sup>Spacing is the maximum distance from center to center between fixtures.

NB Route 101 at Blossom Hill Road OC (Bridge No. 37-0348)  
Structure identification  
(e.g., street no., street name, route no.)

	Number	Width (feet)	Height (feet)
Vehicle openings	1	44	15.0
Pedestrian openings	N/A	N/A	N/A
	Location	Spacing <sup>a</sup> (feet)	
Falsework pavement lighting	R	40	
	L	40	
	C	40 staggered ½ spacing	

NOTE:

R = Right side of traffic

L = Left side of traffic

C = Centered overhead

<sup>a</sup>Spacing is the maximum distance from center to center between fixtures.

NB Loop On-Ramp to Route 101 at Blossom Hill Road OC (Bridge No. 37-0348)  
Structure identification  
(e.g., street no., street name, route no.)

	Number	Width (feet)	Height (feet)
Vehicle openings	1	12	15.0
Pedestrian openings	N/A	N/A	N/A
	Location	Spacing <sup>a</sup> (feet)	
Falsework pavement lighting	R	30	

NOTE:

R = Right side of traffic

L = Left side of traffic

C = Centered overhead

<sup>a</sup>Spacing is the maximum distance from center to center between fixtures.





resulting from piling work, and storm water combined with groundwater.

Design, installation, operation, and monitoring of a TDNWCS and monitoring and disposal of the treated effluent must comply with San Francisco Bay Regional Water Quality Control Board NPDES General Permit for Discharge or Reuse of Extracted and Treated Groundwater Resulting from the Cleanup of Groundwater Polluted by Volatile Organic Compounds, Fuel Leaks and Other Related Wastes (ORDER No. R2-2017-0048 NPDES PERMIT No. CAG912002). You are responsible for all costs and requirements related to obtaining coverage under the Order No. R2-2017-0048.

CAM 17 Metals (antimony, arsenic, barium, cadmium, chromium, cobalt, copper, lead, mercury, nickel, silver, selenium, thallium, vanadium and zinc) and petroleum hydrocarbon products (TPHd) were reported at concentrations exceeding their respective waste discharge requirements (WDRs) in groundwater collected at the job site. The site investigation report is listed as Supplemental Project Information.

You may discharge into a publicly owned treatment works system instead of using a TDNWCS. If contaminated groundwater, storm water, or both are discharged to a publicly owned treatment work, obtain a municipal batch discharge permit. You are responsible for all costs and requirements related to obtaining the municipal batch discharge permit and discharging the water.

### **13-12.01B Submittals**

**13-12.01B(1) Temporary Dewatering and Non-storm Water Discharge Control System Plan** Submit the TDNWCS plan at least 55 days before discharge activities:

Within 20 days of Contract approval, submit 3 copies of your TDNWCS plan for review. The Engineer provides comments and specifies the date when the review stopped if revisions are required. Change and resubmit a revised TDNWCS plan within 15 days of receiving the Engineer's comments. VTA's review resumes when a complete TDNWCS plan has been resubmitted.

When the Engineer authorizes the TDNWCS plan, submit an electronic copy and 4 Printed copies of the authorized TDNWCS plan.

If the Engineer requests changes to the TDNWCS plan based on the State Water Resources Control Board's or RWQCB's comments, amend the TDNWCS plan within 5 business days

The TDNWCS plan must include:

1. Title sheet.
2. Table of contents.
3. Certification and approval sheet described in the Caltrans' *Storm Water Prevention Plan (SWPPP) and Water Pollution Control Plan (WPCP) Preparation Manual*.
4. Amendment log and format described in the Caltrans' *Storm Water Prevention Plan (SWPPP) and Water Pollution Control Plan (WPCP) Preparation Manual*.
5. Description and schedule of the discharge activities.
6. Discharge alternatives, including:
  - 6.1. Dust control
  - 6.2. Percolation
  - 6.3. Storm sewers
  - 6.4. Surface waters
7. Treatment system description and components.
8. Anticipated flow rates
9. Operation and maintenance manual for equipment.
10. Monitoring, sampling, and reporting plan, including quality assurance and quality control.
11. Health and safety plan.
12. Spill prevention plan.
13. Field-recorded data, visual inspection calibration procedures, and examples of logs.
14. Measuring equipment descriptions.
15. Shop drawings showing:

- 15.1. Section and plan views of non-storm water effluent treatment systems
- 15.2. Location of sampling points for water quality measurements
- 15.3. Flow path and placement of pipes, hoses, pumps, holding tanks, and other equipment used to convey water
- 15.4. General position of treatment components relative to excavations or other areas requiring dewatering
- 15.5. Section and plan views of non-storm water effluent treatment systems
- 15.6. Point of non-storm water discharge
16. Daily inspection Report (DIR) form. The DIR must include:
  - 16.1. Discharge volumes
  - 16.2. Water quality monitoring records
  - 16.3. Discharge point information that includes:
    - 16.3.1. Date and time
    - 16.3.2. Weather conditions, including wind direction and velocity
    - 16.3.3. Presence or absence of water fowl or aquatic wildlife
    - 16.3.4. Color and clarity of the effluent discharge
    - 16.3.5. Erosion or ponding downstream of the discharge site
    - 16.3.6. Photographs labeled with the time, date, and location
17. Municipal batch discharge permit from a publicly owned treatment works if required.
18. Coagulant pollution prevention plan with the TDNWCS plan if you use chemical coagulants, in-line flocculants, or both, in the treatment system. Chemical coagulants and flocculants proposed for use in TDNWCS must comply with all provisions under "Active Treatment System (TDNWCS) Requirements" within Attachment F Provisions D and E, in the NPDES *General Permit for Stormwater Discharges Associated with Construction and Land Disturbance Activities (Order No. 2009-0009-DWQ, NPDES No. CAS000002)* and amendments. The coagulant prevention work plan must include
  - 18.1. Description of BMPs to prevent accidental spillage, overfeeding into the treatment system, or other mishandling of coagulant agents
  - 18.2. Monitoring plan for all coagulants, flocculants, or both
  - 18.3. Description of the agents, including chemical and trade names
  - 18.4. Determination of acute and chronic toxicity for aquatic organisms conforming to EPA methods for the agents
  - 18.5. Monitoring plan to detect a residual agent at concentrations at or below established acute toxicity levels for freshwater and marine conditions for that agent

#### **13-12.01B (2) Notice of Discharge Report**

Whenever observations or measurements confirm that a residual chemical or water quality standard is exceeded:

1. Submit the notice of discharge within 48 hours after exceeding the limits
2. Document the reasons for exceeding the water quality standard and any corrective work performed to prevent a recurrence in the notice of discharge

#### **13-12.01B (3) Other Active Treatment System Submittals**

If the TDNWCS discharges treated effluent, submit a DIR within 24 hours. Submit records of delivery and removal of TDNWCS components.

#### **13-12.01C Quality Control and Assurance**

A residual chemical for coagulants must be less than 10 percent of the maximum allowable threshold concentration for the most sensitive species.

Discharges from a TDNWCS must comply with Order No. R2-2012-0012 and other applicable permits.

#### **13-12.02 MATERIALS**

##### **13-12.02A General**

A TNDWCS must be designed for the site conditions and anticipated treatment system design flow rate and must include f1) a treatment system, (2) a collection and conveyance system, (3) a discharge method and location

### **13-12.02B Treatment System**

Primary and secondary treatment may be required, or the design of the treatment system may require combined use of the various treatment components in series to achieve effective treatment. The treatment system must have components to:

1. Remove sediment, turbidity-producing suspended solids, petroleum hydrocarbon, volatile organic compounds (VOCs), and metals. Components may include desilting basins, weir tanks, settling tanks, sediment traps, gravity bag filters sand media filters, pressurized bag filters, cartridge filters, in- line chemical coagulants and flocculants, activated clay filters, activated carbon filters or any combination necessary to provide primary and secondary treatment.
2. Adjust pH or dissolved oxygen by:
  - 2.1. Addition of sulfuric, phosphoric, citric, or nitric acid under the supplier's specifications for treatment of water with high ph. You may use hydrochloric acid if the water is dechlorinated before discharge.
  - 2.2. Filtration through a limestone bed or addition of sodium hydroxide for treatment of water with a low ph. You may use carbon dioxide diffusion that produces carbonic acid for pH adjustment.
  - 2.3. Aeration for treatment of water with low dissolved oxygen.

### **13-12.02C Collection and Conveyance System**

Provide pumps and piping to convey the water from the point of dewatering or storm water capture to the treatment system and to the point of discharge. Pumps and piping must comply with section 74-2.

Use a flow meter to measure all discharges from treatment activities.

### **13-12.02D Temporary Holding Tank System**

Store water pumped during dewatering activities that is not diverted to TNDWCS will be stored in temporary holding tanks placed at the work area.

Use temporary holding tanks including transportable closed-top holding tanks or tanker trucks. Provide a sufficient number of holding tanks based on:

1. Anticipated flow rate of treatment system
2. Pumping rates
3. Capacity inefficiencies due to sediment retention within the holding tanks
4. Sediment settling rates
5. Sediment removal frequency
6. Anticipated water loss or reuse rates

Temporary holding tanks must have holding capacity sufficient to handle the water removed from dewatering activities and to prevent delay of work.

Each temporary holding tank must have an inlet and outlet capable of receiving and discharging flows at a sufficient rate to handle the water removed from dewatering activities.

Maintain a minimum freeboard of 1 foot in each of the temporary holding tanks at all times Clean the holding tanks when 25 percent of the tank's volume is filled with sediments.

### **13-12.02E Discharge Method**

Provide a method for discharging treated water or uncontaminated ground or surface water and include a discharge location. Do not discharge treated water in a way that impacts the natural bedding and aquatic life.

Discharge treated water:

1. To control dust in active work areas.

2. To land where the grade allows sheet flow and the soil allows infiltration.
3. In a way that does not cause erosion and scour. Whenever scour occurs, repair the damage and install a velocity dissipates.

### **13-12.03 CONSTRUCTION**

#### **13-12.03A General**

Water quality must comply with limits for discharge effluents and the receiving waters. Whenever observations or measurements under section 13-12.03B determine the water quality limits are exceeded:

1. Stop the discharge immediately
2. Notify the Engineer
3. Start corrective measures to change, repair, or replace the equipment and procedures used to treat the water

After the Engineer inspects and authorizes your corrective measures, resume treatment and discharge activities under the startup-phase sampling requirements before resuming regular-phase sampling.

Maintain the TDNWCS to provide required function and prevent leaks. Whenever a component of the system is not functioning properly, discontinue treatment activities and repair or replace the component.

Sediments removed from uncontaminated areas during maintenance of the treatment system must be dried, distributed uniformly, and stabilized at a location within the project limits where authorized. Remove contaminated sediments from the site to an appropriately licensed waste management facility under section 5-1.20B (4).

Relocate the TDNWCS as needed.

#### **13-12.03B Monitoring**

##### **13-12.03B (1) General**

Comply with the manufacturer's instructions for all calibrations of the flow meter. Perform calibrations in the presence of the Engineer.

While the system in operation, monitor in conformance with the Monitoring and Reporting Program included in Attachment E of the Order R2-2012-0012 for discharging treated water.

If a batch discharge permit is obtained from a POTW, comply with the Provisions contained in the batch discharge permit including all monitoring and reporting requirements.

Monitoring equipment for the TDNWCS must record data at least once every 15 minutes. Cumulative 2ow data must be recorded daily. The recording system must have the capacity to record a minimum of 7 days of continuous data.

Monitoring equipment must be interfaced with the control system of the TDNWCS to provide shutoff or recirculation whenever effluent readings exceed limits for applicable constituents. The control system must default to recirculation or shutoff during a power failure or other catastrophic event.

The control system must control the dose of the coagulant, flocculent, or both to prevent overdosing.

Comply with the manufacturer's instructions for the use and calibration of meters and devices for taking water quality measurements. Perform calibrations in the presence of the Engineer.

##### **13-12.03B (2) Flow Rate Monitoring**

Flow meter must be used to measure all excavation discharges.

Record the flow-meter totalizer readings and compute average daily volumes for every day that dewatering is performed.

##### **13-12.03C Inspection**

While TDNWCS is being operated, document the results in the DIR. In developing the DIR, refer to the



		No project impacts may occur within the ESA.
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**Add to section 14-2.03B:**

Archaeological monitoring areas within, near, or straddling the project limits are shown.

**Replace section 14-8.03 with:**

**14-8.03 VIBRATION MONITORING**

**14-8.03A General**

**14-8.03A(1) Summary**

Section 14-8.03 includes specifications for vibration monitoring of the properties adjacent to the job site to protect them from excessive vibrations during pile driving operations.

List of Properties for Monitoring includes:

Building name	Address	Assessor's parcel number
Residential	5515 Century Manor Court	678-37-067
Residential	5519 Century Manor Court	678-37-068
Residential	5523 Century Manor Court	678-37-069
Residential	5527 Century Manor Court	678-37-070
Residential	5531 Century Manor Court	678-37-071
Residential	5535 Century Manor Court	678-37-072
Residential	5539 Century Manor Court	678-37-073
Residential	5543 Century Manor Court	678-37-074

The work includes:

1. Furnishing, installing, and maintaining vibration monitoring instrumentation (portable seismographs)
2. Protecting from damage and repairing or replacing damaged or inoperable instruments immediately to ensure continuous monitoring
3. Collecting, interpreting, and reporting vibration data
4. Inspecting, documenting, and protecting existing facilities from damage caused by vibration
5. Implementing required remedial and precautionary measures based on the vibration-monitoring data

Compliance with this section does not relieve you of full responsibility for damage caused by your operations.

**14-8.03A(2) Submittals**

**14-8.03A(2)(a) General**

Submit:

1. Product data
2. Baseline vibration levels
3. Vibration monitoring plan
4. Vibration mitigation plan
5. Vibration data report

**14-8.03A(2)(b) Product Data**

Within 5 working days of receipt of the Notice to Proceed, submit a copy of the instructions and maintenance manual, product data, other pertinent information; and laboratory calibration record and certification of each portable seismograph at the site to the Engineer to review.

Within 5 working days of receipt of each instrument at the site, submit a copy of the instruction manual and the laboratory calibration and test equipment certification.

The certificate of calibration must show that the seismographs are calibrated and maintained under the equipment manufacturer's calibration requirements and that calibrations are traceable to the U.S. National Institute of Standards and Technology (NIST).

**14-8.03A(2)(c) Baseline Vibration Levels**

Submit baseline vibration levels before start of construction work and include photo, date of existing baseline condition for each vibration monitoring area; submit a summary of property and utility conditions and the maximum peak particle velocities; and additional documentation necessary for each vibration monitoring area.

**14-8.03A(2)(d) Vibration Monitoring Plan**

Submit the vibration monitoring plan (VMOP) at least 30 days before any work requiring vibration monitoring.

Allow 14 days for review and authorization. Revise and resubmit the plan within 7 days of receipt of comments, if revisions are required. The Department's review resumes when a complete VMOP has been resubmitted.

Submit an electronic copy on a read-only CD, DVD or other Engineer-authorized data storage device and 4 printed copies of the VMOP incorporating the authorized changes.

Minor changes or clarifications to the initial submittal may be made and attached as amendments to the plan.

VMOP must include:

1. The name of the company providing the vibration monitoring services and the name of the qualified vibration monitoring specialist
2. Description of the instruments and equipment to be used, including model number
3. Measurement locations that include photo and caption
4. Methods for mounting the seismographs
5. Procedures for data collection and analysis
6. Means and methods of providing warning when the particle velocity equals or exceeds specified threshold
7. Name of the designated responsible person; the responsible person must have the authority to stop the work causing the vibration
8. The resumes of the Vibration Instrumentation Engineer and any vibration monitoring technical support, sufficient to define details of relevant experience

**14-8.03A(2)(e) Vibration Mitigation Plan**

Submit the vibration mitigation plan (VMP) at least 30 days before the start of any work requiring vibration monitoring.

VMP must include generalized plans of action to be implemented in the event the particle velocity equals or exceeds specified threshold. The generalized plans of action must include positive measures to control vibrations (e.g. using alternative construction methods) and measures to protect the listed facilities.

Notify the Engineer at least 10 working days before pile driving operations.

Allow 14 days for review and authorization. Revise and resubmit the plan within 7 days of receipt of comments, if revisions are required. The Department's review resumes when a complete VMP has been resubmitted.

Submit an electronic copy on a read-only CD, DVD or other Engineer-authorized data storage device and 4 printed copies of the VMP incorporating the authorized changes.

Minor changes or clarifications to the initial submittal may be made and attached as amendments to the plan. VMP may be conditionally accepted while minor revisions or amendments are being completed.

**14-8.03A(2)(f) Vibration Data Report**

Submit daily a hardcopy and electronic report summarizing data collected, including a logged data chart at each of the seismograph locations before the end of the following day.

Submit a hard copy and an electronic report documenting the results at the seismograph locations within 14 days after the completion of the vibration monitoring.

Vibration instrumentation personnel must sign all vibration data reports and include:

1. Project identification, including county, route, post mile, and project identification as shown
2. Location of the seismographs (clearly label image and identify latitude and longitude location).
3. Location of vibration sources
4. Summary tables indicating the date, time, and magnitude and frequency of maximum single-component peak particle velocity measured during each 1-hour interval of the monitoring period for each seismograph
5. Field data forms (construction vibration monitoring only)
6. Appendix graphs of the strip charts printed during the monitoring periods

**14-8.03A(3) Quality Assurance**

**14-8.03A(3)(a) General**

Vibration monitoring personnel must check and verify the vibration performance in the area adjacent to the job site during operations are below the threshold limits.

**14-8.03A(3)(b) Qualifications**

Vibration monitoring personnel must include a qualified Vibration Instrumentation Engineer who complies with one of the following minimum qualifications:

1. Engineer who is registered as a civil-engineer in the State with at least 5 years of experience in the installation and use of vibration monitoring instruments and data interpretation
2. Professional with graduate level degree from an accredited university in physics or acoustics with at least 4 years of experience in the installation and use of vibration monitoring instruments and data interpretation

Vibration instrumentation personnel must:

1. Be onsite and supervise the installation of vibration monitoring instruments
2. Conduct regular maintenance of seismograph installations
3. Supervise interpretations of vibration monitoring data

Keep copies of training records on the job site.

**14-8.03A(3)(c) Preconstruction Meeting**

Attendees of the preconstruction meeting must include:

1. Department's vibration competent person
2. Your vibration monitoring personnel
3. Your vibration instrument personnel

4. Your project Superintendent
5. Others, as necessary

The meeting agenda must include a review of the job site personnel vibration monitoring requirements, VMOP, VMP, emergency contacts and notification plan, submittals, and any other issues pertinent to the execution of the vibration monitoring-related work.

#### **14-8.03B Materials**

Not Used

#### **14-8.03C Construction**

##### **14-8.03C(1) Equipment**

##### **14-8.03C(1)(a) Vibration Monitoring Equipment**

Portable seismographs must have the following minimum features:

1. Seismic range: 0.01 to 4 inches per second with an accuracy of  $\pm 5$  percent of the measured peak particle velocity or better at frequencies between 10 Hertz and 100 Hertz; and with a resolution of 0.01 inch per second or less.
2. Frequency response ( $\pm 3$  dB points): 2 to 200 Hertz.
3. 3 channels for simultaneous time-domain monitoring of vibration velocities in digital format on 3 perpendicular axes.
4. Power source must be capable of supplying power to monitor vibrations continuously for several days.
5. Capability of internal, dynamic calibration.
6. Capability to transfer data from memory to external device. Instruments must be capable of producing recordings of readings on site within 1 hour of obtaining the readings. Provide computer software to perform analysis and produce reports of continuous monitoring.
7. Continuous monitoring mode must be capable of automatic recording of single-component peak particle velocities and frequencies of peaks with an interval of 1 minute or less.
8. Able to give warning immediately when threshold particle velocity is exceeded.
9. Be waterproof.

Mount the seismographs firmly on the surface slab of concrete or asphalt, or set in undisturbed soil.

Align the seismographs' longitudinal direction of measurement parallel to the property's alignment.

Align the seismographs' transverse direction of measurement perpendicular to the property's alignment.

Place seismographs within 3 feet of the exterior of designated property on the side facing construction activities. The spacing between the seismographs must be less than 100 feet. Use a minimum of 3 seismographs along each of the properties listed in 14-8.03A(1).

##### **14-8.03C(1)(b) Calibration**

Calibrate and maintain all equipment in working order under the equipment use specifications at the manufacturer's product maintenance schedule or certified calibration laboratory within 1 year of their use onsite.

##### **14-8.03C(2) Vibration Monitoring**

Determine baseline vibration levels before start of work for each vibration monitoring area identified.

Comply with section 14-8.04 in monitoring the existing structure's cracks, foundation, and ground settlement of each property adjacent to the job site at pre-construction, during and post-construction.

Document pre-construction and post-construction condition of structures and adjacent properties including photo, date, location, and description of condition.

Monitor and record vibration data during operations.

Seismographs must be set up to give immediate warning when the resultant peak particle velocity calculation from all 3 axes equals or exceeds a threshold value of 0.3 inches per second.

The warning emitted must be instantaneously transmitted to the designated responsible person and the Engineer by warning lights, audible sounds, or electronic transmission.

Stop work immediately and notify the Engineer when vibration readings equal or exceed the specified threshold value followed immediately by a damage survey of impacted structures.

Immediately implement vibration mitigation plan to reduce the vibrations within 24 hours. Do not resume work unless authorized.

**14-8.03C(3) Notifications, Communications, and Postings**

Do not disclose any instrumentation data to third parties nor publish data without the Department's written consent.

**14-8.03D Payment**

Not Used

Replace section 14-8.04 with:

**14-8.04 SURVEY AND MONITORING OF EXISTING NON-HIGHWAY FACILITIES**

**14-8.04A General**

**14-8.04A(1) Summary**

Section 14-8.04 includes specifications for surveying and monitoring of existing non-highway facilities, shown in the following table:

**List of Properties for Monitoring**

Building name	Address	Assessor's parcel number
Residential	5515 Century Manor Court	678-37-067
Residential	5519 Century Manor Court	678-37-068
Residential	5523 Century Manor Court	678-37-069
Residential	5527 Century Manor Court	678-37-070
Residential	5531 Century Manor Court	678-37-071
Residential	5535 Century Manor Court	678-37-072
Residential	5539 Century Manor Court	678-37-073
Residential	5543 Century Manor Court	678-37-074
Casa Alondra Mobile Home Park	5450 Monterey Road, Residences abutting the City or Caltrans right-of-way between station BP 12+00 to 23+00	N/A

The work includes:

1. Surveys of existing non-highway facilities to monitor cracks before, during, and after vibration-related construction operations
2. Collecting, interpreting, inspecting, documenting, and reporting survey results, including implementing required remedial and precautionary measures to be taken
3. Furnishing and installing survey and monitoring equipment and instrumentation required for the work

Existing non-highway facilities include structures and facilities adjacent to the project site located within the vibration monitoring limits map and listed in the List of Properties for Monitoring. Photo survey must include video recordings.

**14-8.04A(2) Submittals**

**14-8.04A(2)(a) General**

Submit:

1. Product data
2. Pre-construction Monitoring Survey Report
  - 2.1. Photo and video survey
  - 2.2. Crack survey
3. Post-construction Monitoring Survey Report
  - 3.1. Photo and video survey
  - 3.2. Crack survey

For each monitoring survey report, allow 5 days for review and authorization. Revise and resubmit within 5 days of receipt of comments, if revisions are required. Allow 3 days for review of the revisions. Submit 4 copies incorporating the required changes after authorization. Minor changes or clarifications to the initial submittal may be made and attached as amendments to the report.

Immediately after the Engineer's authorization, submit 1 copy of printed reports and digital reports to the District Air Quality and Noise Unit.

**14-8.04A(2)(b) Product Data**

Submit:

1. A copy of the instructions and maintenance manual, product data, and other pertinent information of each photo monitoring and crack monitoring instrument for use at the job site before starting pre-construction survey.
2. A list and model numbers of digital photo and video equipment for use at the job site, including digital cameras, photo and video editing software, photo printers, and video software.
3. A sample of 8.5 by 11 inches photo quality glossy heavy weight paper to be used for the Photo and Video Monitoring Reports. Clearly label the project name and project number. Note the paper's weight in pound-paper.

**14-8.04A(2)(c) Pre-Construction Monitoring Survey Reports**

Submit 4 printed copies and 4 digital copies of the following complete pre-construction monitoring reports before the start of construction for each existing survey and monitoring location:

1. Photo and Video Monitoring Survey Reports
2. Crack Monitoring Survey Report

**14-8.04A(2)(d) Photo and Video Monitoring Survey Reports**

Thirty days before the start of pile driving operations, submit 4 copies of the pre-construction photo and video monitoring survey report, including 4 digital copies containing the record of observations and a copy of the video documentation for each facility indexed on the optical media disks.

After construction, submit 4 copies of the post-construction photo and video monitoring survey report, including 4 digital copies containing the record of observations and a copy of the video documentation for each facility indexed on the optical media disks.

Photo Monitoring Survey Report must include:

1. Project name, project description, project number, and project post mile.
2. Title of report.
3. Date of each photo and each video survey for each existing facility.
4. Location description.
5. Orientation.
6. Detailed description of work.

7. Facility condition.
8. Date and document observation, video, and photographs.
9. Interior and exterior assessment of the existing buildings and existing facilities.
10. Name and signature of the designated responsible person for photo survey and video survey. The person must have the authority to work with the vibration instrumentation engineer onsite.
11. Description of the instruments and equipment to be used, including model number.
12. Monitoring locations and building layouts clearly identified.
13. Procedures and methods for photo and video data collection.

Organize photographs in 3-ring binder with a photo protective sleeve, building layout, and summary sheets indexing all photographs.

Store digital photos in JPEG file format on a labeled, CD-ROM 80 min or single sided, single layer DVD 4.7 GB optical disk media.

Store digital copy in PDF format on a labeled, CD-ROM 80 min or single sided, single layer DVD 4.7 GB optical disk media of the index and date photographs, label location, orientation, and labeled with detailed description.

Video Monitoring Survey Report must include:

1. Video storage media organized in 3-ring binder with a protective sleeve, building layout, and summary sheets indexing all videos.
2. Labeled single-sided, single layer 4.7 GB DVD optical media, with the stored digital copy of video recordings, indexed with all the videos.
3. Table listing anomalies along with counter reading or date-time stamp for each anomaly recorded on the video
4. Video monitoring survey in a separate tab dividing the photo and video sections

Organize video storage media in 3-ring binder with a protective sleeve, building layout, and summary sheets indexing all videos.

#### **14-8.04A(2)(e) Crack Monitoring Survey Report**

Thirty days before the start of pile driving operations, submit 4 copies of pre-construction Crack Monitoring Survey Report organized in a 3-ring binder and 4 digital copies in a PDF file format stored on a labeled, CD-ROM 80 min or single sided, single layer DVD 4.7 GB optical disk media for each facility.

Report must include:

1. Project name, project description, project number, and project post mile
2. Title and date of report
3. Date of crack monitoring survey for each existing facility
4. Name and signature of the designated responsible person for monitoring for each existing facility
5. Location address or description
6. Crack gauge placement location description
7. Building layout plan showing the placement of crack monitoring equipment and location description
8. Date-time stamp and document crack observation, including photograph
9. Interior and exterior assessment of the existing facilities
10. Summary of monitoring locations and a layout plan sheet
11. Procedures and methods for crack monitoring data collection
12. Description of the instruments and equipment used
13. Summary of existing facility condition and a list of results of the maximum and minimum crack monitoring survey, and the date observation.
14. Description of main use of each facility
15. Status of main construction operation during observation at each monitoring location
16. Record observation signs of structural defects damage, distress, deformation, or deterioration
17. Relevant sketches, plans, and photographs with titles, and explanations

18. Description and reason of areas not covered by visual inspections
19. Additional information necessary for each facility

**14-8.04A(2)(f) Post-Construction Monitoring Survey Report**

Submit 4 copies of the following final post-construction monitoring survey reports and 4 digital copies of the reports for each survey of existing non-highway monitoring location 10 days after completing operations:

1. Photo and Video Monitoring Survey Reports
2. Crack Monitoring Survey Report

**14-8.04A(3) Quality Assurance**

**14-8.04A(3)(a) General**

Photo and video personnel, and crack monitoring personnel, must prepare reports indicating that monitoring survey performance with the area of the vibration monitoring limit adjacent to the job site during operations are acceptable and are below the monitoring limits.

**14-8.04A(3)(b) Qualifications**

Photo and video monitoring lead person, and crack monitoring lead person, collaborates with the project superintendent to schedule and arrange photo, video, and crack monitoring surveys during operations.

Submit training and qualification records to the Engineer.

Keep copies of training records on the job site.

Photo and video personnel must have verifiable construction experience or a degree or qualifications in photography and videography and must meet the minimum qualifications:

1. Proficient in professional video and photo editing software
2. Strong technical knowledge of cameras
3. Understanding of lighting
4. Setup, operate cameras, video, audio, and props for interior and exterior video capture
5. Organize and maintain photo and video images

Crack monitoring personnel must be either:

1. An engineer who is registered as a structural engineer in the State
2. Individuals with at least 5 years of experience in the assessment of the overall integrity of buildings or parts thereof affected by vibration-related operation during construction, supervised by an engineer who is registered as a structural engineer in the State

Crack monitoring personnel must:

1. Be onsite and supervise the installation of crack-monitoring instruments
2. Supervise data interpretations of crack-monitoring data
3. Have ability to evaluate and report structural assessment of existing structures and facilities
4. Understand building structural systems and layouts
5. Identify critical areas for inspection and cause of damage to buildings in identified areas
6. Organize and maintain data
7. Data interpretation
8. Collaborate with the Engineer or Superintendent

**14-8.04A(3)(c) Preconstruction Meeting**

Attendees of the preconstruction meeting must include:

1. Department's vibration competent person
2. Department's surveyor competent person

3. Your vibration monitoring personnel
4. Your photo monitoring personnel
5. Your video monitoring personnel
6. Your crack monitoring personnel
7. Your project Superintendent
8. Others as necessary

The meeting agenda must include a review of the:

1. Job site personnel photo and video monitoring, crack monitoring and logistic requirements
2. Pre-construction survey, weekly monitoring, and post-construction survey requirements
3. Emergency contacts and notification plan
4. Submittal
5. Any other issues pertinent to the execution of survey and monitoring of existing non-highway facilities-related work

#### **14-8.04B Materials**

##### **14-8.04B(1) Crack Monitor**

Before installation, provide a clean surface free of all grease, loose particles and other barrier materials.

Comply with manufacturers installation instructions.

Each crack monitor must be new and must be appropriately installed for the type of surface.

Comply with manufacturer's instructions for disposing or recycling after completing post-construction survey work.

#### **14-8.04C Construction**

##### **14-8.04C(1) Equipment**

###### **14-8.04C(1)(a) Calibration**

Calibrate and maintain all equipment in working order under the manufacturer's product maintenance requirements.

###### **14-8.04C(1)(b) Photo and Video Monitoring Survey Equipment**

Photo monitoring survey must have the following minimum features:

1. Each photograph printed in color and has a printed image size at least 5 inches by 7 inches.
2. Minimum resolution of image size is 3264 by 2448 pixels or 8 megapixels.
3. Photograph printed on 80-pound paper of the glossy photographic paper. A magazine type quality print capable of color fusion and continuous tone or a laser printer using photo-quality paper.
4. Proof sheets, thumbnail prints, or contact prints are not acceptable.
5. Index and date photographs, label location, orientation, and labeled with detailed description.

Video monitoring survey must have the following minimum features:

1. Video recordings must accompany photo monitoring survey of the foundation, floor, walls, ceiling, roof, improvements, and building elements inside and outside of designated facilities.
2. Condition of the facility, including cracks, settlement, leakage, and other apparent deficiencies.
3. Narrated contemporaneously by the camera operator, documenting the location, orientation, time and date of the scene.
4. Audio and video recordings are made in high-definition (HD) with a minimum digital video HD mode of 1080 resolution with the frame rate of 30 Hertz; and the minimum audio bit rate of 256 kilobit per second. Format can be edited, free of any copy protection, and is viewable by VLC Media Player or equivalent. Record video in daylight or similar conditions capable of documenting architectural cracking in structures for indoor and outdoor conditions.
6. Each video 10 minutes in length, labeled, and indexed.

7. Single facility recorded on a single standard optical disk media.

Perform photo and video monitoring survey equipment at the locations shown in section 14-8.04A(1) List of Properties for Monitoring.

**14-8.04C(1)(c) Crack Monitoring Survey Equipment**

Identify and install crack monitoring equipment before the start of pre-construction survey on existing cracks at the critical locations in each of the facilities.

Crack monitoring instrument must be authorized. Crack monitoring gauge must be capable of measuring cracks to the nearest 0.05 inch.

Calibrated crack monitoring device must be authorized. Crack gauge must be capable of measuring cracks to the nearest 0.05 inch.

Place crack monitoring instrumentation on the exterior face at each facility on the side facing construction activities or at the critical location designated by the qualified instrumentation engineer at the locations shown in section 14-8.04A(1) List of Properties for Monitoring.

**14-8.04C(2) Construction**

**14-8.04C(2)(a) General**

Notify the Engineer 48 hours before starting each type of survey work.

**14-8.04C(2)(b) Pre-Construction Monitoring Survey**

Perform pre-construction monitoring survey 30 days before the start of construction, including:

1. Photo Monitoring Survey
2. Crack Monitoring survey

**14-8.04C(2)(c) Photo and Video Monitoring Surveys**

Perform photo and video monitoring surveys during pile driving operations.

Photo monitoring survey must include video recordings on the inside and outside of the existing facility, including cracks, settlement, leakage, and other apparent deficiencies of the:

1. Foundation
2. Floor
3. Wall
4. Ceiling
5. Roof
6. Improvements
7. Building element
8. Retaining wall

Video survey must include:

1. Contemporaneous narration by the camera operator, documenting the location, orientation, time and date of the scene.
2. Audio and video recordings made in high-definition (HD) with a minimum digital video HD mode of 1080 resolution with the frame rate of 30 Hertz and the minimum audio bit rate of 256 kilobit per second. Format must be edited, free of any copy protection, and viewable by VLC Media Player or equivalent.
3. Video must be recorded in daylight or similar conditions capable of documenting architectural cracking in structures for indoor and outdoor conditions.
4. Videos, each 10 minutes in length, labeled, and indexed.
5. Single facility recorded on a single standard optical disk media.

**14-8.04C(2)(d) Crack Monitoring Survey**

Perform and record crack gauge reading before the start of construction.

Perform and record crack gauge reading within 10 days after pile driving operations for post-construction survey.

Perform and record crack gauge reading daily 3 times per shift during operations.

Record crack gauge measurements at the same time and daily to eliminate deviations in crack magnitude due to heat fluctuations.

Identify location of the crack monitoring survey locations for each existing facility and conduct photo survey documenting each location.

Report crack monitoring readings weekly to Engineer.

Stop work immediately and notify the Engineer when crack readings equal or exceed the specified threshold value. Immediately perform a damage survey of impacted structures and implement an alternate plan during construction operation to reduce the impact of crack measurements. Do not resume work unless authorized.

**14-8.04C(3) Notifications, Communications, and Postings**

Communicate and post at all times in the Contractor's field office that the Contractor must not disclose any instrumentation data to 3rd parties nor publish data without the Department's written consent.

**14-8.04D Payment**

Not Used

**Replace *Reserved* in section 14-11.10 with:**

**14-11.10A General**

Section 14-11.10 includes specifications for managing naturally occurring asbestos (NOA), serpentine and ultramafic rock. One or more of these materials are present within the job site. NOA is used as defined under 17 CA Code of Regs § 93105.

Manage NOA under State laws and regulations and county and municipal ordinances and regulations. Laws and regulations that govern this work include:

1. 8 CA Code of Regs § 1529 (Asbestos) and § 5192 (Hazardous Waste Operations and Emergency Response)
2. 17 CA Code of Regs § 93105 and § 93106
3. 22 CA Code of Regs, Div 4,5, Chp 10
4. Health & Safety Code, Division 20, Chp 6.5 (Hazardous Waste Control)

Manage NOA under the rules and regulations of the following agencies:

1. US EPA
2. DTSC
3. CDPH
4. Cal/OSHA
5. California Air Resources Board (CARB)
6. Bay Area Air Quality Management District

Comply with the Airborne Toxic Control Measures (ATCM) during all earthwork activities on the job site.

#### **14-11.10B Site Conditions**

NOA exists throughout the job site. Manage sediment collected under sections 13-4 and 13-6 at this location as NOA within the job site.

The tested levels of NOA range from non-detect to 0.50 percent asbestos, with an average of 0.140 percent, as analyzed by California Air Resources Board (CARB) Test Method 435.

#### **14-11.10C Notifications**

Notify the APCD or AQMD in writing at least 15 days before starting work that disturbs NOA. Submit proof of notification and any exemption. Keep a copy at the job site.

#### **14-11.10D Submittals**

##### **14-11.10D(1) Daily Ambient Air Monitoring Report**

When required by local APCD or AQMD, perform daily ambient air monitoring on the job site. If daily ambient monitoring is required, every month submit a written air monitoring report. The report must include:

1. Air monitoring results
2. Analysis of results from the prior month
3. Name and location of the laboratory where the analysis was performed
4. Assessment of exposures of workers or the public
5. Descriptions of the type of air monitoring equipment
6. Sampling frequency

##### **14-11.10D(2) Dust Control Plan**

The local air district, APCD or AQMD, may require review and approval of the dust control plan (DCP) and fee payment. If required, submit the DCP approved by the local air district. Otherwise submit the DCP.

The DCP must address all activities that disturb NOA including processing activities under section 19-2.03D wherever they occur.

##### **14-11.10D(3) Asbestos Compliance Plan**

Submit an asbestos compliance plan (ACP) to prevent or minimize worker exposure to asbestos. The ACP must be signed by a CIH. Obtain authorization for the plan before starting any activity that presents the potential for asbestos exposure.

The ACP must comply with the following regulations:

1. 8 CA Code of Regs, § 1529, (Asbestos) and § 5192, (Hazardous Waste Operations and Emergency Response)
2. Occupational Safety and Health Guidance Manual published by the National Institute of Occupational Safety and Health (NIOSH)
3. Occupational Safety and Health Administration (OSHA), including addenda issued up to and including the date of advertisement of the Contract

Include the following information in the ACP:

1. Identification of personnel designated to be on site
2. Job hazard analysis for work assignments
3. Summary of potential risks
4. Worker exposure air monitoring plan
5. Description of personal protective equipment
6. Delineation of work zones on the job site
7. Decontamination procedures
8. General safe work practices
9. Site security measures
10. Emergency response plans

11. Description of worker training

**14-11.10D(4) Sampling and Analysis Plan**

Not Used

**14-11.10D(5) Analytical Test Results**

Not Used

**14-11.10D(6) Fill Material Documentation**

Submit documentation that fill material to be used as cover contains less than 0.25 percent asbestos as required by ATCM.

**14-11.10D(7) NOA Burial Location Report**

Before removing material from the job site submit written acknowledgement of NOA content from property owners of off-site locations where NOA will be temporarily stockpiled.

Within 5 business days of completing placement of NOA at the burial location, submit a report for that burial location, including the form "Burial Location of Soil Containing Naturally Occurring Asbestos" and electronic geospatial vector data shape files of the top and bottom perimeters of the burial location to the Engineer and to:

NOA@dot.ca.gov

The Engineer will notify you within 5 business days of receipt if accepted. If the report is rejected, you have 5 business days to submit a corrected report.

**14-11.10D(8) Disposal Documentation**

Within 10 days after removal from job site, submit as an informational submittal:

1. Bill of lading
  2. Acknowledgement of receipt of material containing NOA from receiving party or landfill facility
- For surplus NOA with asbestos concentrations below between 0.25 percent and 1 percent being disposed at a location other than a permitted landfill facility submit as an informational submittal:

1. Description and a scaled map of the final disposition of the surplus NOA material
2. Certification that the surplus NOA material will not be reused in a surfacing application

If additional test results are required by the property owner or the landfill facility, submit them as an informational submittal.

**14-11.10E Training**

Before performing work in areas with material containing NOA, personnel who have not had the worker training must complete a safety training program that complies with the ACP. The safety training program must meet the requirements of 8 CA Code of Regs §1529, (Asbestos), and § 5192 (b)(4)(B), (Hazardous Waste Operations and Emergency Response). Provide the Engineer written certification of completion of safety training for each trainee before performing work in areas containing NOA.

Provide training, personal protective equipment, and washing facilities for 3 VTA employees.

**14-11.10F Dust Control**

Prevent visible dust emission during excavation, stockpiling, processing activities under section 19-2.03D, transportation, or and placement of NOA and suspected NOA under section 10-5 and 17 CA Code of Regs § 93105(d)(1)(B).

Control dust in areas with NOA and suspected NOA using measures that include the following:

1. Stabilize unpaved areas subject to vehicular traffic by keeping adequately wetted, treated with a chemical dust palliative, or covered with material that contains less than 0.25 percent asbestos.
2. The speed of vehicles and equipment traveling across unpaved areas must not be more than 15 mph unless the road surface and surrounding area is sufficiently stabilized to prevent vehicles and equipment going faster from causing dust that is visible from crossing job site limits.
3. Stockpiles and disturbed areas not subject to vehicular traffic must be located in the plan and stabilized by being kept adequately wetted, treated with a chemical dust palliative, or covered with material that contains less than 0.25 percent asbestos.
4. Conduct activities so that no dirt or mud tracking is visible on any paved roadway open to the public.

Do not leave NOA with asbestos content of 0.25 percent or higher exposed on the surface if disturbed during construction activities. Stabilize these areas by keeping them wetted or by treating them with a chemical dust palliative. Cover disturbed NOA permanently placed during construction activities with a 3-inch-minimum layer of asbestos-free material.

#### **14-11.10G Surveying NOA Burial Locations**

Survey the location of the bottom and top perimeters of each area where you bury NOA.

The survey must be performed by or under the direction of either:

1. Land surveyor licensed under the Bus & Prof Code, Chp 15 (commencing with § 8700)
2. Civil engineer licensed before January 1, 1982 under the Bus & Prof Code, Chp 7 (commencing with § 6700)

Survey 10 points to determine each burial location horizontally and vertically within the specified accuracies and to create closed polygons of the perimeters of the bottom and top of the burial location. If 10 points are not sufficient to define the polygon, add additional points until the polygon is defined. Establish the position of the bottom and top perimeters before placing subsequent layers of material that obstruct the location.

Report each burial location in California State Plane Coordinates in US Survey feet within the appropriate zone of the California Coordinate System of 1983 (CCS83) and in latitude and longitude. Horizontal positions must be referenced to CCS83 (epoch 2007.00 or later National Geodetic Survey [NGS] or California Spatial Reference Center [CSRC] published epoch) to an accuracy of 3 feet horizontally. Identify the points to an accuracy of 1 foot vertically. Reference elevations of the bottom and top of the burial locations to North American Vertical Datum of 1988 (NAVD88). Report accuracy of spatial data in US Survey feet under Federal Geographic Data Committee (FGDC)-STD-007.1-1998.

#### **14-11.10H Stockpiling**

Material containing NOA or suspected NOA may be temporarily stockpiled until it is transported and disposed of or used on site. Limit stockpile locations to areas that contain NOA or suspected NOA within the job site. Cover temporary stockpiles with polyethylene sheeting of 10 mil minimum thickness or stabilize stockpiles by other methods permitted under 17 CA Code of Regs § 93105(d)(1)(3). Temporarily stockpiled material containing NOA or suspected NOA is not selected material under section 19 2.03D.

#### **14-11.10I Blasting**

On job sites that require blasting, minimize the emission of NOA with the use of blasting mats or cover material not containing NOA. Sample and analyze cover material after blasting to determine if it contains NOA. Cover material not containing NOA after blasting is your property. Dispose of cover material containing NOA as specified.

#### **14-11.10J Material Transportation and Placement**

Do not dispose of material containing NOA in a surfacing application as defined in 17 CA Code of Regs § 93106, Asbestos Airborne Toxic Control Measure for Surfacing Applications

Transport surplus NOA containing greater than or equal to 1.0 percent asbestos including sediment collected under sections 13-4 and 13-6 to a landfill with an appropriate permit from a division of the CA

Environmental Protection Agency. You are responsible for identifying the appropriately permitted landfill to receive the NOA. Surplus material containing less than 1.0 percent NOA may be disposed under section 5-1.20B(4). In all cases of transporting and disposing of excess material containing NOA:

**WARNING!**

**This material may contain asbestos**

**It is unlawful to use this material for surfacing or any application in which it would remain exposed and subject to possible disturbances. Extreme care should be taken when handling this material to minimize the generation of dust.**

Material containing NOA excavated from outside the limits shown must be disposed of at an approved facility.

**14-11.10K Close-out**

After project acceptance you have no further responsibility for the NOA in place within the job site. You will not be considered a generator of the hazardous material and no further action is required.

**Add after the 2nd paragraph of section 14-11.12A:**

This project includes removal of yellow painted traffic stripe and yellow thermoplastic traffic stripe that will produce hazardous waste residue.

**Add after the 1st paragraph of 14-11.12E:**

After the Engineer accepts the analytical test results, dispose of yellow thermoplastic and yellow paint hazardous waste residue at a Class 1 disposal facility located in California 30 days after accumulating 220 lb of residue.

If less than 220 lb of hazardous waste residue and dust is generated in total, dispose of it within 60 days after the start of accumulation of the residue.

**Add section 14-11.12F:**

**14-11.12F Payment**

Payment for removal of existing yellow painted traffic stripe is included in the payment for Remove Yellow Thermoplastic Traffic Stripe (Hazardous Waste).

Payment for the Asbestos Compliance Plan is included in the payment for various Contract items involved.

**Add to the 1st paragraph of section 14-11.14A:**

Wood removed from guardrail and roadside signs is treated wood waste.

**Add to section 14:**

**14-13 TREE PROTECTION**

**14-13.01 GENERAL**

**14-13.01A Tree Protection (High Visibility Fabric)**

Tree Protection (High Visibility Fence) must be installed and approved prior to start of work.

No storage of material, topsoil, vehicles or equipment shall be permitted within the tree protection (high visibility fabric) area.

Contractor must notify Engineer to request arborist 72 hours in advance of any work requiring digging around or within the drip line of existing trees and upon installation of tree protection (high visibility fabric) for inspection.

During and upon completion of any trenching/grading operation within a tree's dripline, should any roots greater than one inch (1") in diameter be damaged, broken or severed, root pruning to include flush cutting and sealing of exposed roots should be accomplished under the supervision of a certified ISA arborist or certified ISA tree worker engaged by the Contractor to minimize root deterioration beyond the soil line within twenty-four (24) hours.

Pruning of the foliar canopies to include removal of deadwood is recommended and should be initiated prior to construction operations. Such pruning will provide any necessary construction clearance, will lessen the likelihood or potential for limb breakage, reduce 'windsail' effect and provide an environment suitable for healthy and vigorous growth.

#### **14-13.01A(1) Irrigation**

A supplemental irrigation program may be required for existing trees and should be accomplished at regular three to four week intervals during the period of May 1st through October 31st. Irrigation is to be applied at or about the 'drip line' in an amount sufficient to supply approximately fifteen (15) gallons of water for each inch in trunk diameter.

Irrigation can be provided by means of a soil needle, 'soaker' or permeable hose. When using 'soaker' or permeable hoses, water is to be run at low pressure, avoiding runoff/puddling, allowing the needed moisture to penetrate the soil to feeder root depths.

#### **14-13.01A(2) Mulch**

Mulching with wood chips (maximum depth 3") within tree environments (outer foliar perimeter) is required as shown on the Planting Plans. Do not place mulch within 1' of the existing tree trunk.

#### **14-13.01A(3) Inspection**

Periodic inspections by the Contractor's site arborist are required during construction activities, particularly as trees are impacted by trenching, irrigation or planting operations. Inspections at six (6) week intervals is sufficient to assess and monitor the effectiveness of the tree preservation plan and to provide recommendations for any additional care or treatment. Further, anytime construction activity is expected within or around the drip line of existing trees the arborist must be present to oversee the construction activity.

When construction occurs within drip line of existing trees, pile the soil on the side away from the tree. When this is not possible, place soil on plywood. A tarp, or thick bed of mulch. This is to help prevent cutting into the soil surface when the backhoe or tractor blade refills the trench.

Refill open trenches within hours of excavation when they occur within the drip line of existing trees. If this is not possible and weather is hot, dry, or windy, keep root ends moist by covering them with wet burlap. If temperature is 80°F or greater, the burlap must be inspected every hour and re-wet as necessary to maintain a constant cool moist condition. If temperature is below 80°, the burlap must be inspected every four hours and re-wet as necessary to maintain a constant cool moist condition.

When roots 2" or larger must be cut, shovel by hand near the roots and saw the roots. Accidentally broken roots should be sawed a couple of inches behind the ragged end.

No trenching shall be done within the drip line of existing trees without the approval of the Engineer after consultation with the arborist. Open trenching in the root zone of a tree is prohibited except in cases where the trenching falls outside the drip line of the tree involved. Exceptions will be allowed if the arborist determines that the impact of trenching upon the tree will be negligible.

### **14-13.02 MATERIALS**

#### **14-13.02A High Visibility Fabric**

High visibility fabric for tree protection (high visibility fabric) must consist of one of the following:

1. Polyethylene
2. Polypropylene
3. Combined polyethylene and polypropylene

Sample high visibility fabric under ASTM D 4354, Procedure C.

Test high visibility fabric under ASTM D 4759. All properties must be based on Minimum Average Roll Value.

Identify, store, and handle high visibility fabric rolls and samples under ASTM D 4873.

High visibility fabric must:

1. Contain ultraviolet inhibitors
2. Comply with the requirements shown in the following table:

Property	Specifications	Requirements
Width, inches, Min	Measured	48
Opening size inches	Measured	1" x 1" (Min) 2" x 4" (Max)
Color	Observed	Orange
Roll weight, lb Min for 4' x 100' roll	Measured	12
Tensile strength, lb Min, machine direction x cross direction	ASTM D 4595	225 x 95
Ultraviolet Degradation Percent of original unexposed grab breaking load 500 hr, minimum	ASTM D 4355	70

#### 14-13.02B Posts

Posts must be wood or steel.

Wood posts must be:

1. Untreated fir, redwood, cedar, or pine and cut from sound timber
2. Straight and free of loose or unsound knots and other defects that would render the stakes unfit for use
3. Pointed on the end to be driven into the ground
4. At least 2" x 2" in size and 8 feet long

Steel posts must:

1. Have a "U," "T," "L," or other cross sectional shape that can resist failure from lateral loads.
2. Be pointed on the end to be driven into the ground.
3. Weigh at least 0.75-pound per foot.
4. Be at least 8 feet long.



## DIVISION III EARTHWORK AND LANDSCAPE

### 19 EARTHWORK

#### Add to the end of section 19-2.01A:

Roadway excavation includes excavating, stockpiling, hauling, placement and compaction in embankments or removing the material from the jobsite and placing it offsite in accordance with Section 14-11.10 of these specifications.

At the Contractor's option, excess excavated material may be placed and compacted in specific areas of Caltrans right-of-way within the project limits listed below:

1. Widening the embankment along the southbound off-ramp from right of approximately station "AR-3" 517+00 to "AR-3" 519+00.
2. Widening the embankment inside the southbound loop on-ramp from left of approximately station "BP" 26+00 to "BP" 29+00.

If the Contractor selects this option, Contractor must notify VTA in writing within 90 days after the Notice to Proceed, in order to allow VTA time to revise the plans and obtain Caltrans approval of the revised plans.

If the Contractor selects this option, no additional compensation will be allowed for earthwork. A contract change order will be issued to adjust quantities and provide compensation for changes in other items of work, including irrigation, drainage, erosion control and planting, which are affected by these grading revisions.

#### Add to the end of section 19-3.01A:

Structure backfill includes constructing the geocomposite drain system. The systems must comply with section 68-7.

#### Add to section 19-3.01D(2):

The wall zones for the soil nail wall at Retaining Wall 1 are as shown in the following table:

Wall zone	Beginning station	End station	Upper elevation (ft)	Lower elevation (ft)
1	"RW1" 506+80.00	"RW1" 510+25.86	226	222
2	"RW1" 506+80.00	"RW1" 510+25.86	222	218
3	"RW1" 506+80.00	"RW1" 510+25.86	218	214
4	"RW1" 506+80.00	"RW1" 510+25.86	214	210
5	"RW1" 506+80.00	"RW1" 510+25.86	210	206

#### Replace section 19-3.02A with:

Trench excavation, bedding and backfill for City of San Jose storm drains must conform to Section 1301 of the City of San Jose Standard Specifications dated 1992.

#### Replace section 19-3.03A with:

Construction of trench excavation, bedding and backfill for City of San Jose storm drains must conform to Section 1301 of the City of San Jose Standard Specifications dated 1992.

#### Add to the 1st paragraph of section 19-3.03K:

The maximum excavation lift height must be 5' or less. If you use an exposure duration longer than 1 work shift, perform stability testing. Perform the testing before roadway excavation.



2. The soil analysis report must be made available, in a timely manner, to the Engineer to make any necessary adjustments to the design plans.
4. Contractor must submit documentation verifying implementation of soil analysis report recommendations to the Engineer and the City of San Jose with certificate of completion.

**20-1.01C(1) City of San Jose Submittals**

A list of materials proposed for use on this project for the City of San Jose landscaping including, but not limited to, bubblers, mulch, control valves, gate valves, wires, root barriers, trees, concrete, pipes and conduits must be submitted to the Engineer for review by and to the City of San Jose for review and acceptance.

Provide the list of materials and a copy of the manufacturers' product sheets for all proposed materials and equipment to the Engineer for acceptance prior to purchase and a minimum of 30 days prior to the start of work.

The material submittals must include all materials and equipment needed to construct a fully functional irrigation system as shown on the project plans.

The City's Integrated Pest Management (IPM) Policy requires the Contractor to submit chemical use application and alternative method records to the City once a month, by the 10th of each month, for the previous month's activities.

Questions should be directed to Amber Schat, Environmental Services Specialist, City of San Jose - Environmental Services Department Watershed Protection Division, 200 E. Santa Clara St, 7th Floor, San Jose, CA 95113, Phone: (408) 793-5365, Fax: (408) 271-1930, Email: Amber.Schat@sanjoseca.gov

Organize the materials submittals in a 3-ring binder and include tabs to identify each proposed product. Provide certificates of compliance where applicable. The submittal binder must include a table of contents listing each material or piece of equipment that is being submitted.

Any item which does not fulfill the requirements of these technical specifications will be rejected.

**Add to section 20-1.02C:**

Contractor must reference the County of Santa Clara's Integrated Pest Management (IPM) and Pesticide Use Ordinance at:

[https://library.municode.com/ca/santa\\_clara\\_county/codes/code\\_of\\_ordinances?nodeId=TITBRE\\_DIVB28\\_INPEMAPEUS](https://library.municode.com/ca/santa_clara_county/codes/code_of_ordinances?nodeId=TITBRE_DIVB28_INPEMAPEUS)

Contractor must also reference the City of San Jose Integrated Pest Management at:

<https://www.sanjoseca.gov/Home/ShowDocument?id=50859>

Select herbicides from the following table:

<b>Herbicides</b>						
Herbicide name	Herbicide type					
	Preemergent (granular)	Preemergent (non granular)	Post-emergent	Selective	Non-selective	Systemic

Aminocyclopyrachlor	--	X	--	--	X	X
Aminopyralid	--	--	--	X	--	--
Chlorsulfuron	--	--	--	X	--	--
Clopyralid	--	--	--	--	X	--
Diquat dibromide	--	--	--	--	X	--
Dithiopyr	--	X	--	--	--	--
Fluazifop-P-Butyl	--	--	--	X	--	--
Glyphosate	--	--	X	--	--	X
Imazapyr	--	--	--	--	X	--
Indaziflam	--	X	--	--	X	X
Isoxaben	--	X	--	--	--	--
Oryzalin	--	X	--	--	--	--
Oxyfluorfen	--	X	X	--	--	--
Pendimethalin	X	X	X	--	--	--
Rimsulfuron	--	--	--	X	--	--
Sethoxydim	--	--	X	X	--	--
Sulfometuron-methyl	--	--	--	--	X	--
Sulfosulfuron	--	--	--	--	X	--
Triclopyr	--	--	--	--	--	X

**Delete the 4th paragraph of section 20-1.03A.**

**Replace *You may reduce* in the 1st sentence of the 5th paragraph of section 20-1.03A with:**  
Reduce

**Delete the 5th paragraph of section 20-1.03A.**

**Add to section 20-1.03C(3):**

In groundcover areas and within the area extending beyond the outer limits of the groundcover to the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, existing planting, and fences, control weeds with pesticides or by hand pulling. Where groundcover areas are 12 feet or more from the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, and fences, control weeds within the groundcover areas and 6 feet beyond the outer limits of the groundcover areas.

In mulched areas and within the area extending beyond the outer limits of the mulched areas to the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, existing planting, and fences, control weeds with pesticides or by hand pulling. Where mulched areas are 12 feet or more from the adjacent edges of shoulders, dikes, curbs, sidewalks, walls, and fences, control weeds within the mulched areas and 6 feet beyond the outer limits of the mulched areas.

Within 2 feet of the edges of paved shoulders, dikes, curbs, and sidewalks, control weeds with herbicides or by hand pulling.

In areas where plants are to be planted in groups or rows 15 feet or less apart, control weeds within the planting area and the area extending 6 feet beyond the outer limits of the groups or rows of plants with herbicides or by hand pulling. Hand pull weeds within and on the plant basin walls, spot treat with herbicides outside of the plant basin.

Where the plants are to be planted more than 15 feet apart and are located outside of groundcover areas, control weeds with herbicides or by hand pulling within an area 6 feet in diameter centered at each plant location. Hand pull weeds within and on the plant basin walls, spot treat with herbicides outside of the ``

Hand pull weeds within biofiltration swale and strip areas.

Control weeds in areas to be planted or hydroseeded, under guard rails, from within asphalt concrete surfacing, concrete surfacing, rock blankets, and unpaved gore areas between the edge of pavement and planting areas with herbicides or by hand pulling.

Where pavement, dikes, curbs, sidewalks, walls, and fences are located 12 feet or more beyond mulched areas, plant basins, and groundcover areas, limit mowing to 6 feet beyond these areas.

**Replace the 2nd paragraph of section 20-1.03C(4) with:**

Dispose of mowed material from initial and subsequent mowing during roadside clearing.

**Replace *Reserved* in section 20-1.03E with:**

Do not perform planting work in cultivated areas for a period of 20 days after:

1. Cultivation is complete
2. Irrigation systems have been installed

For cultivated areas, keep the soil sufficiently moist to germinate weeds. Weeds that germinate must be controlled by the use of herbicides.

**Add to section 20-2.01A(4)(e):**

Contractor must provide an irrigation audit in accordance with Title 23 Department of Water Resources Section 492.12: Irrigation Audit, Irrigation Survey, and Irrigation Water Use Analysis prior to project acceptance.

**Add to section 20-2.05B:**

Flow sensor cable must be rated 600V and 194 degree F, be UL listed as Type TC, comply with specifications of ICEA/NEMA and:

1. Consist of 2 no. 18 minimum stranded copper conductors. Insulated conductor must be color coded with a PVC or nylon jacket.
2. Include a tinned copper braid or aluminized polyester film shield. Where the film is used, a no. 18 or larger, stranded or no. 16 solid, tinned, copper drain wire must be placed between the insulated conductors and the shield and in contact with the conductive surface of the shield.
3. Include a black PVC jacket with a minimum nominal thickness of either 50 mils or 48 mils where capacitance of conductors to other conductors and the shield is 87 pF/ft or better. The cable jacket must be marked with the insulation type designation, conductor size, and voltage and temperature ratings.
4. Have an outside diameter of 0.130 to 0.141 inch.
5. Be UV resistant and direct burial type.
6. Have no splices between components except where shown.

**Add to the list in the 1st paragraph of section 20-2.06B(2)(a):**

17. Be EPA WaterSense® approved.

**Add to section 20-2.07C(1):**

Existing irrigation conduits shown on the plans to be incorporated in the new work must be located prior to performing any work on irrigation systems. The location of conduits shown on the Plans is approximate. You will be responsible for exploring and locating existing conduits. You will be responsible for exploring for the existing location up to 25 feet laterally either side of the location shown on the plans.

If debris is encountered in the ends of conduits, remove the debris prior to performing other work in the conduits. Removal of debris within the first 3 feet in these conduits will be at the Contractor's expense. If debris is encountered in the conduits more than 3 feet from the ends of the conduits, the additional debris shall be removed as directed by the Engineer and the removal work will be paid for as extra work in conformance with the provisions of Section G-60, "Force Account Payment," of the General Conditions.

If the conduit is not found, or is not suitable for use, and if directed by the Engineer, install irrigation conduit by directional drilling or jetting as directed by the Engineer. The conduit installation is paid for under section 20-2.08D.

If extending an existing conduit, remove the existing conductors from the conduit.

Use a coupling band if the new conduit matches the existing conduit diameter; otherwise overlap the conduit at least 12 inches.

**Replace the 1st paragraph in section 20-2.07C(2)(a) with:**

Install welded steel pipe by directional drilling.

**Add to section 20-2.08D:**

Installation of irrigation conduit by directional drilling is paid for as 10" Welded Steel Pipe Conduit (Revocable). No adjustment in the price paid per linear foot will be allowed for increase or decrease in the length of conduit installed by directional drilling.

**Replace section 20-2.14 with:**

Contractor must provide a watering report to the Engineer monthly. The watering report shall include a log of the dates watered, approximate quantity of water applied, contact information for who applied the water, photos of the plants in the area, and receipts for water. Failure to provide logs will result in non-acceptance of the project.

Payment for hand watering, arrangement for trucking of water, complying with water application requirements and required traffic control, and preparation of watering reports is included in the payment for Irrigation Systems and no additional payment will be made therefore.

**Add to section 20-3.01B(3)(a):**

Contractor must provide soil management report per State AB1881. Soil amendment must be as shown on the plans unless specified otherwise in the soil management report.

**Add to section 20-4.01A:**

This project has a Type 1 plant establishment period for 260 working days.

**Replace the 1st paragraph of section 20-4.01C(1) with:**

Submit the following seasonal watering schedules for use during the plant establishment period:

1. March through May
2. June through August
3. September through October
4. November through February



Compost must not be derived from mixed municipal solid waste and must not contain paint, petroleum products, pesticides, or other chemical residues harmful to plant or animal life. Metal concentrations in compost must not exceed the maximum listed under 14 CA Code of Regs § 17868.2.

Process compost materials under 14 CA Code of Regs § 17868.3.

**Replace *biodegradable jute, sisal, or coir fiber* in the 1st paragraph of section 21-2.02P with:**  
photodegradable plastic

**Add to section 21-2.02P:**

Straw for fiber roll must be certified weed free under the Department of Food and Agriculture.

**Replace section 21-3 with:**

**21-3 PERMANENT EROSION CONTROL ESTABLISHMENT WORK**

**21-3.01 GENERAL**

**21-3.01A Summary**

Section 21-3 includes specifications for performing permanent erosion control establishment work.

Permanent erosion control establishment work consists of weekly inspections of the project site for deficiencies in erosion control features.

The permanent erosion control establishment period starts after permanent erosion control work has been completed.

The Engineer notifies you when the permanent erosion control establishment period starts and furnishes weekly statements regarding the number of working days credited to the permanent erosion control establishment period after the notification.

At the start of the permanent erosion control establishment period you may request relief from maintenance and protection for work items that are not associated with water pollution control and permanent erosion control establishment work.

Working days on which no work is required during the permanent erosion control establishment period are credited as permanent erosion control establishment working days, regardless of whether or not you performed permanent erosion control establishment work.

Working days on which you fail to adequately perform permanent erosion control establishment work as required are not credited as permanent erosion control establishment working days.

Working days that occur after you fail to meet a due date for a Permanent Erosion Control Establishment (PECE) Report submittal will not be credited as permanent erosion control establishment working days.

**21-3.01B Definitions**

Not Used

**21-3.01C Submittals**

Submit a Permanent Erosion Control Establishment (PECE) Report form as an informational submittal within 24 hours of completing a weekly inspection and within 24 hours of each qualifying rain event. The WPC manager is responsible for the preparation and submittal of the PECE report. The report must identify any deficiencies that require repair, adjustment, or reapplication of materials, including:

1. Slides

2. Slipouts
3. Surface erosion
4. Damage to:
  - 4.1. Erosion control devices
  - 4.2. Water pollution control devices
5. Poor seed germination
6. Poor plant growth
7. Dead or damaged erosion control plant material
8. Misaligned features
9. Required repair work

**21-3.01D Quality Assurance**

Perform a final inspection of the permanent erosion control establishment work in the presence of the Engineer 20 to 30 days before the anticipated contract acceptance date provided by the Engineer.

**21-3.02 MATERIALS**

Not Used

**21-3.03 CONSTRUCTION**

Perform work ordered from the PECE report. This work is change order work.

**21-3.04 PAYMENT**

Not Used

**Add to section 21-4:  
21-4 BIOFILTRATION SWALES**

**21-4.01 GENERAL**

**21-4.01A Summary**

Section 21-4 includes specifications for furnishing and construction of biofiltration swales.

Work includes preparing foundation soil, furnishing and installing filter fabric, permeable material, perforated pipe, compost, cobble dissipation, watering and hydroseed materials.

**21-4.01B Submittals**

Provide the following submittals for review:

Filter fabric  
Compost  
Class 2 permeable material  
Hydroseed material  
Perforated underdrain  
Storm drain cleanout  
Cobble

**21-4.02 MATERIALS**

Compost must conform to section 21-2.02K of these technical specifications.

Filter fabric must conform to section 96-1.02B of the Caltrans Standard specifications and the technical specifications.

Class 2 permeable material must conform to section 68-2.02F(3) of the Caltrans Standard Specifications.

Perforated PVC must be ASTM D-2729, sized per plan.



## DIVISION V SURFACINGS AND PAVEMENTS

### 37 BITUMINOUS SEALS

**Add to section 37-6.02B:**

Crack treatment material must be Type 3.

Crack treatment must be hot-applied.

**Add to section 37-6.03:**

Construct the reservoir 1/2 inch wide by 1/2 inch deep.

**Replace the 2nd sentence of the 8th paragraph of section 37-6.03 with:**

Fill the crack overband not more than 3 inches wide.

^^

### 39 ASPHALT CONCRETE

**Replace section 39-2.01C(3)(c) with:**

**39-2.01C(3)(c) Prime Coat**

Apply a slow-setting asphaltic emulsion as a prime coat to AB areas designated by the Engineer and at a spread rate from 0.15 to 0.40 gal/sq yd. Do not apply more prime coat than can be absorbed completely by the AB in 24 hours.

You may modify the prime coat application rates if authorized.

Close areas receiving prime coat to traffic. Do not allow tracking the prime coat onto pavement surfaces beyond the job site.

**Replace the 2nd paragraph of section 39-2.02A(1) with:**

Produce Type A HMA using a WMA additive technology.

**Replace *Reserved* in section 39-2.02B(3) with:**

The grade of asphalt binder for Type A HMA must be PG 64-10.

For Type A HMA using RAP substitution of greater than 15 percent of the aggregate blend, the virgin binder grade must comply with the PG binder grade specified above with 6 degrees C reduction in the upper and lower temperature classification.

For Type A HMA using RAP substitution of 15 percent or less of the aggregate blend, the grade of the virgin binder must comply with the PG binder grade specified above.

**Add to section 39-2.03B(3)(a):**

The grade of asphalt binder for RHMA-G must be PG 64-16.



4. Calculations for determining the bonded length. Do not rely on any capacity from the grout-to-ground bond within the unbonded length.

**46-1.01C(2)(c) Soil Nail Shop Drawings and Calculations**

Soil nail shop drawings and calculations must include the following additional information:

1. Details and specifications for:
  - 1.1. Anchorage system
  - 1.2. Production soil nails
  - 1.3. Test soil nails
2. Drilling methods and equipment, including:
  - 2.1. Supporting calculations
  - 2.2. Assumed bond strength

**46-1.01C(3) Installation Plan**

**46-1.01C(3)(a) General**

Submit an installation plan for ground anchors and soil nails. The installation plan must include:

1. Name, address, and telephone number of the subcontractor performing the work.
2. Construction schedule and sequence of installing and grouting.
3. Encapsulation details.
4. Repair procedure for damaged sheathing.
5. Drilling methods and equipment, including:
  - 5.1. Drilled hole diameter.
  - 5.2. Equipment space requirements.
6. Grout mix design and testing procedures.
7. Grout placement equipment and procedures, including minimum required cure time.
8. Details for providing the bonded and unbonded length. If packers or other similar devices are to be used, include the type.
9. Testing equipment, including:
  - 9.1. Jacking frame and appurtenant bracing.
  - 9.2. Method and equipment for measuring movement during testing.

The installation plan must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Allow 20 days for review.

**46-1.01C(3)(b) Ground Anchor Installation Plan**

Ground anchor installation plan must include the following additional information:

1. Details and specifications for the anchorage system and ground anchors.
2. Details for the transition between the corrugated plastic sheathing and the anchorage assembly.
3. If shims are used during lock-off, shim thickness and supporting calculations.

**46-1.01C(3)(c) Soil Nail Installation Plan**

Soil nail installation plan must include the following additional information:

1. Details and specifications for:
  - 1.1. Anchorage system
  - 1.2. Production soil nails
  - 1.3. Test soil nails
2. Drilling methods and equipment, including:
  - 2.1. Supporting calculations
  - 2.2. Assumed bond strength

3. Details for isolating installed proof test soil nails during shotcrete application
4. Procedure for extracting grouted soil nails

**46-1.01C(4) Test Data**

Submit the following data for each ground anchor or soil nail test:

1. Key personnel
2. Test loading equipment
3. Anchor or nail location
4. Time and date of:
  - 4.1. Drilling
  - 4.2. Installation
  - 4.3. Grouting
  - 4.4. Testing
5. Hole diameter and depth
6. Drilling method
7. Soil or rock classification and description
8. Bonded and unbonded length
9. Quantity of groundwater encountered within the bonded length
10. Grout quantity and pressure used within the bonded length
11. Anchor end or nail head movement at each load increment or at each time increment during the load hold period
12. Digital photo logs of extracted test soil nails

Submit the test data in electronic and hard copy format within 2 business day after testing is complete. Upon completion of the wall, send an email of the soil nail test results as a tabulated spreadsheet to the Engineer and [Geotechnical.Data@dot.ca.gov](mailto:Geotechnical.Data@dot.ca.gov). Include the contract number and Department's structure number of the wall in the subject line of the email.

**Add to section 46-3.01A:**

Soil Nail wall drainage system must (1) consist of geocomposite drain, filter fabric, and plastic pipe, and (2) comply with section 68-7.

**Add to the 2nd paragraph of section 46-3.01D(2)(b)(ii)(3):**

In addition to the proof test soil nails shown, install and test 5 proof test soil nails at locations determined by the Engineer.

**Replace the 5th paragraph of section 46-3.01D(2)(b)(ii)(3) with:**

Production soil nails within the tributary width of proof test soil nails that fail to comply with the acceptance criteria, except those represented by proof test soil nails selected for supplemental testing, are rejected.

**Replace the 2nd paragraph of section 46-3.02C with:**

Solid steel bars must comply with ASTM A615/A615M, Grade 75.

**Add to section 46-3.03A:**

Expect difficult soil nail installation at Retaining Wall 1 due to the presence of the following conditions:

1. Possible unknown old buried utilities or abandoned structures, concrete rubble etc.
2. NB On-Ramp POC (Bridge 37E0126) foundations
3. Sand, gravel and soft soil conditions with potential for cave-in conditions
4. Groundwater
5. Traffic control







Bridge no.	Control zone
37-0348	Abutment 1
	Bent 2
	Abutment 3

Bridge no.	Control zone
37-6775J	Abutment 1
	Abutment 2

Bridge no.	Control zone
37-675K	Abutment 1
	Abutment 2

**Add to section 49-1.03:**

Expect difficult pile installation due to the conditions shown in the following table:

Pile location		Conditions
Bridge no.	Support location	
37-0348	Abutment 1	Dense to very dense sand
	Bent 2	Dense to very dense sand, low overhead clearance
	Abutment 3	Dense to very dense sand

Pile location		Conditions
Bridge no.	Support location	
37-0675J	Abutment 1	Dense to very dense sand
	Abutment 2	Dense to very dense sand

Pile location		Conditions
Bridge no.	Support location	
37-0675K	Abutment 1	Dense to very dense sand
	Abutment 2	Dense to very dense sand

Pile location		Conditions
Bridge no.	Support location	
37-0676	Abutments 1 and 6	Groundwater, raveling or caving soil conditions
	Bents 2, 3, 4, and 5	Groundwater, raveling or caving soil conditions

**Add to section 49-1.03:**

The abutment 1 pile of the NB 101 On-Ramp POC (Bridge No. 37-0676) must be constructed before the construction of Retaining Wall No. 1 (37E0125).

**Add to section 49-2.01A(3)(b):**

Before installing driven piles, submit a driving system submittal for each pile type for each of the support locations or control zones shown in the following table:

US 101/Blossom Hill Road Interchange Improvement  
Contract C20004

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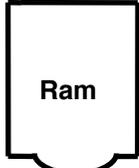
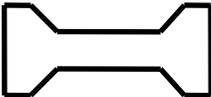
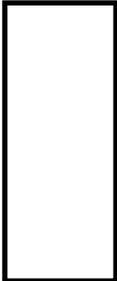
Bridge no.	Pile type	Support location or control zone
37-0348	Class 200 Alt W	Abutment 1
	Class 200 Alt W	Bent 2
	Class 200 Alt W	Abutment 3

Bridge no.	Pile type	Support location or control zone
37-0675J	18" x 0.625" Steel Pipe Pile	Abutment 1
	18" x 0.625" Steel Pipe Pile	Abutment 2

Bridge no.	Pile type	Support location or control zone
37-0675K	18" x 0.625" Steel Pipe Pile	Abutment 1
	18" x 0.625" Steel Pipe Pile	Abutment 2

CALIFORNIA DEPARTMENT OF TRANSPORTATION  
TRANSPORTATION LABORATORY  
**PILE AND DRIVING DATA FORM**

Structure Name : \_\_\_\_\_ Contract No.: \_\_\_\_\_  
 \_\_\_\_\_ Project: \_\_\_\_\_  
 Structure No.: \_\_\_\_\_ Pile Driving Contractor or  
 Dist./Co./Rte./Post Mi: \_\_\_\_\_ Subcontractor \_\_\_\_\_ (Pile Driven By)

 <b>Ram</b>	<b>Hammer</b>	Manufacturer: _____ Model: _____ Type: _____ Serial No.: _____ Min Rated Energy: _____ at _____ Length of Stroke _____ Fuel Setting _____ Max Rated Energy: _____ at _____ Length of Stroke _____ Fuel Setting _____ Ram Weight: _____ kips
 <b>Anvil</b>		Modifications: _____ _____ _____
 <b>Capblock (Hammer Cushion)</b>		Material: _____ Thickness: _____ in Area: _____ in <sup>2</sup> Modulus of Elasticity - E: _____ ksi Coefficient of Restitution - e: _____
 <b>Pile Cap</b>		[ Helmet Bonnet Anvil Block Drivehead ] Weight: _____ kips
 <b>Pile Cushion</b>		Material: _____ Thickness: _____ in Area: _____ in <sup>2</sup> Modulus of Elasticity - E: _____ ksi Coefficient of Restitution - e: _____
 <b>Pile</b>		Pile Type: _____ Length (In Leads): _____ ft Lb/ft.: _____ Taper: _____ Wall Thickness: _____ in Cross Sectional Area: _____ in <sup>2</sup> Design Pile Capacity: _____ kips Description of Splice: _____ _____ Tip Treatment Description: _____ _____

**DISTRIBUTE:**

Translab,  
Foundation Testing

Translab,  
Geotechnical Design

Resident Engineer

Note: If mandrel or follower is used to drive the pile, attach separate manufacturer's detail sheet(s) including weight and dimensions.

Submitted By: \_\_\_\_\_  
 Date: \_\_\_\_\_ Phone No.: \_\_\_\_\_

**Add to section 49-2.01C(2):**

You may use impact hammers that do not comply with the minimum energy requirements to advance piles to within 3 feet of the specified tip elevation at the locations shown in the following table:

Bridge name or no.	Abutment no.	Bent no.
37-0348		2

If you encounter obstructions to driving, provide special driving tips or heavier pile sections, subexcavate below the bottom of footing, or take other measures to prevent damage to the pile during driving.

**Replace the paragraph in section 49-2.01C(3) with:**

For Blossom Hill Road OC (Widen) (Bridge No. 37-0348), SB101 Off-Ramp PUC (Bridge No. 37-0675J) and SB101 On-Ramp PUC (Bridge No. 37-0675K), do not use drilling to attain the specified tip elevation shown for driven piles.

**Add to section 49-2.01C(3):**

Drilling through the center of open-ended steel shells or steel pipe piles to attain the specified tip elevation may be necessary. The diameter of the drilled hole must be less than the inside diameter of the pile. Equipment or methods used for drilling holes must not cause quick soil conditions or cause scouring or caving of the hole. Drilling must not be used within 10 feet of the specified tip elevation. Do not drill before driving piles.

**Add to section 49-2.01C(4):**

At existing embankments and fills, drive piles in predrilled holes at the locations and to the bottom of hole elevations shown in the following table:

Bridge name or no.	Abutment no.	Bent no.	Bottom of hole elevation
Blossom Hill Road OC (Widen) Br. No. 37-0348	1	-	205.0
Blossom Hill Road OC (Widen) Br. No. 37-0348	3	-	203.0

**Add to section 49-2.01C(5):**

If piles at Blossom Hill Road OC (Widen) (Bridge No. 37-0348 R/L), SB101 Off-Ramp PUC (Bridge No. 37-0675J) and SB101 On-Ramp PUC (Bridge No. 37-0675K) do not attain the nominal driving resistance at the specified tip elevation shown, you may allow them to stand for a set period without driving. The set period must be at least 24 hours.

After the set period has elapsed, redrive 2 piles or 10 percent of the piles in the footing, whichever is greater. The Engineer designates which piles are to be redriven. Redriving consists of operating the driving hammer at full rated energy on the pile and calculating the nominal driving resistance of the pile.

If the nominal driving resistance is attained for each pile designated to be redriven, the remaining piles in that footing are considered satisfactory and further driving is not required. If redriving the designated piles demonstrates that the nominal driving resistance has not been attained, redrive all piles in the footing until the nominal driving resistance is attained.

**Replace Reserved in section 49-3.02A(3)(a) with:**

Submit as an informational submittal the proposed drilling equipment operational capacities or descriptions for:

1. Downward force in lb
2. Torque in ft-lb
3. Rotational speed in rpm
4. Rate of penetration in ft/hr
5. Number and type of drilling cutters or drilling teeth on drilling tool

**Add to the list in the 1st paragraph of section 49-3.02A(3)(b):**

11. If permanent casing is used, the following additional requirements must be included in the pile installation plan.
  - 11.1. Method of determining concrete construction joint location inside permanent steel casing during initial concrete placement under slurry.
  - 11.2. Method of slurry removal from permanent steel casing.
  - 11.3. Methods of removing contaminated concrete near pile construction joint inside permanent steel casing, and cleaning reinforcing steel and casing.

**Add to section 49-3.02A(3):**

**49-3.02A(3)(I) Contractor Qualifications and Experience Requirements**

Two months before the start of drilled pile construction, submit a project reference list for approval verifying the successful completion by the Contractor of at least three separate foundation projects with similar ground conditions and drilled piles of diameters, depths, equal to or larger than those shown on the plans. A brief description of each project and the owner's contact person's name and phone number must be included for each project listed.

Two months before the start of drilled pile construction, submit a list identifying the on-site supervisors, and drill rig operators assigned to the project for approval. The list must contain a detailed summary of each individual's experience in pile excavation activities, and placement of assembled steel reinforcing bar cages and concrete in piles.

**Add to section 49-3.02A(4):**

**49-3.02A(4)(f) Contractor Qualifications and Experience Requirements**

The on-site supervisors must have minimum of two years experiences in supervising construction of drilled pile foundations of similar size (diameter and depth) and scope to those shown on the plans, and similar geotechnical conditions to those described in the foundation report for Bridge No. 37-0676. The work experience must be direct supervisory responsibility for the on-site pile construction activities. Project management level positions indirectly supervising on-site pile construction activities are not acceptable for this experience requirement.

Drill rig operators must have a minimum one-year experience in construction of drilled pile foundation.

**Add to section 49-3.02B(6)(c):**

The synthetic slurry must be one of the materials shown in the following table:

Material	Manufacturer
SlurryPro CDP	KB INTERNATIONAL LLC 735 BOARD ST STE 209 CHATTANOOGA TN 37402 (423) 266-6964
Super Mud	PDS CO INC 105 W SHARP ST EL DORADO AR 71731 (870) 863-5707
Shore Pac GCV	CETCO CONSTRUCTION DRILLING PRODUCTS 2870 FORBS AVE HOFFMAN ESTATES IL 60192 (800) 527-9948
Terragel or Novagel Polymer	GEO-TECH SERVICES LLC 220 N. ZAPATA HWY STE 11A-449A LAREDO TX 78043 (210) 259-6386
BIG FOOT	MATRIX CONSTRUCTION PRODUCTS 50 S MAIN ST STE 200 NAPERVILLE IL 60540 (877) 591-3137
POLY-BORE	BAROID INDUSTRIAL DRILLING PRODUCTS 3000 N SAM HOUSTON PKWY EAST HOUSTON TX 77032 (877) 379-7412

Use synthetic slurries in compliance with the manufacturer's instructions. Synthetic slurries shown in the above table may not be appropriate for a given job site.

Synthetic slurries must comply with Caltrans' requirements for synthetic slurries to be included in the above table. The requirements are available from the Offices of Structure Design, P.O. Box 168041, MS# 9-4/11G, Sacramento, CA 95816-8041.

SlurryPro CDP synthetic slurry must comply with the requirements shown in the following table:

**SlurryPro CDP**

Quality characteristic	Test method	Requirement
Density During drilling (pcf)	Mud weight (density), API RP 13B-1, section 4	≤ 67.0 <sup>a</sup>
Before final cleaning and immediately before placing concrete (pcf)		≤ 64.0 <sup>a</sup>
Viscosity During drilling (sec/qt)	Marsh funnel and cup. API RP 13B-1, section 6.2	50–120
Before final cleaning and immediately before placing concrete (sec/qt)		≤ 70
pH	Glass electrode pH meter or pH paper	6.0–11.5
Sand content, percent by volume Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 9	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

<sup>a</sup>If authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

Super Mud synthetic slurry must comply with the requirements shown in the following table:

**Super Mud**

Quality characteristic	Test method	Requirement
Density During drilling (pcf)	Mud weight (density), API RP 13B-1, section 4	≤ 64.0 <sup>a</sup>
Before final cleaning and immediately before placing concrete (pcf)		≤ 64.0 <sup>a</sup>
Viscosity During drilling (sec/qt)	Marsh funnel and cup. API RP 13B-1, section 6.2	32–60
Before final cleaning and immediately before placing concrete (sec/qt)		≤ 60
pH	Glass electrode pH meter or pH paper	8.0–10.0
Sand content, percent by volume Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 9	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

<sup>a</sup>If authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

Shore Pac GCV synthetic slurry must comply with the requirements shown in the following table:

**Shore Pac GCV**

Quality characteristic	Test method	Requirement
Density During drilling (pcf)	Mud weight (density), API RP 13B-1, section 4	≤ 64.0 <sup>a</sup>
Before final cleaning and immediately before placing concrete (pcf)		≤ 64.0 <sup>a</sup>
Viscosity During drilling (sec/qt)	Marsh funnel and cup. API RP 13B-1, section 6.2	33–74
Before final cleaning and immediately before placing concrete (sec/qt)		≤ 57
pH	Glass electrode pH meter or pH paper	8.0–11.0
Sand content, percent by volume Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 9	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

<sup>a</sup>If authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

Terragel or Novagel Polymer synthetic slurry must comply with the requirements shown in the following table:

**Terragel or Novagel Polymer**

Quality characteristic	Test method	Requirement
Density During drilling (pcf)	Mud weight (density), API RP 13B-1, section 4	≤ 67.0 <sup>a</sup>
Before final cleaning and immediately before placing concrete (pcf)		≤ 64.0 <sup>a</sup>
Viscosity During drilling (sec/qt)	Marsh funnel and cup. API RP 13B-1, section 6.2	45–104
Before final cleaning and immediately before placing concrete (sec/qt)		≤ 104
pH	Glass electrode pH meter or pH paper	6.0–11.5
Sand content, percent by volume Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 9	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

<sup>a</sup>If authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

BIG-FOOT synthetic slurry must comply with the requirements shown in the following table:

**BIG-FOOT**

Quality characteristic	Test method	Requirement
Density During drilling (pcf)	Mud weight (density), API RP 13B-1, section 4	≤ 64.0 <sup>a</sup>
Before final cleaning and immediately before placing concrete (pcf)		≤ 64.0 <sup>a</sup>
Viscosity During drilling (sec/qt)	Marsh funnel and cup. API RP 13B-1, section 6.2	30–125
Before final cleaning and immediately before placing concrete (sec/qt)		55-114
pH	Glass electrode pH meter or pH paper	8.5–10.5
Sand content, percent by volume Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 9	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

<sup>a</sup>If authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

POLY-BORE synthetic slurry must comply with the requirements shown in the following table:

**POLY-BORE**

Quality characteristic	Test method	Requirement
Density During drilling (pcf)	Mud weight (density), API RP 13B-1, section 4	62.8-65.8 <sup>a</sup>
Before final cleaning and immediately before placing concrete (pcf)		62.8-64.0 <sup>a</sup>
Viscosity During drilling (sec/qt)	Marsh funnel and cup. API RP 13B-1, section 6.2	50–80
Before final cleaning and immediately before placing concrete (sec/qt)		50-80
pH	Glass electrode pH meter or pH paper	7.0–10.0
Sand content, percent by volume Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 9	≤ 1.0

NOTE: Slurry temperature must be at least 40 °F when tested.

<sup>a</sup>If authorized, you may use slurry in a salt water environment. The allowable density of slurry in a salt water environment may be increased by 2 pcf.

**Replace the 1st paragraph of section 49-3.02C(7) with:**

Section 49-3.02C(7) applies to CIDH concrete piles if an optional construction joint is shown and you choose to construct the optional construction joint.



**Add to section 51-1.01C(1):**

If the methacrylate crack treatment is performed within 100 feet of a residence, business, or public space, submit a public safety plan that includes:

1. Public notification letter with a list of delivery and posting addresses. The letter must describe the work to be performed and state the treatment work locations, dates, and times. Deliver the letter to residences and businesses within 100 feet of overlay work and to local fire and police officials not less than 7 days before starting overlay activities. Post the letter at the job site.
2. Airborne emissions monitoring plan. A CIH certified in comprehensive practice by the American Board of Industrial Hygiene must prepare and execute the plan. The plan must have at least 4 monitoring points including the mixing point, application point, and point of nearest public contact. Monitor airborne emissions during overlay activities.
3. Action plan for protecting the public if levels of airborne emissions exceed permissible levels.
4. Copy of the CIH's certification.

After completing methacrylate crack treatment activities, submit results from monitoring production airborne emissions as an informational submittal.

**Replace the 2nd paragraph of section 51-1.01C(1) with:**

Submit a deck placement plan for concrete bridge decks. Include in the placement plan your method and equipment for ensuring that the concrete bridge deck is kept damp by misting immediately after finishing the concrete surface.

**Add to section 51-1.01C(5):**

Submit the chemical adhesive proposed for use for review and approval by the Engineer.

**Replace *Reserved* in section 51-1.01D(1) with:**

The job site must have at least 4 airborne emissions monitoring points, including the mixing point, application point, and point of nearest public contact. Monitor airborne emissions during methacrylate crack treatment activities.

**Replace the 1st paragraph of section 51-1.01D(3)(b)(i) with:**

The Engineer test roadway concrete surfaces for crack intensity.

**Replace the 2nd paragraph of section 51-1.01D(3)(b)(i) with:**

The Engineer test POC concrete deck surfaces for crack intensity.

**Replace the 1st paragraph of section 51-1.01D(3)(b)(ii) with:**

Test the surface smoothness of the following in the presence of the Engineer: Test the surface smoothness of the following:

**Delete the 2nd paragraph of section 51-1.01D(3)(b)(ii).**

**Replace the 1st paragraph of section 51-1.01D(3)(b)(iii) with:**

After deck surfaces and approach slabs have been textured, test the coefficient of friction of the concrete surfaces under California Test 342.

**Add to section 51-1.02H:**

The chemical adhesive used in the drill and bond (chemical adhesive) dowels in the Blossom Hill Rd OC (Bridge No. 37-0348) abutment fillet extensions must be suitable to resist long-term sustained tension loads and comply with the requirements of ICC-ES AC308.

**Replace Reserved in section 51-1.03A with:**

Span 1 of the NB 101 On-Ramp POC (Bridge No. 37-0676) must be constructed after the construction of Retaining Wall No. 1 (37E0125).

**Add to sections 51-1.03E(3) and 51-1.03E(5):**

Roto hammers with carbide tipped drill bits must be used to drill holes into the existing concrete, rock hammers will not be allowed.

**Replace the 2nd paragraph of section 51-1.03F(5)(a) with:**

The Contractor sets deck elevation control points for use in establishing the grade and cross section of the deck surface. The grade established by the deck elevation control points includes all camber allowances.

**Replace the 1st paragraph of section 51-1.03F(5)(b)(i) with:**

Except for bridge widening and the pedestrian overcrossing, texture the bridge deck surfaces longitudinally by grinding and grooving.

**Replace the 2nd paragraph of section 51-1.03F(6) with:**

The Contractor sets deck elevation control points for use in establishing the grade and cross section of the deck surface. The grade established by the deck elevation control points includes all camber allowances. Landing elevation control points are at the start and end of the landing.

**Add to section 51-3.02C:**

Where shown, bond elastomeric bearing pads to Portland cement concrete surfaces with epoxy adhesive that conforms to bearing pad manufacturer requirements and section 95-1.02F.

**Add to section 51-7.01B:**

Manholes and inlets for City of San Jose storm drains must conform to Section 1207 of the City of San Jose Standard Specifications dated 1992.

**Add to section 51-7.01C:**

Construction of manholes and inlets for City of San Jose storm drains must conform to Sections 1207 and 1305 of the City of San Jose Standard Specifications dated 1992.



HS threaded rods	ASTM A449, Type 1 <sup>a</sup>
HS nonheaded anchor bolts and HS anchor rods	ASTM F1554, Grade 55, Class 2A <sup>a</sup>
Nuts	ASTM A563, including appendix X1 <sup>b</sup>
Washers	ASTM F844
Hardened washers	ASTM F436, Type 1, including S1 supplementary requirements
Components of HS steel fastener assemblies for use in structural steel joints:	
HS bolts	ASTM F3125, Grade 490, Type 1 <sup>c</sup>
Tension control bolts	ASTM F3125, Grade F2280, Type 1
Nuts	ASTM A563DH, including appendix X1 <sup>b</sup>
Hardened washers	ASTM F436, Type 1, Circular, including S1 supplementary requirements
Direct tension indicators	ASTM F959, Type 490-1

<sup>a</sup>Use hardened washers.

<sup>b</sup>Zinc-coated nuts tightened beyond snug or wrench tight must be furnished with a dry lubricant complying with supplementary requirement S2 in ASTM A563.

<sup>c</sup>Grade 490 bolts and accompanying nuts and washers must not be galvanized

**Replace the 3rd table in section 55-1.02D(1) with:**

**Other Materials**

Material	Specification
Carbon steel or forgings, pins, and rollers	ASTM A668/A668M, Class D
Alloy steel for forgings	ASTM A668/A668M, Class G
Pin nuts	ASTM A709/A709M, or A563, including appendix X1 <sup>a</sup>
Carbon-steel castings	ASTM A27/A27M, Grade 65-35, Class 1
Malleable iron castings	ASTM A47/A47M, Grade 32510
Gray iron castings	ASTM A48, Class 30B
Carbon steel structural tubing	ASTM A1085
Steel pipe <sup>b</sup>	ASTM A53, Type E or S, Grade B; ASTM A106, Grade B; or ASTM A139, Grade B
Stud connectors	ASTM A108

<sup>a</sup>Zinc-coated nuts tightened beyond snug or wrench tight must be furnished with a dry lubricant complying with supplementary requirement S2 in ASTM A563.

<sup>b</sup>Hydrostatic testing will not apply.

**Add to section 55-1.02D(2):**

Steel for fracture critical members for bridge no. 37-0676 must:

1. Comply with CVN impact requirements for Zone 2, welding, and welding inspection in "AASHTO/AWS Fracture Control Plan (FCP) for Non-Redundant Members" of AWS D1.5. For the purposes of determining preheat and interpass temperatures and weld metal requirements, use the values for ASTM A709/A709M Grade 50.
2. Be produced by a fabricator certified under *AISC Certification Program for Steel Bridge Fabricators, Intermediate Bridges with Fracture-Critical Members*.

Steel for structural tubing members shown as fracture critical or main tension members must comply with the CVN testing requirements in ASTM A1085. Welding details for cyclically loaded tubular members specified in AWS D1.1 must be used.

**Add to section 55-1.02E(7)(a):**

Studs and stud welding must conform to AWS D1.1, AWS D1.5, and AWS C5.4. If conflicts occur between these codes, the most restrictive requirement must apply.

**Replace Reserved in section 55-1.02E(7)(b) with:**

For welds subject to computed stresses, backing for welds that is left in place in the completed structure must be (1) a single length and (2) the same material as the structural steel being welded.

Single length backing may be either a continuous strip or multiple lengths joined by complete joint penetration butt welds before being installed as backing.

Butt welds in backing material are subject to the same type and frequency of testing as specified for the type of joint in the material being joined. Grind butt welds in backing material flush as necessary to obtain proper inspection and fit-up in the welded joint where backing is used.

**Replace Reserved in section 55-1.02E(7)(c) with:**

All welds must be qualified using AWS D1.1, Clause 4, Part B. Accordingly, weld qualification designations must be shown in the structural steel shop drawings for each weld and the corresponding NDT requirements must be shown in the shop drawings. For the purposes of determining preheat and interpass temperatures, the values for AASHTO M 270M/M 270 or ASTM A709 Grade 50 must be used.

**Add to section 55-1.03C(3):**

Where shown, bond elastomeric bearing pads to sole plate surfaces with epoxy adhesive that conforms to bearing pad manufacturer requirements and section 95-1.02F.

**Replace section 55-2 with:**

**55-2 METAL DECKING**

**55-2.01 GENERAL**

**55-2.01A Summary**

Section 52-2 includes specifications for the metal decking on the NB 101 On-Ramp Pedestrian OC truss. (Bridge No. 37-0676).

**55-2.01B Submittals**

Submit shop drawings for metal decking. Include in the submittal:

1. Layout plan
2. Grade of steel
3. Physical and section properties of members
4. Method of support and grade adjustment
5. Methods of sealing against concrete leaks

Allow 30 days for the review of the shop drawings.

**55-2.02 MATERIALS**

Metal decking must be formed of steel sheet complying with ASTM A653/A653M, Designation SS, Grades 50 through 80, coating designation G90.









## 80 FENCES

Replace *medium or dark green* in the 1st paragraph of section 80-3.02C with:  
AMS-STD 34062

Replace *Class A coating* in the 1st paragraph of section 80-3.02C with:  
Class B coating

Replace section 80-5 with:

### 80-5 TUBULAR STEEL FENCE

#### 80-5.01 GENERAL

Tubular steel fence shall consist of fabricating, furnishing, and constructing the tubular steel fence in accordance with the details shown on the plans, and the requirements in these special provisions.

#### 80-5.02 MATERIALS

Tubular steel fence shall conform to the provisions in Section 51, "Concrete Structures," Section 52, "Reinforcement," Section 55-3, "Fabrication," Section 73, "Concrete Curbs and Sidewalks," Section 75, "Miscellaneous Metal," and Section 90-10, "Minor Concrete," of the Standard Specification and these special provisions.

#### Powder Coating Tubular Steel Fence

Tubular steel fence shall receive a powder coat finish as specified in these special provisions.

All exposed metal surfaces shall be cleaned and prepared in accordance with the instructions of the powder coating manufacturer.

All cleaned surfaces shall receive a single powder coating consisting of dry polyester powder electrostatically applied to the surface and baked to form a smooth, uniform, durable surface. Each shipment of powder coating material shall be accompanied by a Certificate of Compliance as provided in Section 6-1.07. "Certificates of Compliance," of the Standard Specifications.

Manufacturer's descriptive data shall include complete description, performance data and installation instructions for the materials.

The powder shall conform to the following requirements:

	ASTM Designation	Specification Limits
Adhesive to Galvanized Surface	D 3359B	Minimum, 4B
Pencil Hardness	D 3363	H-2H
Flexibility	D 522	Pass, 1/8 inch mandrel
Impact Resistance	D 2794	Pass, 80 Lb-in
Color Stability	G 155, Table X3.1, Cycle 1	2200 hours, C.I.E. L*a*b System Color Tolerance: $\Delta E^*_{ab} < 5$ . No change in 60 degree gloss value.

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Salt spray resistance	B117 and D1654	1500 hours, rating of 8 or greater.
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The color of the powder coating shall match AMS-STD 37031. The total dry film thickness of the powder coating shall not be less than 0.003 inch.

Three samples, 8 inch x 8 inch, with finish color, shall be furnished to the Engineer at the Contractor's expense. The samples shall be fabricated by the Contractor and tested at the Contractor's expense in the presence of the Engineer, unless otherwise directed. A copy of the test results shall be furnished to the Engineer within 15 days following sample fabrication and within sufficient time to allow for review by the Engineer and correction by the Contractor of any deficiencies without delaying completion of the work. The samples shall be used to verify compliance of the powder coating requirements listed herein.

Should the results of any of the tests on the samples fail to comply with these specifications, the powder coating material shall be rejected in accordance with the provisions in Section 6-1.04, "Defective Materials," of the Standard Specifications.

### **80-5.03 CONSTRUCTION**

Not Used.

### **80-5.04 MEASUREMENT AND PAYMENT**

The contract price paid per linear foot for tubular steel security fence and per each for 8' gate (tubular steel security) shall include full compensation for furnishing all labor, materials (including concrete, miscellaneous metal, cleaning and painting), tools, equipment, and incidentals, and for doing all work involved in tubular steel fence and gates, complete in place, including subgrade preparation, and powder coating as shown on the plans, as specified in the Standard Specifications and these special provisions, and as directed by the Engineer.

**Replace section 80-6 with:**

## **80-6 VISUAL SCREEN PANELS**

### **80-6.01 GENERAL**

This section includes specifications for furnishing and constructing visual screen panels, including the following:

1. Polycarbonate plastic glazing
2. Enhanced UV-resistant polycarbonate plastic glazing.
3. Laminated polycarbonate plastic glazing.
4. Steel frames, fasteners and hardware.

#### **80-6.01A References**

1. ANSI Z 97.1 - American National Standard for Glazing Materials Used in Buildings -- Safety Performance Specifications and Methods of Test.
2. ASTM D 256 - Standard Test Method for Determining the Pendulum Impact Resistance of Notched Specimens of Plastics.
3. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.
4. ASTM D 790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

5. ASTM D 1929 - Standard Test Method for Ignition Properties of Plastics.
6. ASTM D 635 – Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
7. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials
8. CAN/ULC 102.2 – Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

#### 80-6.01B Submittals

1. General: Submit the following:
  - A. Product Data: Submit manufacturer's product data; including product description, fabrication information, and compliance with specified performance requirements.
  - B. Submit shop drawings with supporting calculations for Engineer's review for the visual screen panels at the following locations:
    - a. NB Route 101 On-Ramp POC (Bridge No. 37-0676)
    - b. Retaining Wall No. 2 (37E0126)

Shop drawings must include the complete details, materials information and design parameters. Design the visual screen panels to meet the requirements of the AASHTO LRFD Bridge Design Specifications Edition and California Amendments, preface dated January 2014, supplemented by LRFD Guide Specifications for the Design of Pedestrian bridges dated December 2009 with 2015 Interim Revisions. Wind load used in the design must not be less than 32 psf.

Visual screen panel shop drawings and calculations must be sealed and signed by an Engineer who is registered as a Civil Engineer in the State.

- C. Submit product test reports from a qualified independent 3<sup>rd</sup> party testing agency indication each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.
  - a. Test reports required are:
    - i. Rate of Burning (ASTM D 635)
    - ii. Self-Ignition Temperature (ASTM D 1929)
    - iii. Flame Spread and Smoke Developed (ASTM E 84)
    - iv. Impact Strength (ASTM D 3763)
    - v. Safety Glazing and Impact Strength (ANSI Z97.1-2004)
- D. Samples for Initial Selection:
  - a. Submit minimum 12-inch by 12-inch samples. Indicate full color.
- E. Samples for Verification:
  - a. Submit minimum 24-inch by 24-inch sample for each type and color of solid plastic fabrication.
- F. Mockups:

- a. Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.
  - b. Build one full-size visual screen panel mockup with frame and embedded graphic.
  - c. Approved mockups may become part of the completed work if undistributed at time of Substantial Completion.
- G. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.

#### 80-6.01C Quality Assurance

##### 1. Manufacturer's Qualifications

- a. Materials and systems shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least five (5) consecutive years and which can show evidence of those materials being satisfactory used on at least three (3) projects of similar size, scope and location.
- b. Manufacturer must have documented training and qualification program for fabrication and installation of plastic fabrications.

#### 80-6.01D Delivery, Storage and Handling

1. Deliver visual screen panels, frame systems and specified items in manufacturer's standard protective masking.
2. Store materials in a flat orientation in a dry place that is not exposed to exterior elements.
3. Handle materials to prevent damage to finished surfaces.
4. Before installing visual screen panels, permit them to reach room temperature.
5. Do not deliver visual screen panels, frame systems, components and accessories to Project site until areas are ready for installation.

#### 80-6.01E Warranty

1. Manufacturer's Special Warranty: Manufacturer's standard form agreeing to repair or replace units that fail in material or workmanship within the specified warranty period.
2. Warranty Period: 5 years from ship date.
3. The warranty shall not deprive the owner of other rights or remedies the Owner may have under provisions of the Contract, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract.

### **80-6.02 MATERIALS**

#### 80-6.02A Manufacturer

1. Manufacturer: 3form, Inc., Salt Lake City, Utah, USA / telephone 801-649-2500, or approved equal

#### 80-6.02B Materials

1. Koda XT produced from polycarbonate sheet, or approved equal

- a. Engineered polycarbonate resin
  - b. Sheet Size: Maximum 4'x10'
  - c. Thickness: Minimum ¼"
  - d. Basis of Design Product: The design of Plastic Fabrications is based on Koda XT as provided by 3form, Inc. Products from other manufacturers must be approved by the Engineer.
2. Sheet Minimum Performance Attributes:
- a. Rate of Burning (ASTM D 635). Material must attain CC1Rating for a nominal thickness of 1.5 mm (0.060 in.) and greater.
  - b. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-Ignition Temperature greater than 650°F.
  - c. Flame Spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class B (Flame spread less than 75 and smoke less than 450) at thickness of ½".
  - d. Impact Strength. Minimum impact strength test as measured by ASTM D 3763 of 20 ft. lbs. (for durability, shipping, installation, and use).
  - e. Safety Glazing. Material must attain a Class A impact rating in accordance with ANSI Z97.1-2004.
3. Interlayer Materials:
- a. C3 Color: Play with 50,000 options in the core color palette. Combine colors up to three layers deep to control the hue, intensity and translucency, creating an exciting range of exact color specifications.
  - b. HighRes: Translucent high resolution imagery.
4. Frames and Metal Accessories:
- a. Frames and other metal accessories must comply with Section 55-1.02 of the Standard Specifications.
  - b. Painting of frames must comply with Section 59-2 of the Standard Specifications.

#### 80-6.02C Fabrication

1. General: Fabricate visual screen panels, including frames, to designs, sizes and thicknesses indicated and to comply with indicated standards. Sizes, profiles and other characteristics are indicated on the drawings.
2. Comply with manufacturer's written recommendations for fabrication.
3. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
  - a. Sawing: Select equipment and blades suitable for type of cut required.
  - b. Drilling: Drills specifically designed for use with plastic products.
  - c. Milling: Climb cut where possible.
  - d. Routing
  - e. Tapping

#### 80-6.02D Accessories

1. Gaskets shall be as per manufacturer's standards to meet performance criteria.
2. Fasteners shall be per manufacturer's standards to meet performance requirements.

#### 80-6.02E Miscellaneous Materials

3. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.



Submit shop drawings for the chain link railing visual screen, including:

1. Railing and post layout
2. Details for venting and pick up holes
3. Complete details of the chain link railing visual screen (Reference also section 80-6)

**Replace Reserved in section 83-2.01B with:**

**83-2.01B(1) General**

**83-2.01B(1)(a) Summary**

Section 83-2.01B includes specifications for constructing vegetation control around railing and barrier posts.

Constructing minor concrete vegetation control includes clearing and excavation.

**83-2.01B(1)(b) Definitions**

Not Used

**83-2.01B(1)(c) Submittals**

Submit a mix design for the minor concrete to be used for vegetation control. The mix design must show proportions of:

1. Coarse aggregate
2. Fine aggregate
3. Cementitious material
4. Reinforcing fiber
5. Water

Include compressive strength test results with the mix design.

Submit a certificate of compliance for the crumb rubber aggregate, if used. Include the quantity in pounds of crumb rubber.

**83-2.01B(1)(d) Quality Assurance**

Not Used

**83-2.01B(2) Materials**

**83-2.01B(2)(a) General**

Not Used

**83-2.01B(2)(b) Minor Concrete**

**83-2.01B(2)(b)(i) General**

Concrete for vegetation control must comply with the specifications for minor concrete, except the concrete:

1. Must include reinforcing fibers
2. May include crumb rubber aggregate
3. Must contain:
  - 3.1. At least 505 pounds of cementitious material per cubic yard, if crumb rubber aggregate is used
  - 3.2. At least 400 pounds of cementitious material per cubic yard, if crumb rubber aggregate is not used
4. Must have a maximum aggregate size of 3/8 inch

All ingredients must be added at the concrete plant before delivery to the job site.

You may use volumetric proportioning complying with ASTM C685/C685M or as specified.

The minor concrete must have a 28-day compressive strength from 1,400 to 2,500 psi.

**83-2.01B(2)(b)(ii) Crumb Rubber Aggregate**

Crumb rubber aggregate must consist of ground or granulated scrap tire rubber from automobile and truck tires. Do not use tire buffings.

Crumb rubber aggregate must be ground and granulated at ambient temperature.

The crumb rubber aggregate gradation must comply with the requirements shown in the following table:

Sieve size	Percentage passing
1/2"	100
3/8"	90–100
1/4"	35–45
No. 4	5–15
No. 8	0–5
No. 16	0

Crumb rubber aggregate must not contain more than 0.01 percent of wire by mass and must be free of oils and volatile organic compounds.

Do not commingle crumb rubber from different sources.

The crumb rubber aggregate must be  $3.5 \pm 0.5$  percent by weight of the concrete.

**83-2.01B(2)(b)(iii) Reinforcing Fibers**

Reinforcing fibers for minor concrete must be:

1. Manufactured specifically for use as concrete reinforcement from one of the following:
  - 1.1. Polypropylene, polyethylene, or a combination of both.
  - 1.2. Copolymer of polypropylene and polyethylene.
2. Blended ratio from 4 to 5.67 parts by weight of macro synthetic fibers to 1 part by weight of micro synthetic fibers. Synthetic fibers must be:
  - 2.1. Nonfibrillated macro fibers with individual fiber lengths less than  $2 \pm 1/2$  inches.
  - 2.2. Fibrillated or monofilament micro fibers of various lengths and thicknesses.
3. Supplied in sealed, degradable bags of appropriate size for adding whole bags to concrete batches.
4. From a commercial source.

The reinforcing fiber content of the minor concrete must be from 5 to 6 lb/cu yd.

**83-2.01B(2)(b)(iv) Coloring Agent**

Not Used

**83-2.01B(2)(c) Block-Out Material**

The block-out material must be a commercially available expanded polystyrene foam with a compressive strength of  $13 \pm 5$  psi at 10 percent deformation when tested under ASTM D1621.

If authorized, you may substitute an alternative block-out material that complies with the compressive strength requirements of the expanded polystyrene foam.

**83-2.01B(2)(d) Backfill Material**

Backfill material must be Class 2 aggregate base complying with section 26.

**83-2.01B(3) Construction**

**83-2.01B(3)(a) General**

Not Used

**83-2.01B(3)(b) Clearing**

Clear areas to receive vegetation control of vegetation, trash, and debris. Dispose of the removed material.

**83-2.01B(3)(c) Earthwork**

Excavate or backfill areas to receive vegetation control.

If the vegetation control abuts the existing surfacing and the edge of the existing surfacing is not on a neat line, cut the surfacing on a neat line to a minimum depth of 2 inches before removing the surfacing.

Perform grading so that the finished elevation of the vegetation control maintains the existing or planned flow lines, slope gradients, contours, and existing surfacing.

Grade the areas to receive vegetation control to a smooth, uniform surface and compact to a relative compaction of at least 90 percent.

**83-2.01B(3)(d) Block Outs**

For block-out material supplied in more than 1 piece, tape the pieces together to make a smooth surface on the top and sides.

Ensure that the block-out material does not move during concrete placement.

**83-2.01B(3)(e) Forming**

Forming must comply with section 73-1.03C.

Leave forms in place for at least 12 hours after surface finishing.

**83-2.01B(3)(f) Minor Concrete**

Strike off and compact the minor concrete until a layer of mortar is brought to the surface. Match the finished grade to the adjacent section of vegetation control, pavement, shoulder, or existing grade.

Construct contraction joints by scoring concrete with a grooving tool and rounding corners with an edger tool.

If the curing compound method is used for colored concrete, use curing compound no. 6.

**83-2.01B(3)(g) Backfill Material**

Backfill material required for vegetation control under existing guardrail or barrier is change order work. Excavate or backfill areas to receive vegetation control.

**83-2.01B(4) Payment**

Not Used

**Replace *Reserved* in section 83-2.02C(3) with:**

The offset from the face of the Type WB-31 transition railing to the hinge point must be at least 3'-6".

The offset from the face of the adjacent midwest guardrail system to the hinge point must be transitioned from the offset at the Type WB-31 transition railing to 4'-0" using a ratio of 6:1.

**Replace section 83-2.04B with:**

**83-2.04B Alternative In-line Terminal Systems**

**83-2.04B(1) General**

**83-2.04B(1)(a) Summary**

Section 83-2.04B includes specifications for constructing alternative in-line terminal systems.

**83-2.04B(1)(b) Definitions**

Not Used

**83-2.04B(1)(c) Submittals**

Submit a certificate of compliance for alternative in-line terminal systems.

**83-2.04B(1)(d) Quality Assurance**

For each model of alternative in-line terminal system being installed, obtain the manufacturer's check list for the assembly and installation of the alternative in-line terminal systems from the manufacturer's representative or distributor. Notify the Engineer of the alternative in-line terminal systems to be installed at each location before starting installation activities. Complete, sign, and date the check list for each installed in-line terminal system and submit a copy of the completed and signed check list for each installed location, and include the following:

1. Contract number
2. Name of installation Contractor
3. Flare offset used in layout
4. Date of installation
5. Location on the project by post mile, and by station if stationing shown on plans
6. Name and signature of individual completing the checklist.

The Engineer signs and dates the completed check lists, verifying the in-line terminal system at each location was assembled and installed under the manufacturer's instructions and as described.

Use personnel trained by the manufacturer to install in-line terminal systems. A record of training provided by the manufacturer may be requested by the Engineer at any time.

**83-2.04B(2) Materials**

Alternative in-line terminal systems must be one of the following or a Caltrans-authorized equal:

1. Type SoftStop terminal systems must be SoftStop End Terminal System manufactured by Trinity Highway Products, LLC, and must include the connection components. Type SoftStop terminal system - Type SoftStop terminal system must be a SoftStop terminal with a System length of 50'-9 1/2" for test level 3, manufactured by Trinity Highway Products, LLC, and must include items detailed for SoftStop terminal system, as shown. The SoftStop terminal can be obtained from the manufacturer:

Address	Telephone no.
TRINITY HIGHWAY PRODUCTS LLC PO BOX 99 CENTERVILLE UT 84012	(800) 772-7976

2. Type MSKT - Type MSKT terminal system must be a 31" MSKT Guard Rail End Terminal with a system length of 50'-0" as manufactured by Road Systems, Inc., located in Big Spring, Texas, and must include items detailed for Type MSKT terminal system shown on the plans. The MSKT Guard Rail End Terminal can be obtained from the distributor:

Address	Telephone no.
UNIVERSAL INDUSTRIAL SALES PO BOX 699 PLEASANT GROVE UT 84062	(801) 785-0505
GREGORY INDUSTRIES INC 4100 13TH ST SW CANTON OH 44708	(330) 477-4800

3. Type MAX-Tension Tangent Guardrail End Treatment by Barrier Systems, Inc. is a tangent, re-directive gating guardrail terminal. The MAX-Tension has a length of 55'-1/2", and can be flared for an offset of 0 to 2 feet at the head. The MAX-Tension terminal can be obtained from the distributor:

Address	Telephone no.
STATEWIDE SAFETY AND SIGNS INC 130 GROBRIC COURT FAIRFIELD CA 94533	(800) 770-2644

**83-2.04B(3) Construction**

Identify each terminal system by painting the type of terminal system in 2-inch-high, neat, black letters and figures on the backside of the rail element between system posts number 4 and 5. Paint must be metallic acrylic resin type spray paint. Before applying terminal system identification, the surface to receive terminal system identification must be free of all dirt, grease, oil, salt, or other contaminants by washing the surface with detergent or other suitable cleaner. Rinse thoroughly with fresh water and allow to fully dry.

Install Type SoftStop terminal system under the manufacturer's installation instructions. For Type SoftStop terminal system, use W6 x 8.5 steel yielding terminal posts for Posts 1 and 2 and standard W6 x 8.5 steel posts for the other posts. Drive all posts or place them in drilled holes. Backfill the space around the posts with selected earth that is free of rock. Moisten and thoroughly compact each layer. For the terminal with a system length of 50'-9 1/2" or system length of 38'-3 1/2", all blocks must be wood or plastic and must be 8 or 12 inches deep.

For Type MSKT terminal system, install a W6x15 at lower section Post 1 with a soil plate attached and a 6 by 6 by 1/8 inches tube section at upper section Post 1. Install a W6x9 or W6x8.5 post assembly top and post assembly bottom at Post 2. Install W6x9 or W6x8.5 at Posts 3 through 8. Attach a 9'-4 1/2" W-beam MGS rail section to Post 3. Use 8-inch blocks. The posts must be, at your option, driven with or without pilot holes, or placed in drilled holes. Do not pound on the side plates when installing lower post #1 and lower post #2. Space around the posts must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted.

Install Type MAX-Tension terminal system under the manufacturer's installation instructions. Use 8- or 12-inch wood or composite blocks. Install W6x8.5 or W6x9 at post positions after Post 1. Backfill the space around the posts with selected earth that is free of rock. The posts must be, at your option, driven with or without pilot holes, or placed in drilled holes. Space around the posts must be backfilled with selected earth, free of rock, placed in layers approximately 4 inches thick and each layer must be moistened and thoroughly compacted.

**83-2.04B(4) Payment**

Not Used

**Replace the 12th paragraph of section 83-2.06B with:**

Chain link fabric must be 9 gauge and must comply with AASHTO M 181, Type IV, Class B. The color of the vinyl coating must be AMS-STD-34062.

**Add to section 83-2.06B:**

All components of the railing, including structural shapes, tubing, plates, bars, bolts, tension wires and hardware must be painted to match the color of the vinyl-coated chain link fabric. Painting must comply with Section 59-2 Painting Structural Steel of the Standard Specifications.



## 84 MARKINGS

### Add to section 84-2.02A:

Thermoplastic for green bike lane must be composed of material impervious to degradation by motor fuels, lubricants, etc., in conjunction with aggregates, pigments, binders, and anti-skid/anti-slip elements uniformly distributed throughout the material. The thermoplastic material shall conform to AASHTO designation M249, with the exception of the relevant differences due to the material being non-reflective, and being of a color different from white or yellow.

1. The material shall be a resilient thermoplastic product containing intermix of anti-skid/anti-slip elements and where the top surface contains anti-skid/anti-slip elements. These anti-skid/anti-slip elements must have a minimum hardness of 8 (Mohs scale).
2. The material shall be resistant to the detrimental effects of motor fuels, antifreeze, lubricants, hydraulic fluids, etc.
3. The material shall be capable of being applied on bituminous and/or Portland cement concrete pavements.
4. The material shall be capable of conforming to pavement contours, breaks and faults through the action of traffic at normal pavement temperatures.
5. Pigment: The color of the pavement marking material shall be accordance with FHWA Memorandum dated April 15, 2011: Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14). The final shade will be determined and approved by the Engineer.

- a. Daytime chromaticity coordinates for the color used for green colored pavement shall be as follows:

1		2		3		4	
X	y	X	y	x	y	x	y
0.230	0.754	0.266	0.500	0.367	0.500	0.444	0.555

- b. Nighttime chromaticity coordinates for the color used for green colored pavement shall be as follows:

1		2		3		4	
X	y	X	y	x	y	x	y
0.230	0.754	0.336	0.540	0.450	0.500	0.479	0.520

- c. The pigment system shall not contain heavy metals or any carcinogen, as defined in 29 CFR 1910.1200 in amounts exceeding permissible limits as specified in relevant Federal Regulations.
6. Skid Resistance: The surface of the thermoplastic material shall contain factory applied anti-skid elements with a minimum hardness of 8 (Mohs scale). Upon application the material shall provide a minimum skid resistance value of 55 BPN when tested according to ASTM E 303.
7. Slip Resistance: The surface of the thermoplastic material shall contain anti-skid elements with a minimum hardness of 8 (Mohs scale). Upon application the material shall provide a minimum static coefficient of friction of 0.6 when tested according to ASTM C 1028 (wet and dry), and a minimum static coefficient of friction of 0.6 when tested according to ASTM D 2047.



**Replace the 1st sentence in the 1st paragraph of section 86-1.02F(3)(d)(v) with:**

Signal interconnect cable must be a 25-pair type with stranded, tinned, copper no. 22 conductors.

**Replace the 1st sentence in the 15th paragraph of section 86-1.02P(2) with:**

The interior of the enclosure must accept cable-in/cable-out circuit breakers. The circuit breakers must be mounted on nonenergized clips and vertically with the up position of the handle being the *ON* position.

**Replace section 86-1.02Q(3) with:**

**86-1.02Q(3) Controller Cabinets**

**86-1.02Q(3)(a) General**

The traffic signal controller cabinet must be a Model 332L. The ramp metering controller cabinet must be a Model 334L, comply with TEES, and be on the Authorized Material List for traffic signal control equipment. The cabinet must have 3 drawer shelves. Each shelf must be attached to the tops of 2 supporting angles with 4 screws.

The cabinet components include:

1. Multiple AC outlet strip
2. RJ-11 modular jack
3. RJ-45 modular jack
4. DC terminal block

**86-1.02Q(3)(b) Multiple AC Outlet Strip**

The multiple AC outlet strip must:

1. Be 19 inch, rack mountable
2. Have a minimum of 6 receptacle outlets
3. Be rated for 15 A, 125 V(ac)
4. Have internal 12 A, 125 V(ac) circuit breaker
5. Be rated for 36,000 A surge current protection from Hot to Neutral
6. Have an UL 1449 rating for a minimum 400 V
7. Have a minimum 6-foot-long cord

**86-1.02Q(3)(c) RJ-11 Modular Jack**

The RJ-11 modular jack must:

1. Be DIN rail mounting
2. Have 6 interface positions
3. Be rated for 120 V and 1 A
4. Have dimensions of 2 inches (D) by 1.5 inches (W) by 3.25 inches (H)
5. Have a screw clamp connection

**86-1.02Q(3)(d) RJ-45 Modular Jack**

The RJ-45 modular jack must:

1. Be DIN rail mounting
2. Have 8 interface positions
3. Be rated for 120 V and 1 A
4. Have dimensions of 2 inches (D) by 1.5 inches (W) by 3.25 inches (H)
5. Have a screw clamp connection



**Replace the 1st paragraph of section 87-1.03F(2)(c)(ii) with:**

Install Type A and Type D loop detector lead-in cables in conduit at intersection approaches and Type E and Type F loop detector lead-in cables in conduit at on-ramps.

**Delete the 3rd paragraph of section 87-1.03G.**

**Replace the 2nd paragraph of section 87-1.03H(2) with:**

Use either (1) Self-fusing, oil and flame-resistant, synthetic rubber or (2) Pressure-sensitive, adhesive, polyvinyl chloride, 0.007-inch minimum thickness to insulate a splice.

**Add to the end of section 87-1.03T:**

A manufacturer's representative must program the accessible pedestrian signals at the following intersections:

1. Intersection of NB Route 101 Off-Ramp/Coyote Road and Blossom Hill Road
2. Intersection of Monterey Road and Blossom Hill Road (North)

**Add between the 1st and 2nd sentences in the 2nd paragraph of section 87-1.03V(2):**

Saw the slots to allow a minimum of 2 inches of sealant above the top of the uppermost loop wire in the slot.

**Replace the 1st paragraph of the RSS for section 87-4.03B with:**

Install the battery backup system cabinet on the right side of the Model 332L cabinet.

**Add to the end of section 87-21.03C:**

Modifying a lighting system includes removing, adjusting, or adding:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Luminaires
7. Service equipment enclosure
8. Photoelectric control
9. Fuse splice connectors
10. High mast lighting assemblies

Modifying a signal and lighting system includes removing, adjusting, or adding:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Cables

6. Standards
7. Signal heads
8. Internally illuminated street name signs
9. Service equipment enclosure
10. Department-furnished controller assembly
11. Detectors
12. Telephone demarcation cabinet
13. Accessible pedestrian signals
14. Push button assemblies
15. Pedestrian signal heads
16. Luminaires
17. Photoelectric control
18. Fuse splice connectors
19. Battery backup system
20. Flashing beacons
21. Flashing beacon control assembly

Modifying a ramp metering system includes removing, adjusting, or adding:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Signal heads
7. Service equipment enclosure
8. Department-furnished controller assembly
9. Detectors
10. Telephone demarcation cabinet

Modifying interconnection conduit and cable includes removing, adjusting, or adding:

1. Pull boxes
2. Conduit
3. Signal interconnect cables

**Add to the end of section 87-21.03D:**

Removing a lighting system includes removing:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Standards
6. Luminaires
7. High mast lighting assemblies

Removing a signal and lighting system includes removing:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Cables
6. Standards





# **City of San Jose Standard Specifications for Signals, Lighting and Electrical Systems and Interior Lining of Sanitary Sewer Manhole**

**SECTION 86**  
**Signals, Lighting and Electrical Systems**

**86-1.01A General**

Signals, lighting and electrical work shall conform to the provisions of Section 86, "Signals, Lighting and Electrical Systems," of the Standard Specifications and these Special Provisions.

Signal, lighting and electrical work is to be performed at the following location(s):

*Blossom Hill Road and Monterey Road  
Bike and Pedestrian Path running parallel to Blossom Hill Road between Monterey Road  
and Coyote Road (excluding surface mounted fixtures on US-101 southbound ramp bridge  
structure)*

**86-1.03A Equipment List and Drawings**

Equipment list and drawings shall conform to the provisions of Section 86-1.03, "Equipment List and Drawings," of the Standard Specifications and these Special Provisions.

*Payment for compliance with this section shall be deemed included in the various other items of work, and no additional compensation shall be allowed.*

**86-1.05A Maintaining Existing and Temporary Electrical Systems**

Maintaining existing and temporary electrical systems shall conform to the provisions of Section 86-1.05, "Maintaining Existing and Temporary Electrical Systems," of the Standard Specifications.

Where facilities are to remain open to the public use, existing electrical systems including traffic signals, traffic signal vehicle and pedestrian detection facilities, traffic signal communication and monitoring facilities, street lighting facilities, flashing beacons and sign illumination facilities, or approved temporary replacement thereof, shall be kept in effective operation for the benefit of the public during the progress of the work, except when shutdown is permitted to allow for alterations or final removal of the systems. Traffic signal shutdowns shall be limited to periods during normal working hours, or as specified in these Special Provisions. Street lighting systems shutdown shall not interfere with the regular lighting schedule, unless otherwise permitted by the Engineer.

Working drawing for temporary electrical systems necessary to complete the work and maintain existing electrical systems and their function shall be submitted for review. Working drawing shall show all materials, the layout and details necessary to understand the scheme of the drawing. The working drawing shall include description and location of materials used. Materials shall include poles, conductors, conduits, pull boxes, luminaires, traffic heads and any other materials needed to build the temporary electrical system.

Temporary electrical systems shall be built as per all the requirement for a permanent electrical installation. Materials to be used will be the same as for the permanent installation and should have been previously reviewed and allowed to be used by the Engineer. If there are materials to be used that has not been reviewed, provide material submittals for review prior to installation.

The engineer's review of the working drawings of the temporary electrical systems shall not relieve the contractor of any responsibility to conform to the City's requirements.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

### **86-2.03A Foundations**

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

Traffic Signal pole foundations shall conform to the provisions of 2018 Caltrans Standard Specification Section 56-3.01C(2) "Foundations." Concrete shall have a minimum 28-day compressive strength of 3,600 psi.

If the plans call out for a foundation to be removed, the foundation, including anchor bolts, and conduits shall be removed in its entirety. The resulting hole shall be backfilled with Controlled Density Fill (CDF). CDF shall conform to Sections 1301-2.3 and 1301-4.2.7, "Controlled Density Fill" of the Standard Specifications and these Special Provisions.

CDF shall contain a non-calcium chemical accelerating admixture of at least 2% to decrease curing time. The slump of CDF mixture shall be 5 to 8 inches. CDF shall be allowed to cure for at least 24 hours prior to placing sidewalk over it as required.

The Contractor is responsible for protecting and supporting adjacent poles, foundations and utilities during installation, removal and backfill of foundations. Size and shape of existing foundation(s) are approximate. No additional payment will be made for removal of oversized or unusual foundations.

*Payment for backfill, removal and restoration of surface improvements, installation and removal of foundations shall be deemed included in other items of work in the contract and no separate payment will be made therefor.*

### **86-2.04C Standards, Steel Pedestals and Posts**

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

Existing standards which are modified, relocated, repaired or upon which equipment is altered by the Contractor shall be modified, repaired, and rewired as necessary to meet current electric code.

This item of work shall include storing all materials and for furnishing all materials, tools, labor, and equipment necessary for installation of the light standard, mast arm, conductors (internal to the light standard), fused splice connector, foundation, extended foundation cap, bonding and grounding including the grounding electrode, traffic control, painting and required numbering. Standards, steel pedestals and posts shall be measured per each unit by type of standard (luminaire not included), installed in place, completed and accepted as satisfactory. Standards, steel pedestals and posts connected to existing services shall be deemed completed after functional testing.

Existing signal and streetlight poles having a painted finish which are modified, relocated, repaired or upon which is performed shall be repainted in accordance with Section 91, "Paint," of the Standard Specifications.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

### **86-2.05.1 Conduit**

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

Conduits to be installed underground shall be Schedule 40 polyvinyl chloride conduit. Unless otherwise specified, the same type of conduit shall be used for the entire system.

Conduit runs for communications, street lighting, and traffic signals shall be installed either parallel to or perpendicular to the curb, unless otherwise approved by the Engineer prior to placement. Conduit at an oblique angle to the curb will not be permitted. Conduit runs parallel to the curb shall be located not more than 27 inches nor less than 6 inches behind the face of curb, unless otherwise indicated on the plans or approved by the Engineer.

Conduit 1-1/2 inch and larger and in runs of **less than** 10 feet shall have a bending radius of not less than 18 inches. Conduit 1-1/2 inch and larger and in runs of **more than** 10 feet shall have bending radius of not less than 18 inches or 12 times the inside diameter of the conduit, whichever is greater. Maximum bend rise of elbows into pull boxes shall be 45 degrees.

Conduit runs to be located in the street, under street pavement, may be installed by trenching or directional boring as provided below. Conduit runs to be located behind the curb, under the sidewalk or between the curb and sidewalk may be installed by directional boring method as provided below. Conduits can be installed by either jacking or drilling methods with the approval of the engineer. In lieu of jacking or boring, PVC conduit may be installed by the drill rod method in which a drill rod is first installed and the PVC is pulled into the cavity made by the drilling rod as the rod is removed.

A No. 8 (min.) A.W.G., stranded equipment grounding conductor (bare) shall be installed in all new conduit runs and in all existing conduit runs in which work is to be performed, regardless of conduit material type, that remain a part of an existing traffic signal and/or lighting system.

Exceptions to this requirement are; conduit containing only detector lead-in cable(s), provided that the conduit is terminated in pull box(es) that do not have metallic covers or components; or as exempted by the Engineer.

Pull boxes shall be grouted, and conduits proved and cleaned, prior to installing conductors or pull wire.

The Contractor shall clean and prove conduits in the presence of the Inspector, and shall provide 48 hour written notice prior to performing this work.

This item of work shall include furnishing all materials and for all preparation for the installation regardless of the method in which the conduit installed (i.e., directional boring method, trenching, bore and jack, etc.) trenching, jacking and drilling assembly, installation of pull wires, backfill of trenched, removal and restoration of surface improvements, traffic control and all miscellaneous materials and work required for a complete and accepted installation of conduit.

Backfill shall conform to the Standard Specifications Section 1301 "Trenching Excavation, Bedding and Backfill," regardless of type of facility to be located.

#### **86-2.05C.1 Trenching Installation of Conduit in Paved Streets (Single Conduit)**

When approved by the engineer, conduit may be placed under existing pavement in a trench approximately 2 inches wider than the outside diameter of the conduit to be installed. The trench shall not exceed 6 inches in width nor 32 inches in depth, unless otherwise approved by the Engineer. The top of the installed conduit shall be a minimum of 24 inches below finish grade. With the Engineer's approval, the minimum depth may be reduced at locations where existing underground facilities require special precautions, as described in Section 8-1.10, "Utility and Non-Highway Facilities," Section 7-1.11, "Preservation of Property," and Section 15, "Existing Facilities" of the Standard Specifications.

The outline of all areas of pavement to be removed shall be cut to a minimum depth of three inches (3") 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 outside the removal area. The rock cutting excavator shall be shielded to prevent loose material from being thrown away from the machine. The conduit shall be placed in the bottom of the trench and the trench shall be backfilled with sand to a depth of 4 inches over the conduit. The sand shall then be watered to promote densification. The trench shall then be backfilled with Class A concrete, to a depth of 1.5 inches below the pavement surface. The concrete shall be tamped or vibrated to provide a dense material free from excessive voids and rock pockets.

The top 1.5 inches shall be backfilled with asphalt concrete, Type "A" ½ HMA.

Excavation/installation of conduit and concrete backfill shall be completed within the same working day. Asphalt concrete backfill shall be completed within 24 hours after the excavation of the trench.

#### **86-2.05C.2 Trenching Installation of Conduit in Paved Streets (Multiple Conduits)**

The outline of all areas of pavement to be removed shall be cut to a minimum depth of three inches (3") 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 outside the removal area.

Where two or more conduits are placed in a common trench, the following requirements shall be met:

1. Provide 1" minimum separation between outer sides of conduits.
2. Provide 1" minimum separation between outer sides of conduits and the trench walls.
3. Conduit separation shall be effectively maintained by the use of spacers of proper size specifically designed for the purpose. Spacers shall be placed at 4 to 6 foot intervals maximum. The conduit arrangement shall be such that the minimum cover over the uppermost conduit shall be 24 inches.
4. Trench depth shall not exceed 32" from finish grade unless approved otherwise by the Engineer.
5. Conduits shall be covered with sand to a depth of 4" above the uppermost conduit. The sand shall then be watered to promote densification. Care shall be taken not to over water during densification.
6. After the sand is densified, the trench shall be backfilled with Class A concrete, to a depth of 0.10 feet below the pavement surface. The concrete shall be tamped or vibrated to provide a dense material free from excessive voids and rock pockets. The top 0.10 foot shall be backfilled with asphalt concrete, Type "A" 1/2" HMA.

Excavation/installation of conduit(s) and concrete backfill shall be completed within the same working day. Asphalt concrete backfill shall be completed within 24 hours after excavation of the trench.

7. Contractor shall, at the request of the Engineer, open inspection holes as required to determine compliance with the requirements for trench-laid conduit depth and alignment. Inspection holes shall not be backfilled until the conduit installation has been approved by the Engineer. Upon completion of inspection, inspection holes shall be filled to the satisfaction of the Engineer. The opening and restoration of inspection holes shall be at the expense of the Contractor.

#### **86-2.05C.3 Jacking, Drilling, or Directional Boring Methods of Installation of Conduit**

Jacking or drilling method shall conform to the provisions of Section 86-2.05C, "Installation," of the Standard Specifications and these Special Provisions.

Conduits may be installed by jacking, drilling, or directional boring methods with the approval of the engineer.

#### **86-2.05C.4 Installation of Conduit by Directional Boring Method**

The directional drilling may be performed by a contractor possessing a C-12 or D-09 license. The class C-12 or D-09 subcontractors cannot handle or assemble the conduit.

Conduit may be placed by the directional boring method, utilizing a surface launch drill to install the conduit conforming to these Special Provisions.

Directional guidance shall be by means of a tracking system consisting of a radio beacon mounted in the bore head and a hand held locator, allowing tracking of the bore and changes of the bore path due to the presence of obstacles such as existing utilities. Conduit installed by directional boring method shall be installed between 24 and 48 inches below grade under the roadway or driveways, between 18 and 36 inches in all other locations and not vary more than 12 inches horizontally from the centerline of its intended route unless approved by the Engineer to avoid obstacles such as existing utilities. Bentonite or approved equal shall be placed inside the hole to fill all voids around the conduit(s).

The Contractor's attention is directed to Section 2-1.03, "Examination of the Plans, Specifications, Contract and Site of Work," Section 7-1.11, "Preservation of Property," and Section 86-2.05C, "Installation". If the contractor chooses to place conduit by directional boring methods, the Contractor is responsible for all costs related to but not limited to the following: soil conditions, trees, rocks, abandoned concrete, obstructions, existing utilities, abandoned utilities, deep asphalt, and deep aggregate base.

#### **86-2.05C.5 Payment**

Payment for conduit will be full compensation for furnishing all materials, tools, labor, mobilization, and equipment necessary for the installation regardless of the method in which the conduit is installed (i.e., directional boring method, trenching, bore and jack, etc.), including potholing, earthwork, jacking and drilling assembly, mandrelling of conduits, installation of #8 awg bare pull wires, backfill of trenches, traffic control, removal and restoration of surface improvements and all miscellaneous materials and work required for a complete and accepted installation.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

#### **86-2.05C.6 Additional Conduit**

This item of work is provided to account for additional and unforeseen conduit runs which may be required during the course of the contract to complete the work. Conduit shall be schedule 40 PVC and shall conform to the provisions in Section 86-2.05.1, "Conduit" of these Special Provisions and in Section 86-2.05, "Conduit," of the Standard Specifications.

Conduit shall be measured as the horizontal length of conduit from center of facility structure to center of facility structure, installed in place, completed and accepted as satisfactory.

#### **86-2.06 Pull Boxes**

Pull boxes shall conform to the provisions of Section 86-1.02(C), "Pull Boxes," of the Standard Specifications, the Standard Details, and these Special Provisions.

New BIKE PATH LIGHT pull boxes shall be CSJ standard #3½ pull box unless noted otherwise. New #3½ pull boxes shall be polymer concrete and shall have lids with a non-slip polymer top surface. Pull box lid

replacements for existing #3½ concrete pull boxes shall have a non-slip polymer top surface or a polymer lining material. All new pull boxes and replacement lids shall be theft deterrent and shall conform to ANSI/SCTE 77 Tier 22 and lids shall be secured by a minimum of two ½ - 13 threaded by 1 ½" long security bolts. All metallic conductive parts shall be bonded by a bonding jumper with a ring terminal and a self-locking washer.

Truss mounted pull boxes shall be rain-tight steel boxes conforming to current National Electric Code (NEC) standards.

1. The pull box at the truss mounted light fixture shall be 4 inches by 4 inches by 2 1/8 inches and shall have a bolt pattern compatible with the light fixture.
2. The pull box mounted on the truss that does not have a fixture affixed to it shall have a minimum volume of 45 cubic inches. The box shall be as close in size to 45 cubic inches as possible.

All pull boxes placed outside of sidewalk, concrete parkstrip, or foundation cap with the adjacent electrolier shall have a one (1) foot wide concrete collar poured around the pull box to the depth of the pull box installed unless noted otherwise.

Contractor shall furnish and install lightweight composite pull box cover (with bolt down) (i.e., fiberglass, polyester resin, etc.) and use pre-cast reinforced concrete pull box for #5 and #6 new pull box installation. Contractor shall furnish and install lightweight composite #7 pull box cover (with bolt down) and lightweight composite # 7 pull box as designated on the project plans. Cover markings shall conform to Section 86-1.02(C). The cover markings shall be the same as specified for Caltrans boxes but shall include "CSJ" instead of "CALTRANS".

This item of work shall include furnishing all materials and for all preparation, excavation, drain rock, grout, extensions, hangers, grounding electrodes, grounding lug(s), copper braid/bare copper wire, bolt down covers and boxes, traffic control, concrete collar, tools, labor, removal and restoration of surface improvements and equipment necessary for a complete and accepted installation or replacement of a pull box and no additional compensation shall be made therefor. This item of work shall be measured per each, installed in place, completed and accepted as satisfactory. This work may require installing new pull boxes in an existing conduit run.

**When approved by the Engineer for traffic signal modifications only:** In conditions where the surrounding sidewalk or foundation caps cannot be installed until after the new signals are activated, the Contractor may be allowed to install conductors prior to grouting pull boxes, and shall immediately install an approved duct seal in all conduit ends.

This item of work shall include furnishing all material and for all preparation, excavation, drain rock, grout, extensions, hangers, grounding electrodes, covers (with bolt down), traffic control, tools, labor, removal and restoration of surface improvements and equipment necessary for a complete and accepted installation or replacement of a pull box. This work may require installing new pullboxes in an existing conduit run.

This item of work shall include furnishing all materials and for all preparation, excavation, drain rock, grout, extensions, hangers, grounding electrodes, grounding lug(s), copper braid/bare copper wire, bolt down covers and boxes, traffic control, concrete collar, tools, labor, removal and restoration of surface improvements, and equipment necessary for a complete and accepted installation or replacement of a pull box and no additional compensation shall be made therefor. This work may require installing new pullboxes in an existing conduit run. This item of work shall be measured per each, installed in place, completed and accepted as satisfactory.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

### **86-2.06.2 Pull Box Replacement**

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

At those locations where existing pull boxes are replaced with new boxes, the Contractor shall upgrade the state of existing facilities within the box to meet current City of San José Specifications.

The work required to upgrade pull box facilities shall include but not be limited to extending or cutting back PVC, GRS or PCGRS conduits; installing ground rods end bells, bushings, grounding lugs and grounding conductors; raising or lowering pull boxes to grade; replacing damaged conductors, removing and reinstalling conductors, placing drain rock, roofing paper, one inch drain, removal and restoration of surface improvements, and grouting bottom as indicated in City of San Jose Standard Details No. E-02 through E-06.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

### **86-2.06.3 Additional Pull Boxes**

This item of work is provided to account for additional and unforeseen pull box installations, as directed by the Engineer, which may be required during the course of the contract to complete the work. Pull boxes shall conform to Section 86-2.06.1, "Pull Boxes" of these Special Provisions.

This work may require to install new pullboxes in an existing conduit run. This work shall include all conduit work and surface restoration

### **86-2.06.4 Inductive Loop Detector**

The Contractor shall furnish and install traffic control loop detectors including lead-ins up to the hand hole as per CSJ Vehicle Detector Loop Layout Guideline as show on the Project Plans. Exact location of the detection loops shall be laid out by the City Survey Section and verified in the field by the Project Engineer before saw-cutting. Each lane where loops are to be installed shall be equipped with one Type C and one Type D detection loop.

All loop installation work shall be in conformance with Section 86-5 "Detectors," of the Standard Specifications, these Special Provisions, State of California Standard Plans ES-5B and the Detail "CSJ Vehicle Detection Loop Layout Guidelines".

### **86-2.08 Conductors**

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

When installing type THW conductor, the insulation thickness shall be as specified by the 2014 N.E.C., Table 310-104(A), and U.L. Standard 83, adopted September 9, 1998 is acceptable. THW conductors shall be installed for pole wiring connecting to luminaires, except high temperature rated conductor shall be installed for pole wiring connecting to luminaires with high temperature rating.

The power lead-in cable for Lighting Communication Control shall contain four (4) 14 AWG stranded copper conductors, have PE insulation, a PVC jacket, and meet International Municipal Signal Association (IMSA) specification 19-1; Anixter PN 2E-1404 or equivalent. Power conductors shall be colored black, white, red, and green. The fourth conductor, red, shall be labeled "spare." Prior to mounting the devices, the contractor shall allow City of San José Inspector to inspect the devices for proper labeling of the conductors.

Category 5e (Cat5e) shielded cable, for and Lighting Communication Control, shall be DataTuff Waterblocked 7937A as manufactured by Belden, or Equal. Cable shall be outdoor rated, shielded, industrial Ethernet cable and shall be suitable for underground use. Cable shall have a 24 AWG integrated electrostatic discharge drain wire. Copper pairs shall be 24 AWG solid copper and have solid polyolefin insulation. Cable shall have an inner jacket of linear low density polyethylene with a nominal diameter of 0.215 in. Cable shielding shall be aluminum foil bonded to polyester film to provide 100% shield coverage. The cable shall have a linear low density polyethylene outer jacket. Outside diameter of the complete cable shall be 0.276 in. Cable shall conform to ISO/IEC 11801 standards. Cable shall support equipment rated for a minimum of 1 Gbps data throughput. Cable shall be UL rated for sunlight resistance, oil resistance, and a maximum operating voltage of 300 V RMS.

At least 2 feet of slack shall be left in traffic signal conductors at each signal or combined lighting/signal standard. Slack shall be measured by removing the handhole cover on the standard and extending the wire horizontally beyond the handhole opening.

At least 2 feet of slack shall be left in traffic signal and lighting conductors and cables at each signal, lighting or combined lighting/signal standard. Slack in poles shall be measured by removing the handhole cover on the standard, extending the wire horizontally beyond the handhole opening, and measuring the shortest horizontal distance between the handhole and the conductor splice, or between the handhole and the midpoint of un-spliced conductors and cables.

At least 3 feet of slack shall be left in all conductors and cables at each pull box. Slack in pull boxes shall be measured by removing the pull box cover, extending the wire vertically above the handhole opening, and measuring the shortest vertical distance between the rim of the pullbox and the conductor splice, or between the rim and the midpoint of un-spliced conductors and cables.

This item of work shall include furnishing labor, materials, tools, and equipment necessary for the installation of conductors including cable loosening agent, fuse splice connectors, fuses, connectors, splices and removal of existing conductors.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

#### **86-2.08A Cable Loosening Agent**

Cable-loosening agent shall conform to the provisions of Section 87-1.03, "Construction," of the 2018 Caltrans Standard Specifications and Section 86-2.08, "Conductors," and Section 86-1.05, "Maintaining Existing and Temporary Electrical Systems," of the Standard Specifications and these Special Provisions. The cable-loosening agent shall be used with prior approval of the Engineer after normal conductor removal methods prove unsuccessful. The Contractor shall notify the Engineer 48 hours prior to the application of the cable loosening agent and before attempting to remove the conductors. Cable loosening agent shall be spread by use of air pressure to "blow" it through the system by alternating air blasts with doses of cable loosening agent. The amount of cable loosening agent to be applied and the duration the conductors shall be soaked in it shall conform to the manufacturer's recommendation. Immediately after application, the Contractor shall attempt to remove them. Conductors that continue to be stuck shall have the conduit ends plugged with rags and the cable loosening agent allowed to soak in the system. The Contractor shall periodically check if the conductors are coming loose and if so shall proceed to remove them. Cable grips designed to hold the conductors shall be used to pull on all the conductors in the conduit as a unit in addition to pulling on each conductor separately.

The conduit, wire and pull box shall be cleaned of cable loosening agent in accordance to manufacturer's specifications and immediately after the recommended soak time.

Payment shall be full compensation for furnishing all labor, tools, materials, and equipment necessary for application of the cable-loosening agent including the agent, grips, swabs, pulling conductors, appurtenances and cleaning the conduit and making it ready for use.

*Payment for this item shall be deemed included in other items of work and no additional compensation shall be allowed.*

**86-2.09A      Circuitry**

Circuitry shall conform to the provisions of Section 86-2.09A, "Circuitry," of the Standard Specifications.

**86-2.09F      Fused Splice Connector**

Fused splice connector shall conform to the provisions of Section 86-2.09F, "Fused Splice Connector," of the Standard Specifications.

When wiring is performed in existing poles, pull boxes, or other locations, the existing fused splice connector shall be removed and replaced by a new fused splice connector per Standard Details, Standard Specifications, Project Plans, and these Special Provisions.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

**86-2.09G4      Traffic Signal Communication Cable**

Communications cable shall conform to Section 86-2.09G, "Traffic Signal Communication Cable," of the Standard Specifications. All newly installed traffic signal communication cables shall contain a minimum of 25 pairs of conductors.

The contractor shall provide ten lineal feet of signal communication cable slack at each pull box through which the cable passes as well as in each controller cabinet where it is terminated.

Where there is existing interconnect cable, the contractor shall locate and protect existing copper communication conduits and cables from damage. The cables shall not be cut, spliced, or damaged in any way. Should damage to communication conduits or cables occur, contractor shall immediately contact the City Project Inspector, DOT Infrastructure Maintenance at (408) 794-1900, and DOT Operations Division at (408) 535-3823. Contractor shall temporarily repair the damaged cable within two (2) business days and perform permanent repairs within thirty (30) calendar days after the acceptance of the temporary repair, as approved by the City. Permanent

Contractor shall notify the City of San Jose Department of Transportation (DOT), Signal Maintenance Division at (408) 277-5515 and Operations Division at (408) 535-3823, a minimum of two (2) business days prior to the planned disconnect of the copper communications cable. The copper communication cable shall only be disconnected once and shall be out of service no more than five (5) consecutive business days.

**86-2.09G5      Traffic Signal Communication Cable Terminations**

All copper communications cable entering controller cabinets shall be disconnected and/or terminated by City forces. All copper communications cable entering controller cabinets shall be securely taped and sealed with electrical insulating tape.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

### **86-2.10 Bonding and Grounding**

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

Ground connection shall be through an approved 5/8" x 10' copper-clad or 3/4" x 10' galvanized steel rod set obliquely through the foundation and extended above the finished foundation sufficiently to attach a ground clamp and No. 8 or No. 6 bare copper wire as required. Conduit, poles, pedestals, and all other metal parts of the installation shall be made mechanically and electrically secure to form a continuously grounded system. Where a pull box is located adjacent to the standard, the rod shall be driven in the pull box.

Detail E-42 of the Standard Details shall include bonding and grounding between grounding lug and ground rod.

Each new luminaire shall be grounded with a continuous #10 AWG green grounding conductor, unless otherwise specified, which shall be terminated in the luminaire and connected to the grounding wire in the base of the pole. Existing poles without the green grounding conductor for the luminaire shall have one installed.

Grounding conductors for the bicycle and pedestrian pathway lighting shall be as indicated on the plans. The grounding conductor running along the steel truss structure shall be insulated.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

### **86-2.11 Service**

Electrical service installations shall conform to the provisions of Section 86-1.02P(2) "Service Equipment Enclosures" of the Standard Specifications, the Standard Details, and these Special Provisions.

Service cabinets shall have interrupting capacity equal or greater than the available short circuit current available but the minimum interrupting capacity will be 10,000 amperes.

All service cabinets shall be approved by the serving utility. Electric Utility Service Equipment Requirements Committee (EUSERC) number shall be submitted to the Engineer.

Service cabinets shall have an arc flash hazard label as required by the California Electric Code, 2016 edition. An arc flash hazard analysis shall be done by a registered electrical engineer. The arc flash hazard analysis shall include a shock hazard analysis. All calculation and any other information as part of the arc flash hazard analysis shall be submitted.

Service cabinets will also include markings showing the maximum available fault current and the date it was calculated.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

#### **86-2.11A Service Cabinet Painting**

All new service cabinets shall be painted City of San José approved white.

The service cabinet(s) shall have a minimum of 3 mils of an aliphatic urethane self priming color coat followed by a minimum of 1 mil aliphatic urethane Wasset Mc-Antigraffiti clear coating or an approved

equivalent. Use over a phosphatized treated or abraded surface. All coatings shall be compliant to the current VOC requirements.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

#### **86-2.14 Testing**

Testing shall conform to the provisions of Section 86-2.14A, "Testing," of the Standard Specifications.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor*

#### **86-2.14D Insulation Resistance Testing**

Insulation resistance of the traffic signal system with LED indications present shall be tested as follows:

1. Confirm that all field connections in vehicle heads, pedestrian heads, and other indications are terminated.
2. Connect or jumper together all field wires for vehicle heads, pedestrian heads, and other signal indications in the traffic signal controller cabinet.
3. Connect one test lead of the megger to the connected or jumpered field wires and the other test lead to an adequate ground wire.
4. Perform the MEG test and read the results to the City Project Inspector.

New installations shall have an insulation resistance of not less than 10 megohms.

Signal modifications require an insulation resistance test prior to any work being conducted and the resulting value recorded by the City Project Inspector. Following the completion of the modification work, the insulation resistance shall be checked and the resulting value must be equal or better than the recorded insulation resistance value prior to the modification.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

#### **86-2.16 Painting**

Painting shall conform to the provisions of Section 59, "Painting," Section 86-2.16, "Painting," and Section 91, "Paint" of the Standard Specifications and these Special Provisions.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

#### **86-2.17 Furnish and Install Flexible Innerduct**

The Contractor shall furnish and install a flexible polyester/nylon textile innerduct, MaxCell by TVC Communications or approved equal, as shown on the plans and installed according to the manufacturer's recommendations. Rigid or semi-rigid innerduct is not allowed.

The polyester/nylon textile innerduct shall contain three cells and each cell shall accommodate a single cable with an outside diameter no larger than 0.85 inches for 2-inch 1,2, or 3 cell and 1.05 inches for a 3-inch 3 cell. The polyester/nylon textile innerduct shall be sized to fit into the new conduit.

The polyester/nylon textile innerduct shall contain a 1250lb polyester flat woven pull tape. The pull tape shall be constructed of synthetic fiber, printed with accurate sequential footage marks.

A solid copper, polyvinyl color coated conductor (18AWG minimum) for tracing, rated for a minimum of 6 amps and 600 volts, shall be placed in the sidewall edge fold of the textile innerduct.

*Payment for compliance with this section will be deemed included in the various other items of work, and no additional compensation will be allowed therefor.*

### **86-3 NEMA TS2-Type 1, P Cabinet Assembly**

#### **86-3.01 Cabinet Minimum General Requirements**

The cabinet shall be completely wired and tested to the 2003 NEMA Traffic Controller Assemblies specification with NTCIP Requirements Version 02.06 (as amended here in). In addition, and at a minimum, the following requirements shall be met:

City of San Jose traffic signal cabinet specification shall supersede any applicable parts of the Caltrans Standard Specifications and Standard Plans. This specification shall apply to all controller cabinet types with noted exceptions.

All items not covered by these specifications shall conform to 2018 Caltrans Standard Specifications and Standard Plans. Traffic signal cabinets shall also comply with NEMA specifications where applicable.

1. The cabinet shall be designed for 16 channel operation where each load switch socket can be configured for a vehicle phase, pedestrian phase or overlap operation. These load switch sockets shall be configured in this manner without rewiring the back side of the load-bay. BIU load switch drivers 1-16 shall be wired to appropriate load switch sockets via a terminal block located on the front side of the load bay so as to allow checking voltage inputs to the load switch sockets without dropping the load bay.
2. The cabinet shall be wired for up to a minimum of (32) channels of detection, (4) channels of Opticom™ preemption and (4) channels of low priority preemption.
3. The use of PC boards shall not be allowed except in detector racks, SDLC interface panels or BIU cages.
4. The use of plug and play modules shall not be allowed, with the exception of detector rack(s).
5. The cabinet shall be wired to provide a 10-pin "A" connector.
6. All cabinet 120VAC wires shall be 18AWG or greater, including controller "A" and MMU "A & B" cables.
7. The complete cabinet assembly with electronics shall undergo complete input/output function testing by the manufacturer before being released to the City of San Jose.

#### **86-3.02 Model 2070LN Traffic Signal Controller**

Model 2070LN Controller will be furnished by the City

#### **86-3.03 Cabinet Enclosure**

At a minimum, the cabinets shall meet the following criteria:

1. It shall have nominal dimensions of 56" high x 44" width x 25.5" depth and meet the footprint dimensions as specified in Section 7.3, Table 7-1 of NEMA TS2 standards for a Type P cabinet. The cabinet base shall have continuously welded interior mounting reinforcement plates with the same anchor bolt hole pattern as the footprint dimensions.
2. Shall be fabricated from 5052-H32 0.125-inch thick aluminum.
3. The cabinet shall be double-flanged where it meets the cabinet door.
4. The top of the cabinet shall be sloped 1" towards the rear to facilitate water runoff. And shall bend at a 90° angle at the front of the cabinet. Lesser slope angles are not allowed.
5. The inside of the cabinet shall utilize C channel rails. (2) Welded on the back wall on 34" center

- and (4) welded on each side wall on 08" center with 04" between sets. The C channel rails on the back wall shall be 35" in length and start 5" from the bottom of the cabinet interior. The C channel rails on the side walls shall be 48" in length and start 5" from the bottom of the cabinet interior. Adjustable rails are not allowed.
6. The cabinet shall be supplied with the following finishes: the interior powder coat WH-14 (white), the exterior powder coat WH-14 (white).
  7. All external fasteners shall be stainless steel. Pop rivets shall not be allowed on any external surface.
  8. The door handle shall be 3/4" round stock stainless steel bar.
  9. The main door shall contain a police door with a conventional police lock. A key shall be provided for both the cabinet lock and the police door lock. The police door shall be recessed into the main door so that the police door is flush with the main door. A closed-cell, neoprene gasket seal shall be bonded to the enclosure doors. A stiffener plate shall be welded across the width of the inside of the main door to prevent flexing. A main door bar stop shall be a two-position, three-point stop that accommodates open-angles at 90, 125, and 150 degrees. A louvered air entrance located at the bottom of the main door shall satisfy NEMA rod entry test requirements for 3R ventilated enclosures. Bearing rollers shall be applied to ends of door latches to discourage metal-on-metal surfaces from rubbing. The lock assembly shall be positioned so handle does not cause interference with key when opening the door.
  10. The cabinet shall be equipped with a universal lock bracket capable of accepting a Best™ style lock and a Corbin #2 tumbler series lock. The cabinet shall come equipped with a Corbin #2 lock.
  11. The cabinet shall be supplied with two door switches which control the door open status and the cabinet interior lighting circuits.
  12. The cabinet shall have a rail road preemption circuit. This circuit shall be 120VAC with input and output to rail road on detector panel. The relay shall be an 11 pin and mounted on the main panel (load bay).
  13. All exterior seams shall be manufactured with a neatly formed continuously weld construction. The weld for the police box door shall be done on the inside of the cabinet door. All welds shall be free from burrs, cracks, blowholes or other irregularities.
  14. The fan baffle panel seams shall be sealed with RTV sealant or equivalent material on the interior of the cabinet.
  15. The cabinet shall be UL listed.
  16. The cabinet shall come with lifting ears affixed to the upper exterior of the cabinet. These ears shall utilize only one bolt for easy reorientation.
  17. The cabinet shall come with a three-stage, multi-ply progressive density polyester, disposable air filter; and the filter performance shall conform to listed UL 900 Class 2 and conform to ASHRAE Standard 52.1. The filter shall be secured to entrance on main door by two (2) horizontally-mounted restraints.
  18. The door shall be mounted with a single continuous stainless steel piano hinge that runs the length of the door. The hinge shall be attached via stainless steel tamper resistant bolts.

### **86-3.03A      Labels**

A permanent printed thermo vinyl, engraved or silk screened label shall be provided for the following equipment:

1. Receptacles for relay and switching devices.
2. Switches, fuses and circuit breakers.
3. All removable plug-in electronics or equipment.

Labels shall be legible and shall not be obstructed by cabinet wiring, panels or cables. All labels shall conform to the designations on the cabinet wiring prints. Labels for all shelf-mounted electronics and equipment shall be on the face of the shelf directly below their placement in the cabinet.

### **86-3.03B Shelves**

Cabinet shall come with (3) double beveled shelves 10" deep that are reinforced welded with V channel, fabricated from 5052-H32 0.125-inch thick aluminum with double flanged edges rolled front to back. Slotted hole shall be inserted every 7" for the purpose of tying off wire bundles.

### **86-3.03C Cabinet Layout**

The shelves shall be populated as follows.

1. The power supply and (2) detector racks shall be placed on the bottom shelf. The controller and monitor shall be placed on the middle shelf. The top shelf shall be left empty for future electronics.
2. The detector panel for all field inputs shall be located on the lower left wall.
3. The power panel shall be located on the lower right wall.
4. Surge suppressor shall be located on the right wall above the power panel.
5. The SDLC and power supply interface panels shall be located on the left wall between the middle and upper shelves.
6. The 120VAC quad outlets shall be mounted on the right wall, at the top of the "C" channels.
7. Load resistor panel shall be mounted on the left wall under the bottom shelf.
8. One blank panel, populated with a 50-position communications terminal block on the lower right hand, shall be located on the right side of the cabinet between the surge suppressor and the 120VAC quad outlets. A second blank panel shall be located on the left side above the detector panel and end at the top of the "C" channel.

### **86-3.03D Ventilation Fans**

The cabinet shall be provided with two (2) finger safe fans, one mounted on each side of the cabinet plenum, and shall be thermostatically controlled (adjustable between 4-176° Fahrenheit). The safe touch thermostat and power terminal block(s) shall be din rail mounted on right side of cabinet plenum.

### **86-3.03E Computer Shelf**

A slide-out computer shelf 16" length by 12" width by 2" depth shall be installed below the middle shelf underneath the controller. The shelf shall be mounted just right of center so that controller cables will not interfere with the operation of the shelf when equipment is installed. The shelf shall have a hinged cover that opens from the front and shall be powder-coated black. It shall be a General Devices Part # VC4080-99-1168 or equivalent. The door when fully extended shall hold up to 50lbs.

### **86-3.03F Main Panel Configuration (Load - Bay)**

The design of the panel shall conform to NEMA TS2 Section 5, Terminals and Facilities, unless modified herein. This panel shall be the termination point for the controller unit (CU) MSA, (MMU) MSA & B cables, bus interface units 1 & 2 (BIU) and field terminal facilities. The terminal and facilities layout shall be arranged in a manner that allows all equipment in the cabinet and all screw terminals to be readily accessible by maintenance personnel.

- The load-bay shall be fully wired and meet the following requirements:
- The load-bay shall have the following dimensions; constructed from aluminum with a nominal thickness of 0.125 inches, a maximum height of 19" and a maximum width of 37-½ inches including attached wiring bundles.
- The entire assembly shall roll down and provide access to all of the back of panel wiring. All solder terminals shall be accessible when the load-bay is rolled down. The assembly shall be able to roll down without requiring other components, cables or switches to be removed.

- The load-bay shall be designed so that all other cabinet screw terminals are accessible without removing cabinet electronics.
- All the controller (CU) and malfunction management (MMU) cables shall be routed through the back of the load-bay so that they will not be subject to damage during load-bay roll down.
- The top of the load-bay panel shall attach directly to Unistrut™ spring nuts without the use of standoffs and spacers.
- The load-bay shall be balanced such that it will not roll down when the Unistrut™ spring nuts are removed, even when fully loaded with BIUs load switches, flasher and flash transfer relays.
- The load-bay facility shall be wired for 16 channels. Load switch(s) 1-8 shall be vehicle phases 1-8; load switch(s) 9-12 shall be pedestrian phases 2, 4, 6 & 8; load switches 13-16 shall be overlaps A, B, C & D. All load switches shall be routed through a flash transfer relay.
- (16) Load sockets spaced on 2" center per NEMA TS2 section 5.3.1.2, Figure 5-2.
- (8) Flash transfer relay sockets.
- (1) Flasher socket.
- All load switches and flasher shall be supported by a bracket extending at least ½ the length of the load switch.
- (2) Bus interface unit rack slots for BIU's 1 and 2. The load-bay must have space available for a 3rd BIU. All of the cabinet BIU's shall fit into one rack in the top left corner of the load-bay. Multiple racks are not allowed.
- BIU wires connection to the PCB shall be two (2) 34 pin connectors. These connectors shall have locking latches.
- All BIU wiring shall be soldered to backside of a screw terminal. The screw terminals provide access to all functions of BIUs.
- Wiring for one Type-16 MMU. All MMU wiring shall be soldered to backside of a screw terminal. The screw terminals provide access to all functions of the MMU.
- All 24 VDC relays shall have the same base socket, but it shall be different from the 115VAC relays.
- All 115VAC relays shall have the same base socket, but it shall be different from the 24VDC relays. (not applicable to flash transfer relays)
- Shall have a relay that drops +24VDC to load switches when the cabinet is in flash.
- There shall be a wire between the pedestrian yellow field terminals and another terminal on the load bay. The MMU channel 9-12 yellows shall terminate next to said pedestrian yellows terminal.
- The load-bay shall be silkscreened on both sides. Silkscreen shall be numbers and functions on the front side, and numbers only on the back side.
- Field wiring terminations shall be per channel across the bottom of the load-bay. Each channel shall have 3 terminations corresponding to the appropriate vehicle phase Red, Yellow and Green. Default wiring shall be left to right vehicle phases 1-8, pedestrian phases 2, 4, 6 & 8 and overlap channels A, B, C & D following the order of the load switches. Field terminals shall be #10 screw terminal and be rated for 600V.
- All cable wires shall be terminated. No tie-off of unused terminals will be allowed.

All wiring shall conform to NEMA TS2 Section 5.2.5 and table 5-1. Conductors shall conform to military specification MIL-W-16878D, Electrical insulated high heat wire, type B. Conductors #14 or larger shall be permitted to be UL type THHN. Main panel wiring shall conform to the following colors and minimum wire sizes:

Vehicle green load switch output	14 gauge brown
Vehicle yellow load switch output	14 gauge yellow
Vehicle red load switch output	14 gauge red
Pedestrian Don't Walk switch	14 gauge orange
Pedestrian Walk switch	14 gauge blue
Pedestrian Clearance load switch	14 gauge yellow

Vehicle green load switch input	22 gauge brown
Vehicle yellow load switch input	22 gauge yellow
Vehicle red load switch input	22 gauge red
Pedestrian Don't Walk input	22 gauge orange
Pedestrian Walk input	22 gauge blue
Pedestrian Clearance input	22 gauge yellow
Logic Ground	18 gauge white with red tracer
+24V DC	18 gauge red with white tracer
+12V DC	18 gauge pink
AC+ Line	14 gauge black
AC- Line	14 gauge white
Earth Ground	16 gauge green
AC line (load bay)	12/14 gauge black
AC neutral (load bay)	12/14 gauge white
Controller A cables	22 gauge blue <i>with the exception of power wires (AC+ Black, AC- White &amp; Earth Ground Green) These wires shall be 18AWG</i>
MMU A & B cables	22 gauge orange <i>with the exception of power wires (AC+ Black, AC- White &amp; Earth Ground Green Start Delay Relay Common Black, Normally open Black &amp; Normally Closed Black) These wires shall be 18AWG</i>

Two conductors will supply alternating current (AC) power to the load switch sockets. The load switch sockets shall be supplied alternately (every other socket) by each conductor.

The field terminal blocks shall have a screw Type No. 10 post capable of accepting no less than 3 No. 12 AWG wires fitted with spade connectors. Four (4) 12-position terminal blocks shall be provided in a single row across the bottom of the main panel. Spade lugs from internal cabinet wiring are not allowed on field terminal screws. There shall be a second row of four (4) 12-position terminal blocks with screw type #10 above the field terminal blocks. These blocks shall operate the flash program. It shall be changeable from the front of the load-bay. All load switches, flasher, and flash transfer relay sockets shall be marked and mounted with screws. Rivets and clip-mounting is unacceptable.

The power terminal blocks shall have a screw Type No. 10 post capable of accepting no less than 3 No. 12 AWG wires fitted with spade connectors. One (1) 12-position terminal blocks shall be provided vertically on the right side of the load bay. The placement of the power terminal block on any other panel shall not be allowed.

The load bay field, flash program and power terminals shall have a protective plastic cover. This shall be removable by loosening screws but without removing screws.

Wire size 16 AWG or smaller at solder joints shall be hooked or looped around the eyelet or terminal block post prior to soldering to ensure circuit integrity. All wires shall have lugs or terminal fittings when not soldered. Lap joint/tack on soldering is not acceptable. All soldered connections shall be made with 60/40 solder and non-corrosive, non-conductive flux. All wiring shall be run neatly and shall use mechanical clamps and conductors shall not be spliced between terminations. Cables shall be sleeved in braided nylon mesh and wires shall not be exposed.

**86-3.03G Load-Bay and Panel Wire Termination**

All wires terminated behind the main panel or on the back side of other panels shall be **SOLDERED**. No pressure or solder-less connectors shall be used. Printed circuit boards shall only be used on the load bay where connecting to the bus interface units (BIU).

### **86-3.03H Cabinet Light Assembly**

The cabinet shall have an LED lighting fixture with 15 high power LEDs using a cool white color emitting 300lm min @ 12VDC/750mA. The LED shall be a Rodeo Electronics TS-LED-05M02 or approved equivalent. The LED fixture shall be powered by a Mean Well class 2 power supply LPV-20-12 that shall be mounted on the inside top of the cabinet near the front edge. The cabinet light circuit shall be designed so a second LED fixture will be installed in the cabinet without the need of a second power supply. It shall be attached so that it remains stationary when drawer is extended. An on/off switch that is turned on when the cabinet door is opened and off when it is closed shall activate the lighting fixture(s) power supply.

### **86-3.03I Convenience Outlet**

The cabinet shall be wired with one (1) convenience outlet with a ground fault interrupter (GFI) and two (2) quad convenience outlets without ground fault interrupters. The ground fault outlet (GFI) shall be mounted on the right side of the cabinet on or near the power panel. The quad convenience outlets shall be mounted on the right side at top of the "C" channel. No outlets shall be mounted on the door. The GFI power shall be fed through the auxiliary breaker. The quad convenience outlets shall be fed through the equipment breaker. Non-GFI receptacles shall be labeled "Electronic Equipment Only".

### **86-3.03J Auxiliary Panel**

The cabinet shall include an auxiliary switch panel mounted to the interior side of the police panel compartment on the cabinet door. The panel shall be secured to the police panel compartment by (2) screws and shall be hinged at the bottom to allow access to the soldered side of the switches with the use of only a Phillips screwdriver. Both sides of the panel shall be silkscreened. Silk-screening on the backside of the switch panel shall be upside down so that when the panel is opened for maintenance the silk-screening will be right side up. All of the switches shall be protected by a hinged see-through Plexiglas cover.

At a minimum the following switches shall be included:

1. Controller ON/OFF Switch: There shall be a switch that renders the controller and load-switching devices electrically dead while maintaining flashing operations for purpose of changing the controller or load-switching devices. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.
2. Signals ON/OFF Switch: There shall be a switch that renders the field signal displays electrically dead while maintaining controller operation for purpose of monitoring controller operations. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.
3. Stop Time Switch: There shall be a 3-position switch labeled "Normal" (up), "Off" (center), and "On" (down). With the switch in the "Normal" position, a stop timing command shall be applied to the controller by the police flash switch or the MMU (Malfunction Management Unit). When the switch is in its "Off" position, stop timing commands shall be removed from the controller. The "On" position shall cause the controller to stop time. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat. There shall be a red LED indicator light that illuminates when stop time is applied.
4. Technician Flash Switch: There shall be a switch that places the field signal displays in flashing operation while the controller continues to operate. This flash shall have no effect on the operation of the controller or MMU. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.
5. Vehicle Test Switches: Eight (8) vehicle phase inputs shall have momentary pushbutton test switches with black caps. These switches shall be labeled 1, 2, 3, 4, 5, 6, 7 and 8. The switches

shall terminate on an interface panel along with the 32 channel outputs of detector racks. The switches shall be programmable to any detector channel without the use of tools. The interface panel shall reside in the auxiliary panel.

6. Pedestrian Test Switches: Four (4) pedestrian phase inputs shall have momentary pushbutton test switches with black caps. These switches shall be labeled 2, 4, 6, and 8. Each switch shall have a red LED indicator light. These LED indicators are to provide indication as PPB is actuated, and shall be located directly above the respective switch.
7. Preemption Test Switches: Six (6) preempt inputs shall have momentary pushbutton test switches with red caps. These switches shall be labeled 1, 2, 3, 4, 5 & 6. Switch 5 shall be wired to rail road preempt circuit.

### **86-3.03K Police Panel**

Behind the police panel door there shall be switches for use by emergency personnel. The wiring for these switches shall be accessible when the auxiliary panel is open. The following switches shall be included:

1. Flash Switch: There shall be a switch for the police that puts the cabinet into flashing operations. The switch shall have two positions, "Auto" (up) and "Flash" (down). The "Auto" position shall allow normal signal operation. The "Flash" position shall immediately cause all signal displays to flash as programmed for emergency flash and apply stop time to the controller. When the police flash switch is returned to "Auto", the controller shall restart except when the MMU has commanded flash operation. The effect shall be to disable the police panel switch when the MMU has detected a malfunction and all controller and MMU indications shall be available to the technician regardless of the position of the police flash switch. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.
2. Signals ON/OFF Switch: There shall be a switch that renders the field signal displays electrically dead while maintaining controller operation for purpose of monitoring controller operations. The switch shall be a general-purpose bat style toggle switch with .688-inch long bat.

### **86-3.03L Cables**

All wire cable bundles shall be encased in flex or expandable braided sleeving along their entire free length.

All SDLC cables shall be terminated on both ends, securely terminated to the SDLC interface panel with screw type connection and professionally routed in the cabinet interior to easily reach the load bay, controller, malfunction management unit and detector racks. All SDLC connectors shall be fully populated with 15 pins each.

### **86-3.03M Flash Operation**

All cabinets shall be wired to flash for all vehicle channels. Flashing operation shall alternate between the used vehicle phases 1,2,3,4, pedestrian phases 2, 4, OLC & OLD and 5,6,7,8, pedestrian phases 6, 8, OLA & OLB. Flash programming shall be either red, yellow or no flash simply by changing wires on the front of the load-bay.

### **86-3.03N Detector Racks**

At a minimum, the cabinet shall be wired to accommodate (32) channels of detection. One detector rack shall support (16) channels of loop detection, (1) Buss Interface Unit (BIU) and (4) channel of Opticom™. One detector rack shall support (16) channels of loop detection and one (1) Buss Interface Unit (BIU) and (4) channels of low priority preemption. Racks shall be capable of using both two channel or four channel detection devices or Opticom™ cards. The loop cabling shall be connected via a 37 pin DB connector using spring clips. The Opticom and low priority cable shall be connected via a 24 pin connector using locking latches. The power cable shall be a 6 pin connector. All power wires shall be 18AWG. The addressing of

detector racks shall be accomplished via dipswitches mounted to the PCB. There shall be the capability to turn off the TS2 status to the BIU for the uses of TS1 detector equipment via dipswitches mounted to the PCB. There shall be a 34 pin connector using locking latches that breaks the output from the detector to the input of the BIU, there shall also be +24VDC and logic ground on this connector. All racks shall have space at the bottom front for labeling. All racks shall be designed for horizontal stacking. Separate racks for detection and preemption are not allowed.

**86-3.03O      Detector Panel**

The detection panel shall support (32) channels of vehicle detection, (4) channels of emergency vehicle preemption, (4) channel of low priority preemption detection, (8) channels or pedestrian detection and (8) pedestrian returns and output and input for rail road preemption circuit on a single panel. The pedestrian call terminal block shall be (2) single row terminals. They shall be connected by removable buss bars. The loop wires shall be a 22AWG twisted pair, color coded as follows. Channel one brown, channel two red, channel three orange and channel four yellow. One of the twisted pair wires of all colors shall have a white tracer and land on the second position terminal of each loop. The emergency preempt and low priority preempt wires shall be color coded as follows. +24VDC orange, preempt inputs yellow and ground blue. The auxiliary vehicle preemption shall be white with a yellow tracer. This panel will be mounted on the left side of the cabinet below the bottom shelf. The panel shall also include a (19) position solid aluminum, tin plated neutral and ground buss bars with raised slotted & torque style screws heads. They shall be mounted vertically at the bottom of the panel.

**86-3.03P      Power Supply Interface Panel**

The power supply interface panel shall include terminations for all the cabinet power supply inputs and outputs. It shall have a protective plastic cover. This panel shall be mounted on the left wall of the cabinet.

**86-3.03Q      Interconnect Terminal Panel**

There shall be a 25 position terminal block with #6-32 screws part# 671RZ-25-PSB. It shall be mounted vertically on the lower front of the blank panel above the surge suppressor on the right wall of the cabinet.

**86-3.03R      Spare Panels**

Sheet metal panels shall be installed in the available space on the upper left and right sides of the main compartment.

**86-3.03S      Supplemental Loads**

There shall be a supplemental load panel with (4) 2.5K-ohm, 10-watt panel mount resistor. One side terminated to a (4) position terminal block tied to neutral. The other side terminated to another (4) position terminal block. This block shall be left open for future loading in the cabinet.

**86-3.03T      Service Surge Suppression**

The cabinet shall be equipped with an Innovative Technologies model HS-P-SP-120-60A or approved equivalent voltage suppressor mounted on above the power panel. Power to all cabinet wiring shall come through this voltage suppression circuit.

**86-3.03U      Power Panel**

The power panel shall handle all the power distribution and protection for the cabinet and shall be mounted in the bottom right side of the facility. All equipment shall be mounted on a 12"x17" silkscreened aluminum panel and include at a minimum the following equipment:

1. A 40-amp main breaker shall be supplied. This breaker shall supply power to the load bay, load switches and auxiliary panel. It shall also power via the EDCO SHP300-10, the controller, MMU, power supply & detector racks.
2. A 20-amp equipment breaker shall supply power to the convenience outlets.
3. A 15-amp auxiliary breaker shall supply power to the fan, light and GFI.
4. A 50-amp, 125 VAC radio interference line filter.
5. (6) 10-amp spare breakers.
6. A normally open, 50-amp, solid-state relay. The relay shall have a green LED light that is on when energized. (No Mercury Contactors shall be allowed)
7. One see-through Plexiglas cover on stand-offs to protect maintenance personnel from AC line voltages. This shall be removable by loosening screws but without removing screws.
8. Two (19) position solid aluminum, tin plated neutral buss bar with raised slotted & torque style screw heads.
9. One (19) position solid aluminum, tin plated ground buss bar with raised slotted & torque style screw heads.
10. Two MOVs shall be terminated on the 120AC in field terminal. One tied between line and ground, the other between neutral and ground.

#### **86-3.03V Cabinet Components**

1. Malfunction Management Unit (MMU): The cabinet shall come with a (MMU) that meets all the requirements of NEMA TS2-2003 while remaining downward compatible with NEMA TS1. It shall have (2) high contrast LCD displays and an internal diagnostic wizard. It shall come with a 10/100 Ethernet port. It shall come with software to run flashing yellow arrow operation. The MMU shall be an Eberle Design, Inc. model MMU2-16LEip or approved equivalent.
2. Loop Detector: The cabinet shall come with the necessary amount of NEMA TS2 Type A, two-channel, solid state inductive loop detectors required for the operation of the signalized intersection. The detector shall provide a push-button interface and a display showing the relative strength of the vehicle call, operational mode and frequency. The detector shall support the capability to program the unit in one step utilizing the presence of one mid-size vehicle over the roadway loop. The detector shall support up to four operating frequency levels. The detector shall be able to display and report three types of loop faults: open loops, shorted loops, and 25% sudden changes in inductance. The detector shall be Eberle Design, Inc. model LMD622 or approved equivalent.
3. Load Switch: The cabinet shall come with (16) load switches. All load switches shall be discreet type and have LED indications for both the input and output side of the load. The load switches shall be PDC model SSS-86I/O or approved equivalent.
4. Flasher: The cabinet shall come with (1) flasher. The flasher shall be discrete type and have LED indications. The flasher shall be PDC model SSF-86-3 or approved equivalent.
5. Flasher Transfer Relay: The cabinet shall come with (8) heavy duty flash transfer relays. The relays shall be Detrol Controls model 295 or approved equivalent.
6. Bus Interface Unit (BIU): The cabinet shall come with (4) bus interface units (BIU). These shall meet all the requirements of NEMA TS-2 1988 standards. In addition, all BIUs shall provide separate front panel indicator LED's for DC power status and SDLC Port 1 transmit and receive status. The BIUs shall be Eberle Design, Inc. model BIU700 or approved equivalent.
7. Power Supply (PS): The cabinet shall come with a shelf mounted cabinet power supply meeting at minimum TS 2-2003 standards. It shall be a heavy duty device that provides +12VDC at 5 Amps / +24VDC at 2 Amps / 12VAC at .25 Amp, and line frequency reference at 50 mA. The power supply shall provide a separate front panel indicator LED for each of the four outputs. Front panel banana jack test points for 24VDC and logic ground shall also be provided. The power supply shall provide 2A of power and be able to cover the load of two (2) complete detector racks. The power supply shall be Eberle Design, Inc. model PS250 or approved equivalent.
8. Manuals & Documentation: The cabinet shall be furnished with (3) complete sets of cabinet prints.

All cabinet wiring, and layout shall come on (1) E1 size sheet, multiple pages shall not be allowed. Upon request, (1) CDROM with AutoCAD v2008 cabinet drawing for the cabinet wiring shall be provided.

### **86-3.13 Payment**

Payment for the Traffic Signal Controller Cabinet shall include all costs incurred in furnishing, delivering and installation of the foundation, controller cabinets with sub-assemblies and auxiliary equipment, and the system interface termination panel and shall be made under:

*Traffic Signal Controller Cabinet*

*Per Each*

### **86-4.00.1 Traffic Signal and Pedestrian Equipment**

All mast arm vehicle signal heads shall have type "MAS" (side tenon) mounting unless specified otherwise.

All vehicle signal heads, visors, backplates, pedestrian signal housings, and pedestrian pushbutton housings, and signal framework/mountings shall be factory finished black unless specified otherwise on the project plans.

The contractor shall furnish and install red, amber, and green (circular and/or arrow) Light Emitting Diode (LED) modules in all new vehicle signal heads. The LED signal modules shall conform to 2018 Caltrans Standard Specifications and be listed in the 2018 Caltrans Pre-Qualified Product List for LED Traffic Signal Modules. Each signal section shall be provided with a removable full circle metal visor conforming to ANSI Standard D-10.01. Plastic visors shall not be used.

The contractor shall furnish and install a LED countdown type pedestrian signal module in each new pedestrian signal housing. Modules shall be furnished with a Portland Orange "Upraised Hand", Lunar White "Walking Person" and 9" high 2-digit countdown timer. The LED modules shall conform to 2018 Caltrans Standard Specifications.

The contractor shall furnish and install Accessible Pedestrian Signal System. The system shall be a Polara iNavigator 2-Wire system or approved equal. The APS system shall not require any drilling on the cabinet or connection to the pedestrian signal heads.

The system shall consist of a Central Control Unit (CCU), the Accessible Pedestrian Push Button Stations (PBS) with pole mounting assembly, and entire system shall be configurable from any pedestrian button over Bluetooth. The configuration is to be done by a phone or tablet using a mobile app (IOS, Microsoft and Android) provided by the manufacturer.

The Accessible Pedestrian Push Button Station shall be ADA compliant. The Audible-Tactile push button shall be designed to provide both a button with a raised directional vibrating tactile arrow on the button and a variety of audible sounds for different pedestrian signal functions. The unit shall have a weatherproof speaker, and the appropriate informational sign (MUTCD R10-3 9 inch x 12 inch) for each location. The external housing shall not have any polycarbonate or plastic parts. The body shall be UV stabilized, and weather- and chemical- resistant. The assembly shall be shockproof and rainproof in any weather condition.

The System shall meet the following requirements:

- Functionality requirements of MUTCD 2012 Section 4E.09 through 4E.13 regarding Accessible Pedestrian Signals and Detectors
- NEMA TS2 Section 2.1 Temperature and Humidity requirements
- NEMA TS2 Section 2.1 Transient Voltage Protection requirements
- NEMA TS2 Section 2.1 Mechanical Shock and Vibration requirements

- IEC 61000-4-4, IEC 61000-4-5 Transient Suppression requirements
- FCC Title 47, Part 15, Class A Electronic Noise requirements
- NEMA TS 4 (applicable portions of Section 8) Electrical Reliability requirements
- NEMA 250 – Type 4X Enclosure requirements
- Central Control Unit shall meet NEMA 250 – Type 1 enclosure requirements

Functional Requirements:

- The System shall support at least 16 PBSs per intersection (on at least 1 channel) controlled by a single base unit located in the traffic control cabinet.
- The System shall be able to be set to vibrate a tactile arrow button during the WALK interval following a button push and/or every time the walk comes up.
- The System shall have the field-selectable function known as “LOCATE TONE”. This means that during the FLASHING DON’T WALK and the DON’T WALK intervals, the system shall provide a locating tone that emanates from the Pedestrian Push Button Station. The system shall provide at least 3 different sounds to choose from.
- The System shall have the field selectable function known as “Extended Push Activation”. This is defined as the audible WALK message shall only be activated and audible during the WALK interval if the button is depressed for a field selectable minimum period of time (from 0.5 to 6 seconds). Also, for the following walk and clearance intervals, the volumes have a separately settable minimum and maximum volume level.
- The System shall have the field selectable function known as “Informational Message”. This means that a custom message giving the location of the street to cross and the intersection (or other information) will be vocalized only when the button is depressed for a minimum field selectable time.
- The System shall provide a “Wait” message that plays once the button is activated until the Walk cycle goes into effect. This message must have the field selectable option of OFF or repeating every 4, 6, 8 or 10 seconds.
- The System shall have standard “Travel Direction” options that can be selected at the time of installation.
- The System shall have at least 10 field selectable WALK sound options including a cuckoo, a chirp, an MUTCD rapid tick or custom voice message.
- The System shall provide at least 7 Ped-clearance sound choices including audible countdown (field selectable). The audible countdown shall represent the time remaining during the pedestrian Clearance interval. Timing is automatically adjusted to the CLEARANCE INTERVAL timing, provided by the traffic controller.
- The System shall provide 2 language capabilities, selectable by user (as a field selectable feature).
- The System shall provide an Emergency preemption message in conjunction with a preemption system (selectable feature).
- The system LOCATE TONE, WALK, and DON’T WALK audible features shall have independent assignable minimum and maximum volume limits. CLEARANCE volume level shall be controlled by WALK volume setting.
- All sounds for all PBSs shall be synchronized.
- The system shall have a non-visible, ambient sensing microphone located in the pedestrian station in an environmentally protected housing.
- The LOCATE TONE volume shall adjust automatically in response to ambient noise with field selectable adjustment levels from -30dB below to +20dB above ambient in 2.5dB increments.
- All other sounds volumes shall adjust automatically in response to ambient noise with field selectable adjustment levels from -30dB below to +20dB above ambient in 5dB increments.
- The system shall utilize high quality digital audio technology, with a minimum 16-bit sample at a 48 kHz sample rate.

- The PBS firmware and voice messages shall be updatable via Bluetooth. There shall be no requirement for the IC chips or module hardware to be removed or exchanged in order to complete a firmware or audio update.
- The System shall have the option to mute sounds on all crosswalks except activated crosswalk (selectable feature).
- The System shall have a real time clock capable of keeping time when there is no system power, for at least 2 years from the date of manufacture.
- The System shall have the ability to have four separate program configurations with all features available, and any single configuration can be selected through an external input.
- The System shall provide a user settable calendar function, allowing four separate configuration profiles to be configured to become active at different times of the day on a daily, weekly, or holiday basis.
- The entire System shall be configurable from any PBS over Bluetooth.
- The entire System shall be configurable from the CCU over Wi-Fi or Ethernet.
- All field access to selectable options using a Bluetooth, Wi-Fi or Ethernet devices shall be protected using password security.

Pedestrian push buttons shall be mounted 42-inches above the finished walking surface at each pole location identified on the project plans. At locations where the pedestrians push buttons are to be located on poles that are within the sidewalk, the pedestrian pushbuttons shall be mounted 42-inches above the sidewalk walking surface grade. At locations where the pedestrians push buttons are to be installed on poles that are located within raised (6 inch) traffic island including porkchop islands or medians, the pedestrian push buttons shall be mounted 42-inches above the surrounding finished walking surface grade of the raised traffic islands.

Pedestrian signal heads shall have a front screen fabricated of polycarbonate plastic mounted in an aluminum frame in conformance with Option 2 of Section 86-1.02S(3)(d), "Front Screen" of the 2018 Caltrans Standard Specifications.

Each pedestrian signal housing shall be provided with a 2-inch spacer between the special signal bracketing hardware and the pedestrian signal housing. The spacers will allow the pedestrian signal housing to be rotated in place after installation.

*Payment for this work shall be deemed included in the lump sum price for bid item  
870403A "Signal and Lighting System (Monterey Rd and Blossom Hill Rd)"*

#### **86-4.01.1 Traffic Signal Faces and Fittings**

Traffic signal faces and fittings shall conform to the provisions of Section 86-4, "Traffic Signal Faces and Fittings," of the Standard Specifications, the Standard Details, and these Special Provisions.

#### **86-4.06.1 Signal Mounting Assemblies**

Signal mounting assemblies shall conform to the provisions of Section 86-4.06, "Signal Mounting Assemblies," of the Standard Specifications and the Standard Details.

*Payment for work under this section shall be deemed included in other items of work and no additional compensation shall be allowed therefor.*

#### **86-5 Vehicle Detection**

##### **86-5.01E Multi-Sensor Detection System**

**86-5.01E (1) General**

Multi-Sensor Detection System (MSDS) shall be capable of accurately detecting and tracking vehicles, on a lane by lane basis at distances of over 500 feet from the MSDS sensor. The MSDS shall also detect bicycles, and pedestrians in real time. System shall provide accurate stop bar and advance detection in any weather condition. All units associated with the MSDS shall not require rewiring to the City's standard P controller cabinet. All items below shall be provided from the same manufacturer and not require installation by the vendor.

Contractors shall furnish (#) Iteris Vantage Vector Hybrid Unit with (#) Vantage Next CCU unit or approved equal. The entire video detection system shall consist of the following:

- Shelf-mount Central Management Device (CMD) to connect with intersection detection sensors, provide SDLC connection to Traffic Controller, and support standard Transmission Control Protocol (TCP) & Internet Protocol (IP) for remote access and configuration
- Detection Sensor consisting of at least two different sensor technologies including BOTH video imaging and radar
- Sensor mounting bracket(s)
- CCTV monitor
- Programming devices and/or software
- Ethernet Cables (CAT5e or CAT6) for sensor power & operation
- All other necessary equipment for operation
- Training for installation, operation, & maintenance

All items and materials furnished shall be new production models that are currently in distribution.

**86-5.01E (2) Multi-Sensor Detection System Cabinet Hardware**

The MSDS shall be modular by design and be compatible with NEMA TS-1, NEMA TS-2 Type 1 and Type 2, and Caltrans 332 cabinets requiring no adapters.

To allow for flexibility and universal compatibility, CMD shall be shelf-mounted and not require connection into the detector rack. CMD shall not exceed sizes of 11" H x 11" D x 7" L to ensure unit fits within all City standard cabinets.

For ease of operations and maintenance, communications to and between sensors CMD shall not require connections through the detector rack backplane. This includes video inputs/outputs and serial data inputs/outputs. CMD may still obtain power from the detector rack backplane. The CMD shall not exceed 150 Watts and utilize a 48V DC power supply if necessary.

The CMD shall connect to a maximum of four (4) sensors. The CMD shall have built-in surge suppression for each sensor input, as well as, power supplied to the sensors. If fault conditions are detected, the MSDS shall safely shut down power to corresponding sensors and peripherals and place a constant detector call for all detectors affected.

All detection processing shall be performed through the CMD. Detection and status LEDs shall be provided on the front panel of the CMD.

Central Management Device shall provide a minimum of one (1) serial communications port, front panel accessible, in the form of a USB Type A connector, to be used for a pointing device or offline USB storage for bin data and video collection of the entire MSDS. CMD shall allow the upgrading of its firmware through a USB port using a USB thumb drive.

Multi-sensor Detection System shall support Ethernet based network communication capabilities to allow remote configuration and management of the video detection software via an RJ45 port compliant with IEEE 802.3. The MSDS shall support data rates of up to 100 Mbps. The system shall be capable of displaying streaming video in H.264 video codec via the Real Time Streaming Protocol (RTSP), and require no more than one IP to configure the unit. This can be accomplished with additional equipment separate from the detection processor card, such as an addition detector rack card or a stand-alone control unit. The CMD shall be able to be remotely configured.

The MSDS shall have SDLC functionality providing outputs of vehicle detection calls CMD to the signal controller and the passing of time and phase information from the signal controller to the MSDS hardware. All wiring for SDLC functionality shall be made from the front side of the equipment in the form of a 15-pin "D" connector compliant to NEMA TS-2 specifications. In TS-1 cabinets, CMD shall allow for connection from the NEMA-D Cable harness.

**CCTV LED Monitor** - A shelf mount, LED screen shall be connected to the MSDS via HDMI and be used to monitor, configure, and maintain the detection system. The monitor shall meet the following minimum specifications.

<b>Resolution</b>	1024 x 768
<b>Input</b>	HDMI
<b>Screen Size (Diagonal)</b>	10 inches
<b>Aspect Ratio</b>	4:3
<b>Contrast Ratio</b>	600:1
<b>Brightness Level</b>	350 cd/m <sup>2</sup>
<b>Display Colors</b>	0.26 million
<b>Viewing Angle</b>	160 degrees Horizontally, 150 degrees vertically
<b>Response Time</b>	12ms
<b>Operation Temperature</b>	0° - 50° C, <70% relative Humidity
<b>Power</b>	110 VAC or 220 VAC, 50 or 60 Hz
<b>Approximate Mean Time Between Failures (MTBF)</b>	50,000 Hours

### **86-5.01E (3) Vehicle Detection System Software**

The vehicle detection system software shall be capable of detecting the presence of individual vehicles, bicycles, and pedestrians and meet the following specifications:

Vehicle detection zones shall be configured without the use of an external computer, using only a video monitor and mouse using the on-screen menu. Configuration shall include the placement of detection zones, setting detection zone parameters, and viewing of the system settings. All configurations shall occur on real-time video, with no snapshots or still images allowed.

The detection software shall, in real-time, detect and track the presence of vehicles and bicycles. The detection software shall be able to differentiate between bicycles and vehicles, providing the ability to assign separate output channels for bicycle zones to allow traffic controllers to implement special bicycle timing for applications where the traffic controller has separate bicycle detection inputs. This feature shall not require the use of additional modules or equipment.

The MSDS shall be able to calculate speed, volumes, and occupancy for all vehicles, bikes, and pedestrians. This information shall be stored within the device and available for retrieval.

The MSDS shall provide a detection accuracy of at least 98% in good weather conditions and slight degradation under adverse weather conditions where visibility is reduced. In low-visibility conditions, MSDS shall be able to place constant detector calls to the controller. The system shall return to normal operation when conditions are resolved.

Up to 32 detection zones per sensor input shall be supported and each detection zone can be sized to suit the site and the desired vehicle detection region. Each detection zone shall have the ability to change its characteristics based on external inputs (e.g. signal phase). Each zone shall also be able to switch to different zone types (e.g. presence, extension, delay, pulse, etc.) depending on signal state.

Multiple detection zones configured to a single output shall allow Boolean logic modifiers to enable OR by default, and may be AND to indicate vehicle presence on a single approach of traffic movement.

The vehicle detection system software shall employ color overlays that displays phase status and real-time actuation of detection zones upon vehicle detection. on video outputs. The user shall have the ability to enable or disable the display of this information.

#### **86-5.01E (4) Detection Sensor**

The sensor shall consist at least two different sensor technologies, including both video imaging and radar. At least one sensor shall be mounted per intersection approach at the luminaire or signal mast arm.

Camera sensor focus control and field of view parameters shall be configurable from either the camera or the controller cabinet. Site-specific information (i.e. longitude and latitude) shall not be required for configuration.

Sensor shall also meet the following minimum requirements:

<b>Camera Zoom</b>	12x
<b>Imager</b>	Wide Dynamic Range (WDR) >100dB
<b>Radar Frequency</b>	24GHz (K-band)
<b>Radar Accuracy</b>	± 1 MPH
<b>Tracked Objects</b>	>30
<b>Weight</b>	<10 lbs
<b>Operation Temperature</b>	-34° - 74° C
<b>Humidity</b>	0% - 95% (non-condensing)
<b>Enclosure Protection</b>	IP 67
<b>Connection</b>	RJ-45

**Mounting Brackets** - Mounting brackets shall be supplied by the manufacturer and applicable to general installation onto luminaire and traffic signal mast arms.

Project plans shall dictate and supersede the above usage of appropriate mounting brackets and mounting locations.

**Cable (Data & Power)** - Sensor shall require a single shielded CAT5e or CAT6 cable for power, communications, and video. Cable termination at the sensor for video and power shall not require special tools. Both ends of the cable terminating at the sensor and CMD shall be RJ-45 connections.

#### **86-5.01E (5) Installation**

The sensor shall be mounted on the luminaire and /or signal mask arm as shown on the project plans. The mounting brackets for the sensors shall be installed per the manufacturer's specifications.

#### **86-5.01E (6) Services**

**Training** - The vendor shall provide installation, operation, and maintenance, and troubleshooting training at the City's facility and based on availability of City staff. The training shall be comprehensive and cover all aspects of the MSDS equipment and components. A training plan shall be submitted for approval prior

to implementation that outlines the agenda and information to be presented to City staff. Training shall be provided by an engineer or qualified personnel certified by the product manufacturer, with minimum three (3) years of experience in the type of equipment to be installed. The vendor shall provide all necessary equipment to be used during the training sessions for training purposes. The City may elect to record these training sessions for City's sole use for future training purposes. The resulting recordings shall be the sole property of the City and for the sole use of the City.

Upon City's request, vendor shall provide classroom training on City facilities. Two classroom training sessions shall be held with an audience of no more than twelve (12) students per session. Each session shall cover, but not limited to, basic equipment setup and configuration, practical hands-on installation procedures, industry best practices, tips for easy and reliable installation, maximizing the use of the central management system, if available, to minimize equipment downtime, and identifying proper troubleshooting techniques.

In addition to the classroom training, vendors shall provide a maximum four (4) days of hands-on field installation training and technical support at a minimum of three (3) field locations to be determined by the City. Training shall encompass, but not limited, to equipment setup and configuration, wiring and connections, mounting and alignment, and testing. Rigging and actual equipment installation will be performed by City personnel. Field training to be scheduled based on City availability and installation schedule.

Vendor shall provide training manuals for each participant. In addition, vendor shall provide five (5) Maintenance Manuals including pertinent installation, startup instructions, and troubleshooting procedures and five (5) Operation Manuals covering configuration and operations. In addition to the hard copy set of manuals, each manual shall be provided in electronic copy on a CD or DVD in Adobe™ Acrobat format.

**Hardware Warranty, Maintenance, and Support** - All MSDS equipment, including, but not limited to, the sensor and CMD shall be guaranteed against defective materials and workmanship for a three (3) year period from City's receipt of material. Units that are identified as being defective before the warranty has expired shall be replaced within five (5) business days at no cost to the City.

The vendor shall be responsible for all equipment replacement costs, including recall, de-installation and reinstallation, all transportation, for all units determined to be a warranty covered failure within the warranty period.

**Software/Firmware Warranty, Maintenance, and Support** - The software/firmware shall be warranted and supported by the vendor for a three (3) year period from City's receipt of the software/firmware. During this period, support at a minimum shall include, without charge, all publicly available additions and improvements to the functionality, as well as new upgraded functions of the software/firmware.

Notification of alleged and identified operational problems and faults in relation to the software/firmware shall be made as soon as they become known. Distribution of solutions or processes to eliminate and/or reduce the impact of such problems or faults when such solutions or processes become available shall be provided by the vendor to City.

The vendor shall provide during City normal business hours, toll free, phone technical support. This technical support shall be at no additional cost during the software's warranty period. The technical support shall be provided by factory-certified personnel or factory-certified installers.

#### **86-5.01E (7) Payment**

Payment for MSDS shall include all materials, labor, equipment, incidentals, and services related to installing, programming, testing, and training of the multi-sensor detection system.

Packaging, shipping and handling of replacement equipment sent to the City or returning defective video detection equipment by the City shall be at no cost to the City.

*Payment for this work shall be deemed included in the lump sum price for bid item  
870403A "Signal and Lighting System (Monterey Rd and Blossom Hill Rd)"*

## **86-6 Lighting**

Roadway and safety lighting shall conform to the provisions of Section 86-6, "Lighting," of the Standard Specifications, the Standard Plan Details, and these Special Provisions.

*Payment for work under this section shall be deemed included in other items of work and no additional compensation shall be allowed therefor.*

### **86-6.14 Led Luminaires**

#### **86-6.14A Bike and Pedestrian Path Lighting Fixtures**

For Bike and Pedestrian Path lighting, luminaires shall be as follows and as specified in the plans:

- 1) Pole Mounted Fixture:
  - a) The fixture shall be Cree QSQ-A-NM-2ME\*-Z-30K-UL-BK-R or approved equal
  - b) The fixture shall be mounted at 16 feet height
  - c) The pole shall be Valmont Model Number 16006060554 or approved equal
- 2) Truss Mounted Fixture:
  - a) The fixture shall be Voltaire VWP-H-L30-T3-BLK-SF-CD-DIM-UNV or approved equal
  - b) The fixture shall be mounted on truss as specified in these special provisions and as indicated on plans
  - c) The fixture shall be bolted to a 4 inch by 4 inch by 2 1/8 inch steel water-tight junction box. The junction box shall be welded to the truss structure.
  - d) The contractor shall follow the "VWP LED Series Installation Instructions" attached to these special provisions. The entry hole shall be sealed against water intrusion as described in Step 4.
  - e) The wiring shall be fed to the fixture junction box through a steel water-tight junction box with a minimum volume of 45 cubic inches. This junction box shall be located to the side of the fixture at the same height. Placement shall be approved by the engineer.
- 3) Surface-mounted lighting Fixtures (under bridge ceiling):
  - a) The fixture shall be Gardco by Signify, Model Number: SVPG-140L-1200-CW-G2-SM-5-120-DD-F2-MGY or approved equal.
  - b) The fixture shall have a top surface fixture diameter or length or width mounted to pull box of 5.25 inches or less.
  - c) The fixture shall have a height of 5 inches or less.
  - d) The fixture shall have an overall fixture diameter or length or width of 18.5 inches or less.
  - e) The fixture shall be vandal-deterrent and bird deterrent. The fixture listing in 3.a shall have a Bird Deterrent Coil (BXC) installed on top of the fixture, or approved equal.

If a different fixture is proposed, lighting analysis calculations and proposed mounting must be provided to receive fixture approval.

*Payment for Bike and Pedestrian Path Lighting shall be made under:  
870200 "Lighting System"*

#### **86-6.14B INSTALL PHOTOCCELL/ SHORTING CAP**

Installing photocells or shorting caps on new luminaires shall conform to the provisions of Section 86-6.07, "Photoelectric Controls," and Section 86-6.07A, "Types," of the Standard Specifications, and these Special Provisions.

Units for street lighting shall have a "turn-on" of 1 foot-candle and a "turn-off" of 1.5 times the "turn-on". Units shall conform to ANSI standard C136.10. No thermal types are allowed. Units shall have a delay on "turn-off" to prevent cycling because of stray lights such as headlights. The supply voltage rating shall be 60 Hz. 105-130 or 210-240 volts as specified or as required.

The load rating shall be 1800 VA minimum high pressure, low pressure or LED

The work required to install photocells or shorting caps on existing luminaires shall include but is not limited to removal of existing photocell or shorting cap.

*Payment for compliance with this section shall be deemed included in the various other items of work, and no additional compensation shall be allowed.*

#### **86-6.14C      Bike and Pedestrian Path Lighting**

Payment for lighting and electrical work for the bicycle path lighting shown on the plans shall be paid for at the contract lump sum price for the Lighting System, unless noted otherwise. Such lump sum price shall include full compensation for furnishing all labor, materials, tools, equipment, incidentals and installing per each Roadway Lighting System as shown on the plans, as specified in the Specifications and these Special Provisions, and as directed by the Engineer, including but not limited potholing; dust control; removing and installing appurtenances damaged or destroyed during construction; tree trimming, restoration of surface improvements; watering; earthwork; asphalt concrete construction; curb construction; sidewalk, parkstrip, gutter depression and driveway construction; record drawings; maintaining existing and temporary electrical systems; installing foundations, excavating, backfilling; abandoning foundations; installing pole standards, luminaire mast arms; conduits laid in place or directionally bored as required; installing pull boxes; circuitry, fuses, fused splice connectors, bonding and grounding, grounding lugs, luminaires and lamps; making all tests; pole numbering; install photocells or shorting caps; and all other work necessary or required for satisfactory and legally operable installation.

*Payment shall be made under:  
870200 "Lighting System"*

#### **86-7      Removing, Reinstalling or Salvaging Electrical Equipment**

Removing and/or salvaging of equipment shall conform to the provisions of Section 86-7.01, "Removing Electrical Equipment," of the Standard Specifications and these Special Provisions.

Equipment to be salvaged shall be delivered to the City of San José Mabury Yard at 1404 Mabury Road. The contractor shall contact the City of San José Department of Transportation at (408) 794-1969, three (3) working days in advance to arrange for acceptance of salvaged equipment.

*Payment for work under this section shall be deemed included in other items of work and no additional compensation shall be allowed therefore.*

#### **86-9      Traffic Signal Activation**

Prior to the traffic signal activation, the contractor as directed by the Engineer shall align all vehicle heads in the field. The signal shall be complete and ready for operation, and approved ready for activation by Engineer.

*Payment for work under this section shall be deemed included in other items of work and no additional compensation shall be allowed therefor.*

**86-9.1 Traffic Signal System**

**86-9.2 Payment**

Payment for signal, lighting and electrical work shall be on a lump sum basis per each intersection. The lump sum price shall include full compensation for furnishing all labor, tools, equipment and materials, and performing all the work involved in constructing the systems, complete in place as shown on the plans and as specified herein. The work will include but not be limited to maintaining existing and temporary electrical systems, rewiring existing streetlight poles, installing foundations, removal of foundations, abandoning foundations, installing or abandoning standards, conduit, potholing, pull boxes, Pacific Gas and Electric Company's pullboxes, conductors, communications cable, flexible conduit innerduct, circuitry, bonding and grounding, services, traffic signal equipment, installing signal preemption detectors, installing CCTV cameras, installing APS systems, installing non-intrusive detection equipment such as video detection systems and microwave detection equipment, tree removal and trimming, irrigation restorations and/or modifications, landscaping restorations, sidewalk restorations, new sidewalk, new curb, new island cap, lighting equipment, furnishing and installing sign hanger assemblies except for furnishing and delivering traffic signal cabinet assemblies, removal of all utility paint markings, notifications to residents/businesses and survey monument removal and replacements. The work shall also include all specified testing, painting and removal and/or salvage of existing equipment. All existing painted traffic signal poles and painted street lighting standards that are modified in any way shall be re-painted unless otherwise approved in writing by the Engineer.

*Payment will be made under:*

*770010 "Signal and Lighting System [San Jose] (Monterey Rd and Blossom Hill Rd)"*

# VWP LED SERIES

## INSTALLATION INSTRUCTIONS



**WARNING:**

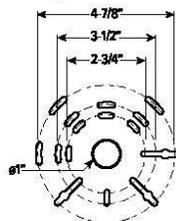
- Caution - Risk of Shock. This product must be installed in accordance with the applicable installation code by a person familiar with the construction and operation of the product and the hazards involved.
- Make sure all electrical power is turned off while installing the fixture.
- Warning Risk of Electrical Shock - Verify that supply voltage is correct by comparing it with the luminaire label information.
- This luminaire must be adequately grounded for protection against shock hazards and to assure proper operation.
- Must be anchored to adequate structure that can safely support fixture weight.
- Disconnect power before servicing.

**TOOLS REQUIRED:** 1/8" hex key (by others)

**STEP 1:** Carefully unpack fixture, taking precautions not to scratch lens or finish. Using hex key, loosen set screws and remove fixture from gasketed mounting plate (or battery box).

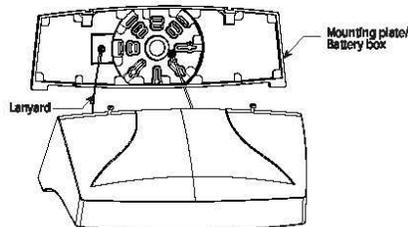
**STEP 2:** Fixture surface mounts to 4" maximum junction box (by others). Position mounting plate/battery box and align mounting pattern (FIG. 2.1) to junction box. For indirect (uplight) mounting, rotate mounting plate 180°. For ease of alignment, remove only the pre-cut portions of gasket that align with selected mounting locations. Feed supply leads through center hole of gasket and mounting plate. Ensure mounting plate is level and secure to junction box with screws, by others.

FIG. 2.1 – Mounting Pattern Detail



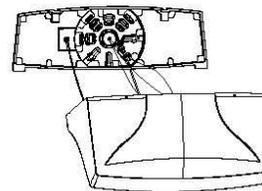
**STEP 3:** With fixture in hand, take the loose end of the lanyard and attach it using the provided keps nut to the threaded pole on the mounting plate. Carefully, let the fixture hang from the lanyard so that you may make wiring connections. **DO NOT DROP THE FIXTURE.**

FIG. 3.1



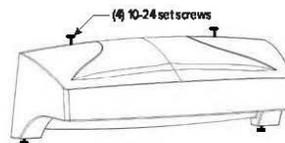
**STEP 4:** Draw in three wires coming through the rubber grommet hole and into the fixture housing. Connect supply ground wire from the mounting plate to the ground wire in fixture. Connect supply power to the connectors coming from the fixture. You may use the included rubber grommet to help seal the wire entry hole from water intrusion. Use outdoor grade silicone caulking at all hardware & wiring entry points to prevent possible water intrusion

FIG. 4.1



**STEP 5:** Carefully tuck wires into the fixture housing (or battery box) and lift fixture onto the mounting plate. Firmly press fixture into mounting plate and, using a 1/8" hex key, tighten the 10-24 set screws.

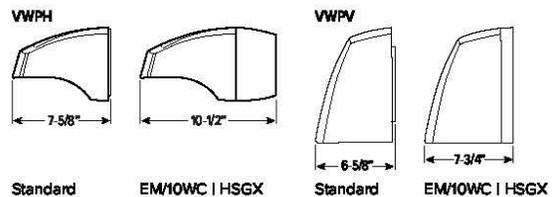
FIG. 5.1



**EM OPTION**

EM driver is enclosed in housing extension (battery box) that comes attached to the back of the fixture in lieu of standard mounting plate. Install following steps 1-5 above, replacing mounting plate with battery box. Mounting pattern remains the same. Overall housing depth is increased, see FIG. 6.1 for side view details.

FIG. 6.1



## SECTION 1503

### INTERIOR LINING OF SANITARY SEWER MANHOLE

**1503-1 General** –Interior lining of sanitary sewer manhole shall be the same as manhole rehabilitation in the following special provisions.

Installer of manhole rehabilitation system shall be certified by the manufacturer of the rehabilitation products. Certification shall be submitted to the Engineer for approval.

The Contractor and the manufacturer shall guarantee workmanship, materials, installation and completed product for a period of three (3) years from the date of substantial completion of the manhole rehabilitation work.

**1503-2 Infiltration Observation** – As part of the television inspection performed prior to rehabilitation, the Contractor shall identify the manholes that show any amount of groundwater infiltration. The Contractor shall submit to the Engineer a written log accompanying the recorded DVD which identifies the manholes and levels of infiltration.

**1503-3 Materials** – All materials used shall be specifically designed for use in manhole rehabilitation. All materials used shall be, whenever possible, from the same manufacturer. All materials shall be submitted to the Engineer for review and approval. The manufacturer shall provide certification that the materials proposed for use are compatible with one another. All materials that shall contact the sewer environment shall be specifically designed for chemical resistance to the sewer environment. The manufacturer shall provide certification verifying the materials meet the following requirements: Epoxy Lining - the material shall meet the requirements set forth in Section 211-2 of the Greenbook, "Chemical Resistance Test (Pickle Jar)," with the maximum allowable weight change of  $\pm 1.5\%$ . Cured in Place Lining - the material shall meet the requirements set forth in ASTM-F1216.

**1503-4 Preparation** – Pipe plugs shall be placed in all pipe openings to the manhole to prevent entry of material into pipelines. Flows in upstream pipes connected to manhole shall be diverted or pumped.

The surface shall be prepared in accordance with the manufacturer's recommendations and these Special Provisions.

1. Manhole rungs, if present, shall be removed prior to any other surface preparation. Existing manhole rungs shall be removed by cutting the rungs flush with the wall of the manhole and any rough edges ground smooth. Any holes in the manhole wall left by the removal of the rungs shall be cleaned and patched with quick setting, non-shrink grout. The quick setting, non-shrink grout shall be submitted to the Engineer for review. The grout shall be mixed and applied without the use of any aggregate as per the manufacturer's specifications and the Standard Specifications and these Technical Specifications.
2. All interior manhole surfaces shall be cleaned with high-pressure water to remove all loose concrete, oils, grease, and other materials that would prevent proper bonding of the coating or lining.
3. Any infiltration that is present shall be stopped using a material specifically designed for such use. Infiltration patching material shall be compatible with any other material that it may contact. Infiltration patching material and manufacturer's installation procedure shall be submitted to the Engineer for review.
4. Prepared surfaces shall be tested for pH and moisture content to ensure proper conditions exist for application of the coating or lining.
5. All voids shall be patched using a material specifically designed for such use. Patching material shall be compatible with any other material that it may contact. A void shall be

defined as any area whose surface is 3/8-inch deeper than the adjacent wall. Void areas shall be patched so as to restore a smooth wall surface.

6. Patching materials shall be allowed to cure properly and in accordance with manufacturer's recommendations prior to application of lining.
7. All debris resulting from the surface preparation operations shall be removed and shall not be allowed to enter the sewer system. If debris does enter the sewer main, contractor will flush and remove material using a vactor at the contractor expense.

**1503-5 Lining/Coating of Invert** – The rehabilitation lining to be used shall extend to and include the invert of the existing manhole. The invert of the manhole shall be raised to provide a smooth transition from the upstream to downstream end. Material used at the manhole invert shall be suited to its intended purpose and shall be compatible with material it contacts.

**1503-6 Removal and Disposal of Debris** – The Contractor shall be responsible for removal and disposal of all debris removed during the cleaning and rehabilitation process. The Contractor shall comply with all Federal, State, and local regulations regarding disposal of debris.

**1503-7 Acceptance Testing** – The completed manhole rehabilitation system shall be subject to spark and/or pull-off (adhesion test) testing. Repairs and re-testing shall be made at Contractor expense until the required tests have been passed. All epoxy based rehabilitation methods shall be subject to spark and adhesion testing. Cured-in-place liner shall be subject to spark testing. Cementitious liner shall be subject to thickness verification in accordance with the manufacturer's recommendations and shall be submitted to the Engineer for approval.

Method of repair of defects shall be in accordance with the manufacturer's recommendations and shall be submitted to the Engineer for review.

**1503-7.1 Spark Test** – This test shall be performed on manholes that have been rehabilitated with cure-in-place or epoxy liner. Spark tester shall be set to a minimum of 100 volts per 1 mil of liner/coating thickness applied. Method of repair of defects shall be in accordance with the manufacturer's recommendations and shall be submitted to the Engineer for approval.

**1503-7.2 Pull-Off or Adhesion Test** – This test shall be performed on manholes that have been rehabilitated with epoxy liner. Measurement of pull-off strength of coatings shall be measured in accordance with ASTM D4541. A minimum of 3 adhesion tests shall be conducted in each structure or more as determined by the Engineer. The tests shall be placed at intervals (top, middle, bottom) in an attempt to obtain an equal representation of the entire application. A minimum of 2 out of 3 total adhesion tests must pass in order for the structure to be considered passing. If additional tests are required by the Engineer, a minimum of 75 percent of the samples must pass. Pull-off adhesion tests which are to be considered "passing" shall indicate "Substrate Failure" as evidenced by not less than 50 percent of substrate bonded to the test sample. If "Substrate Failure" is not achieved and the bond is broken between the applied product and the substrate during testing, pull strength of a minimum of 250 psi shall be "passing". Any areas detected to have inadequate bond strength shall be evaluated by the Engineer. Further bond tests shall be performed in that area to determine the extent of potentially deficient bonded area. Repairs of such deficient bonded areas shall be made at the Contractor's sole expense in accordance with manufacturer's recommendations. The repair method shall be submitted to the Engineer for acceptance.

All Adhesion tests shall be conducted by an independent certified testing firm that specializes in protective coating testing. The Contractor shall submit the qualifications for the independent testing firm to the Engineer for acceptance. Pull-off tests shall be performed in the presence of City Inspector.

**1503-7.3 Final Inspection** – A final visual inspection shall be made by the project inspector and

manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to manufacturer's recommendations.

**1503-8 Methods** – Sanitary Sewer manholes shall be rehabilitated using one of the following methods:

1. Cementitious Liner with Calcium Aluminate Mortar (minimum ½-inch thickness),
2. Epoxy lining (minimum 150 mils thickness),
3. Cured-in-place lining (minimum 125 mils thickness).

**1503-8.1 Cementitious Liner with Calcium Aluminate Mortar** – Cementitious liner material shall be a pre-packaged mortar mix, including all cement, aggregates, and any required additives. The mortar mix shall be pure Calcium Aluminate mortar designed for rehabilitation of deteriorated concrete and brick structures. Prior to application the Contractor shall provide to the Engineer the yield area per bag for the mortar mix. The manufacturer shall certify that the materials are compatible and are designed for use in manhole rehabilitation, sewer pipes, lift stations, or any concrete structure that is exposed to aggressive sanitary sewer environments.

Application shall be according to the manufacturer's recommendations and these Special Provisions.

The chemical composition of the cement portion as well as the aggregates of the mortar mix shall be as follows:

<b>Chemical Analysis of Main Constituents</b>			
Al <sub>2</sub> O <sub>3</sub>	CaO	FeO + Fe <sub>2</sub> O <sub>3</sub>	SiO <sub>2</sub>
39% - 47%	33% - 39%	6% - 15%	4% - 9%

1. The mortar mix shall be designed to withstand long-term exposure to a bacterially corrosive hydrogen sulfide environment that may be expected to produce a pH of 1 on normal Portland Cement Concrete or typical brick and mortar surfaces.
2. The addition of water to the mix shall be in strict accordance with the Manufacturer's recommendations. Re-mixing or tempering shall not be permitted.
3. Cementitious liner with Calcium Aluminate Mortar shall be applied to a thickness of ½- inch minimum. The thickness minimum is in addition to any material required to fill voids. For voids greater than one (1) square foot and less than ¾-inch in depth, the Contractor may request approval from the Engineer to use spray applied cementitious material to fill voids.
4. Contractor shall provide all equipment necessary to individually gauge, control, and monitor the actual amounts of component materials necessary to complete the lining installation. The type of equipment and methods used to gauge, control, and monitor component materials shall be submitted to the Engineer for review and approval.
5. Cementitious liner with Calcium Aluminate Mortar shall be allowed to cure in accordance with the manufacturer's recommendations.
6. Cementitious liner with Calcium Aluminate Mortar shall be applied to all interior surfaces of the manhole structure including invert, benches, walls, cone, chimney, and grade rings.

**1503-8.2 Epoxy Lining** – Epoxy material shall be 100% solids and shall be designed for use in manhole rehabilitation. Epoxy material shall be spray applied and in accordance with the manufacturer's recommendations and these Special Provisions. Flexible epoxy lining will not be allowed. Epoxy lining shall be applied to all interior surfaces of the manhole structure including invert, benches, walls, cone, chimney, and grade rings to create a monolithic lining. Manhole frame casting shall not be coated with epoxy. Minimum thickness of epoxy lining shall be 150 mils.

**1503-8.3 Cured-in-Place Lining** – Prior to ordering liner, measurements shall be taken to ensure that the fabricated liner fits properly in the manhole structure. The completed liner shall be a monolithic structure from the top of the manhole to the invert. Protruding laterals shall be trimmed prior to installation of the liner. The installation and curing of the liner shall be according to the manufacturer's recommendations. Upon proper curing of the liner, main line and lateral connections to the manhole shall be reopened. Suitable grout material shall be used to seal the gaps around the edges of the pipe openings. Quick setting, non-shrink grout shall be used to seal the gaps around the edges of the pipe openings. Final liner thickness shall be 125 mils minimum.

**1503-9 Measurement and Payment** – Payment for rehabilitating manholes shall include full compensation for furnishing all labor, equipment, materials, submittals, safety equipment, installation of diversion or pumping, preparation of manhole, removal of rungs, installation of rehabilitation materials, clean-up, disposal of extraneous material, and acceptance testing.

*Payment for this section will be made under:*

*Interior Lining of Sanitary Sewer Manhole*

*- Per Each Manhole*