REVISED STANDARD SPECIFICATIONS DATED 04-15-22

ORGANIZATION

Revised standard specifications are under headings that correspond with the main-section headings of the *Standard Specifications*. A main-section heading is a heading shown in the table of contents of the *Standard Specifications*. A date under a main-section heading is the date of the latest revision to the section.

Each revision to the *Standard Specifications* begins with a revision clause that describes or introduces a revision to the *Standard Specifications*. For a revision clause that describes a revision, the date on the right above the clause is the publication date of the revision. For a revision clause that introduces a revision, the date on the right above a revised term, phrase, clause, paragraph, or section is the publication date of the revised term, phrase, clause, paragraph, or section. For a multiple-paragraph or multiple-section revision, the date on the right above a paragraph or section is the publication date of the paragraphs or sections that follow.

Any paragraph added or deleted by a revision clause does not change the paragraph numbering of the *Standard Specifications* for any other reference to a paragraph of the *Standard Specifications*.

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DIVISION I GENERAL PROVISIONS

1 GENERAL

04-15-22

Add between the 1st and 2nd paragraphs of section 1-1.01:

10-19-18

Global revisions are changes to contract documents not specific to a section of the Standard Specifications. In each contract document at each occurrence, interpret the following terms as shown:

Term	Interpretation	Conditions
Fed-Std-595	AMS Std 595	--

04-17-20

Grade SS1	Grade SS-1	--
Grade SS1h	Grade SS-1h	--
Grade CSS1	Grade CSS-1	--
Grade CSS1h	Grade CSS-1h	--
Grade QS1h	Grade QS-1h	--
Grade CQS1h	Grade CQS-1h	--

10-15-21

Temporary railing	Temporary barrier system	Except Standard Plans T3A, T3B, T4
Temporary railing (Type K)	Temporary barrier system	Except section 12-3.20, Standard Plans T3A, T3B, T4
Transportation Laboratory	METS	--
Type K temporary railing	Temporary barrier system	Except section 12-3.20, Standard Plans T3A, T3B, T4

Add to the table in the 1st paragraph of section 1-1.06:

04-19-19

CSC	conductor signal cable

04-17-20

NDS	National Design Specification for Wood Construction
BWC	Bonded wearing course

04-15-22

ALR	Area of Localized Roughness
IRI	International Roughness Index
MRI	Mean Roughness Index
PPF	Pavement Profile Format
ProVal	Profile Viewer and Analyzer
UAS	unmanned aircraft systems

Replace the row for *FDR* in the table in the 1st paragraph of section 1-1.06 with:

10-15-21

FDR	full depth recycling

Replace the definition of *schedule* in section 1-1.07B with:

04-15-22

schedule:

1. **baseline schedule:** Initial schedule showing the original work plan starting on the date of Contract approval. This schedule shows no completed work to date and no negative float or negative lag to any activity.
2. **update schedule:** Current schedule developed from the accepted baseline and any subsequent accepted update schedules through regular monthly review to incorporate actual past progress.

Replace the row for *12* in the table in the 1st paragraph of section 1-1.08 with:

04-17-20

12	Orange (Ora)	1750 E 4TH ST STE 100 SANTA ANA CA	1750 E 4TH ST STE 100 SANTA ANA CA 92705-3909

Replace the 9th row in the table of section 1-1.11 with:

04-19-19

Department of Conservation, Division of Mine Reclamation	http://www.conservation.ca.gov/dmr	--	--

Add to the table in section 1-1.11:

04-16-21

Authorized ADSC Standard Mitigation Plan	https://dot.ca.gov/-/media/dot-media/programs/engineering/documents/20201214-caltransapprovedadscstandardmitigationplan-a11y.pdf	--	--
Data Interchange for Materials Engineering	https://dime.dot.ca.gov	MATERIALS ENGINEERING AND TESTING SERVICES DEPARTMENT OF TRANSPORTATION 5900 FOLSOM BLVD SACRAMENTO CA 95819-4612	(916) 227-5238
SWRCB, Land Disposal Program	https://www.waterboards.ca.gov/water_issues/programs/land_disposal/walist.html	--	--

04-15-22

Division of Safety: MASH devices	https://dot.ca.gov/programs/safety-programs/mash	--	--

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2 BIDDING

04-16-21

Replace the 8th paragraph of section 2-1.06B with:

04-16-21

If bridge as-built drawings are available, submit a request to the Office of Structure Maintenance and Investigations electronic mailbox address BIRIS@dot.ca.gov. Include in your request:

1. Business name and address
2. Contact information: name, email address, and telephone number
3. Contract number
4. District-County-Route
5. Bridge number

Replace the 5th paragraph of section 2-1.12B(1) with:

10-19-18

You are responsible to verify at bid opening the DBE firm is certified as a DBE by the California Unified Certification Program and possesses the most specific available NAICS codes or work codes applicable to the type of work the firm will perform on the Contract.

Replace section 2-1.12B(2) with:

10-19-18

2-1.12B(2) DBE Commitment Submittal

Submit DBE information under section 2-1.33.

Submit a copy of the quote from each DBE shown on the DBE Commitment form that describes the type and dollar amount of work shown on the form no later than 4 p.m. on the 5th day after bid opening. If the

last day for submitting the quote falls on a Saturday or holiday, it may be submitted on the next business day with the same effect as if it had been submitted on the 5th day.

Submit a DBE Confirmation form for each DBE shown on the DBE Commitment form to establish that it will be participating in the Contract in the type and dollar amount of work shown on the form. If a DBE is participating as a joint venture partner, submit a copy of the joint venture agreement.

Failure to submit a completed DBE Confirmation form and a copy of the quote from each DBE will result in disallowance of the DBE's participation.

Add between the 4th and 5th paragraphs of section 2-1.15B:

10-19-18

Submit a copy of the quote from each DVBE listed on the Certified DVBE Summary form that describes the type and dollar amount of work shown on the form no later than 4 p.m. on the 4th business day after bid opening.

Add between the 3rd and 4th paragraphs of section 2-1.15C(1):

10-19-18

Submit a copy of the quote from each DVBE listed on the Certified DVBE Summary form that describes the type and dollar amount of work shown on the form no later than 4 p.m. on the 4th business day after bid opening.

Add between the 1st and 2nd paragraphs of section 2-1.18C:

10-19-18

Failure to submit a completed Certified Small Business Listing for the Non–Small Business Preference form by 4 p.m. on the 2nd business day after bid opening will result in a nonresponsive bid.

Replace section 2-1.33B with:

10-19-18

2-1.33B Bid Form Submittal Schedules

2-1.33B(1) General

The *Bid* book includes forms specific to the Contract. The deadlines for the submittal of the forms vary depending on the requirements of each Contract. Determine the requirements of the Contract and submit the forms based on the applicable schedule specified in section 2-1.33B.

Bid forms and information on the form that are due after the time of bid may be submitted at the time of bid.

2-1.33B(2) Federal-Aid Contracts

2-1.33B(2)(a) General

Section 2-1.33B(2) applies to a federal-aid contract.

2-1.33B(2)(b) Contracts with a DBE Goal

2-1.33B(2)(b)(i) General

Section 2-1.33B(2)(b) applies if a DBE goal is shown on the *Notice to Bidders*.

2-1.33B(2)(b)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Federal-Aid Contract with a DBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number
Copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid except for the public works contractor registration number
Copy of the Subcontractor List as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Small Business Status	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations[a]	Time of bid
DBE Commitment	No later than 4 p.m. on the 5th day after bid opening[b]
DBE Confirmation	No later than 4 p.m. on the 5th day after bid opening[b]
DBE Good Faith Efforts Documentation	No later than 4 p.m. on the 5th day after bid opening[b]

[a]Submit only if you choose the option.
[b]If the last day for submitting the bid form falls on a Saturday or holiday, it may be submitted on the next business day with the same effect as if it had been submitted on the day specified.

2-1.33B(2)(b)(iii) Reserved

2-1.33B(2)(c) Contracts without a DBE Goal

2-1.33B(2)(c)(i) General

Section 2-1.33B(2)(c) applies if a DBE goal is not shown on the *Notice to Bidders*.

2-1.33B(2)(c)(ii) Bid Form Schedule

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Federal-Aid Contract without a DBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number
Copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid except for the public works contractor registration number
Copy of the Subcontractor List as submitted at the time of bid with the public works contractor registration numbers	10 days after bid opening
Small Business Status	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations[a]	Time of bid

[a]Submit only if you choose the option.

2-1.33B(2)(c)(iii) Reserved

2-1.33B(2)(d)–2-1.33B(2)(h) Reserved

2-1.33B(3) Non-Federal-Aid Contracts

2-1.33B(3)(a) General

Section 2-1.33B(3) applies to non-federal-aid contracts.

2-1.33B(3)(b) Contracts with a DVBE Goal

2-1.33B(3)(b)(i) General

Section 2-1.33B(3)(b) applies if a DVBE goal is shown on the *Notice to Bidders*.

2-1.33B(3)(b)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Non-Federal-Aid Contract with a DVBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number for a joint-venture contract
For a joint-venture contract, copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations[a]	Time of bid
Certified DVBE Summary	No later than 4 p.m. on the 4th business day after bid opening
California Company Preference	Time of bid
Request for Small Business Preference or Non–Small Business Preference[a]	Time of bid
Certified Small Business Listing for the Non–Small Business Preference[a]	No later than 4 p.m. on the 2nd business day after bid opening

[a]Submit only if you choose the option or preference.

2-1.33B(3)(b)(iii) Reserved

2-1.33B(3)(c) Contracts without a DVBE Goal

2-1.33B(3)(c)(i) General

Section 2-1.33B(3)(c) applies if a DVBE goal is not shown on the *Notice to Bidders*.

2-1.33B(3)(c)(ii) Bid Form Submittal

Submit the bid forms according to the schedule shown in the following table:

Bid Form Submittal Schedule for a Non-Federal-Aid Contract without a DVBE Goal

Form	Submittal deadline
Bid to the Department of Transportation	Time of bid except for the public works contractor registration number for a joint-venture contract
For a joint-venture contract, copy of the Bid to the Department of Transportation as submitted at the time of bid with the public works contractor registration number	10 days after bid opening
Subcontractor List	Time of bid
Opt Out of Payment Adjustments for Price Index Fluctuations[a]	Time of bid
California Company Preference	Time of bid
Certified DVBE Summary[b]	No later than 4 p.m. on the 4th business day after bid opening
Request for Small Business Preference or Non–Small Business Preference[a]	Time of bid
Certified Small Business Listing for the Non–Small Business Preference[a]	No later than 4 p.m. on the 2nd business day after bid opening

[a]Submit only if you choose the option or preference.
[b]Submit only if you obtain DVBE participation or you are the apparent low bidder, 2nd low bidder, or 3rd low bidder and you choose to receive the specified incentive.

2-1.33B(3)(c)(iii) Reserved

2-1.33B(3)(d)–2-1.33B(3)(h) Reserved

2-1.33B(4)–2-1.33B(9) Reserved

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3 CONTRACT AWARD AND EXECUTION

04-17-20

Replace the 1st paragraph of Section 3-1.04 with:

04-17-20

Submit any bid protest to the Office Engineer before contract award.

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4 SCOPE OF WORK

04-16-21

Add to the end of the 2nd paragraph of section 4-1.05A:

04-16-21

If you disagree with the terms of a Change Order, submit an RFI within 10 days of receipt of the approved Change Order.

Add to the end of section 4-1.05B:

04-16-21

Submit an RFI for an ordered change that materially changes the character of work within 10 days of the change.

Replace section 4-1.07 with:

04-16-21

4-1.07 VALUE ENGINEERING

4-1.07A General

Reserved

4-1.07B Value Engineering Change Proposal

You may submit a VECP to reduce any of the following:

1. Total cost of construction
2. Construction activity duration
3. Traffic congestion
4. Right-of-way delay or third-party utility delay
5. Public impact

Before preparing a VECP, meet with the Engineer to discuss:

1. Proposal concept
2. Permit issues
3. Impact on other projects
4. Project impacts, including traffic, schedule, and later stages
5. Peer reviews
6. Overall proposal merits
7. Review times required by the Department and other agencies

The VECP must not impair the project's essential functions or characteristics, including:

1. Service life
2. Operation economy
3. Maintenance ease
4. Desired appearance
5. Design and safety

The VECP must include:

1. Description of the Contract specifications and drawing details for performing the work and the proposed changes.
2. Itemization of Contract specifications and plan details that would be changed.
3. Detailed cost estimate for performing the work under the existing Contract and under the proposed change. Determine the estimates under section 9-1.04.
4. Deadline for the Engineer to decide on the changes.
5. Bid items affected and resulting quantity changes.

Submit a VECP using the Value Engineering Change Proposal Submittal form to the Engineer and the electronic mailbox on the form. The Engineer will acknowledge receipt of a VECP within 5 business days.

The Department makes every effort to consider a VECP. If a VECP is similar to a change in the plans or specifications being considered by the Department at the time the proposal is submitted or if the proposal is based on or similar to plans or specifications adopted by the Department before Contract award, the Department may make these changes without VECP payments. A VECP concept based on an alternative not chosen, but contemplated by the Department before bid, will be considered as a VECP.

If the Department does not approve a Change Order before the deadline stated in the VECP or other date you subsequently stated in writing, the VECP is rejected. The Department does not adjust time or payment for a rejected VECP.

The Department decides whether to accept a VECP and the estimated net construction-cost savings from adopting the VECP or parts of it. The Department may require you to accept a share of the investigation cost as a condition of reviewing a VECP. In determining the estimated net construction-cost savings, the Department excludes your VECP preparation cost and the Department’s VECP investigation costs,

including parts paid by you. After written acceptance, the Department considers the VECP and deducts the agreed cost of the investigation.

If the Department accepts the VECP or parts of it, the Department issues a Change Order that:

1. Incorporates changes in the Contract necessary to implement the VECP or the parts adopted
2. Includes the Department's acceptance conditions
3. States the estimated net construction-cost savings resulting from the VECP
4. Adjusts the payment so that the Change Order results in a credit to the Department of 50 percent of the estimated net construction-cost savings, except if the VECP provides a reduction in traffic congestion or avoids traffic congestion

If a VECP providing for a reduction in traffic congestion or avoiding traffic congestion is accepted by the Department, the Department adjusts the payment that results in a credit to the Department of 40 percent of the estimated net construction-cost savings attributable to the VECP. Submit detailed traffic handling comparisons between the existing Contract and the proposed change, including estimates of the traffic volumes and congestion.

If a VECP providing for a reduction in working days is accepted by the Department, 50 percent of the reduction is deducted from the Contract time.

The Department may apply an accepted VECP for general use on other contracts.

If an accepted VECP is adopted for general use, the Department pays only the contractor who first submitted the VECP and only for the contracts awarded to that contractor before the submission of the accepted VECP.

If the Department does not adopt a general-use VECP, an identical or similar submitted proposal is eligible for acceptance.

4-1.07C Preconstruction Value Engineering Meeting

You may request a preconstruction value engineering meeting by submitting a request after Contract approval and before the start of Contract time.

The preconstruction value engineering meeting creates opportunity for the Contractor and Department personnel involved in daily construction of the project to examine the Contract prior to the start of Contract time to identify potential cost or time saving proposals.

The Department offers the preconstruction value engineering meeting to:

1. Allow real-time feedback on ideas from either the Contractor or Department construction personnel
2. Expedite the process of developing and approving a VECP

The Department may postpone the start of Contract time based on the time required to develop and obtain approval of the VECP if:

1. Meeting results in a viable conceptual VECP
2. Project critical path method schedule is affected

Postponement of the start of Contract time does not apply to a cost-plus-time Contract.

4-1.07D Value Analysis Workshop

Section 4-1.07D applies to a non-building-construction contract with a total bid of over $5 million.

You may request a value analysis workshop by submitting a request after Contract approval.

The Department offers a value analysis workshop to:

1. Identify value-enhancing opportunities
2. Consider changes to the Contract that will reduce the total cost of construction, construction activity duration, or traffic congestion without impairing the essential functions specified for a VECP in section 4-1.07B

If the request is authorized, you and the Engineer:

1. Schedule a value analysis workshop
2. Select a facilitator and workshop site
3. Agree to other workshop administrative details

The workshop must be conducted under the methods described in the Department's *Value Analysis Team Guide*. For the guide, go to the Department's Division of Design website.

The facilitator must be a certified value specialist as recognized by the Society of American Value Engineers.

The Department reimburses you for 1/2 of the workshop cost. The workshop cost is the sum of the workshop-facilitator cost and the workshop-site cost. The Engineer determines the workshop cost based on the facilitator and workshop-site invoice prices minus any available or offered discounts. The Department does not reimburse you for any other associated costs.

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5 CONTROL OF WORK

04-15-22

Replace section 5-1.09B with:

10-16-20

5-1.09B Partnering Meetings

5-1.09B(1) General

Reserved

5-1.09B(2) Partnering Facilitator, Workshops, and Meetings

The Engineer sends you a written invitation to enter into a partnering relationship after Contract approval. Respond within 15 days to accept the invitation and request the initial partnering workshop. After the Engineer receives the request, you and the Engineer cooperatively:

1. Select a partnering facilitator that offers the service of a monthly partnering-evaluation survey with a 5-point rating and agrees to follow the Department's *Partnering Facilitator Standards and Expectations* available at the Department's Division of Construction website.
2. Determine the initial workshop date, duration, and site location.
3. Discuss when, where, and how the project close-out partnering workshop will be held.
4. Agree to other workshop administrative details.

During the initial partnering workshop, determine the schedule for follow-up partnering team meetings. Monthly follow-up partnering team meetings are encouraged through Contract acceptance. Quarterly follow-up partnering team meetings are required if monthly team meetings are not held. Additional partnering workshops may be held outside the scheduled partnering team meetings as determined by you and the Engineer.

5-1.09B(3) Facilitated Dispute Resolution

The Department encourages the project team to exhaust the use of partnering meetings in dispute resolution before engaging an objective third party.

For certain disputes a facilitated dispute resolution session may be appropriate and effective in clarifying issues and resolving all or part of a dispute before referring the dispute to a DRA or DRB.

For projects with a DRB, an additional 20 days can be added before referring the dispute to a DRB traditional dispute meeting in accordance with section 5-1.43E(3)(d). This additional time affords the project team time to plan and hold the facilitated dispute resolution session. To allow this additional referral time, the project team must document its agreement and intention in the partnering charter as part of the dispute resolution plan.

Replace the 6th paragraph of section 5-1.13B(2) with:

10-19-18

If the Department authorizes the termination or substitution of a listed DBE, make good faith efforts to find another DBE. The substitute DBE must (1) perform at least the same dollar amount of work as the original DBE under the Contract to the extent needed to meet the DBE goal and (2) be certified as a DBE with the most specific available NAICS or work code applicable to the type of work the DBE will perform on the Contract at the time of your request for substitution. Submit your documentation of good faith efforts within 7 days of your request for authorization of the substitution. The Department may authorize a 7-day extension of this submittal period at your request. Refer to 49 CFR 26 app A for guidance regarding evaluation of good faith efforts to meet the DBE goal.

Replace the 2nd sentence in the 2nd paragraph of section 5-1.13C with:

10-19-18

The substitute must be another DVBE, unless DVBEs are not available. The substitute must perform the work originally stated.

Replace the 6th paragraph of section 5-1.13C with:

10-19-18

If a DVBE substitute is not available, requests for substitutions of a listed DVBE must include:

1. Contact with the DVBE advocate from the Department and the Department of Veteran Affairs
2. Search results from the Department of General Services' website of available DVBEs
3. Communication with a DVBE community organization nearest the job site, if applicable
4. Documented communication with DVBEs describing the work to be performed, the percentage of the total bid, the corresponding dollar amount, and the responses to the communication

Add to the list in the 1st paragraph of section 5-1.16:

10-16-20

5. Coordinate and manage project safety work

Replace section 5-1.24 with:

10-19-18

5-1.24 CONSTRUCTION SURVEYS

5-1.24A General

The Department places stakes and marks under chapter 12, "Construction Surveys," of the Department's *Surveys Manual*.

Submit your request for Department-furnished stakes:

1. Once staking area is ready for stakes
2. On a Request for Construction Staking form

After your submittal, the Department starts staking within 2 business days.

Preserve stakes and marks placed by the Department. If the stakes or marks are destroyed, the Department replaces them at the Department's earliest convenience and deducts the cost.

Replace section 5-1.26 with:

10-19-18

5-1.26 RESERVED

Replace section 5-1.28 with:

04-16-21

5-1.28 PROJECT SAFETY REVIEWS

Your assigned project safety representative must perform and document project safety reviews with the Engineer:

1. At least 3 business days before the start of job site activities
2. Every other week after the start of job site activities and after any incident that results in serious injury, illness, or fatality to your personnel, subcontractor's and supplier's personnel, and any other persons present at the job site at the request of you or your subcontractors
3. Submit project safety review documentation to the Engineer and correct deficiencies within 3 business days from the day the project safety review is completed or sooner as directed by the Engineer

Upon Contract acceptance, your project safety representative must participate in a safety meeting with the Engineer.

Replace section 5-1.29 with:

04-16-21

5-1.29 JOB HAZARD ANALYSES

Prepare a job hazard analysis for each work activity to be performed on the job site as required by CA Code of Regs § 3203(a)(4) and 1511(b).

Submit each job hazard analysis as an informational submittal.

Each job hazard analysis must identify the following:

1. Work activity description
2. Existing and predictable hazards associated with the work activity
3. Hazard control measures, preventative, or corrective actions to be taken for the work activity

Submit each job hazard analysis at least 5 working days before the start of a work activity. During the project safety reviews required under Section 5-1.28, discuss job hazard analyses for active work activities and work activities planned to start within 5 working days.

Submit a revised job hazard analysis when equipment or methods change results in a change to the hazards previously identified. Submit a revised job hazard analysis within one working day of the identified change.

Replace the 2nd paragraph of section 5-1.37B(3) with:

10-15-21

You may cross the bridge with pneumatic-tired material hauling equipment that exceeds the size and weight limits specified but that does not exceed the load limits shown on the "Material Hauling Equipment Loading" chart.

Replace items 3 and 4 in the 3rd paragraph of section 5-1.37B(3) with:

10-15-21

3. Confine equipment to the material hauling equipment lane using temporary barriers unless the plans show that the entire bridge may be used for hauling equipment and the permanent barriers are completed.

4. Allow at most 1 piece of equipment on the bridge at one time.

Add to the list in the 3rd paragraph of section 5-1.37B(3):

04-15-22

5. Operate equipment at a maximum speed of 25 mph.

Replace the 2nd and 3rd paragraphs of section 5-1.43A with:

10-18-19

Submit potential claim records using the Department's Internet potential claim system. For information on submittal of potential claim records using the Internet potential claim system, go to the Department's Division of Construction website.

A potential claim record that you submit using the Internet potential claim system is the same as the originator of the claim and you signing the potential claim record.

For the Internet potential claim system, potential claim records are:

1. Initial Potential Claim Record form
2. Supplemental Potential Claim Record form
3. Full and Final Potential Claim Record form
4. Closed Potential Claim Record form

Submit a Closed Potential Claim Record form if you choose not to pursue an Initial Potential Claim Record that has been submitted.

Replace item 3.3.4 in the list in the 2nd paragraph of section 5-1.43D with:

04-17-20

3.3.4. Equipment rates at the rental rates listed in Labor Surcharge and Equipment Rental Rates in effect when the affected work related to the potential claim was performed

Add between the 2nd and 3rd paragraphs of section 5-1.43D:

04-17-20

If the total potential claim cost exceeds $500,000, include an independent CPA cost audit report. Submit the audit report within 70 days of the completion of the potentially claimed work. The CPA's cost audit must be performed as an examination-level engagement under the attestation engagements in the *Government Auditing Standards* published by the Comptroller General of the United States. The attest documentation prepared by the CPA in connection with the audit must be submitted for review with the audit report. Within 20 days of the Engineer's request, make your financial records available for an audit by the State for verifying the actual cost described in your audit. The Department does not participate in costs for the report where no entitlement is determined. If entitlement is determined, the Department pays for 1/2 the cost of the report; the Contractor pays for the other 1/2. The cost is determined under section 9-1.05 except no markup is allowed.

Replace section 5-1.43E with:

10-15-21

5-1.43E Alternative Dispute Resolution

5-1.43E(1) General

5-1.43E(1)(a) General

The ADR process must be used for the timely resolution of disputes that arise out of the work.

You must comply with section 5-1.43E to pursue a claim, file for arbitration, or file for litigation.

The ADR process is not a substitute for submitting an RFI or a potential claim record.

Do not use the ADR process for disputes between you and subcontractors or suppliers that have no grounds for a legal action against the Department. If you fail to comply with section 5-1.43 for a potential claim on behalf of a subcontractor or supplier, you release the Department of the subcontractor's or supplier's potential claim.

Do not use the ADR process for quantification of disputes for overhead expenses or costs. For a dispute for overhead expenses or costs, comply with section 9-1.17D.

Each party and the DRA or DRB must complete the Dispute Resolution Advisor Agreement form or Dispute Resolution Board Agreement form and comply with the provisions of the agreement. For these forms, go to the Department's Division of Construction website.

No DRA- or DRB-related meetings are allowed until each party and the DRA or DRB, execute the agreement. However, each party and the DRA or DRB, may agree to sign and execute the agreement at the initial project meeting.

DRA or DRB members must attend each meeting with the parties.

DRA or DRB members must submit an updated disclosure statement whenever there is change in status.

The Department furnishes the DRA or DRB with the Contract documents and provides meeting facilities at no cost to you.

Neither party may meet nor discuss Contract progress or issues with the DRA or DRB members outside of progress meetings, traditional dispute meetings, and informal dispute meetings unless the other party is present or included in the communication.

5-1.43E(1)(b) Definitions

dispute meeting: Traditional and informal dispute meeting.

DRA: 1-member board established by the parties to assist in resolving disputes.

DRB: 3-member board established by the parties to assist in resolving disputes.

party: You or the Department.

1. **the parties:** You and the Department jointly.
2. **each party:** You and the Department severally.

outside technical services: Consultants with no prior direct involvement in the Contract.

5-1.43E(1)(c) Establishment of Procedures

Upon selecting the DRA or DRB, the parties must have an initial project meeting at the start of job site activities with the DRA or DRB to establish and agree to procedures for:

1. Submitting documents
2. Conducting hearings
3. Providing recommendations
4. Performing associated tasks

The established procedures must comply with the Contract and the Dispute Resolution Advisor Agreement or Dispute Resolution Board Agreement. The procedures need not comply with laws of evidence.

5-1.43E(1)(d) Progress Meetings

The parties must periodically meet with the DRA or DRB at the job site so the DRA or DRB members can keep abreast of construction activities and become familiar with the work in progress.

The meetings must be held at the start of job site activities and at least once every 3 months after that.

The parties may agree to waive the scheduled meetings when the only work remaining is plant establishment work or permanent erosion control establishment work.

5-1.43E(1)(e) Traditional Dispute Meetings

You must follow the traditional dispute meeting process to pursue a potential claim.

Either party may refer a dispute to the DRA or DRB. To request a dispute meeting, a party must submit a copy of the referral and supporting documentation to the DRA or DRB and the other party. The documentation must describe the dispute in individual discrete segments such that resolved and unresolved segments are differentiated. The party must include an estimate of the cost of the affected work and impacts to the work completion date.

If the dispute involves a subcontractor, the subcontractor's superintendent or project manager must attend the meeting otherwise your position paper is considered as your entire position.

Only the following persons are allowed to participate and present information at the meeting:

1. Engineer
2. Department's area construction engineer
3. Department's structure representative
4. Your superintendent
5. Your project manager
6. Either party's employees that have direct knowledge of the dispute and direct involvement in the project
7. Consultants directly involved in the development of the estimate or construction
8. Subcontractor's superintendent or project manager if the dispute involves a subcontractor

The person presenting information at the meeting must have been directly involved in the project at the time the dispute occurred.

The following persons are not allowed to attend the meeting:

1. Attorneys
2. Claim consultants
3. Outside technical services not employed by either party unless requested by the DRA or DRB

If the DRA or DRB needs outside technical services to help the DRA or DRB make a recommendation, the parties must agree to the services before they are provided. If the parties and the DRA or DRB agree, the technical services may be provided by technical staff who works for either party.

During a dispute meeting, each party presents its position, makes rebuttals, furnishes relevant documents, and responds to DRA or DRB questions and requests. The following is not allowed:

1. Testimony under oath
2. Cross-examination
3. Reporting of the procedures by a shorthand reporter or by electronic means

If either party fails to attend a dispute meeting, all documents submitted by the nonattending party is considered as the nonattending party's entire position, and the DRA or DRB and the attending party may proceed with the dispute process.

5-1.43E(1)(f) Informal Dispute Meetings

The parties may resolve small and uncomplicated disputes using an informal process. The parties may use this process only if the parties and the DRA or DRB agree its use is appropriate for resolving the dispute.

The informal dispute meeting process is independent from the traditional process. The Department does not grant time extensions for the traditional dispute process if the informal dispute process is used.

Each party furnishes the DRA or DRB a 1-page brief description of the dispute with supporting documentation and any additional information requested by the DRA or DRB.

In an informal dispute meeting, each party presents its position and receives the DRA's or DRB's recommendation orally on the same day the dispute is heard. The DRA or DRB furnishes a 1-page report confirming the recommendation within 5 business days.

Either party may ask for clarification of the DRA's or DRB's recommendation at the dispute meeting.

If the dispute remains unresolved, the parties must notify the DRA or DRB within 5 business days after receipt of the DRA's or DRB's written confirmation of the recommendation.

The DRA or DRB will not be bound by its informal recommendation if a dispute is later heard in a traditional dispute meeting.

If the dispute is not resolved using the informal dispute meeting process, the parties must comply with the traditional dispute meeting specifications.

5-1.43E(1)(g) Recommendations

Recommendations must be based on the Contract and contract documents.

Recommendations resulting from the ADR process are nonbinding.

If the parties resolve the dispute with the aid of the DRA's or DRB's recommendation, the parties must implement the resolution.

5-1.43E(1)(h) Completion of Alternative Dispute Resolution

All ADR activities must be completed before Contract acceptance. Accelerated timeframes may be used if the parties and the DRA or DRB agree.

If a dispute becomes an unresolved claim after Contract acceptance, comply with section 9-1.17D(2).

Neither party may call the DRA or DRB members who served on the Contract as a witness in arbitration or other proceedings that may arise from the Contract.

The parties must indemnify and hold harmless the DRA or DRB members from and against all claims, damages, losses, and expenses, including attorney's fees, arising out of and resulting from the findings and recommendations of the DRA or DRB.

5-1.43E(1)(i) Payment

Pay the DRA or each DRB member $2,000 per day for the DRA's or DRB member's participation at each on-site meeting.

On-site meetings include:

1. Initial project meeting
2. Progress meetings
3. Dispute meetings

The payment includes full compensation for on-site time, travel time and expenses, transportation, lodging, and incidentals for each day or portion thereof.

Before a DRA or DRB member spends any time reviewing the plans or specifications, evaluating positions, preparing recommendations, completing forms, or performing any other off-site DRA- or DRB-related tasks, the parties must agree to pay for the tasks. Pay the DRA or DRB member $200 per hour for these off-site tasks. This payment includes full compensation for incidentals such as expenses for telephone, fax, and computer services.

The Department does not pay for (1) any DRA- or DRB-related work performed after Contract acceptance or (2) your cost of preparing for or attending ADR meetings.

The Department pays:

1. $2,000 for each DRA on-site meeting
2. $6,000 for each DRB on-site meeting
3. $200 per hour for agreed off-site DRA- or DRB-related tasks

The Department does not adjust the unit price for an increase or decrease in the quantity of:

1. DRA on-site meeting
2. DRB on-site meeting
3. Hourly off-site DRA- or DRB-related tasks

Within 60 days of receipt of Department's payment, submit copies of associated invoices and supporting documents in the form of a canceled check or bank statement for DRA- or DRB-payment verification.

5-1.43E(2) Dispute Resolution Advisor

5-1.43E(2)(a) General

Section 5-1.43E(2) applies if a bid item for dispute resolution advisor on-site meeting is shown on the Bid Item List.

Dispute Resolution Advisors must be on the Department's Dispute Resolution Advisor Candidates List at the Department's Division of Construction website.

To be listed on the Department's Dispute Resolution Candidates List, candidates must:

1. Submit a completed Candidate Application for Dispute Resolution Board (DRB) Member / Dispute Resolution Advisor (DRA) form
2. Meet the minimum qualifications for experience
3. Have completed training by the Department
4. Have served on at least 3 dispute resolution boards on a Department contract as a member or at least 2 dispute resolution boards on a Department contract as the chairman

Candidates must submit an updated resume on Dispute Resolution Board (DRB) Member / Dispute Resolution Advisor (DRA) Resume form annually or whenever there is a change in status of active DRAs or DRBs.

5-1.43E(2)(b) DRA Selection

Within 30 days after Contract approval, the parties must select a DRA using the following procedure:

1. Each party nominates 3 DRA member candidates, each candidate must:
    1.1. Be knowledgeable in the contract documents and the type of construction anticipated in the Contract
    1.2. Have no prior direct involvement on the Contract
    1.3. Have no financial interest in the Contract or with the parties, subcontractors, suppliers, consultants, or associated legal or business services within 6 months before award and during the Contract except for payments for Department DRA or DRB services or payments for retirement or pensions from either party not tied to, dependent on, or affected by the net worth of the party
2. The parties must request a disclosure statement from each nominated DRA candidate and must furnish them to the other party. Each statement must include:
    2.1. Current resume of the candidate's experience
    2.2. Declaration statement that describes past, present, anticipated, and planned professional or personal relationships with each of the following:
        2.2.1. Each party involved in the Contract
        2.2.2. Each party's principals
        2.2.3. Each party's counsel
        2.2.4. Associated subcontractors and suppliers
3. The parties are allowed:
    3.1. One-time objection to any of the three candidates without stating a reason
    3.2. Objection to any of the other party's subsequent candidates based on a specific breach of the candidate's responsibilities or qualifications under items 1 and 2 above
4. The parties must select 1 of the candidates to be the DRA. If the parties cannot agree on 1 candidate, each party must select 1 of the candidates nominated by the other and the DRA is decided between the 2 candidates by a coin toss.

5-1.43E(2)(c) DRA Replacement

The services of the DRA may end at any time with a notice of at least 15 days if either of the following occurs:

1. DRA resigns.
2. Either party replaces the DRA for failing to comply with the required employment or financial disclosure conditions of the DRA as described in the Contract and the Dispute Resolution Advisor Agreement.

A DRA replacement is selected the same way as the original DRA. The selection of a replacement DRA must start upon determination of the need for a replacement and must be completed within 15 days. The Dispute Resolution Advisor Agreement must be amended to reflect the change of the DRA.

5-1.43E(2)(d) DRA Traditional Dispute Meeting

If you choose to pursue a potential claim, refer the dispute to the DRA within 5 business days after receiving the Engineer's response to your Supplemental Potential Claim Record. The dispute meeting must be held no later than 25 days after the DRA receives the referral unless the parties agree otherwise.

At least 10 days before the scheduled dispute meeting, each party must furnish documentation to the DRA that supports its position and any additional information requested by the DRA. Upon receipt of both parties' position documentation, the DRA will provide each party the other party’s position documentation.

If the DRA requests additional information within 5 business days after the dispute meeting, the party receiving the request must provide this information to the DRA and the other party within 5 business days after receiving the request.

The DRA furnishes a written recommendation within 10 days after the dispute meeting unless the parties agree to allow more time.

Within 5 business days after receiving the DRA's recommendation, either party may request clarification of any part of the recommendation. The DRA furnishes a written response within 2 business days of the request. Only 1 request for clarification from each party is allowed per dispute.

Within 10 days after receiving the DRA's recommendation, each party must furnish a written response to the DRA and the other party indicating acceptance or rejection of the recommendation. If a party rejects the recommendation and has new information that supports its position, the party may request reconsideration. The reconsideration request must be made within 10 days after receiving the DRA’s recommendation. Only 1 reconsideration request from each party is allowed per dispute.

If the parties accept the DRA's recommendation but cannot agree on the time or payment adjustment within 30 days after accepting the recommendation, either party may request that the DRA recommend an adjustment.

5-1.43E(3) Dispute Resolution Board

5-1.43E(3)(a) General

Section 5-1.43E(3) applies if a bid item for dispute resolution board on-site meeting is shown on the Bid Item List.

Dispute Resolution Board Members must be on the Department's Dispute Resolution Board Candidates List at the Department's Division of Construction website.

To be listed on the Department's Dispute Resolution Board Candidates List, candidates must:

1. Submit a completed Candidate Application for Dispute Resolution Board (DRB) Member / Dispute Resolution Advisor (DRA) form
2. Meet the minimum qualifications for experience
3. Have completed training by the Department

Candidates must submit an updated resume on Dispute Resolution Board (DRB) Member / Dispute Resolution Advisor (DRA) Resume form annually or whenever there is a change in status of active DRAs or DRBs.

5-1.43E(3)(b) DRB Member Selection

Within 45 days after Contract approval, the parties must select DRB members and establish the DRB using the following procedure:

1. Each party nominates a DRB member candidate, each candidate must:
   1.1. Be knowledgeable in the contract documents and the type of construction anticipated in the Contract
   1.2. Have no prior direct involvement on the Contract
   1.3. Have no financial interest in the Contract or with the parties, subcontractors, suppliers, consultants, or associated legal or business services within 6 months before award and during the Contract except for payments for Department DRA or DRB services or payments for retirement or pensions from either party not tied to, dependent on, or affected by the net worth of the party
2. The parties must request a disclosure statement from each nominated DRB member candidate and must each furnish it to the other party. Each statement must include:
   2.1. Current resume of the candidate's experience
   2.2. Declaration statement that describes past, present, anticipated, and planned professional or personal relationships with each of the following:
      2.2.1. Each party involved in the Contract
      2.2.2. Each party’s principals
      2.2.3. Each party’s counsel
      2.2.4. Associated subcontractors and suppliers
3. The parties are allowed:
   3.1. One-time objection to the other party's candidate without stating a reason
   3.2. Objection to the other party's candidate based on a specific breach of the candidate's responsibilities or qualifications under items 1 and 2 above
4. If either party objects to the other party's candidate, the party whose candidate was objected to must nominate another DRB candidate within 5 business days.
5. The 1st candidate from a party that receives no objection becomes that party's selected DRB member.
6. Each party furnishes written notification to its selected DRB member.
7. Within 15 days after their notifications, the selected DRB members recommend to the parties the 3rd DRB member candidate and furnish that candidate’s disclosure statement. If the 2 DRB members cannot agree on the 3rd DRB candidate, they will submit a list of two candidates to the parties for the final selection and approval.
8. Within 10 days after the recommendation, each party must notify the first 2 DRB members whether the party approves of or objects to the recommended 3rd DRB member candidate. Objections may be allowed based on item 3 above.
9. The 3 selected DRB members then decide who will act as the DRB chairman. If the parties do not agree with the selected chairman, the 3rd member will act as the DRB chairman.

5-1.43E(3)(c) DRB Member Replacement

The services of a DRB member may end at any time with a notice of at least 15 days if any of the following occurs:

1. A member resigns.
2. The Department replaces its selected member.
3. You replace your selected member.
4. The Department's and your selected members replace the 3rd member.
5. Either party replaces any member for failing to comply with the required employment or financial disclosure conditions of the DRB membership as described in the Contract and in the Dispute Resolution Board Agreement.

Replacing any DRB member must be accomplished by written notification to the DRB and the other party with substantiation for replacing the member.

A replacement DRB member is selected the same way as the original DRB member. The selection of a replacement DRB member must start upon determination of the need for a replacement and must be

completed within 15 days. The Dispute Resolution Board Agreement must be amended to reflect the change to the DRB.

5-1.43E(3)(d) DRB Traditional Dispute Meeting

If you choose to pursue a potential claim, refer the dispute to the DRB within 21 days after receiving the Engineer's response to your Supplemental Potential Claim Record unless a facilitated dispute resolution is included in the signed original partnering charter, in which case, make the referral within 41 days after receiving the response. The dispute meeting must be held no sooner than 30 days and no later than 60 days after the DRB receives the referral unless the parties otherwise agree.

At least 15 days before the scheduled dispute meeting, each party must provide documentation to the DRB that supports its position and any additional information requested by the DRB. Upon receipt of both parties' position documentation, the DRB chairman will provide each party the other party's position documentation.

If the DRB requests additional information at the dispute meeting, the party receiving the request must provide this information to the DRB and the other party within 10 days after receiving the request.

The DRB furnishes a written recommendation report within 30 days after the dispute meeting unless the parties agree to allow more time.

Within 10 days after receiving the DRB's recommendation report, either party may request clarification of any part of the recommendation. The DRB furnishes a written response within 7 days of the receipt of request. Only 1 request for clarification from each party is allowed per dispute.

Within 30 days after receiving the DRB's recommendation, each party must furnish a written response to the DRB and the other party indicating acceptance or rejection of the recommendation. If a party rejects the recommendation, the party must include a list of specific reasons for the rejection. If a party has new information that supports its position, the party may request a reconsideration. The reconsideration request must be made within 30 days after receiving the DRB's recommendation. Only 1 request for reconsideration from each party is allowed per dispute.

If the parties accept the DRB's recommendation but cannot agree on the time or payment adjustment within 60 days after accepting the recommendation, either party may request that the DRB recommend an adjustment.

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6 CONTROL OF MATERIALS

10-16-20

Replace section 6-1.03 with:

04-19-19

6-1.03 LOCAL MATERIALS

6-1.03A General

Local material must be rock, sand, gravel, earth, or mineral material other than local borrow, or selected material obtained or produced from a source in the work vicinity, specifically for use on the project. Local borrow must not be a material from an established commercial source.

Upon your request, the Department tests material for quality characteristics from an untested local source. If satisfactory material from that source is used in the work, the Department does not charge you for the tests; otherwise, the Department deducts the test costs.

Add to section 6-1:

10-16-20

6-1.06 RESERVED

6-1.07 PROHIBITIONS ON MATERIALS, EQUIPMENT, AND SERVICES

6-1.07A General

Reserved

6-1.07B Telecommunications and Video Surveillance Equipment or Services

Do not enter into, extend, or renew a contract to procure or obtain telecommunications and video surveillance equipment or services as described in 2 CFR 200.216 and 2 CFR 200.471.

Furnish telecommunications and video surveillance equipment with a certificate of compliance. The certificate must state telecommunications and video surveillance equipment was not procured or obtained from manufacturers identified in section 889 of the National Defense Authorization Act for Fiscal Year 2019 (Pub. L. 115-232).

6-1.07C–6-1.07G Reserved

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7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

04-15-22

Replace section 7-1.02D with:

04-15-22

7-1.02D Unmanned Aircraft Systems

Comply with 14 CFR 107 when operating UAS in the proximity of the highway.

Submit the following to the Engineer and https://app.smartsheet.com/b/form/7ad42b76ef9e4f37ba2978520f1b1a5f as an informational submittal at least 7 days before initial operation of UAS:

1. UAS remote pilot information
    1.1. Pilot's full name
    1.2. Pilot's contact information
        1.2.1. Phone number
        1.2.2. Email address
    1.3. Pilot's certification information
        1.3.1. Certificate issuance date
        1.3.2. Certificate expiration date
2. UAS information
    2.1. UAS manufacturer
    2.2. UAS model
    2.3. Registration number
    2.4. Registration issuance date
    2.5. Registration expiration date

Maintain records of UAS flights. Submit a post-flight record as an informational submittal to the Engineer and https://app.smartsheet.com/b/form/5e34deda3bd24f8f8397d895275ecbec within 1 business day of each flight. The post-flight record must include the following:

1. Flight date
2. Flight duration
3. Visual observer name and contact information
4. Purpose of flight
5. UAS Hazard Analysis Contractor/Consultant form, as an attachment
6. Description of any accidents or incidents, if applicable

Do not operate UAS over the traveled way unless preauthorized in writing by the Engineer. Launch and land UAS at least 50 feet from the edge of live traffic.

Replace item 1.3 in the list in the 2nd paragraph of section 7-1.02K(3) with:

10-18-19

1.3. Last four digits of social security number pursuant to Labor Code § 226(a)

10-16-20

Delete the 4th paragraph of section 7-1.02K(3).

Replace the 6th through 10th paragraphs of section 7-1.02K(3) with:

10-16-20

Submit certified payroll records electronically using the Department's contracted certified payroll internet system LCPtracker Pro. For information on submittal of certified payroll records using LCPtracker Pro, go to the LCPtracker website:

https://www.lcptracker.com/solutions/lcptracker

Request user account for your designated representative by submitting LCPtracker Vendor Access Request form.

Replace the 12th paragraph of section 7-1.02K(3) with:

10-18-19

Make all payroll records, including employee's complete social security number, available for inspection and copying or furnish a copy upon request of a representative of the:

1. Department
2. Division of Labor Standards Enforcement of the Department of Industrial Relations
3. Division of Apprenticeship Standards of the Department of Industrial Relations

Replace the 1st sentence in the 5th paragraph of section 7-1.02K(6)(a) with:

10-19-18

Submit copies of your Injury and Illness Prevention Program, Code of Safe Practices, and permits required by Cal/OSHA as informational submittals.

Replace section 7-1.02K(6)(j)(iii) with:

10-18-19

7-1.02K(6)(j)(iii) Unregulated Earth Material Containing Lead

Reserved

Replace *Reserved* in section 7-1.02M(2) with:

10-18-19

Submit the names and emergency telephone numbers of the nearest fire suppression agencies before the start of job site activities as an informational submittal. Post the names and phone numbers at a prominent place at the job site.

Submit a copy of your fire prevention plan required by Cal/OSHA as an informational submittal before the start of job site activities.

04-19-19

Cooperate with fire prevention authorities in performance of the work.

Immediately report fires occurring within and near the project limits by dialing 911 and to the nearest fire suppression agency by using the emergency phone numbers retained at the job site.

Prevent project personnel from setting open fires that are not part of the work.

Prevent the escape of and extinguish fires caused directly or indirectly by job site activities.

Replace the 2nd paragraph of section 7-1.02M(3) with:

04-19-19

For the list of permitted sites, go to the Department of Conservation, Division of Mine Reclamation website.

Replace the 13th paragraph of section 7-1.03 with:

10-18-19

For a taper on a bridge deck or approach slab, construct the taper with rapid setting concrete under section 60-3.02B(2) or polyester concrete under section 60-3.04B(2). Prepare the surface to receive the taper under section 60-3.02C(7). For tapers with aggregate fillers, rake conform edges to ensure smooth transitions. Cure the taper for at least 3 hours or the minimum time recommended by the manufacturer before opening to traffic.

Replace the 4th sentence in the 16th paragraph of section 7-1.03 with:

10-16-20

When not described and if ordered, providing flaggers is change order work.

Replace the 3rd sentence in the 7th paragraph of section 7-1.04 with:

10-16-20

When not described and if ordered, providing flaggers is change order work.

Replace the 13th paragraph of section 7-1.04 with:

10-18-19

Equipment must enter and leave the highway via existing ramps and crossovers and must move in the direction of traffic. All movements of workers and construction equipment on or across lanes open to traffic must be performed in a manner that do not endanger the public. Your vehicles or other mobile equipment leaving an open traffic lane to enter the construction area must slow down gradually in advance of the location of the turnoff to give the traffic following an opportunity to slow down. When leaving a work area and entering a roadway carrying traffic, your vehicles and equipment must yield to traffic. Compensation for flaggers, used for all movement of workers and construction vehicles and equipment on or across lanes open to traffic, is included in the bid items of work involved.

Replace section 7-1.06 with:

04-16-21

7-1.06 INSURANCE

7-1.06A General

Nothing in the Contract is intended to establish a standard of care owed to any member of the public or to extend to the public the status of a third-party beneficiary for any of these insurance specifications.

7-1.06B Casualty Insurance

Obtain and maintain insurance on all of your operations with companies acceptable to the State as follows:

1. Keep all insurance in full force and effect from the start of the work through Contract acceptance.
2. Maintain completed operations coverage with a carrier acceptable to the State through the expiration of the patent deficiency in construction statute of repose set forth in Civ Pro Code § 337.1.
3. All insurance must be with an insurance company with a rating from A.M. Best Financial Strength Rating of A- or better and a Financial Size Category of VII or better.

7-1.06C Workers' Compensation and Employer's Liability Insurance

Under Labor Code § 1860, secure the payment of worker's compensation under Labor Code § 3700.

Submit to the Department the following certification before performing the work (Labor Code § 1861):

> I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.

Contract signing constitutes your submittal of this certification.

Provide Employer's Liability Insurance in amounts not less than:

1. $1,000,000 for each accident for bodily injury by accident
2. $1,000,000 policy limit for bodily injury by disease
3. $1,000,000 for each employee for bodily injury by disease

Coverage shall contain a waiver of subrogation in favor of the State, including its officers, directors, agents, and employees.

If there is an exposure of injury to your employees under the US Longshoremen's and Harbor Workers' Compensation Act, the Jones Act, or under laws, regulations, or statutes applicable to maritime employees, coverage must be included for such injuries or claims.

7-1.06D Liability Insurance

7-1.06D(1) General

Evidence General Liability and Umbrella or Excess Liability Insurance covering all operations by or on behalf of you providing insurance for bodily injury liability, property damage liability, and personal and advertising injury for the limits outlined in 7-1.06D(2). Coverage must extend to premises, operations and mobile equipment, personal and advertising injury, products and completed operations, and contractual liability. Coverage shall not contain a cross-suits exclusion barring coverage for a suit brought by or between Caltrans and another Insured in the policy. Coverage shall also not contain an exclusion for explosion, collapse and underground hazards. Such policies must contain an annual reinstatement of limits during construction operations.

7-1.06D(2) Liability Limits/Additional Insureds

The limits of liability must be at least the values shown in the following table:

Liability Limits

Total bid	For each occurrence[a]	Aggregate for products/completed operation	General aggregate[b]	Umbrella or excess liability[c]
≤ $1,000,000	$1,000,000	$2,000,000	$2,000,000	$5,000,000
> $1,000,000 ≤ $10,000,000	$1,000,000	$2,000,000	$2,000,000	$10,000,000
> $10,000,000 ≤ $25,000,000	$2,000,000	$2,000,000	$4,000,000	$15,000,000
> $25,000,000	$2,000,000	$2,000,000	$4,000,000	$25,000,000

[a]Combined single limit for bodily injury and property damage.

[b]This limit must apply separately to your work under this Contract.

[c]The umbrella or excess policy must contain a clause stating that it takes effect (drops down) in the event the primary limits are impaired or exhausted. The required umbrella liability limits are separate from and in addition to the required general liability limits. The umbrella or excess policies shall not contain exclusions barring follow-form coverage for required coverages in this specification.

Do not require a small business subcontractor to carry liability insurance that exceeds the limits shown in the preceding table. For a small business subcontractor, interpret *Total Bid* in the table as the dollar amount of subcontracted work.

As used in section 7-1.06D(2), a small business:

1. For a non-federal-aid contract is defined in 2 CA Code of Regs § 1896 and is incorporated by this reference
2. For a federal-aid contract is defined in 13 CFR 121.201 and is incorporated by this reference

The State, including its officers, directors, agents (excluding agents who are design professionals), and employees, must be named as additional insureds under the General Liability and Umbrella Liability Policies with respect to liability arising out of or connected with work or operations performed by or on behalf of you under this Contract. Coverage for such additional insureds does not extend to liability:

1. Arising from any defective or substandard condition of the roadway which existed at or before the time you started work, unless such condition has been changed by the work or the scope of the work requires you to maintain existing roadway facilities and the claim arises from your failure to maintain;
2. For claims occurring after the work is completed and accepted unless these claims are directly related to alleged acts or omissions of you that occurred during the course of the work; or
3. To the extent prohibited by Ins Code § 11580.04.

Additional insured coverage must be provided by a policy provision or by an endorsement providing coverage at least as broad as Additional Insured endorsement form CG 2010 and CG 2037 (for completed operations), as published by the Insurance Services Office (ISO), or equivalent form as approved by the Department.

7-1.06D(3) Contractor's Insurance Policies are Primary

The policy must stipulate that the insurance afforded the additional insureds applies as primary insurance. Any other insurance or self-insurance maintained by the State is excess only and must not be called upon to contribute with this insurance.

7-1.06D(4) Contractor's Insurance - Waiver of Subrogation

The policy must stipulate that coverage contains a waiver of subrogation in favor of the State, including its officers, directors, agents (excluding agents who are design professionals), and employees.

7-1.06D(5) Contractor's Insurance - Separation of Insureds

The policy must stipulate that coverage shall apply separately to each insured against whom claim is made or suit is brought, except with respect to the limits of the insurer’s liability.

7-1.06E Automobile Liability Insurance

7-1.06E(1) General

Evidence automobile liability insurance, including coverage for all owned, hired, and non-owned automobiles. The primary limits of liability must be not less than $1,000,000 combined single limit for each accident for bodily injury and property damage liability.

7-1.06E(2) Automobile Liability Insurance Scheduled on Excess Liability Policies

The umbrella or excess liability coverage required under section 7-1.06D(2) also applies to automobile liability. The required limits of liability can be achieved by any combination of primary and excess policies. Automobile liability coverage must be scheduled on excess liability policies in order to meet the required automobile liability limits.

7-1.06F Policy Forms, Endorsements, and Certificates

Provide your General Liability Insurance under Commercial General Liability policy form no. CG0001 as published by the Insurance Services Office (ISO) or under a policy form at least as broad as policy form no. CG0001.

7-1.06G Deductibles

The State may expressly allow deductible clauses, which it does not consider excessive, overly broad, or harmful to the interests of the State. Regardless of the allowance of exclusions or deductions by the State, you are responsible for any deductible amount and must warrant that the coverage provided to the State complies with section 7-1.06.

7-1.06H Enforcement

The Department may assure your compliance with your insurance obligations. Ten days before an insurance policy lapses, expires, or is canceled during the Contract period you must submit to the Department evidence of renewal through a binder or specimen copies of such policies or complete replacement of the policy.

If you fail to maintain any required insurance coverage, the Department may maintain this coverage and withhold or charge the expense to you or terminate your control of the work.

Any failure to comply with the reporting provisions of your policy shall not affect coverage provided to the State, including its officers, directors, agents (excluding agents who are design professionals), and employees.

You are not relieved of your duties and responsibilities to indemnify, defend, and hold harmless the State, its officers, agents, and employees by the Department's acceptance of insurance policies and certificates.

The minimum insurance coverage amounts do not relieve you for liability in excess of such coverage, nor do they preclude the State from taking other actions available to it, including the withholding of funds under this Contract.

7-1.06I Self-Insurance

Self-insurance programs and self-insured retentions in insurance policies are subject to separate annual review and approval by the State.

If you use a self-insurance program or self-insured retention, you must provide the State with the same protection from liability and defense of suits as would be afforded by first-dollar insurance. Execution of the Contract is your acknowledgment that you will be bound by all laws as if you were an insurer as defined under Ins Code § 23 and that the self-insurance program or self-insured retention shall operate as insurance as defined under Ins Code § 22.

Replace section 7-1.09 with:

10-16-20

7-1.09 UNSHELTERED INDIVIDUALS ENCAMPMENTS

Notify the Engineer at least 10 days prior to needing access to areas in the right of way with encampments that affect performance of the work. The Department will remove encampments including encampment debris.

^^

8 PROSECUTION AND PROGRESS

04-15-22

Replace section 8-1.02 with:

04-15-22

8-1.02 SCHEDULE

8-1.02A General

Submit critical path method schedules that are consistent in all respects with time, staging, and work sequencing of the Contract.

Submit your baseline schedule within 15 days of contract approval. Within 5 business days of baseline schedule submittal meet with the Engineer to discuss the baseline schedule.

By the 24th of each month submit an update schedule with required support data that includes the status of work completed to date and the work yet to be performed as planned. The update schedule must have a data date of the 21st day of the month or other date established by the Engineer. The review period does not start until the previous month's required schedule is accepted. The update schedule must show changes from prior accepted schedules. Update schedules not accepted or rejected within the review period will be accepted. Update schedules may be accepted with exceptions noted.

Correct rejected schedules and resubmit them within 7 days upon notification. Allow 7 days for the review of the resubmittal.

Ensure that all activity sequences are logical and that each schedule shows a coordinated plan for completion of the work. If the Contract includes construction staging and you propose changes to the described staging, do not perform work affected by the proposed changes until the Engineer accepts your schedule and the Department approves a Change Order.

Perform critical path work activities in the sequence indicated on the current accepted schedule.

Notify the Engineer in advance of performance of non-critical work activities that comply with Contract requirements but are out-of-sequence with the current accepted schedule. Performance of such work shall not impact the critical path work activities.

The Engineer’s review and acceptance of schedules neither voids any Contract part nor your responsibility for submitting complete and accurate information. Errors or omissions on schedules do not void your responsibility for completing all work within the time specified for completion of the work. If any aspect of the schedule has an error or omission after a schedule has been accepted, correct it on the next update schedule.

Upon completion of the work, the Department returns withholds associated with section 8-1.02 and makes a payment adjustment for work not performed in the same manner as work-character changes.

8-1.02B Level 1 Critical Path Method Schedule

8-1.02B(1) General

Section 8-1.02B applies to a contract without a critical path method schedule bid item shown in the Bid Item list.

Use software to prepare each schedule.

For each schedule submittal, submit:

1. Plotted original, time-scaled network diagram on a sheet at least 8-1/2 by 11 inches with a title block and timeline in PDF file format
2. Schedule data in an authorized electronic file format. File name must include:
   2.1. Contract number
   2.2. Schedule number and date produced
3. Narrative report that includes:
   3.1. Transmittal letter
   3.2. Work completed during the period
   3.3. Identification of unusual conditions or restrictions regarding labor, equipment, or material
   3.4. Description of the current critical path
   3.5. Current and anticipated delays, including:
      3.5.1. Cause of delay
      3.5.2. Impact of delay on other activities, milestones, and completion dates
      3.5.3. Corrective action, mitigation, and schedule adjustments to correct the delay
   3.6. Reasons for any changes you propose to the planned work
   3.7. Pending items and status of:
      3.7.1. Permits
      3.7.2. Change orders
      3.7.3. Time adjustments
      3.7.4. Noncompliance notices
   3.8. Changes to the critical path and scheduled completion date since the last schedule submittal
   3.9. Reasons for an early or late scheduled completion date in comparison to the work completion date
   3.10. Written response to Engineer's comments on the previous month's schedule submittal

8-1.02B(2) Schedule Format

On each schedule, show:

1. Planned and actual start and completion dates of each work activity, including applicable:
   1.1. Submittal development.
   1.2. Submittal review and acceptance.
   1.3. Material procurement.
   1.4. Contract milestones and each required constraint. Constraints other than those required by the specifications may be included if authorized.
   1.5. Equipment and plant setup.
   1.6. Interfaces with outside entities.
   1.7. Erection and removal of falsework and shoring.
   1.8. Test periods.
   1.9. Major traffic stage change.
   1.10. Final cleanup.
2. Order that you propose to prosecute the work.
3. Logical links between the time-scaled work activities.
4. All controlling activities.
5. Clear description of each activity.
6. At least 1 predecessor and 1 successor to each activity except for project start and project end milestones.
7. Duration of at least 1 working day for each activity.
8. Start milestone date as the Contract approval date.

8-1.02B(3) Update Schedule

You may include changes to update schedules that do not alter a critical path or extend the scheduled completion date of the current schedule. Changes may include:

1. Adding or deleting activities
2. Changing activity constraints
3. Changing remaining durations
4. Changing logic

5. Your forecasted date of completion

In advance, discuss with the Engineer, changes that propose an adjustment of the scheduled completion date or alterations in the critical path. If agreement cannot be achieved, submit an RFI.

Meet with the Engineer to review work progress on or before the 1st day of each month, starting 30 days after the baseline schedule is accepted. Discuss, narrative report, progress to date, changes in schedule, unresolved time issues, and additional schedule changes needed.

The update schedule must:

1. Show actual activity start dates, percent complete, remaining duration, and finish dates
2. Show actual durations for work that has been completed, including the Engineer's review and your resubmittal times

If a previous update schedule was not approved, the Engineer may allow you to submit an update schedule that reflects current progress. Submittal of this update schedule does not result in acceptance of prior unaccepted schedules. Prior unaccepted schedules must be corrected and resubmitted upon request.

8-1.02C Level 2 Critical Path Method Schedule

8-1.02C(1) General

Section 8-1.02C applies to a contract if a bid item for a level 2 critical path method schedule is shown in the Bid Item List.

8-1.02C(2) Schedule Format

On each schedule, show:

1. Planned and actual start and completion dates of each work activity, including applicable:
    1.1. Submittal development.
    1.2. Submittal review and acceptance.
    1.3. Material procurement.
    1.4. Contract milestones and each required constraint. Constraints other than those required by the specifications may be included if authorized.
    1.5. Equipment and plant setup.
    1.6. Interfaces with outside entities.
    1.7. Erection and removal of falsework and shoring.
    1.8. Test periods.
    1.9. Major traffic stage change.
    1.10. Final cleanup.
2. Order that you propose to prosecute the work.
3. Logical links between the time-scaled work activities.
4. All controlling activities.
5. At least 50 but not more than 500 activities unless authorized. The number of activities must be sufficient to:
    5.1. Assure adequate planning of the project
    5.2. Permit monitoring and evaluation of progress
    5.3. Perform an analysis of time impacts
6. Clear description of each activity.
7. Alphanumeric activity identification and activity description system for labeling work activities.
8. Identification code for each activity for responsibility, stage, work shifts, location, and bid items.
9. At least 1 predecessor and 1 successor to each activity except for activities that begin at the project start milestone and activities that end at the project end milestone.
10. Activities durations of at least 1 working day and no more than 20 working days for each activity, unless otherwise authorized.
11. Start milestone date as the Contract approval date.
12. Department-owned float as the predecessor activity to the scheduled completion date.

Each activity description must indicate its associated scope or location of work by including such terms as quantity of material, type of work, bridge number, station to station location, side or direction of highway, stage, lane number, shoulder, ramp name, ramp line descriptor, or mainline.

You may show early completion time on any schedule if you comply with the Contract. Early completion time is a resource for your exclusive use. You may increase early completion time by improving production, reallocating resources to be more efficient, performing sequential activities concurrently, or by completing activities earlier than planned.

You may show a scheduled completion date that is later than the work completion date on an update schedule after the baseline schedule is accepted. Provide an explanation for a late scheduled completion date in the narrative report included with the schedule submittal.

8-1.02C(3) Computer Software

Submit a description of your proposed schedule software for authorization.

Software must be compatible with the current version of the Microsoft Windows operating system in use by the Engineer.

The schedule software must be the latest version of Primavera P6 for Windows or equal.

Any proposed schedule software equal to Primavera P6 must be capable of:

1. Generating files that can be imported into Primavera P6
2. Comparing 2 schedules and providing reports of changes in activity ID, activity description, constraints, calendar assignments, start and finish dates, durations, and logic ties

8-1.02C(4) Data, Network Diagrams, Histograms, and Reports

For each schedule submittal, submit:

1. Schedule data in compatible Primavera P6 electronic file format. File name must include:
   1.1. Contract number
   1.2. Schedule number and date produced
2. 1 set of originally plotted, time-scaled network diagrams and a copy in PDF file format.
3. 1 copy of a narrative report in PDF file format.

The time-scaled network diagrams must:

1. Show a continuous flow of information from left to right
2. Be based on early start and early finish dates of activities
3. Clearly show the critical path using graphical presentation
4. Be on 11 by 17 inches or larger sheets, unless otherwise authorized
5. Include a title block and a timeline on each page
6. Be in color

For resource allocated schedules, the time-scaled resource histograms must show materials, labor crafts and equipment classes anticipated to be used. For baseline schedule requiring resource allocation, use average composite crews to display the labor loading of job site construction activities. Optimize and level labor to reflect a reasonable plan for accomplishing the work and to assure that resources are not duplicated in concurrent activities.

The narrative report must be organized in the following sequence with all applicable documents included:

1. Transmittal letter
2. Work completed during the period
3. Identification of unusual conditions or restrictions regarding labor, equipment, or material; including multiple shifts, 7-day work weeks, overtime, or work at times other than regular days or hours
4. Description of the current critical path
5. Current and anticipated delays, including:
   5.1. Cause of delay
   5.2. Impact of delay on other activities, milestones, and completion dates

5.3. Corrective action, mitigation, and schedule adjustments to correct the delay
6. Reasons for any changes you propose to the planned work
7. Pending items and status of:
   7.1. Permits
   7.2. Change orders
   7.3. Time adjustments
   7.4. Noncompliance notices
8. Changes to the critical path and scheduled completion date since the last schedule submittal
9. Reasons for an early or late scheduled completion date in comparison to the work completion date
10. Status of early completion time and Department-owned float, if applicable
11. Written response to Engineer's comments on the previous month's schedule submittal
12. For schedules requiring resource allocations, describe differences between actual resource allocations on activities and those anticipated in the baseline schedule.

8-1.02C(5) Preconstruction Scheduling Conference

Within 5 business days after Contract approval, submit a general time-scaled logic diagram showing the major activities and sequence of planned operations. If the Contract includes construction staging and you propose changes to the described staging, the general time scaled-logic diagram must show the changes and resulting time impacts. You may not perform work affected by the proposed changes to the described staging until the Engineer accepts your schedule and the Department approves a Change Order or provides an authorization to proceed ahead of the issuance of a change order.

Hold a preconstruction scheduling conference with your project manager and the Engineer within 10 days after Contract approval to discuss:

1. Your general time-scaled logic diagram
2. Any proposed changes to described staging
3. Proposed work plan and schedule methodology

At this conference, submit the alphanumeric coding structure and activity identification system for labeling work activities.

The Engineer conducts the preconstruction scheduling conference and reviews the schedule specification with you.

The Engineer provides any required baseline schedule changes to you for implementation within 2 business days of the preconstruction scheduling conference.

If you plan on submitting an early completion baseline schedule that shows work completion in less than 85 percent of the original working days, discuss planned resource allocations, number of crews, and equipment to achieve the early completion.

8-1.02C(6) Baseline Schedule

Starting the week after the preconstruction scheduling conference, meet with the Engineer weekly to discuss and resolve schedule issues until the baseline schedule is accepted. If you and the Engineer agree on the need for a third-party facilitated meeting to assist in resolving baseline schedule issues, the Department pays for 1/2 the cost of the facilitator; the Contractor pays for the other 1/2. The cost is determined under section 9-1.05 except no markup is allowed. If you and the Engineer cannot resolve baseline schedule issues, submit an RFI before starting work.

The baseline schedule must include the entire scope of work and how you plan to complete all work contemplated.

The baseline schedule must show the activities that define the critical path. Multiple critical paths and near-critical paths must be kept to a minimum. A total of not more than 50 percent of the baseline schedule activities must be critical or near critical unless otherwise authorized.

The baseline schedule must not extend beyond the number of original working days.

The baseline schedule must have a data date of Contract approval.

If you submit an early completion baseline schedule that shows work completion in less than 85 percent of the original working days, the baseline schedule must be supplemented with resource allocations for every task activity and include time-scaled resource histograms. Resource allocations must be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for you and your subcontractors.

8-1.02C(7) Update Schedule

You may include changes to update schedules that do not alter a critical path, add a near critical path, or extend the scheduled completion date compared to the current schedule. Changes may include:

1. Adding or deleting activities
2. Changing activity constraints
3. Changing remaining durations
4. Changing logic
5. Your forecasted date of completion

If any proposed change in planned work would alter the critical path or near critical path or extend the scheduled completion date, submit a TIA within 5 days of the proposed change.

Meet with the Engineer to review work progress on or before the 1st day of each month, starting 30 days after the baseline schedule is accepted. Discuss, narrative report, progress to date, changes in schedule, unresolved time issues, and additional schedule changes needed.

The update schedule must:

1. Show actual activity start dates, percent complete, and finish dates
2. Show durations for work that has been completed as the work occurred, including the Engineer's review and your resubmittal times
3. For instances where a baseline schedule requires resource allocations, describe actual resources allocated to activities for work that has been completed and those anticipated for remaining work.

If a previous update schedule was not approved, the Engineer may allow you to submit an update schedule that reflects current progress. Submittal of this update schedule does not result in acceptance of prior unaccepted schedules. Prior unaccepted schedules must be corrected and resubmitted upon request.

8-1.02C(8) Time Impacts

8-1.02C(8)(a) General

Reserved

8-1.02C(8)(b) Time Impact Analysis Submittal

Submit a TIA with each request for adjustment of Contract time or whenever you or the Engineer considers that an authorized or anticipated change may impact the critical path or work progress.

For a Change Order with deferred time, submit TIA updates monthly and within 15 days of completion of the change order work.

The TIA must:

1. Illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone such as those associated with incentives or disincentives for completion of work parts.
2. Use the accepted schedule that has a data date closest to and before the event. If the Engineer determines that the accepted schedule used does not appropriately represent the conditions before the event, the accepted schedule must be updated to the day before the event being analyzed.
3. Include an impact schedule developed from incorporating the event into the accepted schedule by adding or deleting activities or by changing durations or logic of existing activities. If the impact schedule shows that incorporating the event modifies the critical path and scheduled completion date of the accepted schedule, the difference between scheduled completion dates of the 2 schedules may be equal to the adjustment of Contract time. Mitigation measures must be considered before determining the final adjustment of Contract time.

The Engineer may construct and use an appropriate project schedule to determine adjustments in Contract time until you submit the TIA.

Submit 2 copies of the TIA within 10 days of receiving a written request for a TIA or within 5 business days of recognition of an authorized or anticipated change that may impact the critical path or work progress. Authorized TIA schedule changes must be shown on the next update schedule.

If a TIA you submit is rejected, meet with the Engineer within 5 business days of the rejection to discuss and resolve issues related to the TIA. If you are unable to resolve the issues, submit an RFI within 5 business days.

Show only actual as-built work in subsequent update schedules. Do not show unauthorized changes related to the TIA.

Upon completion of an unresolved time impact issue, submit a final time impact analysis for the Engineer to consider.

Once agreement is reached, the authorized TIA schedule changes must be shown on the next update schedule.

An ordered change that affects the critical path is a basis for a time adjustment.

The Department grants a time extension only if the total float is absorbed and the scheduled completion date is delayed 1 or more working days due to the ordered change. The Department may use Department-owned float to mitigate impacts of a Department ordered change.

8-1.02C(8)(c) Department-Owned Float

The Engineer may accrue Department-owned float. The Engineer documents Department-owned float by ordering you to update the Department-owned float activity on the next update schedule.

Include a log of the action on the Department-owned float activity and include a discussion of the action in the narrative report.

The Engineer may use Department-owned float to mitigate past, present, or future Department delays by offsetting a potential time extension for a Change Order.

Prepare a TIA upon request to determine the effect of Department-owned float. Department-owned float is a resource for the exclusive use of the Department.

8-1.02C(9) Final As-Built Schedule

Within 30 days after work completion, submit a final as-built schedule with actual start and finish dates for the activities.

Submit a written certificate with this submittal signed by your project manager or an officer of the company stating:

> "To my knowledge and belief, the enclosed final as-built schedule reflects the actual start and finish dates of the actual activities for the project contained herein."

An officer of the company may delegate in writing the authority to sign the certificate to a responsible manager. In such an instance, include the written delegation with your submittals.

8-1.02C(10) Payment

The Department pays you for level 2 critical path method schedule as follows:

1. A total of 25 percent of the item total is paid upon:
   1.1. Completion of 5 percent of all work
   1.2. Acceptance of schedules and authorization of TIAs and deferred time analyses required when 5 percent of all work is complete
2. A total of 50 percent of the item total is paid upon:
   2.1. Completion of 25 percent of all work
   2.2. Acceptance of schedules and authorization of TIAs and deferred time analyses required when 25 percent of all work is complete

3. A total of 75 percent of the item total is paid upon:
   3.1. Completion of 50 percent of all work
   3.2. Acceptance of schedules and authorization of TIAs and deferred time analyses required when 50 percent of all work is complete
4. A total of 100 percent of the item total is paid upon:
   4.1. Completion of all work
   4.2. Acceptance of schedules and authorization of TIAs and deferred time analyses required when all work is complete
   4.3. Submittal of the certified final as-built schedule

The Department does not adjust payment for any increased or decreased work in submitting schedules.

The Department makes a deduction of $25,000 for failure to submit the certified final as-built schedule.

8-1.02D–8-1.02F Reserved

Replace the row for *Safety* in the table in the 2nd paragraph of section 8-1.03 with:

10-19-18

Safety	Injury and Illness Prevention Program, Code of Safe Practices, and job site posters

Add to the end of the 4th paragraph of section 8-1.05:

04-16-21

If you disagree with a Weekly Statement of Working Days report, submit an RFI within 5 business days of receipt of the report.

Replace the 2nd paragraph of section 8-1.07C with:

04-17-20

Losses for idle equipment, idle workers, and moving or transporting equipment are eligible for delay-related payment adjustments.

Replace item 3 in the list in the 3rd paragraph of section 8-1.07C with:

04-19-19

3. Delay days exclude Saturdays and holidays.

Add to section 8-1.07C:

04-17-20

If you claim additional costs due to impacts from an excusable delay, you must comply with section 5-1.42. Support your claim for additional costs based on the difference between the cost to perform the work as planned and the cost to perform the work as changed as determined under section 9-1.04. The Department adjusts payment for the work portion that was impacted.

Replace the 2nd paragraph of section 8-1.10A with:

10-15-21

The Department may withhold liquidated damages before the accrual date if the anticipated liquidated damages may exceed the value of the remaining work.

Replace the table in the 3rd paragraph of section 8-1.10A with:

10-15-21

Liquidated Damages

Total bid		Liquidated damages per day
From over	To	
$0	$200,000	$2,800
$200,000	$500,000	$3,600
$500,000	$1,000,000	$3,600
$1,000,000	$2,000,000	$4,200
$2,000,000	$5,000,000	$5,200
$5,000,000	$10,000,000	$6,700
$10,000,000	$20,000,000	$9,500
$20,000,000	$50,000,000	$13,200
$50,000,000	$100,000,000	$16,000
$100,000,000	$250,000,000	$19,300

Replace section 8-1.14E with:

10-18-19

8-1.14E Payment Adjustment for Termination

If the Department issues a termination notice, the Engineer determines the payment for termination during the performance period, from contract approval date to contract acceptance date, based on the following:

1. Direct cost for the work performed:
    - 1.1. Including:
        - 1.1.1. Mobilization
        - 1.1.2. Demobilization
        - 1.1.3. Securing the job site for termination
        - 1.1.4. Losses from the sale of materials
    - 1.2. Not including:
        - 1.2.1. Cost of materials you keep
        - 1.2.2. Profit realized from the sale of materials
        - 1.2.3. Cost of material damaged by:
            - 1.2.3.1. Act of God
            - 1.2.3.2. Act of a public enemy
            - 1.2.3.3. Fire
            - 1.2.3.4. Flood.
            - 1.2.3.5. Governor-declared state of emergency
            - 1.2.3.6. Landslide
            - 1.2.3.7. Tsunami
        - 1.2.4. Other credits
2. Cost of remedial work, as estimated by the Engineer, is not reimbursed.
3. Allowance for profit not to exceed 4 percent of the cost of the work performed where a likelihood of having made a profit had the Contract not been terminated is shown.
4. Material handling costs for material returned to the vendor or disposed of as ordered.
5. Costs in determining the payment adjustment due to the termination, excluding attorney fees and litigation costs.
6. Overhead costs.

Termination of the Contract does not relieve the surety of its obligation for any just claims arising out of the work performed.

^^

9 PAYMENT

04-15-22

Add between the 1st and 2nd paragraphs of section 9-1.04A:

04-17-20

The Tentative Daily Extra Work Agreement form is used to identify the labor, materials, and equipment used on change order work paid at force account. Signatures on this form do not constitute final agreement regarding payment.

Replace the 2nd paragraph of section 9-1.06B with:

10-16-20

If the payment for the number of units of a bid item in excess of 125 percent of the Bid Item List is less than $15,000 at the unit price, the Engineer may not adjust the unit price unless you request it.

Replace section 9-1.07B(5) with:

10-19-18

9-1.07B(5) Hot Mix Asphalt Containing Reclaimed Asphalt Pavement

The Engineer calculates the quantity of asphalt in HMA containing RAP using the following formula:

Qrap = *HMARTT* x *Xaa*

where:
Xaa = *Xta* – [(*Xrap x Xra x (Xta-100)) / (100 x (Xra – 100))*]

and:
Qrap = quantity in tons of asphalt used in HMA containing RAP
HMARTT = HMA containing RAP, total tons placed
Xaa = asphalt content of HMA containing RAP adjusted to exclude the asphalt content in RAP, expressed as a percentage of the total weight of HMA containing RAP
Xta = total theoretical asphalt content in HMA containing RAP from the job mix formula, expressed as a percentage of the total weight of HMA containing RAP
Xrap = RAP percentage in HMA containing RAP from the job mix formula, expressed as a percentage of the total dry weight of aggregate in HMA containing RAP
Xra = average asphalt content of RAP from the job mix formula, expressed as percentage of total weight of RAP

Replace item 1.2 in the list in the 2nd paragraph of section 9-1.11C with:

04-16-21

1.2. Superintendents

Replace the 2nd sentence in the 7th paragraph of section 9-1.11E with:

04-19-19

The cost is determined under section 9-1.05 except no markup is allowed.

04-15-22

Delete the 2nd paragraph of section 9-1.16A.

Replace section 9-1.16C with:

10-19-18

9-1.16C Materials On Hand

A material on hand but not incorporated into the work is eligible for a progress payment if:

1. Compliant with other Contract parts
2. Material cost exceeds either of the following:
   2.1. $50,000
   2.2. $25,000 if the requestor is certified as one or more of the following:
      2.2.1. DVBE
      2.2.2. DBE
      2.2.3. Small business as certified by Department of General Services, Office of Small Business and Disabled Veteran Business Enterprise Services
3. Purchased
4. Invoice is submitted
5. Stored within the State and you submit evidence that the stored material is subject to the Department's control
6. Protected from weather and contamination
7. Water pollution control measures are established and maintained
8. Requested on the Department-furnished form

Replace the 1st paragraph of section 9-1.16E(3) with:

10-18-19

During each estimate period you fail to comply with a Contract part, including the submittal of a document as specified, such as QC plans, schedules, traffic control plans and water pollution control submittals, the Department withholds a part of the progress payment except as specified below for the failure to submit a document during the last estimate period.

Replace section 9-1.16F with:

04-16-21

9-1.16F Retentions

The Department does not retain moneys from progress payments due to the Contractor for work performed.

Replace the 3rd paragraph of section 9-1.17C with:

10-18-19

If you claim that the total for work completed, excluding deductions, in the proposed final estimate is less than 90 percent of your total bid, the Department adjusts the final payment to cover your overhead. The adjustment in the final estimate is 10 percent of the difference between 90 percent of your total bid and the total for work completed, excluding deductions. The Department does not make this adjustment on a terminated contract.

Replace section 9-1.17D(2)(b) with:

04-17-20

9-1.17D(2)(b) Overhead Claims

9-1.17D(2)(b)(i) General

Section 9-1.17D(2)(b) includes specifications for overhead claims.

The Department deducts an amount for field and home office overhead paid on added work from any claim for overhead. The home office overhead deduction equals 5 percent of the added work. The field office overhead deduction equals 5-1/2 percent of the added work.

9-1.17D(2)(b)(ii) Definitions

actual daily overhead rates: The home office overhead and field office overhead rates expressed per business day for the contract performance period. The home office overhead rate is calculated using the Eichleay Formula and is based on overhead cost pools and all allocation bases from Contract and company revenues.

added work: Equals the value of the work completed minus the total bid.

contract performance period: The period from Contract approval to Contract acceptance.

9-1.17D(2)(b)(iii) Submittals

Submit the following for an overhead claim:

1. Final amount of additional payment requested.
2. Specific identification of each claim and dates associated with each claim for which you seek reimbursement for specific overhead costs.
3. Audit report prepared by an independent CPA for the contract performance period identifying the actual daily overhead rates, supporting calculations and documentation for both field and home office overhead excluding a profit markup.

Field office overhead costs from which the actual daily overhead rate is calculated must be:

1. Allowable under 48 CFR 31
2. Supported by reliable records
3. Related solely to the project
4. Incurred during the contract performance period
5. Comprised of only time-related field office overhead costs
6. Not a direct cost

Home-office overhead costs from which the actual daily overhead rate is calculated must be:

1. Allowable under 48 CFR 31
2. Supported by reliable records
3. Incurred during the contract performance period
4. Comprised of only fixed home-office overhead costs
5. Not a direct cost

Failure to submit the audit report for an overhead claim with the claim statement is a waiver of the overhead claim and operates as a bar to arbitration on the claim (Pub Cont Code § 10240.2).

The CPA's audit must be performed as an examination-level engagement under the attestation engagements in the *Government Auditing Standards* published by the Comptroller General of the United States. The CPA's audit report must express an opinion of whether or not your calculations of your actual field and home office overhead daily rates comply with section 9-1.17D(2)(b). The attest documentation prepared by the CPA in connection with the audit must be submitted for review with the audit report.

Within 20 days of the Engineer's request, make your financial records available for an audit by the State for verifying the actual daily overhead rates in your audit report. The actual rate of time-related overhead is subject to authorization by the Engineer.

The Department pays for 1/2 the cost of the report unless otherwise specified. The cost is determined under section 9-1.05 except no markup is allowed.

Replace the 3rd and 4th paragraphs of section 9-1.17D(3) with:

04-16-21

If the Engineer determines that a claim requires additional analysis, the Engineer schedules a Department management meeting. Meet with Department management and make a presentation supporting the claim.

After the Engineer or Department management finishes reviewing the claim, the Department makes the final determination of claims and provides it to you. This final determination of claims is the final written decision by the Department on the claims under Pub Cont Code § 10240.1.

Add to the end of the 2nd paragraph of section 9-1.22:

04-16-21

The Department's final written decision on a claim is the final determination of claims as specified in section 9-1.17D(3).

^^

DIVISION II GENERAL CONSTRUCTION

10 GENERAL

04-19-19

Replace the 1st sentence in the 4th paragraph of section 10-6 with:

04-19-19

The sources and discharge of recycled water must comply with the water-recycling criteria of the CDPH, SWRCB Order No. WQ 2016-0068-DDW, and the requirements of the appropriate RWQCB.

^^

11 WELDING

04-15-22

Add to the beginning of section 11:

04-15-22

11-1 GENERAL

Replace the table in the 3rd paragraph of section 11-1.01 with:

04-16-21

AWS code	Year of adoption
D1.1	2020
D1.3	2018
D1.4	2018
D1.5	2020
D1.6	2017
D1.8	2016

Replace the introductory clause in the 1st paragraph of section 11-1.03 with:

04-16-21

Replace clause 8.1.3 of AWS D1.1, the 1st paragraph of clause 9.1.2 of AWS D1.4, and clause 8.1.2 of AWS D1.5 with:

Replace the introductory clause of the 2nd paragraph of section 11-1.04 with:

04-16-21

Replace clause 8.14.6.1 of AWS D1.1, clause 9.8.1 of AWS D1.4, and clause 8.1.3.4 of AWS D1.5 with:

Replace the 1st paragraph of section 11-1.05 with:

04-16-21

Replace the first sentence of clause 7.21.1.1 of AWS D1.1 with the following:

The separation between surfaces of plug and slot welds, and of joints landing on a backing, shall not exceed 1/16 in [2 mm].

Replace clause 5.3.1.1 of AWS D1.5 with the following:

The separation between surfaces of plug and slot welds, and of joints landing on a backing, shall not exceed 2 mm [1/16 in].

If weld joint details proposed for use in the work are not prequalified under clause 5 of AWS D1.1 or figure 4.4 or 4.5 of AWS D1.5, submit the proposed WPS and the intended weld joint locations.

Replace item 2 in the list in the 2nd paragraph of section 11-1.05 with:

04-19-19

2. Be mechanically and radiographically tested. Mechanical and radiographic testing and acceptance criteria must comply with the applicable AWS codes. The type of mechanical testing must be authorized.

Replace the 3rd paragraph of section 11-1.05 with:

10-16-20

If a nonprequalified weld joint configuration is proposed using a combination of WPSs for work welded under AWS D1.1, you may conduct a single test combining the WPSs to be used in production, if the essential variables, including weld bead placement, of each process are limited to those established in table 6.5 of AWS D1.

Replace the 1st and 2nd paragraphs of section 11-1.06 with:

04-16-21

Replace item 3 of clause 8.26.3.2 of AWS D1.5 with:

3. If indications that exhibit these planar characteristics are present at scanning sensitivity, or other evidence exists to suggest the presence of transverse cracks, a more detailed evaluation of the discontinuity by other means must be performed (e.g., alternate UT techniques, RT, grinding, or gouging for visual inspection or MT of the excavated areas.)

Replace the scanning angle in clause 8.24.2.2 of AWS D1.5 with:

e = 45° max

Clause 8.6.5 of AWS D1.1, clause 9.6.5 of AWS D1.4, and clause 8.6.5 of AWS D1.5 do not apply.

Replace the introductory clause of the 1st paragraph of section 11-2.04 with:

04-16-21

Clauses 8.1.4.2 and 8.1.4.4 of AWS D1.1, the 2nd paragraph of clause 9.1.2 of AWS D1.4, clauses 8.1.3.1 through 8.1.3.3 of AWS D1.5, and clause 7.2.3 of AWS D1.8 are replaced with:

Replace item 2 in the list in the 2nd paragraph of section 11-2.04 with:

04-16-21

2. Structural steel for building construction work is performed at a permanent fabrication or manufacturing plant that is certified under the AISC Quality Certification Program, Category BU, Fabricators of Steel Buildings.

Replace the introductory clause in the 1st paragraph of section 11-2.05 with:

04-16-21

Replace clause 8.5.4 of AWS D1.5 with:

Replace section 11-2.06 with:

04-19-19

11-2.06 WELDING PROCEDURES QUALIFICATION

04-16-21

Welding procedures qualification for work welded under AWS D1.5 must comply with clause 7.12 or 7.12.4 of AWS D1.5 and the following:

1. Macroetch tests are required for all WPS qualification tests, and acceptance must comply with clause 7.19.2 of AWS D1.5.
2. If a nonstandard weld joint is to be made using a combination of WPSs, you may conduct a test under figure 7.3, combining the qualified or prequalified WPSs to be used in production, if the essential variables, including weld bead placement, of each process are limited to those established in table 7.6 of AWS D1.5.
3. Before preparing mechanical test specimens, inspect the PQR welds by visual and radiographic tests. The backing bar must be 3 inches in width and must remain in place during NDT. Results of the visual and radiographic tests must comply with clause 8.26.2 of AWS D1.5 excluding clause 8.26.2.2. All other requirements for clause 7.17 are applicable.

10-16-20

When electric resistance welding is used for work welded under AWS D1.1, the welding procedure must be qualified under Clause 6 of AWS D1.1. Welding procedures must be qualified for the thickness and the pole diameter tested. Test samples for tapered poles must be obtained from three locations, each end and the middle of the tapered pole, to qualify for the diameter range tested.

Replace the 3rd paragraph of section 11-3.02 with:

04-19-19

The AISC Certification category for pole structures is Bridge and Highway Metal Component (CPT) or Standard for Steel Building Structures (BU).

^^

Replace section 12 with:

10-18-19

12 TEMPORARY TRAFFIC CONTROL

04-15-22

12-1 GENERAL

12-1.01 GENERAL

Section 12-1 includes general specifications for providing temporary traffic control.

Temporary traffic control, including flagging, apparel, temporary traffic control devices, and equipment for flaggers, must comply with the *California MUTCD,* Part 6, "Temporary Traffic Control."

12-1.02 MATERIALS

Not Used

12-1.03 CONSTRUCTION

Assign flaggers to:

1. Control traffic
2. Warn the public of any dangerous conditions resulting from the work activities
3. Provide for the passage of traffic through the work as specified for the passage of traffic for public convenience and public safety

Maintain flagging apparel, traffic control devices, and equipment for flaggers in good repair.

12-1.04 PAYMENT

Not Used

12-2 RESERVED

12-3 TEMPORARY TRAFFIC CONTROL DEVICES

12-3.01 GENERAL

12-3.01A General

12-3.01A(1) Summary

Section 12-3.01 includes general specifications for providing temporary traffic control devices.

10-15-21

Providing temporary traffic control devices includes installing, placing, maintaining, repairing, replacing, relocating, and removing temporary traffic control devices.

10-18-19

Do not use different types of channelizing devices on the same alignment. The types include plastic drums, portable delineators, channelizers, tubular markers, traffic cones, and Type I and Type II barricades.

12-3.01A(2) Definitions

Category 1 temporary traffic control devices: Small devices weighing less than 100 lb certified as crashworthy by crash testing or crash testing of similar devices. Category 1 temporary traffic control devices include traffic cones, plastic traffic drums, portable delineators, and channelizers.

Category 2 temporary traffic control devices: Small devices weighing less than 100 lb that are not expected to produce significant changes in vehicular velocity but could cause harm to impacting vehicles. Category 2 temporary traffic control devices include barricades and portable sign supports.

10-15-21

Category 3 temporary traffic control devices: Devices weighing 100 lb or more that are expected to produce significant changes in the vehicular velocity of impacting vehicles. These devices include crash cushions, impact attenuator vehicles, temporary barriers, and end treatments for barriers.

10-18-19

orange: Orange, red-orange, fluorescent orange, or fluorescent red-orange.

useable shoulder area: Any longitudinal paved or unpaved contiguous surface adjacent to the traveled way with:

1. Enough weight-bearing capacity to support temporary traffic control devices, such as flashing arrow signs, PCMSs, and impact attenuator vehicles
2. Slope not greater than 6:1 (horizontal:vertical)

12-3.01A(3) Submittals

At least 5 business days before starting any work using the devices or within 2 business days after the request if the devices are already in use, submit as informational submittals:

1. Self-certification for crashworthiness of Category 1 temporary traffic control devices. Either you or the manufacturer must perform the self-certification. Include:
   1.1. Date
   1.2. Federal aid number for a federal-aid contract
   1.3. Contract number, district, county, route, and post miles of the project limits
   1.4. Company name, street address, city, state, and zip code of the certifying vendor
   1.5. Printed name, signature, and title of the certifying person
   1.6. Types of Category 1 temporary traffic control devices
2. List of proposed Category 2 temporary traffic control devices

Obtain a standard form for self-certification from the Engineer.

Submit a sample of the type of portable delineator that you will be using before placing the delineators on the job site.

12-3.01A(4) Quality Assurance

Reserved

12-3.01B Materials

The condition of temporary traffic control devices must comply with the most current edition of the American Traffic Safety Services Association publication *Quality Guidelines for Temporary Traffic Control Devices and Features*.

Category 2 temporary traffic control devices must be on FHWA's list of acceptable crashworthy Category 2 hardware for work zones. For this list, go to FHWA's Safety Program website.

Category 2 temporary traffic control devices must be labeled with the FHWA acceptance letter code and the name of the manufacturer. The label must be legible and permanently affixed to the temporary traffic control device by the manufacturer.

Category 3 temporary traffic control devices must be on the Authorized Material List for highway safety features.

Retroreflectivity for the following materials must comply with Table 2A-3, "Minimum Maintained Retroreflectivity Levels," of the *California MUTCD* and be on the Authorized Material List for signing and delineation materials:

1. Retroreflective sheeting for barricades
2. Retroreflective bands for portable delineators
3. Retroreflective sheeting for construction area signs
4. Retroreflective sheeting for channelizers
5. Reflectors for Type K temporary railing
6. Retroreflective cone sleeves
7. White and orange retroreflective stripes for plastic traffic drums

The following temporary traffic control devices must be visible from 1,000 feet during the hours of darkness under an illumination of legal high-beam headlights by persons with 20/20 vision or vision corrected to 20/20:

1. Retroreflective bands on portable delineators
2. Retroreflective sheeting on channelizers
3. Retroreflective cone sleeves on traffic cones

12-3.01C Construction

Perform all layout work necessary to place channelizing devices:

1. On the proper alignment

2. Uniformly at the location and spacing described
3. Straight on a tangent alignment
4. On a true arc in a curved alignment

If temporary traffic control devices are damaged, displaced, or stop operating or functioning as described from any cause during the progress of the work, immediately repair, repaint, or replace the components and restore them to their original locations and positions.

If ordered, furnish and place additional temporary traffic control devices. This work is change order work unless the temporary traffic control devices are being furnished and placed for public safety or public convenience.

Level and plumb a portable system.

Delineate the location of a trailer mounted system with a taper consisting of 9 traffic cones placed 25 feet apart, except where the system is placed within a lane closure or behind a barrier or guardrail.

When a portable system is not in use, remove it from the job site, place it behind a barrier or guardrail, or move it to an area at least 15 feet from the edge of the traveled way.

10-15-21

12-3.01D Payment

Payment for a system with a DAY unit of measure is based on a continuous 24-hour period. The 24-hour period will start when the system is placed in operation at the first location.

10-18-19

12-3.02 TRAFFIC CONES

12-3.02A General

Section 12-3.02 includes specifications for placing traffic cones.

12-3.02B Materials

A traffic cone must be flexible, orange, and manufactured from commercial-quality material designed for the intended purpose.

The outer section of the portion above the base of the traffic cone must be translucent and fabricated of a highly pigmented, orange, PV compound. The overall height of a traffic cone must be at least 28 inches and the bottom inside diameter of the traffic cone must be at least 10.5 inches.

During the hours of darkness, a traffic cone must have a retroreflective cone sleeve.

Retroreflective cone sleeves must be permanently affixed, double-band, sleeves consisting of 2 white retroreflective bands. The top band must be 6 inches wide and placed a maximum of 4 inches from the top of the cone. The lower band must be 4 inches wide and placed 2 inches below the bottom of the top band. You may use traffic cones with double-band retroreflective cone sleeves during daylight hours.

12-3.02C Construction

Use the same type of retroreflective cone sleeve for all cones used on the project.

Anchor the base of a traffic cone if it does not have enough size and weight to keep the cone in an upright position.

12-3.02D Payment

Not Used

12-3.03 PLASTIC TRAFFIC DRUMS

12-3.03A General

12-3.03A(1) Summary

Section 12-3.03 includes specifications for placing plastic traffic drums.

12-3.03A(2) Definitions

Reserved

12-3.03A(3) Submittals

Submit a certificate of compliance for plastic traffic drums.

12-3.03A(4) Quality Assurance

Reserved

12-3.03B Materials

A plastic traffic drum must comply with the manufacturer's instructions for weight and ballast.

A plastic traffic drum must:

1. Be orange LDPE
2. Be flexible and collapsible upon vehicle impact
3. Have a weighted base to maintain an upright position and prevent displacement by passing traffic
4. Have a height such that the top of the drum is at least 36 inches above the traveled way

The weighted base must:

1. Be detachable
2. Be shaped to prevent rolling upon impact
3. Have a 38-inch maximum outside diameter
4. Have a 4-inch maximum height above the ground surface

12-3.03C Construction

Use 1 type of plastic traffic drum on the project.

Use the same type and brand of retroreflective sheeting for all plastic traffic drums used on the project.

Do not use sandbags or comparable ballast.

Moving plastic traffic drums from location to location if ordered after initial placement is change order work.

12-3.03D Payment

Not Used

12-3.04 PORTABLE DELINEATORS

12-3.04A General

Section 12-3.04 includes specifications for placing portable delineators.

12-3.04B Materials

A portable delineator, including its base, must be made of a material that has enough rigidity to remain upright when unattended and must be flexible or collapsible upon impact by a vehicle. The base must be (1) shaped to prevent rolling after impact and (2) anchored or weigh enough to keep the delineator in an upright position. Ballast for a portable delineator must comply with the manufacturer's instructions.

A portable delineator must be a minimum of 36 inches in height. The vertical portion of a portable delineator must be predominantly orange. The post must be not less than 3 inches in width or diameter. Retroreflectorization of a portable delineator that has a height of less than 42 inches must be provided by two 3-inch-wide white bands placed a maximum of 2 inches from the top with a maximum of 6 inches between the bands. Retroreflectorization of a portable delineator that has a height of 42 inches or more must be provided by four 4- to 6-inch-wide alternating orange and white stripes with the top stripe being orange.

12-3.04C Construction

Use only 1 type of portable delineator on the project.

12-3.04D Payment

Not Used

12-3.05 CHANNELIZERS

12-3.05A General

Section 12-3.05 includes specifications for placing channelizers.

12-3.05B Materials

A channelizer must be on the Authorized Material List for signing and delineation materials.

Its post must be orange.

A channelizer must be affixed with 3-by-12-inch, retroreflective, white sheeting.

12-3.05C Construction

Install channelizers on clean, dry surfaces.

Cement the channelizer bases to the pavement as specified for cementing pavement markers to the pavement in section 81-3.

When no longer required for the work, remove the channelizers and the underlying adhesive used to cement the channelizer bases to the pavement.

Do not remove channelizers that are shown to be left in place at the time of work completion.

12-3.05D Payment

Not Used

12-3.06–12-3.09 RESERVED

12-3.10 BARRICADES

12-3.10A General

Section 12-3.10 includes specifications for placing barricades.

12-3.10B Materials

Markings for barricade rails must be alternating orange and white retroreflective stripes.

Orange retroreflective sheeting must match color PR no. 6, Highway Orange, of the FHWA Color Tolerance Chart.

The interface between the rail surface and the retroreflective sheeting must be free of air bubbles or voids.

The predominant color of barricade components other than the rails must be white or unpainted galvanized metal or aluminum.

You may use a Type III barricade as a sign support if the barricade has been successfully crash tested under *NCHRP Report 350* criteria or the Manual for Assessing Safety Hardware (MASH) crash testing guidelines as a single unit with an attached sign panel of the size and type to be used.

A sign panel for a construction area sign or marker panel to be mounted on a barricade must comply with section 12-3.11B(2).

Do not imprint an owner identification on the retroreflective face of any rail.

12-3.10C Construction

Place each barricade such that the stripes slope downward in the direction road users are to pass.

Place each sand-filled bag near the ground level on the lower parts of the frame or stays to serve as ballast for the barricades. Do not place ballast on top of barricades or over any retroreflective barricade rail face that is facing traffic.

Do not remove barricades that are shown to be left in place at the time of work completion.

Moving a barricade from location to location is change order work if ordered after initial placement of the barricade.

12-3.10D Payment

Not Used

12-3.11 CONSTRUCTION AREA SIGNS

12-3.11A General

12-3.11A(1) Summary

Section 12-3.11 includes specifications for placing construction area signs.

04-17-20

Construction area signs include general information signs and all temporary signs and object markers required for the direction of traffic within the project limits.

10-18-19

12-3.11A(2) Definitions

background: Dominant sign color.

legend: Letters, numerals, tildes, bars, arrows, route shields, symbols, logos, borders, artwork, and miscellaneous characters that are intended to convey specific meanings on traffic signs.

12-3.11A(3) Submittals

Reserved

12-3.11A(4) Quality Assurance

Reserved

12-3.11B Materials

12-3.11B(1) General

04-17-20

Construction area sign must be the product of a commercial sign manufacturer.

10-18-19

The style, font, size, and spacing of the legend must comply with the *Standard Alphabets* published in the FHWA's Standard Highway Signs Book.

The sign must be visible from 500 feet and legible from 300 feet at noon on a cloudless day and during the hours of darkness under an illumination of legal low-beam headlights by persons with 20/20 vision or vision corrected to 20/20. A fabric sign panel on a portable sign is not subject to the visibility and legibility requirements for headlight illumination during the hours of darkness.

04-16-21

Construction area warning and guide signs must have a black legend on a retroreflective, fluorescent orange background. W10-1 advance warning sign for highway-rail grade crossings must have a black legend on a retroreflective fluorescent yellow background.

10-18-19

12-3.11B(2) Stationary-Mounted Signs

04-16-21

Stationary-mounted sign must comply with section 82-2.

10-18-19

A temporary sign support of any type placed within 15 feet from the edge of the traveled way must comply with the specifications for a Category 2 temporary traffic control device.

The sign post must be good, sound wood posts with the breakaway feature as shown for a roadside sign.

Fastening hardware and back braces must be commercial-quality materials.

12-3.11B(3) Portable Signs

Each portable sign must consist of a base, standard or framework, and a sign panel. Units delivered to the job site must be capable of being placed into immediate operation.

A sign panel for a portable sign must comply with the specifications for a stationary-mounted sign panel or be fabricated from one of the following materials:

1. Type VI, retroreflective, elastomeric roll-up fabric
2. Nonretroreflective, cotton, drill fabric
3. Nonretroreflective, flexible, industrial, nylon fabric
4. Another type of fabric if authorized

Do not use nonretroreflective portable signs during the hours of darkness.

The bottom of the portable sign panel must be at least 1 foot above the edge of the traveled way.

12-3.11B(4) Temporary Object Markers

A temporary object marker must be mounted on a stationary wood or metal post and must comply with section 82.

A marker panel for a Type N (CA), Type P (CA), or Type R (CA) object marker must comply with the specifications for a marker panel for a stationary sign panel in section 12-3.11B(2).

A target plate, post, and the hardware for a Type K (CA) and Type L (CA) temporary object marker must comply with the specifications for these items in section 82.

12-3.11B(5) General Information Signs

10-16-20

12-3.11B(5)(a) General

Not Used

04-16-21

12-3.11B(5)(b) Construction Project Funding Identification Signs

Construction project funding identification sign must:

1. Comply with:
   1.1. Section 6F.109(CA) of the California MUTCD
   1.2. Section 82-2.02E
   1.3. Specifications on the Department's Safety Programs website
2. Be 48 by 30 inches for local roadways
3. Be 96 by 60 inches for conventional highways
4. Be 132 by 78 inches for freeways and expressways

10-18-19

12-3.11C Construction

12-3.11C(1) General

Place all construction area signs outside of the traveled way. Do not block a bicycle or pedestrian pathway with a construction area sign.

Place, install, maintain, and remove temporary object markers shown as construction area signs as specified for construction area signs.

Maintain accurate information on construction area signs. Immediately replace or correct signs that convey inaccurate information.

During the progress of work, immediately cover or remove unneeded signs.

Cover each unneeded sign such that the message cannot be seen. Securely fasten the cover to prevent movement from wind.

Check each covered sign daily for damage to the cover and immediately replace any cover if needed.

Clean each construction area sign panel at the time of installation and at least once every 4 months thereafter.

Be prepared to furnish additional construction area sign panels, posts, and mounting hardware or portable sign mounts on short notice due to changing traffic conditions or damage caused by traffic or other conditions. Maintain an inventory of commonly required items at the job site or make arrangements with a supplier who is able to furnish the items daily on short notice.

Replace any damaged construction area sign or repair the sign if authorized.

Remove any sign panel that exhibits irregular luminance, shadowing, or dark blotches at nighttime under vehicular headlight illumination.

12-3.11C(2) Stationary-Mounted Signs

Install stationary-mounted signs as described for the installation of roadside signs except:

1. Back braces and blocks for sign panels are not required for signs 48 inches or smaller in width and diamond-shaped signs 48 by 48 inches or smaller.
2. Bottom of the sign panel must be at least 7 feet above the edge of the traveled way.
3. You may install a construction area sign on an above-ground, temporary platform sign support or on an existing lighting standard or other support if authorized. Do not make holes in a standard to support the sign if it is installed on an existing lighting standard.
4. Post embedment must be at least 2.5 feet if the post hole is backfilled around the post with commercial-quality concrete. The concrete must contain at least 295 pounds of cementitious material per cubic yard.

The Engineer determines the post size and number of posts if the type of sign installation is not shown.

Excavate each post hole by hand methods without the use of power equipment. You may use power equipment where you determine that subsurface utilities are not present in the area of the proposed post hole if authorized. The post-hole diameter must be at least 4 inches greater than the longest cross-sectional dimension of the post if it is backfilled with commercial-quality concrete.

Furnishing, installing, maintaining, moving, and removing any additional construction area signs if ordered is change order work.

12-3.11C(3) General Information Signs

10-16-20

12-3.11C(3)(a) General

Not Used

04-16-21

12-3.11C(3)(b) Construction Project Funding Identification Signs

Do not add information to a construction project funding identification sign unless authorized.

Install construction project funding identification signs before starting major work activities visible to highway users.

Mount construction project funding identification signs on a wood posts under section 82-3.

10-18-19

12-3.11D Payment

Not Used

12-3.12 TELESCOPING FLAG TREES

12-3.12A General

Section 12-3.12 includes specifications for placing telescoping flag trees.

12-3.12B Materials

Telescoping flag trees must be manufactured from commercial-quality material designed for the intended purpose and capable of maintaining an upright position at all times while in use.

12-3.12C Construction

Not Used

12-3.12D Payment

Not Used

12-3.13–12-3.19 RESERVED

10-15-21

12-3.20 TEMPORARY BARRIER SYSTEMS

12-3.20A General

12-3.20A(1) Summary

Section 12-3.20 includes specifications for placing, maintaining, repairing, and removing temporary barrier systems.

Temporary barrier system consists of:

1. New or undamaged used interconnected barrier segments
2. Segment connection hardware
3. Stakes and anchor bolts

12-3.20A(2) Definitions

clear area width: Minimum width throughout the length of the barrier system that must be maintained clear of obstructions, objects, and work resources during non-working hours. The width is measured perpendicular from the non-traffic side toe.

set back distance: Space measured between the closest toe of temporary barrier and the edge of traveled way for both directions of traffic.

12-3.20A(3) Submittals

Submit as informational submittal for each type of temporary barrier system:

1. Certificate of compliance
2. Manufacturer's installation instructions except for Type K temporary railing

Submit a signed manufacturer's replacement evaluation report within 10 days of damage to a temporary steel barrier system.

12-3.20A(4) Quality Assurance

12-3.20A(4)(a) General

Except for Type K temporary railing, temporary barrier systems must:

1. Be on the Authorized Materials List for highway safety features
2. Comply with MASH Test Level 3 requirements
3. Comply with the manufacturer's drawings shown on the Department’s Division of Safety Programs website and the manufacturer’s installation instructions

If a discrepancy exists, governing ranking in descending order is:

1. These specifications
2. Manufacturer’s drawings
3. Manufacturer’s installation instructions

12-3.20A(4)(b) Quality Control

Replace damaged temporary concrete barrier segments with exposed reinforcing steel or concrete spalls 1-1/2 inches in depth and 4 inches in width or greater.

Replace damaged temporary steel barrier segments with permanent bends, tearing, or buckling as described in the signed manufacturer's replacement evaluation report.

Realign temporary barrier system within 2 days of impact or displacement when displaced more than 3 inches.

12-3.20B Materials

12-3.20B(1) General

Temporary barrier segment must:

1. Be a minimum 31-1/2 inches in height
2. Have at least two lifting holes
3. Be designed to be used with temporary traffic screen when required

Temporary barrier segment may have your name or logo on each barrier segment. The name or logo must be no more than 4 inches in height and must be located no more than 12 inches above the bottom of the barrier segment.

12-3.20B(2) Temporary Concrete Barriers

12-3.20B(2)(a) General

Temporary concrete barrier segment must:

1. Be precast concrete with a minimum 4,000-psi compressive strength.
2 Have reinforcement steel that complies with section 52.
3. Have a finished surface that complies with section 51-1.03F(2).
4. Comply with the requirements for precast concrete.
5. Include the manufacturer's name, lot number, and month and year of manufacture stamped on the top of each barrier segment except for Type K temporary railing. The stamped information must be:
    5.1. No more than 6 inches in height.
    5.2. No more than 12 inches in length.
    5.3. From 3/16 to 1/4 inch in depth.
    5.4. Centered on the top width of the barrier segment.

Segment connection hardware must be one of the following:

1. Steel bar loops and connecting pins
2. "J" hook steel plates

Steel bar loops must comply with ASTM A36/A36M.

Connecting pins must comply with ASTM A307. A round bar of the same diameter may be substituted for the connecting pins. The round bar must:

1. Comply with ASTM A36/A36M
2. Have a minimum length of 26 inches
3. Have a 3-inch-diameter, 3/8-inch-thick plate welded on the upper end using a 3/16-inch fillet weld

"J" hook steel plates must be a minimum 18 inches in height.

12-3.20B(2)(b) Temporary Concrete Barrier with "J" Hooks

The steel stakes must be 1-1/2 inches in diameter and 48 inches long.

Anchor hardware must include:

1. 1-inch-diameter, 6-inch-long anchor bolt insert
2. 1-inch-diameter hex head bolt with a minimum length of 11 inches plus thickness of asphalt overlay
3. 3-by-3-by-3/8-inch plate washer
4. Retainer ring

12-3.20B(2)(c) Type K Temporary Railing

Reserved

12-3.20B(2)(d)–12-3.20B(2)(g)

Reserved

12-3.20B(3) Temporary Steel Barriers

Temporary steel barriers segment must:

1. Be galvanized steel.
2. Comply with ASTM A36.
3. Have a joint connection.
4. Include permanent identification information with no more than 6 inches in height and 12 inches in length and centered on the top width of the segment. The identification information must include:
    4.1. Manufacturer's name.
    4.2. Serial number.
    4.3. Lot number.
    4.4. Month and year of manufacture.

12-3.20B(4)–12-3.20B(9)

Reserved

12-3.20B(10) Temporary Terminal Sections

Reserved

12-3.20C Construction

12-3.20C(1) General

Clean temporary barrier segments at time of installation and at least every 6 months thereafter.

Install the temporary barrier system based on the requirements shown in the following table:

Minimum Clear Area Width

Barrier	Configuration	Height differentials 3 feet or less (ft)	Height differentials greater than 3 ft up to 8 feet (ft)	Edge of deck or height differentials greater than 8 feet (ft)	Fixed objects, falsework members, or temporary supports[a] (ft)
12'-6" temporary concrete barrier with "J" hooks	Freestanding	3	4	8	7
	3 stakes per segment traffic side	1	1	2	3
	2 anchor bolts per segment traffic side	1	1	2	3
20-foot temporary concrete barrier with "J" hooks	Freestanding	3	4	8	7
	4 stakes per segment traffic side	1	1	2	3
	3 anchor bolts per segment traffic side	1	1	2	3
50-foot temporary steel barrier	Staked or anchored at both ends only	6	7	9	10
	Staked or anchored every 250 feet	5	6	8	9
	Staked or anchored every 33 feet	1	1	3	4
20-foot Type K temporary railing	Freestanding	2	3	8	7
	2 stakes or 2 anchor bolts per segment traffic side	1	1	3	4
	4 stakes or 4 anchor bolts per segment	N/A	N/A	3	3

[a]The minimum clear area width to a falsework or temporary support footing can be 2 feet less than the clear area width shown. Measure clear area width to the footing edge closest to traffic.

Stake down temporary barrier systems when placed on an asphalt concrete surface.

Anchor down temporary barrier systems when placed on a concrete surface. For bridge decks, confirm the anchor will not penetrate closer than 1-1/2 inches from the bottom of the deck before placement. When temporary barrier is not shown, request the Engineer to verify the bridge deck thickness.

For installations on concrete surfaces, drill holes and bond threaded rods or dowels under section 51-1. Do not drill the top of supporting beams or girders, bridge expansion joints, or drains.

Install stakes and anchor bolts so the heads do not project above the top of the temporary barrier pocket profile.

Install a reflector on the top or face of barrier segments placed within 10 feet of a traffic lane. Space reflectors at approximately 20-foot intervals. Apply adhesive for mounting the reflector under the reflector manufacturer's instructions.

Install a Type P marker panel complying with section 82 at each end of temporary barrier system placed adjacent to a two-lane, two-way highway and at the end facing traffic for temporary barrier installed adjacent to a one-way roadbed. If the temporary barrier is placed on a skew, install the marker at the end of the skew nearest the traveled way.

Maintain a minimum height of 31-1/2 inches above surface for temporary barrier. For paving activities adjacent to temporary barrier, do not pave within 2 feet of the barrier segments unless authorized. For paving under the temporary barrier, remove and reset the barrier.

Remove stakes and anchor bolts so that minimal damage is done to surface.

After removing the temporary barrier systems:

1. Restore the area to its previous condition or construct it to its planned condition if temporary excavation or embankment was used to accommodate the temporary barrier.
2. Remove all threaded rods or dowels to a depth of at least 1 inch below the top of a concrete surface. Fill the resulting holes with mortar under section 51-1 except cure the mortar by the water method or by the curing compound method using curing compound no. 6.
3. Repair a damaged asphalt surface by providing a clean, smooth edge around the damaged area. Repair any heaving caused by stake removal to provide a uniform surface. Remove loose debris and use compressed air to clean out the stake hole. Comply with manufacturer's requirements except fill the stake hole with grout to existing pavement elevation under section 51-1.

If the Engineer orders a lateral move of a temporary barrier system and repositioning is not shown, the lateral move is change order work except for work area access, clear area width compliance, or because of your means and methods to perform the work.

12-3.20C(2) Temporary Concrete Barriers

12-3.20C(2)(a) General

Before placing temporary concrete barrier on the job site and after each described relocation, paint the exposed surfaces of the segments with white paint complying with specifications for acrylic emulsion paint for exterior masonry.

Place and maintain the abutting ends of segments in alignment without substantial offset from each other.

Install temporary barrier systems with the last segment extending a minimum of 60 feet past the length of the protected area.

12-3.20C(2)(b) Temporary Concrete Barrier with "J" Hooks

Install a minimum 200 feet of temporary concrete barrier with "J" hooks.

Place the temporary barrier system on a concrete or asphalt concrete surface. The asphalt concrete surface must have a minimum 2 inches of asphalt concrete over 6 inches of compacted subbase.

Install two parallel temporary barrier systems, one for each direction of travel, when placed between two-way traffic. Maintain the minimum clear area as shown in the table titled "Minimum Clear Area Width" between the two systems. Maintain a minimum 1-foot set back distance.

12-3.20C(2)(c) Type K Temporary Railing

Do not install Type K temporary railing on projects advertised after December 31, 2026.

Install a minimum 160 feet of Type K temporary railing.

Excavate and backfill under section 19-3.

Do not compact earth fill placed behind Type K temporary railing in a curved layout.

Place temporary barrier system on a firm, stable surface. Grade the area to provide a uniform bearing surface throughout the entire length of the system.

Anchor or stake down each end segment and every other segment with four stakes as shown when placed between two-way traffic. Maintain a minimum 1-foot set back distance.

12-3.20C(2)(d)–12-3.20C(2)(g)

Reserved

12-3.20C(3) Temporary Steel Barriers

12-3.20C(3)(a) General

Reserved

12-3.20C(3)(b) 50-Foot Temporary Steel Barriers

Use 50-foot temporary steel barriers with or without rubber pads.

Install a minimum 250 feet of 50-foot temporary steel barrier. The last segment must extend a minimum 25 feet past the length of the protected area.

Place the temporary barrier system on a concrete or asphalt concrete surface. Do not place the system on a dirt or earth surface.

Anchor or stake down the first and last segment of the temporary barrier system.

Maintain a minimum radius of 800 feet for segments placed on a curved layout. For tighter curves down to a 250-foot radius, contact the manufacturer before installation and provide manufacturer's written recommendation for the installation.

Maintain a minimum 2-foot set back distance on both sides of a temporary barrier system used with traffic on both sides of the barrier. Install the temporary barrier system under the manufacturer's instructions.

12-3.20C(3)(c)–12-3.20C(3)(h)

Reserved

12-3.20C(4)–12-3.20C(9)

Reserved

12-3.20C(10) Temporary Terminal Sections

Reserved

12-3.20D Payment

The payment quantity for types of temporary barrier systems is the length measured along the top of the barrier segments.

10-18-19

12-3.21 TEMPORARY TRAFFIC SCREENS

12-3.21A General

Section 12-3.21 includes specifications for installing temporary traffic screens.

12-3.21B Materials

Temporary traffic screen panels must be one of the following:

1. CDX grade or better plywood
2. Weather-resistant strand board
3. Plastic

Plastic temporary traffic screen panels must be on the Authorized Material List for temporary traffic screen.

Wale boards for use with plywood or strand board must be Douglas fir, rough sawn, construction grade or better.

Pipe screen supports must be schedule 40, galvanized steel pipe.

Nuts, bolts, and washers must be cadmium plated.

Screws must be black or cadmium-plated flat head, cross-slotted, with full-thread length.

Temporary traffic screen panels must be CDX grade or better, plywood or weather-resistant strand board.

Wale boards must be Douglas fir, rough sawn, construction grade or better.

Pipe screen supports must be schedule 40, galvanized steel pipe.

Nuts, bolts, and washers must be cadmium plated.

Screws must be black or cadmium-plated flat head, cross-slotted screws with full-thread length.

12-3.21C Construction

Install and anchor temporary traffic screens to the top of the Type K temporary railing. The temporary traffic screen must have 3-foot-long openings spaced at 200-foot intervals.

A lateral move of Type K temporary railing with attached temporary traffic screen is change order work if ordered and repositioning is not shown.

12-3.21D Payment

The payment quantity for temporary traffic screen is the length measured along the line of the screen with no deductions for openings in the temporary traffic screen.

12-3.22 TEMPORARY CRASH CUSHION MODULES

12-3.22A General

Section 12-3.22 includes specifications for placing sand-filled temporary crash cushion modules in groupings or arrays.

If activities expose traffic to a fixed obstacle, protect the traffic from the obstacle with a sand-filled temporary crash cushion. The crash cushion must be in place before opening traffic lanes adjacent to the obstacle.

12-3.22B Materials

Each sand-filled temporary crash cushion module must be manufactured after March 31, 1997 and be on the Authorized Material List for highway safety features.

The color of each module must be standard yellow with black lids as furnished by the manufacturer. Each module must be free from structural flaws and objectionable surface defects.

For a module requiring a seal, the top edge of the seal must be securely fastened to the wall of the module by a continuous strip of heavy-duty tape.

Fill each module with sand under the manufacturer's instructions and to the sand capacity in pounds for each module shown. Sand for filling the modules must be clean, commercial-quality, washed concrete sand. When sand is placed in a module, the sand must contain no more than 7 percent water when tested under California Test 226.

12-3.22C Construction

Use the same type of crash cushion module for a single grouping or array.

Temporary crash cushion arrays must not encroach on the traveled way.

Secure the sand-filled modules in place before starting an activity requiring a temporary crash cushion.

Maintain sand-filled temporary crash cushions in place at each location, including times when work is not actively in progress. You may remove the crash cushions during the work shift for access to the work if the exposed fixed obstacle is 15 feet or more from the nearest lane carrying traffic. Reset the crash cushion before the end of the work shift.

Immediately repair sand-filled temporary crash cushion modules damaged due to your activities. Remove and replace any module damaged beyond repair. Repair and replacement of temporary crash cushion modules damaged by traffic are change order work.

You may place sand-filled temporary crash cushion modules on movable pallets or frames complying with the dimensions shown. The pallets or frames must provide a full-bearing base beneath the modules. Do

not move the modules and supporting pallets or frames by sliding or skidding along the pavement or bridge deck.

Attach a Type R or Type P marker panel to the front of the temporary crash cushion if the closest point of the crash cushion array is within 12 feet of the traveled way. Firmly fasten the marker panel to the crash cushion with commercial quality hardware or by other authorized methods. Attach the Type R marker panel such that the top of the panel is 1 inch below the module lid. Attach the Type P marker panel such that the bottom of the panel rests upon the pallet or roadway surface if pallets are not used.

A lateral move of a temporary crash cushion module is change order work if ordered and the repositioning is not shown.

Remove sand-filled temporary crash cushion modules, including sand, pallets or frames, and marker panels, at Contract acceptance. Do not install sand-filled temporary crash cushion modules in the permanent work.

12-3.22D Payment

The payment quantity for temporary crash cushion module does not include:

1. Modules placed for public safety
2. Modules placed in excess of the number described
3. Repositioned modules

04-16-21

12-3.23 IMPACT ATTENUATOR VEHICLES

12-3.23A General

12-3.23A(1) Summary

Section 12-3.23 includes specifications for using impact attenuator vehicles.

12-3.23A(2) Definitions

impact attenuator vehicle: Deployed impact attenuator mounted to a truck or deployed impact attenuator mounted to a trailer and towed by a truck.

12-3.23A(3) Submittals

Submit a certificate of compliance for each impact attenuator.

12-3.23A(4) Quality Assurance

Reserved

12-3.23B Materials

12-3.23B(1) General

Each impact attenuator vehicle includes:

1. Truck
2. Impact attenuator
3. Type II flashing arrow sign or PCMS
4. Flashing or rotating amber light
5. Two-way communication system

12-3.23B(2) Impact Attenuators

Each impact attenuator must:

1. Be on the Authorized Material List for highway safety features.
2. Comply with MASH test level 3 or NCHRP 350 test level 3 up to December 31, 2026, where the posted speed limit is 50 mph or more.
3. Comply with MASH test level 2 or 3 or NCHRP 350 test level 2 or 3 up to December 31, 2026, where the posted speed limit is 45 mph or less.
4. Be individually identified with the manufacturer's name, address, attenuator model number, and serial number. The name and number must be a minimum 1/2-inch high, located on the street side on the lower left front corner.

5. Have an inverted V-chevron pattern placed across the entire rear of the attenuator and composed of alternating 4-inch-wide, nonreflective black stripes and 4-inch-wide, yellow retroreflective stripes sloping at 45 degrees.

12-3.23B(3) Trucks

Each truck must comply with:

1. Veh Code Div 12
2. Vehicle weight limits as shown in the Authorized Materials List for highway safety features and the impact attenuator manufacturer's instructions except the vehicle weight must be greater than 22,000 pounds when used with a stationary impact attenuator vehicle
3. Impact attenuator manufacturer's mounting requirements

A PCMS used as a flashing arrow sign must comply with the specifications for an arrow board in the *California MUTCD*.

12-3.23C Construction

12-3.23C(1) General

Secure objects, including equipment, tools, and ballast, on impact attenuator vehicles to prevent their loosening upon impact by an errant vehicle.

Do not use a damaged attenuator. Replace any damaged attenuator.

Do not place an impact attenuator vehicle within the buffer space.

Position the front of the impact attenuator vehicle at a distance upstream from the moving work vehicle as shown in the following table:

Impact Attenuator Vehicle Minimum Upstream Placement

Posted speed limit (mph)	Distance (feet)
<45	100
45–55	150
>55	175

Monitor the placement and use of the impact attenuator vehicle on a regular basis and adjust the position to match changing field conditions as construction progresses.

12-3.23C(2) Stationary Impact Attenuator Vehicles

Section 12-3.23C(2) applies if a bid item for stationary impact attenuator vehicles is shown on the Bid Item List.

Use a stationary impact attenuator vehicle to protect workers on foot within the work area when the posted speed limit is 55 mph or greater and workers are not protected by a longitudinal barrier system.

Place the stationary impact attenuator vehicle between the longitudinal buffer space and the work area without intruding into the buffer space. Position the front of the stationary impact attenuator vehicle at a distance upstream of the work area as shown in the following table:

Impact Attenuator Vehicle Placement

Posted speed limit (mph)	Distance (feet)
<45	75
45–55	100
>55	150

Place the transmission in park and set the parking brake or follow the impact attenuator manufacturer's instructions.

12-3.23D Payment

Stationary impact attenuator vehicle will be measured by 1-day of operation counting as 1 measure unit. A day is defined as 24 consecutive hours beginning at the start of the work shift and includes relocation of the stationary impact attenuator.

10-18-19

12-3.24–12-3.29 RESERVED

12-3.30 FLASHING ARROW SIGNS

12-3.30A General

Section 12-3.30 includes specifications for placing flashing arrow signs.

12-3.30B Materials

A flashing arrow sign must comply with the requirements shown in the following table:

Flashing Arrow Sign Requirements

Type	Panel size (min, inches)	Number of panel lights (min)	Legibility distance[a] (min, miles)
I	48 x 96	15	1
II	36 x 72	13	3/4

[a]The legibility distance is the distance that a flashing arrow sign must be legible at noon on a cloudless day and during the hours of darkness by persons with 20/20 vision or vision corrected to 20/20.

A flashing arrow sign must be finished with commercial-quality nonreflective black enamel and must be equipped with yellow or amber lamps that form arrows or arrowheads. Each lamp must be equipped with a visor and the lamps must be controlled by an electronic circuit that provides from 30 to 45 complete operating cycles per minute for each of the displays and modes specified. The control must be capable of dimming the lamps by reducing the voltage to 50 ± 5 percent for nighttime use. Type I signs must have both manual and automatic photoelectric-dimming controls. Dimming in both modes must be continuously variable over the entire dimming range.

A flashing arrow sign must be capable of operating in the following display modes:

1. Pass left display
2. Pass right display
3. Simultaneous display
4. Caution display or alternating diamond

A flashing arrow sign must be capable of operating in the flashing arrow mode or the sequential mode.

In the flashing arrow mode, all lamps forming the arrowhead and shaft must flash on and off simultaneously.

In the sequential mode, either arrowheads or arrows must flash sequentially in the direction indicated.

In the simultaneous display mode, the lamps forming both the right and left arrowheads and the lamps forming the arrow shaft or center 3 lamps for Type I signs must flash simultaneously. For Type II signs, the lamps forming the right and left arrowhead, but not the center lamp, may be illuminated continuously; the lamps forming the shaft and the center lamp of the arrowheads must flash on and off simultaneously.

In the caution display mode, a combination of lamps not resembling any other display or mode must flash.

Each flashing arrow sign must be:

1. Mounted on a truck or trailer
2. Capable of operating when the vehicle is moving
3. Capable of being placed and maintained in operation at locations described

A Type II flashing arrow sign must be controllable by the operator of the vehicle while the vehicle is in motion.

The bottom of the flashing arrow sign must be a minimum of 7 feet above the roadway when mounted.

The trailer for a flashing arrow sign must be equipped with (1) devices to level and plumb the sign and (2) a supply of electrical energy capable of operating the sign.

12-3.30C Construction

Not Used

12-3.30D Payment

Not Used

12-3.31 PORTABLE FLASHING BEACONS

12-3.31A General

Section 12-3.31 includes specifications for placing, maintaining, and removing portable flashing beacons.

12-3.31B Materials

Each portable flashing beacon must have:

1. Standard and base
2. Signal section
3. Flasher unit
4. Battery power source

The components must be assembled to form a complete, self-contained, portable flashing beacon that can be delivered to the job site and placed into immediate operation.

The portable flashing beacon must be weatherproof and operate a minimum of 150 hours between battery recharging and routine maintenance.

The signal section must be yellow and comply with section 86-1.02R(4)(a), except it must be rated for 25 W at 12 V.

The flash rate for the flashing unit must comply with chapter 4L, "Flashing Beacons," of the *California MUTCD*.

The standard must be adjustable to allow variable mounting of the signal section from 6 to 10 feet, from the bottom of the base to the center of the lens, and be capable of being secured at the desired height. The standard must be securely attached to the base and have a length of multiconductor, neoprene-jacketed cable long enough for the full vertical height.

The base must be (1) large enough to accommodate at least two 12 V automotive-type storage batteries and (2) a shape and weight such that the beacon will not roll if struck by a vehicle or pushed over.

12-3.31C Construction

Remove portable flashing beacons from the traveled way at the end of each night's work. You may store the flashing beacon at selected central locations within the highway where designated by the Engineer.

Moving portable flashing beacons from location to location if ordered after initial placement is change order work.

10-16-20

12-3.31D Payment

The payment quantity for portable flashing beacons (ea) is the number of portable flashing beacon locations with each location counting as 1 measurement unit.

10-18-19

12-3.32 PORTABLE CHANGEABLE MESSAGE SIGNS

12-3.32A General

12-3.32A(1) Summary

Section 12-3.32A includes specifications for placing, maintaining, and removing portable changeable message signs.

12-3.32A(2) Definitions

Reserved

12-3.32A(3) Submittals

If requested, submit a certificate of compliance for each PCMS.

Submit your cell phone number before starting the first activity that requires a PCMS.

12-3.32A(4) Quality Assurance

Reserved

12-3.32B Materials

Each PCMS consists of a sign panel, a controller unit, a power supply, and a structural support system.

The PCMS must:

1. Be assembled to form a complete self-contained unit that can be delivered to the job site and placed into immediate operation.
2. Operate at an ambient air temperature from -4 to 158 degrees F.
3. Not be affected by mobile radio transmissions other than those required to control the PCMS.
4. Be capable of displaying a 3-line message with at least 7 characters per line.
5. Provide a complete alphanumeric selection.
6. Be internally or externally illuminated during the hours of darkness, when non-illuminated pixels are used.
7. Have a dimming control that automatically adjusts the character light intensity to provide optimum character visibility and legibility under all ambient lighting conditions. The dimming control must have a minimum 3 manual dimming modes of different intensities.

04-16-21

A message with 18-inch high characters or 12-inch high characters must be visible from a distance of 1,500 feet and legible from a distance of at least 750 feet at noon on a cloudless day and during the night by persons with 20/20 vision or vision corrected to 20/20.

10-18-19

A message with 10-inch high characters must be legible from a distance of at least 650 feet at noon on a cloudless day and during the night by persons with 20/20 vision or vision corrected to 20/20.

The controller must:

1. Be an all solid-state unit.
2. Include at least 5 preprogrammed messages.
3. Have a user adjustable display rate.
4. Have a user adjustable flashing-off time.
5. Include a screen to review the messages before being displayed on the sign.
6. Include a keyboard message entry system. The keyboard must be equipped with a security lockout feature.
7. Have nonvolatile memory to store an infinite number of user created messages.
8. Be installed at a location that allows the user to perform all the functions from a single position.

12-3.32C Construction

Use a PCMS with characters:

1. At least 18 inches in height where the useable shoulder area is 15 feet wide or more
2. At least 12 inches in height where the useable shoulder area is less than 15 feet wide
3. At least 10 inches in height if the PCMS is:
   3.1. Mounted on a service patrol truck or incident response vehicle
   3.2. Used for traffic control where the posted speed limit is less than 40 mph

Place a PCMS 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.

If multiple signs are needed, place each sign on the same side of the road at least 1,000 feet apart on freeways and expressways and at least 500 feet apart on other types of highways.

04-16-21

Operate the PCMS under the manufacturer's instructions. Activate the security lockout feature at all times.

10-18-19

When in operation, place the bottom of a PCMS at least 7 feet above the roadway in areas where pedestrians are anticipated and 5 feet above the roadway elsewhere. Place the top of the PCMS no more than 14.5 feet above the roadway.

If more than one PCMS is simultaneously visible to traffic, only one sign may display a sequential message at any time. Do not use dynamic message displays, such as animation, rapid flashing, dissolving, exploding, scrolling, horizontal movement, or vertical movement of messages. The message must be centered within each line of the display.

You may use an additional PCMS if more than 2 phases are needed to display a message.

Display only messages shown or ordered.

Repeat the entire message continuously in not more than 2 phases of at least 3 seconds per phase. The sum of the display times for both of the phases must be a maximum of 8 seconds. If more than 2 phases are needed to display a message, use an additional PCMS.

You must be available by cell phone during activities that require a sign. Be prepared to immediately change the displayed message if ordered. You may operate the sign with a 24-hour timer control or remote control if authorized.

Keep the PCMS clean to provide maximum visibility.

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

12-3.32D Payment

Not Used

10-15-21

12-3.33 PORTABLE SIGNAL SYSTEMS

12-3.33A General

12-3.33A(1) Summary

Section 12-3.33 includes specifications for installing, maintaining, and removing portable signal systems.

A portable signal system includes:

1. Two or more signal units
2. Portable lighting
3. Portable flashing beacons

The components of a portable signal system are shown.

12-3.33A(2) Definitions

Not Used

12-3.33A(3) Submittals

Submit a certificate of compliance for each portable signal system.

Submit a 24-hour contact phone number before starting the activity that requires the portable signal system.

12-3.33A(4) Quality Assurance

Assign an on-site portable signal system coordinator. The coordinator must be available to service, maintain, and relocate system components as necessary. The coordinator must be accessible 24 hours a day while the system is in operation.

Replace or repair damaged or malfunctioning portable signal system units within 12 hours of notification of a system failure.

12-3.33B Materials

The portable signal system must:

1. Comply with Part 4 of the California MUTCD
2. Be a complete system that can be delivered to the job site and placed into immediate operation
3. Withstand a 90-mph wind speed under AASHTO (2001) Standard Specification for Highway Signs, Luminaries and Traffic Signals
4. Have a minimum one-mile communication range between signal units, not line of sight
5. Provide local and remote system control, monitoring, and diagnostics through a dedicated controller or computer
6. Prevent unauthorized users or electronic devices from gaining access to the portable signal system using an industry authentication and encryption standard level of security
7. Operate in either fixed time, traffic actuated, or manual mode
8. Operate at an ambient air temperature from -40 to 130 degrees F
9. Have secured wireless or wired communication between the signal units
10. Have a fail-safe device that monitors for malfunctions and prevents the system from displaying conflicting indications
11. Display a red/stop indication in all signal heads when a conflict or communication failure is detected
12. Continuously monitor and automatically send email or text alerts to designated personnel for:
    12.1. Signal malfunctions
    12.2. Conflicting indications
    12.3. Communication failures between signal units
    12.4. Power, voltage, and battery low levels
13. Use radar or video detection

A trailer must:

1. Be equipped with stabilizing and leveling devices
2. Be less than 7 feet wide

A signal unit consist of:

1. Two or more signal heads
2. Adjustable overhead mast arm
3. Adjustable shaft
4. Controller unit
5. Communication device
6. Redundant conflict monitoring device
7. Primary and back-up power sources

Signal units must:

1. Be self-contained and trailer mounted
2. Operate as a master or slave in a master-slave configuration
3. Automatically switch between the primary and the back-up power source in the event of a power failure

The signal heads must:

1. Comply with section 86-1.02R
2. Have 12-inch signal sections
3. Be arranged vertically
4. Be mounted one on the shaft and one on the mast arm

The adjustable mast arm must extend a minimum 8 feet separation between signal heads center to center.

The controller unit must:

1. Be an all solid-state unit
2. Have user adjustable timing parameters for each direction of travel, including bicycles and pedestrians
3. Include a 7-inch LCD color graphic touch screen to review the timing parameters
4. Include a keyboard timing entry system. The keyboard must be equipped with a security lockout feature
5. Have nonvolatile memory to store a library of user created traffic control scenarios

Wireless communication devices must be FCC approved Part 15 certified.

The primary power source must be either a generator or a photovoltaic system.

The back-up power source must be either a generator, a photovoltaic system, or battery reserve. The battery reserve must operate the signal unit for at least 10 days continuously without external power or recharge.

Portable lighting must:

1. Comply with 8 CA Regs § 1523
2. Be provided at every signal unit location
3. Be controlled using a photoelectric unit
4. Be part of the signal unit or on a separate trailer

12-3.33C Construction

Provide a portable signal system for reversible traffic control systems as shown.

Notify the Engineer at least 7 days prior to the use of the portable signal system. The traffic operations office from the district in which the work is located will provide the timing parameters.

Place the signal unit trailer as far from the traveled way as practicable where it is visible to approaching traffic without encroaching onto the traveled way.

Position signal heads and any attachments mounted on the mast arm over the road surface from 17 to 19 feet from the bottom of the signal head to the top of the road surface.

Position signal heads mounted on the trailer at a minimum height of 10 feet but not more than 19 feet from the bottom of the signal head to the top of the ground surface.

Operate the portable signal system under the manufacturer's instructions. Have a qualified vendor representative on site to perform the initial set up and enter the timing parameters.

Activate the security lockout feature at all times.

Program all signal units to display a flashing red indication upon startup.

Keep the portable signal system clean to provide maximum visibility.

If the portable signal system operation fails, provide flaggers to control traffic until the system is back in operation.

12-3.33D Payment

Not Used

12-3.34 TEMPORARY FLASHING BEACON SYSTEMS

12-3.34A General

Section 12-3.34 includes specifications for installing, maintaining, and removing temporary flashing beacon systems.

A temporary flashing beacon system must comply with section 87-20.

12-3.34B Materials

The sign panels installed on a temporary flashing beacon system must comply with section 12-3.11.

12-3.34C Construction

Not Used

12-3.34D Payment

Not Used

12-3.35 AUTOMATED WORK ZONE INFORMATION SYSTEMS

12-3.35A General

12-3.35A(1) Summary

Section 12-3.35 includes specifications for installing automated work zone information systems.

12-3.35A(2) Definitions

Reserved

12-3.35A(3) Submittals

Reserved

12-3.35A(4) Quality Assurance

Assign an on-site system coordinator. The coordinator must be available locally to service, maintain, and relocate system components as necessary. The coordinator must be accessible 24–7 while the system is deployed. If the system fails to perform as specified, perform any necessary remedial work and replace any failed components within 24 hours of notification of a system or component failure.

12-3.35B Materials

12-3.35B(1) General

The AWIS must be a proven system that has been successfully deployed and operated in actual work zones or congested areas.

The system must acquire traffic data throughout the work zone and automatically display predetermined information to motorists without operator intervention after system initialization.

Real-time information must be displayed to motorists using a PCMS. The sign must comply with section 12-3.32.

The system must be controlled either locally or remotely by a dedicated controller or computer.

Authorized users must be able to both locally and remotely override motorist information messages.

Traffic sensors must not require adjustments after the initial deployment.

12-3.35B(2) General System Function Requirements

The general system functions of the AWIS must be capable of:

1. Preventing any unauthorized users or systems from gaining access to the PCMSs through an industry authentication and encryption standard level of security.
2. Providing current operational status locally and remotely. Operational status must include current traffic data and messages, communications system, and power status.
3. Delivering notifications either by telephone, voice, or text messages to alert support staff of trouble conditions.

4. Generating trouble alerts for conditions such as (1) low roadside equipment power or voltage, (2) system communications failure, (3) low speed traffic detected, and (4) excessive delay detected.
5. Adjusting the thresholds of reduced speed and congestion-induced delay at which the system initiates a trouble alert.
6. Allowing programming of the hours during which the trouble condition alerting subsystem initiates notification to authorized users.
7. Measuring periodically and automatically the power levels of all equipment. Alert support staff, locally and remotely via a telephone message, in time to provide supplemental power before the system ceases to operate.
8. Displaying preprogrammed messages based on the time of day and day of week.

12-3.35B(3) Motorist Information Message Requirements

The AWIS must be capable of:

1. Displaying predetermined speed, delay, diversion, and closure messages to motorists when user-adjustable thresholds are exceeded.
2. Updating its speed and delay advisory messages at least once per minute. The actual message updates must be consistent with traffic conditions.
3. Selecting messages for each PCMS independently, based on the traffic conditions downstream of the sign.
4. Recording motorist information messages in a comma-separated values file with time and date stamps, including message overrides with user ID.
5. Displaying default messages when traffic conditions, system algorithms, and user parameters do not dictate that an advisory message should be displayed.
6. Displaying separate, independent, default messages on each PCMS.
7. Analyzing traffic parameters in work zones in which there are multiple speed limits.

The following parameters for the selection and presentation of information messages must be adjustable by the user:

1. Message update frequency
2. Minimum delay necessary to trigger a delay advisory message
3. Persistence of delay before a delay message is displayed
4. Level of delay required to trigger a diversion message
5. Change in delay needed to cause a delay advisory message update
6. Change in downstream speed at which a speed advisory message update occurs

12-3.35B(4) System Communication Requirements

The wireless communications subsystem of the AWIS must:

1. Operate independently of the public cellular phone system for receiving data to ensure reliable communications
2. Communicate independent of the line of sight or distance
3. Incorporate an error detection and correction mechanism to ensure the integrity of all traffic condition data and motorist information messages
4. Configure automatically during system initialization

12-3.35B(5) Traffic Data Acquisition Requirements

The AWIS must collect accurate traffic data using a speed measurement technique with an accuracy of ±5 mph, allowing specific information messages. The system must collect data during reduced visibility conditions, including precipitation, fog, darkness, excessive dust, and road debris.

The system must (1) archive the data with time and date stamps and (2) aggregate the data in operator-definable time increments, accessible 24–7 to the Engineer in a comma-separated values file.

12-3.35B(6) User Interface

The system must have a user interface to control the AWIS PCMS communications. The interface must be (1) software compatible with a Windows environment or (2) a web service accessed by a web browser.

Provide any software on a CD or other Engineer-authorized data-storage device for installation at the Department's Transportation Management Center.

The user interface must, at a minimum, provide the user with a list of AWIS PCMSs in the field, location information for each AWIS PCMS, and a real-time on-board display of the message in the field. Control options must, at a minimum, provide the user the ability to change the on-board messages and flash rate.

12-3.35C Construction

Obtain authorization for the message content and the threshold used for triggering the message before displaying any message on a PCMS.

Provide complete setup and support for the AWIS PCMS communications.

12-3.35D Payment

Not Used

12-3.36 PORTABLE TRANSVERSE RUMBLE STRIPS

Reserved

10-16-20

12-3.37 PORTABLE RADAR SPEED FEEDBACK SIGN SYSTEMS

12-3.37A General

Section 12-3.37 includes specifications for placing, maintaining, and removing portable radar speed feedback sign systems.

12-3.37B Materials

A portable radar speed feedback sign system must comply with the requirements for a temporary radar speed feedback sign system, except it must be trailer mounted.

12-3.37C Construction

Not Used

12-3.37D Payment

Not Used

10-18-19

12-3.38 AUTOMATED FLAGGER ASSISTANCE DEVICES

12-3.38A General

12-3.38A(1) Summary

Section 12-3.38 includes specifications for placing, maintaining, and removing automated flagger assistance devices (AFADs).

12-3.38A(2) Definitions

automated flagger assistance devices: Devices that enable a flagger to be positioned out of the lane of traffic and are used to control motorists through work zones. They are designed to be remotely operated either by a single flagger at one end of the work zone or at a central location, or by separate flaggers near the devices.

12-3.38A(3) Submittals

Submit a copy of the manufacturer's operating instructions for the automated flagger assistance devices.

12-3.38A(4) Quality Assurance

Reserved

12-3.38B Materials

04-17-20

The automated flagger assistance device must comply with the *California MUTCD,* Section 6E.04, and Section 6E.06, "Red/Yellow Lens Automated Flagger Assistance Devices."

The device must:

1. Be equipped with a gate arm, which must not extend into the opposing lane
2. Alternately display a steadily illuminated circular red lens and a flashing circular yellow lens to control traffic
3. Have a fail-safe device that prevents the operator from inadvertently actuating a simultaneous flashing circular yellow lens at both ends of the work zone
4. Have a device that monitors for malfunctions and prevents the display of conflicting indication
5. Have a 24-by-30-inch R10-6 STOP HERE ON RED sign mounted on the trailer

The device must continuously monitor the wireless communication links and verify transmission and reception of data between the devices. If communication is lost, the devices must immediately display the circular red/stop indication and lower the gate arms.

12-3.38C Construction

The devices must:

1. Be placed where a flagger station is shown with an unobstructed view from the operator
2. Be placed outside of the traveled lane
3. Be attended by the operator when in use
4. Have a minimum of 9 cones placed on a taper in advance of the device and along the edge of shoulder or edge of the traveled way at 25-foot intervals to a point not less than 25 feet past the device
5. Be clearly visible to approaching traffic and illuminated during the hours of darkness

If any device unit becomes inoperative, do one of the following:

1. Replace the unit with the same type and model.
2. Revert to human flagging operations.
3. Terminate all construction activities requiring the use of the devices.

Incorporate the devices into the traffic control using one of the following methods:

1. Method 1: Place one device at each end of the closure.
2. Method 2: Place one device at one end of the closure and a flagger at the opposite end of the closure.

Use two operators for both methods, except you may use a single operator if:

1. Operator has an unobstructed view of the devices
2. Operator has an unobstructed view of approaching traffic in both directions
3. Second flagger is on-site to assist with manual flagging should the device malfunction, or to direct traffic when drivers fail to comply with the devices

When AFADs are in operation:

1. Use portable transverse rumble strips at your discretion
2. Do not use the 48-inch-by-48-inch C9A (CA) sign
3. Do not use the gate cones

12-3.38D Payment

If automated flagger assistance devices bid item is not shown on the Bid Item List, providing AFADS is change order work.

12-3.39 TEMPORARY RADAR SPEED FEEDBACK SIGN SYSTEMS

12-3.39A General

Section 12-3.39 includes specifications for placing, maintaining, and removing temporary radar speed feedback sign systems.

12-3.39B Materials

A temporary radar speed feedback sign system must comply with the requirements under section 87-20.

12-3.39C Construction

Place the system:

1. As far from the traveled way as practicable where it is visible and legible to approaching traffic. Where practicable, place the sign behind a barrier or guardrail.
2. At or before the crest of roadway vertical curvatures that restrict sight distance.
3. At or before the curve of horizontal roadway curvatures that restrict sight distance.

Install a G20-5aP WORK ZONE plaque.

12-3.39D Payment

Not Used

04-16-21

12-3.40 VARIABLE SPEED LIMIT SIGN SYSTEM

12-3.40A General

12-3.40A(1) Summary

Section 12-3.40 includes specifications for placing, maintaining, and removing variable speed limit sign systems.

12-3.40A(2) Definitions

Not Used

12-3.40A(3) Submittals

Submit as an informational submittal a weekly variable speed limit sign system log report by Tuesday of the following week.

12-3.40A(4) Quality Assurance

Not Used

12-3.40B Materials

12-3.40B(1) General

A variable speed limit sign system consists of:

1. Signs
2. Two flashing beacons
3. Power source

The variable speed limit sign system must:

1. Display the speed limit characters without animation.
2. Automatically adjust the digital display intensity to provide optimum character visibility and legibility under all ambient lighting conditions using a photocell.
3. Create and maintain an electronic log report of the local and remote activities and system failures. The report must include:
    - 3.1. Date and time.
    - 3.2. Location description, county, route, direction, post mile or station, and GPS position.
    - 3.3. Speeds shown on the digital display.
    - 3.4. ON or OFF status of flashing beacons.
    - 3.5. System failure description including:
        - 3.5.1. Cause of failure.
        - 3.5.2. List of equipment that failed.
        - 3.5.3. Work performed to correct the failure.
        - 3.5.4. Duration of failure.
    - 3.6. Name and unique user ID for user operating or repairing the system.
4. Include local and remote control of digital display legend and flashing beacons.

5. Have a scheduling feature to allow for local or remote pre-programming of the digital display legend and flashing beacons at specific times and dates.
6. Send a real-time text or email message to the designated personnel for the following types of alerts:
    6.1. Equipment alerts including low power, loss of power, and loss of communication.
    6.2. Traffic alerts including flashing beacons ON or Off activations and digital display legend changes.

Signs must comply with section 82-2.

The variable speed limit sign includes a digital display as part of the R2-1 sign. The R2-1 sign must be:

1. 48 by 60 inches for freeways and expressways
2. 36 by 48 inches for conventional highways

The variable speed limit sign systems must include a G20-5aP sign above the R2-1 sign. The G20-5aP sign must have characters:

1. 8 inches in height for freeways and expressways
2. 6 inches in height for conventional highways

The digital display must:

1. Be LED white legend on a black background.
2. Have two numerical characters. Each character must be:
    2.1. Based on a minimum 5 x 7 character ratio.
    2.2. At least 18 inches in height for freeways and expressways.
    2.3. At least 14 inches in height for conventional highways.
3. Have a minimum 30 degrees cone of visibility, ±15 degrees from the centerline.

The flashing beacons must:

1. Be yellow and comply with section 86-1.02R(4), except they may be rated for 12 V.
2. Operate in the alternating flashing mode. The flash rate for the flashing unit must comply with chapter 4L, "Flashing Beacons," of the *California MUTCD.*
3. Be securely mounted to assembly.
4. Be positioned vertically, one at a distance no more than 12 inches above the edge of the top sign and one at a distance no more than 12 inches below the edge of the bottom sign.

The power source must be either a generator or photovoltaic system and must include batteries to maintain the system's communication and operation for 10 continuous days without external power or recharge.

12-3.40B(2) Portable Variable Speed Limit Sign Systems

A portable variable speed limit sign system must be trailer mounted.

12-3.40B(3) Temporary Variable Speed Limit Sign Systems

A temporary variable speed limit sign system must be post mounted under section 82-3.

12-3.40C Construction

Place the variable speed limit sign system:
1. As far from the traveled way as practicable where it is visible and legible to approaching traffic. Where practicable, place the sign behind a barrier or guardrail.
2. At or before the crest of roadway vertical curvatures that restrict sight distance.
3. At or before the curve of horizontal roadway curvatures that restrict sight distance.
4. With the bottom of the R2-1 sign a minimum of 7 feet above the roadway.

Delineate trailers with a taper consisting of 9 traffic cones placed 25 feet apart except when placed behind a barrier. Set up and level the portable system.

Activate the flashing beacons and set the digital display to the reduced speed limit only when workers are present within the construction work zone and no more than 15 minutes before workers arrive in the work zone. Do not display unauthorized speed limits.

Deactivate the flashing beacons and change the digital display to the original posted speed limit no later than 15 minutes after workers depart the work zone.

12-3.40D Payment

Not Used

10-18-19

12-4 MAINTAINING TRAFFIC

12-4.01 GENERAL

12-4.01A General

Section 12-4.01 includes general specifications for maintaining traffic through construction work zones.

If local authorities regulate traffic, notify them at least 5 business days before the start of job site activities. Cooperate with the local authorities to handle traffic through the work zone and to make arrangements to keep the work zone clear of parked vehicles.

12-4.01B Materials

Not Used

12-4.01C Construction

Not Used

12-4.01D Payment

Not Used

12-4.02 TRAFFIC CONTROL SYSTEMS

12-4.02A General

12-4.02A(1) Summary

Section 12-4.02 includes specifications for providing a traffic control system to close traffic lanes, shoulders, ramps, and connectors.

A traffic control system for a closure includes flagging and the temporary traffic control devices described as part of the traffic control system. Temporary traffic control devices must comply with section 12-3.

12-4.02A(2) Definitions

Construction Zone Enhanced Enforcement Program (COZEEP): Program that provides California Highway Patrol officers to monitor the movement of traffic within the work zone.

10-16-20

Buffer lane: Closed lane that separates a lane carrying traffic from the work area to enhance safety of workers and allow errant vehicles to recover safely.

10-18-19

designated holidays: Designated holidays are shown in the following table:

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

If a designated holiday falls on a Sunday, the following Monday is a designated holiday. If November 11th falls on a Saturday, the preceding Friday is a designated holiday.

12-4.02A(3) Submittals

12-4.02A(3)(a) General

Submit a request for a minor deviation from the specified work hours. For a project in District 7, submit the request at least 15 days before the proposed closure date. Your request may be authorized if (1) the Department does not accrue a significant cost increase and (2) the work can be expedited and better serve the traffic.

If a closure is not opened to traffic by the specified time, submit a work plan that ensures that future closures will be opened to traffic by the specified time. Allow 2 business days for review.

Submit closure schedule requests and closure schedule amendments using LCS to show the locations and times of the requested closures.

Submit a traffic break request using LCS to show the location and time of the requested traffic break.

12-4.02A(3)(b) Closure Schedules

Every Monday by noon, submit a closure schedule request for planned closures for the next week.

Except for a project in District 7, the next week is defined as Sunday at noon through the following Sunday at noon.

For a project in District 7, the next week is defined as Friday at noon through the following Friday at noon.

Submit a closure schedule request from 25 days to 125 days before the anticipated start of any job site activity that reduces:

1. Horizontal clearances of traveled ways, including shoulders, to 2 lanes or fewer due to activities such as temporary barrier placement and paving
2. Vertical clearances of traveled ways, including shoulders, due to activities such as pavement overlays, overhead sign installation, or falsework girder erection

Submit closure schedule changes, including additional closures, by noon at least 3 business days before a planned closure.

Cancel closure requests using LCS at least 48 hours before the start time of the closure.

The Department notifies you through LCS of authorized and unauthorized closures and closures that require coordination with other parties as a condition for authorization.

12-4.02A(3)(c) Contingency Plans for Closures

Submit a contingency plan for an activity that could affect a closure if a contingency plan is specified in the special provisions or if a contingency plan is requested.

If a contingency plan is requested, submit the contingency plan within 1 business day of the request.

The contingency plan must identify the activities, equipment, processes, and materials that may cause a delay in the opening of a closure to traffic. The plan must include:

1. List of additional or alternate equipment, materials, or workers necessary to ensure continuing activities and on-time opening of closures if a problem occurs. If the additional or alternate equipment, materials, or workers are not on the job site, specify their location, the method for mobilizing these items, and the required time to complete mobilization.
2. General time-scaled logic diagram displaying the major activities and sequence of the planned activities. For each activity, identify the critical event that will activate the contingency plan.

Submit revisions to a contingency plan at least 3 business days before starting the activity requiring the contingency plan. Allow 2 business days for review.

12-4.02A(3)(d) Traffic Break Schedule

Every Monday by noon, submit a traffic break request for the next week. Support for a traffic break is based on local California Highway Patrol staffing levels and may not be available for the date or time requested.

Traffic break requests are limited to the hours when a shoulder or lane closure is allowed.

Cancel a traffic break request using LCS at least 48 hours before the start time of the traffic break.

The Department notifies you through LCS of authorized and unauthorized traffic breaks.

The Department does not adjust time or payment if (1) a California Highway Patrol officer is unavailable for the requested date or time or (2) your request is not authorized.

12-4.02A(4) Quality Assurance

Reserved

12-4.02B Materials

Not Used

12-4.02C Construction

12-4.02C(1) General

Work that interferes with traffic is limited to the hours when closures are allowed.

Do not reduce an open traffic lane width to less than 10 feet. If traffic cones or delineators are used for temporary edge delineation, the side of the base of the cones or delineators nearest to traffic is considered the edge of the traveled way.

Do not simultaneously close consecutive ramps in the same direction of travel servicing 2 consecutive local streets unless authorized.

Notify the Engineer of delays in your activities caused by the denial of either (1) an authorized closure or (2) a closure schedule request for the specified time frame allowed for closures.

Discuss the contingency plan for any activity that could affect the closure schedule with the Engineer at least 5 business days before starting the activity requiring the plan.

If you do not open a closure to traffic by the specified time, suspend work and submit a work plan. No further closures are allowed until your work plan has been authorized.

If the Engineer orders you to remove a closure before the time designated in the authorized closure schedule, any delay caused by this order is an excusable delay.

The Engineer may reschedule a closure that was canceled due to unsuitable weather.

You may use automated flagger assistance devices to enhance the traffic control system for a lane closure on a two-lane convention highway, except if a bid item for automated flagger assistance devices is shown in the Bid Item List, the use of AFADs is required.

Do not use automated flagger assistance devices:

1. On multi-lane highways
2. As a substitute or a replacement for a temporary traffic control signal
3. If the devices impair access for pedestrians and bicycles, unless alternate access is provided
4. If the usable shoulder area is not wide enough to place a trailer mounted device
5. If the distance between the devices is more than 800 feet, except when each device is controlled by a separate operator and radio communication is available between the AFAD operators

12-4.02C(2) Lane Closure System

12-4.02C(2)(a) General

The Department provides LCS training. Request the LCS training at least 30 days before submitting the 1st closure request. The Department provides the training within 15 days after your request.

LCS training is web-based or held at a time and location agreed upon by you and the Engineer. For web-based training, the Engineer provides you the website address to access the training.

Within 5 business days after completion of the training, the Department provides LCS accounts and user IDs to your assigned, trained representatives.

Each representative must maintain a unique password and current user information in the LCS.

The project is not accessible in LCS after Contract acceptance.

12-4.02C(2)(b) Status Updates for Authorized Closures

Update the status of authorized closures using the LCS Mobile web page.

For a stationary closure on a traffic lane, use code:

1. 10-97 immediately before you place the 1st cone on the traffic lane
2. 10-98 immediately after you remove all of the cones from the traffic lane

For a stationary closure on the shoulder, use code:

1. 10-97 immediately before you place the 1st cone after the last advance warning sign
2. 10-98 immediately after you remove the last cone before the advance warning signs

For a moving closure, use code:

1. 10-97 immediately before the actual start time of the closure
2. 10-98 immediately after the actual end time of the closure

For closures not needed on the authorized date, use code 10-22 within 2 hours after the authorized start time.

If you are unable to access the LCS Mobile web page, immediately notify the Engineer of the closure's status.

12-4.02C(3) Closure Requirements and Charts

12-4.02C(3)(a) General

10-16-20

Where two or more lanes in the same direction of travel and on the same side are adjacent to the work area, closures must comply with the buffer lane requirements.

10-18-19

12-4.02C(3)(b) Complete Freeway or Expressway Closure Requirements

Reserved

12-4.02C(3)(c) HOV, Express, and Bus Lane Closure Requirements

Reserved

12-4.02C(3)(d) City Street Closure Requirements

Reserved

12-4.02C(3)(e) Closure Restrictions for Special Events and Venues

Reserved

12-4.02C(3)(f) Closure Restrictions for Designated Holidays and Special Days

Reserved

12-4.02C(3)(g) Freeway or Expressway Lane Requirement Charts

Reserved

12-4.02C(3)(h) Complete Freeway or Expressway Closure Hour Charts

Reserved

12-4.02C(3)(i) Complete Connector Closure Hour Charts and Connector Lane Requirement Charts

Reserved

12-4.02C(3)(j) Complete Ramp Closure Hour Charts and Ramp Lane Requirement Charts

Reserved

12-4.02C(3)(k) Conventional Highway Lane Requirement Charts

Reserved

12-4.02C(3)(l) Complete Conventional Highway Closure Hour Charts

Reserved

12-4.02C(3)(m) City Street Closure Hour Charts and City Street Lane Requirement Charts

Reserved

12-4.02C(3)(n) Concrete Slab and Approach Slab Replacement Closure Hours Table

Reserved

12-4.02C(3)(o)–12-4.02C(3)(s) Reserved

10-16-20

12-4.02C(4) Buffer Lanes

Where two or more lanes are adjacent to a work area, including work on shoulders, you must close the lane adjacent to the work area in accordance with the lane requirement charts as follows:

1. Work is on the traveled way within 6 feet of the adjacent traffic lane.
2. Work is off the traveled way but within 6 feet of the edge of the traveled way, and the posted speed is 45 mph or greater.
3. Work is off the traveled way but within 3 feet of the edge of the traveled way, and the posted speed is less than 45 mph.

Closure of the adjacent traffic lane is not required for:

1. Workers protected by a permanent or temporary barrier
2. Installation, maintenance, or removal of traffic control devices except for temporary railing

For time periods at the beginning or end of work when the lane requirement charts do not allow the closure of the adjacent traffic lane, the following construction activities are allowed without a buffer lane:

1. Paving.
2. Parking, positioning, loading, unloading vehicles, or storing equipment or materials necessary for the work being performed.
3. Placing, removing or maintaining traffic stripes, pavement marking, or pavement markers.
4. Operations not performed by workers on foot such as grinding, grooving, planing, sweeping, applying a tack coat, or operating a crane.
5. Operations where workers on foot are protected, at each work location, within the same closure by an impact attenuator vehicle in the lane adjacent to live traffic.

Do not perform work activities or store equipment, vehicles, or materials within the buffer lane.

10-18-19

12-4.02C(5)–12.4.02C(6) Reserved

12-4.02C(7) Traffic Control System Requirements

12-4.02C(7)(a) General

Control traffic using stationary closures.

If components of the traffic control system are displaced or cease to operate or function as specified, immediately repair them to their original condition or replace them and place them back in their original locations.

04-16-21

Do not start activities that require an impact attenuator vehicle until the attenuator is in place.

10-18-19

Each vehicle used to place, maintain, and remove components of a traffic control system on a multilane highway must have a Type II flashing arrow sign that must operate whenever the vehicle is used for placing, maintaining, or removing the components. For a stationary closure, vehicles with a Type II flashing arrow sign not involved in placing, maintaining, or removing the components must display only the caution display mode. If a flashing arrow sign is required for a closure, activate the sign before the closure is in place.

12-4.02C(7)(b) Stationary Closures

Except for channelizing devices placed along open trenches or excavations adjacent to the traveled way, remove the components of the traffic control system for a stationary closure from the traveled way and shoulders at the end of each work period. You may store the components at authorized locations within the limits of the highway.

If a traffic lane is closed with channelizing devices for excavation work, move the devices to the adjacent edge of the traveled way when not excavating. Space the devices as shown for the lane closure.

04-16-21

Use an impact attenuator vehicle to place and remove components of a stationary traffic control system. Do not use an impact attenuator vehicle on two-lane conventional highways if the vehicle would have to stop within a lane open to traffic to place, maintain, or remove the traffic control system.

04-16-21

12-4.02C(7)(c) Moving Closures

For a moving closure, use a PCMS truck mounted on the upstream sign vehicle. The full operational height to the bottom of the sign may be less than 7 feet above the ground but must be as high as practicable.

If you use a flashing arrow sign in a moving closure, the sign must be truck mounted on the upstream sign vehicle. Operate the flashing arrow sign in the caution display mode if it is being used on a 2-lane highway.

Use an impact attenuator vehicle as a shadow vehicle.

10-18-19

12-4.02C(7)(d) Traffic Breaks

You may request a traffic break for special operations such as:

1. Installation, removal, or replacement of an overhead power line or other utility cable across the highway
2. Installation or removal of traffic control devices in areas without a standard-width shoulder
3. Transportation of large equipment across the highway
4. Access to median areas for workers or equipment

If the Department authorizes the traffic break, the Engineer notifies you and arranges the traffic break with the California Highway Patrol through COZEEP. The duration of a traffic break must not exceed 5 minutes or as authorized.

Two California Highway Patrol officers per vehicle are required for traffic breaks occurring any time from 2200 to 0600 hours.

A minimum of 2 California Highway Patrol vehicles will be assigned to conduct a traffic break.

04-16-21

Place a truck mounted PCMS approximately 2,000 feet upstream of the work area or as agreed upon by the Engineer. Monitor the traffic during the traffic break. If a queue develops, reposition the PCMS truck far enough upstream of the traffic break to provide real-time notification to motorists before they approach the traffic queue.

10-18-19

12-4.02C(8) Traffic Control System Signs

12-4.02C(8)(a) General

Traffic control system signs must comply with section 12-3.11.

12-4.02C(8)(b) Connector and Ramp Closure Signs

Inform motorists of a temporary closing of a (1) connector or a (2) freeway or expressway entrance or exit ramp using:

1. SC6-3(CA) (Ramp Closed) sign for closures of 1 day or less
2. SC6-4(CA) (Ramp Closed) sign for closures of more than 1 day

SC6-3(CA) and SC6-4(CA) signs must be stationary mounted at the locations shown and must remain in place and visible to motorists during the connector or ramp closure.

Notify the Engineer at least 2 business days before installing the sign and install the sign from 7 to 15 days before the closure.

12-4.02C(9) Flagging

12-4.02C(9)(a) General

12-4.02C(9)(a)(i) Summary

Section 12-4.02C(9) includes specifications for flaggers, AFAD operators, additional flaggers, advance flaggers and flagger stations.

12-4.02C(9)(a)(ii) Definitions

04-17-20

AFAD operator: Flagger certified by the manufacturer to operate the specific automated flagger assistance device.

10-18-19

additional flagger: Flagger that controls the flow of traffic at intermediate locations within the limits of a closure with reversible control, at intersections, driveways and other traffic merging points.

advance flagger: Flagger positioned upstream of the traffic control system, who warns approaching traffic of road work ahead and potentially stopped traffic within the advance warning signs.

04-17-20

incidental flagger: Flagger that performs flagging that is not part of a traffic control system.

12-4.02C(9)(a)(iii) Submittals

Submit as informational submittals:

1. Flagger certification for each flagger including AFAD operators. The submittal must include:
   1.1. Name of the individual receiving certification.
   1.2. Name of entity providing certification.
   1.3. Date of certification.
   1.4. Certification expiration date.
2. AFAD manufacturer certification for each AFAD operator. The submittal must include:
   2.1. Name of the manufacturer's authorized trainer.
   2.2. Name of the trainee.
   2.3. Description of device type and model for which training was provided.
   2.4. Date when the training was provided.
3. Training qualifications for each incidental flagger.

12-4.02C(9)(a)(iv) Quality Assurance

Flaggers must be at least 18 years of age and maintain a valid government issued identification and must possess proof of certification during flagging operations.

10-15-21

Flaggers that are part of a traffic control system must be certified by an authorized flagger training provider. The authorized flagger training provider list is available at the Department's Division of Construction website.

04-17-20

In addition, AFAD operators must be certified by the AFAD manufacturer on:

1. Device type and model to be used on the project
2. Installation procedures
3. Local and remote-controlled operation
4. Maintenance of the device

Incidental flaggers must be trained under 8 CA Code of Regs § 1599.

10-18-19

12-4.02C(9)(b) Materials

Not Used

12-4.02C(9)(c) Construction

12-4.02C(9)(c)(i) General

Not Used

12-4.02C(9)(c)(ii) Flaggers

12-4.02C(9)(c)(ii)(A) General

Flaggers should stand in a conspicuous place and be visible to approaching vehicles.

10-16-20

Flaggers must wear a hard hat, safety glasses, and Class 3, high-visibility, safety apparel under ANSI/ISEA 107-2004, or equivalent subsequent revisions.

04-17-20

Flaggers must be equipped with a 24-by-24-inch "STOP/SLOW" paddle with a rigid staff tall enough to maintain the bottom of the paddle a minimum of 6 feet above the pavement.

10-18-19

12-4.02C(9)(c)(ii)(B) Automated Flagger Assistance Device Operators

When AFADs are in operation, the AFAD operators must:

1. Be positioned away from the traveled way
2. Be positioned where they have an unobstructed line of sight to approaching vehicles and to the devices
3. Keep a backup hand held AFAD remote control readily available

A pilot car driver must not operate a device and must not be considered as one of the flaggers present on-site available to operate a device.

10-16-20

12-4.02C(9)(c)(ii)(C) Additional Flaggers

Provide additional flaggers at any of the following locations:

1. At high-volume intersections and driveways between the two flagger stations as described
2. At Multi-lane and circular intersections

04-16-21

For other intersections and driveways, place a sign as described.

10-16-20

Additional flaggers use the STOP/SLOW sign paddle to control vehicles merging into the closure with reversible control.

If additional flaggers are not described, providing additional flaggers is change order work.

10-18-19

12-4.02C(9)(c)(ii)(D) Advance Flaggers

Provide advance flaggers when any of the following conditions exist:

1. Queued traffic reaches the W20-4 (One Lane Road Ahead) sign.
2. When the horizontal roadway curvature restricts the sight distance of approaching traffic.
3. When the vertical roadway curvature restricts the sight distance of approaching traffic.

Advance flaggers use the SLOW sign paddle to warn approaching vehicles of the flagging operation ahead and signals the drivers to slow down. If the STOP/SLOW paddle is used, the STOP side must be covered.

10-16-20

If advance flaggers are not described, providing advance flaggers is change order work.

10-18-19

12-4.02C(9)(c)(iii) Flagger Stations

Place flagger stations such that approaching vehicles have sufficient distance to react and follow the flagger's instructions.

Place a minimum of four cones at 50 feet intervals in advance of flagger stations.

During the hours of darkness, illuminate flagger stations under 8 CA Regs § 1523. Do not start flagging until flagger stations are illuminated.

Place advance warning signs W20-1, C9A(CA), and W3-4 upstream of the additional flagger station at intersections as shown.

Place advance warning signs W20-1, C9A(CA), and W3-4 upstream of the advance flagger station.

10-16-20

Remove the W20-1 sign from all flagger stations downstream from the advance flagger station furthest from the work area.

10-15-21

You may use a full-matrix PCMS in place of an advance flagger. The PCMS must alternately display the message "Prepare to Stop" and the C9A(CA) sign graphic. Place a portable W20-1 sign in advance of the PCMS.

04-16-21

If the distance *E* shown is 1,000 feet or more, place a SW60(CA) as shown. Place an additional SW60(CA) sign for every additional 1,000 feet of separation, space the signs at 1,000-foot intervals.

10-18-19

12-4.02C(9)(d) Payment

Not Used

10-16-20

12-4.02C(10) End of Queue Monitoring and Warning with Truck Mounted Changeable Message Sign

Reserved

12-4.02C(11) Traffic Control Technician

12-4.02C(11)(a) General

12-4.02C(11)(a)(i) Summary

Section 12-4.02C(11) includes specifications for training, certification, and responsibilities for traffic control technicians.

The traffic control technician:

1. Is responsible for the installation, maintenance, and removal of traffic control devices
2. Must have the authority to assign and direct flagging operations

3. Must be knowledgeable about:
    3.1. Section 7-1.03 “Public Convenience"
    3.2. Section 7-1.04 “Public Safety”
    3.3. Section 12 “Temporary Traffic Control”
    3.4. Traffic control system Standard Plans
    3.5. Traffic handling plans and detour plans

10-15-21

Assign a traffic control technician to each closure.

10-16-20

12-4.02C(11)(a)(ii) Definitions

Reserved

12-4.02C(11)(a)(iii) Submittals

12-4.02C(11)(a)(iii)(A) General

Every Monday by noon, submit traffic control daily reports for the previous week as an informational submittal.

12-4.02C(11)(a)(iii)(B) Quality Assurance Submittals

Submit the following as informational submittals:

1. Traffic control technician certification and flagger certification for each traffic control technician and each alternate traffic control technician. The certification must include:
    1.1. Name of the individual receiving certification
    1.2. Name of entity providing certification
    1.3. Date of certification
    1.4. Certification expiration date
2. Contact information for each traffic control technician and each alternate traffic control technician. The submittal must include the name, phone number and email address.
3. Traffic control daily reports for each closure. The traffic control daily report must include:
    3.1. Date
    3.2. Name of traffic control technician
    3.3. Location of traffic control. Provide description, County, Route, Postmile or Station and Direction
    3.4. Reference to traffic control standard plan or project plan sheet
    3.5. For closure information include:
        3.5.1. Lane requirement chart number, start time, and end time
        3.5.2. Facility type: conventional highway, freeway, expressway, on ramp, off ramp, or connector, street
        3.5.3. Number of lanes closed, which lanes are closed, or shoulder closure
        3.5.4. Names of flaggers, if applicable
        3.5.5. Use of construction work zone speed limit reduction, buffer lanes, or COZEEP support, if applicable
    3.6. Documentation of:
        3.6.1. LCS Mobile web page status confirmation for 1097 and 1098, or 1022
        3.6.2. Verification that closure is in compliance with the contract requirements
        3.6.3. Modifications to the traffic control including, a description of the change, the reason for the change, time when the change is implemented
        3.6.4. Traffic control system monitoring including, time of inspection and observations
        3.6.5. Incidents that occur while the traffic control system is in place

12-4.02C(11)(a)(iv) Quality Assurance

12-4.02C(11)(a)(iv)(A) General

The traffic control technician must coordinate with the Engineer the implementation of traffic control systems and traffic handling plans prior to construction, and before major changes in traffic control.

12-4.02C(11)(a)(iv)(B) Training and Certifications

A traffic control technician must be certified as a flagger and as a traffic control technician. Department authorized traffic control technician and flaggers training providers list is available at:

https://dot.ca.gov/programs/construction/safety-traffic/safety-training-courses

12-4.02C(11)(a)(iv)(C) Quality Control

The traffic control technician must:

1. Ensure safe, convenient, and effective passage of motorists, bicyclists, pedestrians, workers, and first responders, through or around the construction work zone
2. Inspect the condition of traffic control devices on a regular basis for compliance with the quality requirements in the American Traffic Safety Services Association publication *Quality Guidelines for Temporary Traffic Control Devices and Features*
3. Ensure the labor, equipment, and materials are available to immediately correct deficiencies in the traffic control system
4. Ensure workers performing flagging operations meet the flagger's certificate requirements
5. Ensure the status of closures is reported using the LCS Mobile web page
6. Verify that all closures comply with the contract requirements and that traffic control devices, including PCMS, arrow boards and radar speed feedback signs, are functioning after traffic control installation

12-4.02C(11)(b) Material

Not Used

12-4.02C(11)(c) Construction

10-15-21

For each closure, a traffic control technician must be present during the installation, operation, and removal of the traffic control system.

10-16-20

Notify the Engineer of the assigned traffic control technician for each closure 1 business day before the closure.

Notify the Engineer before an alternate traffic control technician assumes the duties of the assigned traffic control technician.

Traffic control technicians must be available by:

1. Cellular telephone
2. Two-way radio
3. Mobile internet access

Traffic control technician must:

1. Mark the locations for traffic control devices before installation of closures
2. Monitor work zone traffic control activities and operations, including detours, to ensure the traffic control is functioning properly

When monitoring work zone traffic control, if an imminent danger is identified, take immediate corrective action and notify the Engineer. Notify the Engineer of modifications needed to the traffic control system plans or traffic handling plans if the traffic control is not functioning as required due to changes in traffic or site conditions. Do not implement any changes to the traffic control system plans or traffic handling plans until the proposed revisions are authorized.

12-4.02C(11)(d) Payment

Not Used

12-4.02C(12) Construction Work Zone Speed Limit Reduction

Reserved

12-4.02C(13) Traffic Control Supervision

Reserved

12-4.02C(14)–12-4.02C(25) Reserved

10-18-19

12-4.02D Payment

The Department pays for change order work for a traffic control system by force account for increased traffic control and uses a force account analysis for decreased traffic control.

The Department does not pay for furnishing, placing, relocating, and removing PCMSs used for a traffic break.

The Department deducts the full cost of COZEEP support provided for the traffic break.

The hourly rate for each California Highway Patrol officer providing COZEEP support is $115. This rate includes full compensation for each hour or portion thereof that the officer provides the support. Markups are not added to any expenses associated with COZEEP support.

The minimum number of hours for an officer is 4 hours, except if a closure is already in place and the Engineer authorizes your request for an on-duty officer to conduct a traffic break, the minimum number of hours for an officer is 1 hour.

For a cancellation less than 48 hours before the scheduled start time of COZEEP support, except for a cancellation due to adverse weather or extenuating circumstances, the Department deducts:

1. Minimum of $50 per California Highway Patrol officer if the officer is notified before the start time
2. Maximum of 4 hours of pay per officer if the officer is not notified before the start time

12-4.03 FALSEWORK OPENINGS

04-17-20

12-4.03A General

Section 12-4.03 includes specifications for providing falsework openings.

12-4.03B Materials

Not Used

12-4.03C Construction

12-4.03C(1) General

Reserved

12-4.03C(2) Temporary Railing

Install Type K temporary railing on both sides of vehicular openings through falsework. If ordered, install temporary railing at other falsework less than 12 feet from the edge of a traffic lane. This is change order work.

Temporary railings for vehicular openings must start 150 feet in advance of the falsework and extend past the falsework in the direction of adjacent traffic flow. For 2-way traffic openings, temporary railing must extend at least 60 feet past the falsework in the direction of adjacent traffic flow.

Install temporary crash cushion modules as shown at the approach end of temporary railings located less than 15 feet from the edge of a traffic lane. For 2-way traffic openings install temporary crash cushion modules at the departing end of temporary railings located less than 6 feet from the edge of a traffic lane.

10-15-21

The Engineer determines the exact location and length of temporary barrier system and the type of flare to be used.

04-17-20

Install temporary railing for protecting the falsework before erecting it. Do not remove temporary railing until authorized.

12-4.03D Payment

Not Used

12-4.04 TEMPORARY PEDESTRIAN ACCESS ROUTES

12-4.04A General

12-4.04A(1) Summary

Section 12-4.04 includes specifications for providing, maintaining, and removing temporary pedestrian access routes.

A temporary pedestrian access route includes temporary traffic control devices as shown except for Type K temporary railing and temporary crash cushions.

12-4.04A(2) Definitions

Reserved

12-4.04A(3) Submittals

If work activities require the closure of a pedestrian route and a temporary pedestrian access route is not shown, submit a work plan for a temporary pedestrian access route. The work plan must:

1. Describe the activities, processes, equipment, and materials that will be used to provide the temporary access route
2. Show the locations of the routes and the placement of traffic control devices for each stage of work
3. Include a time-scaled logic diagram displaying the sequence and duration of the planned activities for each stage of work
4. Be sealed and signed by an engineer who is registered as a civil engineer in the State

Submit "Temporary Pedestrian Access Route Contractor Compliance Report," within 2 business days after construction of a temporary pedestrian access route.

Submit "Temporary Pedestrian Access Route Contractor Weekly Report," within 2 business days of completing a weekly inspection.

12-4.04A(4) Quality Assurance

12-4.04A(4)(a) General

Reserved

12-4.04A(4)(b) Quality Control

Perform a review of the temporary pedestrian access route after it is constructed and document compliance on the "Temporary Pedestrian Access Route Contractor Compliance Report."

The Department will conduct a verification inspection after receiving the compliance report.

For a temporary pedestrian access route in use perform a weekly review and document compliance on the "Temporary Pedestrian Access Route Contractor Weekly Report."

12-4.04B Materials

The walkway surface must be slip resistant and surfaced with minor HMA or commercial-quality, bituminous material, commercial-quality concrete, or wood.

A handrail with a circular cross section must have an outer diameter from 1-1/4 to 2 inches. A handrail with a noncircular cross section must have a perimeter from 4 to 6-1/4 inches and a maximum cross-section dimension of 2-1/4 inches.

Fasteners must be rounded to prevent injury to a pedestrian's fingers, hands, and arms and to eliminate sharp edges that could catch on clothing.

A detectable warning surface must be on the Authorized Material List for detectable warning surfaces and match yellow color no. 33538 of AMS.Std.595.

Temporary traffic control devices used to channelize pedestrians must:

1. Be free of sharp or rough edges

2. Have a continuous detectable edging at least 6 inches high and at no more than 2 inches above the walkway surface
3. Be at least 32 inches in height
4. Have smooth connection points between devices to allow for a handrail
5. Have a top and bottom surface in the same vertical plane

12-4.04C Construction

Notify the Engineer 5 business days before closing an existing pedestrian route. Do not close the route until authorized.

If work activities require the closure of a pedestrian route and a temporary pedestrian access route is not shown, provide a temporary pedestrian access route near the traveled way. You may route pedestrians using the existing sidewalk or by constructing a temporary access route.

If a bid item for a temporary pedestrian access route is not shown on the Bid Item List, then constructing a temporary pedestrian access route is change order work, except when the closure is a result of your means and methods.

Construct a temporary pedestrian access route such that:

1. Walkway surface is firm and stable and free of irregularities
2. Cross slope of the pedestrian route is at most 50:1 (horizontal:vertical)
3. Longitudinal slope of the pedestrian route is at most 20:1 (horizontal:vertical)
4. Walkway, landings, blended transitions, and curb ramps are at least 60 inches wide except where not feasible, the width must be at least 48 inches wide with a 60-by-60-inch passing space at least every 200 feet
5. Lateral joints or gaps between surfaces are less than 1/2 inch wide
6. Discontinuities in surface heights are less than 1/2 inch and beveled if greater than 1/4 inch with a slope no greater than 2:1 (horizontal:vertical)
7. Ramps have:
    7.1. Longitudinal slope of at most 12:1 (horizontal:vertical)
    7.2. Rise less than 30 inches
    7.3. Protective edging at least 2 inches high on each side and handrails at a height from 34 to 38 inches above the walkway surface if the rise is greater than 6 inches
8. Curb ramps have:
    8.1. Longitudinal slope of at most 12:1 (horizontal:vertical)
    8.2. Protective edging at least 2 inches high on each side if the curb ramp does not have flares and the rise is greater than 6 inches
9. Pedestrians are channelized when routed off existing pedestrian routes

Construct handrails such that they are continuous, smooth and free of sharp or rough edges.

Provide an overhead covering to protect pedestrians from falling objects and drippings from overhead structures.

If the temporary access route is next to traffic or work activities, place a temporary barrier to separate the route from vehicles and equipment.

Install a detectable warning surface at locations where a curb ramp, landing, or blended transition connects to a street. Install the warning surface such that it extends a minimum of 36 inches in the direction of travel and for the full width of the landing, blended transition, or curb ramp, excluding the flares.

Maintain the temporary pedestrian access route clear of obstructions. Do not allow traffic control devices, equipment, or construction materials to protrude into the walkway. Maintain a continuous unobstructed path connecting all pedestrian routes, parking lots, and bus stops located within the project limits.

Remove the temporary pedestrian access route when the Engineer determines it is no longer needed.

Provide a temporary pedestrian access route through falsework under section 16-2.02.

12-4.04D Payment

Not Used

12-4.05 BRIDGE CLEANING AND PAINTING ACTIVITIES

12-4.05A General

Section 12-4.05 includes specifications for maintaining traffic during bridge cleaning and painting activities.

Signs must comply with section 12-3.11.

12-4.05B Materials

Not Used

12-4.05C Construction

For bridge cleaning and painting activities, place the signs as shown in the following table in addition to those shown on the plans:

Sign no.	Sign description	Requirement
W20-1	Road Work Ahead	Place portable 30-by-30-inch signs at locations where traffic approaches a bridge with work underway. If the approach speed is greater than 50 mph, the sign must be 48 by 48 inches. The sign panel base material must not be plywood. Attach 2 orange, 16 sq in flags to each sign.
--	Cleaning and Painting Operations	Place a 48-by-48-inch sign near each W20-1 sign. Use 4-inch-high black lettering and include your name, address, and telephone number on an orange background.

The Engineer determines the exact locations of the signs. Do not use signs until needed. Maintain the signs in place during bridge cleaning and painting activities. Remove the signs at the end of each work shift.

After each day's bridge cleaning and painting activities, remove obstructions from the roadway to allow for free passage for traffic. Remove blast cleaning residue from the traveled way before opening the area to traffic.

You may lay supply lines along the top of curbs adjacent to railing posts if the lines do not interfere with traffic. Remove the lines when work is not in progress.

12-4.05D Payment

Not Used

12-4.06 TOLL BRIDGES

Reserved

12-4.07–12-4.10 RESERVED

12-5 RESERVED

12-6 TEMPORARY PAVEMENT DELINEATION

12-6.01 GENERAL

Section 12-6 includes specifications for placing temporary pavement delineation except for delineation on a seal coat project.

Temporary painted traffic stripes and painted pavement markings used for temporary delineation must comply with section 84-2.

Temporary signs for no-passing zones must comply with section 12-3.11.

12-6.02 MATERIALS

12-6.02A General

The following types of temporary pavement delineation must be on the Authorized Material List for signing and delineation materials:

1. Temporary pavement markers for long term day/night use (180 days or less)
2. Temporary pavement markers for short term day/night use (14 days or less)
3. Temporary (removable) striping and pavement marking tape (180 days or less)
4. Permanent traffic striping and pavement marking tape
5. Channelizers

12-6.02B Temporary Pavement Markers

Temporary pavement markers must be the same color as the lane line or centerline markers being replaced.

Temporary pavement markers must be for long-term day or night use, 180 days or less, except you may use temporary pavement markers for short-term day or night use, 14 days or less, if you place the permanent pavement delineation before the end of the 14 days.

12-6.02C Channelizers

Channelizers used for temporary edge line delineation must be orange and surface mounted.

12-6.03 CONSTRUCTION

12-6.03A General

If work activities obliterate pavement delineation, place temporary or permanent pavement delineation before opening the traveled way to traffic. The temporary pavement delineation must consist of a lane line and centerline pavement delineation for traveled ways open to traffic. On multilane roadways, freeways, expressways, and 2-lane roadways with shoulders 4 feet or more in width, the temporary pavement delineation must also include edge line delineation for traveled ways open to traffic.

Establish the alignment for temporary pavement delineation, including the required lines or markers. Surfaces to receive an application of paint or removable traffic tape must be dry and free from dirt and loose material. Do not apply temporary pavement delineation over existing pavement delineation or any other temporary pavement delineation. Maintain temporary pavement delineation until no longer needed or replace it with a new striping detail of temporary or permanent pavement delineation.

When the Engineer determines the temporary pavement delineation is no longer required for the direction of traffic, remove the temporary pavement delineation, including any underlying adhesive for temporary pavement markers, from the final layer of surfacing and from the pavement to remain in place. Remove temporary pavement delineation that conflicts with any subsequent or new traffic pattern for the area.

12-6.03B Temporary Lane Line and Centerline Delineation

If lane lines or centerlines are obliterated and temporary pavement delineation to replace the lines is not shown, the minimum lane line and centerline delineation must consist of temporary pavement markers placed longitudinally at 24-foot maximum intervals.

For temporary lane line or centerline delineation consisting entirely of temporary pavement markers for short-term day or night use, 14 days or less, do not use the markers for more than 14 days on lanes opened to traffic. Place the permanent pavement delineation before the end of the 14 days. If the permanent pavement delineation is not placed within 14 days, replace the temporary pavement markers with additional temporary pavement delineation equivalent to the pattern described for the permanent pavement delineation for the area.

If no-passing centerline pavement delineation is obliterated, install the following temporary no-passing zone signs before opening lanes to traffic:

1. W20-1 (Road Work Ahead) sign from 1,000 to 2,000 feet in advance of the no-passing zone
2. R4-1 (Do Not Pass) sign at the beginning of the no-passing zone and at 2,000-foot maximum intervals within the no-passing zone
3. W7-3a (Next ___ Miles) plaque beneath the W20-1 sign for continuous zones longer than 2 miles

4. R4-2 (Pass With Care) sign at the end of the no-passing zone

The Engineer determines the exact location of temporary no-passing zone signs. Maintain the temporary no-passing zone signs in place until you place the permanent no-passing centerline pavement delineation.

Remove the temporary no-passing zone signs when the Engineer determines they are no longer required for the direction of traffic.

12-6.03C Temporary Edge Line Delineation

On multilane roadways, freeways, expressways, and 2-lane roadways with shoulders 4 feet or more in width open to traffic where edge lines are obliterated and temporary pavement delineation to replace those edge lines is not shown, provide temporary pavement delineation for:

1. Right edge lines consisting of any of the following:
   1.1. Solid 6-inch-wide traffic stripe tape of the same color as the stripe being replaced.
   1.2. Traffic cones placed longitudinally at 100-foot maximum intervals.
   1.3. Portable delineators or channelizers placed longitudinally at 100-foot maximum intervals.
2. Left edge lines consisting of any of the following:
   2.1. Solid 6-inch-wide traffic stripe tape of the same color as the stripe being replaced.
   2.2. Traffic cones placed longitudinally at 100-foot maximum intervals.
   2.3. Portable delineators or channelizers placed longitudinally at 100-foot maximum intervals.
   2.4. Temporary pavement markers placed longitudinally at 6-foot maximum intervals.

You may apply temporary traffic stripe paint of the same color as the stripe being replaced instead of solid 6-inch-wide temporary traffic stripe tape where the removal of the temporary traffic stripe is not required.

The Engineer determines the lateral offset for traffic cones, portable delineators, and channelizers used for temporary edge line delineation. If traffic cones or portable delineators are used for temporary edge line delineation, maintain the cones or delineators during the hours of the day when they are in use.

Cement the bases of channelizers used for temporary edge line delineation to the pavement with hot melt bituminous adhesive as specified in section 81-3 for cementing pavement markers to pavement.

12-6.03D Temporary Traffic Stripe, Pavement Marking, and Pavement Markers

12-6.03D(1) General

Reserved

12-6.03D(2) Temporary Traffic Stripe Tape

Except where the temporary traffic stripe is used for 14 days or less, apply temporary removable traffic stripe tape under the manufacturer's instructions and as follows:

1. Slowly roll the tape with a rubber-tired vehicle or roller to ensure complete contact with the pavement surface.
2. Apply the tape straight on a tangent alignment and on a true arc on a curved alignment.
3. Do not apply the tape when the ambient air or pavement temperature is less than 50 degrees F unless otherwise authorized.

For temporary traffic stripe tape used for 14 days or less, apply the temporary removable traffic stripe tape under the manufacturer's instructions.

12-6.03D(3) Temporary Traffic Stripe Paint

Apply temporary traffic stripe paint under section 84-2.03, except you may apply 1 or 2 coats of the temporary traffic stripe paint for new or existing pavement.

You are not required to remove painted temporary traffic stripe that will be covered by paving work.

12-6.03D(4) Temporary Pavement Marking Tape

Apply temporary removable pavement marking tape as specified for applying temporary removable traffic stripe tape in section 12-6.03D(2).

12-6.03D(5) Temporary Pavement Marking Paint

Apply temporary pavement marking paint under section 84-2.03, except you may apply 1 or 2 coats of the temporary pavement marking paint.

You are not required to remove of painted temporary pavement markings that will be covered by paving work.

You may use permanent or temporary removable pavement marking tape instead of temporary pavement marking paint.

12-6.03D(6) Temporary Pavement Markers

Place temporary pavement markers under the manufacturer's instructions. Cement temporary markers to the surfacing with the manufacturer's recommended adhesive except do not use epoxy adhesive in areas where the removal of the pavement markers is required.

You may use retroreflective pavement markers instead of temporary pavement markers for long-term day or night use, 180 days or less, except to simulate patterns of broken traffic stripe. Retroreflective pavement markers used for temporary pavement markers must comply with section 81-3, except the waiting period before placing pavement markers on new asphalt concrete surfacing as specified in section 81-3.03 does not apply. Do not use epoxy adhesive to place pavement markers in areas where the removal of the pavement markers is required.

12-6.04 PAYMENT

The Department does not pay for additional temporary pavement delineation used to replace temporary pavement markers.

Temporary traffic stripe is measured as specified for traffic stripe in section 84.

Temporary pavement marking is measured as specified for pavement marking in section 84.

12-7 TEMPORARY PAVEMENT DELINEATION FOR SEAL COATS

12-7.01 GENERAL

Section 12-7 includes specifications for placing temporary pavement delineation for a seal coat project.

Temporary signs for no-passing zones must comply with section 12-3.11.

12-7.02 MATERIALS

Temporary raised pavement markers for seal coat applications must be temporary pavement markers for short-term day or night use, 14 days or less, on the Authorized Material List for signing and delineation materials.

12-7.03 CONSTRUCTION

Before applying binder that will obliterate existing traffic stripes, place temporary raised pavement markers on the existing traffic stripes except for right edge lines at 24-foot maximum intervals. Place 2 markers side by side on double traffic stripes with 1 marker placed on each stripe longitudinally at 24-foot maximum intervals. Place temporary raised pavement markers under the manufacturer's instructions. Before opening the lanes to uncontrolled traffic, remove the covers from the temporary raised pavement markers.

If you obliterate no-passing centerline pavement delineation, install the following temporary no-passing zone signs before opening lanes to traffic:

1. W20-1 (Road Work Ahead) sign from 1,000 to 2,000 feet in advance of the no-passing zone
2. R4-1 (Do Not Pass) sign at the beginning of the no-passing zone and at 2,000-foot maximum intervals within the no-passing zone
3. W7-3a (Next ___ Miles) plaque beneath the W20-1 sign for continuous zones longer than 2 miles
4. R4-2 (Pass With Care) sign at the end of the no-passing zone

The Engineer determines the exact location of the temporary no-passing zone signs. Maintain the temporary no-passing zone signs in place until you place the permanent no-passing centerline pavement delineation. Remove the temporary no-passing zone signs when the Engineer determines they are no longer required for the direction of traffic.

Maintain temporary pavement delineation until you replace it with the permanent pavement delineation.

12-7.04 PAYMENT

Not Used

12-8-12-10 RESERVED

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13 WATER POLLUTION CONTROL

10-16-20

Replace the 3rd paragraph of section 13-1.01A with:

10-16-20

You may view these manuals at the Stormwater and Water Pollution Control Information link at the Department's Division of Construction website.

Add to the end of section 13-1.01C(1):

04-17-20

Submittals for additional or new WPC practices to manage run-on, run-off, and stormwater conveyance must:

1. Describe the activities, processes, equipment, and materials that will be used to manage the run-on, run-off, and stormwater conveyance through the job site
2. Show the locations of the management practices
3. Include a time-scaled logic diagram displaying the sequence and duration of the management practices for each stage of work
4. Be sealed and signed by an engineer who is registered as a civil engineer in the State

Add after the 2nd paragraph of section 13-1.01C(5):

04-19-19

For partial listing of disposal facilities and their waste acceptance list, go to SWRCB website.

Replace the 3rd paragraph of section 13-1.01D(3) with:

04-17-20

Training for assistant WPC managers who inspect, repair, and maintain WPC practices, collect water quality samples, and record water quality data must include:

1. Review of the sampling and analysis plan and the *Construction Site Monitoring Program Guidance Manual*
2. Health and safety review
3. Sampling simulations

The training for assistant WPC managers must comply with the requirements described under "WPC Manager Training," and includes:

1. Obtaining a certificate by completing the 8-hour WPC manager training
2. Reviewing updates, revisions, and amendments to the training

For training requirements, go to the Construction Storm Water and Water Pollution Control website.

Replace the 1st paragraph of section 13-1.01D(4)(a) with:

04-17-20

Assign a WPC manager to implement the WPCP or SWPPP. Assign an alternate WPC manager to perform the responsibilities of the WPC manager in the manager's absence. The alternate WPC manager must have the same qualifications as the WPC manager. You may assign an assistant WPC manager to act under the supervision of the WPC manager to inspect, repair, and maintain WPC practices, collect water quality samples, and record water quality data. You may have more than one assistant WPC manager.

Replace the 1st paragraph of section 13-1.01D(4)(b) with:

04-17-20

The WPC manager must:

1. Comply with the requirements provided in the Construction General Permit for QSP
2. Comply with the requirements described under "WPC Manager Training," including:
   2.1. Obtaining a certificate by completing the 8-hour training
   2.2 Reviewing updates, revisions, and amendments to the training

For the requirements, go to the Construction Storm Water and Water Pollution Control website.

04-19-19

Delete item 2.6.3 in the list of section 13-1.01D(4)(c).

Replace item 7 in the list in the 1st paragraph of section 13-1.01D(4)(c) with:

04-17-20

7. Revise the WPCP or recommend changes to the SWPPP

Replace the 3rd sentence in the 4th paragraph of section 13-1.03A with:

04-17-20

Additional WPC work is change order work except when the additional WPC practices are a result of your means and methods.

Replace the 1st paragraph of section 13-2.01C with:

04-19-19

Within 7 days after Contract approval, submit one printed copy and an electronic copy on a read-only CD, DVD, or other authorized data-storage device of your WPCP unless different quantities are ordered at the preconstruction conference. You may assign a QSP other than the WPC manager to develop the WPCP.

Replace item 4 in the list in the 2nd paragraph of section 13-2.01C with:

04-19-19

4. Show the locations and types of temporary WPC practices that will be used in the work for whichever has the longest duration in the first:
   4.1. 60 days
   4.2. Construction phase

Replace item 7 in the list in the 2nd paragraph of section 13-2.01C with:

10-16-20

7. Include a copy of each permit obtained by the Department, such as the Department of Fish and Wildlife permits, US Army Corps of Engineers permits, RWQCB 401 certifications, Docket No. ESPO-SMA 15/16-001 Soil Management Agreement for Aerially Deposited Lead-Contaminated Soils with the DTSC (ADL Agreement), ADL Agreement notification, and RWQCB waste discharge requirements for reuse of aerially deposited lead

Replace the 4th paragraph of section 13-2.01C with:

04-19-19

After the Engineer authorizes the WPCP, submit one printed copy and an electronic copy on a read-only CD, DVD, or other Engineer-authorized data-storage device of the authorized WPCP.

04-19-19

Delete the row for Annual Certification in the table in section 13-3.01C(1).

Replace the 1st paragraph of section 13-3.01C(2)(a) with:

04-17-20

Within 15 days of Contract approval, submit 1 printed copy and an electronic copy on a read-only CD, DVD, or other authorized data-storage device of your SWPPP unless different quantities are ordered at the preconstruction conference.

You must assign a QSD to develop and revise the SWPPP.

Replace item 4 in the list in the 2nd paragraph of section 13-3.01C(2)(a) with:

04-19-19

4. Include a schedule showing when:
   4.1. Work activities that could cause the discharge of pollutants into stormwater will be performed
   4.2. WPC practices, including soil stabilization and sediment control, that will be used in the work for whichever has the longest duration in the first:
      4.2.1. 60 days
      4.2.2. Construction phase

Replace item 5 in the list in the 2nd paragraph of section 13-3.01C(2)(a) with:

10-16-20

5. Include a copy of each permit obtained by the Department, such as the Department of Fish and Wildlife permits, US Army Corps of Engineers permits, RWQCB 401 certifications, Docket No. ESPO-SMA 15/16-001 Soil Management Agreement for Aerially Deposited Lead-Contaminated Soils with the DTSC (ADL Agreement), ADL Agreement notification, and RWQCB waste discharge requirements for aerially deposited lead reuse

Replace the 4th paragraph of section 13-3.01C(2)(a) with:

04-19-19

Submit an electronic copy on a read-only CD, DVD, or other Engineer-authorized data-storage device and 4 printed copies of the authorized SWPPP unless fewer quantities are authorized at the preconstruction conference.

Replace the introductory clause in the 7th paragraph of section 13-3.01C(2)(a) with:

04-19-19

Submit a revised SWPPP annually before September 15th and any time:

Add after the 7th paragraph of section 13-3.01C(2)(a):

04-19-19

Revise the SWPPP through amendment. The annual SWPPP amendment must include an annual winterization plan.

The annual winterization plan must describe the preparation for the upcoming rainy season including:

1. Updated schedule
2. Materials and labor
3. Management of stormwater through the job site including:
   3.1. Run-on
   3.2. Run-off
   3.3. Conveyance downslope
4. Management of areas within the job site including:
   4.1. Areas where work is suspended
   4.2. Areas of soil stabilization
   4.3. New disturbed soil areas
5. Changes to monitoring locations
6. Slope stabilization

04-19-19

Delete section 13-3.01C(5).

Replace the 2nd paragraph of section 13-6.02A with:

10-16-20

Fiber rolls, compost socks, rope, stakes, gravel-filled bags, and foam barriers must comply with section 13-10.02.

Add to the list in the 1st paragraph of section 13-10.01C:

10-16-20

6. Compost socks

Replace section 13-10.03J with:

10-16-20

13-10.03J Temporary Compost Sock

Install temporary compost sock under section 21-2.03Q.

Temporary compost sock must not be installed upstream of a nutrient-impaired water body.

^^

14 ENVIRONMENTAL STEWARDSHIP

10-15-21

Replace section 14-6.05 with:

10-15-21

14-6.05 INVASIVE SPECIES CONTROL

Reserved

Add between the 3rd and 4th paragraphs of section 14-10.01:

04-19-19

If ordered, remove solid waste from illegal dumping on the project site. This work is change order work. Illegal dumping is:

1. Third party nonhazardous residential or commercial waste
2. Greater than 1.0 cubic yard per event

Replace section 14-10.03 with:

04-16-21

14-10.03 RECYCLED MATERIALS REPORTING

Submit a Recycled Materials Report form within 5 business days after Contract acceptance. Show the types and amounts of recycled materials incorporated into the project.

If you fail to submit a completed report, the Department deducts $10,000.

Replace section 14-11.05A with:

10-18-19

14-11.05A General

Do not stockpile material containing hazardous waste or contamination unless authorized in your excavation and transportation plan. Stockpiles containing hazardous waste or contamination must not be placed where affected by surface run-on or run-off. Cover stockpiles with a minimum 12-mils-thick plastic sheeting. Do not place stockpiles in ESAs. Stockpiled material must not enter storm drains, inlets, or waters of the State.

Replace section 14-11.14 with:

11-19-20

14-11.14 TREATED WOOD WASTE

Reserved

Replace *Reserved* in section 14-11.15 with:

04-17-20

14-11.15A General

Section 14-11.15 includes specifications for disposing of electrical equipment containing hazardous materials.

14-11.15B Submittals

14-11.15B(1) General

Reserved

14-11.15B(2) Identification of Disposal Facilities

Thirty days before starting work submit the name and address of the appropriately permitted facilities where electrical equipment containing hazardous materials will be taken to dispose or recycle them.

14-11.15C Waste Management

14-11.15C(1) General

When you mishandle and damage electrical equipment you are the generator of resulting hazardous waste and are responsible for cleanup, management, and disposal of this hazardous waste and the associated costs for the work under section 14-11.06.

14-11.15C(2) Universal Waste

14-11.15C(2)(a) General

Universal wastes include removed:

1. Light bulbs
2. E-waste including, electronic devices as described in 22 CA Code Regs § 66273.3(a), containing:
   2.1. Circuit boards, including controller boxes and LED lights
   2.2. Computer screens or video screens
   2.3. Computer keyboards
   2.4. Cathode ray tube devices
3. Batteries as described in 22 CA Code Regs § 66273.2
4. Mercury-containing equipment as described in section 22 CA Code Regs §66273.4(a); such as lamps, timers, and switches
5. Fluorescent tubes, bulbs, and lamps

Manage and dispose of universal waste under 22 CA Code Regs § 66261.9. Transport universal wastes to an appropriately permitted recycling or disposal facility.

14-11.15C(2)(b) Undamaged Lithium Thionyl Chloride batteries

Package removed equipment containing undamaged lithium thionyl chloride batteries and place the packages in US DOT approved sealed shipping containers. Transport the containers to a recycling or disposal facility. Notify the receiving facility 48 hours before delivery. Affix a label to containers of intact units identifying the contents as "Universal Waste: Lithium Thionyl Chloride Batteries."

Ship lithium thionyl chloride batteries that are separated from the electrical equipment units they powered to a recycling or disposal facility under 49 CFR 173.185. Package the batteries such that contact between them and resulting short circuits are avoided. Prevent accidental contact between batteries by:

1. Covering terminal ends to prevent them from touching each other
2. Placing batteries in a sealed plastic bag packed with loose fill, such as vermiculite

The outer packaging must comply with 49 CFR 173.24 and 173.24a. Transport lithium thionyl chloride batteries to an approved hazardous waste recycling or disposal facility. For a partial list of facilities, go to:

http://www.calrecycle.ca.gov/Electronics/Recovery/Approved/Default.htm

14-11.15C(3) Damaged Lithium Thionyl Chloride batteries

Damaged Lithium thionyl chloride batteries are designated as an extremely hazardous waste under 22 CA Code of Regs, Div 4.5, Ch 11, Art 5, App 10.

When lithium thionyl chloride batteries are damaged by your mishandling you are the generator of the resulting hazardous waste and responsible for cleanup, management, and disposal of this hazardous waste and the associated costs for the work under section 14-11.06.

Lithium thionyl chloride batteries found damaged are Department-generated hazardous waste under section 14-11.07. Management of this Department-generated hazardous waste is change order work.

Use a hazardous waste manifest to transport this damaged equipment to an appropriately permitted disposal facility.

14-11.15C(4) Electrical Equipment Containing PCBs

14-11.15C(4)(a) General

PCBs are found in electrical equipment produced before 1979 such as transformers, capacitors, and fluorescent light ballasts.

14-11.15C(4)(b) Transformers and Capacitors

Manage and dispose of transformers and capacitors containing PCBs under 40 CFR Part 761 and 22 CA Code of Regs Div 4.5.

14-11.15C(4)(c) Undamaged Fluorescent Light Ballasts

Manage and dispose of fluorescent light ballasts containing PCBs under 22 CA Code of Regs § 67426.1 et seq. Fluorescent light ballasts containing PCBs must be packaged and transported by a hauler with a current DTSC registration certificate and documentation of compliance with the CA Highway Patrol Basic Inspection of Terminals Program. The hauler must transport the fluorescent light ballasts containing PCBs to a facility permitted for hazardous waste disposal by DTSC.

14-11.15C(4)(d) Damaged Fluorescent Light Ballasts

Damaged fluorescent light ballasts containing PCBs are designated as extremely hazardous waste by DTSC.

When fluorescent light ballasts containing PCBs are damaged by your mishandling you are the generator of the resulting hazardous waste and responsible for cleanup, management, and disposal of this hazardous waste and the associated costs for the work under section 14-11.06.

Fluorescent light ballasts containing PCBs found damaged are Department-generated hazardous waste under section 14-11.07. Management of this Department-generated hazardous waste is change order work.

Use a hazardous waste manifest to transport damaged equipment to an appropriately permitted disposal facility.

14-11.15C(5) Lead Acid Batteries

Removed lead acid batteries are Department-generated hazardous waste. Manage hazardous waste lead acid batteries under 22 CA Code Regs § 66266.80 and 66266.81. Do not dispose of or attempt to dispose of, a lead-acid battery on or in any land, including dumpsters, landfills, lakes, streams, or the ocean.

Upon removal immediately place batteries upright in non-reactive, structurally-secure, closed containers such as polyethylene buckets or drums for transport. Package the batteries under 49 CFR 172.101 and 49 CFR 173.59. Prevent accidental contact between batteries by:

1. Covering terminal ends to prevent them from touching each other
2. Placing batteries in a sealed plastic bag packed with loose fill, such as vermiculite

Label the container with the date the first battery is placed in it and identify the contents as "Lead-acid Batteries."

Use a:

1 Bill of lading under 13 CCR § 1161 for shipments of 9 or less batteries.
2. Hazardous waste manifest for shipments of 10 batteries or more. The Engineer provides the Department's EPA Generator Identification Number for hazardous waste shipment. The Engineer signs the hazardous waste manifests. Notify the Engineer 5 business days before the manifests are to be signed.

Outer packaging must comply with 49 CFR 173.24. Transport batteries to a DTSC permitted recycling facility.

14-11.15C(6) Photovoltaic Panels

Removed photovoltaic panels are Department-generated hazardous waste due to heavy metals content. Manage and dispose of photovoltaic panels under section 14-11.07.

^^

15 EXISTING FACILITIES

10-16-20

Replace item 1.3 in the list in the 7th paragraph of section 15-1.03B with:

10-16-20

1.3. Buried at least 10 feet from the dripline of trees or highway facilities

^^

16 TEMPORARY FACILITIES

10-15-21

Replace the 1st paragraph of section 16-2.02A(1) with:

10-15-21

Section 16-2.02 includes specifications for constructing temporary pedestrian facilities with a protective overhead covering.

Replace section 16-2.02C with:

10-15-21

16-2.02C Construction

If the temporary pedestrian facility is adjacent to traffic or work activities, place a temporary barrier to separate the facility from vehicles and equipment.

Construct handrails on each side of a temporary pedestrian facility as necessary to channelize and protect pedestrians. Handrails must be continuous smooth and free of sharp or rough edges.

Provide an overhead covering, to protect pedestrians. Extend overhead protection for pedestrians at least 4 feet beyond the edge of the work above. Illuminate pedestrian openings through falsework at all times.

The minimum width between the inside face of the handrails must be at least 60 inches. In areas where a width of 60 inches is not feasible, the width must be at least 48 inches wide with a 60 by 60 inch passing space at least every 200 feet. The clear height of the facility measured from the floor surface to the canopy overhead must be at least 8 feet but not greater than 10 feet.

Temporary pedestrian facilities must comply with section 12-4.04C.

^^

DIVISION III EARTHWORK AND LANDSCAPE

19 EARTHWORK

04-15-22

Replace item 1 in the list in the 2nd paragraph of section 19-3.01A with:

04-15-22

1. Excavating foundations for structures, including trenches for culverts, slope protection, pipes, rods, deadmen, cutoff walls, and other facilities

Replace section 19-3.01C(4) with:

04-17-20

19-3.01C(4) Ground Anchor and Soil Nail Walls

Submit shop drawings for earthwork for each ground anchor wall and soil nail wall under section 46-1.01C(2).

10-16-20

Delete the 5th paragraph of section 19-3.02C.

Replace section 19-3.02H with:

10-15-21

19-3.02H Concrete Backfill

19-3.02H(1) General

Reserved

19-3.02H(2) Steel Soldier Piles

Concrete backfill must:

1. Comply with section 90-1
2. Contain at least 505 pounds of cementitious material per cubic yard

Concrete backfill placed under slurry must comply with the requirements above and:

1. Comply with the combined aggregate gradation requirements of 1/2-inch or 3/8-inch maximum gradation as specified in section 90-1.02C(4)(d).
2. Have a slump of 7 to 9 inches. The nominal and maximum slump and penetration in section 90-1.02G(6) do not apply.

Replace the 1st paragraph of section 19-3.03E(1) with:

10-19-18

Place structure backfill in uniform layers. Bring backfill up uniformly on all sides of structures or drainage facilities. Backfill layer thickness must not exceed 0.67 foot before compacting. If you perform compaction by ponding and jetting, the thickness of the backfill layer must not exceed 4 feet.

Replace the 1st sentence in the 3rd paragraph of section 19-3.03E(1) with:

10-19-18

Do not place structure backfill until footings or other parts of structures or drainage facilities are authorized.

Replace section 19-3.03E(2) with:

10-16-20

19-3.03E(2) Reserved

Replace the 2nd paragraph of section 19-3.03K with:

10-16-20

Clean the excavated face of loose materials, mud, rebound, and other materials that prevent or reduce the shotcrete from bonding to soil nails and the receiving surface.

Replace the 3rd sentence in the 6th paragraph of section 19-3.03K with:

10-16-20

Take authorized remedial measures to stabilize the areas.

Add between the 6th and 7th paragraphs of section 19-3.03K:

10-16-20

Reset anchor if soil ravels, sloughs, or shows measurable displacement. Do not remove ground anchor excess tendon length until all lift-off tests for the ground anchor are complete.

Replace the list in the 9th paragraph of section 19-3.03K with:

10-16-20

1. Soil nails or ground anchors are installed and grouted.
2. Reinforced concrete facing if shown is constructed.
3. Grout and concrete facing if shown have cured for at least 72 hours.
4. Soil nail facing anchorages are attached or ground anchors are locked off.

^^

20 LANDSCAPE

04-15-22

Add to section 20-1.01D:

04-17-20

20-1.01D(3) Reserved

Replace item 2 in the list in the 1st paragraph of section 20-1.03C(1) with:

10-18-19

2. Controlling weeds and pests

Replace the 2nd paragraph of section 20-2.01A(4)(d) with:

10-19-18

In the presence of the Engineer, perform a functional test for each system that demonstrates:

1. Components of the system are functioning and integrated with one another.

10-18-19

2. Controller programming is complete including external weather, learned flow, and other system data inputs required to operate the system in the automatic mode.

10-19-18

3. Watering schedule is appropriate for the plants, current weather, season, and site conditions.
4. System has complete sprinkler coverage of the site.

Perform the test for each system:

1. Before planting the plants
2. After irrigation system repair work
3. Annually during plant establishment work
4. Not more than 30 days prior to contract acceptance
5. When ordered

10-19-18

Delete section 20-2.01A(4)(e).

Replace the 2nd and 3rd paragraphs of section 20-2.01B(3) with:

04-15-22

Each warning sign must:

1. Be PS-013(CA) or S28(CA) and comply with the *California MUTCD*
2. Be UV fade and weather resistant and manufactured from flexible vinyl with or without mylar
3. Have a self-adhesive backing

Each warning decal must meet water supplier requirements and:

1. Show the phrase *Recycled Water, Do Not Drink* and the drinking-glass graphic symbol
2. Be UV fade and weather resistant and manufactured from flexible vinyl with or without mylar
3. Have a purple background, white text, and self-adhesive backing

Replace the 1st paragraph of section 20-2.01B(5) with:

10-19-18

Pull boxes must comply with section 86-1.02C and be no. 5 or larger. Pull boxes for low voltage conductors must not have side openings.

Replace the 2nd paragraph of section 20-2.01B(5) with:

04-19-19

Pull box covers used for control and neutral conductors for irrigation equipment operated by the irrigation controller must be marked *SPRINKLER CONTROL*.

Add to section 20-2.01B:

04-19-19

20-2.01B(9) Woven Wire Cloth and Gravel

Woven wire cloth must be galvanized and manufactured with a minimum diameter of 19-gauge wire and have square openings from 1/4 to 1/2 inches.

Gravel must be 3/4-inch gravel or crushed rock. Gravel or crushed rock must be clean, washed, dry, and free from clay or organic material.

Replace the 1st paragraph of section 20-2.01C(2) with:

10-19-18

Perform trenching and backfilling under section 87-1.03E(2).

Replace the introductory clause to the list in the 1st paragraph of section 20-2.01C(3) with:

10-19-18

Install pull boxes under section 87-1.03C at the following locations:

Add to section 20-2.01C(4):

04-19-19

Install valve boxes on woven wire cloth and gravel or crushed rock.

Add to the end of section 20-2.01C(4):

04-17-20

Space remote control valve boxes at least 2 feet from the edge of the adjacent valve box.

Replace items 1 and 2 in the list of section 20-2.02B(4) with:

10-15-21

1. Be made with a 10-gauge minimum-thickness Type 304 stainless steel sheet
2. Have expanded metal side, end, and top panels with openings of approximately 3/4 by 1-3/4 inches

Replace the 1st paragraph of section 20-2.04A(4) with:

10-19-18

Perform field tests on control and neutral conductors. Field tests must comply with the specifications in section 87-1.01D(2)(a).

Replace the 1st and 2nd paragraphs of section 20-2.04B with:

10-19-18

Control and neutral conductors must comply with the provisions for conductors and cables in section 86-1.02F.

Electrical conduit and fittings must comply with section 86-1.02(B).

Replace the 1st paragraph of section 20-2.04C(4) with:

04-19-19

Splice conductors with a UL-listed connector manufactured for copper wire, direct burial irrigation systems. Connector must be prefilled with a moisture sealing compound that encapsulates and protects the splice in a waterproof housing. Connector must be sized for the number and gauge of the conductors at the splice.

Add to the end of the 4th paragraph of section 20-2.06B(2)(a):

10-18-19

Notify the Engineer at least 10 business days before accessing the network communications to integrate new irrigation controllers into the network.

Replace the introductory clause of the 1st paragraph of section 20-2.06B(3) with:

10-19-18

The irrigation controller enclosure cabinet must comply with section 86-1.02Q and must:

Add to the beginning of section 20-2.06C:

10-19-18

Install the irrigation controller enclosure cabinet under 87-1.03Q(1).

Replace the paragraph of section 20-2.07B(3) with:

10-18-19

Corrugated HDPE pipe must comply with ASTM F667 or be Type S complying with AASHTO M252 or AASHTO M294. Couplings and fitting must be as recommended by the pipe manufacturer.

Replace section 20-2.07B(5) with:

04-16-21

20-2.07B(5) PVC Pipe Conduit and PVC Pipe Conduit Sleeve

PVC pipe conduit and PVC pipe conduit sleeve must be schedule 40 complying with ASTM D1785.

Fittings must be schedule 80.

Replace section 20-2.07C(3) with:

04-16-21

20-2.07C(3) PVC Pipe Conduit and PVC Pipe Conduit Sleeve

Where shown, install PVC pipe conduit and PVC pipe conduit sleeve under surfacing. PVC pipe conduit under surfacing must be installed using directional boring under section 20-2.07C(2)(b).

Cap ends of conduit until used.

Replace the 3rd paragraph of section 20-2.09B(1) with:

04-19-19

Threaded nipples for swing joints and risers must be schedule 80, PVC 1120 or PVC 1220 pipe, and comply with ASTM D1785..

Replace the 1st sentence in the 5th paragraph of section 20-2.09B(1) with:

04-15-22

Flexible hose for sprinkler assemblies must be leak-free, non-rigid and comply with ASTM D2287.

Add to the end of section 20-2.10B(6):

10-18-19

Flanged adapters used to connect pipe to gate valves must be metal.

Replace section 20-2.10B(7) with:

04-17-20

Each pressure regulating valve used on the downstream side of the control valves must be:

1. Threaded type with outflow pressure clearly marked on the regulator
2. Plastic body with a working pressure of 125 psi or greater
3. Stainless-steel compression spring

Each pressure regulating valve used on the upstream side of the control valves must be:

1. Flanged or threaded and manufactured of brass or bronze
2. Capable of withstanding a working pressure of 300 psi or greater
3. Adjustable with a stainless-steel spring and seat
4. Tapped and plugged for a pressure gauge and if shown with a gauge installed

Add to section 20-2.10B:

04-16-21

20-2.10B(11) Automatic Flush Valve

Automatic flush valve body must be one-piece thermoplastic threaded type. The body must be serviceable by unthreading the valve from the male adapter. The body must use a molded synthetic

rubber seal. Valve must open automatically. The seat must be constructed of molded synthetic rubber that is held in the open position with a stainless steel spring. Flush rate must be at least 1.5 gpm at 60 psi.

20-2.10B(12) Air or Vacuum Relief Valve

Air relief valve body must be thermoplastic. Valve must be continuous acting air vent type. Valve must have a minimum release rate volume of 260 cfm at 5 psi.

Add to section 20-2.10C:

04-16-21

20-2.10C(8) Automatic Flush Valve

Install automatic flush valve under manufacturer's instructions. Valve box must contain a gravel bed that will absorb at least 1 gpm of water.

20-2.10C(9) Air Relief Valve

Install air relief valve under the manufacturer's instructions.

Replace the 1st paragraph of section 20-2.11C with:

04-16-21

Install wye strainer assembly on the upstream side of the control valve.

Replace item 1 in the list in the paragraph of section 20-2.13B(2)(d) with:

04-15-22

1. 2-piece, high-density, injection-molded polyethylene and must have a nonconductive inner liner with hot-dip galvanized nuts and bolts.

Replace item 1 in the list in the paragraph of section 20-2.13C(2)(e) with:

04-15-22

1. 2-piece, 8-inch, 14-gauge epoxy-coated or galvanized steel band. The band must be four 2-inch-wide glass-reinforced polyester or polyethylene runners, with hot-dip galvanized nuts and bolts.

Add between the 2nd and 3rd paragraphs of section 20-3.01A(3)(a):

04-15-22

Submit a copy of the mycorrhizae manufacturer's product data sheet showing:

1. Name, address, telephone number and web address of the manufacturer
2. Date of manufacturing
3. Species of fungi
4. Spores per gram for each species
5. Ingredients other than fungi

Replace the 1st paragraph of section 20-3.01A(3)(c) with:

04-15-22

Submit a certificate of compliance for sod, soil amendment and plant tubes.

Replace the table in the 3rd paragraph of section 20-3.01B(2)(a) with:

10-19-18

Plant group designation	Description	Container size (cu in)
A	No. 1 container	152–251
B	No. 5 container	785–1242
C	Balled and burlapped	--
E	Bulb	--
F	In flats	--
H	Cutting	--
I	Pot	--
K	24-inch box	5775–6861
M	Liner[a]	--
O	Acorn	--
P	Plugs[a, b]	--
S	Seedling[c]	--
U	No. 15 container	2768–3696
Z	Palm Tree	--

[a]Do not use containers made of biodegradable material.
[b]Grown in individual container cells.
[c]Bare root.

Replace section 20-3.01B(2)(b) with:

10-15-21

20-3.01B(2)(b) Cuttings

20-3.01B(2)(b)(i) General

Cuttings must be taken from designated areas or you must make arrangements to supply cuttings. To obtain cuttings outside of project limits, but within the State right-of-way, contact the local district encroachment permit office.

Take cuttings randomly from healthy, vigorous plants free of pests and disease. Make cuts with sharp, clean tools. Clean and disinfect cutting tools before taking cuttings from a different cutting source and at the end of each day. Tree branch cuttings must be harvested from various trees within a stand.

Cuttings must not be harvested from more than 25 percent of an individual plant and not more than 50 percent from plants in the same area.

Cuttings must be covered and the ends kept wet until planted. Cuttings that have dried out or withered must be discarded.

20-3.01B(2)(b)(ii) Carpobrotus and Delosperma Cuttings

Carpobrotus cuttings must be a minimum of 10 inches in length and not have roots.

Delosperma cuttings must be a minimum of 6 inches in length and not have roots.

20-3.01B(2)(b)(iii) Willow and Cottonwood Cuttings

Willow and cottonwood cuttings must be:

1. Reasonably straight
2. Cut square above a leaf bud to form the tip
3. Cut at an approximate 45-degree angle at the base below a leaf bud
4. Cut square at the top above a leaf bud
5. Trim off leaves and branches flush with the cutting stem
6. From 20 to 24 inches in length
7. From 3/4 to 1-1/2 inches in diameter at the base of the cutting

Cuttings must be harvested from dormant plants after leaf drop and before buds open in early spring.

At least 50 percent of the base of the cuttings must be soaked for a minimum of 5 days, but not more than 30 days in fresh clean water to allow buds to swell prior to planting. Cuttings must be soaked in a shaded location until the time of planting. Cuttings that have been soaking for more than 30 days must be discarded.

20-3.01B(2)(b)(iv)–20-3.01B(2)(b)(viii) Reserved

Replace the introductory clause of the 1st paragraph of section 20-3.01B(4)(b) with:

10-19-18

Slow-release fertilizer must be a pelleted or granular form with a nutrient release over a 3 to 4 month period and be within the chemical analysis ranges shown in the following table:

Replace section 20-3.01B(5) with:

04-15-22

20-3.01B(5) Root Stimulants

20-3.01B(5)(a) General

Root stimulant must be in labeled containers showing weight and manufacturer's name.

20-3.01B(5)(b) Reserved

Add between the 1st and 2nd paragraphs of section 20-3.01C(1):

04-15-22

Apply mycorrhizae inoculant under the manufacturer's instructions within 1.5 years of manufacturing date at the locations, rates, sequence, and number of applications shown.

Replace section 20-3.01C(3) with:

10-19-18

Water plants as needed to keep the plants in a healthy growing condition.

Add to section 20-3.02C(3)(a):

04-16-21

Where plants are shown to be planted in RECP areas, cut the RECP to provide a planting hole with minimal damage to the RECP. Secure cuts and loose edges of the RECP with fasteners after plants have been planted. Fasteners must be steel staples complying with section 21-2.02R. If you substitute steel staples with an alternative attachment device, submit a sample of the device at least 5 business days for approval before its installation.

Replace the 12th paragraph of section 20-3.02C(3)(b) with:

10-15-21

Install the foliage protector as follows:

1. Cut the bottom of the wire cylinder to match the slope of the ground and bottom of the plant basin. Remove sharp points of wire by bending or blunting.
2. Install support stakes for foliage protectors vertically into the soil. Space the support stakes equally around the plant and root ball.
3. Wrap wire mesh around the plant to form a cylinder. Secure the cylinder to support stakes with 16-gauge tie wire. Verify that the cylinder is snug against the support stakes but loose enough to be raised after untying for work within the plant basin.
4. Install jute mesh cover over the foliage protector and secure with twine.

Replace section 20-3.02C(3)(d) with:

10-15-21

20-3.02C(3)(d) Cuttings, Liners, Pots, Plugs, and Seedling Plants

20-3.02C(3)(d)(i) General

Before planting, ensure the soil is moist to a minimum depth of:

1. 2 to 4 inches for *Carpobrotus* and *Delosperma* cuttings
2. 6 to 8 inches for liners, plugs, and seedling plants
3. 10 to 12 inches for willow and cottonwood cuttings and pots

If shown, apply fertilizer to cuttings, liners, pots, plugs and seedling plants. Water immediately after planting.

If shown, apply root stimulant before planting under the manufacturer's instructions.

If shown, install foliage protectors under section 20-3.02C(3)(b).

Dispose of trimmings and unused cuttings, plugs, and seedling plants.

Plant cuttings during the period specified. If cuttings, liners, pots, plugs, and seedling plants cannot be planted prior to the start of plant establishment work, plant them during the plant establishment period.

20-3.02C(3)(d)(ii) Carpobrotus and Delosperma Cuttings

When planting *Carpobrotus* and *Delosperma* cuttings, make sure a minimum of 2 nodes are covered with soil. Gently compact the soil around each cutting without damaging the cutting. The basal end of:

1. *Delosperma* cuttings must be at least 2 inches below the surface of the soil
2. *Carpobrotus* cuttings must be at least 4 inches below the surface of the soil

20-3.02C(3)(d)(iii) Willow and Cottonwood Cuttings

Excavate planting holes for willow and cottonwood cuttings perpendicular to the ground line, or at the angle shown. Ensure planting hole excavation is large enough to receive the cuttings and fertilizer without damaging the bark. If you encounter solid rock or other unyielding material when excavating for planting holes, excavate new holes and backfill the unused holes.

Plant the base of the cutting at least 10 to 12 inches deep with 3 to 5 bud scars exposed above the ground. If more than 5 bud scars are exposed, trim off the excess cutting length.

If shown, place fertilizer in the backfill of each cutting, from 6 to 12 inches below grade and approximately 1 inch from the cutting.

Backfill the plant holes with excavated material after planting. Distribute the excavated material evenly within the hole without clods, lumps, or air pockets. Compact the backfill so the cutting cannot be easily removed from the soil. Do not damage the cutting's bark.

20-3.02C(3)(d)(iv) Reserved

Replace item 3 in the list in the 2nd paragraph of section 20-4.01A with:

10-18-19

3. Controlling weeds and pests

Replace the 1st paragraph of section 20-4.03G with:

10-18-19

Operate the electric irrigation systems utilizing external weather, learned flow, and other system data inputs required to operate the system in the automatic mode, unless otherwise authorized.

10-19-18

Delete the 3rd paragraph of section 20-4.03G.

Replace the 1st paragraph of section 20-5.03A(2) with:

10-18-19

Preemergent must be granular oxadiazon.

Replace the paragraph of section 20-5.03A(3)(c) with:

10-18-19

After compaction, apply preemergent at the maximum label rate. Do not apply preemergent more than 12 inches beyond the inert ground cover limits. Complete the preemergent application and inert ground cover placement within the same day.

Replace section 20-5.03B(2)(b) with:

10-16-20

20-5.03B(2)(b) Concrete

Concrete must be minor concrete. Aggregate size must be from 3/8 to 3/4 inch.

Add to the end of section 20-5.03B(3):

10-19-18

If you are ordered to remove existing concrete below ground within the limits of the rock blanket, saw cut the concrete before removal. This work is change order work.

Replace the 1st paragraph of section 20-5.03C(3) with:

10-16-20

Place gravel and compact.

Replace section 20-5.04B(6) with:

10-16-20

20-5.04B(6) Pine Needle Mulch

Pine needle mulch must:

1. Be derived from pine needles
2. Be a blend of pine needles and not more than 25 percent by volume of bark, cones and small twigs
3. Contain at least 95 percent by volume pine needles from 4 to 12 inches in length
4. Not be crushed

Add between the 6th and 7th paragraphs of section 20-5.04C:

10-16-20

Place pine needle mulch uniformly without clumping.

Replace item 1 in the list in the 1st paragraph of section 20-10.03A(3) with:

10-19-18

1. Transplanting trees. The work plan must include methods of lifting, transporting, storing, planting, guying, watering and maintaining each tree to be transplanted. Include the root ball size, method of root ball containment, and a maintenance program for each tree.

Replace item 2 in the list in the 1st paragraph of section 20-10.03A(3) with:

10-18-19

2. Maintain existing planted areas. The work plan must include controlling the weeds, fertilizing, mowing and trimming of turf areas, watering, and controlling pests.

Replace item 6 in the list in the 2nd paragraph of section 20-10.03A(4) with:

10-18-19

6. Pests

Add to the end of section 20-10.03C(3):

10-19-18

Water transplanted trees immediately after planting and as needed to keep it in a healthy growing condition until contract acceptance.

Add to the end of section 20-10.03C(4):

10-19-18

Water existing plants as needed to keep them in a healthy growing condition until contract acceptance.

^^

21 EROSION CONTROL

04-15-22

Add to section 21-2.01C(2):

04-16-21

Submit a 1 cu ft compost sample from the compost producer. Obtain authorization before delivering the compost to the job site.

Replace section 21-2.01C(3) with:

10-18-19

21-2.01C(3) Seed

At least 60 days before seed application, submit proof that the purchase order for seed required for the Contract has been placed and accepted by the seed vendor. Include the seed's botanical names, quantity ordered, and the anticipated date of delivery on the purchase order.

Submit a copy of the supplier's seed analysis report and seed label for each seed species before application.

Seed analysis report must show:

1. Seed variety including botanical name and common name
2. Percent pure live seed
3. Percent by weight inert matter
4. Percent by weight other crop seed
5. Percent by weight weed seed
6. Name of restricted noxious weed seed by number per pound of seed
7. Germination test results
8. Name and address of the supplier or grower

9. Name and address of the seed laboratory
10. Date of the analysis

Seed labels must show:

1. Seed variety including botanical name and common name
2. Lot number or other lot identification
3. Origin
4. Net weight
5. Percent pure live seed
6. Percent total viability
7. Percent by weight inert matter
8. Percent by weight other crop seed
9. Percent by weight weed seed
10. Name of restricted noxious weed seed by number per pound of seed
11. Name and address of the supplier or grower
12. Date the seed was labeled

Add to section 21-2.01C:

04-15-22

21-2.01C(5) Fiber Reinforced Matrix

At least 7 days prior to purchase of fiber reinforced matrix submit:

1. Manufacturer information:
   1.1. Name
   1.2. Address
   1.3. Telephone number
   1.4. E-mail address
   1.5. Website
2. Product Label
3. Certification of compliance

After application of fiber reinforced matrix, submit a document that indicates:

1. Compliance with the specified application rates
2. Areas treated, and quantity of material applied
3. Application date and time

Replace section 21-2.01D(3) with:

10-18-19

21-2.01D(3) Seed

Seed must be tested for purity and germination by a seed laboratory certified by the Association of Official Seed Analysts or by a seed technologist certified by the Society of Commercial Seed Technologists. Seed test must be performed for germination within 12 months before application.

Replace the 3rd paragraph of section 21-2.02B with:

04-16-21

Stockpile duff until work area to receive duff is complete. Duff stockpiles must not exceed 5 feet in height. Duff stockpiles must not be covered with a material that will stop air circulation, increase duff pile temperatures, or harm beneficial biological activity and resident seeds.

Replace item 1 in the list in the paragraph of section 21-2.02C with:

10-16-20

1. Consist of fertile, friable soil of loamy character with a pH range from 6 to 7 that contains organic matter in quantities natural to the region and capable of sustaining healthy plant life

Replace section 21-2.02I with:

04-15-22

21-2.02I Mycorrhizae Inoculant

Mycorrhizae inoculant must comply with section 20-3.01B(5).

Replace the 1st paragraph of section 21-2.02P with:

04-15-22

Fiber roll must be a premanufactured roll filled with rice or wheat straw, wood excelsior, cotton, or coconut fiber. Fiber roll must be covered with biodegradable jute, sisal, wood fiber, cotton, or coir fiber netting secured tightly at each end and must be one of the following:

1. 8 to 10 inches in diameter and at least 1.1 lb/ft
2. 10 to 12 inches in diameter and at least 3 lb/ft

Replace the 2nd paragraph of section 21-2.03J with:

04-19-19

Do not incorporate materials within 3 feet of the pavement edge.

04-19-19

Delete the 4th paragraph of section 21-2.03J

Replace section 21-2.03K with:

04-15-22

21-2.03K Fiber Reinforced Matrix

Apply fiber reinforced matrix with hydraulic spray equipment.

Add water to fiber reinforced matrix as recommended by the manufacturer and mix sufficiently to ensure an even application. A dispersing agent may be added to the mixture if authorized.

Equipment must have a built-in continuous agitation and discharge system capable of producing a homogeneous mixture and uniform application rate. The tank must have a minimum capacity of 1,000 gallons. You may use a smaller tank if authorized.

Apply fiber reinforced matrix in the locations and at the rates shown and as follows:

1. Apply in successive passes as necessary to achieve the specified application rate
2. Form a continuous uniform mat as follows:
   2.1. Apply in 2 or more directions if necessary
   2.2. Apply in layers as necessary to avoid slumping and aid drying
3. Start application within 60 minutes after adding seed to the tank

After final application, do not allow pedestrians or equipment on the treated areas.

Replace item 2 in the list in the 2nd paragraph of section 21-2.03Q with:

10-18-19

2. Secure compost sock to soil surface with Type 1 installation. Do not construct a furrow.

Replace the 1st paragraph of section 21-2.04 with:

04-15-22

The payment quantity for bid items paid for by area is the area measured parallel to the ground surface except overlaps, embedment, and key trenches.

^^

DIVISION IV SUBBASES AND BASES

23 GENERAL

10-15-21

Replace the row for *Reclaimed pavements (sq yd)* in the table in the 1st paragraph of section 23-1.01D(2)(a) with:

10-15-21

Recycled pavements (sq yd)	≥ 10,000

^^

24 STABILIZED SOILS

10-15-21

Replace the 1st paragraph of section 24-3.02 with:

10-15-21

Cement must comply with section 90-1.02B(2).

^^

27 CEMENT TREATED BASES

10-15-21

Replace the 1st paragraph of section 27-1.02 with:

10-15-21

Cement must comply with section 90-1.02B(2).

^^

28 CONCRETE BASES

10-15-21

Replace the 1st paragraph of section 28-2.01D(1)(a) with:

04-19-19

The cylinders for compressive strength testing under ASTM C31 or ASTM C192 must be 6 by 12 inches.

Replace the 3rd paragraph of section 28-2.02A with:

10-15-21

Cement content in LCB must not exceed 300 lb/cu yd.

Replace the 1st paragraph of section 28-2.02B with:

04-19-19

The SCM content requirements in the 4th paragraph of section 90-1.02B(3) do not apply to LCB.

Replace the 1st paragraph of section 28-3.02C with:

04-17-20

Asphaltic emulsion must be Grade SS1.

Replace section 28-5.02C with:

10-16-20

28-5.02C Curing Seal

The curing seal must be asphaltic emulsion Grade SS1.

^^

29 TREATED PERMEABLE BASES

10-15-21

Replace the 1st paragraph of section 29-3.02A with:

10-15-21

Cement must comply with section 90-1.02B(2).

^^

Replace the heading of section 30 with:

04-15-22

30 RECYCLED PAVEMENT

04-15-22

Replace *reclamation* at each occurrence in section 30 with:

10-15-21

recycling

Replace *reclaimed* at each occurrence in section 30 with:

10-15-21

recycled

Replace *pulverized roadbed* at each occurrence in section 30 with:

10-15-21

full depth recycling—no stabilizer

Replace the 2nd paragraph in section 30-2.01C with:

10-15-21

The QC plan must include a pulverizing and paving plan outlining the sequence of work, including the maximum production rate for full depth recycling—no stabilizer activities.

Replace section 30-4 with:

10-15-21

30-4 FULL DEPTH RECYCLING—CEMENT

30-4.01 GENERAL

30-4.01A Summary

Section 30-4 includes specifications for constructing a recycled pavement base using FDR—cement.

Constructing an FDR—cement base includes:

1. Pulverizing existing asphalt concrete pavement and underlying materials
2. Mixing with water, cement, and if specified, supplementary aggregate
3. Grading and compacting the mixture
4. Applying asphaltic emulsion and sand cover

30-4.01B Definitions

Lot: 1,000 sq yd of FDR—cement

30-4.01C Submittals

30-4.01C(1) General

With the QC plan, submit the mix design.

Submit quality control test results along with the daily reports.

Submit QC test results to fdr@dot.ca.gov.

30-4.01C(2) Quality Assurance Submittals

30-4.01C(2)(a) General

Reserved

30-4.01C(2)(b) Mix Design

Submit each FDR—cement mix design at least 2 weeks before starting FDR—cement operations. Each mix design submittal must be sealed and signed by an engineer who is registered as a civil engineer in the State.

You may submit multiple mix designs to optimize the cement content and adjust for varying underlying materials.

Each mix design submittal must include:

1. Area represented by the mix design by beginning and ending stations.
2. Gradation of the mixture before addition of cement.
3. Cement content in percent by weight of the dry mixture and in lb/sq yd surface application rate.
4. Supplementary aggregate in percent by weight of the dry mixture, if supplementary aggregate is specified.
5. Moisture content of the material when mixing, relative to OMC.
6. Test results and any worksheets, photographs, and graphs.
7. Unconfined compressive strength test results.
8. Moisture-density curve of the material at the specified cement content.
9. Certificate of compliance for cement.

30-4.01C(2)(c) Quality Control Reporting

With the daily report, submit the following based on the testing frequencies specified:

1. General Information:
   1.1. Weather:
      1.1.1. Ambient air temperature before starting daily FDR—cement activities, including time of temperature reading.
      1.1.2. Road surface temperature before starting daily FDR—cement activities, including time of temperature reading.
2. Average forward speed of pulverizing equipment
3. FDR—cement quality control test results for unconfined compressive strength
4. Depth of pulverization

With the daily report, submit the test results for the quality characteristics within the times after sampling shown in the following table:

FDR—Cement Quality Characteristic Test Result Reporting Time Allowances

Quality characteristic	Maximum reporting time allowance
Water sulfates	Before work starts
Water chlorides	
Aggregate gradation	24 hours
Moisture content	
Laboratory maximum wet density	
Relative compaction	
Unconfined compressive strength	24 hours after testing specimens

30-4.01D Quality Assurance

30-4.01D(1) General

Relative compaction must be determined under California Test 231 and the following:

1. For a recycled layer 0.5-foot thick and less, perform 1 relative density test at mid layer. For thickness greater than 0.5-foot, test at every 0.5-foot intervals from 2 inches above the bottom of the FDR—cement layer.
2. A sample must contain no more than 5 percent retained on the 2-inch sieve and 15 percent retained on the 1-1/2-inch sieve.
3. Correction for oversize material does not apply.
4. Use the laboratory wet test maximum density closest in proximity to the lot to determine relative compaction. If the relative compaction for a lot is less than 95 percent in accordance with ASTM D1557 requirements, perform California Test 216 and California Test 226 for each noncompliant lot and recalculate the relative compaction.

The Engineer tests each test strip under section 30-4.01D(4).

30-4.01D(2) Mix Design

Develop a mix design for each materials sampling location. The mix design must produce FDR—cement with an unconfined compressive strength from 300 to 600 psi, determined at 7 days under ASTM D1633, Method A, with the exceptions shown in FDR—Cement Quality Characteristic Requirements table under section 30-4.02A.

Notify the Engineer at least 2 business days before sampling.

Use materials from the specified FDR—cement mixing depth. If any portion of existing asphalt concrete pavement is to be removed before pulverizing, remove that portion of asphalt concrete pavement from the samples used in the mix design. If additional samples of subgrade material are needed, sampling locations can be excavated outside the edge of pavement to variable dimensions. Characterize and record sampling location features such as layer thicknesses and types, distresses, interlayers, thin or thick areas, digouts, and adhesion to the base. Use the sampled material to determine the mix design represented by the sampling location, according to the proportions of the pavement structure shown.

Before opening the mix design sampling locations to traffic, backfill sampling locations by replacing and compacting with an authorized material or minor HMA that complies with section 39-2.07. Backfill and compact to the existing grade and thickness of asphalt concrete pavement, in the Engineer's presence.

30-4.01D(3) Quality Control

30-4.01D(3)(a) General

Reserved

30-4.01D(3)(b) Sampling, and Testing

Assign a ground supervisor whose sole purpose is to monitor the FDR—cement activities, advise project personnel, and interface with the quality control testing personnel. The ground supervisor must not have any sampling or testing duties.

Test the quality characteristics of FDR—cement shown in the following table:

FDR—Cement Quality Characteristic Sampling Locations and Testing Frequencies

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Aggregate gradation	California Test 202	Test strip and 1 per 2 lots	Loose mix after pulverizing and mixing
Moisture content	California Test 226	Test strip and 2 per day[a]	Loose mix after pulverizing and mixing[b]
Unconfined compressive strength	ASTM D1633	Test strip and 1 per 2 lots	
Laboratory maximum wet density	California Test 216	Test strip and 2 per day	Same location as California Test 231
Relative compaction[c]	California Test 231	Test strip and 1 per lot	Compacted mix

[a]If test fails, minimum test frequency is 1 per lot.
[b]Sample immediately after mixing is complete.
[c]Verify the moisture content reading made under California Test 231 with California Test 226.

Measure and record the actual cut depth at both ends of the pulverizing drum at least once every 300 feet along the cut length. Take measurements in the Engineer's presence.

30-4.01D(4) Department Acceptance

The Department accepts FDR—cement based on:

1. Visual inspection for the following:
   1.1. No segregation, raveling, or loose material
   1.2. Variance must not be more than 0.05 foot measured from the lower edge of a 12-foot straightedge
   1.3. Uniform surface texture throughout the work limits

2. Compliance with the quality characteristics shown in the following table:

FDR—Cement Requirements for Acceptance

Quality characteristic	Test method	Value
Cement application rate (lb/sq yd)	Calibrated tray or equal	Mix design rate ± 5%
Relative compaction (min, %, wet density)	California Test 231	95

3. FDR—cement thickness for each lot. The thickness must be within 0.05 foot of the thickness shown. Verify the thickness at a location determined by, and in the presence of the engineer by one of the following methods:
   3.1. Excavate a test pit that is at least 1 by 1-foot and use phenolphthalein
   3.2. Survey equipment

30-4.02 MATERIALS

30-4.02A General

The quality characteristics for the FDR—cement must comply with the requirements shown in the following table:

FDR—Cement Quality Characteristic Requirements

Quality characteristic	Test method	Requirement
Aggregate gradation (%, passing)[a] Sieve Size: 3 inch 2 inch 1-1/2 inch	California Test 202	 100 95–100 85–100
Moisture content (%)	California Test 226	Mix design ± 2 percent
Unconfined compressive strength (psi)	ASTM D1633[b]	Specified in section 30-4.01D(2)
Laboratory maximum wet density (lb/cu ft)	California Test 216	Use for relative compaction calculation
Relative compaction (min, %, wet density)[c]	California Test 231	95

[a]Perform aggregate gradation on samples collected from full recycled depth.

[b]Method A, except:

1. Test specimens must be compacted under ASTM D1557, Method A or B.
2. Test specimens must be cured by sealing each specimen with 2 layers of plastic at least 4-mil thick. The plastic must be tight around the specimen. Seal all seams with duct tape to prevent moisture loss. Sealed specimens must be placed in an oven for 7 days at 100 ± 5 degrees F. At the end of the cure period, specimens must be removed from the oven and air-cooled. Duct tape and plastic wrap must be removed before capping. Specimens must not be soaked before testing.

[c]Verify the moisture content reading made under California Test 231 with California Test 226.

30-4.02B Cement

Reserved

30-4.02C Water

Reserved

30-4.02D Supplementary Aggregate

If supplementary aggregate is specified, supplementary aggregate must comply with the specifications for Class 2 aggregate base in section 26.

30-4.02E Asphaltic Emulsion

Asphaltic emulsion must be Grade SS-1h or CSS-1h.

Notify the Engineer if you dilute the asphaltic emulsion with water. The ratio by weight of added water to asphaltic emulsion must not exceed 1 to 1.

Measure added water weight.

30-4.02F Sand Cover

Sand used for sand cover must comply with the material specifications for fine aggregate under section 90-1.02C(3). Sand must not contain more than 2 percent moisture by dry weight of sand.

30-4.02G Test Pit Backfill Material

Backfill for test pits must be FDR—cement treated material.

30-4.03 CONSTRUCTION

30-4.03A General

Do not start FDR—cement activities if the ambient air temperature is below 40 degrees F or the road surface is below 40 degrees F. If the ambient air temperature falls below 40 degrees F during FDR—cement activities, you may only compact and finish FDR—cement.

Backfill test pits and compact to 95 percent under California Test 231. After compaction, the repair area must not vary more than 0.05 foot from the adjacent FDR—cement surface.

30-4.03B Equipment

The FDR—cement mixing machine must have independent and interlocked systems for water and must include the following:

1. Digital electronic controller system
2. Pumping system
3. Spray bar system

The cement distributor must have a vacuum or dust suppressant system to minimize airborne cement during spreading of the cement on the grade.

Storage equipment for water must not leak and must be attached to the FDR—cement mixing machine with a tow bar and hose. The hose must be attached to the bar and must not touch the ground at any time.

Grading and compacting equipment must be self-propelled and reversible. The frequency and amplitude of vibrating rollers must be adjustable and exceed a force of 15 tons in vibratory mode.

30-4.03C Pulverizing

Unless otherwise authorized, do not pulverize more material than can be mixed with cement and compacted in one day.

Do not leave a wedge where the pulverizing drum cuts into the existing material. The 1st cut width must use the full width of the pulverizing drum. Subsequent cuts must overlap at least 4 inches. Do not leave a gap of unpulverized material between cuts. If an overlap is less than 4 inches, immediately back up and pulverize the deviation along the correct cut line.

Mark the existing pavement where the center of the pulverizing drum stops. Start the following cut on this alignment at least 2 feet behind the mark.

30-4.03D Spreading Materials

Spread cement uniformly over the full roadway surface width. Do not spread cement more than 30 minutes before mixing. Do not apply dry cement in windy conditions that will result in dust outside the FDR—cement area. The spread rate must be the mix design rate or the ordered rate in lb/sq yd ± 5 percent.

Do not spread cement and supplementary aggregate before pulverizing.

30-4.03E Mixing

The overlap requirements in section 30-4.03C apply to mixing. With each cut, adjust the quantity of water proportionally to the actual cut width. If an overlap is less than 4 inches, immediately back up and pulverize the deviation along the correct line without adding water or cement.

Water must be injected through the mixing machine. The injection rate of mixing water must be sufficient to produce the FDR—cement material mixing moisture content described in the mix design.

Mark where the center of the pulverizing drum stops. Start the following cut on this alignment at least 2 feet behind the mark.

30-4.03F Compacting and Grading

Immediately after pulverizing and mixing, compact FDR—cement to the minimum relative compaction. Do not allow more than 2 hours between final mixing of the pulverized material with cement and completion

of compaction. Check thickness of compacted FDR material in test pit with phenolphthalein prior to final compaction and grading.

During grading and final compaction with vibratory steel drum rollers, add water to maintain the mixing moisture content as described in the mix design. After final compaction, do not place cement treated soil to fill low areas in the grade.

30-4.03G Finishing

Immediately after compaction, apply water and roll with pneumatic-tired rollers or steel drum roller with no vibration. The finished surface must be free of ruts, bumps, indentations, segregation, raveling, and any loose material.

Keep the compacted surface damp by lightly watering until asphaltic emulsion is applied.

Apply a diluted asphaltic emulsion to the finished surface when it is damp but free of standing water at the end of the day. The application rate of asphaltic emulsion must be from 0.13 to 0.25 gal/sq. yd. Do not water after applying asphaltic emulsion.

Spread sand cover after asphaltic emulsion is applied under section 37-4.03C. Remove excess sand from the surface by sweeping before opening to traffic.

During the period from 48 to 56 hours after compaction, microcrack the surface by applying 2 to 3 single passes using a 12-ton vibratory steel drum roller at maximum amplitude travelling from 2 to 3 mph.

Maintain the FDR—cement surface free of ruts, bumps, indentations, raveling, and segregation. Repair damaged FDR—cement material with minor HMA.

Determine the finished FDR—cement thickness before placing HMA. If FDR—cement thickness is less than the specified thickness by more than 0.05 foot, excavate a test pit at least 1 by 1-foot in the vicinity of the noncompliant test pit to determine the extent of the deficient thickness. Remove the FDR—cement material deficient in thickness by cold planing to a depth of 0.2 foot below the finished FDR—cement grade. Replace the planed FDR—cement with the HMA specified for the project and compact under section 39-2.01C.

For each lot of FDR—cement, the HMA layer must be placed within 7 days from final compaction of the FDR—cement base unless otherwise authorized.

Immediately before placing HMA, apply asphaltic emulsion at a rate from 0.03 to 0.05 percent residual binder content.

Do not place HMA until authorized.

30-4.04 PAYMENT

Not Used

^^

DIVISION V SURFACINGS AND PAVEMENTS

36 GENERAL

04-15-22

Replace section 36-3 with:

04-15-22

36-3 PAVEMENT SMOOTHNESS

36-3.01 GENERAL

36-3.01A Summary

Section 36-3 includes specifications for measuring the smoothness of pavement surfaces.

36-3.01B Definitions

Area of Localized Roughness: Continuous moving average of the 25-foot International Roughness Index values for each wheel path using a 25-foot continuous interval and a 250-mm filter.

Mean Roughness Index: 0.1-mile International Roughness Index values for the left and right wheel paths for the same traffic lane using a 250-mm filter.

Profile Viewer and Analyzer: An engineering software application that allows users to view and analyze pavement profiles.

wheel paths: Pair of parallel lines 3 feet left and right of the center of a traffic lane. Left and right wheel paths are based on the direction of travel.

36-3.01C Submittals

36-3.01C(1) General

Reserved

36-3.01C(2) Inertial Profiler Data

At least 15 days before measuring pavement smoothness with an inertial profiler, register with the Department's secure file sharing system. To obtain information on the registration process, send an e-mail with your contact information to asphalt.smoothness@dot.ca.gov for asphalt and concrete.smoothness@dot.ca.gov for concrete surfaces.

Within 12 hours or on the same day of completing smoothness measurement, submit electronic copy of the raw profile data as a PPF file on an authorized data storage device, along with a coordinated video or images taken at intervals no greater than 52.8 feet for the existing and baseline profiles. Also, submit a hard copy or a PDF file listing the following:

1. Profile data collection time and date
2. Data collection software version used
3. Sensor serial number
4. Low- and high-pass filter used
5. 0.1-mile MRI values

Within 2 business days after each day of profiling, submit the profile information to the Engineer and to the Department's secure file sharing system. After submitting the profile information to the Department’s file sharing system, send a notification of your electronic submittal to the Engineer and to the applicable e-mail address above with the names of the files submitted.

For each surface subject to inertial profile smoothness requirements, the profile data information must include:

1. Raw profile data for each lane.
2. ProVAL ride quality analysis report for the MRI of each lane in a PDF file. Report the following:
   2.1. Listing of MRI values for 0.1-mile segments or portions thereof
   2.2. Input data including the specified MRI threshold and fixed segment length
   2.3. Raw profile data name selections
   2.4. Areas exempt from inertial profile smoothness requirements
3. ProVAL ride quality analysis report for the IRI of the left and right wheel paths of each lane in a PDF file. Report the following:
   3.1. Listing of ALR
   3.2. Input data including the specified area of the localized roughness threshold and continuous segment length
   3.3. Raw profile data name selections
   3.4. Areas exempt from inertial profile smoothness
4. GPS data file for each lane. Submit the data file in GPS eXchange file format.
5. Manufacturer's recommended calibration and verification test results for the inertial profiler.
6. Inertial profiler's calibration and verification test results, including results for bounce, block, and the distance measurement instrument.
7. Completed Pavement Smoothness Inertial Profiler Submittal Record form.

Submit Asphalt Concrete Pavement Smoothness Corrections Information form or Concrete Pavement Smoothness Corrections Information form with your final profile data information submittal.

Submit the raw profile data in an unfiltered PPF file. Use the following file naming convention:

YYYYMMDD_TTCCCRRR_EA_D_L_W_B_E_X_PT.EXT

where:
YYYY = year
MM = month, leading zero
DD = day of the month, leading zero
TT = district, leading zero
CCC = county, 2- or 3-letter abbreviation as shown in section 1-1.08
RRR = route number with no leading zeros
EA = Contract number, excluding the district identification number, expressed as 6 characters
D = traffic direction, *NB*, *SB*, *WB*, or *EB*
L = lane number from left to right in the direction of travel
W = wheel path, *L* for left, *R* for right, or *B* for both
B = beginning station to the nearest foot, such as *10+20*, or beginning postmile to the nearest hundredth, such as 25.06 with no leading zero.
E = ending station to the nearest foot, such as *14+20*, or ending postmile to the nearest hundredth, such as *28.06* with no leading zero.
X = profile operation, *EXIST* for existing pavement, *BASELINE* for existing pavement after performing repairs, *PAVE* for after paving, and *FINAL* for completed pavement documentation of compliance.
PT = project type profiled, such as *Type A HMA*, *RHMA-G*, *OGFC*, *JPCP*, *CRCP, or Grind*
EXT = *PPF* for raw profile data file extension.

If you are submitting multiple inertial profiler data files, compress the files into a .ZIP file format and submit them using the file-naming convention *TT_EA_X_YYYYMMDD.zip*.

36-3.01C(3) Smoothness Corrective Grinding Plan

At least 2 business days before performing corrective grinding for areas that do not meet the smoothness requirements, submit a corrective grinding plan as an informational submittal.

The corrective grinding plan must include:

1. Grinder make and model
2. Grinder wheelbase in feet, measured from the front centerline to the back centerline of the single wheel or tandem wheel spread
3. Grinder head position in feet, measured relative to the centerline of the front single wheel or the front tandem wheel spread
4. Tandem wheel spreads in feet
5. Tabular listing of the planned corrective grinding, including:
   5.1. Begin and end locations in stationing to the nearest foot
   5.2. Width of grind, such as left half lane, right half lane, or full-width lane
   5.3. Corresponding grinder head depths to the nearest 0.01 inch
   5.4. Direction of grind such as forward, reverse, forward-forward, reverse-reverse, forward-reverse, reverse-forward
6. Forecasted improvement in terms of the MRI and ALR values

36-3.01C(4) Straightedge Measurements

Within 2 business days of measuring smoothness with a straightedge, submit a list of the areas requiring smoothness correction or a report stating there are no areas requiring smoothness correction. Identify the areas requiring smoothness correction by:

1. Location number
2. District-County-Route
3. Beginning station or postmile to the nearest 0.01 mile
4. For correction areas within a traffic lane:

4.1. Lane direction, *NB, SB, EB*, or *WB*
4.2. Lane number from left to right in the direction of travel
4.3. Wheel path, *L* for left, *R* for right, or *B* for both

5. For correction areas not within a traffic lane:
   5.1. Identify the pavement area, such as shoulder, weigh station, or turnout
   5.2. Direction and distance from the centerline, *L* for left or *R* for right
6. Estimated size of correction area

36-3.01C(5) Smoothness Quality Control Plan

Submit a written smoothness quality control plan to the Engineer at or before preconstruction meeting, except the layout plan. Submit the layout plan as an addendum to the smoothness quality control plan no later than 3 days after the *EXIST* profile is collected. The plan must include:

1. Organization: Contact names, organizational chart, telephone numbers, current certifications and titles, and roles and responsibilities of personnel for monitoring smoothness, collecting profile data, submitting data, pay adjustment requests and reports, and implementing corrective actions.
2. Inertial profiler certification:
   2.1. Inertial profiler certification issued by the Department
   2.2. Operator certification for the inertial profiler issued by the Department
   2.3. Manufacturer's instructions and test procedures for calibration and verification of the inertial profiler
3. Schedule: The methods and timing used for monitoring or testing ride quality or both throughout the placement operation process. Indicate the approximate timing of acceptance testing for the profile operations defined in section 36-3.01C(6)(b) in relation to placement operations.
4. Layout plan:
   4.1. Establish semipermanent reference points at the beginning and end of the project based on the plans. For each profile run, define additional semipermanent reference points for the begin and end position of each run. Show the position and name of each semipermanent reference point. These reference points must be located outside of the traveled way, perpendicular to the beginning position of each lane. Where beginning positions are adjacent to each other but staggered, use separate beginning positions. Semipermanent reference points used to establish the beginning position of a profile run must be labeled in the field and in the pavement profiles using the following naming convention:

   XXX-D-L-STA-VAL

   where:
   XXX = *Beg* for the beginning of each profile run, *End* for the end of each profile run, *ExB* for the beginning point of the areas excluded from inertial profiler testing and *ExE* for the end point of the areas excluded from inertial profiler testing.
   D = traffic direction, *NB*, *SB*, *WB*, or *EB*.
   L = lane number from left to right in the direction of travel, such as *1*, *2*, or *3*.
   STA = station to the nearest foot, such as *10+20*. Do not use postmiles.
   VAL = use *INC* where the value of stationing in the PPF file will increase in the direction of travel. Use *DEC* where the absolute value of the stationing in the PPF file will decrease in the direction of travel.
   Use the same label name regardless of the stage of the profile.

   4.2. For each semipermanent reference point, include a KMZ file with:
      4.2.1. Color photographs clearly displaying the physical label used to define the semipermanent reference points.
      4.2.2. Listing of GPS coordinates.

Semipermanent reference points, wherever possible, must be recorded by inertial profilers using electronic eye readings of reflectors.

36-3.01C(6) Smoothness Payment Adjustment Request

36-3.01C(6)(a) General

Smoothness payment adjustment request must include a ProVAL project file and a payment adjustment spreadsheet for each lane.

36-3.01C(6)(b) ProVAL Project File

After completing final corrections, submit an electronic ProVAL project file for each lane using the same naming convention listed in section 36-3.01C(2), except:

1. *B* = use the common beginning station found in all profiles included in the ProVAL project file followed by the postmile to the nearest tenth of a mile, such as *675+84 (12.83)* for station 675+84 and post mile 12.83.
2. *E* = use the ending station found in the *FINAL* profile followed by the postmile to the nearest tenth of a mile.
3. *X* = *PAYADJ*.
4. *EXT* = *PVP* for ProVAL project file extension.

Use a single ProVAL project file for each lane. Each ProVAL project file must contain the PPF files from the profile operation shown in the following table:

Profiles Needed by Smoothness Table

Profile	HMA pavement constructed on existing pavements	New HMA pavement alignment or new realignments	Concrete pavement target 60/67.5/75	Grind concrete pavement percent improvement
EXIST	X	--	--	X
BASELINE	X	--	--	X
PAVE	X	X	X	--
FINAL	X	X	X	X

Establish and maintain stationing to allow for direct comparison of smoothness data between you and the Engineer in subsequent tests. The profiles must:

1. Align with each other in ProVAL.
2. Use the same beginning station position in all profile files and in a single ProVAL project file.
3. Use the same semipermanent reference points for the beginning and ending positions of each profile required by section 36-3.01C(5).
4. For alignment purposes, the end station determined from the profiles distance measuring instrumentation of each sequentially numbered 0.1-mile segment or portion thereof in the *BASELINE*, *PAVE* and *FINAL* profiles must be no greater than 20 feet in the first mile when compared to the same sequentially numbered segment end station in the *EXIST* profile. For locations more than 1 mile but less than 2.5 miles, the difference must be prorated from 20 feet to 50 feet. For locations more than 2.5 miles from the beginning position of the profile, the difference must be no greater than 50 feet. Where these differences create an additional sequentially numbered segment and when needed to bring the sequentially numbered segments back into alignment, the event defining the ending position of the partial segment in the PPF file of the *BASELINE*, *PAVE* and *FINAL* profiles may be adjusted no more than 20 feet within the first 2.5 miles, and no more than 50 feet at all other locations. Include the same leave-out sections referenced to the same semipermanent reference points.

36-3.01C(6)(c) Payment Adjustment Spreadsheet

For each lane, submit payment adjustment spreadsheet using the Department-furnished worksheet. Data must be exported directly from the ProVAL project file Ride Quality module into the corresponding worksheet using the following settings:

1. Analysis Type set to *Fixed Interval*
2. Ride Quality Index set to *MRI*

3. Threshold using numeric value
4. Segment Length in feet set to *528.00*

Obtain the worksheet from the following site:

https://dot.ca.gov/programs/construction/pavement-smoothness

When sequentially numbered segments are misaligned and adjustments are required as described in section 36-3.01C(6)(b), make the adjustments within the ProVAL project file before exporting data to a worksheet and notify the Engineer.

36-3.01C(7) Inertial Profiler Verification Test

Within 2 business days after the annual cross-correlation testing, submit a ProVAL profiler certification analysis report for the test results to the Engineer and to the e-mail address:

smoothness@dot.ca.gov

36-3.01D Quality Assurance

36-3.01D(1) General

Reserved

36-3.01D(2) Certifications

The inertial profiler must display a current certification decal showing the expiration date.

The operator must be certified for each model of inertial profiler operated.

The certifications issued by the Department for the inertial profiler and operator must be current.

36-3.01D(3) Quality Control

36-3.01D(3)(a) General

Reserved

36-3.01D(3)(b) Smoothness Measurement

36-3.01D(3)(b)(i) General

Measure pavement smoothness using an inertial profiler.

The following areas are excluded from MRI smoothness requirements but are subject to ALR:

1. Continuous pavement less than 1,000 feet in length
2. Ramps
3. Turn lanes
4. Acceleration and deceleration lanes

The following areas are excluded from smoothness measurement with an inertial profiler but are subject to the 12-foot straightedge measurement:

1. Areas within 15 feet of manholes, weigh-in-motion, railroad crossing, cattle guards, bus pad, and transverse gutter pans
2. Sections of traffic lane immediately adjacent to edge of traveled way where the distance between edge of traveled way and the longitudinal gutter pan is less than or equal to 8 feet
3. Areas within 25 feet of the beginning and 25 feet beyond the end of the intersection radius
4. Areas within 25 feet of the roundabout radius
5. Shoulders
6. Miscellaneous areas such as medians, gore areas, turnouts, and maintenance pullouts
7. Areas within 15 feet of the beginning of an approach slab or bridge, and 40 feet beyond the end of a departure slab or bridge
8. Horizontal curves with a radius less than the following and within the superelevation transition of such curves:
   8.1. 150 feet for asphalt pavements
   8.2. 300 feet for concrete pavements

9. Pavement length less than 25 feet
10. Areas of HMA with a single opportunity within 20 feet of locations where localized roughness exceeds 160 inches per mile on the *BASELINE* profile after filtering the profile with the ProVAL Moving Average Low Pass filter with a 30-foot short cutoff wavelength
11. HMA placed under concrete pavement

Where measurement with inertial profiler is required:

1. Determine the pavement smoothness by obtaining the IRI for the left and right wheel paths on each traffic lane.
2. Determine the MRI and ALR using ProVAL.

Where OGFC is required, test the pavement smoothness of the final asphalt or concrete pavement surface before and after placing OGFC.

36-3.01D(3)(b)(ii) Inertial Profiler Calibration and Verification Tests

Notify the Engineer at least 2 business days before performing calibration and verification testing of the inertial profiler.

Conduct the following calibration and verification tests in the Engineer's presence each day before profiling:

1. Block test to verify the accuracy of the height sensor under California Test 387
2. Bounce test to verify the combined accuracy of the height sensor and accelerometer under California Test 387
3. Distance measurement instrument test to verify the accuracy of the distance measuring instrument under California Test 387
4. Manufacturer's recommended tests

Conduct a cross-correlation verification test of the inertial profiler in the Engineer's presence before performing the initial profiling. A verification test must be performed at least annually. Conduct 5 repeated runs of the inertial profiler on an authorized 0.1-mile test section. Calculate a cross-correlation to determine the repeatability of your device under California Test 387 using a ProVAL profiler certification analysis with a 3-foot maximum offset. The cross-correlation must be a minimum of 0.92.

36-3.01D(3)(b)(iii) Collecting and Analyzing Data

Operate the inertial profiler under the manufacturer's instructions. Collect profiling data under AASHTO R 57 at 1-inch recording intervals using a minimum 4-inch line laser sensor and analyze IRI using a 250-mm filter.

Establish semipermanent reference points for aligning inertial profiler runs and locating potential corrective grinding. Maintain semipermanent reference points until Department acceptance testing is completed.

While collecting the profile data to determine the IRI values, record semipermanent reference points at the beginning and end of the profile run and the beginning and end of the following locations in the raw profile data:

1. Bridge approach slabs
2. Bridges
3. Culverts visible on the roadway surface
4. Railroad crossings
5. At-grade intersections
6. Project limits
7. Change in pavement type

Profile the left and right wheel paths of each lane. Determine the MRI for 0.1-mile fixed segments using the ProVAL ride quality analysis with a 250-mm filter. Calculate the MRI of each lane. Segments less than 0.05 mile will not be evaluated for MRI but must comply with ALR requirement. Segments greater than or equal to 0.05 mile and less than or equal to 0.10 mile must comply with the MRI specifications for a 0.1-mile segment. Pay adjustments for segments greater than or equal to 0.05 mile and less than or equal to

0.10 mile will be calculated based on a prorated length. Determine the ALR using ProVAL with the average IRI values for each wheel path using a 25-foot continuous interval and a 250-mm filter.

36-3.01D(4) Department Acceptance

36-3.01D(4)(a) General

The Department accepts pavement surfaces for smoothness based on compliance with the smoothness specifications for the type of pavement surface specified.

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

1. 0.01 foot when the straightedge is laid parallel with the traffic lane centerline
2. 0.02 foot when the straightedge is laid perpendicular to the centerline and extends from edge to edge of a traffic lane
3. 0.02 foot when the straightedge is laid within 24 feet of a pavement conform

36-3.01D(4)(b) Profile Verification

The Engineer may perform verification testing using the Department's inertial profiler. The Engineer notifies you of the Department's intention to perform verification testing. Your acceptance test results are considered acceptable and will be used for incentive and disincentive payments if your mean MRI is within 10 percent of the Department's mean MRI obtained over the same selected project length. When your test results are not considered acceptable, the Department's MRI values will be used in the calculation for incentive and disincentive payments for that evaluated length and the Department will have 15 days to complete an evaluation of both profiler certifications.

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. Notify the Engineer within 5 business days of receiving the verification test result if you will dispute it. An independent third party will perform referee testing over the same selected project length. Before the third party participates in a dispute resolution, their profiler and operator must be certified under the Department's Profiler Certification Program. The independent third party must have no prior direct involvement with this Contract or no current direct involvement with you. The mean MRI value used in the calculation for incentive and disincentive payments will be from the party whose mean MRI value is closer to the independent third party and the other party pays for the independent third party's testing.

36-3.02 MATERIALS

Not Used

36-3.03 CONSTRUCTION

Notify the Engineer of the beginning location by station and start time at least 2 business days before each day of profiling.

Before profiling, remove foreign objects from the pavement surface and mark the begin and end station on the pavement shoulder. The stationing must be the same when profiling more than 1 surface.

36-3.04 PAYMENT

Not Used

37 BITUMINOUS SEALS

04-15-22

Replace the 2nd paragraph of section 37-1.01C with:

04-15-22

At least 10 days before starting bituminous seal activities, submit the names and certifications for the laboratories performing testing.

Replace the 2nd paragraph of section 37-1.01D(1) with:

04-15-22

For emulsion testing, quality control laboratories must be AASHTO re:source accredited for asphalt emulsions and asphalt binders.

Add to section 37-1.01D(1):

10-16-20

Take samples under California Test 125.

Replace item 1 in the list in the 1st paragraph of section 37-2.01A(3) with:

10-16-20

1. Samples for:
   1.1. Asphaltic emulsion chip seal, two 1-quart samples of asphaltic emulsion
   1.2. Polymer modified asphaltic emulsion chip seal, two 1-quart samples of polymer modified asphaltic emulsion
   1.3. Asphalt rubber binder chip seal, two 1-quart samples of base asphalt binder
   1.4. Asphalt rubber binder chip seal, five 1-quart samples of asphalt rubber binder

Replace the last paragraph of section 37-2.01A(3) with:

04-15-22

Within 3 days after taking asphaltic emulsion or asphalt binder quality control samples, submit the quality control laboratory's test results.

Replace *2 per day* in the row for *Gradation (% passing)* in the table in the 2nd paragraph of section 37-2.01A(4)(b)(ii) with:

04-15-22

1 per day per active stockpile

Replace *2 per day* in the row for *Cleanness value (min)* in the table in the 2nd paragraph of section 37-2.01A(4)(b)(ii) with:

04-15-22

1 per day per active stockpile

Replace section 37-2.01A(4)(b)(iii) with:

04-15-22

37-2.01A(4)(b)(iii) Chip Seals

For a chip seal, perform sampling and testing in the presence of the Engineer at the specified frequency and location for the quality characteristic shown in the following table:

Chip Seal Quality Control Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Binder application rate (gal/sq yd)	ASTM D2995[a]	1 per week per distributor truck and before chip seal production starts	Pavement surface

[a]Use a durable pad appropriate for the type of binder being sprayed.

Replace the 8th paragraph of section 37-2.01A(4)(c) with:

04-15-22

If the test results for the aggregate gradation do not comply with specifications, you may remove the chip seal represented by these tests or propose a corrective action plan to remain in place. Do not start chip seal activities until the corrective action plan is authorized. If you choose not to remove the chip seal, submit a request that it remain in place with a payment deduction.

Replace the introductory clause in the 3rd paragraph of section 37-2.01B(3)(a) with:

04-15-22

The laboratory must conduct the Vialit test using the proposed asphaltic emulsion or asphalt binder and aggregate for compliance with the requirements shown in the following table:

Add after the 3rd paragraph of section 37-2.01B(3)(a):

04-15-22

Vialit Test method can be requested by sending email to: Vialit Test@dot.ca.gov.

Replace the 3rd paragraph of section 37-2.01C(4)(b) with:

04-15-22

For asphaltic emulsion or asphalt binder, overlap longitudinal joints by not more than 4 inches.

Replace the 1st paragraph of section 37-2.01C(4)(c)(i) with:

04-15-22

Do not allow vehicles to drive on asphaltic emulsion or asphalt binder before spreading aggregate.

Replace the heading of section 37-2.02 with:

04-15-22

37-2.02 CATIONIC ASPHALTIC EMULSION CHIP SEALS

Replace section 37-2.02A(3) with:

04-15-22

37-2.02A(3) Submittals

Reserved

Replace the heading of section 37-2.02A(4)(b)(ii) with:

04-15-22

37-2.02A(4)(b)(ii) Cationic Asphaltic Emulsions

Replace the 1st paragraph of section 37-2.02A(4)(b)(ii) with:

04-15-22

In the presence of the Engineer, take two 1-quart samples at the specified frequency and location under CT 125.

Replace the introductory clause in the 2nd paragraph of section 37-2.02A(4)(b)(ii) with:

04-15-22

For asphaltic emulsion, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Replace the title of the table in the 2nd paragraph of section 37-2.02A(4)(b)(ii) with:

04-15-22

Rapid-Setting Cationic Asphaltic Emulsion

04-15-22

Delete footnote *a* and the superscript *a* in the table in the 2nd paragraph of section 37-2.02A(4)(b)(ii).

Replace section 37-2.02B(2) with:

04-15-22

37-2.02B(2) Cationic Asphaltic Emulsions

Asphaltic emulsion must be either Grade CRS-2 or CRS-2h.

Replace the heading of section 37-2.02C(2) with:

04-15-22

37-2.02C(2) Cationic Asphaltic Emulsions

Add to the end of section 37-2.02C(2):

04-15-22

If high winds blow debris on roadway or cause spreading issues for binder, cease operations.

Replace the heading of section 37-2.03 with:

04-15-22

37-2.03 CATIONIC POLYMER MODIFIED ASPHALTIC EMULSION CHIP SEALS

Replace section 37-2.03A(3) with:

04-15-22

37-2.03A(3) Submittals

Immediately after sampling, submit two 1-quart samples of polymer modified asphaltic emulsion taken in the presence of the Engineer.

Replace section 37-2.03A(4)(b)(ii) with:

04-15-22

37-2.03A(4)(b)(ii) Cationic Polymer Modified Asphaltic Emulsions

Take two 1-quart samples at the specified frequency and location under CT 125 in the presence of the Engineer.

Quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following tables:

Rapid-Setting Cationic Polymer Modified Asphaltic Emulsion (If using PMCRS or PMCRS-2h)

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol Viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Distributor truck
Storage stability test, 1 day (max, %)			
Sieve test (max, %)			
Demulsibility (min, %)			
Particle charge			
Residue by distillation or evaporation (min, %)	AASHTO T 59[a]		
Tests on residue from evaporation test:			
Penetration, 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Distributor truck
Penetration, 4 °C, 200g for 60 seconds	AASHTO T 49		
Ductility, 25 °C (min, mm)	AASHTO T 51		
Torsional recovery (min, %) Or Elastic recovery, 25 °C (min, %)	California Test 332 AASHTO T 301		
Ring and Ball Softening Point (min, °F)	AASHTO T 53		

[a]Follow the temperature guidelines under section 94-1.02F.

Rapid-Setting Polymer-Modified Rejuvenating Asphaltic Emulsion Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Saybolt Furol viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Distributor truck
Storage stability test, 1 day (max, %)			
Sieve (max, %)			
Oil distillate (max, %)			
Particle charge			
Demulsibility (min, %)			
Residue from distillation or evaporation test (min, %)			
pH	ASTM E70		
Tests on residue:			
Viscosity, at 60 °C, (Pa-s) (max)	AASHTO T 202	Minimum 1 per day per delivery truck	Distributor truck
Penetration, 4 °C, (dmm)	AASHTO T 49		
Elastic recovery, 25 °C (min, %)	AASHTO T 301		

Replace the 2nd paragraph of section 37-2.03B(2) with:

04-15-22

A polymer modified asphaltic emulsion must be either Grade PMCRS-2, PMCRS-2h, or PMRE.

04-15-22

Delete the 3rd paragraph of section 37-2.03B(2):

Replace the 1st paragraph of section 37-2.04A(4)(b)(iv) with:

04-15-22

For asphalt rubber binders, you must perform sampling and testing in the presence of the Engineer at the specified frequency and location for the quality characteristics shown in the following tables:

Asphalt Rubber Binder Quality Control Requirements (Viscosity)

Quality characteristic	Test method	Sampling location	Frequency
Descending viscosity[a]	ASTM D7741/D7741M	Reaction vessel	1 per lot[b]
Viscosity	ASTM D7741/7741M	Distribution truck	15 minutes before use per lot[b]

[a]Start taking viscosity readings at least 45 minutes after adding crumb rubber modifier and continue taking viscosity readings every 30 minutes until 2 consecutive descending viscosity readings have been obtained and the final viscosity complies with the specification requirement.
[b]A lot is defined in the *MPQP*. Test results to be performed and submitted for acceptance.

Asphalt Rubber Binder Quality Control Requirements

Quality characteristic	Test method	Sampling location	Frequency
Cone penetration at 25 °C (0.10 mm)	ASTM D217	Distribution truck	1 per lot[a]
Resilience at 25 °C (% rebound)	ASTM D5329		
Softening point (°C)	ASTM D36/D36M		

[a]A lot is defined in the *MPQP*. Laboratory test results to be performed and submitted for acceptance.

Replace the 1st paragraph of section 37-2.04A(4)(c)(iv) with:

10-16-20

For Department acceptance testing, take two 1-quart samples and one 1-gallon sample of asphalt rubber binder in the presence of the Engineer for every 5 lots or once a day, whichever is greater.

04-15-22

Replace the table in the 2nd paragraph of section 37-2.04A(4)(c)(iv) with:

Asphalt Rubber Binder

Quality characteristic	Test method	Requirement
Cone penetration at 25 °C (0.10 mm)	ASTM D217	25–70
Resilience at 25 °C (min, % rebound)	ASTM D5329	18
Softening point (°C)	ASTM D36/D36M	52–74
Viscosity at 190 °C (centipoises)[a]	ASTM D7741/D7741M	1,500–4,000

[a]Prepare sample for viscosity test under California Test 388.

Replace item 1 in the list in the 1st paragraph of section 37-3.01A(3) with:

10-16-20

1. Samples for:
   1.1. Asphaltic emulsion slurry seal, two 1-quart samples of asphaltic emulsion
   1.2. Polymer modified asphaltic emulsion slurry seal, two 1-quart samples of polymer modified asphaltic emulsion
   1.3. Micro-surfacing, two 1-quart samples of micro-surfacing emulsion

Replace the 2nd paragraph of section 37-3.01A(3) with:

04-15-22

At least 10 days before starting placement of a slurry seal or micro-surfacing, submit a laboratory report of test results and the proposed mix design from an AASHTO re:source accredited laboratory for asphalt emulsions and pavement preservation. The laboratory must sign the laboratory report and mix design.

Replace the table in the 7th paragraph of section 37-3.01A(3) with:

04-15-22

Quality Control Test Reporting Requirements

Quality characteristic	Maximum reporting time allowance
Los Angeles Rattler loss (max, %)	2 business days
Percent of crushed particles (min, %)	2 business days
Durability (min)	2 business days
Gradation (% passing by weight)	48 hours
Sand equivalent (min)	48 hours
Moisture content (%)	48 hours

Replace section 37-3.01A(4)(b)(i) with:

04-15-22

37-3.01A(4)(b)(i) General

For mix designs, quality control laboratories must be AASHTO re:source accredited for pavement preservation.

Replace the table of section 37-3.01A(4)(b)(ii) with:

04-15-22

Aggregate Quality Control

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Los Angeles Rattler loss (max, %) At 500 revolutions	California Test 211	1st day of production	See California Test 125
Percent of crushed particles (min, %)	AASHTO T 335	1st day of production	See California Test 125
Sand equivalent (min)	California Test 217	1 per working stockpile per day	See California Test 125
Durability (min)	California Test 229	1st day of production	See California Test 125
Gradation (% passing by weight)	California Test 202	1 per working stockpile per day	See California Test 125
Moisture content, from field stockpile (%)	AASHTO T 255[a]	1 per working stockpile per day	See California Test 125

[a]Test aggregate moisture at field stockpile every 2 hours if you are unable to maintain the moisture content to within a maximum daily variation of ±0.5 percent.

Replace section 37-3.02A(3) with:

10-16-20

37-3.02A(3) Submittals

Immediately after sampling, submit two 1-quart samples of asphaltic emulsion or polymer modified asphaltic emulsion taken in the presence of the Engineer.

Replace section 37-3.02A(4)(b)(i) with:

10-16-20

37-3.02A(4)(b)(i) General

Take two 1-quart samples of asphaltic emulsion and polymer modified asphaltic emulsion for Department acceptance testing.

Replace the introductory clause in the 1st paragraph of section 37-3.02A(4)(b)(ii) with:

04-15-22

For asphaltic emulsions, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Replace the title in the table of section 37-3.02A(4)(b)(ii) with:

04-15-22

Quick-Setting Asphaltic Emulsion

Replace section 37-3.02A(4)(b)(iii) with:

04-15-22

37-3.02A(4)(b)(iii) Polymer Modified Asphaltic Emulsion

For polymer modified asphaltic emulsions, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Quick-Setting Polymer Modified Cationic Asphaltic Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling Location
Tests on emulsion:			
Saybolt Furol Viscosity at 25 °C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Sieve test (%)	AASHTO T 59		
Storage stability after 1 day (%)	AASHTO T 59		
Residue by evaporation (min, %)	AASHTO T 59[a]		
Particle charge	AASHTO T 59		
Tests on residue by evaporation:			
Penetration at 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Delivery truck
Ductility at 25 °C (min, mm)	AASHTO T 51		
Torsional recovery (min, %) Or Elastic recovery, 25 °C (min, %)	California Test 332 AASHTO T 301		

[a]Follow the temperature guidelines under section 94-1.02F.

Replace section 37-3.02B(2) with:

04-15-22

37-3.02B(2) Asphaltic Emulsions

The asphaltic emulsion must be Grade CQS-1h.

Replace section 37-3.02B(3) with:

04-17-20

37-3.02B(3) Polymer Modified Asphaltic Emulsions

A polymer modified asphaltic emulsion must be grade PMCQS-1h.

A polymer modified asphaltic emulsion must consist of an elastomeric polymer mixed with an asphaltic material uniformly emulsified with water and an emulsifying or stabilization agent.

A polymer modified asphaltic emulsion must use either neoprene polymer or butadiene and styrene copolymer. The polymer must be homogeneous and milled into the asphaltic emulsion at the colloid mill.

Replace section 37-3.03A(3) with:

10-16-20

37-3.03A(3) Submittals

Immediately after sampling, submit two 1-quart samples of micro-surfacing emulsion taken in the presence of the Engineer.

Replace section 37-3.03A(4)(b)(ii) with:

04-15-22

37-3.03A(4)(b)(ii) Micro-surfacing Emulsions

Take two 1-quart samples of micro-surfacing emulsion for Department acceptance testing.

For a micro-surfacing emulsion, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Micro-Surfacing Emulsion

Quality characteristic	Test method	Minimum sampling and testing frequency	Sampling location
Tests on emulsion:			
Saybolt Furol Viscosity, at 25°C (Saybolt Furol seconds)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Storage stability, 1 day (max, %)			
Sieve test (max, %)			
Residue by distillation or evaporation (min, %)	AASHTO T 59	Minimum 1 per day per delivery truck	Delivery truck
Tests on residue:			
Penetration at 25 °C	AASHTO T 49	Minimum 1 per day per delivery truck	Delivery truck
Softening point (min, ºC)	AASHTO T 53		
Torsional recovery (min, %) or Elastic recovery, 25 °C (min, %)	California Test 332 AASHTO T 301		

Replace section 37-3.03B(2) with:

04-17-20

37-3.03B(2) Micro-surfacing Emulsions

A micro-surfacing emulsion must be grade MSE.

A micro-surfacing emulsion must be a homogeneous mixture of asphalt, an elastomeric polymer, and an emulsifier solution.

04-15-22

Add an elastomeric polymer modifier to asphalt or emulsifier solution before emulsification.

Replace item 1 in the paragraph of section 37-4.01A(3) with:

10-16-20

1. Two 1-quart samples of asphaltic emulsion

Add to section 37-4.01A:

10-16-20

37-4.01A(4) Quality Assurance

Reserved

Replace section 37-4.02A(3) with:

10-16-20

37-4.02A(3) Submittals

Immediately after sampling, submit two 1-quart samples of asphaltic emulsion taken in the presence of the Engineer.

Replace the 1st paragraph of section 37-4.02A(4)(b)(ii) with:

10-16-20

Take two 1-quart samples for Department acceptance testing.

Replace the introductory clause in the 2nd paragraph of section 37-4.02A(4)(b)(ii) with:

04-15-22

For asphaltic emulsions, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Replace the title in the table of section 37-4.02A(4)(b)(ii) with:

04-15-22

Quick-Setting Asphaltic Emulsion

Replace section 37-4.02A(4)(b)(iii) with:

04-15-22

37-4.02A(4)(b)(iii) Asphaltic Emulsion Spread Rates

For fog seals, perform sampling and testing in the presence of the Engineer at the specified frequency and location for the quality characteristic shown in the following table:

Fog Seal Quality Control Requirements

Quality characteristic	Test method	Minimum sampling and testing frequency	Location of sampling
Asphaltic emulsion spread rate (gal/sq yd)	ASTM D2995	First day of production	Pavement surface

Replace item 3 in the list in the paragraph of section 37-4.02A(4)(c) with:

04-15-22

3. The Department's determination of residual asphalt

Replace the 1st and 2nd paragraphs of section 37-4.02C with:

04-15-22

Immediately before applying fog seal, clean surface to receive fog seal by removing any extraneous material affecting adhesion of the fog seal with the existing surface. Use self-propelled brooms to clean the existing pavement.

Dilution and application rates are dependent on the surface conditions. You determine the dilution rate, but it must not be more than 50 percent water or 1:1 ratio and diluted emulsion must be applied with a residual asphalt rate from 0.02 to 0.06 gal/sq yd.

Replace items 1 and 2 in the list in the 2nd paragraph of section 37-5.01C with:

04-15-22

1. Name of the quality control laboratory to perform testing and mix design.
2. Laboratory report of test results and a proposed mix design. The report and mix design must include the specific materials to be used and show a comparison of test results and specifications. The mix design report must include the quantity of water allowed to be added at the job site. The quality control laboratory performing the tests must sign the original laboratory report and mix design.

Replace the 6th paragraph of section 37-5.01C with:

10-16-20

Immediately after sampling, submit two 1-quart samples of parking area seal taken in the presence of the Engineer.

Replace the introductory clause in the 1st paragraph of section 37-5.01D(2)(b) with:

04-15-22

For an asphaltic emulsion, the quality control laboratory must perform sampling and testing at the specified frequency and location for the quality characteristics shown in the following table:

Replace the introductory clause in the 1st paragraph of section 37-5.01D(2)(d) with:

04-15-22

For a parking area seal, the quality control laboratory must perform sampling and testing at the specified frequency for the quality characteristics shown in the following table:

Replace the 2nd paragraph of section 37-6.01C with:

04-15-22

If your selected crack treatment material is not on the Authorized Material List for flexible pavement crack treatment material, submit a sample and test results from each batch or lot 20 days before use. Testing must be performed by a quality control laboratory and test results must comply with the specifications. Test reports must include the information specified for the certificate of compliance submittal. Each hot-applied crack treatment material sample must be a minimum of 3 lbs and submitted in a silicone release container. Each cold-applied crack treatment material sample must be a minimum of 2 quarts and submitted in a plastic container.

^^

39 ASPHALT CONCRETE

04-15-22

Replace *12 months* at each occurrence in section 39 with:

10-15-21

24 months

Replace *AASHTO T 324 (Modified*) and *AASHTO T 324* at each occurrence in section 39 with:

04-17-20

California Test 389

04-17-20

Delete the row for *AASHTO T 324* in the table in the 5th paragraph of section 39-2.01A(1).

Add to the table in the 5th paragraph of section 39-2.01A(1):

10-16-20

ASTM D5095	2007

Replace the 1st and 2nd paragraphs of section 39-2.01A(3)(d) with:

04-19-19

If ordered, submit QC test results within 3 business days of a request.

04-17-20

Delete the 1st paragraph of section 39-2.01A(4)(a).

Replace the 2nd paragraph of section 39-2.01A(4)(a) with:

10-16-20

Take samples under California Test 125. Reduce samples of HMA to testing size under California Test 306.

Replace item 2 in the list in the 2nd paragraph of section 39-2.01A(4)(b) with:

10-16-20

2. Asphalt binder. Take at least two 1-qt samples. If the asphalt binder is modified or rubberized, the asphalt binder must be sampled with the components blended in the proportions to be used.

Replace the 3rd, 4th, and 5th paragraphs of section 39-2.01A(4)(d) with:

10-15-21

The Engineer verifies the JMF for renewal under section 39-2.01A(4)(b) except:

1. Engineer keeps the samples until you provide test results for your part on a Contractor Job Mix Formula Renewal form.
2. Engineer may use the most recent aggregate quality test results within the past one year, or the Engineer may perform aggregate quality tests.
3. Engineer may use RAP and binder test results from the project where renewal samples are taken, or the Engineer may perform RAP and binder tests.
4. Department tests samples of materials obtained from the HMA production unit after you submit test results that comply with the mix design specifications.
5. After completion of the JMF verification renewal document review, the Engineer verifies each proposed JMF within 20 days of receiving the verification renewal samples and the complete Contractor Job Mix Formula Renewal form.
6. You may not adjust the JMF due to a failed verification.
7. For each HMA type and aggregate gradation specified, the Engineer verifies at no cost to you 1 proposed JMF renewal within a 24 month period.

Replace the 1st sentence in the 2nd paragraph of section 39-2.01A(4)(h)(i) with:

04-17-20

Condition each at-the-plant sample of HMA mixture for testing under AASHTO 283 in compliance with sections 7.1.2, 7.1.3, and 7.1.4 of AASHTO R 30.

Add to section 39-2.01A(4)(h)(v):

10-16-20

California Test 389 and AASHTO T 283 are not required if production start-up evaluation is within 45 days of the date the Hot Mix Asphalt Verification form is signed.

If production stops for more than 60 days, perform a production start-up evaluation. If production stops for more than 30 days but less 60 days, perform a reduced production start-up evaluation. Reduced production start-up evaluation is production start-up evaluation without California Test 389 and AASHTO T 283.

04-15-22

If you proceed before receipt of the test results, the Engineer may consider the HMA placed to be represented by these test results. If production start-up evaluation fails, stop production.

Add between the 3rd and 4th paragraphs of section 39-2.01A(4)(i)(i):

04-19-19

You must assist in collecting Engineer acceptance samples. Sample in the presence of the Engineer. Split the Engineer acceptance samples into at least 4 parts. Engineer retains 3 parts and you keep 1 part.

Replace the 1st sentence in the 5th paragraph of section 39-2.01A(4)(i)(i) with:

04-17-20

The Engineer conditions each at-the-plant sample of HMA mixture for testing under AASHTO 283 in compliance with sections 7.1.2, 7.1.3, and 7.1.4 of AASHTO R 30.

Replace section 39-2.01A(4)(i)(iii) with:

04-15-22

39-2.01A(4)(i)(iii) Pavement Smoothness

39-2.01A(4)(i)(iii)(A) General

Schedule smoothness testing with the Engineer. Unless otherwise authorized, all smoothness testing must be performed in the presence of the Engineer.

Measure smoothness of new pavement alignment or pavement realignment with an inertial profiler. The Department determines smoothness pay adjustments using the Pay Adjustment for New Pavement Alignment or Pavement Realignment table in section 39-2.01A(4)(i)(iii)(B).

Measure smoothness of pavement constructed on existing pavement surfaces with an inertial profiler. The Department determines pay adjustments as shown in the applicable Pay Adjustment for Pavement Constructed on Existing Pavement Surfaces table in section 39-2.01A(4)(i)(iii)(C).

Measure smoothness of:

1. Existing asphalt concrete surface before performing any work on the surface and submit the result labeled as the *EXIST* inertial profiler data file. Notify the Engineer if MRI results vary more than 10 percent from the MRI information provided by the Department at the time of advertisement. For projects suspended for more than 30 days, measure the smoothness of the existing surface that has not received an HMA overlay and submit the result labeled as *EXISTR* inertial profiler data file.
2. Existing pavement segments if structural repairs such as remove and replace asphalt concrete or leveling courses are made and submit the result labeled as *BASELINE* inertial profiler data file.
3. Pavement segments, exclusive of OGFC on new HMA, before performing any HMA smoothness corrections and submit the result labeled as *PAVE* inertial profiler data file.
4. Pavement segments, exclusive of OGFC on new HMA, after performing any HMA smoothness corrective work and submit the results labeled as *FINAL* inertial profiler data file. Use the *PAVE* inertial profiler data as the *FINAL* inertial profiler data if there is no corrective work in the segment.
5. Pavement segments of OGFC before performing any OGFC smoothness correction and submit the result labeled as *PAVEO* inertial profiler data file.
6. Pavement segments of OGFC after performing any OGFC smoothness corrective work and submit the result labeled as *FINALO* inertial profiler data file. Use the *PAVEO* inertial profiler data file as the *FINALO* inertial profiler data file when no corrective work in the segment is performed.

MRI_0 is the lower MRI value from the *EXIST* and *BASELINE* profiles for the 0.1-mi segment.

Notify the Engineer 10 days before collecting inertial profiler data. Allow the Engineer 2 days after receipt of your data to complete inertial profiler verification of all data except the *FINAL* inertial profiler data. Allow the Engineer 10 days after receipt of your data to complete verification of *FINAL* inertial profiler data.

The Department uses the accepted inertial profiler data for acceptance and determination of the payment adjustment.

Segments may be correctively ground to improve pay adjustments to full pay. The Department does not allow corrective grinding into positive pay adjustments. The Department determines positive pay adjustment segments before any corrective grinding. Correction of ALR in positive pay adjustment segments cannot improve pay.

Corrective actions may be diamond grinding or remove and replace at your option and must comply with section 39-2.01C(16).

When OGFC is being placed over the surface of HMA, corrective actions apply to the HMA surface on which the OGFC is being placed. Smoothness requirements for OGFC are specified in section 39-2.04A(4)(c)(iii).

39-2.01A(4)(i)(iii)(B) Pay Adjustments for New Pavement Alignment or Pavement Realignment

The Department applies pavement smoothness pay adjustments to 0.1-mi segments based on your verified inertial profiler data as shown in the following table:

Pay Adjustment for New Pavement Alignment or Pavement Realignment

MRI_{SEG} (in/mi)	Pay adjustment per 0.1 mi per lane ≥ 0.3'[a]	Pay adjustment per 0.1 mi per lane <0.3'[a]	Corrective action
≤ 40.00	+ $900.00	+ $450.00	None
40.01–50.00	+ (50.00 - MRI_{SEG}) x $90.00	+ (50.00 - MRI_{SEG}) x $45.00	None
50.01–60.00	Full pay	Full pay	None
60.01–80.00	- (MRI_{SEG} - 60.00) x $142.50	- (MRI_{SEG} - 60.00) x $101.25	Optional
> 80.00	--	--	Mandatory

[a]Total HMA thickness exclusive of OGFC and HMA leveling courses and structural section repairs

No ALR over 160 in/mi are allowed.

39-2.01A(4)(i)(iii)(C) Pay Adjustments for Pavement Constructed on Existing Pavement Surfaces

The Department applies pavement smoothness payment adjustments using a pay range of target MRI. The target MRI (MRI_T) is determined based on the *EXIST* or *BASELINE* MRI (MRI_0) exclusive of the OGFC and the number of opportunities as shown in the following table:

Target MRI (MRI_T)

Number of opportunities	Target MRI (MRI_T)[a]
1	= 0.2 x MRI_0 + 45
2	= 0.1 x MRI_0 + 50
3 or more	= 55

[a]If the calculated MRI_T is less than 55, use MRI_T = 55

Opportunities for improving smoothness include:

1. A single lift of asphalt. Where an HMA layer thickness allows the layer to be placed in more than 1 lift, the number of opportunities will be equal to the maximum number of lifts the layer can be broken into regardless of aggregate size chosen.
2. Micro milling or cold planing not in the same shift as the paving. When you choose to micro mill or cold plane and pave in the same shift but have the option to micro mill or cold plane and pave in different shifts, the micro milling or cold planning will still be considered a separate opportunity.
3. Segment correction.

The Department applies pavement smoothness pay adjustments to 0.1-mi segments based on your verified inertial profiler data as shown in the following table:

Pay Adjustment for Pavement Constructed on Existing Pavement Surfaces

Pay Ranges [b]	Payment adjustment per 0.1 mi per lane ≥ 0.30'[a]	Payment adjustment per 0.1 mi per lane < 0.30'[a]	Corrective action
$MRI_{SEG} \leq MRI_T - 20$	+ $900.00	+ $450.00	May only grind areas to meet ALR thresholds
$MRI_T - 20 < MRI_{SEG} \leq MRI_T - 5$	+ (($MRI_T - 5$) - MRI_{SEG}) x $60.00	+ (($MRI_T - 5$) - MRI_{SEG}) x $30.00	May only grind areas to meet ALR thresholds
$MRI_T - 5 < MRI_{SEG} \leq MRI_T + 5$	Full pay	Full pay	May only grind areas to meet ALR thresholds
$MRI_T+5 < MRI_{SEG} \leq$ greater of 90 or (MRI_T+20)	- (MRI_{SEG} - (MRI_T + 5)) x $190.00, deduction not to exceed -$2,850	- (MRI_{SEG} - (MRI_T + 5)) x $90.00, deduction not to exceed -$1,350	Corrective actions permitted
MRI_{SEG} > greater of 90 or (MRI_T+20)	--	--	Mandatory correction

[a]Total HMA thickness exclusive of OGFC and HMA leveling courses and structural section repairs.
[b]MRI_{SEG} = the MRI of each 0.1-mile section of completed lane after all corrections.

No ALR greater than ALR_{MAX} are allowed. ALR_{MAX} is the greater value of 160 in/mi or calculated value using the following equation:

$$ALR_{MAX} = 2.1 \times MRI_T$$

39-2.01A(4)(i)(iii)(D) Verification Testing

The Engineer verifies your inertial profiler data under section 36-3.01D(3)(b)(ii).

Replace the 1st through 3rd paragraphs of section 39-2.01A(4)(i)(iv) with:

04-19-19

You and the Engineer must work together to avoid potential conflicts and to resolve disputes regarding test result discrepancies. You and the Engineer may only dispute each other's test results if one party's test results pass and the other party's test results fail.

If there is a dispute, submit your test results and copies of paperwork including worksheets used to determine the disputed test results within 3 business day of receiving Engineer's test results. An independent third party performs referee testing. Before the third party participates in a dispute resolution, it must be qualified under AASHTO re:source program and the Department's Independent Assurance Program. The independent third party must have no prior direct involvement with this Contract. By mutual agreement, the independent third party is chosen from:

1. Department laboratory in a district or region not in the district or region the project is located
2. Transportation Laboratory
3. Laboratory not currently employed by you or your HMA producer

If the Department's portion of the split acceptance samples are not available, the independent third party uses any available material agreed by you and the Engineer as representing the disputed HMA for evaluation.

Replace the 1st paragraph of section 39-2.01B(2)(b) with:

04-17-20

If the proposed JMF indicates that the aggregate is being treated with dry lime or lime slurry with marination, or the HMA with liquid antistrip, then testing the untreated aggregate under AASHTO T 283 and California Test 389 is not required.

Replace section 39-2.01B(5) with:

10-16-20

39-2.01B(5) Liquid Antistrip Treatment

Do not use liquid antistrip as a substitute for asphalt binder.

Total amine value for amine-based liquid antistrip must be a minimum of 325 when tested under ASTM D2074. Dosage for amine-based liquid antistrip must be from 0.25 to 1.00 percent by weight of asphalt.

Nonvolantile content of organosaline-based liquid antistrip must be 40 percent minimum when tested under ASTM D5095. Dosage for organosaline-based liquid antistrip must be from 0.05 to 0.15 percent by weight of asphalt.

Use only 1 liquid antistrip type or brand at a time. Do not mix liquid antistrip types or brands.

Store and mix liquid antistrip under the manufacturer's instructions.

Replace section 39-2.01C(3)(d) with:

04-15-22

39-2.01C(3)(d) Reserved

Replace section 39-2.01C(3)(e) with:

04-15-22

39-2.01C(3)(e) Prepaving Corrections

39-2.01C(3)(e)(i) General

Section 39-2.01C(3)(e) applies to existing asphalt concrete surfaces if a bid item for Segment Correction is shown in the Bid Item List.

When micro milling is used, the cold planing equipment and operation must comply with section 39-3.04C. The micro milling drum must have cutting teeth that are:

1. Tungsten-carbide or diamond tipped
2. Spaced no greater than 1/4-inch apart on center
3. Configured such that the deviation in elevation between any 2 teeth does not exceed 1/16 inch

Dispose of grinding or micro milling residue.

Pave within 7 days of prepaving corrections.

The final pavement surface must comply with section 39-2.01A(4)(i)(iii).

39-2.01C(3)(e)(ii) Segment Correction

Section 39-2.01C(3)(e)(ii) applies to existing asphalt concrete segments if a bid item for segment correction number of 0.1-mi sections is shown on the Bid Items List.

Develop a correction plan and submit within 5 days before making segment corrections. Include the maximum removal depth according to the ProVAL smoothness assurance analysis grinding report or other 3D modeling software report. Do not remove more than 15 percent of the existing pavement thickness.

Correction includes one or a combination of the following:

1. Diamond grinding in the wheel paths, the entire surface, or cold planer or paver smoothness referencing locations
2. Micro milling in the wheel paths, the entire surface, or cold planer or paver smoothness referencing locations
3. 3D modeling of the existing roadway and subsequent automatic machine guidance of either cold planer, paver, or both
4. Alternative method of correction authorized by the Engineer that complies with final HMA pavement smoothness requirements

Upon authorization of your correction plan, correct the existing roadway.

Segment correction is considered an opportunity for improvement.

Notify the Engineer of those areas where existing pavement depth limits a 0.1-mi segment correction. The Engineer may order you to:

1. Not perform correction of the 0.1-mi segment. The *EXIST* profile MRI will be the MRI_0. Final pavement surface must comply with section 39-2.01A(4)(i)(iii)(C).
2. Correct to a limited depth and measure smoothness of the corrected areas with an inertial profiler. The profile after making correction will be the *BASELINE* profile. Final pavement surface must comply with section 39-2.01A(4)(i)(iii)(C). Do not consider this correction as an opportunity for the percent improvement MRI_T determination.
3. Correct by a different method and measure smoothness of the corrected 0.1-mi segment with an inertial profiler. Corrective work performed by a different method is change order work. The profile after making correction will be the *BASELINE* profile. Final pavement surface must comply with section 39-2.01A(4)(i)(iii)(C).

Replace the table in the 3rd paragraph of section 39-2.01C(3)(f) with:

Tack Coat Application Rates for HMA

04-17-20

HMA over:	Minimum residual rates (gal/sq yd)		
	CSS-1/CSS-1h, SS-1/SS-1h, and QS-1h/CQS-1h asphaltic emulsion	CRS-1/CRS-2 and QS-1/CQS-1 asphaltic emulsion	Asphalt binder and PMCRS-2/PMCRS-2h asphaltic emulsion
New HMA (between layers)	0.02	0.03	0.02
Concrete pavement and existing asphalt concrete surfacing	0.03	0.04	0.03
Planed pavement	0.05	0.06	0.04

Replace the 9th paragraph of section 39-2.01C(3)(f) with:

04-16-21

If authorized, you may change the tack coat application rates.

Replace the 1st sentence in the 1st paragraph of section 39-2.01C(4)(a) with:

04-15-22

Longitudinal joints in the top layer must match lane lines or be offset 0.5 foot, if ordered, to avoid permanent pavement delineation conflicts.

Replace section 39-2.02A(4)(b)(iii) with:

04-16-21

39-2.02A(4)(b)(iii) Reclaimed Asphalt Pavement

Sample and test mix design RAP stockpile under California Test 384. Report the average AASHTO T 308 uncorrected binder content on page 4 of your Contractor Hot Mix Asphalt Design Data form. When the mix design RAP stockpile is augmented, sample RAP used to augment the stockpile at a minimum frequency of 1 sample per 1,000 tons under California Test 384 before augmenting the stockpile. Test each sample to determine the uncorrected binder content under AASHTO T 308. Average the results of the 3 tests. When tested under AASHTO T 308, the uncorrected binder content of each augmented RAP sample must be within ±2.00 percent of the average uncorrected asphalt binder content reported on page 4 of your Contractor Hot Mix Asphalt Design Data form. You must use the same ignition oven used to determine the uncorrected asphalt binder content reported on page 4 of your Contractor Hot Mix Asphalt Design Data form.

The augmented RAP sample when tested under AASHTO T 209 must be within ±0.06 of the average maximum specific gravity reported on page 4 of your Contractor Hot Mix Asphalt Design Data form.

During Type A HMA production, sample RAP twice daily and perform QC testing for:

1. Aggregate gradation at least once a day under California Test 384
2. Moisture content at least once a day

04-17-20

Replace footnote a in the table in item 1 in the list in the paragraph of section 39-2.02A(4)(e) with:

10-18-19

[a]The Engineer determines combined aggregate gradations containing RAP under California Test 384. The Engineer uses the correlation factor from Contractor Hot Mix Asphalt Design Data form and mathematically combines the virgin and corrected RAP aggregate gradations at the correct proportions to obtain the combined gradation.

Replace the table in item 2 in the list in the paragraph of section 39-2.02A(4)(e) with:

10-18-19

Reclaimed Asphalt Pavement Quality

Quality characteristic	Test method	Requirement
Uncorrected binder content (% within the average value reported[a])	AASHTO T 308	±2.00
Specific gravity (within the average value reported[b])	AASHTO T 209	±0.06

[a]Average uncorrected binder content of three ignition oven tests performed at JMF verification. Engineer must use the same ignition oven used to determine the average uncorrected binder content at JMF verification.

[b]Average maximum specific gravity reported on page 4 of Contractor Hot Mix Asphalt Design Data form.

Replace the row for *Moisture susceptibility (min, psi, dry strength)* in the table in item 3 in the list in the paragraph of section 39-2.02A(4)(e) with:

04-19-19

For RAP substitution equal to or less than 15% moisture susceptibility (min, psi, dry strength)	AASHTO T 283	100
For RAP substitution greater than 15% moisture susceptibility (psi, dry strength)	AASHTO T 283	100-300[h]

Replace the row for *Hamburg wheel track (min number of passes at inflection point)* in the table in item 3 in the paragraph of section 39-2.02A(4)(e) with:

04-17-20

Hamburg wheel track (number of passes at inflection point)	California Test 389	Report only

Replace the row for *Moisture susceptibility (min, psi, wet strength)* in the table in item 3 in the list in the paragraph of section 39-2.02A(4)(e) with:

10-16-20

Moisture susceptibility (min, psi, wet strength)	AASHTO T 283[i]	70

Add a footnote to the table in item 3 in the list in the paragraph of section 39-2.02A(4)(e):

04-19-19

[h]Not required in the following areas:

1. Southern San Luis Obispo or Santa Barbara County in District 5.
2. Kern County in District 6.
3. Kings County in District 6: route 5, post mile 0 to 17; route 33, post mile 0 to 19; route 41, post mile 0 to 16.
4. Tulare County in District 6: route 65, post mile 0 to 10; route 99, post mile 0 to 10; route 43, post mile 0 to 15.

Add footnote *i* to the table in item 3 in the list in the paragraph of section 39-2.02A(4)(e):

10-16-20

[i]Freeze thaw required

Replace the row for *Hamburg wheel track (min number of passes at inflection point)* in the 1st paragraph of section 39-2.02B(2) with:

04-17-20

Hamburg wheel track (number of passes at inflection point)	California Test 389[c]	Report only

Replace the row for *Moisture susceptibility, dry strength* in the table in the 1st paragraph of section 39-2.02B(2) with:

04-19-19

For RAP substitution equal to or less than 15% moisture susceptibility (min, psi, dry strength)	AASHTO T 283	100
For RAP substitution greater than 15% moisture susceptibility (psi, dry strength)	AASHTO T 283	100-300[e]

Add a footnote to the table in the 1st paragraph of section 39-2.02B(2):

04-19-19

[e]Not required in the following areas:

1. Southern San Luis Obispo or Santa Barbara County in District 5.
2. Kern County in District 6.
3. Kings County in District 6: route 5, post mile 0 to 17; route 33, post mile 0 to 19; route 41, post mile 0 to 16.
4. Tulare County in District 6: route 65, post mile 0 to 10; route 99, post mile 0 to 10; route 43, post mile 0 to 15.

Replace the 3rd and 4th paragraphs of section 39-2.02B(2) with:

04-19-19

For RAP substitution of 15 percent or less, the grade of the virgin binder must be the specified grade of asphalt binder for Type A HMA.

For RAP substitution greater than 15 percent and not exceeding 25 percent, the grade of the virgin binder must be the specified grade of asphalt binder for Type A HMA with the upper and lower temperature classification reduced by 6 degrees C. Hamburg wheel track requirements are based on the grade of asphalt binder specified for Type A HMA.

Replace the 2nd sentence in the 2nd paragraph of section 39-2.02B(11) with:

04-19-19

For RAP substitution of 15 percent or less, RAP must be within ±3 of RAP percentage shown in your Contractor Job Mix Formula Proposal form without exceeding 15 percent. For RAP substitution of greater than 15 percent, RAP must be within ±3 of RAP percentage shown in your Contractor Job Mix Formula Proposal form without exceeding 25 percent.

Replace the row for *Hamburg wheel track (min number of passes at 0.5-inch rut depth)* in the table in item 2 in the paragraph of section 39-2.03A(4)(e)(i) with:

04-17-20

Hamburg wheel track (min number of passes at 0.5-inch rut depth) Base binder grade: PG 64 or lower PG 70	California Test 389	 15,000 20,000

Replace the row for *Hamburg wheel track (min number of passes at inflection point)* in the table in item 2 in the paragraph of section 39-2.03A(4)(e)(i) with:

04-17-20

Hamburg wheel track (number of passes at inflection point)	California Test 389	Report only

Replace the row for *Moisture susceptibility (min, psi, wet strength)* in the table in item 2 in the list in the paragraph of section 39-2.03A(4)(e)(i) with:

10-16-20

Moisture susceptibility (min, psi, wet strength)	AASHTO T 283[g]	70

Add footnote *g* to the table in item 2 in the list in the paragraph of section 39-2.03A(4)(e)(i):

10-16-20

[g]Freeze thaw required

Replace the last sentence in the 1st paragraph of section 39-2.03A(4)(e)(ii)(D) with:

04-15-22

Each sample must be placed into six 1-qt cans with open tops and friction lids.

Replace the row for *Hamburg wheel track (min number of passes at 0.5-inch rut depth)* in the table in 1st paragraph of section 39-2.03B(2) with:

04-17-20

Hamburg wheel track (min number of passes at 0.5-inch rut depth) Base binder grade: PG 64 or lower PG 70	California Test 389[d]	 15,000 20,000

Replace the row for *Hamburg wheel track (min number of passes at inflection point)* in the table in 1st paragraph of section 39-2.03B(2) with:

04-17-20

Hamburg wheel track (number of passes at inflection point)	California Test 389[d]	Report only

Replace section 39-2.04A(4)(c)(iii) with:

04-15-22

39-2.04A(4)(c)(iii) Pavement Smoothness of OGFC

39-2.04A(4)(c)(iii)(A) General

The pavement smoothness of a 0.1 mi segment of OGFC must comply with the requirements shown in the following table:

OGFC Pavement Smoothness Acceptance Criteria

OGFC placement on	Applicable section
Existing pavement	39-2.04A(4)(c)(iii)(B)
Existing pavement with cold plane	39-2.04A(4)(c)(iii)(C)
HMA overlay or new construction	39-2.04A(4)(c)(iii)(D)

Corrective action is required only to reduce ALR below the maximum allowed. Corrective action must not reduce pavement thickness more than allowed in section 39-2.01C(16). Correction may be diamond grinding or remove and replace at your option. The maximum pay adjustment for remove and replace areas is full pay.

39-2.04A(4)(c)(iii)(B) OGFC Paved on Existing Pavement

The target MRI for OGFC (MRI_{TO}) is determined using the following equation:

MRI_{TO} = (0.2 x MRI_0 + 45) or 55, whichever is larger

where:
MRI_0 = the lower of the *EXIST* MRI or *BASELINE* MRI
MRI_{SEGO} = MRI of each 0.1-mi segment from *PAVEO* profile for OGFC paving

The Department applies pavement smoothness pay adjustments to 0.1-mi segments based on your verified profiler data as shown in the following table:

Pay Adjustment for OGFC Paved on Existing Pavement

Pay Ranges	Payment adjustment per 0.1 mi per lane	Corrective action
$MRI_{SEGO} \leq MRI_{TO} - 20$	+ $450.00	May only grind to meet ALR thresholds
$MRI_{TO} - 20 < MRI_{SEGO} \leq MRI_{TO} - 5$	+ (($MRI_{TO} - 5$) - MRI_{SEGO}) x $30.00	May only grind to meet ALR thresholds
$MRI_{TO} - 5 < MRI_{SEGO} \leq MRI_{TO} + 5$	Full pay	May only grind to meet ALR thresholds
$MRI_{TO} + 5 < MRI_{SEGO} \leq MRI_{TO} + 20$	- (MRI_{SEGO} - (MRI_{TO} + 5)) x $90.00	May only grind to meet ALR thresholds
$MRI_{SEGO} > MRI_{TO} + 20$	- (MRI_{SEGO} - (MRI_{TO} + 5)) x $90.00	May only grind to meet ALR thresholds

No ALR greater than ALR_{MAX} is allowed. ALR_{MAX} is the greater value of 160 in/mi or calculated value using the following equation:

$ALR_{MAX} = 2.1 \times MRI_{TO}$

39-2.04A(4)(c)(iii)(C) OGFC Paved on Existing Pavement with a Cold Planed Surface

The Department applies pavement smoothness pay adjustments to segments where a bid item for cold plane asphalt concrete applies as shown in the following table:

Pay Adjustment for OGFC Paved on Existing Pavement with a Cold Planed Surface

MRI_{SEG} (in/mi)	Pay adjustment per 0.1 mi per lane	Corrective action
≤ 55.00	+ $450.00	May only grind to meet ALR thresholds
55.01–70.00	+ (70.00 - MRI_{SEGO}) x $30.00	May only grind to meet ALR thresholds
70.01–80.00	Full pay	May only grind to meet ALR thresholds
> 80.00	- (MRI_{SEGO} - 80.00) x $135.00	May only grind to meet ALR thresholds

MRI_{SEGO} = MRI of each 0.1-mi segment from PAVE profile for OGFC paving.

No ALR over 160 in/mi are allowed.

39-2.04A(4)(c)(iii)(D) OGFC Paved on New Construction or HMA Overlay

The Department determines payment adjustments using a percent of targeted MRI (PoT) for the OGFC. The MRI_{TO} of the segment must be less than or equal to $MRI_{FINALHMA}$.

Determine the Percent of Target MRI (PoT) of each completed 0.1-mi segment of lane using the following equations:

$(\%)\ PoT = (MRI_{SEGO} / MRI_{TO}) \times 100$ rounded to the nearest tenth of 1 percent

where:
MRI_{SEGO} = MRI of each 0.1-mi segment from *PAVEO* profile for OGFC paving.
$MRI_{FINALHMA}$ = Final MRI of HMA layer where OGFC is placed

MRI_{TO} = $MRI_{FINALHMA}$ or 55, whichever is larger.

The Department applies pavement smoothness pay adjustments to 0.1-mi segments based on your verified inertial profiler data as shown in the following table:

Pay Adjustment for OGFC on New Construction or HMA Overlay

PoT	Payment adjustment per 0.1 mi per lane	Corrective action
PoT ≤ 100% of MRI_{TO}	Full pay	May only grind to meet ALR thresholds
PoT > 100% of MRI_{TO}	- (PoT - 100.00) x $100.00	May only grind to meet ALR thresholds

No ALR over 160 in/mi are allowed.

Replace the table in the 3rd paragraph of section 39-2.04C with:

Tack Coat Application Rates for OGFC

04-17-20

OGFC over:	Minimum residual rates (gal/sq yd)		
	CSS-1/CSS-1h, SS-1/SS-1h, and QS-1h/CQS-1h asphaltic emulsion	CRS-1/CRS-2 and QS-1/CQS-1 asphaltic emulsion	Asphalt binder and PMCRS-2/PMCRS-2h asphaltic emulsion
New HMA	0.03	0.04	0.03
Concrete pavement and existing asphalt concrete surfacing	0.05	0.06	0.04
Planed pavement	0.06	0.07	0.05

Replace the 8th and 9th paragraphs of section 39-2.04C with:

04-19-19

For RHMA-O and RHMA-O produced with WMA water injection technology, and RHMA-O-HB and RHMA-O-HB produced with WMA water injection technology:

1. Spread and compact if the ambient air temperature is at least 55 degrees F and the surface temperature is at least 60 degrees F
2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 280 degrees F
3. Complete compaction before the surface temperature drops below 250 degrees F

For RHMA-O produced with WMA additive technology and RHMA-O-HB produced with WMA additives technology:

1. Spread and compact if the ambient air temperature is at least 45 degrees F and the surface temperature is at least 50 degrees F
2. Complete the 1st coverage using 2 rollers before the surface temperature drops below 270 degrees F
3. Complete compaction before the surface temperature drops below 240 degrees F

Spread sand at a rate from 1 to 2 lb/sq yd on RHMA-O and RHMA-O-HB with or without WMA technology pavement after finish rolling activities are complete. Keep traffic off the pavement until spreading of the sand is complete.

Replace the 2nd paragraph of section 39-2.05A(1)(a) with:

04-17-20

Placing a BWC consists of applying a bonded wearing course asphaltic emulsion and placing the specified HMA in a single pass with an integrated paving machine.

Replace the 1st paragraph of section 39-2.05A(1)(d)(ii) with:

10-16-20

Take two 1-gallon samples of BWC.

Replace the 1st paragraph of section 39-2.05A(1)(d)(iii) with:

10-15-21

The Department accepts asphaltic emulsion based on compliance with the requirements for bonded wearing course asphaltic emulsion.

Replace the paragraph of section 39-2.05A(2)(b) with:

04-15-22

Asphaltic emulsion must be bonded wearing course asphaltic emulsion

Replace the paragraph of section 39-2.07B(3) with:

10-15-21

Reserved

Add to section 39-2:

04-16-21

39-2.11–39-2.20 RESERVED

^^

40 CONCRETE PAVEMENT

04-15-22

10-16-20

Delete *full-depth crack* and its definition in section 40-1.01B.

Replace *working crack* and its definition in section 40-1.01B with:

10-16-20

working crack: Crack parallel to and within 4 inches of a planned JPCP contraction joint.

Add to section 40-1.01B:

10-16-20

uncontrolled crack: Any crack in JPCP that is not a working crack.

Replace the 2nd paragraph of section 40-1.01C(4) with:

10-15-21

At least 15 days before starting field qualification, submit the proposed concrete mix proportions, the corresponding mix identifications, and laboratory test reports, including measurements of 3 modulus of rupture and 3 compressive strength, for each trial mixture at 3, 7, 14, 21, 28, and 42 days.

Replace the 2nd paragraph of section 40-1.01C(9) with:

10-19-18

Submit your coefficient of thermal expansion test data at:

https://dime.dot.ca.gov/

Replace the 3rd paragraph of section 40-1.01D(1) with:

10-15-21

Provide material, labor and equipment that meets the initial curing requirement to assist the Engineer in fabricating, curing and handling specimens for the Department's modulus of rupture and compressive strength testing. Failure to maintain the proper curing environment during initial cure will not be basis for rejection of samples, dispute resolution, or claim against the Department. Secure the initial curing equipment at all times to protect against theft and damage.

Add to the list in the 3rd paragraph of section 40-1.01D(3):

10-15-21

17. Compressive strength

Replace the 3rd paragraph of section 40-1.01D(5) with:

10-15-21

To determine the minimum content of cementitious materials or the maximum ratio of water to cementitious materials, use the compressive strength equivalent to modulus of rupture values of at least 570 psi for 28 days age and at least 650 psi for 42 days age. Compressive strength must be tested under CT 521.

Replace the row for *Density* in the table in the 1st paragraph of section 40-1.01D(7)(a) with:

04-17-20

Unit weight	California Test 518	1 per 4 hours

Add to the list in the 4th paragraph of section 40-1.01D(7)(a):

04-17-20

6. Unit weight

Replace item 2 in the list in the 8th paragraph of section 40-1.01D(7)(a) with:

04-17-20

2. 1 point falls outside the suspension limit line for individual penetration, unit weight or air content measurements

Replace the 2nd paragraph of section 40-1.01D(7)(b) with:

10-15-21

For field qualification, the compressive strength must be equivalent to a modulus of rupture at an age of 42 days or earlier of at least:

1. 625 psi for each single beam
2. 650 psi for the average of 3 beams

Replace the row for *modulus of rupture at 28 days* in the table in the 1st paragraph of section 40-1.01D(8)(a) with:

10-15-21

Compressive strength at 42 days	California Test 521	1,000 cu yd

Replace n_v in the 1st paragraph of section 40-1.01D(8)(b)(ii) with:

04-17-20

n_v = number of Department's tests (minimum of 3 required)

Replace the 4th paragraph of section 40-1.01D(8)(b)(ii) with:

04-17-20

If your QC test results are not verified, core at least 3 specimens from the concrete pavement under section 40-1.03M. For dispute resolution, the Engineer selects the core locations and the Department contracts with an independent testing laboratory or uses the Department's laboratory to test these specimens for air content under ASTM C457. The Engineer compares these test results with your QC test results using the t-test method. If your QC test results are verified based on this comparison, the Engineer uses your QC test results for acceptance of concrete pavement for air content, otherwise, the Engineer uses the test results from the dispute resolution process and you pay for the independent testing.

Replace the row for *modulus of rupture at 28 days* in the table in the 1st paragraph of section 40-1.01D(8)(c)(i) with:

10-15-21

Compressive strength at 42 days (min, psi)	California Test 521	650[b] equivalent modulus of rupture to compressive strength

Replace the row for pavement smoothness in the table in the 1st paragraph of section 40-1.01D(8)(c)(i) with:

04-15-22

Pavement smoothness	California Test 387, AASHTO R 56, and AASHTO R 57	1. No area of localized roughness greater than 160 in/mi, except when grinding existing pavement 2. For Mean Roughness Index (MRI) acceptance, refer to the Concrete Pavement Smoothness Selection Table in section 40-1.01D(8)(c)(iii)

Replace the note *b* in the table in the 1st paragraph of section 40-1.01D(8)(c)(i) with:

10-15-21

[b]Average of the individual test results of 3 cylinders

Replace section 40-1.01D(8)(c)(iii) with:

04-15-22

40-1.01D(8)(c)(iii) Pavement Smoothness

The Department verifies and accepts pavement smoothness based on the results of your inertial profiler testing under section 36-3.

For grinding existing concrete pavement, measure profile:

1. Before any work is performed to calculate existing MRI
2. After any pavement replacement work is performed but before grinding to calculate baseline MRI
3. After grinding is complete to calculate final MRI

For all other concrete pavement project types, measure profile:

1. After placing concrete but before performing any smoothness correction to calculate pavement MRI
2. After performing any smoothness correction to calculate final MRI

Pavement smoothness is measured under section 36-3. The following tables show the pavement and project types and the applicable smoothness. A partial section less than 0.05 mi will not receive proportional pay adjustment but still must meet ALR thresholds.

Concrete Pavement Smoothness Selection Table

Pavement Type	Project Type	Smoothness Table
CRCP	New alignment	Target 60
	Widening or lane replacement	Target 67.5
JPCP	New alignment	
	Widening or lane replacement	Target 75
CRCP/JPCP	Grinding existing concrete pavement	Percent Improvement (PI)

Target 60 Smoothness Table

0.1-mi MRI (in/mi)	Pay Adjustment/0.1 mi	Corrective Action[a]
≤ 45.00	+ $1500	None
45.01 – 55.00	+ ((55 - *MRI*) x $150)	None
55.01 – 65.00	0	None
65.01 – 80.00	- ((*MRI* - 65) x $150)	Optional[b]
> 80.00	-	Mandatory[c]

[a]Corrective action must not reduce pavement thickness below minimums in section 40-1.01D(8)(c)(iv). Applicable to MRI only.
[b]Diamond grinding allowed.
[c]Correction is diamond grinding.

Target 67.5 Smoothness Table

0.1-mi MRI (in/mi)	Pay Adjustment/0.1 mi	Corrective Action[a]
≤ 50.00	+ $1500	None
50.01 – 60.00	+ ((60 - *MRI*) x $150)	None
60.01 – 75.00	0	None
75.01 – 90.00	- ((*MRI* - 75) x $150)	Optional[b]
> 90.00	-	Mandatory[c]

[a]Corrective action must not reduce pavement thickness below minimums in section 40-1.01D(8)(c)(iv). Applicable to MRI only.
[b]Diamond grinding allowed.
[c]Correction is diamond grinding.

Target 75 Smoothness Table

0.1-mi MRI (in/mi)	Pay Adjustment/0.1 mi	Corrective Action[a]
≤ 50.00	+ $1500	None
50.01 – 60.00	+ ((60 - *MRI*) x $150)	None
60.01 – 90.00	0	None
> 90.00	-	Mandatory[b]

[a]Corrective action must not reduce pavement thickness below minimums in section 40-1.01D(8)(c)(iv). Applicable to MRI only.
[b]Mandatory correction is diamond grinding.

The Department does not pay for mandatory smoothness corrections. Grinding to improve pay to positive pay adjustments is allowed if thickness is not deficient under section 40-1.01D(8)(c)(iv). Pavement smoothness pay adjustments are applied in addition to other pay adjustments.

The corrective action for grinding existing concrete pavement project types or new continuous PCP is based on the final MRI, as shown in the following table:

Percent Improvement Smoothness Table

0.1-mi MRI_{exist}[a] (in/mi)	0.1-mi MRI_{final}[b] (in/mi)	Corrective Action
≤ 100	≤ 60	None
	>60	Mandatory[c]
> 100	≤ 0.6 x MRI_{exist}	None
	> 0.6 x MRI_{exist}	Mandatory[c]

[a]Existing MRI.
[b]Final MRI.
[c]Mandatory correction is another pass of diamond grinding.

Replace section 40-1.01D(8)(c)(v) with:

04-17-20

40-1.01D(8)(c)(v) Determining Modulus of Rupture from Pavement Cores

For each approved mix design, a correlation between flexural beam strength and compressive core strength may be developed to evaluate low modulus of rupture results from projects. If the average 28-day modulus of rupture is below 570 psi, you may use compressive strength results from pavement cores to determine the equivalent 28-day modulus of rupture.

In the presence of engineer:

1. From the test strip, fabricate an additional 3 beams, and take a total of 15 cores under ASTM C42 to test 3 cores at each age of 28, 42, 56, 70, and 91 days.
2. If test strip is not constructed, fabricate additional 3 beams on the first day of production and placement of concrete pavement, and take total 15 cores under ASTM C42 to test 3 cores at each age of 28, 42, 56, 70, and 91 days.
3. Break 3 beams at 28 days and take the average.
4. Break 3 cores at each age of 28, 42, 56, 70, and 91 days under ASTM C 39 and take the average at each age.

Use the following formula to calculate the equivalent 28-day modulus of rupture:

$$MOR = MORs \times [Cp(t)/Cs(t)]^{1/2}$$

where:

MOR = equivalent 28-day modulus of rupture in psi
MORs = average modulus of rupture in psi of 3 beams taken from the test strip at 28 days
Cs(t) = average compressive strength in psi of 3 cores taken from the test strip at (t): 28, 42, 56, 70, or 91 days under ASTM C39
Cp(t) = average compressive strength in psi of 3 cores taken from the pavement project at (t): 28, 42, 56, 70, or 91 days under ASTM C39

Submit all test results to engineer on the same date of completion of testing.

If the 28-day modulus of rupture is below 570 psi, select an age equal to one of the test ages from the test strip and drill 3 concrete cores under ASTM C42 of same diameter as the test strip from the area not complying to the acceptance strength requirement and test in presence of engineer for compressive strength under ASTM C39. The average compressive strength of 3 concrete cores will be used to determine the equivalent 28-day modulus of rupture.

Replace introductory clause in the 4th paragraph of section 40-1.03J with:

10-15-21

Do not allow traffic or use equipment on concrete pavement before the concrete has attained a modulus of rupture of 550 psi, or equivalent compressive strength if using maturity per section 40-1.03L, based on your testing unless:

Add to the list in the 4th paragraph of section 40-1.03J:

04-17-20

2.5 You must monitor for damage and immediately discontinue access and suspend operations if any damage becomes apparent

Replace section 40-1.03L with:

10-15-21

40-1.03L Use of the Maturity to Determine Opening to Traffic Concrete Strength

As an alternative to modulus of rupture testing, you can use the maturity method under ASTM C1074 to estimate the equivalent compressive strength for opening to traffic, use of equipment, and for early use of concrete pavement under section 40-1.03K.

Provide, install, and maintain all the maturity testing equipment.

Develop the strength-maturity relationship using:

1. Specimens prepared under ASTM C1074
2. Datum temperature of 14 degrees F
3. Nurse-Saul Method
4. Logarithmic best-fit curve with a R^2 value of at least 0.90

Develop the strength-maturity relationship in the laboratory when you are designing your mix or in the field during the test strip or first day of production and submit the results to the Engineer. During test strip and production:

1. Place a sensor at mid-depth and at 1.5 ft from the edge of pavement at the beginning and at the end of the placement.
2. Estimate in-place strength of concrete based on your strength-maturity relationship per ASTM C1074.
3. Validate once for test strip and every 15,000 cubic yards or 30 days of concrete production, whichever comes first

The maturity method is not used to estimate compressive strength for acceptance of concrete pavements.

Replace section 40-1.03N with:

10-16-20

40-1.03N Spall and Ravel Repair

Repair spalled or raveled areas that are any of the following:

1. Deeper than 0.05 foot
2. Wider than 0.10 foot
3. Longer than 0.30 foot

Repair spalls or ravels under section 41-4 and complete the repairs before opening a lane or lanes to traffic. Remove and replace JPCP slabs that have combined raveled areas more than 5 percent of the total slab area or a single raveled area more than 4 sq ft.

Replace the 2nd paragraph of section 40-1.03O with:

10-15-21

Do not start corrective work until:

1. Pavement has at least a 550 psi modulus of rupture or equivalent compressive strength if using maturity under section 40-1.03L
2. Corrective method is authorized

Replace section 40-2 with:

10-18-19

40-2 CONTINUOUSLY REINFORCED CONCRETE PAVEMENT

40-2.01 GENERAL

40-2.01A Summary

Section 40-2 includes specifications for constructing continuously reinforced concrete pavement.

Constructing continuously reinforced concrete pavement includes terminal joints and expansion joints.

40-2.01B Definitions

Reserved

40-2.01C Submittals

For field qualification, submit the test data for the coefficient of thermal expansion of the concrete.

If you request to use plastic chairs to support the transverse bars, submit a sample of the plastic chair, including:

1. Manufacturer's instructions for the applicable use and load capacity
2. Chair spacing
3. Your calculation for the load on a chair for the area of bar reinforcement it supports

During production, submit the test data for the coefficient of thermal expansion as an informational submittal.

40-2.01D Quality Assurance

For field qualification, test the coefficient of thermal expansion of the concrete under AASHTO T 336. The coefficient of thermal expansion must not exceed 6.0 microstrain/degree F.

During the evaluation of the test strip, the Engineer visually checks the reinforcement and dowel and tie bar placement.

During production, test the coefficient of thermal expansion of the concrete at a frequency of 1 test for each 5,000 cu yd of paving but not less than 1 test for a project with less than 5,000 cu yd of concrete.

40-2.02 MATERIALS

40-2.02A General

Reserved

40-2.02B Transverse Bar Assembly

Transverse bar assemblies may be used to support longitudinal bars instead of transverse bars and other support devices.

40-2.02C Intermediate Transverse Bars

Intermediate transverse bars do not need to be epoxy-coated for a project not shown to be in a high desert or any mountain climate region.

40-2.02D Joints

Joint seals for transverse expansion joints must comply with section 51-2.02.

Geosynthetic bond breaker for expansion joint support slabs must comply with section 36-2.

40-2.03 CONSTRUCTION

40-2.03A General

Reserved

40-2.03B Bar Reinforcement

Place bar reinforcement under section 52-1.03D except you may request to use plastic chairs. Plastic chairs will be considered only for support directly under the transverse bars. You must demonstrate the vertical and lateral stability of the bar reinforcement and plastic chairs during the construction of the test strip.

For a transverse bar in a curve with a radius under 2,500 feet, place the reinforcement in a single continuous straight line across the lanes and aligned with the radius point as shown.

Lap splice bar reinforcement under section 52-6. For low carbon, chromium-steel bar reinforcement, the length of lap splice must be at least 30 inches.

40-2.03C Construction Joints

Transverse construction joints must be perpendicular to the lane line. Construct the joints so that the nearest longitudinal bar splice is at least 42 inches away from each side of the joint.

Clean joint surfaces before placing concrete against the surfaces. Remove laitance, curing compound, and other foreign materials.

40-2.03D Correcting Noncompliant Pavement Work

40-2.03D(1) General

The specifications for repairing cracks in section 40-1.03N do not apply to CRCP. Do not apply high-molecular-weight methacrylate to cracks in CRCP.

CRCP that develops raveling areas of 6 by 6 inches or greater requires partial depth repair.

40-2.03D(2) Partial Depth Repair

Partial depth repair must comply with section 41-4 except:

1. Determine a rectangular boundary which extends 6 inches beyond the damaged area. The depth of the saw cut must be between 2 inches from the surface to 1/2 inch above the longitudinal bars.
2. Provide additional reinforcement if each length of the repair boundaries is equal to or greater than 3 feet.

40-2.03D(3) Full-Depth Repair

40-2.03D(3)(a) General

Remove the full-depth of CRCP except for the portion of reinforcement to remain in place. Provide continuity of the reinforcement. For low carbon, chromium-steel bar reinforcement, the length of lap splice must be at least 30 inches. Splicing must comply with section 52-6. Do not damage the base, concrete, and reinforcement to remain in place. Place concrete in the area where you removed CRCP.

40-2.03D(3)(b) Transverse Cracks

Make initial full-depth transverse saw cuts normal to the lane line a distance of 3 feet on each side of the transverse crack.

40-2.03D(3)(c) Longitudinal Cracks

Remove the cracked area normal to the lane line for the full width of the lane a distance of 1 foot beyond each end of the crack. You may propose alternate limits with your repair plan.

40-2.03E Reserved

40-2.04 PAYMENT

Not Used

Add to the end of section 40-4.03B:

10-16-20

Replace JPCP for 4.5 feet on both sides of a joint with a rejected dowel bar.

Replace section 40-4.03C with:

10-16-20

40-4.03C Correcting Cracks

Correct JPCP cracks as follows:

1. Repair working cracks.
2. Remove and replace JPCP slabs that have uncontrolled cracks from joint to joint or edge to edge.
3. For other uncontrolled cracks, stop production, notify the Engineer, and submit a Corrective Action Plan for approval.

The Corrective Action Plan must include the following:

1. Root-cause analysis
2. Details for location, orientation, width, and depth of cracks
3. Proposed procedures for treatment or replacement
4. Details for demonstrating compliance with approved treatment procedures
5. Corrective steps to prevent reoccurrence

If the joints are sealed, repair working cracks by routing and sealing. Use a router mounted on wheels with a vertical shaft and a routing spindle that moves along the crack on its caster wheels. Form a reservoir 3/4-inch deep by 3/8-inch wide in the crack and fill with sealant. The equipment must not cause raveling or spalling.

Treat the contraction joint adjacent to the working crack by either of the following methods:

1. Applying epoxy resin under ASTM C881/C881M, Type IV, Grade 2
2. Pressure injecting epoxy resin under ASTM C881/C881M, Type IV, Grade 1

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41 EXISTING CONCRETE PAVEMENT

10-15-21

Replace the 4th paragraph of section 41-1.03D with:

10-15-21

Place portland cement concrete and modified high-alumina concrete on surfaces treated with a bonding agent recommended by the concrete manufacturer. If no bonding agent is recommended by the manufacturer, place concrete on damp surfaces that are not saturated.

Replace the 1st and 2nd paragraphs of section 41-2.02B with:

10-15-21

Grout must consist of Type II portland cement or Type IL cement, fly ash, and water. Use from 2.4 to 2.7 parts fly ash to 1 part portland cement or portland limestone cement by weight. Use enough water to produce the following grout efflux times determined under California Test 541, Part D:

1. From 10 to 16 seconds for subsealing
2. From 10 to 26 seconds for jacking

Cement for grout must comply with the specifications for Type II portland cement or Type IL cement in section 90-1.02B(2).

Replace the 2nd paragraph of section 41-10.01C with:

04-17-20

At least 15 days before delivery of the chemical adhesive to the job site, submit the SDS and the manufacturer's instructions for:

1. Handling and storage
2. Installation procedures
3. Minimum cure time
4. Use of chemical adhesive

Replace the 3rd paragraph of section 41-10.02A with:

04-17-20

Each chemical adhesive system container must clearly and permanently show the:

1. Manufacturer's name
2. Material name
3. Lot or batch number
4. Expiration date
5. Evaluation report number
6. Directions for use
7. Storage requirement
8. Warnings or precautions required by State and federal laws and regulations

Replace section 41-10.03A with:

04-17-20

41-10.03A General

Drill holes for bars as shown without damaging the adjacent concrete. Clean drilled holes under the chemical adhesive manufacturer's installation instructions. Holes must be dry at the time of placing the chemical adhesive and bars. Immediately after inserting the bar into the chemical adhesive, support the bar to prevent movement until chemical adhesive has cured the minimum time recommended by the manufacturer.

Use a grout retention ring when drilling and bonding dowel bars. Apply dowel bar lubricant to the entire exposed portion of the dowel bar.

If the Engineer rejects a bar installation: stop paving, drilling, and bonding activities. Adjust your procedures and obtain the verbal authorization before resuming paving, drilling, and bonding.

Cut the rejected bar flush with the pavement joint surface and coat the exposed end of the bar with chemical adhesive. Offset the new hole 3 inches horizontally from the rejected hole's center.

^^

DIVISION VI STRUCTURES

46 GROUND ANCHORS AND SOIL NAILS

10-15-21

Replace section 46-1.01C(2) with:

04-17-20

46-1.01C(2) Shop Drawings

46-1.01C(2)(a) General

Submit shop drawings and supporting calculations to OSD, Documents Unit for initial review. Notify the Engineer of the submittal. Include in the notification the date and contents of the submittal.

Submit 6 copies of the general project information, 5 copies of the fabricators plan, and 3 copies of the construction plan.

Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Allow 30 days for the Department's review.

After review, submit from 6 to 12 copies of final shop drawings and supporting calculations, as requested, for authorization and use during construction.

46-1.01C(2)(b) General Project Information Plan

General project information plan must include:

1. Name, address, email address, and phone number of the contractor or subcontractor performing the work.
2. Wall construction schedule with construction sequence.

04-16-21

3. Wall construction staging schedule and layout of ground anchors and soil nails with identification numbers of ground anchors and soil nails based on the following labeling convention:
   - 3.1. Identification number "r_ccc", where "r" represents row numbers starting with "1" or "A" from top to bottom and "ccc" represents column numbers starting with "001" from down-station to up-station.
   - 3.2. For structures that include both ground anchors and soil nails, use separate identification systems and add "GA" for ground anchors and "SN" for soil nails preceding the identification numbers.
   - 3.3. Identify sacrificial test ground anchors and soil nails based on the nearest down-station production ground anchor and soil nail. Label the test type with "Proof Test", "Verification Test", or "Performance Test" preceding the identification numbers.

04-17-20

4. Table of lengths, tendon sizes, centralizers, and drilled-hole diameters.
5. For ground anchors, calculations for determining the bonded length and assumed bonded strength. Do not rely on any capacity from the grout-to-ground bond within the unbonded length.
6. Procedures for installing verification and proof test nails.
7. Bench width requirements for installation equipment.
8. Excavation lift height and maximum duration of exposure for each wall zone, including:
   - 8.1. Methods to stabilize the exposed excavated face if face is not maintaining its integrity
   - 8.2. Supporting calculations

46-1.01C(2)(c) Fabrication Plan

Fabrication plan must include:

1. Details and specifications for:
   - 1.1. Ground anchors and anchorage system
   - 1.2. Production and test soil nails
2. Corrosion protection details and repair procedure for:
   - 2.1. Damaged sheathing
   - 2.2. Couplers

04-16-21

3. Testing equipment, including:
   3.1. Jacking frame and appurtenant bracing.
   3.2. Method and equipment for measuring movement during testing.

10-15-21

   3.3. Calculations that demonstrate the jacking frame and appurtenant bracing can support the test equipment at maximum test load on the (1) soils or (2) structural element with factor of safety for bearing capacity greater than 2.0.

04-17-20

4. For ground anchors, details for the transition between the corrugated plastic sheathing and the anchorage assembly. If shims are used during lock-off, include:
   4.1. Shim thickness
   4.2. Supporting calculations

You may start fabrication early by requesting an authorization of the fabrication plan portion before the complete shop drawings submittal is authorized. If the early fabrication plan is authorized, you are fully responsible for any changes that may occur after starting fabrication.

46-1.01C(2)(d) Construction Plan

Construction plan must include:

1. Methods of excavation for the staged lifts and types of excavation equipment.
2. Details for measuring the movement of the excavated face and the wall during stability testing and construction.
3. Measures to ensure wall and slope stability during construction.
4. Details for providing the bonded and unbonded length. If packers or other similar devices are used, include the type.
5. For soil nails, details for isolating installed proof test soil nails during shotcrete application.
6. Dewatering plan to divert, control, and dispose of surface and groundwater during construction
7. Drilling methods and equipment, including:
   7.1. Size of drilled hole
   7.2. Space requirements
8. Grout mix design and testing procedures.
9. Grout placement equipment and procedures, including minimum required cure time.
10. Testing equipment including method and equipment for measuring movement during testing.
11. For soil nails, include procedure for extracting grouted soil nails.

Replace section 46-1.01C(3) with:

04-16-21

46-1.01C(3) Test Data

Submit each ground anchor and soil nail test data in both electronic and hard copy format by noon the following working day after testing is complete.

For each test include:

10-15-21

1. Supervisory personnel, subcontractors, and personnel performing the test

04-16-21

2. Test loading equipment
3. Ground anchor and soil nail identification number, location, and test type
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 ground anchors and soil nails

For electronic format of test data, compile test data using the Quail software provided by the Department. For each wall, email the latest accumulated test data in XML format generated by Quail to Geotechnical.Data@dot.ca.gov and the Engineer. Include the contract number and the Department's structure number of the wall in the subject line of the email.

Replace *Not Used* in section 46-1.01D(1) with:

10-19-18

Welding must comply with AWS D1.1.

Replace the introductory clause in the 1st paragraph of section 46-1.03A with:

04-16-21

Water or grout from ground anchor and soil nail construction must not:

Add to the end of section 46-1.03A:

10-19-18

Shotcrete must comply with section 53-2.

10-19-18

Delete the 3rd paragraph of section 46-1.03B.

Replace the 1st paragraph of section 46-1.03C with:

04-16-21

Before you insert each ground anchor and soil nail into a drilled hole, clean the anchor or nail of oil, grease, dirt, and other extraneous substances and repair or replace any damaged sheathing.

Use centralizers to position the ground anchor and soil nail in the center of the drilled hole. The diameter of the centralizers must be no more than (1) 0.5-inch smaller than the diameter of the drilled hole, or (2) 0.25-inch smaller than the inside diameter of casing, if casing is used.

Add to the end of section 46-2.01C:

04-16-21

If a pullout failure occurs, submit the pullout failure load as part of the test data.

Replace the 3rd paragraph of section 46-2.01D(2)(b)(i) with:

04-16-21

Do not stress against the concrete until it has attained a compressive strength of at least 2,880 psi and has cured for at least 7 days.

Replace the note for the table in the 1st paragraph of section 46-2.01D(2)(b)(ii) with:

10-15-21

NOTES:
FTL = Factored test load shown
AL = Alignment load = 0.10FTL
[a]Maximum test load

Replace section 46-2.01D(3)(b)(i) with:

04-16-21

46-2.01D(3)(b)(i) General

Incrementally load the ground anchor until the maximum test load is held for the specified duration or a pullout failure occurs. If a pullout failure occurs, record the pullout failure load.

Add to the list in the 1st paragraph of section 46-2.01D(3)(b)(ii):

04-16-21

3. Pullout failure does not occur.

Replace the 1st paragraph of 46-2.02B with:

04-17-20

Strand tendons, bar tendons, and bar couplers must comply with section 50-1.02B and must be on the Authorized Material List for post-tensioning systems.

Replace the 1st sentence in the 2nd paragraph of section 46-2.02B with:

10-19-18

The anchorage enclosure and the steel tube and bearing plate of the anchorage assembly must be galvanized steel and comply with sections 55-1.02D(1) and 55-1.02E(1).

Replace item 9 in the list in the 3rd paragraph of section 46-2.02D with:

10-19-18

9. Have the physical properties shown in Table 4.1 of *Recommendations for Prestressed Rock and Soil Anchors* published by the Post-Tensioning Institute

Replace the 11th paragraph of section 46-2.03A with:

04-16-21

Space centralizers at 5-foot maximum intervals for the full length of the tendon, with the uppermost centralizer located less than 2 feet from the end of the steel tube and the deepest centralizer located 2 feet from the end of the anchor.

Replace the 1st paragraph of section 46-2.03C with:

04-16-21

Use spacers to separate individual strands of strand tendons within both the bonded and unbonded lengths so that the entire surface of each strand is bonded in the grout in the bonded length and each sheathed strand is surrounded by grout in the unbonded length. The spacers must be:

1. Spaced at 5 feet maximum
2. Less than 2 feet from the ends of the strand tendon
3. Made of plastic

4. Strong enough to support the individual strands during construction

Replace the 4th paragraph of section 46-2.03D with:

10-19-18

Immediately after lock-off, perform a lift-off test to verify that the lock-off load has been attained. The lift-off load must be within 10 percent of the specified lock-off load. If necessary adjust the shim thickness to achieve the lock-off load. If the load is not within 10 percent of the specified lock-off load, the anchorage must be reset and another lift-off load reading must be made. Repeat the process until the specified lock-off load is obtained.

Replace the 2nd paragraph of section 46-3.01A with:

10-19-18

A soil nail consists of a solid steel bar with an anchorage assembly that is placed in a drilled hole and then grouted.

Replace the 2nd and 3rd paragraphs of section 46-3.01C(1) with:

10-15-21

If production soil nails are rejected under section 46-3.01D(2)(b)(ii)(C), submit revised shop drawings.

If additional verification soil nails are required under section 46-3.01D(2)(b)(ii)(B), submit revised shop drawings.

Replace the 1st paragraph of section 46-3.01C(2) with:

10-15-21

If additional verification soil nails are required under section 46-3.01D(2)(b)(ii)(B), submit a test boring report for the additional verification soil nails.

Replace section 46-3.01D(2)(b)(ii)(1) with:

04-16-21

46-3.01D(2)(b)(ii)(A) General

10-19-18

Determine the test load using the following equation:

$T = Lb \times Qb$

where:
T = test load, pounds

04-16-21

Lb = soil nail bonded length, feet, 10 feet minimum for proof test; 8 feet minimum for verification test

10-19-18

Qb = test load per unit length of bond, pounds/foot

Replace the heading of section 46-3.01D(2)(b)(ii)(2) with:

04-16-21

46-3.01D(2)(b)(ii)(B) Verification Test

Replace the 1st through 3rd paragraphs of section 46-3.01D(2)(b)(ii)(2) with:

04-16-21

Perform verification testing in the Engineer's presence.

Install and test 2 verification test soil nails (1) for each wall zone, or (2) when you change equipment or method of drilling or grouting. You may install and test the nails during stability testing.

Conduct the verification test as follows:

1. Incrementally load the test soil nail as shown in the following table:

Verification Test Loading Schedule

Load increment	Hold time (minutes)
AL	Until stable
0.20T	1–2
0.40T	1–2
0.60T	1–2
0.80T[a]	60
1.00T[b,c]	10
AL	Until stable

10-15-21

NOTES:
T = Test load
AL = Alignment load = 0.10T
[a]Creep test
[b]Acceptance test load for verification test
[c]Maximum test load for verification test

04-16-21

2. Apply each load increment in less than 1 minute and hold it for the length of time shown in the table titled "Verification Test Loading Schedule."
3. Measure and record the applied test load and the nail head movement at each load increment.
4. During the creep test:
   4.1. Hold the load constant for 60 minutes.
   4.2. Start the observation period for the load hold when the pump starts to apply the load increment from 0.60T to 0.80T.
   4.3. Measure and record the nail head movement at 1, 2, 3, 4, 5, 6, 10, 20, 30, 40, 50, and 60 minutes.
   4.4. Plot a creep curve as a function of the logarithm of time, showing the nail head movement from 6 to 60 minutes.
5. If the movement measured from 6 to 60 minutes is less than 0.08 inch:
   5.1. Increase the load incrementally to 1.00T.
   5.2. Hold the load constant for 10 minutes.
   5.3. Start the observation period for the load hold when the pump starts to apply the load increment from 0.80T to 1.00T.
   5.4. Measure and record the nail head movement at 1, 2, 3, 4, 5, 6, and 10 minutes.
   5.5. Reduce the load to the ending alignment load and record the residual movement.
6. If the movement measured from 6 to 60 minutes is 0.08 inch or greater, reduce the load to the ending alignment load.

Replace the 8th paragraph of section 46-3.01D(2)(b)(ii)(2) with:

04-19-19

If the Engineer revises soil nail lengths or test load per unit length of bond values, any additional verification test soil nails are change order work.

Replace section 46-3.01D(2)(b)(ii)(3) with:

04-16-21

46-3.01D(2)(b)(ii)(C) Proof Test

Perform proof testing in the Engineer's presence at the locations shown.

10-15-21

Production soil nails will be authorized when all the proof test soil nails within the same wall zone are authorized.

04-16-21

Test against a temporary yoke that bears directly on the shotcrete facing. Test loads transmitted through the temporary yoke must not fracture the shotcrete or cause displacement or sloughing of the soil surrounding the drilled hole.

Conduct the proof test as follows:

1. Incrementally load the test soil nail as shown in the following table:

Proof Test Loading Schedule

Load increment	Hold time (minutes)
AL	Until stable
0.20T	1–2
0.40T	1–2
0.60T	1–2
0.80T[a]	10 or 60
1.00T[b,c]	1–2
AL	Until stable

10-15-21

NOTES:
T = Test load
AL = Alignment load = 0.10T
[a]Creep test
[b]Acceptance test load for proof test
[c]Maximum test load for proof test

04-16-21

2. Apply each load increment in less than 1 minute and hold it for the length of time shown in the table titled "Proof Test Loading Schedule."
3. Measure and record the applied test load and the nail head movement at each load increment.
4. During the creep test:
   4.1. Hold the load constant for 10 minutes.
   4.2. Start the observation period for the load hold when the pump starts to apply the load increment from 0.80T to 1.00T.
   4.3. Measure and record the nail head movement at 1, 2, 3, 4, 5, 6, and 10 minutes.
5. If the movement measured from 1 to 10 minutes is greater than 0.08 inch:
   5.1. Hold the load constant for an additional 50 minutes.
   5.2. Measure and record the nail head movement at 20, 30, 40, 50, and 60 minutes.
   5.3. Plot a creep curve as a function of the logarithm of time, showing the nail head movement from 6 to 60 minutes.
6. Reduce the load to the ending alignment load and record the residual movement.

Production soil nails represented by proof test soil nails that fail to comply with the acceptance criteria are rejected.

Submit revised shop drawings for replacement soil nails that show alternative installation methods, revised production soil nails, or a modified soil nail plan.

10-15-21

Delete section 46-3.01D(2)(b)(ii)(4).

Replace section 46-3.02A with:

04-19-19

46-3.02A General

Each production soil nail must be either a solid steel bar encapsulated full length in a grouted corrugated plastic sheathing or an epoxy-coated prefabricated solid steel bar partially encapsulated in a grouted corrugated plastic sheathing as shown.

Epoxy-coated prefabricated solid steel bars must comply with the specifications for epoxy-coated prefabricated reinforcement in section 52-2.03, except the average coating thickness after curing must be from 10 to 15 mils.

Solid steel bar for test soil nails is not required to be epoxy coated or encapsulated in grouted plastic sheathing.

Replace the heading of section 46-3.02B with:

10-19-18

46-3.02B Anchorage Assemblies

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

10-16-20

Concrete anchors on bearing plates must comply with the specifications for studs in clause 9 of AWS D1.1.

Replace section 46-3.02C with:

10-19-18

46-3.02C Solid Steel Bars

Solid steel bars must be either:

1. Threaded bars with spirally-deformed, ribbed threads continuous along the entire length of the bar.
2. Deformed reinforcing bars with at least a 6-inch length of thread cut into the bar on the anchorage end. Use coarse threading and the next larger reinforcing bar size.

Solid steel bars must comply with ASTM A615/A615M or A706/A706M, Grade 60 or ASTM A615/A615M, Grade 75.

Splicing must be authorized.

Epoxy coating at the anchorage end of epoxy-coated bars may be omitted for a maximum of 6 inches. Metal surfaces of assembled splices of epoxy-coated bars must be epoxy coated.

Choose the solid steel bar size and grade for test soil nails. Test soil nail bars must not be smaller than the production soil nails they represent.

Replace the 1st paragraph of section 46-3.03A with:

10-19-18

Determine the drilled-hole diameter and installation method required to achieve the test load per unit length of bond values shown.

Replace section 46-3.03B with:

04-16-21

46-3.03B Test Soil Nails

Construct verification and proof test soil nails using the same equipment, methods, nail inclination, and drilled hole diameter as to be used for production soil nails.

Drill, install, and grout verification test soil nails in the Engineer's presence.

Install the verification test soil nails within the limits of each wall zone or within the limits of the excavated stability test face. Space the verification test soil nails at least 10 feet apart.

Grout only the bonded length of verification and proof test soil nails. Form the terminating grout surface perpendicular to the soil nail alignment using a forming device. The forming device must:

1. Have a diameter no more than 1 inch smaller than the drilled hole diameter
2. Be made of materials that can form a minimum 8-inch compressible zone measured along the test soil nail alignment
3. Not deform during test soil nail installation

Grout overflow above the forming device is allowed, but the forming device must not be submerged by overflowed grout.

Do not splice a test soil nail within the bonded length.

Remove each verification and proof test soil nail to 6 inches behind the front face of the shotcrete after testing is complete. Fill the voids with grout.

If ordered, extract verification and proof test soil nails selected by the Engineer. Fill the voids with grout. Photograph the extracted test nails in 5-foot section intervals.

Replace the 2nd paragraph of section 46-3.03C with:

04-16-21

Space the centralizers at 7.5 feet maximum intervals along the bar length and 1.5 feet from the bar ends. You may use plastic centralizers.

Replace the 3rd paragraph of section 46-3.03C with:

10-19-18

Splice the solid steel bar only where shown on the authorized shop drawings or at the end of a soil nail that is ordered to be lengthened.

Replace the 1st sentence in the 7th paragraph of section 46-3.03C with:

10-19-18

Hand tighten the nut on the end of the production soil nail bar before shotcrete hardening begins. Ensure the bearing plate is fully seated on the shotcrete.

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47 EARTH RETAINING SYSTEMS

10-16-20

Replace section 47-3 with:

10-16-20

47-3 RESERVED

^^

48 TEMPORARY STRUCTURES

10-15-21

Replace section 48-1.01 with:

04-17-20

48-1.01 GENERAL

48-1.01A Summary

Section 48-1 includes general specifications for constructing temporary structures.

If a railroad company is involved, falsework, temporary supports, and jacking support systems must comply with any additional requirements of the railroad company.

04-16-21

Section 11 does not apply to temporary structures.

04-17-20

48-1.01B Definitions

frame: Portion of a bridge between expansion joints.

jacking: Positioning of new or existing structures or portions thereof, by jacks or other mechanical methods.

previously welded splice: Splice made in a temporary-structure member in compliance with AWS D1.1 or other recognized welding standard, before contract award.

temporary-structure adjustment: Grading or adjusting of temporary structures.

48-1.01C Submittals

48-1.01C(1) General

Submit 6 copies of shop drawings and 2 copies of calculations for:

1. Falsework
2. Temporary supports
3. Temporary decking
4. Jacking
5 Adjustment

48-1.01C(2) Temporary-Structure Inspection Report

Temporary-structure inspection reports must be:

1. Prepared daily during jacking and temporary-structure adjustment activities. Reports must be submitted:
   1.1. By close of business the following business day
   1.2. Before opening the roadway on or under the temporary structure to traffic
2. Prepared before placing concrete

The temporary-structure inspection report must be prepared, sealed, and signed by the temporary-structure engineer.

The temporary-structure inspection report must include:

1. Description of the progress of the jacking and adjustment activities
2. Description and evaluation of the condition of the temporary structure and supported structure
3. Inspection findings and the certifications listed in section 48-1.01D(2) that are completed by the temporary-structure engineer

48-1.01C(3) Adjustment Plan Shop Drawings

Submit adjustment plan shop drawings if the falsework or temporary supports are to be adjusted more than 1/2 inch.

The adjustment plan shop drawings and calculations must be sealed and signed by the temporary-structure engineer.

Adjustment plan shop drawings and calculations must include:

1. Methods and sequencing for the adjustment.
2. Descriptions of equipment to be used.
3. Location of jacks or other adjustment equipment.
4. Detailed sequence for releasing of bracing.
5. Details and calculations for the stability and adjustment of the falsework or temporary supports during all stages of the adjustment including any additional required temporary bracing.
6. Calculations that include stresses, deflections, and loads in all load carrying members, bracing, and equipment as well as any redistributed loads resulting from the adjustment. Calculations must also include the effect of the adjustment sequence.

48-1.01D Quality Assurance

48-1.01D(1) General

Reserved

48-1.01D(2) Temporary-Structure Engineer

The temporary-structure engineer must:

1. Be registered as a civil engineer in the State.
2. Have experience in temporary structure design or temporary structure construction inspection.
3. Seal and sign the shop drawings.
4. Be present during all jacking and adjustment activities.
5. Prepare, seal, and sign a daily temporary-structure inspection report during jacking and temporary-structure adjustment activities.
6. The temporary-structure engineer must inspect and certify that:
   - 6.1. Temporary structure is stable before jacking activities or adjustments and before concrete is placed.
   - 6.2. Temporary structure complies with the authorized shop drawings.
   - 6.3. Materials and workmanship are satisfactory for the work.
7. Stop activity if any unanticipated issues occur.
8. Propose revisions to the authorized shop drawings to address any issues. Do not resume temporary structure activities until the proposed revisions are authorized.

The temporary-structure engineer may assign a representative to perform the temporary structure activities specified in section 48-1.01D. The temporary-structure engineer must submit a letter that is sealed and signed certifying that the representative:

1. Is registered as a civil engineer in the State
2. Has experience in temporary structure design or temporary structure construction inspection
3. Is familiar with the authorized shop drawings and the stresses the members are required to sustain
4. Will attend at least 1 job site visit with the Engineer and your temporary-structure superintendent to discuss the authorized shop drawings

Add to list in the 2nd paragraph of section 48-2.01A:

04-17-20

5. Includes illumination for vehicular and pedestrian traffic

Add to the end of section 48-2.01A:

04-17-20

Falsework used as temporary supports must comply with section 48-3.

Replace section 48-2.01B with:

04-17-20

48-2.01B Definitions

independent support system: Support system that is in addition to a falsework removal system that employs methods of holding falsework from above by winches, hydraulic jacks with prestressing steel, HS steel rods, or cranes.

falsework release: Lowering of falsework to the point that it no longer supports the loads imposed by the permanent structure, or any element, that the falsework was designed to support during construction. Falsework release includes blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

falsework removal: Releasing, lowering, and disposing of the falsework.

Add between the 1st and 2nd paragraphs of section 48-2.01C(1):

10-16-20

Submit a certificate of compliance for the timber used to construct falsework. The certificate of compliance must verify the grade and species of the timber.

Replace the last paragraph of section 48-2.01C(1) with:

04-17-20

Submit a falsework lighting plan at least 10 days before starting construction on falsework containing openings for vehicular traffic, pedestrians, or railroad.

The plan must include:

1. Location, spacing, and mounting heights of luminaires
2. Types of luminaires
3. Calculations of illumination levels used to determine placement of luminaries
4. Plot of illumination points used to demonstrate compliance with the illumination levels requirements
5. Lighting circuit diagrams

Replace section 48-2.01C(2) with:

04-17-20

48-2.01C(2) Shop Drawings

Submit shop drawings and calculations for falsework.

The falsework shop drawings and calculations must be sealed and signed by the temporary-structure engineer for any of the following conditions:

1. Height of any portion of the falsework measured from the ground line to the soffit of the superstructure is more than 14 feet

2. Any individual falsework clear span is more than 16 feet
3. Falsework contains openings for vehicular, pedestrian, or railroad traffic
4. Falsework removal systems support falsework from above by winches, hydraulic jacks with prestressing steel, HS rods or cranes

10-16-20

Shop drawings and calculations for falsework piles with a calculated nominal resistance greater than 100 tons must be sealed and signed by an engineer who is registered as a civil or geotechnical engineer in the State.

04-17-20

Falsework shop drawings and calculations must include:

1. Details of erection and removal activities.
2. Methods and sequences of erection and removal, including equipment.
3. Maximum falsework adjustment height.
4. Details for the stability of falsework during all stages of erection and removal activities.
5. Superstructure placing diagram showing concrete placing sequence and construction joint locations. If a schedule for placing concrete is shown, no deviation is allowed.
6. Assumed soil bearing values for falsework footings.
7. Maximum horizontal distance falsework piles may be pulled for placement under caps.
8. Maximum deviation of falsework piles from vertical.
9. Anticipated total falsework and formwork settlements, including footing settlement and joint take-up.
10. Grade, species, and type of any timber or structural composite lumber. Include manufacturer's tabulated working stress values for composite lumber.
11. Design calculations that include stresses and deflections in load carrying members.
12. Provisions for complying with temporary bracing requirements.
13. Welding standard used for welded members, including previously welded splices.
14. The following information for falsework removal systems employing methods of holding falsework from above by winches, hydraulic jacks with prestressing steel, HS steel rods, or cranes:
    - 14.1. Design code used for the analysis of the structural members of the independent support system
    - 14.2. Provisions for complying with current Cal/OSHA requirements
    - 14.3. Load tests and ratings within 1 year of intended use of hydraulic jacks and winches
    - 14.4. Location of the winches, hydraulic jacks with prestressing steel, HS steel rods, or cranes
    - 14.5. Analysis showing that the bridge deck and overhang are capable of supporting all loads at all time
    - 14.6. Analysis showing that winches will not overturn or slide during all stages of loading
    - 14.7. Location of deck and soffit openings if openings are needed
    - 14.8. Details of repair for the deck and soffit openings after falsework removal

Submit separate falsework shop drawings and calculations for each:

1. Single bridge or portion of bridge
2. Frame for multi-frame bridges

Add to section 48-2.01D:

04-17-20

48-2.01D(3) Falsework Lighting

After the installation of falsework lighting, measure the illumination levels in the presence of the Engineer, during the hours of darkness. For pavement and pedestrian walkway lighting, the measurements must be taken at ground level with the meter sensor pointing upward. For portal lighting, measurements must be taken at the face of the surface areas specified with the meter sensor perpendicular to the surface areas.

Falsework lighting must comply with the illumination levels shown in the following table:

Illumination Levels

Illumination Area	Average Illuminance (fc) (E_{avg})	Uniformity (E_{avg}/E_{min})
Pavement	0.6	4.0
Portal	1.0	4.0
Pedestrian Walkway	2.0	4.0

Replace the 1st paragraph of section 48-2.01D(2) with:

04-17-20

Except for previously welded splices, welding must comply with AWS D1.1. Welding of bar reinforcement must comply with AWS D1.4.

Replace the 2nd paragraph of section 48-2.01D(2) with:

10-16-20

Perform NDT on welded splices using UT or RT. Each weld and any repair made to a previously welded splice must be tested. You must select locations for testing. The length of a splice weld where NDT is to be performed must be a cumulative weld length equal to 25 percent of the original splice weld length. The cover pass must be ground smooth at test locations. Acceptance criteria must comply with the specifications for cyclically loaded nontubular connections subject to tensile stress in clause 8 of AWS D1.1. If repairs are required in a portion of the weld, perform additional NDT on the repaired sections. The NDT method chosen must be used for an entire splice evaluation, including any repairs.

Replace *Reserved* in section 48-2.02A with:

04-17-20

Wood must comply with the NDS. Timber used for falsework construction must be seasoned with moisture content not to exceed 19 percent.

Add to the end of section 48-2.02B(1):

04-17-20

Where falsework for multiple level bridges is supported on the deck of a structure:

1. Falsework must bear directly on either:
   1.1. Girder stems, bent caps, or end diaphragms of the supporting structure.
   1.2. Falsework sills that transmit the load to the girder stems, bent caps, or end diaphragms without applying any stress to the deck slab.
2. Additional falsework must be in place beneath the supporting structure when construction loads are imposed on the supporting structure. Design and construct additional falsework to support all construction loads imposed on the supporting structure from the upper structure.

Design the falsework lighting, for pavement, portals, and pedestrian walkways at or under falsework openings, to illuminate:

1. Falsework portals during the hours of darkness
2. Pavement, with portals less than 150 feet apart, during the hours of darkness
3. Pavement, with portals 150 feet or more apart, 24 hours a day
4. Pedestrian walkways 24 hours a day

Lighting branch circuits must not exceed 20 A.

Replace the 2nd sentence in the 1st paragraph of section 48-2.02B(2) with:

04-17-20

The minimum total design load for any falsework for combined live and dead load is 100 psf, including members that support walkways.

Replace the 4th paragraph of section 48-2.02B(2) with:

10-19-18

The assumed horizontal load the falsework bracing system must resist must be the sum of the actual horizontal loads due to equipment, construction sequence or other causes, and a wind loading. The assumed horizontal load in any direction must be at least 2 percent of the total dead load.

Replace the table in the 7th paragraph of section 48-2.02B(2) with:

04-17-20

Height zone, H (feet above ground)	Wind pressure value	
	Shores or columns adjacent to traffic (psf)	At other locations (psf)
H≤30	20	15
30<H≤50	25	20
50<H≤100	30	25
H>100	35	30

Replace the table in the 8th paragraph of section 48-2.02B(2) with:

04-17-20

Height zone, H (feet above ground)	Wind pressure value	
	For members over and bents adjacent to traffic opening (psf)	At other locations (psf)
H≤30	2.0 *Q*	1.5 *Q*
30<H≤50	2.5 *Q*	2.0 *Q*
50<H≤100	3.0 *Q*	2.5 *Q*
H>100	3.5 *Q*	3.0 *Q*

NOTE:

Q = 1 + 0.2*W*, but not more than 10

where:

W = width of the falsework system in feet, measured in the direction of the wind force

Add to the end of section 48-2.02B(3)(a):

10-15-21

Deflection due to reinforced concrete loading only must not exceed 1/240 of the span length.

Replace section 48-2.02B(3)(b) with:

10-15-21

48-2.02B(3)(b) Timber

Design stresses for timber and timber connections must not exceed stresses specified in the current NDS.

Adjustment factors used to determine allowable stresses for timber members and connections must comply with NDS for the appropriate condition of use and species.

Pile design load for timber piles must not exceed 45 tons.

Replace the 1st and 2nd paragraphs of section 48-2.02B(3)(c) with:

04-17-20

Except for flexural compressive stresses, the design load for identified grades of steel must not exceed the allowable strength specified in the AISC *Steel Construction Manual*.

Except for flexural compressive stresses, the design load for unidentified steel must not exceed the allowable strength specified for steel complying with ASTM A36/A36M in the AISC *Steel Construction Manual* or as shown in the following table:

Quality characteristic	Requirement
Tension, axial and flexural (psi)	22,000
Compression, axial (psi)	$16{,}000 - 0.38(L/r)^{2}$[a]
Shear on gross section of web of rolled shapes (psi)	14,500
Web yielding for rolled shapes (psi)	27,000
Modulus of elasticity (E) (psi)	30×10^{6}

NOTES:

L = unsupported length, inches

r = radius of gyration of the member, inches

[a]*L*/*r* must not exceed 120

Replace the table in the 3rd paragraph of section 48-2.02B(3)(c) with:

10-15-21

Quality characteristic	Requirement
Compression, flexural (psi)	$12{,}000{,}000/[(L \times d)/(b \times t)]$[a]
Modulus of elasticity (E) (psi)	30×10^{6}

NOTES:

L = unsupported length, inches

d = least dimension of rectangular columns or the width of a square of equivalent cross-sectional area for round columns, or the depth of beams, inches

b = width of the compression flange, inches

t = thickness of the compression flange, inches

F_y = specified minimum yield stress in psi

[a]Not to exceed (1) 22,000 psi for unidentified steel, (2) 22,000 psi for steel complying with ASTM A36/A36M, or (3) $0.6F_y$ for other identified steel

Replace item 6 in the list in the 3rd paragraph of section 48-2.02B(4) with:

10-15-21

6. Falsework member minimum clear area width must comply with section 12-3.20C(1) and the requirements specified in the following table:

Minimum Clear Area Width

Falsework member	To permanent railing members and barriers
Footings	0'-3"
Piles	2'-6"
Other members	2'-6"

Add to section 48-2.02:

04-17-20

48-2.02C Falsework Lighting

48-2.02C(1) General

A falsework luminaire must:

1. Be commercially available
2. Include brackets and locking screws

48-2.02C(2) Pavement Illumination

Not Used

48-2.02C(3) Portal Illumination

Portal illumination includes plywood clearance guides 4 feet wide by 8 feet high and luminaires.

48-2.02C(4) Pedestrian Walkway Illumination

Not Used

04-17-20

Delete the 3rd paragraph of section 48-2.03A.

Add to section 48-2.03A:

04-17-20

During concrete placement, if (1) events occur that the Engineer determines will result in a structure that does not comply with the structure as described or (2) settlement variance is greater than 3/8-inch from the values shown on shop drawings, stop concrete placement and apply corrective measures. If the measures are not provided before initial concrete set occurs, stop concrete placement at the location ordered.

Detour traffic from the lanes over which falsework is being erected, released, adjusted, or removed.

Replace the 3rd paragraph of the section 48-2.03B with:

04-17-20

Falsework piles must be driven and assessed under section 49. The actual nominal driving resistance must be at least twice the falsework pile design load. For pile acceptance, the required number of hammer blows in the last foot of driving is determined using the formula in 49-2.01A(4)(c).

Add between the 2nd and 3rd paragraphs of section 48-2.03C:

10-19-18

Falsework erection includes adjustments or removal of components that contribute to the horizontal stability of the falsework system.

04-17-20

Delete the 8th paragraph of section 48-2.03C.

Replace section 48-2.03D with:

04-17-20

48-2.03D Removal

Release and remove falsework such that portions of falsework to be removed remain stable.

Falsework release includes blowing sand from sand jacks, turning screws on screw jacks, and removing wedges.

Except for concrete above the deck, do not release falsework supporting any span of a:

1. Simple span bridge before 10 days after the last concrete has been placed
2. Continuous or rigid frame bridge before 10 days after the last concrete has been placed:
    2.1. In that span
    2.2. In adjacent portions of each adjoining span for a length equal to one-half of the span where falsework is to be released
3. Simple span, continuous, or rigid frame bridge until the supported concrete has attained a compressive strength of 2,880 psi or 80 percent of the specified strength, whichever is greater

Do not release falsework for prestressed portions of structures until prestressing steel has been tensioned.

Do not release falsework supporting any span of a continuous or rigid frame bridge until all required prestressing is complete (1) in that span and (2) in adjacent portions of each adjoining span for a length equal to at least one half of the span where falsework is to be released.

Release falsework supporting spans of CIP girders, slab bridges, or culverts before constructing or installing railings or barriers on the spans, unless authorized.

Release falsework for arch bridges uniformly and gradually. Start at the crown and work toward the springing. Release falsework for adjacent arch spans concurrently.

Do not release falsework that supports overhangs, deck slabs between girders, or girder stems that slope 45 degrees or more from vertical before 7 days after deck concrete has been placed.

You may release falsework supporting the sides of girder stems that slope less than 45 degrees from vertical before placing deck concrete if you install lateral supports. Lateral supports must be:

1. Designed to resist rotational forces on the girder stem, including forces due to concrete deck placement
2. Installed immediately after each form panel is removed
3. Installed before releasing supports for the adjacent form panel

Do not release falsework for bent caps supporting steel or PC concrete girders before 7 days after placing bent cap concrete.

Release falsework for structural members subject to bending as specified for simple span bridges.

Do not release falsework for box culverts and other structures with decks lower than the roadway pavement and span lengths of 14 feet or less until the last placed concrete has attained a compressive strength of 1,600 psi. Curing of the concrete must not be interrupted. Falsework release for other box culverts must comply with the specifications for the release of bridge falsework.

Do not release falsework for arch culverts sooner than 40 hours after concrete has been placed.

Remove falsework piling to at least 2 feet below the original ground or streambed. Remove falsework piling driven within ditch or channel excavation limits to at least 2 feet below the bottom and side slopes of the excavated areas.

Falsework removal systems employing methods of holding falsework by winches, hydraulic jacks with prestressing steel, HS steel rods, or cranes must also be supported by an independent support system when the falsework is over vehicular, pedestrian, or railroad traffic openings open to traffic.

Bridge deck and soffit openings used to facilitate falsework removal activities must:

1. Have a 6-inch maximum diameter opening.
2. Be located away from the wheel paths for deck openings.
3. Be formed with corrugated HDPE pipe complying with section 20-2.07B(3).

Before filling the bridge deck and soffit openings with concrete:

1. Trim HDPE pipes 1 inch from the exposed surface of the top of deck, bottom overhand, and soffit
2. Clean and roughen concrete surfaces of opening. Fill the opening with rapid setting concrete complying with section 60-3.02B(2) or with a concrete mix of equal or higher strength than the deck. Finish surface must comply with section 51-10.3F(2).

Falsework removal over roadways with a vertical traffic opening of less than 20 feet must start within 14 days after the falsework is eligible to be released and must be completed within 45 days after it is eligible to be released.

Replace section 48-2.03E with:

04-17-20

48-2.03E Falsework Lighting

48-2.03E(1) General

Notify the Engineer at least 5 business days before the installation of the falsework lighting.

Fasten power cables to the supporting structure at a minimum 3-foot intervals and within 12 inches from every box. Encase cables within 8 feet of the ground in a minimum 1/2-inch Type 1 conduit.

Enclose splices in junction boxes.

Provide power for the falsework lighting under section 87-20.

Energize lighting circuits immediately after supporting structures have been erected.

48-2.03E(2) Pavement Illumination

Provide pavement illumination on roadways beneath falsework structures.

Install luminaires:

10-15-21

1. Along the sides of the opening not more than 4 feet behind or 2 feet in front of the roadway face of the temporary barrier system

04-17-20

2. 12 to 16 feet above the roadway surface without obstructing the light pattern on the pavement
3. Aimed to avoid glare to motorists
4. Spaced to comply with the illumination levels table
5. At the ends no more than 10 feet inside portal faces

Measure the illumination levels at a minimum two points per lane, one on each side within one-quarter of the lane width from the lane stripe. Use this pattern to start the measurements at both ends of the falsework and then at 15-foot intervals through the length of the pavement under the falsework.

48-2.03E(3) Portal Illumination

Provide portal illumination on the sides facing traffic. Install luminaires and clearance guides immediately after falsework vertical members are erected.

Fasten clearance guides:

1. To the vertical support adjacent to the traveled way, facing traffic
2. Vertically with the bottom of the clearance guide from 3 to 4 feet above the roadway

10-15-21

3. With the center located approximately 3 feet horizontally behind the face of the temporary barrier system on the roadway side

04-17-20

Paint clearance guides before each installation with not less than 2 applications of flat white paint.

If ordered, repainting is change order work.

Install luminaires on the structure directly over the vertical support, approximately 16 feet above the pavement and 6 feet in front of the guides. Aim the luminaires to illuminate the exterior falsework beam, the clearance guides, and the overhead clearance sign and comply with the illumination levels table.

Measure the illumination levels at the center and four corners of the clearance guides, at the exterior falsework beam, and at the overhead clearance sign.

48-2.03E(4) Pedestrian Walkway Illumination

Provide pedestrian walkway illumination immediately after the protective overhead covering is erected.

Install the luminaires a minimum 8 feet clearance in the protective overhead covering and center them over the pedestrian walkway. Space the luminaires through the pedestrian walkway as needed to comply with the illumination levels table. Install luminaires at the ends no more than 7 feet inside the pedestrian walkway openings.

Measure the illumination levels at a minimum two points, one on each side within one-quarter of the walkway width from the edge. Use this pattern to start the measurements at both ends of the falsework and then at 10-foot intervals through the length of the pedestrian walkway.

Replace section 48-3.01A with:

10-16-20

48-3.01A Summary

Section 48-3 includes specifications for providing temporary supports for structures during retrofit, reconstruction, erection, and removal activities.

Jacking assemblies, accessories, and activities required to jack and support structures must comply with section 48-5.

Falsework must comply with section 48-2.

Replace section 48-3.01B with:

10-16-20

48-3.01B Definitions

Reserved

Replace the 2nd paragraph of section 48-3.01C(1) with:

10-16-20

Submit a copy of the displacement monitoring record after completing the work.

Replace the 1st and 2nd paragraphs of section 48-3.01C(2) with:

10-16-20

Submit the following:

1. Descriptions and values of all loads, including construction equipment loads.
2. Descriptions of equipment to be used.
3. Details and calculations for jacking and supporting the structure.
4. Stress sheets, anchor bolt layouts, shop details, erection plans, and removal plans for the temporary supports.
5. Assumed soil bearing values and design stresses for temporary support footings, including anticipated foundation settlement.
6. Maximum distance temporary-support piles may be pulled for placement under footing caps.
7. Maximum deviation of temporary-support piles from a vertical line through the point of fixity.
8. Details for use of permanent piles. Include any additional loads imposed on the piles.
9. Details for additional bracing required during erection and removal of temporary supports.

10. Details of the displacement monitoring system, including equipment, location of control points, and methods and schedule for taking measurements.
11. Mitigation plan for jacking the structure if settlement occurs in the temporary supports.

Calculations must show a summary of computed stresses in (1) temporary supports, (2) connections between temporary supports and the structure, and (3) load-supporting members. The computed stresses must include the effect of the jacking sequence. Calculations must include a lateral stiffness assessment of the temporary support system.

10-19-18

Delete the 4th paragraph of section 48-3.01C(2).

Replace section 48-3.01D with:

10-16-20

48-3.01D Quality Assurance

48-3.01D(1) General

Welding, welder qualification, and welding inspection for temporary supports must comply with AWS D1.1.

48-3.01D(2) Quality Control

Reserved

Replace section 48-3.02B with:

04-17-20

48-3.02B Design Criteria

The Engineer does not authorize temporary support designs based on allowable stresses or design load greater than those specified in section 48-2.02B(3).

If falsework loads are imposed on temporary supports, the temporary supports must also satisfy the deflection criteria in section 48-2.02B(3).

The temporary support system must support the initial jacking loads and the minimum temporary support design loads and forces shown. As a minimum, the horizontal load to be resisted in any direction by the temporary support system must be (1) the sum of actual horizontal loads due to equipment, construction sequence, or other causes plus an allowance for wind and (2) not less than 5 percent of the total supported dead load at the location being considered. Adjust vertical design loads for the weight of the temporary supports and jacking system, construction equipment loads, and additional loads imposed by jacking activities. Construction equipment loads must be at least 20 psf of deck surface area of the frame involved.

10-16-20

For column repair or removal, the temporary supports must resist the described lateral design forces applied at the point where the column to be removed meets the superstructure. Stiffness of temporary supports must match the described minimum stiffness. If the temporary support stiffness exceeds the described minimum stiffness, increase the lateral design forces to be compatible with the temporary support lateral stiffness.

04-17-20

Place temporary supports, that are resisting transverse lateral loads, within 1/2 of the span length from the existing bent. Place temporary supports, that are resisting longitudinal lateral loads, within the frame where columns are to be removed.

You may use the permanent piles as part of the temporary support foundation. Do not move or adjust permanent piles from the locations shown. If you install permanent piles longer than described to support the temporary supports above the top of the footing and later cut off the piles at their final elevation, you must use shear devices adequate to transfer all pile reactions into the footing.

Design temporary support footings to carry the loads imposed without exceeding the estimated soil bearing values or anticipated settlements. You must determine soil bearing values.

Where temporary supports are placed on the deck of an existing structure:

1. Temporary supports must bear either:
   1.1. Directly on girder stems, bent caps, or end diaphragms of the supporting structure
   1.2. On falsework sills that transmit the load to the stems, bent cap, or end diaphragms without overstressing any member of the new or existing structure
2. Temporary supports must not induce permanent forces into the completed structure or produce cracking.
3. Place additional temporary supports beneath the existing structure where temporary support loads are imposed on the existing structure. Design and construct the additional temporary supports to support all loads from the upper structure and construction activities.

Provide additional bracing as required to withstand all imposed loads during each phase of temporary support erection and removal. Include wind loads complying with section 48-2.02B(2) in the design of additional bracing.

Mechanically connect (1) the structure to the temporary supports and (2) the temporary supports to their foundations. Mechanical connections must be capable of resisting the lateral design forces. Friction forces developed between the structure and temporary supports (1) are not considered an effective mechanical connection and (2) must not be used to reduce lateral forces.

Design mechanical connections to accommodate movement resulting from adjustments made to the temporary supports.

If the concrete is to be prestressed, design temporary supports to support changes to the loads caused by prestressing forces.

Temporary supports must comply with the specifications for falsework in section 48-2.02B(4).

Replace section 48-3.03 with:

10-16-20

48-3.03 CONSTRUCTION

Where described, install temporary crash cushion modules under section 12-3.22 before starting temporary support activities. Remove crash cushion modules when authorized.

Construct and remove temporary supports under the specifications for falsework in section 48-2.03.

If traffic is carried on the structure on temporary supports, do not release temporary supports until the supported concrete has attained 100 percent of the described strength.

Remove attachments from the existing structure. Restore concrete surfaces to original conditions except where permanent alterations are shown.

Replace section 48-4.01 with:

04-17-20

48-4.01 GENERAL

48-4.01A Summary

Section 48-4 includes specifications for temporary decking for joint or deck reconstruction.

Temporary decking must consist of a steel plate system that spans the incomplete work.

Concrete anchorage devices and nonskid surface must comply with section 75-3.

48-4.01B Definitions

Reserved

48-4.01C Submittals

Submit shop drawings and calculations for temporary decking.

Shop drawings and calculations for temporary decking must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Temporary decking shop drawings and calculations must include:

1. Storage location of equipment and materials that allows for 1 shift of work and placement of temporary decking within the time allowed
2. Construction sequence and schedule details
3. Cure time for concrete to be placed under temporary decking
4. Details for removing temporary decking and restoring the existing structure

If temporary decking is not shown, shop drawings and calculations must also include:

1. Design calculations, including the description, location, and value, of all loads
2. Details of the connection between the temporary decking and the existing or new structure

Submit a certificate of compliance for temporary decking materials.

Sections 48-1.01C(2), 48-1.01C(3), and 48-1.01D(2) do not apply for temporary decking.

48-4.01D Quality Assurance

Reserved

Replace *Not Used* in section 48-4.02 with:

04-17-20

48-4.02A General

Yield strength of steel plate must be greater than or equal to 36 ksi.

Bolts must comply with ASTM F3125, Grade A325.

Nuts must comply with ASTM A563/563M.

Material for temporary tapers must be rapid setting concrete or polyester concrete complying with section 60-3.02B(2) or 60-3.04B(2).

48-4.02B Design Criteria

If temporary decking is not shown, the temporary decking design must:

1. Comply with the unfactored permit loads, braking force, and HL93 loads except lane load from the current *AASHTO LRFD Bridge Design Specifications* with *California Amendments*.
2. Not exceed the allowable stresses or design loads specified in section 48-2.02B(3).
3. Have live load deflection not exceeding 1/300 of the temporary decking span for the design load.
4. Provide for temporary decking with a uniform surface with a coefficient of friction of at least 0.35 when measured under California Test 342.
5. Provide for temporary decking that is mechanically connected to the existing structure and adjacent approaches. If a steel plate spans a joint, the mechanical connection must accommodate at least 50 percent of the movement rating shown for that joint.
6. Not overstress, induce permanent forces into, or produce cracking in the existing structure.

Replace section 48-4.03 with:

04-17-20

48-4.03 CONSTRUCTION

For bolted connections, drill the holes without damaging the adjacent concrete. Do not damage existing reinforcement.

If the temporary decking does not extend the entire width of the roadway, taper the sides of the temporary decking at a 12:1 (horizontal: vertical) ratio.

Cure temporary tapers at least 3 hours before allowing traffic on the temporary decking.

If unanticipated displacements, cracking, or other damage occurs to the existing structure or to any new components installed in or adjacent to the deck, stop work on the deck and perform corrective measures.

Edges of steel plate systems must be in full contact with the existing deck and the adjacent approach slab. If used, shims must be securely attached to the plate.

Do not allow traffic on deck concrete until it has attained the compressive strength shown.

When temporary decking is no longer needed, immediately remove temporary decking materials and connections from the existing structure. Patch holes with rapid setting concrete complying with section 60-3.02. Remove modifications to the existing structure except where permanent alterations are shown.

Replace section 48-5 with:

10-16-20

48-5 JACKING

48-5.01 GENERAL

48-5.01A Summary

Section 48-5 includes specifications for jacking the bridge superstructure using a jacking support system.

48-5.01B Definitions

Reserved

48-5.01C Submittals

The submittal for shop drawings and calculations must include:

1. Descriptions, locations, and values of all loads, including construction equipment loads
2. Jacking construction sequence including staging areas for equipment and materials for jacking support systems
3. Type, model number, and weight of equipment to be used including:
   3.1. Jack capacity
   3.2. Certified calibration chart for each jack
   3.3. Certified indicator to determine jacking force
4. Details and calculations with the load paths for jacking and supporting the structure including a redundant system of supports to ensure stability of the jacking system during jacking activities
5. Stress sheets, anchor bolt layouts, shop drawing details, and erection and removal plans for the jacking support system
6. Assumed soil bearing values and design stresses for support footings, including anticipated foundation settlement
7. Details for bracing required during erection and removal
8. Details of the displacement monitoring system, including equipment, location of control points, and methods and schedule of taking measurements
9. Any additions or modifications to the structure in connection with the jacking support systems including:
   9.1. Temporary strengthening and stiffening members
   9.2. Permanent stiffening members
10. Mitigation plan for jacking the structure if settlement occurs

Calculations must show a summary of computed stresses in the jacking support system and the connections between the jacking support system and the bridge superstructure. The computed stresses must include the effect of the jacking sequence.

Shop drawings and calculations must be sealed and signed by an engineer who is registered as a civil engineer in the State.

Submit the displacement monitoring records.

48-5.01D Quality Assurance

48-5.01D(1) General

Calibrate each jack within 6 months of use and after each repair. Each jack and its gauge must (1) be calibrated as a unit with the cylinder extension in the approximate position that it will be at the final jacking force and (2) accompanied by a certified calibration chart. Each load cell must be calibrated. Calibration must be performed by an authorized laboratory.

48-5.01D(2) Displacement Monitoring

04-16-21

Perform an initial survey to record the location of the structure before starting work. Monitor and record vertical and horizontal displacements of the jacking support system and the structure. Use vandal-resistant displacement monitoring equipment. Perform monitoring continuously during jacking activities. Make monitoring records available at the job site during normal work hours. Monitoring records must be sealed and signed by an engineer who is registered as a civil engineer in the State.

04-16-21

As a minimum, monitor the structure at the supported or jacking locations and at the midspan of both adjoining spans. Locate control points at each location near the center and at both edges of the superstructure. As a minimum, record elevations at the following times:

10-16-20

1. Before starting jacking activities
2. Immediately after completing jacking
3. After completing bridge removal
4. Before connecting the superstructure to the substructure
5. After removing the jacking support system

48-5.02 MATERIALS

48-5.02A General

Reserved

48-5.02B Design Criteria

The jacking support system must resist the structure dead load and lateral design forces shown, plus any additional loads from jacking equipment and activities. As a minimum, the horizontal load to be resisted in any direction for the jacking support system and temporary bracing must be (1) the sum of actual horizontal loads due to equipment, construction sequence, or other causes plus an allowance for wind as specified in section 48-2.02B(2) and (2) not less than 5 percent of the total dead load of the structure being jacked. If the jacking support system lateral stiffness exceeds the described minimum stiffness, increase the lateral design forces to be compatible with the jacking support system lateral stiffness.

Systems involving modifications to the bridge that impair the structural integrity, intended serviceability, or design capacity of the bridge are not allowed.

48-5.03 CONSTRUCTION

Equip each jack with a pressure gauge or load cell for determining the jacking force. Each pressure gauge must have an accurately reading dial at least 6 inches in diameter. Each load cell must be provided with an indicator to determine the jacking force.

Provide a redundant system of supports to ensure stability of the jacking system during jacking activities.

Stop jacking activities if unanticipated displacements, cracking, or other damage occurs. Corrective measures must be authorized and implemented before resuming jacking activities.

Before starting jacking activities at a location being supported, the jacking support system must (1) apply a force to the structure that is equal to the initial jacking load or the dead load shown and (2) hold that load until all initial compression and settlement of the system is completed.

During jacking activities, apply loads simultaneously. Control and monitor jacking operations to prevent distortion and stresses that would damage the structure. Maintain total vertical displacements at control points to less than 1/4 inch from elevations recorded before jacking or as authorized.

Jack the superstructure uniformly to the position described. Distribute the load uniformly across each hinge, abutment, bent, or span. If authorized, place galvanized shims as necessary to provide uniform loading at bearing pads.

After reconstruction activities, the monitored control points must not deviate by more than 1/4 inch from the initial vertical survey elevations or other authorized elevations.

Remove attachments required for jacking from the superstructure and apply the described finish to concrete surfaces.

48-5.04 PAYMENT

Not Used

Add to the end of section 48-6.01C(1):

04-17-20

Sections 48-1.01C(2), 48-1.01C(3), and 48-1.01D(2) do not apply for temporary wood poles.

Replace Reserved in section 48-6.01D(1) with:

04-17-20

A temporary-structure engineer is not required.

04-17-20

Delete the 3rd paragraph of section 48-6.02B.

Replace the 2nd and 3rd paragraphs of section 48-6.03A with:

10-15-21

Install a temporary barrier system at temporary wood pole locations that are less than 15 feet from the edge of a traffic lane.

Install temporary barrier system before erecting temporary wood poles. Do not remove temporary barrier system until authorized.

^^

49 PILING

04-15-22

Replace section 49-1.01B with:

04-16-21

49-1.01B Definitions

control zone: Zone where subsurface conditions are similar to the corresponding support location.

dry hole: Drilled hole that requires no work to keep it free of water.

dewatered hole: Drilled hole that:

1. Accumulates no more than 12 inches of water at the bottom during a 1-hour period without pumping from the hole
2. Has no more than 3 inches of water at the bottom immediately before placing concrete

3. Does not require temporary casing to control groundwater

nominal driving resistance: Sum of (1) nominal resistance required to resist the factored axial loads and (2) driving resistance from unsuitable, liquefiable, or scourable penetrated soil layers that do not contribute to the design resistance.

nominal resistance: Geotechnical resistance required to resist the factored axial loads.

Replace the 4th paragraph of section 49-1.01D(3) with:

04-16-21

Install load test piles with the same equipment to be used for installation of production piles.

Replace the 6th paragraph of section 49-1.01D(4) with:

10-19-18

Except for load test piles and anchor piles, drive the 1st production pile in the control zone. Do not install any additional production piles until dynamic monitoring has been performed, and the Engineer provides you with the bearing acceptance criteria curves for any piles represented by the dynamically monitored piles.

Add to the end of section 49-1.03:

04-16-21

For a mechanically stabilized embankment abutment, drive or install the piles before constructing the mechanically stabilized embankment around the piles. Mechanically stabilized embankment reinforcement must maintain a 6-inch clearance around the piles.

Replace the 3rd paragraph of section 49-2.01D with:

10-19-18

The payment quantity for furnish piling is the length measured along the longest side of the pile from the specified tip elevation shown to the plane of pile cutoff, except for dynamically monitored piles. For dynamically monitored piles, the payment quantity for furnish piling includes an additional length of 2 times the largest cross-sectional dimension of the pile plus 2 feet.

Add to the end of section 49-2.02A(2):

10-19-18

longitudinal weld length: The length of a continuous longitudinal weld.

circumferential weld length: The length of a continuous weld around the circumference of the pipe pile.

spiral weld length: The length of one full 360-degree spiral weld revolution around the circumference of the pipe pile.

Replace the 3rd paragraph of section 49-2.02A(4)(b)(iii)(B) with:

10-19-18

For welding performed under AWS D1.1:

1. Perform NDT on 25 percent of each longitudinal, circumferential, or spiral weld length using RT or UT.
2. If repairs are required in a portion of the tested weld:

2.1. Perform additional NDT on untested areas on each end of the initial portion tested. The length of additional NDT on each end must equal 10 percent of the weld length. If it is not possible to perform 10 percent of the weld length on one end, perform the remaining percentage on the other end.
2.2. After this additional 20 percent of NDT is performed, determine and record the total cumulative repair lengths from all NDT for each weld length. If the cumulative weld repair length is equal to or more than 10 percent of the weld length, then perform NDT on the entire weld length.
2.3. Perform NDT on the repaired portion plus 2 inches on each end of the repaired weld excavation.

Replace the 2nd paragraph of section 49-2.02A(4)(b)(iii)(C) with:

10-19-18

Perform NDT on 25 percent of the weld length performed by each welder, using RT or UT at locations selected by the Engineer. The Engineer may select several locations on a given splice. The cover pass must be ground smooth at locations to be tested.

Replace the 4th paragraph of section 49-2.02A(4)(b)(iii)(C) with:

10-19-18

If repairs are required in a portion of the tested weld:

1. Perform additional NDT on untested areas on each end of the initial portion tested. The length of additional NDT on each end must equal 10 percent of the pipe's outside circumference. If it is not possible to perform 10 percent of the weld length on one end, perform the remaining percentage on the other end.
2. After this additional 20 percent of NDT is performed, determine and record the total cumulative repair lengths from all NDT for each weld length. If the cumulative weld repair length is equal to or more than 10 percent of the pipe's outside circumference, then perform NDT on the entire weld length.
3. Perform NDT on the repaired portion plus 2 inches on each end of the repaired weld excavation.

Replace the 5th paragraph of section 49-2.02B(1)(a) with:

10-16-20

For welding and prequalifying base metal under Table 5.3 of AWS D1.1, treat steel pipe piles complying with ASTM A252 as either ASTM A572/572M, Grade 50, or ASTM A709/709M, Grade 50.

Replace the 7th paragraph of section 49-2.02B(1)(a) with:

10-16-20

For groove welds using submerged arc welding from both sides without backgouging, qualify the WPS under Table 6.5 of AWS D1.

Replace the 5th paragraph of section 49-2.02B(1)(b) with:

10-16-20

If splicing steel pipe piles using a circumferential weld, the piles must comply with the fit-up requirements of clause 10.23.1 of AWS D1.1.

Replace *clause 4.9.4* in item 2.3 in the list in the 2nd paragraph of section 49-2.02B(2) with:

10-16-20

Clause 6.10.4

Replace section 49-2.05A with:

10-15-21

49-2.05A General

Section 49-2.05 includes specifications for furnishing and installing permanent steel sheet piles.

Replace section 49-3.01B(2) with:

04-19-19

49-3.01B(2) Mass Concrete

Section 49-3.01B(2) applies to CIP concrete piles with a diameter greater than 8 feet.

For piles with a diameter greater than 8 feet and less than or equal to 14 feet:

1. The specifications for SCM content in the 4th paragraph of section 90-1.02B(3) do not apply.

10-15-21

2. The SCM content of the concrete must comply with the following:
   2.1. Any combination of portland cement or portland limestone cement and fly ash satisfying:

   Equation 1:

   $(12 \times FM)/MC \geq X$

   where:
   FM = fly ash complying with AASHTO M 295, Class F, with a CaO content of up to 10 percent, including the quantity in blended cement, lb/cu yd
   MC = minimum quantity of cementitious material specified, lb/cu yd
   X = 3.0 for 8 < D ≤ 10, where D = pile diameter in feet
   X = 4.0 for 10 < D ≤ 14, where D = pile diameter in feet

   Equation 2:

   $MC - MSCM - PC \geq 0$

   where:
   MC = minimum quantity of cementitious material specified, lb/cu yd
   MSCM = minimum sum of SCMs that satisfies equation 1, lb/cu yd
   PC = quantity of Type IL cement or portland cement, including the quantity in blended cement, lb/cu yd

   2.2. You may replace any portion of the cement with any SCM complying with section 90-1.02B(3) if equations 1 and 2 are satisfied as specified above.

04-19-19

For piles with a diameter greater than 14 feet, the concrete must comply with the specifications for mass concrete in section 51-6.

Replace section 49-3.02A(2) with:

10-15-21

49-3.02A(2) Definitions

Reserved

Replace the introductory clause in the 2nd paragraph of section 49-3.02A(3)(b) with:

04-16-21

For concrete placed under slurry, submit the additional information:

Replace item 3 in the list in the 2nd paragraph of section 49-3.02A(3)(g) with:

04-16-21

3. Step by step description of the mitigation work to be performed, including drawings if necessary. If the *ADSC Standard Mitigation Plan* is an acceptable mitigation method, include the most recent version. For the most recent Department-published version of *ADSC Standard Mitigation Plan*, go to the Authorized ADSC Standard Mitigation Plan website.

Replace the 3rd sentence in the 1st paragraph of section 49-3.02A(3)(h) with:

04-16-21

The mitigation report must be sealed and signed by an engineer who is registered as a civil engineer in the State, except for mitigation performed under the current Department-published version of *ADSC Standard Mitigation Plan 'A' – Basic Repair*.

Replace the 7th paragraph of section 49-3.02A(4)(d)(iii) with:

04-16-21

If a rejected pile requires mitigation, the Department withholds 30 percent of the contract item price of the rejected pile. The Department returns the withholding upon compliance with sections 49-3.02A(3)(h) and 49-3.02A(4)(d).

Replace the 1st paragraph of section 49-3.02B(2) with:

10-15-21

Concrete placed under slurry must:

1. Contain at least 675 pounds of cementitious material per cubic yard.
2. Have a slump of 7 to 9 inches. The nominal and maximum slump and penetration specifications in section 90-1.02G(6) do not apply.

Replace the paragraph in section 49-3.02B(3) with:

10-15-21

For concrete placed under slurry, the combined aggregate gradation must comply with the 1/2-inch or 3/8-inch maximum gradation specified in section 90-1.02C(4)(d).

Add to the end of section 49-3.02C(1):

04-19-19

You may construct CIDH concrete piles 24 inches in diameter or larger by excavating and depositing concrete under slurry.

Replace section 49-3.02C(5) with:

04-15-22

49-3.02C(5) Vertical Inspection Pipes

For acceptance testing, install and test vertical inspection pipes as follows:

1. Log the elevations of the inspection pipe couplers and pile reinforcing cage couplers.
2. Cap each inspection pipe at the bottom. Extend the pipe from 3 feet above the pile cutoff to the bottom of the reinforcing cage. Provide a temporary top cap or similar means to keep the pipes clean before testing. If pile cutoff is below the ground surface or working platform, extend inspection pipes

to 3 feet above the ground surface or working platform. Log the elevation of the top of inspection pipes.

3. If any changes are made to the pile tip, extend the inspection pipes to the bottom of the reinforcing cage.
4. Install inspection pipes in a straight alignment and parallel to the main reinforcement. Securely fasten inspection pipes in place and provide protective measures to prevent misalignment or damage to the inspection pipes during installation of the reinforcement and placement of concrete in the hole. Construct CIDH concrete piles such that the relative distance of inspection pipes to vertical steel reinforcement remains constant.
5. After concrete placement is complete, fill inspection pipes with water to prevent debonding of the pipe.
6. Provide safe access to the tops of the inspection pipes.
7. After placing concrete and before requesting acceptance testing, test each inspection pipe in the Engineer's presence by passing a rigid cylinder through the length of pipe. The rigid cylinder must:
   7.1. Be 1-1/4-inch diameter by 4.5-foot long.
   7.2. Weigh 12 pounds or less.
   7.3. Be able to freely pass down through the entire length of the pipe under its own weight and without the application of force.
8. When performing acceptance testing, inspection pipes must provide a 2-inch-diameter clear opening and be completely clean, unobstructed, and either dry or filled with water as authorized.
9. After acceptance testing is complete, completely fill the inspection pipes with water.

If the rigid cylinder fails to pass through the inspection pipe or if the inspection pipes were improperly installed:

1. Completely fill the inspection pipes with water immediately.
2. Suspend concrete placement in the remaining piles until additional measures to prevent blockage or bending of the inspection pipe are authorized by the Engineer.
3. Perform either of the following:
   3.1. Request the Department to perform CSL.
   3.2. Core a nominal 2-inch-diameter hole through the concrete for the entire length of the pile.

If CSL is requested:

1. The Department will perform CSL if the Engineer determines that CSL is necessary. Allow the Department 15 days to perform CSL and generate a CSL report. If CSL is performed, the Department will deduct $2,000 if the pile diameter is 5 feet or under and $4,000 if the pile diameter is over 5 feet.
2. Allow 10 days for the Department to determine whether the blocked pipe requires coring, hydro-blasting for downhole camera inspection, or if it is acceptable. Day 1 of the 10 days is either (1) the 1st day after the CSL report has been generated by the Department or (2) the 1st day after it is determined that CSL is not necessary or cannot be performed. If the Engineer determines that:
   2.1. Coring is required, core holes complying with the coring requirements below.
   2.2. Hydro-blasting is required, perform hydro-blasting.
   2.3. The blocked pipe is acceptable, the amount shown in the anomaly deduction table under section 49-3.02A(4)(d)(iii) will be deducted for each blocked pipe up to the maximum total deduction.

If you choose to core or if the Engineer determines that coring is required:

1. Coring must not damage the pile reinforcement.
2. Locate cored holes as close as possible to the inspection pipes they are replacing and no more than 5 inches clear from the reinforcement.
3. Core holes using a double wall core barrel system with a split tube type inner barrel. Coring with a solid type inner barrel is not allowed.
4. Coring methods and equipment must provide intact cores for the entire length of the pile.
5. Photograph and store concrete cores as specified for rock cores in section 49-1.01D(5).
6. The coring operation must be logged by an engineering geologist or civil engineer licensed in the State and experienced in core logging. Coring logs must comply with the Department's *Soil and Rock Logging, Classification, and Presentation Manual* for rock cores. Coring logs must include core

recovery, rock quality designation of the concrete, locations of breaks, and complete descriptions of inclusions and voids encountered during coring.
7. The Department evaluates the portion of the pile represented by the cored hole based on the submitted coring logs and concrete cores.

If the Department determines a pile is anomalous based on the CSL results, downhole camera inspection, or coring logs and concrete cores, the pile is rejected.

Replace the 1st paragraph of section 49-3.02C(6) with:

04-15-22

Section 49-2.01A(4)(c) and the 5th through 7th paragraphs of section 49-2.01C(5) do not apply to permanent steel casings.

Replace the 3rd paragraph of section 49-3.02C(7) with:

10-16-20

Section 49-2.01A(4)(c) and the 5th through 7th paragraphs of section 49-2.01C(5) do not apply to permanent casings specified in section 49-3.02C(7).

04-19-19

Delete the 2nd paragraph of section 49-3.02C(8).

Replace section 49-4 with:

10-15-21

49-4 STEEL SOLDIER PILING

49-4.01 GENERAL

49-4.01A Summary

Section 49-4 includes specifications for drilling holes, installing steel soldier piles, and placing concrete in the holes.

49-4.01B Definitions

dewatered hole: Drilled hole that:

1. Accumulates no more than 12 inches of water at the bottom during a 1-hour period without pumping from the hole
2. Has no more than 3 inches of water at the bottom immediately before placing concrete

49-4.01C Submittals

49-4.01C(1) General

Reserved

49-4.01C(2) Pile Installation Plan

Submit a pile installation plan. Include descriptions, details, and supporting calculations for:

1. Concrete mix designs for concrete backfill and lean concrete backfill
2. Methods, toolings, and equipment for drilling and cleaning hole
3. Number and sequence of piles you plan to install each day
4. Removing, handling, and disposing of drill cuttings
5. If temporary casing is used, proposed method of installing, drilling, placing concrete, and removing temporary casing
6. Placing, aligning, plumbing, spacing and securing the position of the pile before concrete placement
7. Theoretical volume of concrete to be placed at each pile
8. Verifying the bottom of the drilled hole is clean before concrete placement
9. Determining top of concrete elevation during concrete placement

10. Method of concrete placement in a dry or dewatered hole

For concrete placed under slurry, submit the additional information:

1. Method of placing concrete in a hole that is neither dry nor dewatered
2. Manufacturer's recommendations on the use of and test reports on the physical and chemical properties of the proposed slurry and any slurry chemical additives, including SDSs
3. Determining volume of slurry required for the work
4. Methods and equipment used for containment, mixing, agitating, placing, recirculating, and cleaning of the slurry
5. Slurry testing equipment and testing procedures
6. Methods of removing, handling, and disposing of drilled cuttings, contaminated concrete, and slurry

49-4.01C(3) Concrete Backfill Placement Report

Submit a concrete backfill placement report as an informational submittal within 2 business days of completion of concrete backfill placement in the hole.

The concrete backfill placement report must include:

1. Pile number, location, as-built tip elevation and concrete backfill cutoff elevation
2. Dates of drilling, concrete placement, and total quantity of concrete placed
3. Details of any hole stabilization methods and materials used
4. Drilling and tooling equipment used to complete the pile

49-4.01D Quality Assurance

Reserved

49-4.02 MATERIALS

49-4.02A General

Steel soldier piles must comply with section 49-2.03.

Concrete anchors must comply with the specifications for studs in clause 9 of AWS D1.1.

49-4.02B Slurry

Mineral slurry and synthetic slurry must comply with section 49-3.02B(6).

You may use water slurry. Water slurry must comply with the requirements shown in the following table:

Water Slurry Requirements

Quality characteristic	Test method	Requirement
Density Before final cleaning and immediately before placing concrete (pcf)	Mud weight (density), API RP 13B-1 Section 4	≤64[a]
Sand content Before final cleaning and immediately before placing concrete (%)	Sand, API RP 13B-1, section 9	≤1.0

[a]If authorized, you may use salt water slurry. The allowable density of the slurry may be increased by 2 pcf.

49-4.03 CONSTRUCTION

49-4.03A General

Construct steel soldier piles in a dry or dewatered hole. If the hole is not dry or dewatered and if authorized, construct steel soldier piles under slurry.

Drilling the hole, installing the pile, and placing concrete backfill and lean concrete backfill must be performed in a continuous operation, unless otherwise authorized.

Place concrete evenly on all sides of the pile and continuously from the bottom of the hole to the cut-off elevation. Concrete placement must not disturb pile alignment.

49-4.03B Drilled Holes

The axis of the drilled hole must not deviate from plumb more than 1 inch per 10 feet of length.

During drilling, do not disturb the foundation material surrounding the pile. Equipment or methods used for drilling holes must not cause (1) quick soil conditions or (2) scouring or caving of the hole.

If the pile center-to-center spacing is less than four pile diameters, do not drill holes for the adjacent piles until 24 hours have elapsed after concrete placement in the preceding pile.

If slurry is used during drilling operations, maintain the slurry level at a height required to maintain a stable hole but not less than 10 feet above the piezometric head.

After drilling begins, complete construction of the pile in one work shift to prevent deterioration of the surrounding foundation material. Remove and dispose of deteriorated foundation material, including material that has softened, swollen, or degraded, from the exposed surface.

Verify the bottom of the drilled hole is clean before placing the pile in the drilled hole.

If authorized, you may use temporary casing to control caving or ground water. Temporary casing must comply with section 49-3.02C(3).

If authorized to control caving or water seepage, you may enlarge portions of the hole, backfill the hole with slurry cement backfill or concrete, and redrill the hole to the diameter shown. The enlarged hole must allow for at least a 6-inch annulus of slurry cement or concrete surrounding the pile after the hole is redrilled.

49-4.03C Steel Soldier Piles

Plumb, align, and secure the pile before placing concrete. The hole must provide at least a 2-inch horizontal clearance around the pile for the full length of the hole. Provide vertical clearance at the tip of the pile as shown. Provide spacers if necessary. Ream or enlarge holes to provide the required clearance.

Before placing concrete, the pile must be secured in place and must not be suspended from a crane or other mobile equipment.

Maintain clearance and alignment of the pile in the hole while placing concrete.

49-4.03D Placing Concrete

Section 49-4.03D applies if placing concrete in a dry or dewatered hole.

Section 51-1.03D(3) does not apply to steel soldier piling.

Drilled holes must be clean and free of debris before concrete is placed.

Concrete must be directed to the bottom of the hole and not allowed to strike the sides of the hole. Placing concrete must not result in disturbance or caving of the hole. If necessary to prevent disturbance, use adjustable length pipes or tremie tubes to direct concrete to the bottom of the hole.

If temporary casing is used, remove temporary casing during concrete placement. Maintain the concrete within the casing at a level required to maintain a stable hole, but not less than 5 feet above the bottom of the casing, to prevent displacement of the concrete.

49-4.03E Placing Concrete Under Slurry

Section 49-4.03E applies if placing concrete under slurry.

Carefully place concrete in a compact, monolithic mass, using a method that prevents washing of the concrete. Do not vibrate the concrete.

The delivery system must consist of two tremie tubes, one on each side of the soldier pile, fed by one or more concrete pumps. The tremie tubes must be watertight steel tubes with sufficient rigidity to keep the tube ends in the mass of concrete placed for the full period of placement.

Do not allow concrete to fall into the groundwater or drilling slurry during concrete placement. Cap each delivery tube with a watertight cap or plug each tube above the slurry level with a tight-fitting moving plug

that expels the slurry from the tubes as the tubes are charged with concrete. The caps or plugs must be designed to release as the tubes are charged.

Extend each tremie tube to the bottom of the hole before charging the tube with concrete. After charging the tube with concrete, induce the flow of concrete through the tube by slightly raising the discharge end.

During concrete placement:

1. Embed the tip of the delivery tube within 6 inches of the bottom of the hole until 10 feet of concrete has been placed. Maintain embedment of the tip at least 10 feet below the top surface of the concrete.
2. Do not rapidly raise or lower the delivery tube.

If temporary casing is used, remove temporary casing from the hole during concrete placement. Maintain the concrete within the casing at the level required to prevent intrusion of groundwater, slurry, or soil, in the concrete but not less than 5 feet above the bottom of the casing until you reach the limits of concrete placement. Withdrawal of the casing must not cause contamination of the concrete with slurry.

Remove scum, laitance, and slurry-contaminated concrete from the top of the pile. Dispose of material resulting from placing concrete under slurry.

49-4.04 PAYMENT

Not Used

^^

51 CONCRETE STRUCTURES

04-15-22

Add to the beginning of section 51-1.01C(1):

04-19-19

If ordered, submit concrete form design and materials data for each forming system.

Replace section 51-1.01C(5) with:

04-17-20

51-1.01C(5) Drill and Bond Dowel—Chemical Adhesive

For each lot or batch of chemical adhesive used for drill and bond dowel chemical-adhesive systems, submit the following:

1. Certificate of compliance, including the material name and lot or batch number
2. Manufacturer's installation procedures, including the minimum cure time
3. SDS

For each chemical adhesive, submit 1 test sample for every 100 cartridges or fraction thereof to be used. The test sample must consist of 1 cartridge of chemical adhesive, 1 mixing nozzle, and 1 retaining nut. Submit test samples to METS at least 25 days before use.

Each test sample must clearly and permanently show the following:

1. Manufacturer's name
2. Material name
3. Lot or batch number
4. Expiration date
5. Evaluation report number
6. Directions for use
7. Storage requirements
8. Warnings or precautions required by State and federal laws and regulations

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

04-16-21

Before the testing, clean the test area by sweeping and removing debris.

Add between the 4th and 5th paragraphs of section 51-1.01D(3)(b)(ii):

04-16-21

Concrete roadway surfaces on the bridge deck and approach slabs must comply with the following smoothness requirements:

1. Profile trace having no high points over 0.02 foot
2. Profile count of 5 or less in any 100-foot section for portions within the traveled way
3. Surface not varying more than 0.02 foot from the lower edge of a 12-foot-long straightedge placed transversely to traffic

04-16-21

Delete the 6th paragraph of section 51-1.01D(3)(b)(ii).

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

10-15-21

After deck surfaces and approach slabs have been textured, the Engineer performs friction testing of the concrete surfaces under California Test 342. Allow 25 days for the Department to schedule for coefficient of friction testing.

Add to the end of section 51-1.01D(3):

04-17-20

51-1.01D(3)(c) Drill and Bond Dowel—Chemical Adhesive

The Department will verify the chemical adhesive used in the drill and bond dowel chemical adhesive system is chemically consistent with the chemical adhesive material on the Authorized Materials List.

Add to the end of section 51-1.02B:

10-18-19

Concrete for concrete bridge decks or PCC deck overlays must contain:

1. Polymer fibers. Each cubic yard of concrete must contain at least 1 pound of microfibers and at least 3 pounds of macrofibers.
2. Shrinkage reducing admixture. Each cubic yard of concrete must contain at least 3/4 gallon of a shrinkage reducing admixture. If you use the maximum dosage rate shown on the Authorized Material List for the shrinkage reducing admixture, your submitted shrinkage test data does not need to meet the shrinkage limitation specified in section 90-1.02A.

Replace section 51-1.02D with:

04-17-20

51-1.02D Rapid Strength Concrete

For bridge decks or PCC deck overlays:

1. RSC must have a minimum 28-day compressive strength of 4,500 psi
2. RSC must contain at least 675 pounds of cementitious material per cubic yard

10-16-20

3. If your RSC shrinkage test results are 0.024 percent or less without the use of a shrinkage reducing admixture:

04-17-20

   3.1 Use of shrinkage reducing admixture is not required
   3.2 Fibers are not required
4. If you use the maximum dosage rate shown on the Authorized Material List for shrinkage reducing admixture, your shrinkage test results must be 0.032 percent or less

RSC must have a minimum 28-day compressive strength of 4,000 psi.

If you use chemical admixtures or SCMs, the same proportions must be used when testing.

If you use aggregate that is not on the Authorized Material List for innocuous aggregate, the cement in your proposed mix design must comply with one of the following:

1. Any hydraulic cement, with or without any proposed SCM, must have an expansion ratio of less than 0.10 percent when tested with glass aggregate under ASTM C1260. Test specimens must be prepared using proportions of ingredients under ASTM C441.
2. For Portland cement, the quantity of SCM in your proposed mix design must satisfy equation 1 of section 90-1.02B(3).

The specifications for a reduction in the operating range and contract compliance for cleanness value and sand equivalent specified in section 90-1.02C(2) and section 90-1.02C(3) for aggregate, do not apply to RSC used for a bridge element.

Replace the 1st paragraph of section 51-1.02G with:

10-15-21

Grout must consist of portland cement or portland limestone cement and water, with a water content of at most 4 gallons per 94 pounds of cement.

Replace the 1st paragraph of section 51-1.02H with:

04-17-20

Chemical adhesives for bonding dowels must be on the Authorized Material List for chemical adhesives and must be appropriate for the installation conditions of the project.

10-18-19

Delete the 5th paragraph of section 51-1.03C(2)(b).

Replace section 51-1.03D(2) with:

10-16-20

51-1.03D(2) Concrete Bridge Decks and Diaphragms

For decks on structural steel, install cross frames the entire width of the bridge before placing the deck concrete.

For concrete decks placed on bridges composed of continuous steel girders, place the portion of deck over the supports last.

For bridges composed of simple span PC concrete girders made continuous, place the deck (1) at least 5 days after placing the intermediate diaphragms or (2) after intermediate diaphragm concrete has attained a concrete compressive strength of at least 3,000 psi. Place end diaphragms with the portion of the deck over the supports last.

For bridges composed of simple span PC concrete girders not made continuous, place the deck (1) at least 5 days after placing the intermediate and end diaphragms or (2) after diaphragm concrete has attained a concrete compressive strength of at least 3,000 psi.

Deck closure pours must comply with the following:

1. During primary deck placement and for at least 24 hours after completing the deck placement, reinforcing steel protruding into the closure space must be free from any connection to reinforcing steel, concrete, forms, or other attachments of the adjacent structure.
2. Closure pour forms must be supported from the superstructure on both sides of the closure space.

Replace the 1st paragraph of section 51-1.03E(1) with:

10-16-20

Where shown, paint the structure name, bridge number, year constructed, and other bridge identification information. Painting concrete must comply with section 78-4.03C(3).

Bridge identification on the bridge barrier must comply with section 83-1.03D.

Bridge identification on the bridge substructure must be (1) painted at each structure approach facing and (2) visible to approaching traffic. At bents or piers, paint identification 10 feet above roadway finish grade elevation or water surface elevation.

Add to the end of section 51-1.03E(1):

04-17-20

Repair rejected holes, that will not be encased in concrete, with bonding material complying with section 51-1.02C.

Replace the 2nd paragraph of section 51-1.03E(3) with:

04-17-20

If reinforcement is encountered during drilling before the specified depth is attained, notify the Engineer. Unless coring through the reinforcement is authorized. Drill a new hole adjacent to the rejected hole to the depth shown.

Replace section 51-1.03E(5) with:

04-17-20

51-1.03E(5) Drill and Bond Dowel—Chemical Adhesive

Install dowels for the drill and bond dowel chemical adhesive system under the manufacturer's instructions. When installing dowels in new concrete, install after the concrete has cured for at least 28 days.

Drill the holes without damaging the adjacent concrete. Remove all loose dust and concrete particles from the hole and protect the hole from deleterious materials until the anchor is installed.

If reinforcement is encountered during drilling before the specified depth is attained, notify the Engineer. Unless coring through the reinforcement is authorized. Drill a new hole adjacent to the rejected hole to the depth shown.

Immediately after inserting the dowel into the chemical adhesive, support the dowel as necessary to prevent movement until the chemical adhesive has cured the minimum time specified in the manufacturer's instructions. Dowels must not be adjusted by bending. The adhesive must be fully cured before the dowel is put into service.

Replace dowels that fail to bond or are damaged.

Replace section 51-1.03F(4) with:

10-15-21

51-1.03F(4) Class 2 Surface Finish

Where a Class 2 surface finish is described:

1. Apply an ordinary surface finish to the concrete surface.
2. Abrasive blast the surface to a rough texture and then thoroughly wash the surface with water.
3. Pneumatically apply a mortar coat approximately 1/4 inch thick in at least 2 passes to the damp surface. The coating must firmly bond to the concrete surface.

The mortar coat must consist of either (1) sand, portland cement or portland limestone cement, and water, mechanically mixed before entering the nozzle or (2) premixed sand and cement, with water added before leaving the nozzle. The proportion of cement to sand must be at least 1 to 4. Use sand with a grading suitable for the work.

You may substitute cementitious material complying with section 90 for portland cement or portland limestone cement. You may use admixtures specified in section 90 if authorized.

Do not mortar coat areas where bridge name or other designations are to be painted.

The coating surface must be (1) uniform without unsightly bulges, depressions, or other imperfections and (2) as left by the nozzle. Protect the coating from damage and keep it damp for 3 days after placing. Remove and replace loose areas of coating.

Where a Class 2 surface finish is described for a pedestrian undercrossing, use silica sand and white portland cement or white portland limestone cement.

Replace the 2nd paragraph of section 51-1.03H with:

10-18-19

Cure the top surface of bridge decks by (1) misting and (2) the water method using a curing medium under section 90-1.03B(2). After strike-off, immediately and continuously mist the deck with an atomizing nozzle that forms a mist and not a spray. Continue misting until the curing medium has been placed and the application of water for the water method has started. At the end of the curing period, remove the curing medium and apply curing compound on the top surface of the bridge deck during the same work shift under section 90-1.03B(3). The curing compound must be curing compound no. 1.

10-18-19

Delete the 4th paragraph of section 51-1.03H.

Add to section 51-1.03:

10-19-18

51-1.03J Temporary Decking

If you are unable to complete bridge reconstruction activities before the bridge is to be opened to traffic, furnish and maintain temporary decking under section 48-4 until that portion of the work is complete.

Add to the end of section 51-2.01A(1):

10-18-19

The specifications for (1) shrinkage in section 90-1.02A, (2) shrinkage reducing chemical admixture in section 51-1.02B, and (3) polymer fibers in section 51-1.02B do not apply to concrete used to fill blocked-out recesses for joint seal assemblies.

Replace section 51-2.02B with:

04-16-21

51-2.02B Type A and AL Joint Seals

51-2.02B(1) General

51-2.02B(1)(a) Summary

Section 51-2.02B includes specifications for installing Type A and AL joint seals.

Type A and AL joint seals consist of field-mixed silicone sealant placed in grooves in the concrete.

51-2.02B(1)(b) Definitions

Reserved

51-2.02B(1)(c) Submittals

At least 15 days before delivery to the job site, submit a certificate of compliance, SDS, and manufacturer's instructions for:

1. Storing and installing:
   1.1. Joint seals.
   1.2. Backer rods. Include manufacturer data sheet verifying compatibility with the joint sealant.
2. Storing and applying primer, if required by the manufacturer.

51-2.02B(1)(d) Quality Assurance

Reserved

51-2.02B(2) Materials

Reserved

51-2.02B(2)(b) Type A and AL Joint Seal

Type A and AL joint seals must be on the Authorized Materials List for type A and AL joint seals.

Label sealant containers or provide identification tickets for tanks of 2-component material. Include the following:

1. Material designation
2. Lot number
3. Manufacturer's name
4. Date of manufacture and expiration

51-2.02B(2)(c) Backer Rods

Polyethylene foam or rod stock for retaining sealant must be commercial quality with a continuous, impervious glazed surface.

51-2.02B(3) Construction

51-2.02B(3)(a) General

Do not use sealant or adhesive that has skinned over or cannot be redispersed by hand stirring.

Do not use liquid components that have been exposed to air for more than 24 hours.

Abrasive blast clean joints and remove foreign material with high-pressure air immediately before installing seals. Protect waterstops during cleaning.

Joint surfaces must be surface dry when seals are installed.

Place the sealant using equipment that mixes and extrudes the sealant into the joint. The equipment and the sealant placement must be as recommended by the sealant manufacturer.

51-2.02B(3)(b) Type A Seal Preparation

For Type A joint seals, do not start cutting grooves until joint material is delivered to the job site.

Concrete saws for cutting grooves in the concrete must have diamond blades with a minimum thickness of 3/16 inch. Cut both sides of the groove simultaneously for a minimum 1st pass depth of 2 inches. The completed groove must have:

1. Top width within 1/8 inch of the width shown or ordered
2. Bottom width not varying from the top width by more than 1/16 inch for each 2 inches of depth
3. Uniform width and depth

Cutting grooves in existing decks includes cutting any conflicting reinforcing steel.

Saw cutting grooves is not required at the following locations:

1. Joints armored with metal
2. Joints in curbs, sidewalks, barriers, and railings, if grooves are formed to the required dimensions
3. Existing joints where Type A seals are to be installed

Remove all material from the deck joint to the bottom of the saw cut. Remove foreign material from joints in curbs, sidewalks, barriers, railings, and deck slab overhangs.

Repair spalls, fractures, or voids in the grooved surface at least 64 hours before installing the joint seal. Bevel the lips of saw cuts by grinding.

The Engineer may order you to saw cut grooves at existing joints to be sealed with a Type A joint seal. This work is change order work.

51-2.02B(3)(c) Type AL Seal Preparation

For Type AL joint seals, remove expanded polystyrene and foreign material to the depth of the joint seal. Grind or edge the lip of the joint.

51-2.02B(4) Payment

Not Used

Replace the 2nd paragraph of section 51-4.01C(1) with:

04-19-19

For PC PS concrete girders and deck panels, submit an erection work plan. The work plan must be signed by an engineer who is registered as a civil engineer in the State and include procedures, details, and sequences for:

1. Unloading
2. Lifting
3. Erecting
4. Temporary bracing installation

Replace the 1st paragraph of section 51-4.01C(2)(a) with:

04-19-19

Submit shop drawings for PC concrete members to the OSD Documents Unit unless otherwise specified.

Replace *Reserved* in section 51-4.01C(2)(e) with:

04-19-19

For PC deck panels, shop drawings must include:

1. Panel materials, shapes, and dimensions.
2. Deck panel layout identifying the locations of each panel.
3. Reinforcing, joint, and connection details.
4. Complete details of the methods, materials, and equipment used in prestressing and precasting work.
5. Type of texture and method of forming the textured finish.

6. Methods and details for lifting, bracing, and erection.
7. Method of support and grade adjustment.
8. Methods of sealing against concrete leaks.

Replace the 2nd paragraph of section 51-4.02B with:

04-19-19

Handle, store, transport, and erect PC members in a position such that the points of support and directions of the reactions with respect to the member are approximately the same as when the member is in its final position.

Replace *Reserved* in section 51-4.02D(7) with:

04-19-19

Clearly label the top surface of each panel with the word *TOP* as shown on the deck panel layout using waterproof paint or other authorized means.

Apply a coarse texture to at least 90 percent of the deck panel top surface area by brooming with a stiff bristled broom or by other suitable devices that results in uniform scoring parallel with the prestressing strands. The top surface texture must have a maximum 1/8-inch texture.

Each camber strip must:

1. Consist of high density expanded polystyrene with a minimum compressive strength of 55 psi.
2. Consist of a single layer and extend continuously under each deck panel.
3. Achieve a height that accounts for roadway profile, cross slope, and girder camber.
4. Have 1/4-inch v-notches or 1/2 by 1/2-inch slots cut into the top surface on 4-foot centers.

Camber strip dimensions must comply with the following table:

Polystyrene Camber Strip Dimensions

Height (H) (inches)	Width (W) (inches)
1 to 2.5	1.5
Greater than 2.5 and less than or equal to 3.5	1.75
Greater than 3.5 and less than or equal to 4	2

Chemical adhesive must be suitable for use with concrete and polystyrene.

For the concrete deck pour, the aggregate must comply with the 1/2-inch maximum or the 3/8-inch maximum combined aggregate gradation specified in section 90-1.02C(4)(d).

Add between the 5th and 6th paragraphs of section 51-4.03B:

10-19-18

Erect steel or PC girders onto the supporting concrete, such as bent caps or abutments, after the concrete attains a compressive strength of 2,880 psi or 80 percent of the specified strength, whichever is greater.

Replace *Reserved* in section 51-4.03G with:

04-19-19

Construct the deck panel system in the following sequence:

1. After girders and diaphragms are in place, place each polystyrene camber strip along the top of each girder. Apply a continuous bead of chemical adhesive to the top and bottom of each camber strip to prevent gaps between the camber strip and concrete members.

2. Place each deck panel as shown on the deck panel layout such that each panel bears uniformly on the camber strips.
3. Abrasive blast clean deck panel and girder surfaces before placing deck reinforcement. Remove all surface laitance, curing compound, and other foreign materials. Thoroughly clean under the edges of each panel to ensure removal of construction debris before the stage 1 deck pour.
4. Place deck reinforcement.
5. Place deck concrete in a two-stage continuous pour:
   5.1. Place and vibrate stage 1 concrete over the girders by completely filling the area between the camber strips in from 15 to 30 feet longitudinal sections ahead of the stage 2 concrete deck pour. Check slots or holes in camber strips to ensure removal of air voids and full consolidation during concrete placement.
   5.2. Place stage 2 concrete deck over stage 1 concrete and deck panels as to not result in a cold joint between the two stages.

If required, install temporary bracing between the ends of each deck panel to prevent transverse panel movement that could lead to loss of bearing on the camber strips.

Loads placed on deck panels during construction must not exceed 50 psf.

Replace the row for *Apparent elongation* in the table in the 2nd paragraph of section 51-5.02B with:

04-19-19

Apparent elongation (max, percent)	ASTM D4632	35

Replace the 1st paragraph of section 51-5.02F with:

04-15-22

Steel components of abutment ties must comply with section 75-1.

Replace the 3rd paragraph of section 51-5.02F with:

04-15-22

Steel angles, plates, and bars at concrete barrier joints must comply with section 75-1.

Replace section 51-8 with:

10-15-21

51-8 HINGE TRANSVERSE SHEAR KEY

51-8.01 GENERAL

Section 51-8 includes specifications for fabricating hinge transverse shear keys.

51-8.02 MATERIALS

Hinge transverse shear keys must consist of HSS tubular section, HS threaded rods, nuts, washers, angles, mechanical expansion anchors, building paper, polyethylene, and thread-locking system.

04-15-22

HSS tubular section must comply with the specifications for steel structural tubing in section 55-1.02D(1).

10-15-21

HS threaded rods, nuts, and washers must comply with section 55-1.02D(1).

Angles must comply with section 55-1.02D(3).

Mechanical expansion anchors must comply with section 75-3.02C.

Building paper must be commercial-quality, 30-pound asphalt felt.

Polyethylene must have a compressive strength of at least 10 psi with a deflection between 5 percent and 15 percent when tested under ASTM D3575, Suffix B.

Thread-locking systems must comply with section 75-3.02B.

Galvanize under section 75-1.02B. After galvanizing, alterations resulting in new exposed surfaces, including holes or cut ends, must be coated as specified for repairing damaged galvanized surfaces under section 75-1.02B.

51-8.03 CONSTRUCTION

Not Used

51-8.04 PAYMENT

Not Used

^^

52 REINFORCEMENT

10-15-21

Replace the definition for *affected zone* of section 52-1.01B with:

10-16-20

Any weld and the greater of 1 inch or 1 bar diameter adjacent to the weld, or portion of the reinforcing bar where any properties of the bar, including the physical, metallurgical, or material characteristics, have been changed by either:

1. Fabrication or installation of a splice
2. Manufacturing process for headed bar reinforcement

Add to section 52-1.01B:

10-16-20

group: Set of 5 or fewer consecutive lots after the 1st lot.

Replace the 2nd paragraph of section 52-1.01C(3) with:

10-16-20

Submit the following:

1. Copy of the certified mill test report for each heat and size of reinforcing steel showing:
   1.1. Physical and chemical analysis
   1.2. Manufacturing location
2. Two copies of a list of all reinforcement before starting reinforcement placement

Replace the 1st paragraph of section 52-1.02B with:

10-16-20

Reinforcing bars must be deformed bars complying with ASTM A706/A706M, Grade 60, except you may use:

1. Deformed bars complying with ASTM A615/A615M, Grade 60, in:
   1.1. Junction structures
   1.2. Sign and signal foundations
   1.3. Minor structures
   1.4. Mechanically-stabilized-embankment concrete panels
2. Deformed or plain bars complying with ASTM A615/A615M, Grade 40 or 60, in:

2.1. Slope and channel paving

10-15-21

2.2. Concrete barrier Type 60

10-16-20

3. Plain bars for spiral or hoop reinforcement in structures and concrete piles

Add to the list in the 2nd paragraph of section 52-1.02B:

10-16-20

10. Drainage inlets

Replace section 52-1.02E with:

04-17-20

52-1.02E Dowels

52-1.02E(1) General

Reinforcing steel dowels must be deformed bars complying with section 52-1.02B.

Threaded rods used as dowels must comply with section 75-1.02A.

52-1.02E(2) Dowels for Drill and Bond Dowel—Chemical Adhesive

Dowels for drill and bond dowel chemical-adhesive systems must be one of the following:

1. Threaded rods complying with ASTM F1554, Grade 36
2. Deformed bar reinforcement complying with section 52-1.02B
3. Stainless steel reinforcement complying with ASTM A955/A955M, Grade 60, UNS Designation S31653, S32304, S32205, or S31803

Replace the 2nd paragraph of section 52-2.02A(3)(c) with:

10-16-20

Submit a certificate of compliance for the patching material and one of the following:

1. Certification that the patching material is compatible with the epoxy powder to be used.
2. Copy of the patching material container label showing the patching material is compatible with the epoxy powder to be used.

10-16-20

Delete the 3rd paragraph of section 52-2.02A(3)(c).

Replace the 1st paragraph of section 52-2.02A(4)(b) with:

10-16-20

Test samples must comply with the requirements for coating thickness specified in ASTM A775/A775M for bar reinforcement or ASTM A884/A884M Class A, Type 1 for wire reinforcement, as follows:

1. If both test samples comply with the requirements, the Department accepts all epoxy-coated reinforcement represented by the test.
2. If both test samples do not comply with the requirements, the Department performs 1 additional test on the reinforcement of the same size from the same shipment. This additional test consists of testing 2 test samples, randomly selected by the Engineer, for coating thickness. If both test samples do not comply with the specified requirements, the Department rejects all epoxy-coated reinforcement represented by the test.

Replace the 1st paragraph of section 52-2.03A(4)(b) with:

10-16-20

Test samples must comply with the requirements for coating thickness specified in ASTM A934/A934M for bar reinforcement or ASTM A884/A884M Class A, Type 2 for wire reinforcement, as follows:

1. If both test samples comply with the requirements, the Department accepts all epoxy-coated reinforcement represented by the test.
2. If both test samples do not comply with the requirements, the Department performs 1 additional test on the reinforcement of the same size from the same shipment. This additional test consists of testing 2 test samples, randomly selected by the Engineer, for coating thickness. If both test samples do not comply with the specified requirements, the Department rejects all epoxy-coated reinforcement represented by the test.

Replace the 2nd paragraph of section 52-5.01D(3) with:

10-16-20

After receiving notification that lots are ready for QC testing, the Engineer randomly selects department acceptance test samples and places tamper-proof markings or seals on the test samples. Test samples must be removed from:

1. First QC lot
2. Each subsequent group of QC lots

Replace the introductory clause in the 2nd paragraph of section 52-5.01D(4)(b) with:

10-16-20

Headed bar reinforcement test samples are tested for necking under Necking Option I as specified in CT 670 and tensile tested:

Replace the 2nd paragraph of section 52-5.02 with:

10-16-20

At fracture, headed bar reinforcement must comply with:

1. Tensile requirements of ASTM A970/A970M, Class A.
2. Necking requirements under CT 670 by showing signs of visible necking in the reinforcing bar. The visible necking must be located outside the affected zone.

Replace section 52-6.01B with:

10-16-20

52-6.01B Definitions

Reserved

Replace item 10.2. in the list in the 2nd paragraph of section 52-6.01C(4)(b) with:

10-16-20

10.2. Strain measured on the side without the fracture

Replace item 6 in the list in the 1st paragraph of section 52-6.01C(6)(c) with:

10-16-20

6. Manufacturer's QC Process Manual that details the production process and the frequency of QC measures

Replace the 2nd and 3rd paragraphs of section 52-6.01D(2)(b) with:

10-16-20

Each operator must prepare 4 prequalification splice test samples for each bar size of each splice coupler model type and position to be used.

Splice test samples for operator and procedure prequalification must have been prepared and tested no more than 2 years before the submittal of the splice prequalification report.

Replace the 1st paragraph of section 52-6.01D(3)(b) with:

10-16-20

After completing the ultimate butt splices in a lot, including any required epoxy coating, notify the Engineer that the splices are ready for testing. The Engineer selects splice test samples at the job site or PC plant. For hoops, the Engineer selects splice test samples from the completed lot at the job site, PC plant, or fabrication plant.

Replace the 4th paragraph of section 52-6.01D(4)(b)(iv) with:

10-16-20

For splices made vertically at the jobsite in or above their final positions for bar reinforcement of columns or CIP concrete piles, you may prepare test samples as specified for service splice test samples in section 52-6.01D(4)(b)(iii) if authorized. Test the splice test samples as specified for ultimate butt splice test samples.

Replace the 1st paragraph of section 52-6.01D(5) with:

10-16-20

The Department tests and accepts service splices and ultimate butt splices as specified for QC testing in section 52-6.01D(4).

Replace the 3rd paragraph of section 52-6.02B(1) with:

10-16-20

Mechanical couplers must be on the Authorized Material List for steel reinforcing couplers. Resistance welding fabricators must be on the Authorized Material List for resistance welding fabricators.

Replace the introductory clause in the 3rd paragraph of section 52-6.03B with:

10-16-20

For uncoated and galvanized reinforcing bars complying with ASTM A615/A615M, Grade 60, ASTM A706/A706M, ASTM A1035/A1035M, or ASTM A767/A767M, Class 1, the length of lap splices must be at least:

Replace the introductory clause in the 4th paragraph of section 52-6.03B with:

10-16-20

For epoxy-coated reinforcing bars and alternatives to epoxy-coated reinforcing bars complying with ASTM A775/A775M, ASTM A934/A934M, or ASTM A1055/A1055M, the length of lap splices must be at least:

Replace the 3rd through 5th paragraphs of section 52-6.03C(4) with:

10-16-20

Make butt welds with multiple weld passes without an appreciable weaving motion using a stringer bead having a width at most 2.5 times the diameter of the electrode when using shielded metal arc welding. Remove slag between each weld pass. Weld reinforcement must not exceed 0.16 inch in convexity.

Electrodes for welding must have a minimum CVN impact value of 20 ft-lb at 0 degrees F.

For welding of bars complying with ASTM A 615/A 615M, Grade 40 or 60, the requirements of Table 7.2 of AWS D1.4 are superseded by the following: The minimum preheat and interpass temperatures must be 400 degrees F for Grade 40 bars and 600 degrees F for Grade 60 bars. Immediately after completing the welding, cover at least 6 inches of the bar on each side of the splice with insulated wrapping to control the rate of cooling. The insulated wrapping must remain in place until the bar has cooled below 200 degrees F.

^^

53 SHOTCRETE

10-18-19

Replace the 1st paragraph of section 53-1.01A with:

10-18-19

Section 53-1 includes general specifications for applying shotcrete.

Replace section 53-1.01B with:

10-18-19

53-1.01B Definitions

shotcrete: Concrete pneumatically projected at high velocity onto a surface to achieve compaction.

dry-mix shotcrete: Dry aggregates and cementitious materials are mixed before entering the delivery hose. Mixing water is added at the nozzle.

wet-mix shotcrete: Dry aggregates, cementitious materials, and water are mixed before entering the delivery hose. If used, accelerator may be added at the nozzle.

rebound: Aggregate coated with cement paste that ricochets away from the surface against which the shotcrete is being applied.

Replace *Reserved* in section 53-1.01D with:

10-18-19

Air pressure and shotcrete supply at the nozzle must be uniform and provide a steady, continuous flow of shotcrete. Inspect nozzles and nozzle body components before each work shift. Replace nozzles and components under the manufacturer's instructions.

Replace the introductory clause to the list in the 2nd paragraph of section 53-1.02 with:

10-18-19

For dry-mix shotcrete:

Replace the introductory clause to the list in the 3rd paragraph of section 53-1.02 with:

10-18-19

For wet-mix shotcrete:

Replace the 1st sentence in item 2 in the list in the 3rd paragraph of section 53-1.02 with:

10-18-19

2. You may substitute a maximum of 40 percent coarse aggregate for the fine aggregate.

Replace section 53-1.03B with:

10-18-19

53-1.03B Preparing Receiving Surfaces

Evenly grade the receiving surface before applying shotcrete. No point on the graded slope may be above the slope plane shown.

Thoroughly compact the receiving surface. The receiving surface must contain enough moisture to provide a firm foundation and prevent excess absorption of water from the shotcrete. The receiving surface must be free of surface water.

Forms must comply with section 51-1.03C(2). Reinforce, secure, and brace forms to maintain form alignment against distortion from shotcrete operations. Install and maintain alignment control means at corners or offsets not established by forms or shotcrete operations.

Use ground wires to establish thickness, surface planes, and finish lines. Use temporary coverings to protect adjacent surfaces from the nozzle stream.

Replace section 53-1.03C with:

10-18-19

53-1.03C Applying Shotcrete

Dry-mix or wet-mix shotcrete must be applied by the nozzle.

Apply shotcrete using small circular motions of the nozzle while building the required thickness. Direct the nozzle perpendicular to the receiving surface with the nozzle held at such a distance to produce maximum consolidation and full encapsulation of the reinforcement. Shotcrete must completely encase reinforcement and other obstructions.

Apply shotcrete first in corners, voids, and areas where rebound or overspray cannot easily escape. Do not incorporate rebound or overspray in the work.

Before applying subsequent layers of shotcrete:

1. Allow shotcrete to stiffen sufficiently. Remove hardened overspray and rebound from adjacent surfaces, including exposed reinforcement.
2. Use a cutting rod, compressed air blowpipe, or other authorized methods to remove all loose material, overspray, laitance, or other deleterious materials that may compromise the bond of the subsequent layers of shotcrete.
3. Bring the receiving surface to a saturated surface-dry condition immediately before applying subsequent layer.

For dry-mix shotcrete:

1. Adjust air volume, material feed volume, and distance of the nozzle from the work as necessary to encase reinforcement.
2. Maintain uniform water pressure at the nozzle of at least 15 psi greater than the air pressure at the machine.
3. Do not use aggregate and cementitious materials that have been mixed for more than 45 minutes.

For wet-mix shotcrete:

1. Transport shotcrete under section 90-1.02G(3).
2. Apply ground wires at approximately 7-foot centers.

3. Select a slump range that will effectively encapsulate reinforcement within the work but not cause shotcrete to sag or slough during application.

Replace section 53-1.03D with:

10-18-19

53-1.03D Finishing Shotcrete

Apply shotcrete to the line and grade shown. Leave finished shotcrete surface as gun finish unless otherwise described.

Do not initiate cutting or finishing until the shotcrete has set sufficiently to avoid sloughing or sagging. The finished surface must be smooth and uniform for the type of work involved.

Remove and replace loose areas of shotcrete.

Cure shotcrete for at least 7 days by any of the methods specified in section 90-1.03B. If the curing compound method is used for a gun or roughened surface, apply the curing compound at twice the specified rate. If you add a coloring agent to the shotcrete and you use the curing compound method for curing the shotcrete, use curing compound no. 6.

Protect shotcrete under section 90-1.03C.

Replace the 2nd paragraph of section 53-1.04 with:

10-18-19

The Department does not pay for shotcrete applied outside the dimensions shown or to fill low areas of receiving surfaces.

Replace the paragraph of section 53-2.01A with:

10-18-19

Section 53-2 includes specifications for applying structural shotcrete. Structural shotcrete must be applied using wet-mix shotcrete.

Replace *qualifications* in item 1.1 in the list in the 1st paragraph of section 53-2.01C with:

10-18-19

certifications

Replace the paragraph of section 53-2.01D(2) with:

10-18-19

Nozzlemen performing the work must hold current ACI CPP 660.1-17 certification as a nozzleman for wet-mix shotcrete. Nozzlemen performing overhead shotcrete work must hold current qualifying ACI CPP 660.1-17 certification in the overhead shooting orientation for wet-mix shotcrete.

Replace the 2nd paragraph of section 53-2.01D(3) with:

10-18-19

Each nozzleman performing the work must construct 1 unreinforced test panel and 1 reinforced test panel for each proposed mix design. The test panel orientation must match the orientation of the work.

Replace the 1st sentence in the 1st paragraph of section 53-2.01D(4)(b) with:

10-18-19

Obtain at least four 3-inch-diameter test cores from each 50 cu yd, or portion thereof, of shotcrete applied.

Add between the 1st and 2nd paragraphs of section 53-2.01D(4)(b):

10-19-18

For soil nail walls, do not core through waler bars.

Replace section 53-2.02 with:

10-18-19

53-2.02 MATERIALS

Shotcrete must comply with the specifications for concrete in section 90-1.

Shotcrete must have a minimum compressive strength of 3,600 psi, unless otherwise described.

Mortar and alternative filler material must comply with section 60-3.05B(2).

10-18-19

Delete the 2nd paragraph of section 53-2.03.

Add between the 3rd and 4th paragraphs of section 53-2.03:

10-18-19

Before applying shotcrete, reinforcement must be:

1. Free from loose rust, oil, curing compound, overspray, or other material deleterious to the bond between concrete and steel.
2. Lapped separated by one of the following:
   2.1. Three times the diameter of the largest reinforcing bar.
   2.2. Three times the maximum size aggregate.
   2.3. Two inches, whichever is least, unless otherwise specified. Lapped bars must be in the same plane and parallel to the shooting direction.
3. Securely tied to minimize movement or vibration.

The temperature of reinforcement and receiving surfaces must be below 90 degrees F before applying shotcrete.

Apply the wet-mix shotcrete continuously removing accumulations of rebound and overspray using a compressed air blowpipe. Ensure the nozzleman and the blowpipe operator work together and the nozzleman does not get ahead of the blowpipe operator.

10-18-19

Delete the 4th paragraph of section 53-2.03.

Replace the 7th paragraph of section 53-2.03 with:

10-18-19

If a finish coat is used, clean the surface before applying the finish coat. Wash receiving surface with an air-water blast to remove all loose material, laitance, overspray, or other material that may compromise the bond of subsequent layers of shotcrete.

10-18-19

Delete the 8th paragraph of section 53-2.03.

Replace the 12th paragraph of section 53-2.03 with:

10-18-19

After removing field QC test cores, fill the holes with mortar or alternative filler material. If using mortar, apply mortar under section 51-1.03E(2). If using an alternative filler material, apply a bonding epoxy before placing the filler material. Apply the alternative filler material under the manufacturer's instructions.

^^

55 STEEL STRUCTURES

04-16-21

Replace the introductory clause in the 2nd paragraph of section 55-1.02E(7)(a) with:

04-16-21

Replace Table 4.2 of AWS D1.5 with the following table:

Replace the 3rd paragraph of section 55-1.02E(7)(a) with:

10-16-20

Dimensional details and workmanship for welded joints in tubular and pipe connections must comply with clause 10 of AWS D1.1.

^^

56 OVERHEAD SIGN STRUCTURES, STANDARDS, AND POLES

10-15-21

Replace section 56-1.01D(2)(b)(i) with:

04-19-19

56-1.01D(2)(b)(i) General

Perform NDT of steel members under AWS D1.1 and the requirements shown in the following tables:

Nondestructive Testing for Steel Standards and Poles

Weld location	Weld type	Minimum required NDT
Circumferential splices around the perimeter of tubular sections, poles, and arms	CJP groove weld with backing ring	100% UT or RT
Longitudinal seam	CJP or PJP groove weld	Random 25% MT
Longitudinal seam within 6 inches of a circumferential weld	CJP groove weld	100% UT or RT
Welds attaching base plates, flange plates, pole plates, or mast arm plates to poles or arm tubes	CJP groove weld with backing ring and reinforcing fillet	t≥ 1/4 inch: 100% UT and 100% MT t< 1/4 inch: 100% MT after final weld pass
	External (top) fillet weld for socket-type connections	100% MT
Hand holes and other appurtenances	Fillet and PJP welds	MT full length on random 25% of all standards and poles
Longitudinal seam on the telescopic female end, designated slip-fit length plus 6 inches	CJP groove weld	100% UT or RT

NOTE: t = pole or arm thickness

Nondestructive Testing for Overhead Sign Structures

Weld location	Weld type	Minimum required NDT
Base plate to post	CJP groove weld with backing ring and reinforcing fillet	100% UT and 100% MT
Base plate to gusset plate	CJP groove weld	100% UT
Circumferential splices of pipe or tubular sections	CJP groove weld with backing ring	100% UT or RT
Split post filler plate welds	CJP groove weld with backing bar	100% UT or RT
Longitudinal seam weld for pipe posts	CJP groove weld	t < 1/4 inch: 25% MT t ≥ 1/4 inch: 25% UT or RT
	PJP groove weld	Random 25% MT
Chord angle splice weld	CJP groove weld with backing bar	100% UT or RT
Truss vertical, diagonal, and wind angles to chord angles	Fillet weld	Random 25% MT
Upper junction plate to chord (cantilever type truss)	Fillet weld	Random 25% MT
Bolted field splice plates (tubular frame type)	CJP groove weld	100% UT and 100% MT
Cross beam connection plates (lightweight extinguishable message sign)	Fillet weld	Random 25% MT
Arm connection angles (lightweight extinguishable message sign)	Fillet weld	100% MT
Mast arm to arm plate (lightweight extinguishable message sign)	CJP groove weld with backing ring	t ≥ 1/4 inch: 100% UT and 100% MT t < 1/4 inch: 100% MT after final weld pass
Post angle to post (lightweight extinguishable message sign)	Fillet weld	100% MT
Hand holes and other appurtenances	Fillet and PJP welds	MT full length on random 25% of all sign structures

NOTE: t = pole or arm thickness

Replace section 56-1.01D(2)(b)(ii) with:

04-19-19

56-1.01D(2)(b)(ii) Ultrasonic Testing

10-16-20

For UT of welded joints with any members less than 5/16-inch thick or tubular sections less than 24 inches in diameter, the acceptance and repair criteria must comply with Clause 10.26.1.1 of AWS D1.1.

10-15-21

When performing UT, use an authorized procedure under AWS D1.1, Annex O.

10-16-20

For UT of other welded joints, the acceptance and repair criteria must comply with Table 8.3 of AWS D1.1 for cyclically loaded nontubular connections.

04-16-21

After galvanization, perform additional inspection for toe cracks along the full length of all CJP groove welds at multisided tube-to-transverse base plate connections using UT.

Replace section 56-2 with:

04-16-21

56-2 OVERHEAD SIGN STRUCTURES

56-2.01 GENERAL

56-2.01A Summary

Section 56-2 includes specifications for constructing overhead sign structures.

Furnishing sign structures includes furnishing anchor bolt assemblies, removable sign panel frames, sign structure hardware, and fabricated sign structures at the job site, ready for installation, including welding and painting or galvanizing as required.

Installing sign structures includes installing anchor bolt assemblies, removable sign panel frames and sign panels, and performing any welding and painting or galvanizing required during installation.

Types of overhead sign structures include:

1. Truss
2. Versatile truss
3. Bridge mounted
4. Tubular

56-2.01B Definitions

Reserved

56-2.01C Submittals

56-2.01C(1) General

Allow 30 days for the Department's review.

56-2.01C(2) Shop Drawings

Submit 2 copies of shop drawings for sign structures. Include:

1. Sign panel dimensions
2. Span lengths
3. Post heights
4. Anchorage layouts
5. Proposed splice locations
6. Snugging and tensioning pattern for anchor bolts and HS bolted connections
7. Details for permanent steel anchor bolt templates
8. Details of clips, eyes, or removable devices for preventing damage to the finished galvanized or painted surfaces used for:
    8.1. Securing the sign during shipping
    8.2. Lifting and moving during erection

56-2.01C(3) Quality Control Program

Submit a QC program for sign structures. Include methods, equipment, and personnel to be used during fabrication and installation.

Submit the QC program with the shop drawing submittal.

56-2.01D Quality Assurance

56-2.01D(1) General

Reserved

56-2.01D(2) Quality Control

56-2.01D(2)(a) General

Reserved

56-2.01D(2)(b) Nondestructive Testing

Reserved

56-2.01D(2)(c) Walkway Safety Railing

The assembled and raised walkway safety railing must have less than 1 inch of wobble when a 50-lb horizontal load is applied alternating each way at the top center of each railing section.

56-2.01D(3) Department Acceptance

The Department inspects structural materials for sign structures at the fabrication site. You must:

1. Notify the Engineer when the materials are delivered to the fabrication site
2. Allow at least 10 days after delivery of the material for inspection before starting fabrication

56-2.02 MATERIALS

56-2.02A General

Materials must comply with section 55.

Do not use weathering steel.

56-2.02B Bars, Plates, Shapes, and Structural Tubing

56-2.02B(1) General

Materials must comply with the requirements shown in the following table:

Structural Steel

Material	Specification
Bars and plates	ASTM A36/A36M; ASTM A709/A709M, Grade 36 or 50; ASTM A572/A572M, Grade 42 or 50; or ASTM A1043/A1043M, Grade 36 or 50
Bars and plates for overhead versatile truss	ASTM A709/A709M, Grade 50; ASTM A1043/A1043M, Grade 50; ASTM A572/A572M, Grade 50; or ASTM A945/A945M, Grade 50
Other open shapes	ASTM A36/A36M; ASTM A709/A709M, Grade 36 or 50; ASTM A992/A992M; ASTM A1043/A1043M, Grade 36 or 50; or ASTM A529/A529M, Grade 50
Other open shapes for overhead versatile truss	ASTM A709/A709M, Grade 50; ASTM A529/A529M, Grade 50; ASTM A572/A572M, Grade 50; ASTM A992/A992M; ASTM A1043/A1043M, Grade 50; or ASTM A913/A913M, Grade 50

Light fixture mounting channel must be continuous slot channel made from one of the following:

1. Steel complying with ASTM A1011/A1011M, Designation SS, Grade 33
2. Extruded aluminum of alloy 6063-T6 complying with ASTM B221 or B221M

Structural tubing and hollow structural sections must be structural steel complying with ASTM A500/A500M, Grade B or ASTM A1085.

Surface flatness after galvanizing must comply with ASTM A6/A6M for the following:

1. Base plates that are to come in contact with concrete, mortar, or washers and leveling nuts
2. Plates in high-strength bolted connections

56-2.02B(2) Charpy V-notch Impact

10-15-21

Steel components over 1/2-inch thick must comply with the CVN testing requirements for ASTM A709/A709M Grade 50 steel in section 55-1.02D(2) if they are shown as main tension members or are welded to members shown as main tension members. For HSS shapes, the thickness is the nominal wall thickness. For other shapes, the thickness is the largest of the nominal thicknesses of the member. HSS members complying with ASTM A1085 are exempt from this requirement.

56-2.02C Sheets

Sheets must be carbon steel complying with ASTM A1011/A1011M, Designation SS, Grade 33.

56-2.02D Bolted Connections

Bolts, nuts, and washers must comply with section 55-1.02D(1).

Components of HS bolts must comply with section 55 for high strength steel fastener assemblies unless the bolts are shown to be snug tight. Bolts, nuts, and washers for HS bolts shown to be snug tight must comply only with section 55-1.02D(1).

Anchor bolts must comply with ASTM F1554, Grade 55, weldable steel.

Use a permanent steel template to maintain the proper anchor bolt spacing.

Provide 1 top nut, 1 leveling nut, and 2 washers for the upper threaded portion of each anchor bolt.

56-2.02E Anchorages

Anchorages for bridge mounted sign structures must comply with the specifications for concrete anchorage devices in section 75-3.

56-2.02F Pipe Posts

Pipe posts must be welded or seamless steel pipes. Spiral seam welds are not allowed. The maximum ultimate tensile strength of pipe posts must not exceed 90 ksi. The maximum tensile yield strength of pipe posts must not exceed 70 ksi. Pipe posts having a yield strength of 50 ksi or more must comply with the Charpy V-Notch requirements in ASTM A1085/1085M.

Manufactured pipe posts must comply with one of the following:

1. API Specification 5L PSL2 Grades X52M or X52N, using nominal pipe sizes for threaded end pipe.
2. If the specified yield strength is 35 ksi or less:
   2.1. ASTM A53/A53M, Grade B
   2.2. ASTM A106/A106M, Grade B
   2.3. ASTM A1085/A1085M, Grade A
   2.4. API Specification 5L PSL1 or PSL2 Grades B, X42R or X42M, using nominal pipe sizes for threaded end pipe

You may fabricate pipe posts from steel complying with one of the following:

1. ASTM A572/A572M, Grade 50
2. ASTM A709/A709M, Grade 50
3. ASTM A1043/A1043M, Grade 50
4. ASTM A945/A945M, Grade 50
5. If the specified yield strength is 35 ksi or less:
   5.1. ASTM A36/A36M
   5.2. ASTM A709/A709M, Grade 36
   5.3. ASTM A572/A572M, Grade 42
   5.4. ASTM A1043/A1043M, Grade 36

56-2.02G Walkway Gratings

56-2.02G(1) General

Gratings must be the standard product of an established grating manufacturer.

56-2.02G(2) Steel Walkway Gratings

Steel walkway gratings must comply with the following:

1. Material for gratings must be structural steel complying with ASTM A1011/A1011M as specified for Designation CS, Type B or Designation SS, Grade 36, Type 1
2. For welded type gratings, each joint must be full resistance welded under pressure to provide a sound, completely beaded joint
3. For mechanically locked gratings:

3.1. Method of fabrication and interlocking of the members must be authorized
3.2. Fabricated grating must be equal in strength to the welded type

4. Gratings must be accurately fabricated and free from warps, twists, or defects affecting their appearance or serviceability including:
   4.1. Ends of all rectangular panels must be square
   4.2. Tops of the bearing bars and cross members must be in the same plane
   4.3. Gratings distorted by the galvanizing process must be straightened

56-2.02G(3) Aluminum Walkway Gratings

Aluminum walkway gratings must comply with the following:

1. Standard Specifications for Metal Bar Gratings and treads as published in the *NAAMM Metal Bar Grating Manual*, latest edition
2. Minimum grating panel width is 2’ nominal
3. Either Type P-19-4 1-1/4 by 3/16 inch aluminum or Type P-19-4 1-1/2 inch I-Bar aluminum
4. Include toe boards that project vertically a nominal 4” above top of gratings and are securely attached to grating

56-2.02H Elastomeric Bearing Pads

Elastomeric bearing pads must comply with section 51-3.02.

56-2.02I Safety Chain at Walkways

Safety chain at walkways must comply with ASTM A413/A413M, Grade 43. The nominal chain size must be 1/4 inch. Use the minimum length that allows lock-up of safety railing.

56-2.02J Safety Cable at Walkways

Safety cable at walkways must:

1. Be constructed of Type 302 or 304 stainless steel 7 by 19 wire strand core cable
2. Have a cable breaking strength of at least 10,000 lb
3. Not be prestretched

56-2.02K Fabrication

56-2.02K(1) General

Sign structures must be:

1. Free from kinks, twists, or bends
2. Uniform in appearance

Fabricate sign structures into the largest practical sections before galvanizing.

Assemble the completed sections in the shop. Check sections for straightness, alignment, and dimension. Correct any variation.

Affix clips, eyes, and removable brackets to all signs and all posts for securing the sign during shipping, lifting, moving, and erection. Secure the sign as necessary to prevent damage to the finished galvanized or painted surfaces.

Do not make any holes in members unless the holes are shown or authorized.

Form the posts for tubular sign structures to the radii shown by heat treatment or by fabrication methods that will not:

1. Crimp or buckle the interior radius of the pipe bend
2. Change the physical characteristics of the material

56-2.02K(2) Welding

PJP longitudinal seam welds for tapered tubular members must have at least the minimum penetration shown but not less than 60 percent penetration. Within 6 inches of circumferential welds, longitudinal seam welds must be CJP groove welds.

Except for welds at posts shown as PJP welds, longitudinal seam welds of fabricated pipe posts must be CJP groove welds.

Except for walkway safety railing, welding filler metal for versatile truss must be greater than or equal to 70 ksi.

10-15-21

Obtain authorization prior to repairs of cracks or more than 2 repairs to circumferential welds and to base plate-to-post welds.

04-16-21

56-2.02K(3) Bolted Connections

Except for HS bolts shown to be snug-tight, HS bolted connections must be HS assemblies complying with section 55-1.02E(6) except assemblies must consist of:

1. HS steel bolts
2. Nuts
3. Hardened washers
4. Direct tension indicators

HS fastener assemblies and any other HS bolts, nuts, and washers attached to sign structures must be zinc-coated by the mechanical deposition process.

Nuts for HS bolts at joints designated as snug-tight must not be lubricated.

Use an alternating snugging and tensioning pattern for anchor bolts and HS bolted splices. Once tensioned, do not reuse HS fastener components.

For bolt diameters less than 3/8 inch, the diameter of the bolt hole must be not more than 1/32 inch larger than the nominal bolt diameter.

For bolt diameters greater than or equal to 3/8 inch, the diameter of the bolt hole must be not more than 1/16 inch larger than the nominal bolt diameter.

56-2.02K(4) Walkway

Safety cable at walkways must be continuous between lugs. Before tightening cable clips at the end anchorage, remove the slack in the cable.

Safety cable at walkways must not be kinked, knotted, deformed, frayed, or spliced.

Install clips at safety cables under the manufacturer's instructions.

56-2.02K(5) Handholes

The edges of handholes and other large post and arm openings must be ground smooth. The roughness of edges must be less than 0.001 inch.

56-2.02K(6) Identification Plate

Attach rectangular corrosion-resistant metal identification on all trusses and posts using stainless steel rivets or stainless steel screws as follows:

1. For posts, locate the plate on the traffic side near the base of all posts.
2. For trusses, locate the plate on an outward face of a bottom chord angle where it will be easily visible from the shoulder or the median.

The lettering on each identification plate must be:

1. Either depressed or raised
2. 1/4 inch tall
3. Legible
4. Readable after the support structure is coated and installed

Include the following information on the plate.

1. Name of the manufacturer
2. Date of manufacture
3. Contract number
4. *Standard Plan* year
5. Length, use one of the following:
   5.1. For posts, “h=” and the dimension from bottom of base plate to bottom of truss
   5.2. For single trusses, the length of each cantilever
   5.3. For two post trusses, the length of the center span and the length of each cantilever

56-2.02L Surface Finish

56-2.02L(1) General

Galvanize all ferrous metal parts of the following sign structure types:

1. Truss
2. Bridge mounted
3. Tubular

Except for tubular type sign structures, do not paint sign structures.

Clean and paint all ferrous metal parts of tubular sign structures after galvanizing, including the areas to be covered by sign panels.

Do not treat galvanized surfaces with chemicals before cleaning and painting.

Galvanize and do not paint walkway gratings, walkway brackets, gutters, safety railings, steel mountings for light fixtures, and all nuts, bolts, and washers for sign structures after fabrication.

56-2.02L(2) Galvanizing

Galvanizing must comply with section 75-1.02B except surfaces may be coated with zinc by the thermal spray coating process if authorized.

If authorized to use thermal spray coating, apply the coating under section 59-5. The thickness of the sprayed zinc coat must be at least 5 mils.

Do not use zinc solders or zinc alloys that contain tin to repair a damaged galvanized surface.

56-2.02L(3) Cleaning and Painting

Where specified, clean and paint sign structures under section 59-4.

56-2.03 CONSTRUCTION

56-2.03A General

Do not fasten any bridge-mounted sign to concrete elements of bridges or railings before the concrete attains a compressive strength of 2,500 psi.

After erection, remove the brackets used to secure tubular sign structures during shipping and lifting.

Install sign panels as shown. Install laminated and formed sign panels on sign structures using fastening hardware of the type and sizes shown.

Complete the CIDH concrete pile foundation at least 7 days before erecting the sign structure.

Plumb or rake posts as required by adjusting the leveling nuts before tightening nuts. Do not use shims or similar devices. After final adjustments of both top nuts and leveling nuts on anchorage assemblies have been made and the structure is properly positioned, tighten nuts as follows:

1. Tighten leveling nuts and top nuts, following a crisscross pattern, until bearing surfaces of all nuts, washers and base plates are in firm contact.
2. Use an indelible marker to mark the top nuts and base plate with lines showing relative alignment of the nut to the base plate.
3. Tighten top nuts following a crisscross pattern:
   3.1. Additional 1/6 turn for anchor bolts greater than 1-1/2 inches in diameter.
   3.2. Additional 1/3 turn for other anchor bolts.

3.3. Tightening tolerance for all top nuts is ± 1/8 turn.

4. If anchor bolts project beyond the top face of the top nut by more than 1 inch or if requested, mechanically cut off excess anchor bolt and paint over cured primer with paint to identify anchor bolt grade as follows:
   4.1. Grade 36: blue
   4.2. Grade 55: yellow
   4.3. Grade 105: red

56-2.03B Existing Sign Structures

56-2.03B(1) General

Work involving existing sign structures must comply with section 15.

56-2.03B(2) Remove Sign Structure

Reserved

56-2.03B(3) Reconstruct Sign Structure

Reserved

56-2.03B(4) Modify Sign Structure

Reserved

56-2.03B(5) Relocate Sign Structure

Reserved

56-2.03B(6) Salvage Sign Structure

Reserved

56-2.04 PAYMENT

The payment quantity for install sign structure does not include the weight of sign panels.

For determining the payment quantity for furnish sign structure and install sign structure, the weight of extruded aluminum used for steel slot channel for the light fixture mounting channel is the computed weight of the steel channel.

Replace item 3 in the list in the 2nd paragraph of section 56-3.02B(2) with:

04-16-21

3. Galvanize under section 75-1.02B

Replace the 8th paragraph of section 56-3.02B(3)(c) with:

10-15-21

Obtain authorization prior to repairs of cracks or more than 2 repairs to circumferential welds and to base plate-to-pole welds.

^^

57 WOOD AND PLASTIC LUMBER STRUCTURES

10-16-20

10-16-20

Delete the 4th paragraph of section 57-2.01B(3).

Replace the 5th paragraph of section 57-2.01B(3) with:

10-16-20

Timber and lumber treated with waterborne preservatives must be dried after treatment and have no visual evidence of preservative on the surface.

Replace the 7th paragraph of section 57-2.01B(3) with:

10-16-20

Manually applied wood preservative must comply with AWPA Standard M4.

10-16-20

Delete the 2nd paragraph of section 57-2.01C(3)(a).

Replace the 3rd paragraph of section 57-2.01C(3)(a) with:

10-16-20

Chromated copper arsenate must not be used for handrails or other applications with possible direct exposure to the public.

Replace the introductory clause of the 7th paragraph of section 57-2.01C(3)(a) with:

10-16-20

For lumber treated with ammoniacal copper zinc arsenate, alkaline copper quaternary ammonium compound, or copper azole:

Replace the 3rd paragraph of section 57-2.01C(3)(b) with:

10-16-20

If treated timber is framed, cut, or bored after treatment, thoroughly swab each cut, dap, or hole with 2 applications of a preservative as specified in AWPA Standard M4.

10-16-20

Delete the 2nd paragraph of section 57-2.02B.

Add to section 57-2.02B:

04-19-19

HDPE shims must be commercial quality.

Replace section 57-2.02C with:

10-18-19

57-2.02C Construction

Install lagging members 4 inches thick or less with a 3/8-inch gap between members. Install lagging members greater than 4 inches thick with a 1/2-inch gap between members.

Replace the table in the 4th paragraph of section 57-3.02C with:

10-19-18

Quality characteristic	Test method	Requirement
Density of concrete core (kg/m^3, min)	ASTM D792	1,762
28-day compressive strength of concrete core (psi, min)	ASTM C579	5,000
Structural strength of shell: Tensile strength, tensile modulus (percent loss) Flexural strength, flexural modulus (percent loss)	 ASTM D638 ASTM D790	 Less than 10 after UV deterioration test specified for plastic lumber
Dry film thickness of coating (mils, min)	--	15
Color change of coating	ASTM D4587, Test Cycle 2	No visible color change when tested for 800 hours
Initial adhesion of coating (psi, min)	ASTM D4541, Test Method D, E, or F and Protocol 2	150
Decrease in initial adhesion of coating, decrease (percent)	ASTM D4541, Test Method D, E, or F and Protocol 2 ASTM D1183, Test Condition D[a]	No more than 10 following 2 exposure cycles

[a]Use a low temperature phase at 4 ± 5 °F and high temperature phase at 140 ± 5 °F.

^^

59 STRUCTURAL STEEL COATINGS

04-15-22

Replace the 2nd paragraph in section 59-1.01D with:

10-19-18

Measure coating adhesion strength with a self-aligning adhesion tester under ASTM D4541, Test Method D, E, or F and Protocol 2.

Replace the 2nd paragraph of section 59-1.02C with:

10-19-18

Coatings selected for use must comply with the volatile organic compound concentration limits specified for the air quality district where the coating is applied. The undercoats and finish or final coats selected for use must be compatible with each other.

Add to section 59-1.03A:

04-15-22

Provide lighting under SSPC-Guide 12 during surface preparation, cleaning, painting, and inspection.

Replace the 4th through 6th paragraphs of section 59-1.03B with:

04-15-22

Do not apply paint if:

1. Freshly painted surfaces may become damaged by rain, fog, condensation, or moisture of any kind
2. Atmospheric temperature or relative humidity will not remain within the specified application conditions during the drying period
3. Steel surface temperature is less than 5 degrees F above the dew point

Repair or replace paint damaged by weather.

If authorized, you may perform cleaning and painting activities during inclement weather by creating artificial conditions to within the specified limits inside an enclosure. Air movement within enclosures must be adequate to meet the atmospheric conditions throughout the entire enclosure.

Replace section 59-1.03C(2) with:

04-15-22

59-1.03C(2) Pressure Rinsing

Pressure rinse to remove dust or deleterious material from surfaces using a pressure wash system with a minimum nozzle pressure of 1,160 psi. Keep the nozzle tip from 12 to 18 inches from the surface. The nozzle must have a maximum fan tip angle of 45 degrees.

Replace section 59-1.03C(3) with:

04-15-22

59-1.03C(3) Pressure Washing

Pressure wash to remove loosely adhered coatings and contaminants from surfaces. Use a pressure wash system with a nozzle pressure from 2,500 to 5,000 psi and a rotary tip.

Replace the 1st paragraph of section 59-1.03C(4) with:

04-15-22

Steam clean to remove dirt, grease, loose chalky paint, and other foreign material from surfaces under SSPC-SP 1. Steam temperature at the nozzle must be from 265 to 375 degrees F.

Replace the 1st paragraph of section 59-1.03C(5) with:

04-15-22

Blast clean surfaces to receive undercoat paint.

Replace the 9th paragraph of section 59-1.03D with:

04-15-22

Unless otherwise authorized, pressure rinse painted surfaces before applying the next coat for either of the following conditions:

1. 7 days or more have elapsed after the application of the most recently applied coat
2. Dust or deleterious material is present on the painted surface

Replace the 1st paragraph of section 59-2.01A(1) with:

04-15-22

Section 59-2 includes specifications for preparing and painting structural steel, except galvanized or thermal spray coated surfaces.

Add after the paragraph of section 59-2.01A(3)(a):

10-19-18

If requested by the Engineer, submit documentation from the coating manufacturer verifying the compatibility of the undercoats and finish or final coats selected for use.

Add to section 59-2.01A(3)(a):

04-15-22

Submit quality control reports for cleaning and painting activities within 2 business days of having performed work upon which reports are based.

Replace the 2nd paragraph of section 59-2.01A(3)(c) with:

04-15-22

Submit the work plan after attending the prepainting meeting and include:

1. Names of the painting contractor and any subcontractors to be used.
2. One copy of each current and applicable ASTM and SSPC specification and qualification procedure.
3. Coating manufacturer's guidelines and instructions for surface preparation, painting, drying, curing, handling, shipping, and storage of painted structural steel. Include testing methods and maximum allowable levels for soluble salts.
4. Materials, methods, and equipment to be used.
5. Proof of required SSPC-QP certifications. For work requiring SSPC-QP 1 or SSPC-QP 2 certification, include:
   5.1. List of all personnel who will perform surface preparation or paint application.
   5.2. Proof of CAS certifications, as required under (1) SSPC-QP 1, Mandatory Annex A and (2) the SSPC CAS Implementation Schedule in effect at the time of contract advertisement.
6. Methods to control environmental conditions.
7. Methods to protect the coating during curing, shipping, handling, and storage.
8. Rinse-water collection plan.
9. Detailed paint repair plan for damaged areas.
10. Procedures for containing blast media and water.
11. Examples of proposed daily quality control reports for testing, measurements, and documentation to be performed, including type of testing, location, lot size, time, weather conditions, test personnel, and results.
12. Description of enclosures and other methods for preventing release of overspray and new paint into the surrounding environment.
13. Procedures for constructing demonstration panels on existing steel surfaces.
14. Proposed schedule of inspection hold points.

Replace section 59-2.01A(4)(a) with:

04-15-22

59-2.01A(4)(a) General

59-2.01A(4)(a)(i) General

Reserved

59-2.01A(4)(a)(ii) Hold Points

Hold points are designated times that (1) provide safe access and (2) allow for quality assurance inspection of the work prior to proceeding to the next portion of the work.

Designate hold points:

1. Prior to start of cleaning
2. After completion of pressure washing
3. Prior to the start of blast cleaning
4. After completion of all cleaning work for any portion of a structure

5. Prior to each coating application
6. After completion of each coating application

Add additional hold points if requested by the Engineer.

Notify the Engineer a minimum of 24 hours prior to each hold point.

59-2.01A(4)(a)(iii) Demonstration Panels

Prepare demonstration panels on existing surfaces prior to starting surface preparation production work. Demonstration panels are regions on the existing structural steel surfaces that are prepared, cleaned, and painted for the purpose of demonstrating the methods, materials, and processes to be used during production work.

Demonstration panels must:

1. Represent the variety of the work to be performed.
2. Meet contract requirements for cleaning and painting structural steel
3. Be a total area of at least 50 square feet
4. Be kept accessible during production work, unless authorized

At least 25 square feet of the completed demonstration panels must demonstrate the complete coating system. The remaining demonstration panel areas must demonstrate a variety of partially completed stages of the coating system.

Obtain authorization of the demonstration panels before starting production work.

If authorized, demonstration panels, or portions thereof, may be incorporated into the production work.

Replace item 1 in the list in the 2nd paragraph of section 59-2.01A(4)(d)(ii) with:

04-15-22

1. Perform 3 adhesion tests per girder or 1,000 sq ft of painted surface, whichever is less. If less than 1,000 sq ft is painted in a work shift, perform 3 tests. If 2 or more locations fail adhesion requirements, the area represented by the tests is rejected. If 1 of the locations fails adhesion requirements, test 3 additional locations. If any of the additional locations fail, the area represented by the tests is rejected. Repair rejected areas by blast cleaning and repainting. Repair test locations meeting adhesion requirements by applying organic zinc-rich primer to the specified dry film thickness.

Replace the 2nd paragraph of section 59-2.01C(1) with:

04-15-22

You must provide enclosures for cleaning and painting structural steel. Enclosures must prevent release of overspray and new paint into the surrounding environment during paint application. Maintain atmospheric conditions inside enclosures within specified limits.

Replace the 2nd and 3rd paragraphs of section 59-2.01C(3)(b)(i) with:

04-15-22

After pressure washing or steam cleaning, spot blast clean painted surfaces having rust or foreign material remaining that would hinder bonding of new paint. If there is no bid item for spot blast cleaning, this is change order work. Spot blast clean surfaces under SSPC-SP 6. For small areas, the Engineer may allow cleaning under SSPC-SP 11.

Clean previously painted surfaces under SSPC-SP 2. Feather edges of remaining paint. Do not use pneumatic chipping hammers unless authorized.

Replace the 1st and 2nd paragraphs of section 59-2.01C(3)(b)(ii) with:

04-15-22

Blast clean steel surfaces to be coated with inorganic zinc under SSPC-SP 10. After blast cleaning, surfaces must have a dense, uniform, angular anchor pattern of 1.5 to 3.5 mils when measured under ASTM D4417.

Where shown, spot blast clean existing painted steel surfaces under SSPC-SP 6. After blast cleaning, surfaces must have a dense, uniform, angular anchor pattern of at least 1.5 mils when measured under ASTM D4417.

Replace the 4th paragraph of section 59-2.02C with:

04-15-22

Where described, apply final or finish coats after installation and excavation are complete. For steel soldier piles that have no exposed surfaces or when finish coats are not required, you may apply final coat before installation and erection.

Replace section 59-4.03C with:

04-15-22

59-4.03C Testing of Inorganic Zinc Coating

Reserved

Replace the 2nd paragraph of section 59-4.03D with:

04-15-22

The 1st finish coat color must match no. 24558 of AMS-STD-595. The 2nd finish coat color must match no. 24491 of AMS-STD-595.

Replace the 2nd paragraph of section 59-5.01D(3) with:

04-15-22

Bend test coupons under section 6.5 of SSPC-CS 23.00/AWS C 2.23M. Coupons must exhibit no cracking with lifting from substrate.

Replace the 5th through 7th paragraphs of section 59-5.01D(4) with:

04-15-22

Inspect surfaces for visual cleanliness under SSPC-SP 10 before applying coating.

Test coating thickness under section 6.3 of SSPC-CS 23.00/AWS C 2.23M. Perform 1 test for every 150 sq ft of coating and 1 test for each faying surface.

Perform cut testing under SSPC-CS 23.00/AWS C 2.23M. Perform 3 tests of 3 cuts for every 1,000 sq ft of coating. Surfaces must exhibit no peeling or delamination.

Replace the 3rd paragraph of section 59-5.03 with:

04-15-22

Blast clean surfaces under SSPC-SP 10. Surfaces must have a sharp, angular anchor pattern of from 2.5 to 4.0 mils. Reblast surfaces that rust or become contaminated before coating is applied.

Replace the 6th paragraph of section 59-5.03 with:

04-15-22

You may field weld thermal spray-coated surfaces if authorized in advance. Remove thermal spray coating from weld locations by blast cleaning under SSPC-SP 10 or with power tools under SSPC-SP 11 immediately before welding. Recoat welded connections after fabrication.

^^

60 EXISTING STRUCTURES

04-15-22

Add to section 60-2.02A(1):

04-15-22

Temporary supports must comply with section 48-3.

Replace the 1st and 2nd paragraphs of section 60-2.02A(3) with:

04-15-22

If a daily removal report is required, submit the daily removal report as an informational submittal. Submit the daily report by close of business on the following business day.

Submit a bridge removal work plan for each bridge. Include details for the following:

1. Removal sequence, including staging of removal activities and equipment locations
2. Temporary supports or bracing
3. Locations where work is performed over traffic, utilities, or railroad property
4. Locations and types of protective covers
5. Protection of people, property, utilities, and improvements
6. Methods for preventing material, equipment, and debris from falling onto traffic or railroad property

04-15-22

Delete the 5th paragraph of section 60-2.02A(3).

Replace section 60-2.02A(4) with:

10-15-21

60-2.02A(4) Quality Assurance

60-2.02A(4)(a) General

Reserved

60-2.02A(4)(b) Preconstruction Meeting

Schedule and hold a preconstruction meeting for bridge removal.

The following personnel must attend the preconstruction meeting with the Engineer:

1. Contractor
2. Engineer of Record for bridge removal work plan
3. Demolition subcontractor if applicable
4. Railroad representative if applicable

The Engineer conducts the meeting. Be prepared to discuss:

1. Authorized bridge removal work plans
2. Key contact persons and phone numbers

3. Coordination with lane closures, Traffic Operations, and Construction Zone Enhanced Enforcement Program
4. Equipment used for bridge removal work
5. Removal of any utilities
6. Removal of any items to be salvaged and stored
7. Debris containment and collection plan
8. Personal protective equipment
9. Hazardous material handling, storage, and removal
10. Protocol for handling unexpected conditions
11. Protecting adjacent facilities and utilities
12. Lane closure schedule if applicable
13. Contingency plan if applicable

60-2.02A(4)(c) Quality Control

04-15-22

For bridge removal work plans signed by a registered engineer, the engineer signing the work plan must confirm the conditions at least 1 business day before the start of bridge removal activities by visual inspection. Discuss the condition of the structure with the Contractor's project superintendent and the Engineer at the site.

For bridge removal activities, the engineer signing the work plan must:

1. Be registered as a civil engineer in the State.
2. Have experience in bridge removal plan design or bridge removal construction inspection.
3. Be present at all times during bridge removal activities.
4. Ensure compliance with the authorized work plan.
5. Stop the operation if it is unsafe. Before resuming operations, submit a proposed revision to the authorized work plan to remedy the unplanned occurrence.
6. Prepare a daily removal report for removal activities. The report must describe work activities for each day and the condition of the remaining structure. The report must be sealed and signed by an engineer who is registered as a civil engineer in the State.

The engineer signing the work plan may assign a representative to perform the bridge removal activities specified above. The engineer signing the work plan must submit a letter that is sealed and signed certifying that the representative:

1. Is registered as a civil engineer in the State
2. Has experience in bridge removal plan design or bridge removal construction inspection
3. Is familiar with the authorized work plan
4. Will attend at least 1 job site visit with the Contractor’s project superintendent and the Engineer to discuss the authorized work plan at least 1 business day before beginning the bridge removal activities

Replace section 60-2.02B with:

04-19-19

60-2.02B Materials

Design criteria for temporary support shoring and temporary bracing must comply with section 48-3.02B.

Add to section 60-3.01A:

10-19-18

If you are unable to complete bridge reconstruction activities before the bridge is to be opened to traffic, furnish and maintain temporary decking under section 48-4 until that portion of the work is complete.

04-15-22

Where shown, (1) repair and prepare surfaces and (2) apply deck treatments and overlays to approach slabs as specified for concrete bridge deck surfaces.

Add to the beginning of section 60-3.02C(1):

04-15-22

Protect existing drain inlets, joint seals, joint seal assemblies, and other facilities to be incorporated into the new work from damage.

Replace the 3rd and 4th paragraphs of section 60-3.02C(3) with:

04-19-19

Remove asphalt concrete surfacing by cold milling under the following conditions:

1. If a membrane seal is shown:
   1.1. Remove the seal by cold milling
   1.2. Do not remove more than 1/2 inch of the existing concrete slab

2. If a membrane seal is not shown:
   2.1. Remove asphalt concrete surfacing until a 1/2-inch minimum of surfacing remains on top of existing concrete slab
   2.2. Use other authorized means to remove the remaining asphalt concrete without damage to the concrete slab

Add to section 60-3.02C(3):

04-19-19

Where a portion of the asphalt concrete surfacing is to remain, saw cut a 2-inch-deep true line along the edge to remain in place before removing asphalt concrete. Remove the asphalt concrete without damaging the surfacing to remain in place.

Replace section 60-3.02C(8) with:

04-15-22

60-3.02C(8) Remove Polyester Concrete Overlay

Remove polyester concrete overlay by micro milling.

Before removing the overlay, verify the depth of polyester concrete at supports and midspan of each structure:

1. In each shoulder
2. In the traveled way
3. At the roadway crown, if a crown is present

Remove no more than 1/8 inch of the underlying concrete surface.

Remove residual polyester concrete remaining on the surface after micro milling by other authorized means. Do not damage the underlying concrete.

Replace item 3 in the list in the 9th paragraph of section 60-3.04B(1)(d) with:

10-15-21

3. RSC using hydraulic cement other than portland cement or portland limestone cement no sooner than 3 days after concrete placement and your test results for prequalification of RSC show that the concrete attained at least 3,500 psi compressive strength

04-19-19

Delete the 3rd paragraph of section 60-3.04B(3)(a).

Replace the 9th paragraph of section 60-3.04B(3)(c) with:

04-19-19

Protect the overlay from moisture and do not allow traffic or equipment on the overlay (1) for a minimum of 4 hours cure time after final finishing and (2) until each rebound test result for the final finish shows a reading of at least 28 when tested under ASTM C805. The cure time must be extended if ordered. The rebound test may not be used to reduce the 4-hour cure time of the overlay.

Replace section 60-3.05E with:

04-16-21

60-3.05E Galvanic Anodes

Reserved

Replace section 60-3.05F with:

10-15-21

60-3.05F Replace Bearings

60-3.05F(1) General

Section 60-3.05F includes specifications for replacing bearing pads or steel rocker bearings with elastomeric bearing pads.

Elastomeric bearing pads must comply with section 51-3.02.

Temporary supports must comply with section 48-3.

Jacking must comply with section 48-5.

60-3.05F(2) Materials

Not Used

60-3.05F(3) Construction

Temporary supports must include jacking assemblies required to jack and support the imposed loads and structures. Temporary or permanent stiffening members are required at all girder locations, directly above the applied jacking forces, unless otherwise authorized.

When the bridge is in the raised position, do not allow traffic on the bridge until the structure is secured and fully supported by temporary supports.

Remove the existing bearing pads and steel rocker bearings under section 60-2.02, except a bridge removal work plan is not required.

For steel rocker bearings, remove the existing steel keeper plates, steel masonry plates, grout pads, anchor bolts and rocker bearings. Flame or air-arc type of cutting equipment is not allowed to remove existing keeper plates. Sharp, marred, or roughened corners and edges resulting from removal operations must be slightly rounded by grinding or other suitable means.

Steam clean existing bearing seats and bearing contact areas on the bottoms of concrete girders to remove waxy residue and other deleterious materials.

Use oil-free compressed air for final cleaning to remove all loose material from bearing contact areas before placing new elastomeric bearing pads.

Verify bearing surface of seats are level. Ensure equal bearing on the entire area of each pad.

60-3.05F(4) Payment

Not Used

Replace the 1st paragraph of section 60-4.06A(4) with:

04-16-21

For field welding of column casings:

1. Only visual inspection is required
2. 2nd sentence of clause 5.13.2 and the 1st sentence of clause 5.13.3 of AWS D1.5 do not apply

Replace the 10th paragraph of section 60-4.09B(2)(a) with:

10-19-18

Steel parts must comply with ASTM A36/A36M or A576, Grade 1030 and must not be rimmed or capped steel.

Replace section 60-4.10 with:

10-16-20

60-4.10 BRIDGE SEAT EXTENDERS FOR RETROFITS

60-4.10A General

60-4.10A(1) Summary

Section 60-4.10 includes specifications for fabricating and installing bridge seat extenders.

Bridge seat extenders must comply with the specifications for miscellaneous bridge metal in section 75-3.

60-4.10A(2) Definitions

Reserved

60-4.10A(3) Submittals

Submit a work plan showing the method of grouting pipe seat extenders to prevent grout from entering the hinge area.

60-4.10A(4) Quality Assurance

Inspect bridge seat extender materials at the fabrication site.

Notify the Engineer:

1. When materials have been delivered to the fabrication site
2. At least 10 days before starting fabrication

60-4.10B Materials

60-4.10B(1) General

Reserved

60-4.10B(2) Pipe Seat Extenders

Pipe seat extenders must consist of double extra-strong steel pipes, HS threaded rods, nuts, and washers.

Double-extra strong steel pipe must comply with ASTM A53/A53M, Grade B. HS threaded rods, nuts, and washers must comply with section 55-1.02D(1).

Galvanize double-extra strong steel pipe under section 75-1.02B. After galvanizing, any alterations resulting in new exposed surfaces, including holes or cut ends, must be coated as specified for repairing damaged galvanized surfaces under section 75-1.02B.

Grout for bonding the pipe to the cored hole must comply with section 60-4.06B(2). Any filler materials or seals must not restrict joint movement.

60-4.10B(3) Slab Bridge Seat Extenders

Slab bridge seat extenders must consist of steel plates, support tubes, bolts, bars, nuts, washers, pins, and elastomeric bearing pads.

Slab bridge seat extender must comply with section 55. Elastomeric bearing pads must comply with section 51-3.02. The support tubes must comply with ASTM A500/A500M, Grade B.

Galvanize seat extender under section 75-1.02B. After galvanizing, any alterations resulting in new exposed surfaces, including holes or cut ends, must be coated as specified for repairing damaged galvanized surfaces under section 75-1.02B.

Epoxy mortar must consist of a mixture of epoxy binder and aggregate. The epoxy mortar must comply with section 95-1.02C. The mix proportions of epoxy mortar must be 1-part binder to 1-part aggregate by volume. Aggregate must consist of a combination of 1-part material passing the no. 30 sieve and 3-parts material passing the no. 20 sieve.

60-4.10C Construction

60-4.10C(1) General

Reserved.

60-4.10C(2) Pipe Seat Extenders

Reserved

60-4.10C(3) Slab Bridge Seat Extenders

Place epoxy mortar under section 95-1.03.

Place elastomeric bearing pads under section 51-3.02C. Bond elastomeric bearing pads to steel support tubes with adhesive complying with Federal Specification MMM-A-121.

60-4.10D Payment

The payment quantity for seat extender does not include the weight of nonmetallic materials used in constructing the seat extenders.

Replace section 60-4.11 with:

10-15-21

60-4.11 REPLACE ACCESS DOORS

60-4.11A General

60-4.11A(1) Summary

Section 60-4.11 includes specifications for replacing access doors.

Replacing access doors includes (1) removing an existing recessed access door with hinges, and (2) installing a new access door with frame.

60-4.11A(2) Definitions

Reserved

60-4.11A(3) Submittals

Submit 3 copies of access door assembly shop drawings for each location requiring a new access door assembly. Shop drawings must include:

1. Name of fabricator
2. Field measurement of the height, width, and wall thickness
3. Details for temporary metal covers including connections or fasteners to be used

60-4.11A(4) Quality Assurance

Reserved

60-4.11B Materials

Materials for access door assemblies and associated hardware must comply with section 75-3.02.

Access door assemblies consist of:

1. Sheet steel door with stiffeners
2. Lock cover and hasp
3. Door frame

Fabricate access door assemblies in a shop. Do not punch, cut, or weld assemblies in the field, except for tack welds of the expansion anchors.

Galvanize access door assemblies and hardware under section 75-1.02B.

After galvanizing, the access door assemblies and hardware must be free of fins, abrasions, and rough edges.

Repairs to galvanized surfaces must comply with section 75-1.02B.

60-4.11C Construction

Verify existing access opening sizes before fabricating access door assemblies. Where the existing door or cover is unusable after opening, furnish and install a temporary metal cover over the opening. This work is change order work.

If the existing access opening is smaller than the opening size shown on the plan, enlarge the opening by saw-cutting full-depth to the dimension shown. Cut existing reinforcement 1 inch below the surface. Clean and patch the holes under section 51-1.03F(2). This work is change order work.

Remove the existing steel cover.

Clean and prepare the concrete surface surrounding the existing frame. Refinish concrete edging so the new frame is flush with the existing frame.

Furnish a padlock for the access door assembly until Contract acceptance.

Do not leave any access opening uncovered and unsecured at the end of a work shift.

60-4.11D Payment

Not Used

^^

DIVISION VII DRAINAGE FACILITIES

Replace section 62 with:

04-17-20

62 STORMWATER TREATMENT

04-16-21

62-1 GENERAL

62-1.01 GENERAL

62-1.01A Summary

Section 62-1 includes general specifications for constructing permanent stormwater treatment best management practices.

Earthwork must comply with section 19.

Concrete and joint seals must comply with section 51.

Sealant must comply with section 41-5.

Reinforcement must comply with section 52.

Underdrain must comply with section 68-2.

Miscellaneous metal must comply with section 75.

Cable railing must comply with section 83-2.07.

62-1.01B Definitions

Reserved**62-1.01C Submittals**

At least 5 business days before placing permeable material, submit a certificate of compliance for the gradation of the material from the source.

No more than 5 business days after placing permeable material, submit:

1. At least one ASTM D6913 test on permeable material sampled at:
   1.1. Job site
   1.2. Authorized location
2. Verification that the permeable materials testing results meet the gradation requirements

62-1.01D Quality Assurance

Submit verification that the placed material complies with the gradation for the Class 4 and Class 5 permeable materials.

Submit verification of the uniformity coefficient for Class 5 permeable material.

For Department acceptance, the depth of the permeable material will be measured after the in-place washing is complete.

62-1.02 MATERIALS

62-1.02A General

Not Used

62-1.02B Class 4 Permeable Material

Class 4 permeable material must consist of sand, gravel, or crushed stone that is hard, durable, and clean. The material must be free from organic material, clay balls, or other deleterious substances.

The percentage composition by weight of Class 4 permeable material in place must comply with the gradation requirements shown in the following table:

Class 4 Permeable Material Gradation Requirements

Sieve size	Percentage passing
2"	100
1-1/2"	95–100
3/4"	50–100
3/8"	15–55
No. 4	0–25
No. 8	0–5
No. 100	0

Class 4 permeable material must have a durability index of not less than 40.

62-1.02C Class 5 Permeable Material

Reserved

62-1.02D Miscellaneous Metal

Fabricate the parts shown in the table below from the corresponding materials shown:

Miscellaneous Metal Parts

Part	Material
Ladders	Steel
Handrails	Steel
Trash screen	Steel
Components of riser support brackets	Stainless steel complying with ASTM A276, Grade 304 CIP inserts must be ferrule loop type

62-1.02E Filter Fabric

Class D filter fabric must comply with the requirements shown in the following table:

Class D Filter Fabric

Quality characteristic	Test method	Requirement
Permittivity (min and max, sec^{-1})	ASTM D4491	1.6–1.8
Apparent opening size, average roll value (min and max, US standard sieve size)	ASTM D4751	60–80
Grab breaking load, 1-inch grip, in each direction (min, lb)	ASTM D4632	120
Apparent elongation, in each direction (min, %)	ASTM D4632	50
UV resistance, retained grab breaking load, 500 hours (min, %)	ASTM D4355	70

62-1.02F–62-1.02I Reserved

62-1.03 CONSTRUCTION

62-1.03A General

Placing filter fabric must comply with section 68-1.03B.

62-1.03B Permeable Material

62-1.03B(1) General

04-16-21

Before placement, wash Class 4 and Class 5 permeable materials:

1. To remove silt and clay particles
2. With potable water equal to at least 4 times the volume of the material being placed

After placement, wash Class 4 and Class 5 permeable materials:

1. With potable water
2. Until the discharged water has a turbidity reading of:
   2.1. 30 NTU or less for a project within the Tahoe Hydrologic Unit
   2.2. 200 NTU or less for a project outside the Tahoe Hydrologic Unit

04-17-20

Capture the wash water. Handle the wash water by any of the following means:

1. Dispose of
2. Use as dust control
3. Disperse onsite in an authorized location other than the BMP

62-1.03B(2) Class 5 Permeable Material

Place Class 5 permeable material:

1. In a way that does not damage or displace the filter fabric
2. Using methods that produce a finished surface as shown

62-1.03C–62-1.03H Reserved

62-1.04 PAYMENT

Not Used

62-2 DESIGN POLLUTION PREVENTION INFILTRATION AREA

Reserved

62-3 INFILTRATION TRENCH

04-16-21

62-3.01 GENERAL

62-3.01A Summary

Section 62-3 includes specifications for constructing infiltration trenches.

Concrete curb must comply with section 73.

62-3.01B Definitions

Reserved

62-3.01C Submittals

At least 5 business days before placing permeable material, submit a certificate of compliance for the gradation of the material from the source.

62-3.01D Quality Assurance

Reserved

62-3.02 MATERIALS

62-3.02A General

Filter fabric must be Class D.

62-3.02B Surface Gravel

Surface gravel must be Class 1, Type A permeable material under section 68-2.02F.

62-3.02C Trench Filler Material

Trench filler material must be Class 6 permeable material and must consist of rock or high porosity backfill material. Rock must be non-crushed, pre-washed, clean, hard, sound, durable, and uniform in quality. Rock must be free of detrimental quantity of soft, friable, thick elongated or laminated pieces, organic material, clay balls, oil, alkali, or other deleterious substances.

The percentage composition by weight of Class 6 permeable material in place must comply with the gradation requirements shown in the following table:

Class 6 Permeable Material Gradation Requirements

Sieve size	Percentage passing
4"	100
3"	75
2"	8
1.5"	2

Class 6 permeable material must have a minimum durability index of not less than 40.

62-3.02D Observation Well

PVC pipe for the observation well must be perforated, have a smooth wall, and comply with AASHTO M278.

PVC matted end cap and vented well cap must comply with AASHTO M278.

Concrete must be minor concrete.

Pull box must comply with section 86-1.02C, except an electronic marker is not required. The cover marking must be *OBSERVATION WELL*.

62-3.02E Alternative Trench Filler Material

Reserved

62-3.03 CONSTRUCTION

62-3.03A General

Place filter fabric under section 68-1.03B.

62-3.03B Observation Well

The only joint allowed in the pipe in the observation well is between the perforated and solid wall pipe sections.

Place the observation well pipe vertically.

No permeable material, sand, or other material must be inside the well pipe.

62-3.04 PAYMENT

Not Used

04-17-20

62-4 INFILTRATION BASIN

Reserved

62-5 INFILTRATION GALLERY

Reserved

62-6 RESERVED

62-7 BIORETENTION

Reserved

62-8 DETENTION BASIN

Reserved

62-9 AUSTIN EARTH BERM

Reserved

62-10 AUSTIN VAULT SAND FILTER

Reserved

62-11 DELAWARE SAND FILTER

Reserved

62-12 GROSS SOLIDS REMOVAL DEVICE

04-16-21

62-12.01 GENERAL

Section 62-12 includes specifications for constructing gross solids removal devices.

62-12.02 MATERIALS

62-12.02A General

Reserved

62-12.02B Miscellaneous Metal

Fasteners used to connect grates and screen to the frame must be vandal-resistant.

Stainless steel wedge-wire screens, plates, and bars must comply with ASTM A240/ A240M, Type 304, with a no. 2B finish.

Finished screens must be descaled by immersion in a nitric/hydrofluoric acid bath, rinsed, and air dried to achieve passivation.

Fasteners, anchorage devices, hardware for the inclined screen and screened pipe must be Type 304 stainless steel.

Welding of steel members must comply with AWS D1.1, D1.4, and D1.5. Welding of stainless steel members must comply with AWS D1.6.

Before welding, prepare and clean with stainless steel brushes and non-ferrous abrasives. Equipment used in the fabrication of carbon steel must not be used.

After welding, the stainless steel surface must be smooth and without waves.

Fabricate the parts shown in the table below from the corresponding materials shown:

Miscellaneous Metal Parts

Part	Material
Jet plate	Steel
Deflector	Steel
Cleanout	Steel or Type 304 stainless steel
Chain	Steel

62-12.02C Fiberglass Reinforced Plastic Components

Reserved

62-12.02D Inclined Screen

Inclined screen must be stainless steel wedge wire.

The screen slot width must be between 0.17 to 0.20 inch.

Stainless steel wedge wire screen must have an open area from 60 to 70 percent of the total screen area.

62-12.02E Screened Pipe

Screened pipe, joints, supports, hatches, doors and ancillary hardware must be constructed of stainless steel. Screened pipe must comply with ASTM A778, and must be Type 316L.

Screened pipe must be 0.25-inch thick well screen with machine-made evenly spaced louvered openings perpendicular to the axis of the casing. Fabricate screened pipe with perforations and louvers as shown.

Fabrication tolerances on the screened pipe, joints, hatches, and doors must not exceed 0.20 inch.

Screened pipe sections must be joined after fabrication. Sections must be numbered using a metal tagging system after compatibility matching, with the tag indicating project location and section number. Section numbering must indicate the placement at each location, with the non-louvered section being labeled as the first section and continuing sequentially until the final section for each location. The metal tags must remain in place after installation.

62-12.02F Frame and Grates

Frames and grates for linear radial gross solids device must be steel.

Each grate section must be readily removable where shown. Frame and grate supports must be provided at openings and must clear ladders and other access points. Grate openings that fit around protrusions such as pipes and ladders must be discontinuous at approximately the centerline of opening so that each section of grate is easily removable.

62-12.03 CONSTRUCTION

Installation of inclined screens and supports, jet plates, and ancillary features must comply with sections 55-1.02E(6)(c) and 55-1.02E(7).

Install inclined screen, screened pipe, joints, hatches, doors, supports, and ancillary features such that gaps do not exceed 0.20 inch.

Install screened pipe with the aperture facing away from the discharge end of the pipe.

62-12.04 PAYMENT

Not Used

04-17-20

62-13 MULTI-CHAMBER TREATMENT TRAIN

Reserved

62-14 TRACTION SAND TRAP

Reserved

62-15–62-24 RESERVED

62-25 EXISTING STORMWATER TREATMENT

Reserved

^^

64 PLASTIC PIPE

10-15-21

Add to section 64-2.01C:

04-17-20

If recycled resin is used for corrugated polyethylene pipe, submit the percent of recycled resin.

Replace the 1st and 2nd paragraphs of section 64-2.02A with:

10-15-21

Plastic pipe must be Type C or Type S corrugated polyethylene pipe, corrugated PVC pipe with smooth interior, or polypropylene dual wall pipe.

The residue from the ignition of polyethylene, PVC, and polypropylene compounds must not exceed 30 percent as determined under ASTM D2584 except the muffle furnace temperature must be 840 ± 45 degrees F.

Replace the 2nd and 3rd paragraphs of section 64-2.02C with:

04-17-20

Type C and Type S corrugated polyethylene pipe must comply with AASHTO M 294.

HDPE compounds used in the manufacture of corrugated polyethylene pipe and fittings must comply with AASHTO M 294 except the mix must contain from 2 to 4 percent well-dispersed carbon black and at least 49 percent virgin resin.

Replace section 64-2.02E with:

10-15-21

64-2.02E Polypropylene Dual Wall Pipe

Polypropylene dual wall pipe and fittings must have a smooth interior wall and annular exterior corrugations complying with ASTM F2881. Polypropylene dual wall pipe must not exceed 60 inches in nominal diameter.

Polypropylene compound for pipe and fitting production must be impact modified copolymer materials and meet the requirements of ASTM F2881.

Pipe and fittings must be manufactured from virgin compounds. Reworked plastic may be used if it meets the requirements for rework plastic conforming to ASTM F2881.

Pipe must be colored or black. Carbon black content must be from 2 to 3 percent by weight for black pipe. Add UV stabilizers for colored pipe under the manufacturer's instructions.

Gaskets must be elastomeric and comply with ASTM F477. No reworked material will be allowed in the manufacture of the gasket. Gasket must be covered with a removable, protective wrap to ensure the gasket is free from debris.

All pipes and fittings must be clearly marked with:

1. Manufacturer's name or trademark
2. Nominal size
3. Specification designation
4. Plant location or designation code
5. Date of manufacture

Pipe must be marked at intervals of not more than 12 feet.

Store pipe and fittings above ground on adequate blocking. Pipe must be kept clean and fully drained during storage. Pipe, fittings, and gaskets must be covered or wrapped if exposed to sunlight during storage.

Replace section 64-2.02F with:

10-15-21

64-2.02F Joints

Plastic pipe joints must comply with section 61-2.01D(2)(b) for standard or positive joints. Where sleeve joint connections are used, the sleeve width must be at least 7-3/4 inches and engage at least 2 corrugations of each pipe being joined.

Joints for pipes shown as watertight must be watertight under pressure and all conditions of expansion, contraction, and settlement, and must comply with section 61-2.01D(2)(a) for watertightness.

For corrugated polyethylene pipe:

1. If watertight joints are shown, use Type S corrugated polyethylene pipe with gaskets. If watertight joints are not shown, use gasketed joints when specified. Gaskets for Type C corrugated polyethylene pipe must be installed on each side of the joint. Gaskets must comply with ASTM F477 and be factory-installed.
2. Corrugated polyethylene pipe joints manufactured to comply with section 61-2.01D(2)(b) for integral joints must be laid to line and grade with sections closely jointed. Corrugated polyethylene pipe to be joined by sleeve joints must be laid to line and grade with the separate sections not more than 1-1/2 inches apart and then firmly joined together with at least 2 corrugations from each pipe section engaged in the coupler.

For corrugated PVC pipe with smooth interior:

1. Elastomeric gaskets must comply with ASTM F477 for low-head applications. Use extruded or molded gaskets cured in a way so that any cross section will be dense, homogeneous, and free of pores, blisters, pitting or other imperfections. Double gaskets must be single-piece gaskets that fit into the first 2 full corrugation valleys on the spigot end. Ship gaskets in containers that will prevent damage from UV exposure and handling.
2. Wyes, tees, reducers, elbows, couplings, laterals, and other fittings must be molded or fabricated under ASTM F949 for cell classification 12454 or 13343 as specified in ASTM D1784.
3. Lubricant must comply with the pipe manufacturer's instructions. The lubricant must not have a detrimental effect on gaskets or pipes.
4. Joints must comply with section 61-2.01D(2)(b) for integral joints except the joint overlap requirements are as shown. Pipe joints must be bell and spigot type with gaskets ready for field

assembly. Install joints so that the elastomeric gasket will be compressed radially between the pipe bell and spigot to form a tight seal when assembled.

For polypropylene dual wall pipe:

1. All joints must be watertight unless otherwise described
2. Joints must comply with ASTM D3212 and be bell and spigot type unless alternative connections are shown
3. Gaskets must be installed at all joints
4. Lubricant used for the assembly of the gasketed joint must be as recommended by the pipe manufacturer with no detrimental effect on the gasket or pipe
5. Install joints so that the elastomeric gasket will be compressed radially between the pipe bell and spigot to form a tight seal when assembled

Replace the 2nd paragraph of section 64-2.03A with:

10-15-21

Install Type S corrugated polyethylene pipe, corrugated PVC pipe, or polypropylene dual wall pipe wherever smooth interior wall type is shown.

Replace item 2 in the list in 1st paragraph of section 64-2.03B with:

10-15-21

2. Backfill corrugated polyethylene pipe or polypropylene dual wall pipe greater than 48 inches in nominal diameter with either controlled low-strength material under section 19-3.02G or with slurry cement backfill under section 19-3.02E.

Replace item 3 in the list in the 1st paragraph of section 64-2.03B with:

04-16-21

3. Place controlled low-strength material used for structure backfill to a level at least 12 inches or 0.7 times the pipe diameter above the pipe crown, whichever is greater.

Add to the end of section 64-2.03C:

10-15-21

Place polypropylene dual wall pipe under the manufacturer's instructions except corrugated couplings must be split collar, engaging at least 2 full corrugations when non-watertight joints are allowed. Shortening pipe sections in the field must comply with the manufacturer's instructions.

^^^

65 CONCRETE PIPE

10-15-21

Replace the 2nd paragraph of section 65-2.01D(3) with:

10-16-20

Pipes 24 inches in nominal diameter and smaller do not need to be tested to the load to produce a 0.01-inch-wide crack if the pipe is subjected to a load equivalent to the ultimate test load and complies with section 65-2.02. Instead of broken pipe pieces obtained as specified above, cores weighing at least 2.2 pounds from pipe sections selected by the Engineer may be used for the absorption test. Pipe sections that have been tested to the actual 0.01-inch-wide crack will not be load-tested further, and those sections that comply with or exceed the required strength and workmanship standards may be used in the work if authorized.

Replace the 2nd paragraph of section 65-2.01D(5) with:

10-16-20

Oval shaped reinforced concrete pipe 24 inches in nominal diameter and smaller does not need to be tested to the load to produce a 0.01-inch-wide crack if the pipe is subjected to a load equivalent to the ultimate test load and complies with section 65-2.02. Instead of broken pipe pieces obtained as specified above, cores weighing at least 2.2 pounds from pipe sections selected by the Engineer may be used for the absorption test. Pipe sections that have been tested to the actual 0.01-inch-wide crack will not be load-tested further, and those sections that comply with or exceed the required strength and workmanship standards may be used in the work if authorized.

Replace the 2nd paragraph of section 65-2.02A with:

10-16-20

The concrete for reinforced concrete pipe must contain at least 470 pounds of cementitious material per cubic yard and have a water to cementitious material ratio that does not exceed 0.40 by weight. You may use SCM. Circumferential reinforcement must have a minimum cover of 1 inch, except pipes with a nominal diameter of 18 inches or less must have a minimum cover of 3/4 inch.

Replace item 1 in the list in the 3rd paragraph of section 65-2.02F with:

10-15-21

1. Cement mortar composed of 1 part portland cement or portland limestone cement and 2 parts sand by volume and the following:
   - 1.1 Well graded sand passing a no. 8 sieve.
   - 1.2 Mix materials to a consistency suitable for the purpose intended. Use the mortar within 30 minutes after you add the mixing water.
   - 1.3 You may use admixtures of hydrated lime, fire clay, diatomaceous earth, or other authorized inert material in the mortar to facilitate workability. Obtain authorization for the quantity of admixture.

Replace the 4th paragraph of section 65-2.03C with:

10-15-21

Do not allow free water to come in contact with the pipeline until portland cement or portland limestone cement sealing materials have set at least 24 hours.

^^

66 CORRUGATED METAL PIPE

10-19-18

Replace the 1st paragraph in section 66-1.02D with:

10-19-18

Coupling bands for corrugated metal pipe must comply with either section 66-1.02D or section 61-2.01D(2)(b).

Replace the 6th paragraph in section 66-1.02D with:

10-19-18

Joints for siphons and joints for pipes shown as watertight must be watertight under pressure and all conditions of expansion, contraction, and settlement, and must comply with section 61-2.01D(2)(a) for watertightness.

Replace the 4th paragraph of section 66-2.03 with:

10-19-18

Place cement treated structure backfill for slotted corrugated steel pipe as shown and under section 19-3.02F(3) for soil cement beddings. Cover the completed cement treated structure backfill with a curing seal of asphaltic emulsion, Grade SS1 or CSS1.

^^

68 SUBSURFACE DRAINS

04-16-21

Replace section 68-8 with:

04-16-21

68-8 PREFABRICATED VERTICAL DRAINS

68-8.01 GENERAL

68-8.01A Summary

This section includes specifications for installing prefabricated vertical drains.

68-8.01B Definitions

refusal: Drive sleeve or mandrel advancing rate less than 3 inches per second with full applied force.

68-8.01C Submittals

68-8.01C(1) General

Submit:

1. Certificate of compliance
2. Test samples representing every 8,000 linear ft
3. Minimum average roll values as defined under ASTM D4759

Label submittals with the manufacturer's name and product information.

68-8.01C(2) Shop Drawings

Submit 5 copies of shop drawings. Upon review completion, submit from 6 to 12 copies, as requested, for authorization and use during construction.

Shop drawings and calculations must be stamped and signed by an engineer who is registered as a civil engineer in the State.

Shop drawings must include:

1. Your name, address, telephone number, and email address.
2. Plans showing the layout, identification, and working surface and bottom elevations of prefabricated vertical drains.
3. Proposed installation sequence.
4. Proposed method to loosen and penetrate stiff upper soil layers before installing prefabricated vertical drains and method to backfill the loosen holes, if needed.
5. Manufacturer, model number, description and specifications of installation equipment.
6. Manufacturer, model number, description and specifications of devices for measuring and recording plumbness, installation length, and depth.

68-8.01C(3) Construction Record

Submit daily construction record within 24 hours. Include identification, location, and depth of installed prefabricated vertical drains.

68-8.01D Quality Assurance

68-8.01D(1) General

Reserved

68-8.01D(2) Quality Control

Reserved

68-8.01D(3) Department Acceptance

68-8.01D(3)(a) General

Reserved

68-8.01D(3)(b) Verification Testing

Do not start installation until the verification test is accepted.

Install 2 prefabricated vertical drains at locations determined by the Engineer. Use the same equipment and method to be used for installation. Perform verification tests in the Engineer's presence.

The verification test must demonstrate that the proposed equipment and method can install prefabricated vertical drains to the depth shown.

The Department rejects verification tests that fail to install prefabricated vertical drains to the depth shown. Submit revised shop drawings for additional verification tests. Repeat verification testing until the results demonstrate that the proposed equipment and method can install prefabricated vertical drains to the depths shown.

68-8.01D(3)(c) Acceptance Testing

Reserved

68-8.02 MATERIALS

Prefabricated vertical drains must consist of a polymeric core with filter fabric integrally bonded to both sides of the core creating a stable drainage void. Prefabricated vertical drains must be free of defects, rips, or holes.

Identify prefabricated vertical drain rolls under ASTM D4873. Label or tag must include lot or control numbers, individual roll number, date of manufacture, manufacturer, and product identification.

Prefabricated vertical drains must comply with the requirements shown in the following table:

Prefabricated Vertical Drains

Quality characteristic	Test method	Requirement
Total discharge capacity @ 72 psi and unit hydraulic gradient (min, gallon per minute)	ASTM D4716	1.6
Tensile strength (min, lb)	ASTM D4595	225
Nonwoven geotextile of prefabricated vertical drains		
Apparent opening size, average roll value (max, μm(US Sieve))	ASTM D4751	212(70)
Permittivity (min, sec^{-1})	ASTM D4491	0.3
Grab tensile strength (min, lb)	ASTM D4632	112
Puncture strength (min, lb)	ASTM D6241	125
Trapezoidal tear (min, lb)	ASTM D4533	55

68-8.03 CONSTRUCTION

Handle and store prefabricated vertical drains under the manufacturer’s instructions and ASTM D4873. During shipment and storage, the prefabricated vertical drains must be wrapped in a heavy-duty protective covering. Store and protect prefabricated vertical drains from sunlight, mud, dirt, dust, debris, and detrimental substances.

Before installation, survey, mark, and label the prefabricated vertical drain locations as shown. Install prefabricated vertical drains within 6 inches from the locations shown.

Install prefabricated vertical drains from the working surface and to the tip elevation shown.

Equipment for installing prefabricated vertical drains must:

1. Be plumbed with deviation from vertical less than 1 in 50 during installation of the prefabricated vertical drains.
2. Be able to advance through the soil at the job site to the design tip elevation.
3. Have a cross-sectional area of the driving sleeve or mandrel combined with the anchor less than 10 square inches.
4. Have a driving sleeve or mandrel that can protect the prefabricated vertical drain material from tears, cuts, and abrasions during installation.

Advance the driving sleeve or mandrel at a constant force or constant rate.

Protect prefabricated vertical drains from tears, cuts, and abrasions during installation. Anchor the tip of each prefabricated vertical drains with a rod or anchor plate.

You may end the prefabricated vertical drain at an elevation within 8 feet of the design tip elevation.

Do not use jetting or impact method.

If authorized, you may use auger or vibrator to loosen and penetrate stiff upper soil layers before installing prefabricated vertical drains. Auger holes must be 6 inches or less in diameter and extend less than 12 inches past the obstruction. Backfill the auger hole with sands immediately after installation of each prefabricated vertical drain.

Cut installed prefabricated vertical drains neatly with at least 12 inches protruding above the working surface.

Do not damage previously installed prefabricated vertical drains.

You may splice prefabricated vertical drains. Spliced section of prefabricated vertical drains must have the same or better structural and hydraulic properties than prefabricated vertical drains without splice. Place the end of the trailing roll of prefabricated vertical drains inside the geotextile covering of the existing roll. Overlap each end of prefabricated vertical drains with geotextile covering at least 8 inches.

Prefabricated vertical drains that are out of plumb, out of location, damaged, or improperly installed are rejected. Install 2 additional prefabricated vertical drains for each rejected prefabricated vertical drain 2 feet away from the rejected prefabricated vertical drain and at locations determined by the Engineer.

68-8.04 PAYMENT

Not Used

^^

70 MISCELLANEOUS DRAINAGE FACILITIES

04-15-22

Replace item 1 in the list in the 1st paragraph of section 70-5.02B(2) with:

10-15-21

1. Cement and aggregate must comply with section 90-1 except for the aggregate gradation requirements

Replace the 5th paragraph of section 70-7.02C with:

04-15-22

Clevis plate, expansion anchors, yoke, rod, pipe clamps, nuts and bolts, and other fittings must be steel and comply with section 75-1.

Replace the list in the 4th paragraph of section 70-7.02D with:

04-15-22

1. Epoxy binder
2. Epoxy adhesive for pavement markers

^^

71 EXISTING DRAINAGE FACILITIES

04-15-22

Replace section 71-3.01A(4)(b) with:

04-17-20

71-3.01A(4)(b) Preconstruction Meetings

71-3.01A(4)(b)(i) General

Reserved

71-3.01A(4)(b)(ii) Prerehabilitation Meeting

Before starting cleaning and preparation work, you must schedule and attend a prerehabilitation meeting with the Engineer. Include any subcontractors, manufacturers and other parties involved in the culvert work. Provide a meeting facility that is within 5 miles of the job site or at another location accepted by the Engineer.

71-3.01A(4)(b)(iii) Pregrouting Meeting

Before starting grouting work, you must schedule and conduct a grouting meeting with the Engineer and your personnel involved in the grouting work, including your:

1. Project superintendent
2. Supervisory personnel
3. Grouting foreman
4. Grouting subcontractors

Provide a meeting facility that is within 5 miles of the job site or at another location accepted by the Engineer.

Replace section 71-3.01A(4)(c) with:

04-17-20

71-3.01A(4)(c) Quality Control

71-3.01A(4)(c)(i) General

Reserved

71-3.01A(4)(c)(ii) Annular Space Grouting

The grout cast density at the point of placement must be from 53 to 68 lb/cu ft and the minimum compressive strength must be 300 psi at 28 days.

Test the grout for compressive strength under ASTM C495 except that specimens must be moist cured before the 28-day compressive strength test and not be oven dried. If the grouting plan shows multiple stages, the grouting plan must include test results that verify that the grout stiffness is adequate for placement of multiple lifts.

For each batch of grout, perform density and viscosity tests under ASTM C138 and ASTM C939 in the presence of the Engineer. Grout density must be within 3 lb/cu ft of the density in the authorized grout plan with mix design. The time of efflux (outflow) must not exceed 20 seconds as specified in ASTM C939 unless otherwise authorized.

For pipeliners with a stiffness of less than 29 psi, the grout pump's pressure measured at the point of injection must not exceed either of the following:

1. 5 psi
2. Manufacturer's instruction

For pipeliners with a stiffness of at least 29 psi, the grout pump's pressure measured at the point of injection must not exceed 7.25 psi.

The pipeliner must be able to withstand a static head of grout that is 6 inches above the highest crown elevation. The maximum grout pressure for a static grout head must not exceed the grout pump's maximum allowable pressure.

Install a grout pressure gauge and recorder immediately adjacent to each injection port. Continuously record on paper with ink the actual grouting pressure versus time. Record grout pressure to an accuracy of ±0.5 psi. Attach a gauge to a saddle-type diaphragm seal to prevent clogging with grout.

71-3.01A(4)(c)(iii) CCTV Recording

CCTV recordings must be made and submitted in high quality electronic media such as CD or DVD.

The CCTV equipment must include:

1. CCTV camera with articulating head
2. Transporter adapted for conditions of the culvert
3. Television monitor
4. Lighting
5. Cables and power sources

CCTV equipment must:

1. Be specifically designed and constructed for pipe inspection
2. Have camera lighting for minimizing reflective glare
3. Have an adjustable focal-distance range from 6 inches to infinity
4. Produce a minimum resolution of 356 lines per inch for both the camera and monitor
5. Have a remote-reading meter counter accurate to 1 percent over the length of the particular section being inspected

Verify the accuracy of the distance meter in the CCTV with a walking meter, roll-a-tape, or other authorized device.

Where human entry is possible for the entire length of the culvert, you may use a handheld video camera with lighting as an alternative to CCTV. Video and audio content must comply with the requirements for CCTV. Inspect at a rate that is not more than 30 feet per minute.

71-3.01A(4)(c)(iv) Photographs

Use a digital camera and lighting. Lighting and photo quality must be suitable to provide clear and focused photographs of the entire culvert surface under all conditions.

71-3.01A(4)(c)(v) Monitoring of Annular Space Grouting

Wherever a pipeliner with annular space grouting is described, monitor the grouting and record pressures throughout the grouting process. Verify compliance with the manufacturer's instructions for each phase of the grouting process. Gauges must comply with ANSI B40, Grade 2A. The pressure gauges, recorder, and field equipment must be calibrated by an independent testing agency.

71-3.01A(4)(c)(vi) Pipeliners

Pipeliners must be continuous over the entire length of the culvert and must have no visual defect such as foreign inclusions, concentrated ridges, discoloration, pitting, pin holes, cracking or other deformities. The pipeliner must not be over-deflected. There must not be segregation or voids in the grout.

71-3.01A(4)(c)(vii) Deflection Testing of Pipeliners

If a pipeliner with annular space grouting is described, test the pipeliner for deflection. Test after grouting and in the presence of the Engineer.

For pipeliners with a nominal inside diameter of 36 inches or less, either pull a mandrel through the pipeliner by hand or use another authorized method. The mandrel must be:

1. Rigid and nonadjustable
2. Comprised of at least 9 legs and have an odd number of total legs
3. Longer than it is wide
4. Made of steel
5. Fitted with pulling rings at each end
6. Stamped or engraved on some segment other than a runner indicating pipeliner material specification, nominal size, and mandrel outside diameter (e.g., HDPE F 714-SDR 26- 36" – 31.569")
7. Furnished in a suitable carrying case labeled with the same data as stamped on the mandrel
8. Authorized before use

For pipeliners with a nominal inside diameter greater than 36 inches, determine the deflection using a 1-inch diameter, rigid, nonadjustable metal bar; a minimum-radius rigid template; or other authorized method.

The pipeliner must not be over-deflected. For pipeliners 36 inches or less in nominal diameter, the mandrel must pass through the entire pipeliner. For pipeliners greater than 36 inches in nominal diameter, the deflection must be the lesser of either of the following:

1. 5 percent greater than the actual dimension of the pipeliner in place. This actual dimension includes the pipe joint system.
2. 6-1/2 percent of the nominal pipeliner dimension.

If more than 8 percent of the nominal pipeliner dimension is over-deflected, the pipeliner is rejected. If 8 percent or less of the nominal pipeliner dimension is over-deflected, the pipeliner may remain in place and the Department deducts 20 percent of the bid amount for that pipeliner.

Replace item 2 in the list in the 1st paragraph of section 71-3.01B(2) with:

04-17-20

2. Not less than 590 lb of cementitious material per cubic yard

Replace the 1st paragraph of section 71-4.03C with:

04-15-22

Modify inlet, manhole, and riser structures as shown.

Replace section 71-5.03B with:

04-17-20

71-5.03B Frames, Covers, and Grates

Adjust frames, covers, and grates must comply with section 78-23.03.

04-17-20

Delete the 2nd through 5th paragraphs of section 71-5.04.

^^

DIVISION VIII MISCELLANEOUS CONSTRUCTION
72 SLOPE PROTECTION

04-15-22

10-15-21

Delete the 1st paragraph of section 72-2.03A.

10-15-21

Delete the 1st paragraph of section 72-3.03A.

Replace the 7th paragraph of section 72-5.03 with:

10-15-21

Spread and tamp concrete until it is thoroughly compacted and mortar flushes to the surface. If the slope is too steep to allow the use of concrete wet enough to flush with tamping, tamp concrete until it is consolidated and immediately trowel on a mortar surface that is 1/4 inch thick. The mortar must consist of 1 part portland cement or portland limestone cement and 3 parts fine aggregate.

Replace the 2nd paragraph of section 72-11.01C(2) with:

10-15-21

Spread and tamp concrete until it is thoroughly compacted and mortar flushes to the surface. If the slope is too steep to allow the use of concrete wet enough to flush with tamping, tamp the concrete until it is consolidated and immediately trowel on a mortar surface that is 1/4 inch thick. The mortar must consist of 1 part portland cement or portland limestone cement and 3 parts fine aggregate.

Replace section 72-11.03B(3) with:

04-15-22

72-11.03B(3) Mortar

Cement must comply with section 90-1.02B(2).

Hydrated lime must comply with ASTM C207, Type S.

Mortar sand must be commercial quality and free of organic impurities and lumps of clay and shale.

Mortar must consist by volume of 1-part cement, from 0 to 0.5 part hydrated lime, and from 2.25 to 3 parts mortar sand. Add enough water to make a workable mortar. Accurately measure and thoroughly mix each batch of mortar. Do not retemper mortar more than 1 hour after mixing.

Reduce the amount of lime as necessary to prevent leaching and efflorescence on the finished surface.

You may use a premixed packaged mortar blend of cement, lime, and sand, without color, that requires only water to prepare for use as mortar. Packages of the premixed mortar must show the manufacture's name, brand, weight, and color identification.

Add to section 72-11:

04-15-22

72-11.04 SLOPE PAVING WITH ROCK COBBLE

72-11.04A General

72-11.04A(1) Summary

Section 72-11.04 includes specifications for constructing slope paving using rock cobbles on mortar beds.

72-11.04A(2) Definitions

Reserved

72-11.04A(3) Submittals

Submit 2 samples of the rock cobble at least 15 days before placing the rock cobble surface of the slope paving.

If using premixed mortar, submit the manufacturer's instructions for the mixing proportions and procedures.

72-11.04A(4) Quality Assurance

Reserved

72-11.04B Materials

72-11.04B(1) General

Reserved

72-11.04B(2) Rock Cobble

Rock used for the slope paving with rock cobble must be clean and smooth rock obtained from a single source. Flat or needle shapes must not be used unless the thickness of the individual pieces are greater than 1/3 the length.

Rock must be mostly tan, but include a variety of colors including red, rose, brown, gray, and light gray river rock cobble.

Rock used for the slope paving with rock cobble must conform to the following gradation:

Screen size (in)	Percentage passing
8	100
6	50–85
4	0–50

72-11.04B(3) Mortar

Mortar must comply with section 72-11.03B(3).

72-11.04C Construction

72-11.04C(1) General

Protect surfaces of completed rock cobble, concrete, and other materials on the exposed surface from spillage, splatters, and other deposits of cementitious materials from rock cobble construction. Remove these deposits without damage to the materials or exposed surfaces.

Stains, efflorescence, laitance, splashes, or spots on the faces of rock cobble exposed to view must be removed.

72-11.04C(2) Installation on a Mortar Bedding

The top surface of the shotcrete or concrete base must be lightly and evenly scored horizontally and vertically with a metal scratcher having grooves not more than 1 inch apart.

Cure the shotcrete or concrete base by the water method for at least 2 days before placing rock cobbles.

Clean concrete areas to be in contact with mortar of loose or foreign material that would prevent bonding between the mortar and the concrete surfaces. Flush the concrete areas with water and allow them to dry to a surface-dry condition immediately before placing mortar.

Lay and embed rock cobble in mortar. Rock cobble must be tightly seated so the mortar is flushed into the joints. Excess mortar must be removed.

After the rock cobbles have been set in the mortar, exposed top surfaces must be thoroughly cleaned.

Unless authorized, the clear distance between placed rock cobbles must not exceed 1-1/2 inches.

Loose rocks must be reset.

Cure mortar by keeping the surface damp for 3 days.

72-11.04D Payment

Not Used

^^

73 CONCRETE CURBS AND SIDEWALKS

10-15-21

Replace the 2nd paragraph of section 73-2.03A with:

10-15-21

Anchor steel dowels in drilled holes with mortar made from equal parts by volume of portland cement or portland limestone cement, sand, and water. You may use anchor bolts instead of anchored steel dowels if authorized.

Replace the 3rd paragraph of section 73-1.02A with:

04-17-20

Preformed expansion joint filler must comply with ASTM D1751. As an alternative, a semi-rigid, closed-cell polypropylene foam, preformed joint filler that complies with ASTM D8139 may be used.

Replace the paragraph of section 73-1.02B with:

04-17-20

Detectable warning surface must be on the Authorized Material List for detectable warning surfaces and must match yellow color no. 33538 of AMS-STD-595.

^^

75 MISCELLANEOUS METAL

04-16-21

Replace the last paragraph in section 75-3.02B with:

10-18-19

Thread-locking systems must (1) consist of a cleaner, primer, and anaerobic thread-locking adhesive and (2) be on the Authorized Material List for anaerobic thread-locking systems. Apply all components of the system under the manufacturer's instructions.

Replace the 1st paragraph of section 75-3.02C(1) with:

04-16-21

Concrete anchorage devices must be on the Authorized Material List for stud mechanical expansion anchors, shell-type mechanical expansion anchors, resin capsule anchors, or cast-in-place inserts.

04-17-20

Delete the 3rd paragraph of section 75-3.02C(2).

Replace section 75-3.02C(3) with:

04-17-20

75-3.02C(3) Resin Capsule Anchors

Reserved

04-17-20

Delete the 3rd paragraph of section 75-3.02C(4).

^^

78 INCIDENTAL CONSTRUCTION

10-16-20

Replace section 78-4.03 with:

04-19-19

78-4.03 PAINTING CONCRETE

78-4.03A General

78-4.03A(1) Summary

Section 78-4.03 includes specifications for preparing and painting concrete surfaces.

78-4.03A(2) Definitions

Reserved

78-4.03A(3) Submittals

Submit the coating manufacturer's application instructions at least 7 days before use.

78-4.03A(4) Quality Assurance

Reserved

78-4.03B Materials

Coatings for concrete must comply with the specifications for acrylic emulsion paint for exterior masonry in section 91-4.02B.

Coatings must be white.

78-4.03C Construction

78-4.03C(1) General

Reserved

78-4.03C(2) Surface Preparation

Before painting, surfaces must be:

1. At least 28 days old.
2. Prepared under SSPC-SP 13/NACE no. 6. Pressure rinse the prepared surfaces before applying the paint.
3. Thoroughly dry. You may use artificial drying methods if authorized.

78-4.03C(3) Application

Apply at least 2 coats under the manufacturer's instructions and SSPC-PA 7. Protect adjacent surfaces during painting using an authorized method.

10-16-20

Paint text on structures and barriers in 2-1/2-inch high black letters. Black text must contrast with the background. If ordered, adjust text size and paint color to accommodate for paint location.

04-19-19

78-4.03D Payment

Not Used

Replace section 78-4.04 with:

04-19-19

78-4.04 STAINING CONCRETE AND SHOTCRETE

78-4.04A General

78-4.04A(1) Summary

Section 78-4.04 includes specifications for preparing and staining concrete and shotcrete surfaces.

78-4.04A(2) Definitions

acid stain: non-tintable, transparent stain that contains dilute acid.

water-based stain: semi-transparent or solid water-based coating in an acrylic emulsion vehicle, that can be tinted to match an AMS-STD-595 color.

78-4.04A(3) Submittals

78-4.04A(3)(a) General

Submit the stain and sealer manufacturer's product data and application instructions at least 7 days before starting staining activities.

78-4.04A(3)(b) Contractor Qualifications

Submit the following documentation at least 10 days before the prestaining meeting:

1. Summary of the staining contractor's experience that demonstrates compliance with section 78-4.04A(4)(c).
2. List of at least 3 projects completed in the last 5 years that demonstrate the staining contractor's ability to stain surfaces similar to the surfaces for this project. For each project include:
   2.1. Project description
   2.2. Name and phone number of the owner
   2.3. Staining completion date
   2.4. Color photos of the completed stained surface

78-4.04A(3)(c) Staining Quality Work Plan

Submit a staining quality work plan at least 10 days before the prestaining meeting. The work plan must include details for preparing and staining the surfaces to achieve the required color, and for sealing the surfaces, including:

1. Number of applications that will be used to apply the stain
2. For each application of the stain, a description of:
   2.1. Manufacturer, color, finish, and percentage strength mixture of the stain that will be applied
   2.2. Proposed methods and tools for applying the stain
3. Proposed methods for protecting adjacent surfaces during staining
4. Proposed methods and tools for applying the sealer

For acid stains, the work plan must also include a rinse water collection plan for containing all liquid, effluent, and residue resulting from preparing and staining the surfaces.

78-4.04A(4) Quality Assurance

78-4.04A(4)(a) General

Reserved

78-4.04A(4)(b) Test Panels

Stain the authorized test panel complying with section 51-1.01D(2)(c) or section 53-3.01D(3).

The test panel must be:

1. Stained using the same personnel, materials, equipment, and methods to be used in the work
2. Accessible for viewing
3. Displayed in an upright position near the work
4. Authorized for staining before starting the staining work

If ordered, construct additional test panels until a satisfactory color is attained. The preparing and staining of additional test panels is change order work.

The Engineer uses the authorized stained test panel to determine the acceptability of the stained surface.

Dispose of the test panels after the staining work is complete and authorized. Notify the Engineer before disposing of the test panels.

78-4.04A(4)(c) Contractor Qualifications

The staining contractor must have experience staining surfaces to simulate the appearance of natural rock formations or stone masonry, and must have completed at least 3 projects in the past 5 years involving staining of surfaces similar to the surfaces for this project.

78-4.04A(4)(d) Prestaining Meeting

Before starting staining activities, conduct a meeting to discuss the staining quality work plan. Meeting attendees must include the Engineer and all staining contractors.

78-4.04B Materials

78-4.04B(1) General

Reserved

78-4.04B(2) Stain

78-4.04B(2)(a) General

The stain must be:

1. Commercially available product designed specifically for exterior applications
2. Specifically manufactured for staining concrete surfaces

78-4.04B(2)(b) Acid Stain

Acid stain must:

1. Contain dilute acid that penetrates and etches the surfaces
2. Be a water-based solution of inorganic metallic salts
3. Produce abrasion-resistant color deposits

78-4.04B(2)(c) Water-based Stain

Water-based stain must be:

1. Acrylic emulsion
2. Non-fading and UV resistant
3. Capable of producing irregular, mottled tones

78-4.04B(3) Sealer

The sealer must be as recommended by the stain manufacturer, clear and colorless, and have a matte finish when dry.

78-4.04B(4) Joint Sealing Compound

Reserved

78-4.04C Construction

78-4.04C(1) General

At locations where there is exposed metal adjacent to the surfaces to be stained, seal the joint between the surfaces to be stained and the exposed metal with a joint sealing compound before applying the stain.

78-4.04C(2) Surface Preparation

Test surfaces for acceptance of the stain before applying the stain. Clean surfaces that resist accepting the stain and retest until passing.

Before staining, the surfaces must be:

1. At least 28 days old
2. Prepared under SSPC-SP 13/NACE no. 6
3. Thoroughly dry

78-4.04C(3) Application

78-4.04C(3)(a) General

Apply the stain under the manufacturer's instructions. Protect adjacent surfaces during staining. Drips, puddles, or other irregularities must be worked into the surface.

Apply the sealer under the manufacturer's instructions.

78-4.04C(3)(b) Acid Stain

Work the acid stain into the concrete using a nylon bristle brush in a circular motion.

After the last coat of stain has dried, rinse the stained surfaces with water and wet scrub them with a stiff-bristle nylon brush until the rinse water runs clear. Collect all rinse water.

78-4.04D Payment

Not Used

Replace section 78-23 with:

04-17-20

78-23 ADJUST UTILITY FRAMES, COVERS, AND MANHOLES

78-23.01 GENERAL

Section 78-23 includes specifications for adjusting utility access box frames, covers, and manholes.

Work performed on existing utility frames, covers, grates and manholes must comply with section 15.

78-23.02 MATERIALS

Not Used

78-23.03 CONSTRUCTION

Lower and raise utility frames, covers, grates and manholes by lowering before cold planing and raising after paving or surfacing. Before opening the lane to traffic, either (1) complete permanent paving or surfacing or (2) temporarily fill any depressions with HMA.

Do not adjust to final grade until the adjacent pavement or surfacing is complete.

For a structure that is to be raised, remove the cover or frame and trim the top of the structure to provide a suitable foundation for the new material.

Instead of using new materials similar in character to those in the existing structure, you may use raising devices to adjust a manhole to grade. Before starting paving work, measure and fabricate raising devices. Raising devices must:

1. Comply with the specifications for section 75 except that galvanizing is not required
2 Have a shape and size that matches the existing frame
3. Be match marked by painting identification numbers on the device and corresponding structure
4. Result in an installation that is equal to or better than the existing one in stability, support, and nonrocking characteristics
5. Be fastened securely to the existing frame without projections above the surface of the road or into the clear opening

Where manholes are to be lowered, remove the top portion to 3.5 feet below finished grade or to an authorized depth. Adjust the manhole using the taper needed to match the finished grade.

If a manhole cover is unstable or noisy under traffic, place a coil of asphalt-saturated rope, a plastic washer, or asphaltic compound on the cover seat. Before placement, obtain authorization for use of the material.

78-23.04 PAYMENT

Not Used

^^

80 FENCES

10-18-19

Replace the 1st paragraph of section 80-2.02B with:

10-18-19

Line posts must comply with ASTM A702 except packaging of posts is not required. You may omit the anchor plate if the post is set in a concrete footing with a minimum cross-sectional dimension of 6 inches and a depth equal to the full penetration of the post.

Replace item 3 in the list in the 1st paragraph of section 80-2.02D with:

10-18-19

3. Be one of the following:
   - 3.1. 12-1/2 gauge, Class 3
   - 3.2. 13-1/2 gauge, Class 3
   - 3.3. 14 gauge, Class 3
   - 3.4. 15-1/2 gauge, Class 3

Replace the 2nd paragraph of section 80-3.02B with:

10-19-18

Posts and braces must comply with the strength requirements in ASTM F1043 for one of the following:

1. Group IA, regular grade, for round pipes
2. Group IC, 50,000 psi yield, for round pipes
3. Group II-L for roll-formed posts and braces

Replace the list in section 80-4.02B(1)(b) with:

10-19-18

1. Comply with ASTM A1064 and have a Class 1 zinc coating complying with ASTM A641
2. Be welded or woven galvanized steel wire fabric
3. Be made of at least 16-gauge wire
4. Be 36 inches wide

Replace the paragraph in section 80-4.02B(2) with:

10-19-18

The materials for a temporary desert tortoise fence must comply with section 80-4.02B(1).

Replace the 2nd sentence in the 1st paragraph of section 80-4.02C(2) with:

10-19-18

Embed the posts at maximum 10-foot intervals into the ground.

^^

DIVISION IX TRAFFIC CONTROL DEVICES

82 SIGNS AND MARKERS

04-16-21

Replace the list in the 1st paragraph of section 82-2.01C with:

04-19-19

1. Aluminum sheeting
2. Retroreflective sheeting
3. Color imaging methods and film
4. Protective-overlay film

Replace section 82-2.02C with:

04-17-20

82-2.02C Retroreflective Sheeting

Retroreflective sheeting used for the background and legend must comply with ASTM D4956-13 and must be on the Authorized Material List for signing and delineation materials.

Retroreflective sheeting must be Type XI, except for white background signs, it must be Type VIII or IX.

Warning sign plaques and panels must be retroreflective fluorescent orange or fluorescent yellow background.

Type VIII, IX, and XI retroreflective sheeting must have Class 1, 3, or 4 adhesive backing. Adhesive backing must be pressure sensitive and fungus resistant.

Retroreflective sheeting must be applied to sign panels at the fabrication plant under the retroreflective sheeting manufacturer's instructions without appreciable stretching, tearing, or other damage.

Orientation of the legend must comply with the retroreflective sheeting manufacturer's instructions.

Retroreflective sheeting on a sign panel with a minor dimension of 48 inches or less must be a single, contiguous sheet without splices except for the splices produced during the manufacture of the retroreflective sheeting. Sign panel with a minor dimension greater than 48 inches may have 1 horizontal splice in the retroreflective sheeting other than the splices produced during the manufacture of the retroreflective sheeting.

Unless the retroreflective sheeting manufacturer's instructions require a different method, splices in the retroreflective sheeting must overlap by at least 1 inch. The retroreflective sheeting on either side of a splice must not exhibit a color difference under incident and reflected light.

Replace section 82-2.02D with:

04-19-19

82-2.02D Color Imaging Methods and Film

The material used for color imaging methods, film, and protective-overlay must be recommended by the retroreflective sheeting manufacturer.

Colored retroreflective sheeting must be used for the background.

Signs with green, red, blue, or brown backgrounds may use reverse-screened-process color on white retroreflective sheeting for the background color. The coefficient of retroreflection must be at least 70 percent of the coefficient of retroreflection specified in ASTM D4956 for the corresponding color of retroreflective sheeting.

The sign must have outdoor weatherability characteristics equivalent to those specified for the corresponding color of retroreflective sheeting in ASTM D4956.

Replace the 2nd paragraph of section 82-3.01A with:

04-17-20

Roadside signs include ground-mounted signs and Type N (CA), Type P (CA), and Type R (CA) marker panels.

Add to section 82-3.01B:

04-17-20

ground-mounted sign: Roadside sign or signs with a wide-flange metal post.

Replace section 82-3.01D with:

10-16-20

82-3.01D Quality Assurance

When delivered to the job site, treated posts must:

1. Comply with the specified grading requirements
2. Be dry
3. Have no visual evidence of preservative on the surface

Add to section 82-3.02B:

04-16-21

Wide-flange metal posts must be fabricated from structural steel complying with ASTM A36/A36M. Nuts, bolts, and washers for the breakaway connections of a wide-flange steel post must comply with ASTM A325.

Perforated square steel tube posts and square steel anchor sleeves must:

1. Be fabricated from galvanized hot rolled steel complying with ASTM 1011 Grade 50 and galvanized under ASTM 653 G-90.
2. Have a minimum 60 ksi yield strength after cold forming.
3. Have zinc coated corner welds. Corner welds must be scarfed and then a conversion coating and clear organic polymer topcoat must be applied.

Perforated square steel tube post must have 7/16-inch diameter holes or punch-outs 1-inch on center on all four sides.

Gravel or stone for a steel tube post foundation must be natural rough surface gravel or broken stone.

Concrete for a steel tube post foundation must be minor concrete that contains at least 470 pounds of cementitious material per cubic yard.

10-16-20

Delete the 3rd paragraph of section 82-3.02C.

Replace the 4th paragraph of section 82-3.02C with:

10-16-20

Posts must be treated under section 57-2.01B(3) and under AWPA U1, Use Category UC4A, Commodity Specification A. Posts must be incised, and the minimum retention of preservative must comply with AWPA requirements.

Add to section 82-3.02E:

04-16-21

Sign panel drive rivets must be galvanized steel or aluminum.

Square steel tube post drive rivets must be galvanized steel.

Replace the 9th paragraph of section 82-3.03A with:

04-16-21

Backfill the space around the wide-flange metal posts with minor concrete that contains at least 470 pounds of cementitious material per cubic yard.

Add to section 82-3.03A:

04-16-21

Fasten square steel tube posts to square steel anchor sleeves with square steel tube post drive rivets.

Add to section 82-3.03B:

04-16-21

Attach sign panel to square steel tube post with sign panel drive rivets. Place a fiber washer between the rivet head and the sign face.

Replace section 82-5.01A with:

10-19-18

Section 82-5 includes specifications for fabricating and installing markers, including milepost markers.

Replace the 2nd paragraph in section 82-5.02E with:

10-19-18

A target plate for milepost marker or Type L-1 (CA) or Type L-2 (CA) object marker installed on a metal post must be manufactured from an aluminum sheet or zinc-coated steel sheet.

Replace section 82-5.02H with:

10-19-18

82-5.02H Milepost Markers

Letters and numerals on a milepost marker must be made with opaque black paint or film. The paint and film must have an equivalent outdoor weatherability as the retroreflective sheeting specified in ASTM D4956. Nonreflective, opaque, black film must be vinyl or acrylic material.

Film for letters and numerals must be computer cut and have pressure-sensitive adhesive.

Replace the 5th paragraph of section 82-5.03 with:

10-19-18

Use stencils to paint letters and numerals on milepost markers.

Add to the end of section 82-9.03:

04-17-20

82-9.03F Installation of Sign Panels on Existing Posts

Install roadside sign panels on existing posts with fastening hardware under section 82-2.03A.

Replace the 1st paragraph of section 82-9.04 with:

04-17-20

Payment for furnishing sign panels of any type is not included in the payment for install sign panel on existing frame and post.

Payment for removing existing sign panel is included in the payment for install roadside sign panel on existing post.

^^

83 RAILINGS AND BARRIERS

04-15-22

Add to the end of section 83-1.03:

10-16-20

83-1.03D Miscellaneous Construction

Where shown, paint the structure name, bridge number, year constructed, and other bridge identification information. Painting concrete must comply with section 78-4.03C(3).

Bridge identification on the bridge barrier must be (1) painted at each structure approach, (2) visible to approaching traffic, and (3) located near the paving notch, if applicable.

For open bridge barrier rails, paint bridge identification on the widest rail element.

For structures with adjacent retaining walls or approaches where metal beam bridge railings extend beyond the structure, paint bridge identification on the concrete end block of the barrier.

For bents and piers, paint bridge identification corresponding to the name and number shown, on the face of the bridge barrier directly above the centerline of each bent or pier.

Replace section 83-2.01A(3) with:

04-19-19

83-2.01A(3) Construction

For midwest guardrail systems and thrie beam barrier, install steel foundation tubes and soil plates in soil.

Add to section 83-2.01A(3):

04-16-21

Cut off any excess bolt that extends more than 0.5 inch beyond the nut.

Replace section 83-2.02C(1)(c) with:

10-16-20

83-2.02C(1)(c) Bolt Holes and Cuts in Wood Posts and Blocks

If copper naphthenate, Alkaline Copper Quaternary ammonium compound, or copper azole is used to treat wood posts and blocks, before inserting the bolts, fill the bolt holes with grease.

You may field bore the 2-3/8-inch-diameter holes shown for wood guardrail terminal posts and wood rail tensioning assembly posts.

If you perform field cutting or boring after treatment, manually treat with preservative under section 57-2.01C(3)(b).

Replace the 4th paragraph of section 83-2.03C with:

04-19-19

If median barrier delineation is shown, match the barrier marker spacing to the raised pavement marker spacing on the adjacent median edge line pavement delineation.

Replace the 3rd paragraph of section 83-2.05B(3) with:

10-16-20

Stud bolts must comply with the specifications for studs in clause 9 of AWS D1.1.

Add to section 83-2.05B(3):

04-15-22

Anchor bolts for ST-75 railing must comply with ASTM F1554, Grade 105.

Replace section 83-2.08 with:

04-16-21

83-2.08 TUBULAR RAILINGS

83-2.08A General

83-2.08A(1) Summary

Section 83-2.08 includes specifications for constructing tubular railings.

Tubular railing includes rail tubes, post tubes, plates, rail splice sleeves, and fasteners.

Paint for galvanized railing must comply with section 59-3.

83-2.08A(2) Definitions

Reserved

83-2.08A(3) Submittals

Submit a certificate of compliance verifying that all components of the tubular railing comply with section 83-2.08B.

Submit shop drawings for tubular railing. Shop drawings must include:

1. Details for venting holes in rails, posts, and sleeves
2. Railing layout
3. Complete details for the construction of the work including methods of construction, sequence of shop and field assembly, galvanization, and installation procedures

Submit 7 copies of the shop drawings. Allow 25 days for review. Upon authorization, the Engineer returns 2 copies to you for use during construction.

83-2.08A(4) Quality Assurance

Reserved

83-2.08B Materials

The materials for tubular railing components must comply with the specifications shown in the following table:

Material	Specification
Rail and post tubes	ASTM A500/A500M, Grade B
Rolled bars and plates	ASTM A36/A36M
Rail splice sleeves	ASTM A36/A36M
Bolts	ASTM F3125, Grade A325/A325M, Type 1
Threaded rods	ASTM A449, Type 1
Nuts for bolts and threaded rods	ASTM A563/A563M
Washers for bolts and threaded rods	ASTM F436/F436M

Bolts and threaded rods furnished under ASTM A449 must comply with the mechanical requirements specified in ASTM A449 after galvanizing.

Rail tubes must be shop bent or fabricated to fit the horizontal curve if the radius is less than 900 feet.

If the vertical radius of the tubular handrailing is 30 feet or less, that portion of the railing must be either shop bent or built up from 1/4-inch-thick structural steel plates. The built-up tubular rail elements must match the seamless tubing in appearance.

The difference between out-to-out rail splice sleeve dimensions and the clear inside dimensions of the tubular steel rail elements must not exceed 3/16 inch after galvanizing.

Carefully handle the materials such that no parts are bent, broken, abraded, or otherwise damaged. Do not use manufacturing, handling, or installation methods that damage or distort the members or damage the galvanizing.

83-2.08C Construction

83-2.08C(1) General

Before the tubular railing parts are assembled, clean the bearing surfaces and surfaces to be in permanent contact. If the railing is mounted on a concrete surface, the post bases must be true and flat to provide uniform bearing.

Tubular railings must present a smooth, uniform appearance in their final position and conform closely to the horizontal and vertical lines as shown.

83-2.08C(2) Tubular Handrailing

Adjust the vertical position of the tubular handrailing to compensate for the camber and dead load deflection of the superstructure. The Engineer determines the adjustment amount before the railing is installed.

The metal railing posts to which the chain link railing attaches must fit the mounting brackets, pipe sleeves, and other connection fittings.

Where necessary, install shims at posts and rail elements to provide uniform bearing and conformance with the horizontal lines and vertical grade lines. Shims at steel posts must be commercial-quality, galvanized sheet steel.

83-2.08C(3) Tubular Bicycle Railing

When mounted on concrete barriers, cast sleeves for threaded rods in concrete. If authorized, you may drill and bond the threaded rods using chemical adhesive systems under section 51-1.

Erect railing true to line and grade. Posts must be normal to the profile grade. Transverse to the profile grade, railings must be plumb within a tolerance not to exceed 0.02 foot in 10 feet. Adjacent rail elements must align with each other within 1/16 inch.

83-2.08D Payment

Not Used

10-15-21

Delete the 7th paragraph of section 83-3.01A.

Replace section 83-3.02F with:

10-15-21

83-3.02F Reserved

Replace section 83-3.03A(7) with:

04-15-22

83-3.03A(7) Finishing

Before applying the curing compound, the surface finish of Type 60 series concrete barriers must be free from surface pits larger than 1 inch in diameter, and you must give the surface a soft brush finish with strokes parallel to the line of the barriers. Do not finish the surface with a brush application of grout.

To facilitate finishing, remove fixed forms for CIP Type 60 series concrete barriers as soon as possible after the concrete has set enough to maintain the barrier shape without support.

The surface finish of Type 60 series concrete barriers must be Class 1 surface finish if cured by the forms-in-place method.

At least 7 days after placing Type 60 series concrete barriers, give the exposed surfaces a final light abrasive blast finish to achieve a uniform appearance.

The final surface finish of concrete barriers other than Type 60 series must be a Class 1 surface finish. Any alternative method of final surface finishing must be authorized.

Class 1 surface finish must comply with section 51-1.03F(3).

Replace section 83-3.03A(8) with:

04-15-22

83-3.03A(8) Curing

Cure the exposed surfaces of concrete barriers by the curing compound method using curing compound no. 6.

For concrete barriers on bridges and walls that do not support soundwalls, you may cure the formed surfaces of the barriers by keeping the forms in place for at least 12 hours after placing the concrete. No further curing is required after the forms are removed.

For Type 60 series concrete barriers not using the forms-in-place curing method, apply the curing compound using a mechanical sprayer capable of applying the curing compound to at least one entire side and the top of the concrete barrier in one application at a uniform rate of coverage. Protect the spray against wind.

In freeze-thaw areas, cure concrete barriers on bridges and walls by the water method.

For Type 80 and Type 85 series concrete barriers, cure the formed surfaces of the barriers by keeping the forms in place for at least 36 hours after placing the concrete. No further curing is required after the forms are removed.

Replace the paragraph of section 83-3.03A(11) with:

04-19-19

Where concrete barrier markers are shown, cement the markers to the barrier under the manufacturer's instructions. Match the barrier marker spacing to the raised pavement marker spacing on the adjacent median edge line pavement delineation.

Replace section 83-3.03A(12) with:

10-15-21

83-3.03A(12) Reserved

^^^

84 MARKINGS

04-15-22

Replace section 84-2 with:

10-19-18

84-2 TRAFFIC STRIPES AND PAVEMENT MARKINGS

84-2.01 GENERAL

84-2.01A Summary

Section 84-2 includes specifications for applying traffic stripes and pavement markings.

Traffic stripes and pavement markings must comply with ASTM D6628 for daytime and nighttime color.

Retroreflectivity must be measured under ASTM E1710 and the sampling protocol specified in ASTM D7585.

84-2.01B Definitions

10-18-19

pavement marking: Transverse marking which includes shoulder or gore marking, traffic island marking, word or numeral or symbol marking, arrow, limit line, stop line, yield line, crosswalk marking, speed measurement marking, speed reduction marking, speed hump marking, parking space marking, and route shield marking.

10-19-18

traffic stripe: Longitudinal centerline or lane line used for separating traffic lanes in the same direction of travel or in the opposing direction of travel or a longitudinal edge line marking the edge of the traveled way or the edge of a lane at a gore area separating traffic at an exit or entrance ramp. A traffic stripe is shown as a traffic line.

84-2.01C Submittals

For each lot or batch of traffic stripe material, primer, and glass beads, submit:

1. Certificate of compliance, including the material name, lot or batch number, and manufacture date
2. METS notification letter stating that the material is authorized for use, except for thermoplastic and primer
3. SDS
4. Manufacturer's Instructions

For each lot or batch of thermoplastic, submit a manufacturer's certificate of compliance and the following test results from the California Test 423:

1. Brookfield Thermosel viscosity
2. Hardness
3. Yellowness index, white only
4. Daytime luminance factor
5. Yellow color, yellow only
6. Glass bead content
7. Binder content

The date of the test must be within 1 year of use.

Submit test results for each lot of beads specifying the EPA test methods used and tracing the lot to the specific test sample. The testing for lead and arsenic content must be performed by an independent testing laboratory.

Submit the thermoplastic test stripe to the Engineer.

Submit the retroreflectivity test result within 5 days of testing the traffic stripes and pavement markings. The data must include the retroreflectivity, time, date, and GPS coordinates for each measurement.

84-2.01D Quality Assurance

84-2.01D(1) General

Reserved

84-2.01D(2) Quality Control

Before starting permanent application of methyl methacrylate and two component paint traffic stripes and pavement markings, apply a test stripe on roofing felt or other suitable material in the presence of the Engineer. The test stripe section must be at least 50 feet in length.

Upon request, apply a thermoplastic test stripe on suitable material in the presence of the Engineer during the application of thermoplastic traffic stripes or markings. The test stripe must be at least 1 foot in length.

Remove loose glass beads before measuring the retroreflectivity. Obtain authorization to proceed with the application of traffic stripes and pavement markings.

Within 30 days of application, test the traffic stripes and pavement markings under the test methods and frequencies shown in the following table:

Traffic Stripe Testing Frequency

Quality characteristic	Test method	Minimum sampling and testing frequency
Initial retroreflectivity (min, $mcd \cdot m^{-2} \cdot lx^{-1}$) White Yellow	ASTM E1710	ASTM D7585[a]

[a]Use the referee evaluation protocol for project length less than 10 miles. For project lengths greater than or equal to 10 miles, add one evaluation for every additional mile.

Verify the glass bead application rate by stabbing the glass bead tank with a calibrated rod.

84-2.01D(3) Department Acceptance

The Engineer will perform a nighttime, drive-through, visual inspection of the retroreflectivity of the traffic stripes and pavement markings and notify you of any locations with deficient retroreflectivity. Test the retroreflectivity of the deficient areas to confirm striping and pavement markings meets the requirements.

The thermoplastic test stripe will be tested for yellow color, daytime luminance factor, and yellowness index requirements by METS.

84-2.02 MATERIALS

84-2.02A General

Reserved

84-2.02B Glass Beads

Each lot of glass beads must comply with EPA Test Method 3052 and 6010B or 6010C. Glass beads must contain less than 200 ppm each of arsenic and lead.

Type 1 glass beads must comply with AASHTO M 247.

Type 2 glass beads must comply with AASHTO M 247. At least 75 percent of the beads by count must be true spheres that are colorless and do not exhibit dark spots, air inclusions, or surface scratches when viewed under 20X magnification.

High-performance glass beads must be on the Authorized Material List for high-performance glass beads.

Large-gradation glass beads must be on the Authorized Material List for two component traffic paint.

Glass beads for methyl methacrylate must be on the Authorized Material List for methyl methacrylate traffic striping and pavement marking.

Glass beads for paint must comply with State Specification 8010-004.

Glass beads must be surface treated, according to the bead and the material manufacturer's instructions, to promote adhesion with the specified material.

84-2.02C Thermoplastic

Thermoplastic must comply with State Specification PTH-02HYDRO, or PTH-02ALKYD.

Sprayable thermoplastic must comply with State Specification PTH-02SPRAY.

Each lot or batch of thermoplastic must be tested under California Test 423.

84-2.02D Methyl Methacrylate

Methyl methacrylate traffic paint must:

1. Be on the Authorized Material List for methyl methacrylate traffic striping and pavement marking
2. Be Category 2

84-2.02E Traffic Striping and Pavement Marking Tape

Traffic striping and pavement marking tape must be on the Authorized Material List for signing and delineation materials.

04-19-19

White tape must have an initial retroreflectivity of a minimum 700 mcd/m2.

Yellow tape must have an initial retroreflectivity of a minimum 500 mcd/m2.

10-19-18

When contrast is required for traffic stripping and pavement marking tape, the tape must be pre-formed and retroreflective, consisting of a white film with retroreflective beads and a contrasting black film border. The contrasting black border must be a nonreflective film bonded on each side of the white film to form a continuous roll. Each black border must be a minimum of 2 inches wide. The width of the tape must be at least 4 inches wider than the stripe width.

84-2.02F Two-Component Paint

Two-component traffic paint must be on the Authorized Material List for two component traffic paint.

04-15-22

84-2.02G Paint

Paint must comply with the requirements shown in following table:

Paint Specifications

Paint type	Color	Specification
Waterborne traffic line	White, yellow, and black	State Specification PTWB-01R2
Waterborne traffic line for the international symbol of accessibility and other curb markings	Blue, red, and green	Federal Specification TT-P-1952F

84-2.02H–84-2.02L Reserved

84-2.03 CONSTRUCTION

84-2.03A General

Establish the alignment for traffic stripes and the layouts for pavement markings with a device or method that will not conflict with other traffic control devices.

Protect existing retroreflective pavement markers during work activities.

Remove existing pavement markers that are coated or damaged by work activities and replace with an equivalent marker on the Authorized Material List for signing and delineation materials.

A completed traffic stripe or pavement marking must:

1. Have well defined edges
2. Be uniform
3. Be free from runs, bubbles, craters, drag marks, stretch marks, and debris

A completed traffic stripe must:

1. Be straight on a tangent alignment
2. Be a true arc on a curved alignment
3. Not deviate from the width shown by more than:
   3.1. 1/4 inch on a tangent alignment
   3.2. 1/2 inch on a curved alignment

The length of the gaps and individual stripes that form a broken traffic stripe must not deviate by more than 2 inches from the lengths shown. The gaps and stripes must be uniform throughout the entire length of the traffic stripe.

Protect newly placed traffic stripes and pavement markings from traffic and work activities until the traffic stripes and pavement markings are dry or hard enough to bear traffic.

Use mechanical methods to remove dirt, contaminants, and loose material from the pavement surface before applying the traffic stripe or pavement marking.

Use abrasive blast cleaning to remove laitance and curing compound from the surface of new concrete pavement before applying the traffic stripe or pavement marking.

Construct recesses as shown in the following table:

Recess Depth Requirements

Material	Requirement	
	Depth (mils)	Depth (in)
Thermoplastic	375	3/8
Two component traffic paint	250	1/4
Methyl methacrylate traffic paint	250	1/4

Construct recesses for double traffic stripes in a single pass.

Before applying the traffic stripes and pavement markings:

1. Allow wet ground recesses to dry a minimum of 24 hours
2. Remove all powdery residue from dry recess
3. Keep the recesses dry and free from debris

Apply traffic stripes and pavement markings before the end of the same work shift.

84-2.03B Application of Traffic Stripes and Pavement Markings

84-2.03B(1) General

Apply material for a pavement marking with a stencil or a preformed marking.

Immediately remove drips, overspray, improper markings, or material tracked by traffic, using an authorized method.

Apply a traffic stripe or a pavement marking only to a clean, dry surface during a period when the pavement surface temperature is above 50 degrees F.

Apply traffic stripe or pavement marking and glass beads in a single pass. You may apply the glass beads by hand on pavement markings.

Embed glass beads to a depth of 1/2 their diameters.

Distribute glass beads uniformly on traffic stripe and pavement markings.

Glass beads with integral color must match the color of the stripe or pavement marking.

Apply glass beads with two separate applicator guns when two gradations are specified.

Allow enough overlap distance between new and existing striping patterns to ensure continuity at the start and end of the transition.

The retroreflectivity of applied traffic stripes and pavement markings must comply with the requirements shown in the following table:

Retroreflectivity Requirements

Traffic stripe material	White (min, $mcd \cdot m^{-2} \cdot lx^{-1}$)	Yellow (min, $mcd \cdot m^{-2} \cdot lx^{-1}$)
Paint	250	125
Thermoplastic	250	125
Thermoplastic with wet night enhanced visibility	700	500
Two component	250	125
Methyl methacrylate	500	300
Tape	700	500

84-2.03B(2) Thermoplastic

84-2.03B(2)(a) General

Apply primer or surface preparation adhesive under the manufacturer's instructions:

1. To all roadway surfaces except for asphaltic surfaces less than 6 months old
2. At a minimum rate of 1 gallon per 300 square feet
3. To allow time for the thermoplastic primer to dry and become tacky before application of the thermoplastic

Do not thin the primer.

Preheat thermoplastic using preheaters with mixers having a 360-degree rotation.

Apply thermoplastic in a single uniform layer by spray or extrusion methods.

Completely coat and fill voids in the pavement surface with the thermoplastic.

Apply recessed thermoplastic at a thickness so that the top is 0 to 1/16 inch below the pavement surface.

84-2.03B(2)(b) Extruded Thermoplastic

Apply extruded thermoplastic at a temperature of 400 to 425 degrees F or as recommended by the manufacturer.

Apply extruded thermoplastic for a traffic stripe at a rate of at least 0.36 lb of thermoplastic per foot of 6-inch-wide solid stripe. The applied traffic stripe must be at least 0.060 inch thick.

Apply extruded thermoplastic pavement markings at a thickness from 0.100 to 0.150 inch.

Apply Type 2 glass beads to the surface of the molten thermoplastic at a rate of at least 8 lb of beads per 100 sq ft.

84-2.03B(2)(c) Sprayable Thermoplastic

Apply sprayable thermoplastic at a temperature of 350 to 400 degrees F.

Apply sprayable thermoplastic for a traffic stripe at a rate of at least 0.24 lb of thermoplastic per foot of 6-inch-wide solid stripe. The applied stripe must be at least 0.040 inch thick.

84-2.03B(2)(d) Thermoplastic with Enhanced Wet-Night Visibility

Apply a thermoplastic traffic stripe or pavement marking with enhanced wet-night visibility in a single pass and in the following order:

1. Uniform layer of extruded thermoplastic
2. Layer of high-performance glass beads
3. Layer of Type 2 glass beads

Apply thermoplastic with enhanced wet-night visibility at a maximum speed of 8 mph.

Apply thermoplastic with enhanced wet-night visibility for a traffic stripe at a rate of at least 0.47 lb of thermoplastic per foot of 6-inch-wide solid stripe. The applied stripe must be at least 0.090 inch thick.

Apply thermoplastic with enhanced wet-night visibility for a pavement marking at a rate of at least 1.06 lb of thermoplastic per square foot of marking. The applied pavement marking must be at least 0.100 inch thick.

Apply high-performance glass beads at a rate of at least 6 lb of glass beads per 100 sq ft of stripe or marking. Apply Type 2, glass beads at a rate of at least 8 lb of glass beads per 100 sq ft of stripe or marking.

84-2.03B(3) Methyl Methacrylate

Apply the methyl methacrylate when the pavement surface and atmospheric temperatures are from 40 to 104 degrees F.

Apply methyl methacrylate paint at a minimum thickness of 0.090 inch.

Apply recessed methyl methacrylate paint at a minimum thickness of 0.200 inch.

Apply the glass beads recommended by the methyl methacrylate manufacturer.

84-2.03B(4) Traffic Striping and Pavement Marking Tape

Do not use traffic stripe and pavement marking tape on existing open graded friction course or chip seal.

Prepare pavement surface and use primer under the traffic tape manufacturer's written instructions. Apply tape to clean and dry pavement surface. Roll or tamp the traffic tape in place.

84-2.03B(5) Two-Component Paint

Apply a two-component painted traffic stripe or pavement marking in a single pass and in the following order:

1. Coat of two-component paint
2. Application of large gradation glass beads recommended by the two-component paint manufacturer
3. Application of Type 1 glass beads

Apply two-component paint when the pavement surface temperature is above 39 degrees F and the atmospheric temperature is above 36 degrees F. The temperature of the paint must comply with the paint manufacturer's instructions.

Apply two-component paint and glass beads at a maximum speed of 10 mph.

Apply large-gradation glass beads at a minimum rate of 11.7 lb of beads per gallon of paint.

Apply Type 1 glass beads at a minimum rate of 8.3 lb of beads per gallon of paint.

Apply two-component paint for the traffic stripes and pavement markings at the thickness and application rates shown in the following table:

Type of pavement	Stripe thickness (min, inch)	Application rate (min, sq ft/gal)
HMA open graded/chip seal	0.025	64
HMA dense graded	0.020	80
Concrete	0.020	80

Apply recessed two-component paint at a thickness between 0.020 and 0.025 inch.

84-2.03B(6) Paint

Do not apply paint if:

1. Fresh paint could become damaged by rain, fog, or condensation
2. Atmospheric temperature could drop below 50 degrees F during the drying period

Do not thin paint.

Use mechanical means to paint traffic stripes and pavement markings and to apply glass beads for traffic stripes.

The striping machine must be capable of superimposing successive coats of paint on the 1st coat and on existing stripes at a minimum speed of 5 mph.

Where the configuration or location of a traffic stripe is such that the use of a striping machine is not practicable, you may apply the traffic paint and glass beads by other methods and equipment if authorized.

Apply traffic stripes and pavement markings in 1 coat on existing pavement surfaces, at an approximate rate of 107 sq ft/gal.

Apply traffic stripes and pavement markings in 2 coats on a new pavement surface. The 1st coat of paint must be dry before applying the 2nd coat.

Apply 2-coat paint at the approximate rate of 215 sq ft/gal for each coat.

Paint a 1-coat, 3-inch-wide black stripe between the two 6-inch-wide yellow stripes of a double traffic stripe. If the two 6-inch-wide yellow stripes are applied in 2 coats, apply the black stripe concurrently with the 2nd coat of the yellow stripes.

On 2-lane highways:

1. If the 1st coat of the centerline stripe is applied in the same direction as increasing post miles, use the right-hand spray gun of the 3 spray guns to apply a single yellow stripe
2. If the 1st coat of the centerline stripe is applied in the same direction as decreasing post miles, use the left-hand spray gun of the 3 spray guns to apply a single yellow stripe
3. Apply the 2nd coat of centerline striping in the opposite direction of the 1st coat

Apply glass beads at an approximate rate of 5 lb of beads per gallon of paint.

Verify the application rate of paint by stabbing the paint tank with a calibrated rod. If the striping machine has paint gauges, the Engineer may measure the volume of paint using the gauges instead of stabbing the paint tank with a calibrated rod.

84-2.03B(7) Contrast Striping

04-19-19

Contrast striping consists of black striping placed on each side of a white stripe.

10-19-18

You may use permanent tape instead of paint or thermoplastic.

Apply contrast stripe paint in one coat.

Do not use glass beads or other reflective elements in contrast striping material.

84-2.03B(8)–84-2.03B(10) Reserved 04-19-19

84-2.04 PAYMENT 10-19-18

The payment quantity for a traffic stripe is the length measured along the line of the traffic stripe without deductions for gaps in the broken traffic stripe.

The payment quantity for a pavement marking is the area covered.

A double traffic stripe consisting of two-6-inch-wide yellow stripes are measured as 2 traffic stripes except for painted traffic stripes and sprayable thermoplastic traffic stripes.

A double sprayable thermoplastic traffic stripe consisting of two 6-inch-wide yellow stripes are measured as single traffic stripe.

A double painted traffic stripe consisting of two 6-inch-wide yellow stripes separated by a 3-inch-wide black stripe is measured as a single traffic stripe.

The payment quantity for contrast striping is the length measured along the line of the traffic stripe without deductions for gaps in the broken traffic stripe.

Replace section 84-9 with:

10-19-18

84-9 EXISTING MARKINGS

84-9.01 GENERAL

84-9.01A Summary

Section 84-9 includes specifications for removing existing markings.

Work performed on existing markings must comply with section 15.

84-9.01B Definitions

Reserved

04-19-19

84-9.01C Submittals

10-19-18

Submit your proposed method for removing traffic stripes and pavement markings at least 7 days before starting the removal work. Allow 2 business days for the review.

84-9.02 MATERIALS

Not Used

84-9.03 CONSTRUCTION

84-9.03A General

Remove existing traffic stripes before making any changes to the traffic pattern.

Remove existing traffic stripes and pavement markings before applying the following materials:

1. Traffic stripe and pavement marking tape
2. Two component traffic stripes and pavement markings
3. Methyl methacrylate traffic stripes and pavement markings

04-19-19

Remove contrast stripes, traffic stripes and pavement markings, including any paint in the gaps, by methods that do not remove pavement to a depth of more than 1/8 inch.

10-19-18

Remove pavement markings such that the old message cannot be identified. Make any area removed by grinding rectangular. Water must not puddle in the ground areas. Fog seal ground areas on asphalt concrete pavement.

Sweep up or vacuum any residue before it can (1) be blown by traffic or wind, (2) migrate across lanes or shoulders, or (3) enter a drainage facility.

84-9.03B Remove Traffic Stripes and Pavement Markings Containing Lead

Reserved

84-9.03C–84-9.03J Reserved

84-9.04 PAYMENT

The payment quantity for remove traffic stripe is the measured length multiplied by:

1. 0.67 for a single 4-inch-wide traffic stripe
2 1.34 for a single 8-inch-wide traffic stripe
3. 2 for a double traffic stripe

The payment quantity for remove traffic stripe does not include the gaps in broken traffic stripes. Payment for removal of paint evident in a gap is included in the payment for remove traffic stripe of the type involved.

10-18-19

If no bid item is shown on the Bid Item List for remove pavement marking, remove pavement marking is paid for as remove traffic stripe of the types shown in the Bid Item List and the payment quantity for 1 square foot of pavement marking is 2 linear feet.

^^

DIVISION X ELECTRICAL WORK

86 GENERAL

04-15-22

Replace section 86-1.01B with:

10-19-18

86-1.01B Definitions

accessible pedestrian signal: Accessible pedestrian signal as defined in the *California MUTCD*.

accessible walk indication: Activated audible and vibrotactile action during the walk interval.

actuation: Actuation as defined in the *California MUTCD*.

ambient sound level: Background sound level in dB at a given location.

ambient sound sensing microphone: Microphone that measures the ambient sound level in dB and automatically adjusts the accessible pedestrian signal speaker's volume.

audible speech walk message: Audible prerecorded message that communicates to pedestrians which street has the walk interval.

CALiPER: Commercially Available LED Product Evaluation and Reporting. A U.S. Department of Energy program that individually tests and provides unbiased information on the performance of commercially available LED luminaires and lights.

controller assembly: Assembly for controlling a system's operations, consisting of a controller unit and auxiliary equipment housed in a waterproof cabinet.

controller unit: Part of the controller assembly performing the basic timing and logic functions.

correlated color temperature: Absolute temperature in kelvin of a blackbody whose chromaticity most nearly resembles that of the light source.

detector: Detector as defined in the *California MUTCD*.

electrolier: Assembly of a lighting standard and luminaire.

flasher: Device for opening and closing signal circuits at a repetitive rate.

illuminance gradient: Ratio of the minimum illuminance on a 1-foot square of sign panel to that on an adjacent 1-foot square of sign panel.

inductive loop detector: Detector capable of being actuated by an inductance change caused by a vehicle passing or standing over the loop. An inductive loop detector includes a loop or group of loops installed in the roadway and a lead-in cable installed and connected inside a controller cabinet.

junction temperature: Temperature of the electronic junction of the LED device. The junction temperature is critical in determining photometric performance, estimating operational life, and preventing catastrophic failure of the LED.

L70: Extrapolated life in hours of the luminaire when the luminous output depreciates 30 percent from the initial values.

lighting standard: Pole and mast arm supporting the luminaire.

link: Part of a system which provides a data connection between a transmitter and receiver.

LM-79: Test method from the Illumination Engineering Society of North America specifying the test conditions, measurements, and report format for testing solid state lighting devices, including LED luminaires.

LM-80: Test method from the Illumination Engineering Society of North America specifying the test conditions, measurements, and report format for testing and estimating the long-term performance of LEDs for general lighting purposes.

luminaire: Assembly that houses the light source and controls the light emitted from the light source.

mid-span access method: Procedure in which fibers from a single buffer tube are accessed and spliced to a multi buffer tube cable without cutting the unused fibers in the buffer tube, or disturbing the remaining buffer tubes in the cable.

National Voluntary Laboratory Accreditation Program: U.S. Department of Energy program that accredits independent testing laboratories.

optical time domain reflectometer: Fiber optic test equipment that is used to measure the total amount of power loss between two points and over the corresponding distance. It provides a visual and printed display of the relative location of system components such as fiber sections, splices and connectors as well as the losses that are attributed to each component and or defects in the fiber.

pedestrian change interval: Pedestrian change interval as defined in the *California MUTCD*.

powder coating: Coating applied electrostatically using exterior-grade, UV-stable, polymer powder.

power factor: Ratio of the real power component to the complex power component.

power meter: Portable fiber optic test equipment that, when coupled with a light source, is used to perform end-to-end attenuation testing. Its display indicates the amount of power injected by the light source at the designed wavelength of the system under testing that arrives at the receiving end of the link.

pretimed controller assembly: Assembly operating traffic signals under a predetermined cycle length.

programming mechanism: Device to program the accessible pedestrian signal operation.

pull box: Box with a cover that is installed in an accessible place in a conduit run to facilitate the pulling in of wires or cables.

push button information message: Push button information message as defined in the *California MUTCD.*

push button locator tone: Push button locator tone as defined in the *California MUTCD*.

segment: Continuous cable terminated by 2 splices, 2 connectors or 1 splice and 1 connector.

signal face: Signal face as defined in the *California MUTCD*.

signal head: Signal head as defined in the *California MUTCD*.

signal indication: Signal indication as defined in the *California MUTCD*.

signal section: Signal section as defined in the *California MUTCD*.

signal standard: Pole with or without mast arms carrying 1 or more signal faces.

street side lumens: Lumens from a luminaire directed to light up areas between the fixture and the roadway, such as traveled ways and freeway lanes.

surge protection device: Subsystem or component that protects equipment against short-duration voltage transients in power line.

total harmonic distortion: Ratio of the rms value of the sum of the squared individual harmonic amplitudes to the rms value of the fundamental frequency of a complex waveform.

traffic-actuated controller assembly: Assembly for operating traffic signals under the varying demands of traffic as registered by detector actuation.

traffic phase: Traffic phase as defined in the *California MUTCD*.

vehicle: Vehicle as defined in the *California Vehicle Code*.

vibrotactile pedestrian device: Vibrotactile pedestrian device as defined in the *California MUTCD*.

10-19-18

Delete the 9th and 10th paragraphs of section 86-1.01C(1).

Replace section 86-1.01C(3) with:

10-19-18

86-1.01C(3) Luminaires

Submit for a luminaire:

1. Maximum power in watts
2. Maximum designed junction temperature
3. Heat sink area in square inches
4. Designed junction-to-ambient thermal resistance calculation with thermal resistance components clearly defined
5. L70 in hours when extrapolated for the average nighttime operating temperature
6. Life expectancy based on the junction temperature
7. Manufacturer's data sheet for the power supply, including the rated life

Submit the manufacturer's QC test data for luminaires as an informational submittal.

Replace section 86-1.01C(4) with:

10-19-18

86-1.01C(4) Reserved

Replace section 86-1.02B with:

04-15-22

86-1.02B Conduit and Accessories

86-1.02B(1) General

Conduit and fittings must comply with the requirements shown in the following table:

Conduit and Fitting Requirements

Type	Requirement
1	Must be hot-dip galvanized rigid steel complying with UL 6 and ANSI C80.1. The zinc coating must comply with copper sulfate test requirements in UL 6. Fittings must be electrogalvanized and certified under UL 514B.
2	Must comply with requirements for Type 1 conduit and be coated with PVC or polyethylene. The exterior thermoplastic coating must have a minimum thickness of 35 mils. The internal coating must have a minimum thickness of 2 mils. Coated conduit must comply with NEMA RN 1, or NRTL PVC-001.
3	Must be Type A, extruded, rigid PVC conduit complying with UL 651 or must be HDPE conduit complying with UL 651A.
4	Must have an inner, flexible metal core covered by a waterproof, nonmetallic, sunlight-resistant jacket, and must be UL listed for use as a grounding conductor. Fittings must be certified under UL 514B.
5	Must be intermediate steel complying with UL 1242 and ANSI C80.6. The zinc coating must comply with copper sulfate test requirements specified in UL 1242. Fittings must be electrogalvanized and certified under UL 514B.

Bonding bushings installed on metal conduit must be insulated and be galvanized or zinc-alloy type.

Shop-cut threads must be protected from corrosion under the standards shown in the following table:

Shop-Cut Thread Corrosion Protection

Conduit	Standard
Types 1 and 2	ANSI C80.1
Type 5	ANSI C80.6

Primer for metal conduit threads and damaged areas must be on the Authorized Material List for organic zinc-rich primers. Aerosol cans are not allowed.

Conduit for fiber optic cable systems must be schedule 40 high density polyethylene, complying with NEMA TC-7, except for horizontal directional drilling.

Conduit used for horizontal directional drilling must be high density polyethylene Type IPS, SDR 9 and comply with ASTM F2160.

Sealing plug must:

1. Be reusable
2. Withstand a pressure of 5 psi
3. Provide an airtight seal
4. Seal conduit and innerducts simultaneously

Sealing plug for empty conduit must have a rope tie.

Innerduct must be:

1. HDPE tubing or fabric mesh pouch.
2. Nominal 1 inch inside diameter, with a minimum Standard Dimension Ratio (SDR) rating of 11.
3. Continuous without splices or joints.
4. Ribbed inside and outside when used inside a conduit.
5. Ribbed inside and smooth on the outside for direct burial.
6. Unique color throughout the entire length of the conduit segment.

7. Shipped and stored on a reel, covered to protect colors from UV deterioration. The reel must be marked with:
   7.1. Manufacturer's name.
   7.2. Contract number.
   7.3. Size and length of the innerduct.

High density polyethylene for innerduct must:

1. Comply with ASTM D3485, D3035, D2239, and D2447, and NEMA TC7 and TC2
2. Have a minimum tensile yield strength of 3300 psi under ASTM D638
3. Have a density of 59.6187 lb/ft^3 ± 0.3121 lb/ft^3 under ASTM D1505

Tracer wire must be a minimum no. 12 copper conductor with orange insulation Type TW, THW, RHW, or USE. For direct burial, the tracer wire insulation must be Type UF.

86-1.02B(2) Structures Accessories

Steel hangers, steel brackets, and other fittings used to support conduit in or on a wall or bridge structure must comply with section 75-3.

Precast concrete cradles for conduit must be made of minor concrete and commercial-quality welded wire fabric. The minor concrete must contain a minimum of 590 lb of cementitious material per cubic yard. The cradles must be moist cured for a minimum of 3 days.

Expansion-deflection fittings for an expansion joint with a 1-1/2-inch movement rating must be watertight and include a molded neoprene sleeve, a copper bonding jumper, and 2 silicon bronze or zinc-plated iron hubs.

Expansion-deflection fittings for an expansion joint with a movement rating greater than 1-1/2 inches must be as shown.

Conduit expansion and deflection fittings must include a copper bonding jumper with an ampacity rating per NEC.

Replace section 86-1.02C with:

10-18-19

86-1.02C Pull Boxes

86-1.02C(1) General

A pull box cover must have a marking on the top that is:

1. Clearly defined
2. Uniform in depth
3. Parallel to the longer side
4. From 1 to 3 inches in height

The cover marking must include *CALTRANS* and one of the following:

1. *SERVICE* for service circuits from a service equipment enclosure to a subpanel
2. *SERVICE IRRIGATION* for circuits from a service equipment enclosure to an irrigation controller
3. *SERVICE BOOSTER PUMP* for circuits from a service equipment enclosure to the booster pump
4. *TDC POWER* for circuits from a service equipment enclosure to telephone demarcation cabinet
5. *LIGHTING* for a lighting system
6. *SIGN ILLUMINATION* for a sign illumination system
7. *SIGNAL AND LIGHTING* for a signal and lighting system
8. *RAMP METER* for a ramp metering system
9. *TMS* for a traffic monitoring station
10. *FLASHING BEACON* for a flashing beacon system
11. *CMS* for a changeable message sign system
12. *INTERCONNECT* for an interconnect conduit and cable system
13. *FIBER OPTIC* for fiber optic cable system

14. *ELECTRICAL SYSTEMS* if more than one system is shared in the same pull box

The cover marking must not include *CALTRANS*, only the following:

1. *ELECTRICAL SERVICE* for circuits from an electrical utility to a service equipment enclosure
2. *TELEPHONE* SERVICE for circuits from a telephone utility to a telephone demarcation cabinet

A metal pull box cover must include a fitting for a bonding conductor.

The hardware must be stainless steel containing 18 percent chromium and 8 percent nickel.

86-1.02C(2) Roadway Pull Boxes

86-1.02C(2)(a) General

A pull box cover must have a nonskid surface.

The pull boxes and covers must not have exposed fibers or reinforcement on the finish surfaces that are exposed.

The load rating must be:

1. Stenciled or stamped on the inside and outside of the pull box
2. Stamped on the outside of the cover

If a transformer or other device is to be placed in the pull box, include recesses for a hanger.

Hold-down bolts must:

1. Be a Penta Head 1/2-13UNC
2. Have a thread lock material
3. Withstand a torque from 55 to 60 ft-lb
4. Withstand a minimum pull-out strength of 750 lb

The opening in which the cover sets must have length and width dimensions 1/8 inch greater than the cover.

86-1.02C(2)(b) Nontraffic Pull Boxes

A nontraffic pull box and cover must comply with ANSI/SCTE 77, "Specification for Underground Enclosure Integrity," for Tier 22 load rating and must be gray or brown.

An extended pull box must be a minimum 22 inches deep and may be a single box or a box with an extension made of the same material as the pull box. The extension may be another pull box if the bottom edge of the pull box fits into the opening for the cover.

The hold down bolts, nuts, and washers must be a captive design.

The pull box must have a 1/2-13 coarse-thread insert with drainage hole, to secure the hold down bolts.

The cover must have a 1/2 inches by 4 inches pull slot with a 3/16-inch center pin.

The cover markings must be cast in the mold of the cover or be engraved on a metal or UV resistant ABS plate secured to the cover with stainless steel screws.

86-1.02C(2)(c) Traffic Pull Boxes

A traffic pull box and cover must comply with AASHTO HS20-44 and load tested under AASHTO M 306.

A traffic pull box must be reinforced with a galvanized steel Z bar welded frame. The frame must be anchored to the box with 2-1/4-inch-long concrete anchors with a 1/4-inch diameter. The pull box must have 4 concrete anchors, one in each corner, and two near the middle one on each of the longer sides, except for a no. 3-1/2(T) pull box.

The frame must have nuts fabricated with the frame or spot welded to the underside of the frame, to secure the hold down bolts.

The nuts must be zinc-plated carbon steel, vibration-resistant, and have a wedge ramp at the root of the thread.

The cover must:

1. Be steel, reinforced and galvanized post fabrication.
2. Be countersunk approximately 1/4 inch to accommodate the bolt head. When tightened, the hold down bolt head must be no more than 1/8 inch above the top of the cover.
3. Have a 1/2-inch by 2-inch pull slot with a guard under the cover to prevent entry of more than 3 inches below the bottom surface of the cover without deflection.

Before galvanizing a steel cover, the manufacturer must apply the cover marking by one of the following methods:

1. Use a cast iron strip at least 1/4-inch thick with letters raised a minimum of 1/16 inch. Fasten the strip to the cover with 1/4-inch, flathead, stainless steel machine bolts and nuts. Peen the bolts after tightening.
2. Use a sheet steel strip at least 0.027-inch thick with letters raised a minimum of 1/16 inch. Fasten the strip to the cover by spot welding, tack welding, or brazing with 1/4-inch stainless steel rivets or 1/4-inch, roundhead, stainless steel machine bolts and nuts. Peen the bolts after tightening.
3. Bead weld the letters on the cover such that the letters are raised a minimum of 3/32 inch.

86-1.02C(2)(d) Tamper Resistant Pull Boxes

86-1.02C(2)(d)(i) General

Not Used

86-1.02C(2)(d)(ii) Tamper-Resistant Nontraffic Pull Box

86-1.02C(2)(d)(ii)(A) General

A tamper resistant nontraffic pull box must include a pull box with one of the following:

1. Anchored cover
2. Lockable cover
3. Pull box insert

86-1.02C(2)(d)(ii)(B) Anchored Cover

The anchored cover must:

1. Be of 1/2-inch-thick mild steel, hot dip galvanized, post fabrication.
2. Have spikes removed from the galvanized surfaces.
3. Have a center space for a top lock nut that must be torqued to 200 ft-lb.
4. Have a center opening for a stainless-steel threaded cap to cover the lock nut.
5. Weigh a minimum of 85 lb.
6. Include an all-around security skirt of 1/4-inch thick steel. The skirt must be sized to encase a nontraffic pull box or sized to fit within a traffic pull box.
7. Be welded to the skirt.

86-1.02C(2)(d)(ii)(C) Lockable Cover

The lockable cover must:

1. Be manufactured from minimum 3/16-inch-thick galvanized steel or a polymer of minimum strength equal to 3/16-inch steel.
2. Be secured to the pull box with a locking mechanism of equal or greater strength than the manufactured material.
3. Have 1/2-by-2-inch slot holes for lifting.
4. Have dimensions complying with one of the following:
    4.1. Department's standards for pull box covers as shown if the lockable cover is secured to the inside lip of the pull box.
    4.2. Department's standards for the length and width as shown for pull box covers if the lockable cover is secured to the top of the pull box.

86-1.02C(2)(d)(ii)(D) Pull Box Insert

The pull box insert must:

1. Be made of minimum 3/16-inch-thick or 10 gauge mild hot-dipped galvanized steel
2. Have a minimum of 2 mounting brackets that rest under the side or end wall
3. Be lockable with a padlock having a minimum 3/8-inch shackle
4. Have dimensions complying with the Department's standards for the length and width as shown for pull box covers

86-1.02C(2)(d)(iii) Tamper Resistant Traffic Pull Box

A tamper resistant traffic pull box must include a pull box with an anchored cover.

86-1.02C(3) Structure Pull Boxes

A no. 7 pull box must:

1 Be 12 by 12 by 12 inches.
2. Be manufactured with 0.075-inch sheet steel.
3, Have 3/4-inch flanges on the top and bottom.
4. Have one 1-inch and one 1-1/2-inch knockouts on each side, except for the covers

10-16-20

5. Have drilled and tapped holes on the top and the bottom flanges for the cover screws. The hole pattern and spacing must be the same at the top and bottom.

10-18-19

6. Have covers that secure to the box with eight 1/4-inch diameter, 20NC brass machine screws.

A no. 8 pull box must:

1 Be 12 by 12 by 12 inches.
2. Be manufactured with 0.135-inch sheet steel.
3. Mount to the structure with three 3/8-inch diameter machine screws per side.
4. Have 1-1/2-inch knockouts on each side, except the cover.

10-16-20

5. Have drilled and tapped holes on the sides and the bottom for the cover screws. The holes must be reinforced with a 1-by-1-by-0.135-inch bar inside the box.

10-18-19

6. Have a cover with 3/4-inch flanges on the sides and bottom with the corners welded at the bottom. The cover must secure to the box with, three 1/4-inch diameter by 1/2-inch long cadmium plated brass or stainless steel, machine screws.

A no. 9 pull box must:

1 Be 24 by 9-1/2 by 6-1/4 inches.
2. Be manufactured with 0.075-inch sheet steel.
3. Have a rain tight hood.
4, Have a 1-1/2-by-4-1/2-by-0.135-inch strap welded to the back of the box at each corner, parallel to the long side. The strap must have a 1/4-inch hole on the exposed end.
5. Have a 1-inch lip around the opening.

10-16-20

6. Have drilled and tapped holes with a minimum 1/4-inch thread length, at the ends of the bottom lip for the cover screws.

10-18-19

7. Have a 3-inch knockout on each side at the bottom and at the center of the bottom.
8. Have a 2-inch knockout on each side at the top and at both ends of the bottom.
9. Have an L 5/8-by-7/8-by-0.075-inch formed angle spot welded to the inside of the top on both sides and on the bottom.
10. Have a cover manufactured with 0.125-inch steel, that secures to the box with two 3/8-inch diameter by 3/4-inch long stainless-steel flathead screws with 11/16-inch diameter countersink holes. The cover must include a 1/16-inch neoprene gasket.

A no. 9A pull box must:

1 Be 20 by 8 by 8-1/2 inches.
2. Be manufactured with 0.075-inch sheet steel.
3. Have 3/4-inch flanges on the top.
4, Have drilled holes on the short sides for the cover screws. The holes must have a stainless-steel hex nut or a 1/4-by-5/8-by-8-inch bar spot welded to the bottom of the flange.
5. Have a 3-inch knockout on each side at the top and at the center of the bottom.
6. Have a 2-inch knockout on each side at the bottom and at both ends of the bottom.
7. Have a cover manufactured with 0.105-inch steel, that secures to the box with four 3/8-inch diameter stainless steel hex head cap screws, two on each short side. The cover must have a rain tight hood and include a 1/16-inch neoprene gasket.

Pull box corner joints must be lapped and spot welded or riveted.

Concentric and eccentric multiple size knockouts are not be allowed.

Replace section 86-1.02D(3) with:

10-19-18

86-1.02D(3) Warning Tape

Warning tape must be orange color polyolefin film, minimum elongation of 500 percent before breakage, water and corrosion resistant, and comply with requirements shown in the following table:

Warning Tape Requirements

Quality characteristic	Requirement
Thickness (min, mil)	4
Width (in)	4
Tensile strength of material (min, psi)	2800
Message spacing intervals (ft)	3

The warning tape must have a printed message that reads: *CAUTION: CALTRANS FACILITIES BELOW*.

The printed text height and color must be 1 inch, black color text over bright orange background.

Replace the 2nd paragraph of section 86-1.02E with:

10-19-18

Each sensor must:

1. Have a dissipation factor less than 0.04 nF when measured in the 20 nF range
2. Have resistance greater than 20 Megaohms
3. Be 1/4 inch wide by 6 feet long by 1/16 inch thick
4. Have a RG-58C/U coaxial screen transmission cable, jacketed with high-density polyethylene, rated for direct burial and resistant to nicks and cuts
5. Operate over a temperature range from -40 to 160 degrees F
6. Have a signal to noise ratio equal to or greater than 10 to 1
7. Have an output signal of a minimum 250 mV ± 20 percent for a wheel load of 400 lb at 55 mph and 70 degrees F
8. Have an insulation resistance greater than 500 MΩ
9. Have a life cycle of a minimum 25 million equivalent single axle loadings

Replace section 86-1.02F(1) with:

10-19-18

86-1.02F(1) General

Conductors and cables must be clearly and permanently marked the entire length of their outer surface with:

1. Manufacturer's name or trademark
2. Insulation-type letter designation
3. Conductor size
4. Voltage
5. Number of conductors for a cable

The minimum insulation thickness and color code requirements must comply with NEC.

Replace the 2nd paragraph of section 86-1.02F(2)(a) with:

10-19-18

Conductors must be identified as shown in the following table:

Conductor Identification

04-17-20

Circuit	Signal phase or function	Identification			Copper size
		Insulation color		Band symbols	
		Base	Stripe[a]		

Signals (vehicle)[a,b]	2, 6	Red, yellow, brown	Black	2, 6	14
	4, 8	Red, yellow, brown	Orange	4, 8	14
	1, 5	Red, yellow, brown	None	1, 5	14
	3, 7	Red, yellow, brown	Purple	3, 7	14
	Ramp meter 1	Red, yellow, brown	None	No band required	14
	Ramp meter 2	Red, yellow, brown	Black	No band required	14
Pedestrian signals	2p, 6p	Red, brown	Black	2p, 6p	14
	4p, 8p	Red, brown	Orange	4p, 8p	14
	1p, 5p	Red, brown	None	1p, 5p	14
	3p, 7p	Red, brown	Purple	3p, 7p	14
Push button assembly or accessible pedestrian signal	2p, 6p	Blue	Black	P-2, P-6	14
	4p, 8p	Blue	Orange	P-4, P-8	14
	1p, 5p	Blue	None	P-1, P-5	14
	3p, 7p	Blue	Purple	P-3, P-7	14
Traffic signal controller cabinet	Ungrounded circuit conductor	Black	None	CON-1	6
	Grounded circuit conductor	White	None	CON-2	6
Highway lighting pull box to luminaire	Ungrounded - line 1	Black	None	No band required	14
	Ungrounded - line 2	Red	None	No band required	14
	Grounded	White	None	No band required	14
Multiple highway lighting	Ungrounded - line 1	Black	None	ML1	10
	Ungrounded - line 2	Red	None	ML2	10
	Ungrounded - line 3	White	None	ML3	10
Lighting control	Ungrounded - Photoelectric unit	Black	None	C1	14
	Switching leg from Photoelectric unit or SM transformer	Red	None	C2	14
Service	Ungrounded - line 1 (signals)	Black	None	No band required	6
	Ungrounded - line 2 (lighting)	Red	None	No band required	8
Sign lighting	Ungrounded - line 1	Black	None	SL-1	10
	Ungrounded - line 2	Red	None	SL-2	10
Flashing beacons	Ungrounded between flasher and beacons	Red or yellow	None	FB-Location.[c]	14
Grounded circuit conductor	Push button assembly or accessible pedestrian signal	White	Black	No band required	14
	Signals and multiple lighting	White	None	No band required	10
	Flashing beacons and sign lighting	White	None	No band required	12
	Lighting control	White	None	C-3	14

	Service	White	None	No band required	14
Spares		Black	None	No band required	14

Notes:
[a]On overlaps, the insulation is striped for the 1st phase in the designation, e.g., phase (2+3) conductor is striped as for phase 2.
[b]Band for overlap and special phases as required
[c]Flashing beacons having separate service do not require banding.

10-19-18

Delete the 4th paragraph of section 86-1.02F(2)(a).

Replace the 2nd paragraph of section 86-1.02F(2)(c)(ii) with:

10-19-18

An equipment grounding conductor must be insulated.

Replace the 3rd paragraph of section 86-1.02F(3)(d)(ii) with:

10-19-18

Cable must comply with the requirements shown in the following table:

Cable type	Conductor quantity and type	Cable jacket thickness (mils)		Maximum nominal outside diameter (inch)	Conductor color code
		Average	Minimum		

3CSC	3 no. 14	44	36	0.40	Blue/black stripe, blue/orange stripe, white/black stripe
5CSC	5 no. 14	44	36	0.50	Red, yellow, brown, black, white
9CSC	1 no. 12 8 no. 14	60	48	0.65	No. 12 - white, No. 14 - red, yellow, brown, black, red/black stripe, yellow/black stripe, brown/black stripe, white/black stripe
12CSC	1 no. 12 11 no. 14	60	48	0.80	No. 12 - white No. 14 - red, yellow, brown, black, red/black stripe, yellow/black stripe, brown/black stripe, black/red stripe, black/white stripe, red/white stripe, brown/white stripe
28CSC	1 no. 10 27 no. 14	80	64	0.90	No. 10 - white No. 14 - red/black stripe, yellow/black stripe, brown/black stripe, red/orange stripe, yellow/orange stripe, brown/orange stripe, red/silver stripe, yellow/silver stripe, brown/silver stripe, red/purple stripe, yellow/purple stripe, brown/purple stripe, red/2 black stripes, brown/2 black stripes, red/2 orange stripes, brown/2 orange stripes, red/2 silver stripes, brown/2 silver stripes, red/2 purple stripes, brown/2 purple stripes, blue/black stripe, blue/orange stripe, blue/silver stripe, blue/purple stripe, white/black stripe, black/red stripe, black

Replace section 86-1.02F(3)(d)(iv) with:

10-15-21

86-1.02F(3)(d)(iv) Railroad Preemption Cables

A railroad preemption cable must be an 18-conductor cable having a polyvinyl chloride or polyethylene jacket. The cable jacket must be rated for 600 V(ac) and 75 degrees C.

The railroad preemption cable color code must be as shown in the following table:

Railroad Preemption Cable Color Code

Conductor no.	Color Code
1	Black
2	White
3	Red
4	Green
5	Orange
6	Blue
7	White/black stripe
8	Red/black stripe
9	Green/black stripe
10	Orange/black stripe
11	Blue/black stripe
12	Black/white stripe
13	Red/white stripe
14	Green/white stripe
15	Blue/white stripe
16	Black/red stripe
17	White/red stripe
18	Orange/red stripe

The individual conductors in the cable must:

1. Be stranded and comply with ASTM B286
2. Have Type THW insulation
3. Be 14 AWG

Replace the 3rd paragraph of section 86-1.02G with:

10-19-18

The self-adhesive reflective labels must:

1. Be from 3 to 5 mils thick
2. Have all black capital characters on a white background
3. Extend beyond the character by a minimum of 1/4 inch

Replace the 4th paragraph of section 86-1.02H with:

10-19-18

PVC electrical tape must have a minimum thickness of 6 mils.

Replace section 86-1.02K with:

04-17-20

86-1.02K Luminaires

86-1.02K(1) General

A luminaire must:

1. Be self-contained, not requiring assembly.
2. Comply with UL 1598 for luminaires in wet locations.
3. Have a power supply with ANSI/IEC 60529 rating of at least IP65.
4. Weigh less than 35 lb.
5. Have a minimum 60,000 hours L70 rating under LM-80 and TM-21 at an ambient temperature of 25 degrees C.
6. Operate over a temperature range from -40 to 130 degrees F.
7. Be operationally compatible with photoelectric controls.
8. Have a nominal correlated color temperature of 3000 K under ANSI C78.377 and a color rendering index of 70 or greater.
9. Have a maximum effective projected area of 1.4 sq ft when viewed from either side or end.
10. Comply with ANSI C136.31.
11. Have a power factor of 0.90 or greater. The total harmonic distortion, current, and voltage induced into a power line by a luminaire must not exceed 20 percent. Test voltage will be at 120 V(ac), 240 V(ac), or 480 V(ac).

04-15-22

12. Comply with the maximum power consumption and isofootcandle curves as shown, except for roadway luminaires.

04-17-20

13. Be on the Authorized Material List for LED luminaires or must be submitted and passed testing for addition to the AML.

A luminaire must include a surge protection device to withstand high-repetition noise transients caused by utility line switching, lightning strikes, and other interferences. The device must protect the luminaire from damage and failure due to transient voltages and currents as defined in Tables 1 and 4 of ANSI/IEEE C64.41.2 for location category C-High. The surge protection device must comply with UL 1449 and ANSI/IEEE C62.45 based on ANSI/IEEE C62.41.2 definitions for standard and optional waveforms for location category C-High.

The luminaire must operate over the voltage range:

1. From 95 to 277 V(ac) for luminaires rated 120, 240, or 277 V(ac)
2. From 347 to 480 V(ac) for luminaires rated 480 V(ac)

The fluctuations of line voltage must have no visible effect on the luminous output.

The luminaire's housing, external bolts, screws, hinges, hinge pins, and door closure devices must withstand a 1008 hour cyclic salt fog spray/UV test under ASTM D5894 and an evaluation under ASTM D714 with a blister rating of 8 or greater and no more than medium density.

The luminaire's housing must be marine-grade alloy with less than 0.2 percent copper or die cast aluminum.

The housing must be designed to prevent the buildup of water on its top surface. Exposed heat sink fins must be oriented to allow water to run off the luminaire and carry dust and other accumulated debris away from the unit. The optical assembly of the luminaire must be protected against dust and moisture intrusion to at least an ANSI/IEC 60529 rating of IP66. The power supply enclosure must be protected to at least an ANSI/IEC 60529 rating of IP43.

If the components are mounted on a down-opening door, the door must be hinged and secured to the luminaire's housing separately from other components. The door must be secured to the housing to prevent accidental opening. A safety cable must mechanically connect the door to the housing.

A luminaire must have a barrier-type terminal block secured to the housing to connect field wires. The terminal screws must be captive and equipped with wire grips for conductors up to no. 6.

Terminals must be identified and marked.

If needed, each refractor or lens must be made of UV-inhibiting high-impact plastic, such as acrylic or polycarbonate, or heat and impact-resistant glass. The refractor or lens must be resistant to scratching. Polymeric materials, except for the lenses of enclosures containing either the power supply or electronic components of the luminaire, must be made of UL94 V-0 flame-retardant materials.

The luminaire must be permanently marked inside the unit and outside of its packaging box. Marking consists of:

1. Manufacturer's name or trademark
2. Month and year of manufacture
3. Model, serial, and lot numbers
4. Rated voltage, wattage, and power in VA

An LED luminaire must:

1. Comply with Class A emission limits under 47 CFR 15(B) for unintentional radiators.
2. Have a power supply with:
   2.1. 2 leads to accept standard 0-10 V(dc) control.
   2.2. Dimming control compatible with IEC 60929, Annex E. If the control leads are open or the analog control signal is lost, the circuit must default to 100-percent power.
   2.3. Case temperature self-rise of 77 degrees F or less above ambient temperature in free air with no additional heat sinks.
3. Not be cooled by fans or other menchanical devices.

86-1.02K(2) Roadway Luminaires

A roadway luminaire must:

1. Have a housing color that matches a color no. 26152 to 26440, 36231 to 36375, or 36440 of AMS-STD-595
2. Have an ANSI C136.41-compliant, locking-type, photocontrol receptacle with dimming connections and a watertight shorting cap
3. Have an uplight rating of "U0" per IES TM-15-11

04-15-22

4. Have identification labels outside the unit on the side that will face the road. The labels include:
   4.1. Equipment identification characters as shown in the following table:

Equipment Identification Characters

Luminaire Type	Label
Roadway 11	R11
Roadway 12	R12
INT S-A	SA
INT S-B	SB
INT S-C	SC
INT M-A	MA
INT M-B	MB
INT M-C	MC
INT L-A	LA
INT L-B	LB
INT L-C	LC

   4.2. Rated wattage

04-17-20

The luminaire's housing must have a slip fitter that must:

1. Fit on mast arms with outside diameters from 1-5/8 to 2-3/8 inches

2. Be adjustable to a minimum of ±5 degrees from the axis of the tenon in a minimum of 5 steps: +5, +2.5, 0, -2.5, -5
3. Have clamping brackets that:
   3.1. Are made of corrosion-resistant materials or treated to prevent galvanic reactions
   3.2. Do not bottom out on the housing bosses when adjusted within the designed angular range
   3.3. Do not permanently set more than 1/32 inch when tightened

86-1.02K(3) Overhead Sign Luminaires

An overhead sign luminaire must:

1. Have a uniformity average to minimum ratio of 10:1 for the distribution of light reflected on a 16' wide by 12' high sign panel
2. Not allow more than 2.5 percent of the rated lumens to project above 65 degrees measured up from the horizontal plane in the direction of the sign panel
3. Mount at a maximum height of 12 inches above the top of the mounting rails
4. Mount directly to the sign structure as shown or with a mounting adapter that meets the material requirements of the luminaire's housing

Replace section 86-1.02M with:

10-19-18

86-1.02M Photoelectric Controls

Photoelectric control types are as shown in the following table:

Photoelectric Control Types

Control type	Description
I	Pole-mounted photoelectric unit. Test switch and a 15-A circuit breaker per ungrounded conductor, housed in an enclosure.
II	Pole-mounted photoelectric unit. Contactor, a 15-A circuit breaker per ungrounded conductor, and test switch located in a service equipment enclosure.
III	Pole-mounted photoelectric unit. Contactor, a 15-A circuit breaker per ungrounded conductor, and a test switch housed in an enclosure.
IV	A photoelectric unit that plugs into a NEMA twist-lock receptacle, integral with the luminaire.
V	A photoelectric unit, contactor, a 15-A circuit breaker per ungrounded conductor, and test switch located in a service equipment enclosure.

The pole-mounted adaptor for Type I, II, and III photoelectric controls must include a terminal block and cable supports or clamps to support the wires.

Photoelectric unit must:

1. Have a screen to prevent artificial light from causing cycling.
2. Have a rating of 60 Hz, 105-130 V(ac), 210-240 V(ac), or 105-240 V(ac).
3. Operate at a temperature range from -20 to 55 degrees C.
4. Consume less than 10 W.
5. Be a 3-prong, twist-lock type with a NEMA IP 65 rating, ANSI C136.10-compliant.
6. Have a fail-on state.
7. Fit into a NEMA-type receptacle.
8. Turn on from 1 to 5 footcandles and turn off from 1.5 to 5 times the turn-on level. Measurements must be made by procedures in *EEI-NEMA Standards for Physical and Electrical Interchangeability of Light-Sensitive Control Devices Used in the Control of Roadway Lighting.*

Type I, II, III, and V photoelectric controls must have a test switch to allow manual operation of the lighting circuit. Switch must be:

1. Single-hole mounting, toggle type
2. 15 A, single pole and single throw

3. Labeled *Auto-Test* on a nameplate

Photoelectric control's contactor must be:

1. Normally open
2. Mechanical-armature type with contacts of fine silver, silver alloy, or equal or better material
3. Installed to provide a minimum space of 2-1/2 inches between the contactor terminals and the enclosure's sides

The terminal blocks must be rated at 25 A, 600 V(ac), molded from phenolic or nylon material, and be the barrier type with plated-brass screw terminals and integral marking strips.

Replace section 86-1.02N with:

10-19-18

86-1.02N Fused Splice Connectors

The fused splice connector for 240 and 480 V(ac) circuits must simultaneously disconnect both ungrounded conductors. The connector must not have exposed metal parts except for the head of the stainless steel assembly screw. The head of the assembly screw must be recessed a minimum of 1/32 inch below the top of the plastic boss that surrounds the head.

The connector must protect the fuse from water or weather damage. Contact between the fuse and fuse holder must be spring loaded.

Fuses must:

1. Be standard, midget, ferrule type
2. Have a nontime-delay feature
3. Be 13/32 by 1-1/2 inches

Fuse ratings for luminaires are shown in the following table:

Fuse Current Rating Requirements

Circuit voltage	Fuse voltage rating	Soffit and roadway luminaires
120 V(ac)	250 V(ac)	5 A
240 V(ac)	250 V(ac)	5 A
480 V(ac)	500-600 V(ac)	5 A

Fuse ratings for transformers are shown in the following table:

Fuse Current Rating Requirements

Circuit voltage	Fuse voltage rating	Fuse current rating for Single phase (two wires) Transformers (primary side)		
		1 kVA	2 kVA	3 kVA
120 V(ac)	250 V(ac)	10 A	20 A	30 A
240 V(ac)	250 V(ac)	6 A	10 A	20 A
480 V(ac)	500-600 V(ac)	3 A	6 A	10 A

Replace section 86-1.02P(1) with:

10-19-18

86-1.02P(1) General

The enclosures must be rated NEMA 3R and include a dead front panel and a hasp with a 7/16-inch-diameter hole for a padlock.

Except for a service equipment enclosure, an enclosure must:

1. Be manufactured from steel and either galvanized, cadmium plated, or powder coated
2. Mount to a standard, pole, post, or sign structural frame
3. Provide a minimum space of 2-1/2 inches between the internal components and the enclosure's sides

The enclosure's machine screws and bolts must not protrude outside the cabinet wall.

The fasteners on the exterior of an enclosure must be vandal resistant and not be removable. The exterior screws, nuts, bolts, and washers must be stainless steel.

Replace the 1st paragraph of section 86-1.02P(2) with:

04-19-19

Service equipment enclosure must:

1. Comply with the Electric Utility Service Equipment Requirements Committee
2. Meet the requirements of the service utility
3. Be watertight
4. Be factory wired and manufactured from steel and galvanized or have factory-applied, rust-resistant prime and finish coats, except Types II and III
5. Be marked as specified in NEC to warn of potential electric-arc flash hazards

04-19-19

Delete the 5th paragraph of 86-1.02P(2).

Add between 6th and 7th paragraphs of section 86-1.02P(2):

10-19-18

Service equipment enclosure must have the meter view windows located on the front side of the enclosure for Types III-AF, BF, CF and DF.

Service equipment enclosure must have the meter view windows located on the back side of the enclosure for Types III-AR, BR, CR and DR.

Replace the 7th paragraph of section 86-1.02P(2) with:

04-19-19

The meter area must have a sealable, lockable, weather-tight cover that can be removed without the use of tools.

04-19-19

Delete the 2nd sentence of the 9th paragraph of section 86-1.02P(2).

10-19-18

Delete section 86-1.02P(3).

Replace section 86-1.02Q with:

10-15-21

86-1.02Q Cabinets

86-1.02Q(1) General

Cabinets must be factory wired except for battery backup system cabinets.

The fasteners on the exterior of a cabinet, except for battery backup system cabinets, must be removable and vandal resistant. The exterior screws, nuts, bolts, and washers must be stainless steel.

Terminal blocks, circuit breakers, and a power supply must be UL approved.

86-1.02Q(2) Controller Cabinets

86-1.02Q(2)(a) General

The controller cabinet must comply with TEES and include anchor bolts.

86-1.02Q(2)(b) Department-Furnished Controller Cabinets

The Department furnishes the controller unit, controller cabinet, and all auxiliary equipment required to operate the system. The Department does not furnish anchor bolts.

86-1.02Q(3) Telephone Demarcation Cabinets

86-1.02Q(3)(a) General

The doors of a telephone demarcation cabinet must be attached using continuous aluminum steel piano hinges.

86-1.02Q(3)(b) Type A Telephone Demarcation Cabinets

Reserved

86-1.02Q(3)(c) Type B Telephone Demarcation Cabinets

A Type B telephone demarcation cabinet consists of a mounting panel, outlets, circuit breaker, fan, dead front plates, and fuse.

The mounting panel must be made of 3/4-inch-thick ACX-grade plywood.

The mounting panel must be fastened to the cabinet with nuts, lock washers, and flat washers to 10 welded studs.

The cabinet must be made of 0.125-inch-thick anodized aluminum.

The cabinet door must be hung and secured with drawn latches, lockable with a padlock. The padlock latches must each have a minimum 7/16-inch-diameter hole.

Ventilation louvers must be located on the door.

The fan must be located in a ventilator housing and be controlled thermostatically. The thermostat control must have a range from 80 to 130 degrees F.

The thermostat and fan circuit must be protected with a fuse rated for 175 percent of the motor capacity. The fan capacity must be a minimum 25 cfm.

86-1.02Q(3)(d) Type C Telephone Demarcation Cabinets

Reserved

86-1.02Q(4) Battery Backup System Cabinets

A battery backup system includes the cabinet, batteries, and the Department-furnished electronics assembly.

The electronics assembly includes the inverter/charger unit, manual bypass, and the battery harness.

The cabinet for a battery backup system must:

1. Comply with TEES
2. Be submitted and pass testing for addition to the Authorized Material List

Add between the 2nd and 3rd paragraphs of section 86-1.02R(2):

10-19-18

Bracket arms must be long enough to allow proper alignment of signals and backplate installation.

Replace the 2nd paragraph for section 86-1.02R(3) with:

04-16-21

A metal backplate must be made of a minimum 1/16-inch-thick aluminum alloy 3003-H14.

Add to the end of section 86-1.02R(3):

04-17-20

Backplates for signal and lighting systems must have a 2-inch retroreflective strip on the face around the perimeter. The strip must be Type XI fluorescent yellow retroreflective sheeting on the Authorized Material List for signing and delineation materials.

Replace item 2 in the list in the 5th paragraph of section 86-1.02R(4)(a)(iii) with:

10-19-18

2. Be a black color throughout, including the door, matching color no. 17038, 27038, or 37038 of AMS-STD-595

Replace section 86-1.02S(3)(c) with:

04-17-20

86-1.02S(3)(c) LED Countdown Pedestrian Signal Face Modules

10-15-21

An LED countdown pedestrian signal face module must be on the Authorized Material List for LED countdown pedestrian signal face modules.

04-17-20

An LED countdown PSF module must:

1. Comply with ITE publication ST-055-E, Pedestrian Traffic Control Signal Indicators: Light Emitting Diode (LED) Signal Modules.
2. Be manufactured with materials that comply with ASTM D3935.
3. Have circuit boards that comply with TEES, chapter 1, section 6.
4. Have symbols that are at least 9 inches high and 5-1/4 inches wide each. The 2-digit countdown display, *Upraised Hand*, and *Walking Person* indications must be electronically isolated from each other. The 3 indications must not share a power supply or interconnect circuitry.
5. Use ultra-bright-type LED rated for 60,000 hours of continuous operation. Individual LEDs must be wired such that a loss or failure of 1 LED will not result in a loss of more than 5 percent of the module's light output. Failure of an individual LED in a string must not result in a loss of an entire string or other indication.
6. Have a manual control to turn on and off the 2-digit countdown display.
7. Have the lot number, month, and year of manufacture permanently marked on the back.
8. Have prominent and permanent vertical markings for accurate indexing and orientation within the pedestrian signal housing. Markings must be a minimum of 1 inch in height and include an up arrow and the word *up* or *top.*

Upon initial testing at 25 degrees C, the module must have at least the luminance values shown in the following table:

Luminance Values

PSF module symbol	Luminance (fL)
Upraised hand and 2-digit countdown timer	1,094
Walking person	1,547

The module must not exceed the power consumption requirements shown in the following table:

Maximum Power Consumption Requirements

PSF module display	At 24 ºC	At 74 ºC
Upraised Hand	10.0 W	12.0 W
Walking Person	9.0 W	12.0 W
2-digit countdown timer	6.0 W	8.0 W

If the pedestrian change interval is interrupted, then the 2-digit countdown timer and display must reset to the full pedestrian change interval before being initiated the next time. The 2-digit countdown display on the PSF module must go dark within a second after displaying "0".

Replace section 86-1.02T with:

10-15-21

86-1.02T Accessible Pedestrian Signals

Accessible pedestrian signal (APS) must be on the Authorized Material List for Accessible Pedestrian Signals.

An APS must comply with the *California MUTCD*, chapter 4E, and must:

1. Have an audible speech message that plays when the push button is actuated. The accessible pedestrian signal must have at least 5 audible message options.
2. Have a push button locator tone that clicks or beeps.
3. Allow the pushbutton to activate the pedestrian phase during any failure of the APS features.
4. Have a controllable and programmable volume level and messaging.
5. Be weatherproof and shockproof.
6. Weigh 7 lb maximum.
7. Measure 16 by 6 by 5 inches, maximum.
8. Have a switch for a push button.
9. Have a vibrotactile device on the push button or on the arrow.
10. Have an internal weatherproof speaker.
11. Have a microphone that senses the ambient sound level.
12. Include touch-free technology.

Theft-proof bolts used for mounting the enclosure to the standard must be stainless steel with a content of 17 percent chromium and 8 percent nickel. The enclosure must be shaped to fit the pole's curvature.

The color of a metallic enclosure must match color no. 33538 of AMS-STD-595.

The color of a plastic enclosure must match color no. 17038, 27038, or 37038 of AMS-STD-595.

The separation between adjacent holes used for conductors and mounting must be at least twice the diameter of the larger hole.

The speaker grills must be located on the surface of the enclosure. The speakers must not interfere with the enclosure or its mounting hardware.

The signal interface cable between the APS and the pedestrian signal head must be rated for outdoor use and have:

1. Four no. 18 stranded tinned copper conductors with a minimum insulation thickness of 15 mils
2. Cable jacket with a minimum thickness of 20 mils and rated for a minimum:
   2.1. 300 V(ac)
   2.2. 176 degrees F
3. Nominal outside diameter less than 350 mils
4. Conductor color code of black, white, red, and green

Touch-free technology must:

1. Activate a pedestrian phase when a pedestrian hand motion is detected during a set time interval
2. Have user adjustable detection area and time interval parameters

3. Detect the pedestrian hand motion up to a 6-inch range from the face of the sensor within a minimum ± 45-degree cone zone from the center of the sensor.

Replace the 1st paragraph of section 86-1.02U with:

10-19-18

The housing for a push button assembly must be made of die-cast aluminum, permanent mold-cast aluminum, or UV-stabilized self-extinguishing structural plastic.

The housing must have a uniform color that matches color no. 17038, 27038, or 37038 of AMS-STD-595.

Replace the 2nd paragraph of section 86-1.02W(4) with:

10-19-18

The cured hot-melt rubberized asphalt sealant must comply with the requirements shown in the following table:

Cured Hot-Melt Rubberized Asphalt Sealant Requirements

Quality characteristic	Test method	Requirement
Cone penetration, 25 °C, 150 g, 5 s (max, 1/10 mm)	ASTM D5329	35
Flow, 60 °C, 5 hr (max, mm)		5
Resilience, 25 °C (min, %)		25
Softening point (min, °C)	ASTM D36	82
Ductility, 25 °C, 5 cm/min (min, cm)	ASTM D113	30
Flash point, Cleveland Open Cup (min, °C)	ASTM D92	288
Viscosity, no. 27 spindle, 20 rpm, 190 °C (Pa•s)	ASTM D4402	2.5–3.5

Replace the 2nd paragraph of section 86-1.02Y with:

10-19-18

A transformer must be a dry type designed for operation on a 60 Hz supply. The transformer must have a decal showing a connection diagram. The diagram must show either color coding or wire tagging with primary (H1, H2) or secondary (X1, X2) markers and the primary and secondary voltage and volt-ampere rating. A transformer must comply with the electrical requirements shown in the following table:

Transformer Electrical Requirements

Quality characteristic	Requirement
Rating (V(ac))	120/240, 120/480, 240/120, 240/480, 480/120, or 480/240
Efficiency (%)	> 95
Secondary voltage regulation and tolerance from half load to full load (%)	±3

^^

87 ELECTRICAL SYSTEMS

04-15-22

Replace *Reserved* in section 87-1.01C with:

10-19-18

Submit a digital file for geographic information system mapping for:

1. Conduit

2. Pull boxes
3. Cabinets
4. Service equipment enclosures
5. Standards

The digital file must consist of:

1. Longitudinal and latitude coordinates, under the WGS84 reference coordinate system. The coordinates must be in decimal format having 6 significant figures after the decimal point. Coordinates must be read at the center of pull boxes, cabinet, standards, and service equipment enclosures; and on top of conduit at 20-foot intervals before backfill.
2. Type, depth and size for conduits.
3. Type for pull boxes, standards, cabinets, and service equipment enclosures.

Replace item 4 in the list in the 1st paragraph of section 87-1.01D(2)(a) with:

10-19-18

4. Luminaires

Replace the 2nd paragraph of section 87-1.01D(2)(a) with:

10-18-19

Submit a sample size as shown in the following table:

Electrical Material Sampling

Contract quantity	Test sample size
1–8	1
9–15	2
16–25	3
26–90	5
91–150	8
151–280	13
281–500	20
501–1200	32

Replace the 2nd paragraph of section 87-1.01D(2)(c) with:

10-16-20

Test the battery backup system in the presence of the Engineer by turning off the service power to the electrical system to be powered by the battery backup system. The electrical system must remain in full continuous operation for 30 minutes. If the test fails, correct the problem and retest the system. After successful completion of the test, turn on the service power for the electrical system.

Replace section 87-1.01D(2)(d) with:

10-19-18

87-1.01D(2)(d) Piezoelectric Axle Sensors

Piezoelectric axle sensors test consists of:

1. Demonstrating for each sensor:
   1.1. Capacitance is within 20 percent of the value shown on the sensor's data sheet
   1.2. Dissipation factor is less than 0.04 nF when measured in the 20 nF range
   1.3. Resistance is greater than 20 Megaohms
2. Collecting a minimum of 100 vehicle records for each lane and demonstrating:
   2.1. Volume is within ±3 percent accuracy

2.2. Vehicle classification is within 95 percent accuracy by type

Replace the 7th paragraph of section 87-1.03A with:

10-19-18

Notify the Engineer immediately if an existing facility is damaged by your activities:

1. Damaged existing traffic signal systems must be repaired or replaced within 24 hours. If the system cannot be fixed within 24 hours or it is located on a structure, provide a temporary system until the system can be fixed.
2. Damaged existing lighting systems must be repaired or replaced by nightfall. If the system cannot be fixed by nightfall, provide a temporary system until the system can be fixed.

Add to the end of section 87-1.03A:

10-19-18

Collect the geographic information system mapping data.

Replace section 87-1.03B with:

04-15-22

87-1.03B Conduit Installation

87-1.03B(1) General

The installation of conduit includes installing caps, bushings, and pull tape and terminating the conduit in pull boxes, foundations, poles, or a structure.

Limit the number of bends in a conduit run to no more than 360 degrees between pull points.

Use conduit to enclose conductors except where they are installed overhead or inside standards or posts.

You may use a larger size conduit than specified for the entire length between termination points. Do not use a reducing coupling.

Extend an existing conduit using the same material. Terminate conduits of different materials in a pull box.

Use a minimum trade size of conduit of:

1. 1-1/2 inches from an electrolier to the adjacent pull box.
2. 1 inch from a pedestrian push button post to the adjacent pull box.
3. 2 inches from a signal standard to the adjacent pull box.
4. 3 inches from a controller cabinet to the adjacent pull box. Install two 3-inch conduits between controller cabinet and adjacent pull box.
5. 2 inches from an overhead sign to the adjacent pull box.
6. 2 inches from a service equipment enclosure to the adjacent pull box.
7. 1-1/2 inches if unspecified.

Make conduit cuts square and true.

Thread metal conduit with standard conduit-threading dies.

Ream the ends of shop-cut and field-cut conduit to remove burrs and rough edges.

Do not use slip joints or running threads to couple metal conduit. If a standard coupling cannot be used, use a threaded union coupling. Tighten couplings for metal conduit to maintain a good electrical connection.

Use Type 1 conduit:

1. On all exposed surfaces

2. In concrete structures
3. Between a structure and the nearest pull box

Cut Type 2 conduit with pipe cutters; do not use hacksaws. Tighten conduit into couplings or fittings using strap wrenches or approved groove joint pliers.

Apply 2 coats of unthinned primer and paint all metal conduit:

1. Exposed threads
2. Field-cut threads, before installing conduit couplings
3. Damaged surfaces

Do not remove shop-installed conduit couplings.

Repair damaged Type 2 conduit and coupling coating by:

1. Cleaning the conduit or coupling and painting it with 1 coat of rubber-resin-based adhesive under the manufacturer's instructions. Wrap the damaged area with at least 1 layer of 2-inch-wide, 20 mils-minimum-thickness, PVC tape under ASTM D1000 with a minimum tape overlap of 1/2 inch.
2. Painting damaged spots of 1/4 inch or less in diameter with a brushing-type compound supplied by the conduit manufacturer.

Cut Type 3 conduit with tools that do not deform the conduit. Use solvent weld connections.

If factory bends are not used, bend the conduit to a radius no less than 6 times its inside diameter without crimping or flattening it. Comply with the bending requirements shown in the following table:

Conduit-Bending Requirements

Type	Requirement
1	Use equipment and methods under the conduit manufacturer's instructions.
2	Use a standard bending tool designed for use on thermoplastic-coated conduit. The conduit must be free of burrs and pits.
3	Use equipment and methods under the conduit manufacturer's instructions. Do not expose the conduit to a direct flame.
5	Use equipment and methods under the conduit manufacturer's instructions.

Do not install new conduit through foundations.

Install conduit terminating in a standard or pedestal from 2 to 3 inches above the foundation. Slope the conduit toward the handhole opening.

Terminate conduit installed through the bottom of a nonmetallic pull box 2 inches above the bottom and 2 inches from the wall closest to the direction of the run.

Cap the ends of conduit for future use or until installation of conductors or cables. Cap the threaded ends of metal conduit with standard pipe caps. Install a plastic cap on all other types of conduit.

Install threaded bushings on metal conduits and bond them using a jumper. Install nonmetallic bushings or end bells on other types of conduit.

Install pull tape in conduit or innerducts to remain empty, with at least 2 feet of slack at each end. Attach the tape's ends to the conduit.

87-1.03B(2) Conduit Installation for Structures

87-1.03B(2)(a) General

Paint exposed Type 1 conduit the same color as the structure.

Install galvanized steel hangers, steel brackets, and other fittings to support conduit in or on a wall or bridge structure.

Install an expansion fitting at structure expansion joints with a movement rating of less than 1-1/2 inch.

Install a conduit expansion-deflection fitting at structure expansion joints with a movement rating of 1-1/2 inch or greater.

87-1.03B(2)(b) New Structures

Seal and make watertight the conduits which lead to soffits, wall-mounted luminaires, other lights, and fixtures located below the pull box grade.

If you place a conduit through the side of a nonmetallic pull box, terminate the conduit 2 inches from the wall and 2 inches above the bottom. Slope the conduit toward the top of the box.

For ease of installation and if authorized, you may use Type 4 conduit instead of Type 1 conduit for the final 2 feet of conduit entering a pull box in a reinforced concrete structure.

For conduit installed inside of bridge structures, you must:

1. Install precast concrete cradles.
2. Bond precast concrete cradles to a wall or bridge structure with one of the following:
   2.1. Epoxy adhesive for bonding freshly-mixed concrete to hardened concrete.
   2.2. Rapid-set epoxy adhesive for pavement markers.
   2.3. Standard-set epoxy adhesive for pavement markers.
3. Use a pipe sleeve or form an opening for a conduit through a bridge structure. The sleeve or opening through a prestressed member or conventionally reinforced precast member must be:
   3.1. Oriented transverse to the member.
   3.2. Located through the web.
   3.3. No more than 4 inches in size.
4. Wrap the conduit with 2 layers of asphalt felt building paper and securely tape or wire the paper in place for a conduit passing through a bridge abutment wall. Fill the space around the conduit with mortar under section 51-1, except the proportion of cementitious material to sand must be 1 to 3. Fill the space around the conduits after prestressing is completed.

Mark the location of conduit ends with a 3-inch tall "Y" for all conduits installed in structures or terminating at curbs. Mark the "Y" on the face of a curb, gutter or wall, directly above the conduit, and above grade line.

87-1.03B(2)(c) Existing Structures

Run surface-mounted conduit straight and true, horizontal or vertical on the wall, and parallel to walls on ceilings or similar surfaces. Support the conduit at a maximum of 5-foot intervals where needed to prevent vibration or deflection. Support the conduit using galvanized, malleable-iron, conduit clamps, and clamp backs secured with expansion anchorage devices. Use the largest diameter of galvanized, threaded studs that will pass through the mounting hole in the conduit clamp.

87-1.03B(3) Conduit Installation Underground

87-1.03B(3)(a) General

Notify the Engineer at least 4 business days before starting horizontal directional drilling method or jack and drill method.

Install conduit to a depth of:

1. 18 inches, minimum, under sidewalk and curbed paved median areas
2. 42 inches, minimum, below the bottom of the rail of railroad tracks
3. 30 inches, minimum, everywhere else below grade

Install Type 1 or Type 2 conduit with explosion-proof sealing fittings, within the limits of hazardous locations as specified in NEC for Class I, division 1.

Install a minimum 1-1/2-inch diameter Type 1 or Type 2 conduit under railroad tracks.

You may lay conduit on existing pavement within a new curbed median constructed on top.

Install conduit under pavement by either the horizontal directional drilling method or jack and drill method.

Place conduit couplings at a minimum of 6 inches from the face of a foundation.

87-1.03B(3)(b) Conduit in Trenches

87-1.03B(3)(b)(i) General

Backfill trench with:

1. A minimum of 2 inches of sand bedding before installing the conduit
2. 18 inches of slurry concrete over the conduit
3. Native material over the slurry cement

Use slurry concrete under section 19-3.02E except, the size of the aggregate must be 3/8 inch or smaller.

Grade the trench surface to match the existing grade.

87-1.03B(3)(b)(ii) High Density Polyethylene Conduit Installation

For sweeps, maintain a conduit bend radius of a minimum 10 times the outside diameter of the conduit.

Conduits must not protrude more than 2 inches inside the pull box and vaults, and must enter at an angle less than 20 degrees from either the vertical or horizontal axis.

Demonstrate a minimum of 2 test fusions to the Engineer prior to performing fusion operations on HDPE conduit to be installed.

Join HDPE conduit using the electro fusion method recommended by the conduit manufacturer. Do not expose conduit to direct flame. The electro-fusion must be performed by a person certified by the conduit manufacturer.

Place warning tape in the trench 6 inches below finished grade.

Slurry concrete must be pigmented to match color no. 21105 of AMS-STD-595.

Blow out all conduits with compressed air until all foreign material is removed, before installing innerducts.

Install innerducts as one continuous unit between vaults. Innerducts may be interrupted inside pull boxes located between vaults and cabinets.

Lubricate innerducts per manufacturer's instructions during installation.

Seal the ends of conduit after cables or pull tape are installed.

87-1.03B(3)(b)(iii) Trench-In-Pavement Method

Install conduit using a trench approximately 2 inches wider than the outside diameter of the conduit but not exceeding 6 inches in width.

Dig the trench by hand to the required depth at pull boxes.

When work includes resurfacing the road:

1. Complete the trenching before the final pavement layer is applied
2. Backfill the trench with slurry cement up to the pavement’s surface by the end of each workday

When work does not include resurfacing the road and the trench is in asphalt concrete pavement, backfill the:

1. Trench with slurry cement up to 2 inches below the pavement’s surface by the end of each workday
2. Remaining top 2 inches with HMA Type A under Section 39-2, within 3 days after trenching. Clean the trench and apply a tack coat before placing the HMA

87-1.03B(3)(c) Horizontal Directional Drilling Method

Install a conduit to a minimum depth of 4 feetand maximum depth of 6 feet. If you must install a conduit less than 4 feet in depth or greater than 6 feet in depth, the installation must be authorized.

The diameter of the bore hole must be no larger than 1.5 times the outside diameter of the conduit.

Water-based mineral slurry or wetting solution may be used to lubricate the boring tool and stabilize the soil surrounding the boring path.

Dispose of residue per section 13-4.03D.

The horizontal directional drilling equipment must have directional control of the boring tool and have an electronic boring tool location detection system. During operation, the equipment must be able to determine the location of the tool both horizontally and vertically.

Use a mandrel to prove the conduit is free and clear of dirt, rocks, and other debris after installation.

87-1.03B(3)(d) Jack and Drill Method

Keep the jacking or drilling pit 2 feet away from the edge of pavement except when installing conduit under rail-road tracks. Construct the jacking or drilling pit a minimum of 13 feet from the centerline of the track to the closest side of the pit. Do not weaken the pavement or soften the subgrade with excessive use of water.

Cover the jacking pit with planking if left overnight.

If an obstruction is encountered, obtain authorization to cut small holes in the pavement to locate or remove the obstruction.

You may install Type 2 or Type 3 conduit under the pavement if a hole larger than the conduit's diameter is predrilled. The predrilled hole must be less than one and half the conduit's diameter.

Remove the conduit used for drilling or jacking and install new conduit for the completed work.

Replace section 87-1.03C with:

10-18-19

87-1.03C Installation of Pull Boxes

87-1.03C(1) General

Install pull boxes no more than 200 feet apart.

Place the cover on the box when not working in it.

87-1.03C(2) Roadway Pull Boxes

87-1.03C(2)(a) General

You may install larger pull boxes than specified or shown and additional pull boxes to facilitate the work except in structures.

10-16-20

Where a roadway pull box is adjacent to a post or standard, place the pull box within 5 feet from the post or standard on the downstream side of traffic when practical.

10-18-19

Install a pull box on a minimum 6-inch deep bed of crushed rock and grout it before installing conductors. The grout must be from 0.5 to 1 inch thick and sloped toward the drain hole. Place a layer of roofing paper between the grout and the crushed rock sump. Make a 1-inch drain hole through the grout at the center of the pull box.

Set the pull box such that the top is 1-1/4 inches above the surrounding grade in unpaved areas and leveled with the finished grade in sidewalks and other paved areas.

Grout around conduits that are installed through the sides of the pull box.

Bond and ground the metallic conduit before installing conductors and cables in the conduit.

Bond metallic conduits in a nonmetallic pull box using bonding bushings and bonding jumpers.

Do not install pull boxes in concrete pads, curb ramps, or driveways.

Reconstruct the sump of a pull box if disturbed by your activities. If the sump was grouted, remove and replace the grout.

87-1.03C(2)(b) Nontraffic Pull Boxes

For a buried nontraffic pull box, install the electronic marker and set the box such that the top is from 6 to 8 inches below the surrounding grade. Place a 20-mil-thick plastic sheet made of HDPE or PVC virgin compounds to prevent water from entering the box.

When a pull box is in a structure, modify the base as required.

Place mortar between a nontraffic pull box and a pull box extension.

Where a nontraffic pull box is in the vicinity of a curb in an unpaved area, place the box adjacent to the back of the curb if practical.

If you replace the cover on a nontraffic pull box, anchor it to the box.

Perform the electronic marker test.

87-1.03C(2)(c) Traffic Pull Boxes

Place minor concrete around and under a traffic pull box as shown.

Bolt the steel cover to the box when not working in it.

Bond the steel cover to the conduit with a minimum 3-foot-long jumper and bolt it down after installing the conductors and cables.

87-1.03C(2)(d) Tamper-Resistant Pull Boxes

Install the tamper-resistant pull boxes under the manufacturer's instructions.

87-1.03C(3) Structure Pull Boxes

Install structure pull boxes parallel to the structure.

After removing the knockouts, flatten the surrounding area.

Bond conduit to a structure pull box using locknuts on the inside and outside of the box.

Cover pull boxes with a 1/4-inch plywood during pouring of PCC. For a no. 9 pull box, the upper edge of the plywood must fit against the lower edge of the rain tight hood.

Install no. 7 pull box with bottom flanges flush with the bottom of the box girder. Place top and bottom covers and seal the pull box during PCC pouring.

For no. 9 and 9A pull boxes:

1. Form a 1:1 chamfer around the cover
2. Use the drain hole in the center if the box is horizontal and the low end drain hole if the box is inclined
3. Mounted in a sloping parapet, drill a 1/2-inch elongated drain hole in the center if the box is horizontal or the low end if the box is inclined

Replace section 87-1.03D with:

10-16-20

87-1.03D Battery Backup System Cabinets

Install the battery backup system cabinet to the right side of the controller cabinet. If installation on the right side is not possible, obtain authorization for installation on the left side.

Construct access opening between controller cabinet and battery backup cabinet using:

1. 2-inch nylon-insulated, steel chase nipple
2. 2-inch steel sealing locknut
3. 2-inch nylon-insulated, steel bushing

Remove the jumper between the terminals labeled *BBS-1* and *UBS-1* and the jumper between the terminals labeled *BBS-2* and *UBS-2* in the 7-position terminal block in the controller cabinet before connecting the Department-furnished electronics assembly.

Install the electronics assembly and batteries in the battery backup system cabinet. Obtain authorization for installation of the electronics assembly in the controller cabinet.

Replace section 87-1.03E(2) with:

04-15-22

87-1.03E(2) Trenching

Do not trench until conduit or direct burial cables are on-site and ready for installation.

Place excavated material in a location that will not interfere with traffic or surface drainage.

Compact native material backfill to a minimum relative compaction of:

1. 95 percent when placed within the hinge points and in areas where pavement is to be constructed
2. 90 percent when placed outside the hinge points and not under pavement

Restore the sidewalks, pavement, and landscaping at a location before starting excavation at another location.

Replace section 87-1.03E(3) with:

10-15-21

87-1.03E(3) Concrete Pads, Foundations, and Pedestals

Construct concrete pads, foundations, and pedestals under section 56-3.

Construct a pad in front of a Type III service equipment enclosure. The pad must be 24 inches in length, 4 inches in thickness, and must match the width of the foundation.

In unpaved areas, place the top of the foundation 6 inches above the surrounding grade, except place the top:

1. 1 foot 6 inches above the grade for 336LS cabinets
2. 1 foot 8 inches above the grade for Type C telephone demarcation cabinets
3. 2 inches above the grade for Type III service equipment enclosures

The pad must be 2 inches above the surrounding grade in unpaved areas.

In and adjacent to the sidewalk and other paved areas, place the top of the foundation 4 inches above the surrounding grade, except place the top:

1. 1 foot 6 inches above the grade for 336LS cabinets
2. 1 foot 8 inches above the grade for Type C telephone demarcation cabinets
3. Level with the finished grade for Type III service equipment enclosures

The concrete pad must be level with the finished grade in paved areas.

Add between the 3rd and 4th paragraphs of section 87-1.03F(1):

04-17-20

Provide conductor and cable slack to comply with the requirements shown in the following table:

Conductor and Cable Slack Requirements

Location	Slack (feet)
Signal standard	1
Lighting standard	1
Signal and lighting standard	1
Pull box	3
Splice	3
Controller cabinet	6
Standards with slip base	0

Replace the last paragraph of section 87-1.03F(1) with:

04-19-19

Install a tracer wire.

Replace section 87-1.03F(2) with:

04-17-20

87-1.03F(2) Cables

87-1.03F(2)(a) General

Reserved

87-1.03F(2)(b) Communication Cables

87-1.03F(2)(b)(i) General

Terminate the ends of the communication cables as shown.

87-1.03F(2)(b)(ii) Category 5E and 6 Cables

Do not splice category 5E and 6 cables.

87-1.03F(2)(b)(iii) Telephone Cables

Do not splice telephone cables between the telephone demarcation point and the controller cabinet.

87-1.03F(2)(c) Copper Cables

87-1.03F(2)(c)(i) General

Reserved

87-1.03F(2)(c)(ii) Detector Lead-in Cables

Install a Type B or C detector lead-in cable in conduit.

Seal the ends of the lead-in cable before installing it in the conduit to prevent moisture from entering the cable.

Splice loop conductors for each direction of travel for the same phase, terminating in the same pull box, to a separate lead-in cable running from the pull box adjacent to the loop detector to a sensor unit mounted in the controller cabinet. Install the lead-in cable without splices except at the pull box when connecting to loop wire.

Verify in the presence of the Engineer that the loops are operational before making the final splices between loop conductors and the lead-in cable.

Identify and tag each lead-in cable with the detector designation at the cabinet and pull box adjacent to the loops.

87-1.03F(2)(c)(iii) Conductors Signal Cables

Do not splice signal cables except for a 28-conductor cable.

Provide identification at the ends of terminated conductors in a cable as shown.

Provide identification for each cable in each pull box showing the signal standard to which it is connected except for the 28-conductor cable.

Connect conductors in a 12-conductor cable as shown in the following table:

12CSC Color Code and Functional Connection

Color code	Termination	Phase
Red	Red signal	2, 4, 6, or 8
Yellow	Yellow signal	2, 4, 6, or 8
Brown	Green signal	2, 4, 6, or 8
Red/black stripe	Red signal	1, 3, 5, or 7
Yellow/black stripe	Yellow signal	1, 3, 5, or 7
Brown/black stripe	Green signal	1, 3, 5, or 7
Black/red stripe	Spare or as required for red or *DONT WALK*	--
Black/white stripe	Spare or as required for yellow	--
Black	Spare or as required for green or *WALK*	--
Red/white stripe	Pedestrian signal *DONT WALK*	--
Brown/white stripe	Pedestrian signal *WALK*	--
White	Terminal block	Neutral

Provide identification for each 28-conductor cable C1 or C2 in each pull box. The cable labeled *C1* must be used for signal phases 1, 2, 3, and 4. The cable labeled *C2* must be used for signal phases 5, 6, 7, and 8.

Connect conductors in a 28-conductor cable as shown in the following table:

28CSC Color Code and Functional Connection

Color code	Termination	Phase
Red/black stripe	Red signal	2 or 6
Yellow/black stripe	Yellow signal	2 or 6
Brown/black stripe	Green signal	2 or 6
Red/orange stripe	Red signal	4 or 8
Yellow/orange stripe	Yellow signal	4 or 8
Brown/orange stripe	Green signal	4 or 8
Red/silver stripe	Red signal	1 or 5
Yellow/silver stripe	Yellow signal	1 or 5
Brown/silver stripe	Green signal	1 or 5
Red/purple stripe	Red signal	3 or 7
Yellow/purple stripe	Yellow signal	3 or 7
Brown/purple stripe	Green signal	3 or 7
Red/2 black stripes	Pedestrian signal *DONT WALK*	2 or 6
Brown/2 black stripes	Pedestrian signal *WALK*	2 or 6
Red/2 orange stripes	Pedestrian signal *DONT WALK*	4 or 8
Brown/2 orange stripes	Pedestrian signal *WALK*	4 or 8
Red/2 silver stripes	Overlap A, C	OLA[a], OLC[a]
Brown/2 silver stripes	Overlap A, C	OLA[c], OLC[c]
Red/2 purple stripes	Overlap B, D	OLB[a], OLD[a]
Brown/2 purple stripes	Overlap B, D	OLB[c], OLD[c]
Blue/black stripe	Pedestrian push button	2 or 6
Blue/orange stripe	Pedestrian push button	4 or 8
Blue/silver stripe	Overlap A, C	OLA[b], OLC[b]
Blue/purple stripe	Overlap B, D	OLB[b], OLD[b]
White/black stripe	Pedestrian push button common	--
Black/red stripe	Spare	--
Black	Spare	--
White	Terminal block	Neutral

OL = Overlap; A, B, C, and D = Overlapping phase designation
[a]For red phase designation
[b]For yellow phase designation
[c]For green phase designation

Use the neutral conductor only with the phases associated with that cable. Do not intermix neutral conductors from different cables except at the signal controller.

87-1.03F(2)(c)(iv) Signal Interconnect Cable

Do not splice the cable unless authorized.

If splices are authorized, insulate the conductor splices with heat-shrink tubing and overlap the insulation at least 0.6 inch. Cover the splice area of the cable with heat-shrink tubing and overlap the cable jacket at least 1-1/2 inches. Provide a minimum of 3 feet of slack at each splice.

87-1.03F(2)(c)(v) Railroad Preemption Cables

Do not splice railroad preemption cable from controller cabinet to railroad cabinet.

Terminate individual conductors with ferrule connectors in the controller cabinet.

Provide identification on both ends of the cable and connect the cable end in the controller cabinet as shown in the following table:

10-15-21

Color Code and Functional Connection

Conductor no.	Color Code	Controller Cabinet Field Terminal Connections	Conductor Identification
1	Black	Not Used	Spare
2	White	Not Used	Spare
3	Red	FT8-A145	Health Status DC+
4	Green	Not Used	Spare
5	Orange	FT7-A134	Simultaneous DC-
6	Blue	FT7-A131	Advance DC-
7	White/black stripe	Not Used	Spare
8	Red/black stripe	FT8-A144	Gate Down/Island
9	Green/black stripe	Feld Terminal FT8-A142	Advance Pedestrian Preemption
10	Orange/black stripe	FT7-A135	Simultaneous Primary
11	Blue/black stripe	FT7-A132	Advance Primary
12	Black/white stripe	Not Used	Spare
13	Red/white stripe	FT8-A143	Gate Down/Island DC-
14	Green/white stripe	FT8-A141	Advance Pedestrian Preemption DC-
15	Blue/white stripe	FT7-A133	Advance Secondary
16	Black/red stripe	Not Used	Spare
17	White/red stripe	FT8-A146	Health Status DC-
18	Orange/red stripe	FT7-A136	Simultaneous Secondary

04-17-20

Keep all exposed conductors the same length and individually insulate spare conductors against each other.

Provide a minimum 6 feet of slack in the pull box adjacent to the railroad cabinet.

Connect the cable end in the railroad cabinet as directed by the railroad agency representative.

04-17-20

Delete the 4th paragraph of 87-1.03F(3)(a).

Replace the 1st paragraph of section 87-1.03F(3)(c)(ii) with:

10-19-18

Install a Type 1 or 2 inductive loop conductor except use Type 2 for Type E and F loop detectors.

10-19-18

Delete the last paragraph of section 87-1.03G.

Replace the 4th paragraph of section 87-1.03H(2) with:

10-19-18

Use Method B as follows:

1. Cover the splice area completely with an electrical insulating coating and allow it to dry.
2. Apply 3 layers of half-lapped, PVC electrical tape.
3. Apply 2 layers of butyl-rubber, stretchable tape with liner.
4. Apply 3 layers of half-lapped, PVC, pressure-sensitive, adhesive tape.
5. Cover the entire splice with an electrical insulating coating and allow it to dry.

Replace section 87-1.03N with:

10-19-18

87-1.03N Fused Splice Connectors

Install a fuse splice connector with a fuse in each ungrounded conductor for luminaires, except for overhead sign luminaires. The connector must be located in the pull box adjacent to the luminaires.

If the pull box for the roadway luminaire is tamper resistant, install a fuse splice connector with 10 A fuse in the pull box and an additional fuse splice connector with a 5 A fuse in the handhole.

Install a fuse splice connector with a fuse on primary side of transformer.

Crimp the connector terminals onto the ungrounded conductors using a tool under the manufacturer's instructions. Insulate the terminals and make them watertight.

Add between the 2nd and 3rd paragraphs of section 87-1.03P:

04-16-21

Apply a sealing compound between the foundation and the enclosure before installing the enclosure.

Replace section 87-1.03T with:

10-15-21

87-1.03T Accessible Pedestrian Signals

Install accessible pedestrian signals of the same manufacturer at each location.

Do not install APS components inside the controller cabinet.

Identify conductors on both ends of the signal interface cable. Label each conductor according to their function under the manufacturer's instructions.

Attach the accessible pedestrian signal to the standard with self-tapping screws. Drill a 1-inch diameter hole on the standard for the signal interface cable.

Install the 9 by 12 inches R10-3j (CA) sign using the adapter plate provided by the APS manufacturer.

Point the arrow on the accessible pedestrian signal in the crossing direction.

When using a push button assembly post, cut the post to 2 inches above the R10-3j (CA) sign.

Furnish the equipment and hardware to set up and calibrate the accessible pedestrian signal.

Arrange to have a manufacturer's representative at the job site to program the accessible pedestrian signal with an audible message or tone.

When replacing an existing accessible pedestrian signal, the enclosure color must match the color of the existing enclosure.

Add to the end of section 87-1.03U:

10-19-18

When replacing an existing push button assembly, the housing color must match the color of the existing housing.

04-17-20

Delete the 9th paragraph for section 87-1.03V(2).

Add between the 1st and 2nd paragraphs of section 87-1.03Y:

04-19-19

Use a submersible type transformer inside pull boxes.

Replace the 2nd paragraph of section 87-2.03A with:

10-19-18

Tighten the cap screws of the luminaire's clamping bracket to 10 ft-lb for roadway luminaires.

Replace section 87-3 with:

10-19-18

87-3 SIGN ILLUMINATION SYSTEMS

87-3.01 GENERAL

Section 87-3 includes specifications for constructing sign illumination systems.

Sign illumination system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors
5. Overhead sign luminaires
6. Service equipment enclosure
7. Photoelectric control

The components of a sign illumination system are shown on the project plans.

87-3.02 MATERIALS

Reserved

87-3.03 CONSTRUCTION

Perform the conductor test.

Install overhead sign luminaires under the manufacturer's instructions.

Do not modify the sign structure or mounting channels.

Perform the operational tests for the system.

87-3.04 PAYMENT

Not Used

Replace section 87-4 with:

04-17-20

87-4 SIGNAL AND LIGHTING SYSTEMS

87-4.01 GENERAL

Section 87-4 includes specifications for constructing signal and lighting systems.

Signal and lighting system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors and cables
5. Standards
6. Signal heads

7. Service equipment enclosure
8. Department-furnished controller assembly
9. Detectors
10. Telephone demarcation cabinet
11. Accessible pedestrian signals
12. Push button assemblies
13. Pedestrian signal heads
14. Luminaires
15. Photoelectric control
16. Fuse splice connectors
17. Battery backup system
18. Flashing beacons
19. Flashing beacon control assembly

The components of a signal and lighting system are shown on the project plans.

87-4.02 MATERIALS

87-4.02A General

Not used

87-4.02B Railroad Preemption

A wire jumper for railroad preemption must be:

1. Stranded
2. 14 AWG
3. White with red stripes

87-4.03 CONSTRUCTION

87-4.03A General

Set the foundation for a standard such that the mast arm is perpendicular to the centerline of the roadway.

Tighten the cap screws of the roadway luminaire's clamping bracket to 10 ft-lb.

Label the month and year of the installation inside the luminaire housing's door.

Perform the conductor and operational tests for the system.

87-4.03B Railroad Preemption

Connect the C16 harness plug to the C16 socket on the Output File no. 2LX in the controller cabinet.

Connect the terminated conductors of the C16 harness to terminal block TB9 on input panel no.1 in the controller cabinet as shown in the following table:

Input Panel No. 1 Connections

Pin	Label	TB9
1	J-12D	4
2	J-12J	5
3	J-13D	7
4	J-13J	8
5	J-14D	10
6	J-14J	11

Terminate wire jumpers with spade connectors on both ends.

Connect three wire jumpers approximately 4 feet in length as show in the following table:

Jumper Connections

Jumper	Bus	TB9
1	DC-	6
2	DC-	9
3	DC-	12

Connect three wire jumpers approximately 2 inches in length as show in the following table:

Jumper Connections

Jumper	Terminal Block	Pin	Pin
1	TB-12	5	7
2	TB-13	5	7
3	TB-14	5	7

87-4.04 PAYMENT

Not Used

Replace section 87-7.02 with:

10-19-18

87-7.02 MATERIALS

Flashing beacon control assembly includes:

1. Enclosure.
2. Barrier-type terminal blocks rated for 25 A, 600 V(ac), made of molded phenolic or nylon material and have plated-brass screw terminals and integral marking strips.
3. Solid state flasher complying with section 8 of NEMA standards publication no. TS 1 for 10 A, dual circuits.
4. 15-A, circuit breaker per ungrounded conductor.
5. Single-hole-mounting toggle type, single-pole, single-throw switches rated at 12-A, 120 V(ac). Switches must be furnished with an indicating nameplate reading *Auto - Test*. A 15-A circuit breaker may be used in place of the toggle switch.

Replace section 87-8 with:

10-16-20

87-8 PEDESTRIAN HYBRID BEACON SYSTEMS

87-8.01 GENERAL

87-8.01A Summary

Section 87-8 includes specifications for constructing pedestrian hybrid beacon system.

A pedestrian hybrid beacon system includes:

1. Foundations
2. Pull boxes
3. Conduit
4. Conductors and cables
5. Standards
6. Pedestrian hybrid beacon face
7. Pedestrian signal heads
8. Service equipment enclosure
9. Department-furnished controller assembly
10. Accessible pedestrian signals
11. Push button assemblies
12. Luminaires

13. Fuse splice connectors
14. Battery backup system

The components of a pedestrian hybrid beacon system are shown on the project plans.

87-8.01B Definitions

Reserved

87-8.01C Submittals

Reserved

87-8.01D Quality Assurance

87-8.01D(1) General

Reserved

87-8.01D(2) Quality Control

Verify the sequence for the pedestrian hybrid beacon system per California *MUTCD*, Chapter 4F, Figure 4F-3 "Sequence for a Pedestrian Hybrid Beacon" during the operational test.

Test the battery backup system.

87-8.02 MATERIALS

87-8.02A General

The pedestrian hybrid beacon system must comply with California *MUTCD*, Chapter 4F.

87-8.02B Pedestrian Hybrid Beacon Face

A pedestrian hybrid beacon face consists of two red indications on the top and one yellow indication on the bottom.

87-8.03 CONSTRUCTION

Install pedestrian hybrid beacon system under sections 87-4.03A.

Install battery backup system.

87-8.04 PAYMENT

Not Used

Replace the 1st paragraph of section 87-12.03 with:

10-19-18

Install changeable message sign on sign structure under section 56-2.

Add to the list in the 2nd paragraph of section 87-14.01A:

10-16-20

8. Signs

Replace section 87-14.02 with:

10-19-18

87-14.02 MATERIALS

87-14.02A General

Vehicle speed feedback sign consists of a housing, display window, and radar unit.

Sign must:

1. Comply with the California MUTCD, Chapter 2B

2. Have an operating voltage of 120 V(ac) for permanent installations
3. Have a maximum weight of 45 lb
4. Have a wind load rating of 90 mph
5. Have an operating temperature range from -34 to 165 degrees F
6. Have a retroreflective white sheeting background

87-14.02B Housings

Housing must:

1. Be weatherproof (NEMA 3R or better) and vandal resistant
2. Be made of 0.09-inch-gauge welded aluminum with the outer surfaces being UV resistant
3. Have the manufacturer's name, model number, serial number, date of manufacture, rated voltage and rated current marked inside
4. Have the internal components easily accessible for field repair without removal of the sign

87-14.02C Display Windows

Display window consists of a cover, LED character display, and dimming control. Character display and cover must deflect together without damage to the internal electronics and speed detection components.

Cover must be:

1. Vandal resistant and shock absorbent
2. Field replaceable with the removal of external stainless-steel, tamper proof fasteners

Cover must be made of a minimum 0.25-inch-thick, shatter-resistant polycarbonate.

LED character display must:

10-16-20

1. Consist of two 7-segment, solid-state, numeric characters, which must:
    1.1. Be a minimum:
        1.1.1. 18 inches in height for freeways and expressways
        1.1.2. 14 inches in height for conventional highways
    1.2. Have a width-to-height ratio between 0.7 and 1.0
    1.3. Have a stroke width-to-height ratio of 0.2
    1.4. Be visible from a minimum distance of 1500 feet and legible from a minimum distance of 750 feet
    1.5. Consist of a minimum 16 LEDs, which must:
        1.5.1. Be amber and have a wavelength from 590 to 600 nm and rated for minimum 60,000 hours
        1.5.2. Maintain a minimum 85 percent of the initial light output after 48 months of continuous use over the temperature range

10-19-18

2. Be capable of displaying the detected vehicle speed within 1 second
3. Remain blank when no vehicles are detected within the radar detection zone
4. Have the option to flash the pre-set speed limit when the detected vehicle speed is 5 miles higher than the pre-set speed
5. Be viewable only by the approaching traffic

Dimming control must:

1. Automatically adjust the character light intensity to provide optimum character visibility and legibility under all ambient lighting conditions
2. Have minimum 3 manual dimming modes of different intensities

87-14.02D Radar Units

Radar unit must:

1. Be able to detect up to 3 lanes of approaching traffic
2. Operate with an internal, low power, 24.159 GHz (K-band)

3. Be FCC approved Part 15 certified
4. Have a speed accuracy of ±1 mph
5 Have a maximum 15 W power consumption

Add between the 1st and 2nd paragraphs of section 87-14.03:

10-16-20

Install R2-1 SPEED LIMIT sign.

Add to the list in the 2nd paragraph of section 87-18.01:

10-18-19

4. 12 position terminal block

Replace section 87-18.02 with:

10-18-19

87-18.02 MATERIALS

Terminal block must comply with TEES, chapter 1, section 3.

Replace the 2nd paragraph of section 87-18.03 with:

10-18-19

Install the terminal block on the input panel in the controller cabinet.

Connect the signal interconnect cable to the terminal block as shown in the following table:

Signal Interconnect Termination

Terminal Block	Color
1	BLUE
2	BLACK
3	RED
4	BLACK
5	BROWN
6	BLACK
7	GREEN
8	BLACK
9	YELLOW
10	BLACK
11	WHITE
12	BLACK

Replace 87-19 with:

10-19-18

87-19 FIBER OPTIC CABLE SYSTEMS

87-19.01 GENERAL

87-19.01A Summary

Section 87-19 includes specifications for constructing fiber optic cable systems.

A fiber optic cable system includes:

1. Conduit and accessories

2. Vaults
3. Warning tape
4. Fiber optic cables
5. Fiber optic splice enclosures
6. Fiber distribution units
7. Fiber optic markers
8. Fiber optic connectors and couplers

The components of a fiber optic system are shown on the project plans.

87-19.01B Definitions

Reserved

87-19.01C Submittals

At least 15 days before cable installation, submit:

1. Manufacturer's procedures for pulling fiber optic cable
2. Test reports from a laboratory accredited to International Standards Organization/International Electrotechnical Commission 17025 by the American Association for Laboratory Accreditation (A2LA) or the ANSI-ASQ National Accreditation Board (ANAB) for:
    2.1. Water penetration
    2.2. Cable temperature cycling
    2.3. Cable impact
    2.4. Cable tensile loading and fiber strain
    2.5. Cable compressive loading
    2.6. Compound flow
    2.7. Cyclic flexing
3. Proof of calibration for the test equipment including:
    3.1. Name of calibration facility
    3.2. Date of calibration
    3.3. Type of equipment, model number and serial number
    3.4. Calibration result

Submit optical time-domain reflectometer data files for each test in a Microsoft Excel format.

After performing the optical time-domain reflectometer test and the power meter and light source test, submit within 4 business days a hard copy and electronic format:

1. Cable Verification Worksheet
2. Segment Verification Worksheet
3. Link Loss Budget Worksheet

The worksheets are available at the Division of Construction website.

87-19.01D Quality Assurance

87-19.01D(1) General

Reserved

87-19.01D(2) Quality Control

Notify the Engineer 4 business days before performing field tests. Include exact location of the system or components to be tested. Do not proceed with the testing until authorized. Perform each test in the presence of the Engineer.

The optical time-domain reflectometer test consists of:

1. Inspecting the cable segment for physical damage.
2. Measuring the attenuation levels for wavelengths of 1310 and 1550 nm in both directions for each fiber using the optical time-domain reflectometer.
3. Comparing the test results with the data sheet provided with the shipment. If there are attenuation deviations greater than 5 percent, the test will be considered unsatisfactory and the cable segment

will be rejected. The failure of any single fiber is a cause for rejection of the entire segment. Replace any rejected cable segments and repeat the test.

The power meter and light source test consists of:

1. Testing each fiber in a link using a light source at one end of the link and a power meter at the other end
2. Measuring and recording the power loss for wavelengths of 1310 and 1550 nm in both directions

Index matching gel is not allowed.

Installation and splicing of the fiber optic cable system must be performed by a certified fiber optic installer.

The optical time-domain reflectometer test and the power meter and light source test must be performed by a certified fiber optic technician.

The certification for the fiber optic installer and fiber optic technician must be from an organization recognized by the International Certification Accreditations Council and must be current throughout the duration of the project.

87-19.02 MATERIALS

87-19.02A General

All metal components of the fiber optic cable system must be corrosion resistant.

All connectors must be factory-installed and tested.

Patch cords, pigtails, and connectors must comply with ANSI/TIA-568.

Pigtails must have a minimum 80 N pull out strength.

A splice cassette may be used in place of a pigtail and a splice tray.

Each cable reel must have a weatherproof label or tag with information specified in ANSI/ICEA S-87-640 including:

1. Contractor's name
2. Contract number
3. Number of fibers
4. Cable attenuation loss per fiber at 1310 and 1550 nm

The labeled or tagged information must also be in a shipping record in a weatherproof envelope. The envelope must be removed only by the Engineer.

87-19.02B Vaults

A vault must:

1. Comply with section 86-1.02C and AASHTO HS 20-44, and load tested under AASHTO M 306.
2. Be a minimum:
   2.1. 4 feet wide by 4 feet high by 4 feet long nominal inside dimensions for box type.
   2.2. 4 feet high by 4 feet outside diameter for round type.
3. Have a minimum access of:
   3.1. 30 inches diameter for round type.
   3.2. 3 feet wide by 3 feet long for box type.
4. Be precast either modular or monolithic.
5. Have cable racks installed on the interior sides. A rack must:
   5.1. Be fabricated from ASTM A36 steel plate.
   5.2. Support a minimum of 100 pounds per rack arm.
   5.3. Support a minimum of 4 splice enclosures and a minimum of 4 cables with a minimum slack of 50 feet each.
   5.4. Be hot-dip galvanized after manufacturing.
   5.5. Be bonded and grounded.

6. Have a minimum:
   6.1. Two 4-inch diameter knockouts on each side for box type.
   6.2. Two 4-inch diameter knockouts placed every 90 degrees for round type.
7. Have a minimum 2-inch-diameter drain hole at the center of base.

Entry points for knockouts must not cause the cable to exceed its maximum bend radius.

The access cover must:

1. Be a two-piece torsion-assisted sections or a minimum 30-inch-diameter cast iron.
2. Have inset lifting pull slots.
3. Have markings *CALTRANS* and *FIBER OPTIC*.

87-19.02C Fiber Optic Cable

The fiber optic cable must:

1. Comply with 7 CFR parts 1755.900, 1755.901, and 1755.902, and ANSI/ICEA S-87-640
2. Be a singlemode, zero-dispersion, and have non-gel loose type buffer tubes
3. Have no splices
4. Have a Type H or Type M outer jacket
5. Be shipped on a reel
6. Have 10 feet of length on each end of the cable accessible for testing

87-19.02D Fiber Optic Splice Enclosures

A fiber optic splice enclosure must:

1. Not exceed 36 inches in length, 8 inches in width, and 8 inches in height
2. Be made of thermoplastic material, weather proof, chemical and UV resistant, and re-sealable
3. Accommodate a minimum of 8 internal splice trays
4. Have from 1/4 to 1 inch in diameter cable entry ports
5. Have brackets, clips and cable ties
6. Have means to anchor the dielectric member of the fiber optic cable
7. Include grounding hardware

87-19.02E Fiber Distribution Units

The fiber distribution unit consists of a housing, a patch panel, a 12-multicolor pigtail, and a splice tray.

The fiber distribution unit must be self-contained and pre-assembled.

The housing must:

1. Be a 19-inch rack-mountable modular-metal enclosure
2. Be a one rack unit
3. Have cable clamps to secure buffer tube to the chassis
4. Have cable accesses with rubber grommets or similar material to prevent the cable from coming in contact with the bare metal
5. Be weatherproof
6. Have a hinged top door with a latch or thumbscrew to hold it in the closed position

A patch panel must have a minimum of 12-singlefiber type connector sleeves.

A pigtail must:

1. Be a simplex single mode fiber in a 900 µm tight buffer with a 12-inch-outer-diameter PVC jacket
2. Have a fiber optic connector attached on one end and bare fiber on the other end
3. Be at least 3 feet in length
4. Have the manufacturer's part number on the jacket

Pigtails must be single-fiber or ribbon type.

87-19.02F Patch Cords

Patch cords must:

1. Be a singlemode fiber in a 900 µm tight buffer with a 0.12-inch-outer-diameter PVC jacket
2. Have fiber optic connectors attached on both ends
3. Be at least 6 feet in length
4. Have manufacturer's part number on the jacket

Duplex patch cords must be of round cable structure, and not have zip-cord structure.

87-19.02G Splice Trays

Splice trays must:

1. Have brackets to spool incoming fibers a minimum of 2 turns.
2. Have means to secure and protect incoming buffer tubes, pigtails, and a minimum of 12 heat shrink fusion splices.
3. Be stackable.
4. Have a snap-on or hinged cover. The cover may be transparent.

87-19.02H Fiber Optic Markers

Fiber optic markers must be:

1. Type K-2 (CA) object markers for vaults or pull boxes.
2. Disk markers for paved areas and transition points from unpaved to paved areas. The disk marker must be metallic, lead free and 4 inches in diameter, and must have a mounting stem at the center of the disk. The mounting stem must be a minimum 3 inches long and a minimum 0.70 inch in diameter.
3. Non-reflective Class 1, Type F, flexible post delineators for unpaved areas.

87-19.02I Fiber Optic Connectors and Couplers

Connectors must be:

1. 0.1-inch ceramic ferrule pre-radiused type
2. Capped when not used

Couplers must be made of the same material as the connector's housing and have ceramic sleeves.

Singlemode fiber optic connectors must have a yellow strain relief boot or a yellow base.

87-19.03 CONSTRUCTION

87-19.03A General

Perform the optical time-domain reflectometer test:

1. On the fiber optic cable upon its arrival to the job site and before its installation. Complete the Cable Verification Worksheet. Do not install the fiber optic cable until the Engineer's written approval is received.
2. After the fiber optic cable segments have been pulled, but before breakout and termination. Complete the Segment Verification Worksheet.
3. Once the passive cabling system has been installed and is ready for activation. If the measured individual fusion splice losses exceed -0.30 dB, re-splice and retest. At the conclusion of the optical time-domain reflectometer test, perform the power meter and light source test. If the measured link loss exceeds the calculated link loss, replace the unsatisfactory cable segments or splices and retest. Complete the Link Loss Budget Worksheet.

87-19.03B Vaults Installation

Install a vault as shown and with the side facing the roadway a minimum of 2 feet from the edge of pavement or back of dike, away from traffic.

Install the top of the vault flush with surrounding grade in paved areas and 2 inches above the surrounding grade in unpaved areas.

Place 6 inches of minor concrete around vaults. In unpaved areas, finish top of concrete at a 2 percent slope away from cover. In paved areas, finish top of concrete to match existing slope.

Bolt the steel cover to the vault when not working in it.

87-19.03C Fiber Optic Cable Installation

Install fiber optic cable by a certified installer or a representative from the fiber optic cable manufacturer during installation.

When using mechanical aids to install fiber optic cable:

1. Maintain a cable bend radius at least twenty times the outside diameter of the cable
2. Use cable grips having a ball bearing swivel
3. Use a pulling force on a cable not to exceed 500 pound-foot or manufacturer's recommended pulling tension, whichever is less

When installing the cable using the air blown method, the cable must withstand a static air pressure of 110 psi.

Lubricate the cable using a lubricant recommended by the cable manufacturer.

Install fiber optic cable without splices except where shown.

Provide a minimum of 65 feet of slack for each fiber optic cable at each vault. Divide the slack equally on each side of the splice enclosure.

04-17-20

Install tracer wires in the fiber optic conduits and innerducts as shown. Provide a minimum 3 feet of slack tracer wire in each pull box and splice vault from each direction. You may splice tracer wire at intervals of not less than 500 feet and only inside splice vaults or pull boxes.

10-19-18

If a fiber optic cable and tracer wire is installed in an innerduct, pulling a separate fiber optic cable into a spare duct to replace damaged fiber will not be allowed.

Apply a non-hygroscopic filling compound to fiber optic cable openings.

Seal the ends of conduit and innerducts after cables are installed.

Install strain relief for fiber optic cable entering a fiber optic enclosure.

Identify fibers and cables by direct labeling, metal tags, or bands fastened in such a way that they will not move. Use mechanical methods for labeling.

Provide identification on each fiber optic cable or each group of fiber optic cables in each vault and at the end of terminated fibers. Fiber optic cable must be identified as shown in the following table:

Cable Identification[a]

Sequence order	Description	Code	Numbers of characters
1	Fiber type	S: Singlemode	1
2	Fiber count	###: Example 048	3
3	Begin point	T: TMC H: Hub V: Video Node D: Data Node C: Cable Node TV: Camera CM: CMS E: Traffic Signal RM: Ramp Meter TM: Traffic Monitoring/ Count Station/Vehicle Count Station (VDS, TMS) HA: Highway Advisory Radio EM: Extinguishable Message Sign RW: Roadway Weather Information System WM: Weigh In Motion WS: Weigh-Station Bypass System SV: Vault SC: Splice Cabinet	1 or 2
4	Begin point county abbreviation	AA or AAA: Examples: Orange (ORA), San Mateo (SM)	2 or 3
5	Begin point route number	###: Examples: 005, 082, 114	3
6	Begin point post mile	#####: 02470 (example 024.70): Actual PM value to the 1/100 value	5
7	End Point	In the same way as for Begin Point	1 or 2
8	End point county abbreviation	In the same way as for Begin Point County Abbreviation	2 or 3
9	End point route number	In the same way as Begin Point Route Number	3
10	End point post mile	In the same way as Begin Point Post Mile	5

[a]Cable identification example: The cable code S 048 SV SM 084 02470 SV SC 082 02510 describes a singlemode, 48 strand, cable starting at a fiber optic vault in San Mateo County on Route 84 at post mile 24.70, and ending at another fiber optic vault in Santa Clara County on Route 82 at post mile 25.10.

Place labels on the cables at the following points:

1. Fiber optic vault and pull box entrances and exits
2. Splice enclosures entrance and exit
3. Fiber distribution unit entrance

Lace fiber optic cable inside controller cabinets and secure to the cage.

Support the fiber optic cable within 6 inches from a termination and every 2 feet.

Secure fiber optic cables to the cable racks. Store excess cable in a figure 8 fashion.

87-19.03D Fiber Optic Cable Splices

Use fusion splicing for fiber optic cables.

Splice single-buffer tube cable to multi-buffer tube cable using the mid-span access method under manufacturer's instructions. Any mid-span access splice or fiber distribution unit termination must involve only those fibers being spliced as shown.

Place fiber splices in the splice enclosures installed in the vaults.

87-19.03E Splice Enclosures Installation

Maintain an equal amount of slack on each side of the splice enclosure.

Secure the fiber optic splices in splice tray.

Secure the splice trays to the inner enclosure.

Label cables and buffer tubes.

Do not seal fiber splice enclosure until authorized and the power meter and light source test is performed. Seal the enclosure under manufacturer's instructions.

Flash test the outer enclosure under manufacturer's instructions in the presence of the Engineer. Visually inspect the enclosure. If bubbles are present, identify the locations where the bubbles are present, take corrective actions and repeat the flash test until no bubbles are present.

Attach the splice enclosure to the side wall of a vault or hub with a minimum 2 feet distance between the ground and the bottom of the enclosure.

Secure fiber optic cables to the chassis using cable clamps for fiber optic units.

Connect a minimum of one bonding conductor to a grounding electrode after mounting the fiber optic enclosure to the wall. If there are multiple bonding conductors, organize the conductors in a neat way.

87-19.03F Fiber Optic Distribution Unit Installation

Spool incoming buffer tubes 2 feet in the splice tray and expose 1 foot of individual fibers.

Maintain a minimum 2-inch-bend radius during and after installation in the splice tray.

Splice incoming fibers in the splice tray.

Restrain each fiber in the splice tray. Do not apply stress on the fiber when located in its final position.

Secure buffer tubes near the entrance of the splice tray.

Secure splice trays under manufacturer's instructions.

Label splice tray after splicing is completed.

Install patch cords in fiber distribution units and patch panels. Permanently label each cord and each connector in the panel with the system as shown.

87-19.03G Fiber Optic Markers Installation

Install fiber optic markers at 12-inch offset on the side furthest away from the edge of travel way:

1. For fiber optic cable at 500 feet apart in areas where the distance between vaults or pull boxes is greater than 500 feet
2. Adjacent to vaults and pull boxes
3. For fiber optic cable turns at:
    3.1. Beginning of the turn
    3.2. Middle of the arc
    3.3. End of the turn

When a fiber optic cable crosses a roadway or ramp, install a disk marker over the conduit trench on:

1. Every shoulder within 6 inches from the edge of pavement
2. Delineated median
3. Each side of a barrier

Install markers under section 81 except each retroreflective face must be parallel to the road centerline and facing away from traffic.

87-19.04 PAYMENT

Not Used

Replace section 87-20 with:

04-17-20

87-20 TEMPORARY ELECTRICAL SYSTEMS

87-20.01 GENERAL

Section 87-20 includes specifications for providing, maintaining, and removing temporary electrical systems.

Temporary systems may be mounted on wood posts or trailers.

Obtain the Department's authorization for the type of temporary electrical system and its installation method.

A temporary system must operate on a continuous, 24-hour basis.

A temporary electrical system must have a primary power source and a back-up power source from:

1. Commercial utility company
2. Generator system
3. Photovoltaic system

87-20.02 MATERIALS

87-20.02A General

Temporary wood poles must comply with section 48-6.

The components of a temporary system are shown on the project plans.

If you use Type UF-B cable, the minimum conductor size must be no. 12.

A back-up power source must:

1. Have an automatic transfer switch
2. Start automatically and transfer the system load upon reaching the operating voltage in the event of a power source failure

A trailer must be equipped with devices to level and plumb the temporary system.

87-20.02B Generators

A generator must:

1. Be 120 V(ac) or 120/240 V(ac), 60 Hz, 2.5 kW minimum, continuous-duty type
2. Be powered by a gasoline, LPG, or diesel engine operating at approximately 1,800 rpm with an automatic oil feed
3. Be equipped to provide automatic start-stop operation with a 12 V starting system
4. Have generator output circuits that have overcurrent protection with a maximum setting of 15 A
5. Have a spark arrester complying with Pub Cont Code § 4442

87-20.02C Automatic Transfer Switches

An automatic transfer switch must provide:

1. Line voltage monitoring in the event of a power outage that signals the back-up power source to start
2. Start delay, adjustable from 0 to 6 seconds, to prevent starting if the power outage is only momentary and a stop delay, adjustable from 0 to 8 minutes, to allow the back-up power source to unload
3. Transfer delay from 0 to 120 seconds to allow the back-up power source to stabilize before connecting to the load and retransfer delay from 0 to 32 minutes to allow the line voltage to stabilize
4. Mechanical interlock to prevent an application of power to the load from both sources and to prevent backfeeding from the back-up power source to the primary power source

87-20.02D–87-20.02G Reserved

87-20.02H Temporary Flashing Beacon Systems

A temporary flashing beacon system consists of a flashing beacon system, wood pole, and a power source.

The system must comply with the specifications for flashing beacon systems in section 87-7.

87-20.02I Temporary Lighting Systems

A temporary lighting system consists of a lighting system, a power source, and wood poles.

The system must comply with the specifications for lighting systems in section 87-2.

87-20.02J Temporary Signal Systems

A temporary signal system consists of a signal and lighting system, wood poles and posts, and a power source.

The system must comply with the specifications for signal and lighting systems in section 87-4, except signal heads may be mounted on a wood pole, mast arm, tether wire, or a trailer.

87-20.02K Temporary Radar Speed Feedback Sign Systems

A temporary radar speed feedback sign system must comply with the specifications for a radar speed feedback sign system in section 87-14, except, the LED character display must remain blank when no vehicles are detected or when the detected vehicle speed is 10 miles less than the preset speed.

87-20.03 CONSTRUCTION

10-15-21

87-20.03A General

Provide power and telecommunication services for temporary systems. Do not use existing services unless authorized.

Commercial power must be 120 V(ac) or 120/240 V(ac) single phase. Make arrangements with the utility company for providing service. Protect the power source in a locked enclosure. Provide keys for all locks to the Engineer.

You may install conductors and cables:

1. In a conduit
2. Suspended form wood poles at least 25 feet above the roadway
3. Suitable for direct burial

Install conduit outside the paved area at a minimum of 12 inches below grade for Type 1 and 2 conduit and at a minimum of 18 inches below grade for Type 3 conduit.

Install direct burial conductors and cables outside the paved area at a minimum depth of 24 inches below grade.

Install conductors and cables in Type 1, 2, or 3 conduit when mounted on wood poles to a height of 10 feet above the grade.

Place conductors across structures in a Type 1, 2, or 3 conduit. Attach the conduit to the outside face of the structure.

Mount the photoelectric unit at the top of the standard or wood post.

You may abandon:

1. Conductors and cables in sawed slots
2. Underground conduit after removing conductors

04-17-20

87-20.03B–87-20.03G Reserved

87-20.03H Temporary Flashing Beacon Systems

Protect each flashing beacon with a fused splice connector on the line side. Wherever conductors are run overhead, install the fused splice connector in the line side outside of the control assembly.

87-20.03I Temporary Lighting Systems

Protect each luminaire with a fused splice connector on the line side. Wherever conductors are run overhead, install the fused splice connectors in the line side before entering the mast arm.

87-20.03J Temporary Signal Systems

You may splice conductors that run to a terminal compartment or a signal head on a pole to the through conductors of the same phase in a pull box adjacent to the pole. Do not splice conductors or cables except in a pull box or in a NEMA 3R enclosure.

The Department provides the timing for the temporary signal.

Maintain the temporary signal except for the Department-furnished controller assembly.

87-20.03K Reserved

87-20.04 PAYMENT

Not Used

Add between the 1st and 2nd paragraphs of section 87-21.03A:

04-17-20

Remove foundation under section 56-3.01C(2)(a).

Add to section 87-21.03A:

04-17-20

Remove electrical equipment, designated as a hazardous waste.

Replace the introductory clause of the 2nd paragraph of section 87-21.03B(2) with:

04-16-21

Maintain the following systems:

Replace item 7 in the list in the 2nd paragraph of section 87-21.03B(2) with:

10-19-18

7. Camera system

^^^

DIVISION XI MATERIALS

90 CONCRETE

04-15-22

Add to section 90-1.01B:

10-18-19

CIP structural concrete members: CIP components of bridge structures, piling, retaining walls, sound walls, box culverts, drainage inlets, approach slabs, bridge railing, and bridge barriers.

Replace section 90-1.01C(6) with:

10-18-19

90-1.01C(6) Mix Design

90-1.01C(6)(a) General

Submit the concrete mix design before using the concrete in the work and before changing the mix proportions or an aggregate source.

90-1.01C(6)(b) Cast-In-Place Structural Concrete Members

10-16-20

For CIP structural concrete members, submit with your mix design results from the tests specified in 90-1.01D(10)(b)(iv) and the results from the tests shown in the following table:

10-18-19

Quality characteristic	Test method
Specific gravity and absorption of coarse aggregate	ASTM C127
Specific gravity and absorption of fine aggregate	ASTM C128
Durability index for fine aggregate	California Test 229
Soundness	California Test 214
Resistance to degradation	ASTM C131
Organic impurities	California Test 213
Chloride concentration of water for washing aggregates and mixing concrete	California Test 422
Sulfate concentration of water for washing aggregates and mixing concrete	California Test 417
Impurities in water for washing aggregates and mixing concrete	ASTM C191 or ASTM C266 and ASTM C109

Replace section 90-1.01C(8) with:

10-18-19

90-1.01C(8) Testing

90-1.01C(8)(a) General

If the concrete is tested for shrinkage, submit the test data with the mix design.

If prequalification is specified, submit certified test data or trial batch test reports under section 90-1.01D(5)(b).

If 56 days are allowed for the concrete to attain the compressive strength described, submit test results under section 90-1.01D(5)(a).

90-1.01C(8)(b) Cast-In-Place Structural Concrete Members

For CIP structural concrete members, submit test results within 3 business days after completing each QC test. For submittal of test results, go to:

http://dime.dot.ca.gov/

For CIP structural concrete members, include the following with the test results:

1. Contract number
2. Mix design number
3. Test sample identification number
4. Date and time of test
5. Batch plant
6. Batch number
7. Bridge number and description of element
8. Supporting data and calculations
9. Name, certification number, and signature of the QC tester

If additional compressive strength test results are needed for CIP structural concrete members to facilitate your schedule, submit a plot of the strength projection curve.

Add to the end of section 90-1.01C:

10-18-19

90-1.01C(11) Quality Control Plan for Cast-In-Place Structural Concrete Members

Section 90-1.01C(11) applies to CIP structural concrete members.

Submit 3 copies of the QC plan for review.

Submit an amended QC plan or an addendum to the QC plan when there are any changes to:

1. Concrete plants
2. Testing laboratories
3. Plant certification or laboratory accreditation status
4. Tester or inspector qualification status
5. QC personnel
6. Procedures and equipment
7. Material sources
8. Material testing

Allow the Department 5 business days to review an amended QC plan or an addendum to the QC plan.

90-1.01C(12) Concrete Materials Quality Control Summary Report for Cast-In-Place Structural Concrete Members

Section 90-1.01C(12) applies to CIP structural concrete members.

During concrete production for CIP structural concrete members, submit a concrete materials QC summary report at least once a month. The report must include:

1. Inspection reports.
2. Test results.
3. Documentation of:
   3.1. Test result evaluation by the QC manager
   3.2. Any discovered problems or deficiencies and the corrective actions taken
   3.3. Any testing of repair work performed
   3.4. Any deviations from the specifications or regular practices with explanation

10-16-20

4. Certificate of compliance for the structural concrete material signed by the QC manager. The certificate must state that the information contained in the report is accurate, the minimum testing frequencies specified in section 90-1.01D(10)(b)(iv) are met, and the materials comply with the Contract.

10-18-19

90-1.01C(13) Polymer Fibers

For concrete used in concrete bridge decks or PCC deck overlays, submit:

1. Fiber manufacturer's product data and application instructions
2. Certificate of compliance for each shipment and type of fiber

Replace the 3rd paragraph of section 90-1.01D(5)(a) with:

10-18-19

If the concrete is designated by compressive strength, the strength of concrete that is not steam cured is determined from cylinders cured under Method 1 of California Test 540.

Replace the 9th paragraph of section 90-1.01D(5)(a) with:

04-16-21

A compressive strength test represents no more than 300 cu yd of concrete and consists of the average compressive strength of two 6-by-12-inch cylinders or three 4-by-8-inch cylinders made from material taken from a single load of concrete. If a cylinder shows evidence of improper sampling, molding, handling, or testing, the cylinder is discarded and the test consists of the compressive strength of the remaining cylinders.

Add to the end of section 90-1.01D:

10-18-19

90-1.01D(7) Qualifications for Cast-In-Place Structural Concrete Members

Section 90-1.01D(7) applies to CIP structural concrete members.

QC laboratory testing personnel must have an ACI Concrete Laboratory Testing Technician, Level 1 certification or an ACI Aggregate Testing Technician, Level 2 certification, whichever certification includes the test being performed.

QC field testing personnel and field and plant inspection personnel must have an ACI Concrete Field Testing Technician, Grade I certification.

90-1.01D(8) Certifications for Cast-In-Place Structural Concrete Members

04-16-21

Each concrete plant used for CIP structural concrete members must have a current authorization under the Department's *MPQP*.

10-18-19

Each QC testing laboratory must be an authorized laboratory with current accreditation from the AASHTO Accreditation Program for the tests performed.

90-1.01D(9) Preconstruction Meeting for Cast-In-Place Structural Concrete Members

Section 90-1.01D(9) applies to CIP structural concrete members.

Before concrete placement, hold a meeting to discuss the requirements for structural concrete QC. The meeting attendees must include the Engineer, the QC manager, and at least 1 representative from each concrete plant performing CIP structural concrete activities for the Contract.

90-1.01D(10) Quality Control

90-1.01D(10)(a) General

Reserved

90-1.01D(10)(b) Cast-In-Place Structural Concrete Members

90-1.01D(10)(b)(i) General

Section 90-1.01D(10)(b) applies to CIP structural concrete members.

Develop, implement, and maintain a QC program that includes inspection, sampling, and testing of structural concrete materials for CIP structural concrete members.

Perform all sampling, testing, and inspecting required to control the process and to demonstrate compliance with the Contract and the authorized QC plan.

Provide a QC field inspector at the concrete delivery point while placement activities are in progress.

Provide a testing laboratory and the testing personnel for QC testing.

The QC inspector and the QC manager must be fully authorized by the Contractor to reject material.

QC testers and inspectors must be your employees or must be hired by a subcontractor providing only QC services. QC testers and inspectors must not be employed or compensated by a subcontractor or by other persons or entities hired by subcontractors who will provide other services or materials for the project.

If lightweight concrete, RSC, or SCC is used as structural concrete, you must also comply with the sampling and testing specifications of that section.

90-1.01D(10)(b)(ii) Quality Control Plan

The QC plan must detail the methods used to ensure the quality of the work and provide the controls to produce concrete. The QC plan must include:

1. Names and documentation of certification or accreditation of the concrete plants and testing laboratories to be used
2. Names, qualifications, and copies of certifications for the QC manager and all QC testing and inspection personnel to be used
3. Organization chart showing QC personnel and their assigned QC responsibilities
4. Example forms, including forms for certificates of compliance, hard copy test result submittals, and inspection reports
5. Methods and frequencies for performing QC procedures, including inspections and material testing
6. Procedures to control quality characteristics, including standard procedures to address properties outside of the specified operating range or limits, and example reports to document nonconformances and corrective actions taken
7. Procedures for verifying:
    7.1. Materials are properly stored during concrete batching operations
    7.2. Batch plants have the ability to maintain the concrete consistency during periods of extreme heat and cold
    7.3. Admixture dispensers deliver the correct dosage within the accuracy requirements specified
    7.4. Delivery trucks have a valid National Ready Mixed Concrete Association certification card
8. Procedures for verifying that the weighmaster certificate for each load of concrete shows:
    8.1. Concrete as batched complies with the authorized concrete mix design weights
    8.2. Moisture corrections are being accurately applied to the aggregates
    8.3. Cementitious materials are from authorized sources
    8.4. Any water that is added after batching at the plant
9. Procedures for visually inspecting the concrete during discharge operations

Allow the Department 5 business days to review an amended QC plan or an addendum to the QC plan.

90-1.01D(10)(b)(iii) Quality Control Manager

Assign a QC manager. The QC manager must have one of the following qualifications:

1. Civil engineering license in the State
2. ACI Concrete Laboratory Testing Technician, Level 1 certification
3. NICET Level II concrete certification
4. ICC Reinforced Concrete Special Inspector certification
5. ASQ Certified Manager of Quality/Organizational Excellence with the qualifying 10 years of experience and body of knowledge in the field of concrete

During concrete placement, the QC manager must be at the plant or job site within 3 hours of receiving notification from the Engineer.

90-1.01D(10)(b)(iv) Quality Control Testing Frequencies

For each mix design used to produce CIP structural concrete, perform sampling and testing in compliance with the following tables:

Aggregate QC Tests

Quality characteristic	Test method	Minimum testing frequency
Aggregate gradation	California Test 202	Once per each day of pour
Sand equivalent	California Test 217	
Cleanness value	California Test 227	
Moisture content of fine aggregate	California Test 226	1–2 times per each day of pour, depending on conditions

Concrete QC Tests

Quality characteristic	Test method	Minimum testing frequency
Slump	ASTM C143/C143M	Once per 100 cu yd or each day of pour, whichever is more frequent, and when requested by the Engineer
Uniformity[a]	ASTM C143/C143M, California Test 533, and California Test 529	When ordered by the Engineer
Air content, (freeze-thaw area)	California Test 504[b]	If concrete is air entrained, once per 30 cu yd or each day of pour, whichever is more frequent
Air content, (non-freeze-thaw area)	California Test 504[b]	If concrete is air entrained, once per 100 cu yd or each day of pour, whichever is more frequent
Temperature	California Test 557	Once per 100 cu yd or each day of pour, whichever is more frequent
Density	California Test 518	
Compressive strength[c,d]	California Test 521	

[a]As specified in section 90-1.01D(4).
[b]Use ASTM C173/C173M for lightweight concrete.
[c]Mark each cylinder with the Contract number, the date and time of sampling, and the weighmaster certificate number.
[d]You may need additional test samples to facilitate your schedule.

90-1.01D(10)(b)(v) Inspection Reports

Document each inspection performed by a QC inspector in an inspection report that includes:

1. Contract number
2. Mix design number
3. Date and time of inspection
4. Plant location
5. Concrete placement location
6. Batch number
7. Reviewed copies of weighmaster certificates
8. Description of the inspection performed
9. Name, certification number, and signature of the QC inspector

90-1.01D(10)(b)(vi) Rejection of Material

If any of the QC concrete test results fail to comply with the specified requirements, the batch of concrete must not be incorporated in the work. Notify the Engineer. Repeat the QC concrete tests on each subsequent batch until the test results comply with the specified requirements.

If 3 consecutive batches fail to comply with the specified requirements, (1) revise concrete operations as necessary to bring the concrete into compliance and (2) increase the frequency of QC testing. The

revisions must be authorized before resuming production. After production resumes, you must receive authorization before returning to the QC testing frequency authorized in the QC plan.

90-1.01D(11) Department Acceptance

90-1.01D(11)(a) General

Reserved

90-1.01D(11)(b) Cast-In-Place Structural Concrete Members

The Department accepts concrete incorporated into CIP structural concrete members based on only the Department's test results. QC test results will not be used for Department acceptance.

Replace the table in the 1st paragraph of section 90-1.02A with:

10-18-19

Type of work	Maximum length change of laboratory cast specimens at 28 days drying (average of 3) (percent)
Paving and approach slab concrete	0.050
Bridge deck concrete	0.032

Add to the end of section 90-1.02A:

10-18-19

For new bridge decks or PCC deck overlays, fibers must comply with ASTM D7508. Microfibers must be from 1/2 to 2 inches long. Macrofibers must be from 1 to 2-1/2 inches long.

Replace the 2nd paragraph of section 90-1.02B(1) with:

10-15-21

Unless otherwise specified, the cementitious material must be one of the following:

1. Combination of Type II or V portland cement and SCM
2. Combination of blended cements and SCM
3. Blended cement

Replace section 90-1.02B(2) with:

10-15-21

90-1.02B(2) Cement

Portland cement must comply with ASTM C150/C150M Type II, III or V, except:

1. Alkali content must not exceed 0.60 percent by mass of alkalies as $Na_2O + 0.658\ K_2O$ when determined under AASHTO T 105
2. Autoclave expansion must not exceed 0.50 percent
3. C_3S content of Type II cement must not exceed 65 percent
4. Type III cement may be used only if specified or authorized

Blended cement, including portland limestone cement, Type IL must comply with AASHTO M 240, except:

1. Maximum limits on pozzolan content do not apply
2. Sulfate resistance must be moderate (MS) or high (HS)
3. Alkali content in cement portion of blended cements must not exceed 0.60 percent by mass of alkalies as $Na_2O + 0.658\ K_2O$ when determined under AASHTO T 105

Replace item 3 in the list in the 1st paragraph of section 90-1.02B(3) with:

04-16-21

3. Raw or calcined natural pozzolans complying with AASHTO M 295, Class N, except the maximum allowable loss on ignition is 10 percent, and either of the following:
   3.1. Available alkali as $Na_2O + 0.658\ K_2O$ must not exceed 1.5 percent when tested under ASTM C311.
   3.2. Total alkali as $Na_2O + 0.658\ K_2O$ must not exceed 5.0 percent when tested under AASHTO T 105.

Replace the 3rd paragraph of section 90-1.02B(3) with:

10-15-21

The quantity of cement and SCM in concrete must comply with the minimum cementitious material content specified.

Replace the 4th paragraph of section 90-1.02B(3) with:

10-15-21

The SCM content in concrete must comply with one of the following:

1. Any combination of cement and SCMs, satisfying equations 1 and 2:

   Equation 1:

   $[(25 \times UF) + (12 \times FA) + (10 \times FB) + (6 \times SL)]/MC \geq X$

   where:
   UF = silica fume, metakaolin, or UFFA, including the quantity in blended cement, lb/cu yd
   FA = natural pozzolan or fly ash complying with AASHTO M 295, Class F or N, with a CaO content of up to 10 percent, including the quantity in blended cement, lb/cu yd
   FB = natural pozzolan or fly ash complying with AASHTO M 295, Class F or N, with a CaO content of greater than 10 percent and up to 15 percent, including the quantity in blended cement, lb/cu yd
   SL = GGBFS, including the quantity in blended cement, lb/cu yd
   MC = minimum quantity of cementitious material specified, lb/cu yd
   X = 1.8 for innocuous aggregate, 3.0 for all other aggregate

   Equation 2:

   $MC - MSCM - PC \geq 0$

   where:
   MC = minimum quantity of cementitious material specified, lb/cu yd
   MSCM = minimum sum of SCMs that satisfies equation 1, lb/cu yd
   PC = quantity of Type IL cement or portland cement, including the quantity in blended cement, lb/cu yd

2. 15 percent Class F fly ash with at least 48 oz of $LiNO_3$ solution added per 100 lb of portland cement or portland limestone cement. The CaO content of the fly ash must not exceed 15 percent.

04-15-22

Delete the 5th paragraph of section 90-1.02C(2).

04-15-22

Delete the 3rd paragraph of section 90-1.02C(3).

Replace the 5th and 6th paragraphs of section 90-1.02F(4)(a) with:

10-15-21

Except for Type IL cement, weigh bulk blended cement in an individual hopper and keep it separate from the aggregates until the ingredients are released for discharge into the mixer.

Bulk portland cement, Type IL cement and SCM may be weighed in separate weigh hoppers or in the same weigh hopper. Keep the cement and SCM separate from the aggregates until the ingredients are released for discharge into the mixer.

Replace items 1 and 2 in the list in the 5th paragraph of section 90-1.02F(4)(c) with:

04-16-21

1. Test results for 1 compressive strength test consisting of the average strength of cylinders made from material taken within the first 1/3, and 1 compressive strength test consisting of the average strength of cylinders made from material taken within the last 1/3, of a single batch of concrete discharged from the stationary mixer. Strength tests and cylinder preparation must comply with section 90-1.01D(5).
2. Calculations demonstrating that the average of the compressive strengths taken within the first 1/3 of the batch do not differ by more than 7.5 percent from the average of the compressive strengths taken within the last 1/3 of the batch.

Replace the table in section 90-1.02G(6) with:

04-19-19

Type of work	Nominal		Maximum	
	Penetration (in)	Slump (in)	Penetration (in)	Slump (in)
Concrete pavement	0–1	--	1.5	--
Nonreinforced concrete members	0–1.5	--	2	--
Reinforced concrete structures with:				
Sections over 12 inches thick	0–1.5	1–3	2.5	5
Sections 12 inches thick or less	0–2	1–4	3	6
Concrete placed under water	--	6–8	--	9
CIP concrete piles	2.5–3.5	5–7	4	8

Replace the 2nd paragraph of section 90-1.02H with:

10-15-21

The cementitious material to be used in the concrete must be a combination of Type II or V portland cement or Type IL (MS or HS) cement and SCM.

Replace the 6th paragraph of section 90-1.02H with:

10-15-21

For pavement, the total cementitious material must be composed of one of the following options, by weight:

1. 25 percent natural pozzolan or fly ash with a CaO content of up to 10 percent and 75 percent portland cement or Type IL cement
2. 20 percent natural pozzolan or fly ash with a CaO content of up to 10 percent, 5 percent silica fume, and 75 percent portland cement or Type IL cement
3. 12 percent silica fume, metakaolin, or UFFA, and 88 percent portland cement or Type IL cement
4. 50 percent GGBFS and 50 percent portland cement or Type IL cement

For structures, the total cementitious material must be composed of one of the following options, by weight:

1. 25 percent natural pozzolan or fly ash with a CaO content of up to 10 percent and 75 percent portland cement or Type IL cement.
2. 20 percent natural pozzolan or fly ash with a CaO content of up to 10 percent, 5 percent silica fume, and 75 percent portland cement or Type IL cement.
3. 12 percent silica fume, metakaolin, or UFFA, and 88 percent portland cement or Type IL cement.
4. 50 percent GGBFS and 50 percent portland cement or Type IL cement.
5. 25 to 50 percent fly ash with a CaO content of up to 10 percent, and no natural pozzolan. The remaining portion of the cementitious material must be (1) portland cement, (2) Type IL cement, or (3) a combination of portland cement or Type IL cement and UFFA, metakaolin, GGBFS, or silica fume.

Replace the 3rd paragraph of section 90-1.02I(2)(b) with:

10-15-21

The cementitious material must be composed of any combination of (1) either portland cement or Type IL cement and (2) at least 1 SCM satisfying the following equation:

Equation 1:

$$[(25 \times UF) + (12 \times FA) + (10 \times FB) + (6 \times SL)]/TC \geq X$$

Replace section 90-1.03B(2) with:

04-19-19

90-1.03B(2) Water Method

The water method must consist of keeping the concrete continuously wet by applying water for a curing period of at least 7 days after the concrete is placed.

Keep the concrete surface wet by applying water with an atomizing nozzle that forms a mist until the surface is covered with curing media. Do not allow the water to flow over or wash the concrete surface. At the end of the curing period, remove curing media.

Use any of the following curing media to retain moisture:

1. Mats, rugs, or carpets
2. Earth or sand blankets
3. Sheeting materials complying with the durability and water vapor transmission rate specified in section 5 of ASTM C171

To ensure proper coverage during curing:

1. Cover the entire concrete surface with the curing media
2. Secure the curing media joints to retain moisture
3. Keep the curing media within 3 inches of the concrete at all points along the surface being cured

Monitor concrete surface temperature during curing. Ensure that surface temperature is maintained at 140 degrees F or below. If the surface temperature exceeds 140 degrees F, determine cause and provide alternative curing methods to the Engineer for authorization.

Add to section 90-3.01D:

10-16-20

90-3.01D(5) Shrinkage

Items 2 and 3 in the 1st paragraph of section 90-1.01D(3) do not apply.

Test the RSC for shrinkage as specified in section 90-1.01D(3) except:

1. Remove each specimen from the mold at the time of 1 hour +/- 15 min before the initial comparator reading and place the specimen in lime-saturated water at 73 ± 3 degrees F until the initial comparator reading
2. Take a comparator reading at an age of 10 times the final set time or 24 hours, whichever is earlier, and record it as the initial reading

Replace footnote b for the table in item 2.1 in the 1st paragraph of section 90-3.02A with:

04-16-21

[b]If you use accelerating chemical admixtures, include them when testing

10-19-18

Delete the 2nd paragraph of section 90-3.02A.

Replace the 7th paragraph of section 90-3.02B(4) with:

10-16-20

The volumetric mixer must be equipped such that accuracy checks can be made. Recalibrate the proportioning devices at a minimum of every 90 days or when you change the source or type of any ingredient.

Replace the 2nd paragraph of section 90-4.01A with:

10-18-19

The specifications for (1) shrinkage in section 90-1.02A, (2) shrinkage reducing chemical admixture in section 51-1.02B, and (3) polymer fibers in section 51-1.02B do not apply to PC concrete members.

Add to section 90-4.01C(1):

04-19-19

Submit your QC test results for the tests performed under section 90-4.01D as an informational submittal. The QC test results must be submitted electronically through the Data Interchange for Materials Engineering website within 3 business days of completion of each QC test and must include the concrete mix design number.

Replace the table titled "Concrete QC Tests" in the 5th paragraph of section 90-4.01D(2)(c) with:

04-16-21

Concrete QC Tests

Quality characteristic	Test method	Minimum testing frequency
Compressive strength	ASTM C172/C172M, ASTM C31/C31M, and ASTM C39/C39M	Once per 100 cu yd of concrete cast, or every day of casting, whichever is more frequent
Slump	ASTM C143/C143M	
Temperature at time of mixing	ASTM C1064/C1064M	
Density	ASTM C138	Once per 600 cu yd of concrete cast or every 7 days of batching, whichever is more frequent
Air content	ASTM C231/C231M or ASTM C173/C173M[a]	If concrete is air entrained, once for each set of cylinders, and when conditions warrant

[a]ASTM C173/C173M must be used for lightweight concrete.

^^

91 PAINT

10-15-21

Replace section 91-1.01 with:

10-15-21

91-1.01 GENERAL

Section 91-1 includes general specifications for furnishing paint used for highway construction.

^^

92 ASPHALT BINDERS

10-16-20

Add to the beginning of section 92-1.01D(3):

10-16-20

Take samples of asphalt binder under California Test 125.

10-16-20

Delete the 2nd sentence in the 3rd paragraph of section 92-1.01D(3).

^^

94 ASPHALTIC EMULSIONS

10-16-20

Replace section 94 with:

04-17-20

94-1.01 GENERAL

94-1.01A Summary

Section 94 includes specifications for furnishing asphaltic emulsions.

94-1.01B Definitions

Reserved

94-1.01C Submittals

Submit an SDS for each shipment of asphaltic emulsion to the job site.

If you use the asphaltic emulsion before the Department's sampling and testing is complete, submit a certificate of compliance for each shipment to the job site. The certificate of compliance must include:

1. Shipment number and date
2. Source asphalt emulsion plant, consignee, and destination
3. Type and description of material with specific gravity and quantity
4. Contract or purchase order number
5. Signature by the manufacturer of the material
6. Certified test results

If no certificate of compliance is submitted, do not use asphaltic emulsion until authorized.

94-1.01D Quality Assurance

10-16-20

Take samples of asphaltic emulsion under California Test 125.

Store samples in clean and airtight sealed containers. Samples taken must be placed in wide mouth plastic containers and taken in the presence of the Engineer. Samples must be stored at temperatures from 40 to 120 degrees F until submitted for testing.

94-1.02 MATERIALS

94-1.02A General

Asphaltic emulsions must be composed of a bituminous material uniformly emulsified with water and an emulsifying or a stabilizing agent. Polymer-modified asphaltic emulsion must contain a polymer.

Rapid-setting asphaltic emulsions must be tested within 7 days after delivery to job site. All other asphaltic emulsions must be tested within 14 days of delivery to job site. The asphaltic emulsion must be homogeneous after thorough mixing and not separated by freezing. Asphaltic emulsion separated by freezing will not be tested.

94-1.02B Slow-Setting Anionic Asphaltic Emulsions

Slow-setting anionic asphaltic emulsion must comply with the requirements shown in the following table:

Slow-Setting Anionic Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement	
		Grade SS-1	Grade SS-1h
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	20–100	
Storage stability test, 1 day (max, %)		1	
Cement mixing test (max, %)		2.0	
Sieve test (max, %)		0.10	
Residue from distillation or evaporation test (min, %)[a]		57	
Tests on residue:			
Penetration, 25 °C (dmm)	AASHTO T 49	100–200	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400	400
Solubility in trichloroethylene (min, %)	AASHTO T 44	97.5	97.5

[a]Distillation is the defining test if there is a conflict with evaporation.

94-1.02C Slow-Setting Cationic Asphaltic Emulsions

Slow-setting cationic asphaltic emulsion must comply with the requirements shown in the following table:

Slow-Setting Cationic Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement	
		Grade CSS-1	Grade CSS-1h
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	20–100	
Storage stability test, 1 day (max, %)		1	
Particle charge[a]		Positive	
Cement mixing test (max, %)		2.0	
Sieve test (max, %)		0.10	
Residue from distillation or evaporation test (min, %)[b]		57	
Tests on residue:			
Penetration, 25 °C (dmm)	AASHTO T 49	100–250	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400	400
Solubility in trichloroethylene (min, %)	AASHTO T 44	97.5	97.5

[a]Must comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.

[b]Distillation is the defining test if there is a conflict with evaporation.

94-1.02D Rapid-Setting Cationic Asphaltic Emulsions

Rapid-setting cationic asphaltic emulsion must comply with the requirements shown in the following table:

Rapid-Setting Cationic Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement			
		Grade CRS-1	Grade CRS-2	Grade CRS-1h	Grade CRS-2h
Saybolt Furol viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59	20–100	100–400	20–100	100–400
Storage stability test, 1 day (max, %)		1			
Demulsibility (min, %)[a]		40			
Particle charge[b]		Positive			
Sieve test (max, %)		0.10			
Residue from distillation or evaporation test (min, %)[c]		60	65	60	65
Tests on residue:					
Penetration, 25 °C (dmm)	AASHTO T 49	100–250		40–90	
Ductility, 25 °C, 50 mm/minute (min, mm)	AASHTO T 51	400		400	
Solubility in trichloroethylene (min, %)	AASHTO T 44	97.5		97.5	

[a]Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.
[b]Must comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.
[c]Distillation is the defining test if there is a conflict with evaporation.

94-1.02E Cationic Emulsified Recycling Agent

Cationic emulsified recycling agent for cold-in-place recycling must comply with the requirements shown in the following table:

Cationic Emulsified Asphalt Requirements

Quality characteristic	Test method	Requirement Emulsified recycling agent
Sieve test (max, %)	AASHTO T 59	0.10
Residue from distillation or evaporation test (min, %)[a]		63
Sieve test (max, %)		Positive
Tests on residue:		
Penetration, 25 °C (dmm)	AASHTO T 49	40–120
Ductility, 25 °C (min, mm)	AASHTO T 51	400
Creep stiffness:	AASHTO T 313	
Test temperature (°C)		-12
S-value (max, MPa)		300
M-value (min)		0.300

[a]Distillation is the defining test if there is a conflict with evaporation.
[b]Must comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.

94-1.02F Rapid-Setting Polymer-Modified Asphaltic Emulsions

Rapid-setting polymer-modified asphaltic emulsion must comply with the requirements shown in the following table:

Rapid-Setting Polymer-Modified Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement	
		Grade PMCRS-2	Grade PMCRS-2h
Saybolt Furol viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59[e]	100–400	
Storage stability test, 1 day (max, %)		1	
Sieve test (max, %)		0.30	
Demulsibility (min, %)[a]		40[b]	
Particle charge[b]		Positive	
Residue from distillation or evaporation test (min, %)[c]		65	
Tests on residue:			
Penetration, 25 °C (dmm)	AASHTO T 49	100–200	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400	400
Torsional recovery (min, %)[d] or Elastic recovery, 25 °C (min, %)[d]	California Test 332 AASHTO T 301	20 65	20 65
Penetration, 4 °C, 200 g for 60 seconds (min, dmm)	AASHTO T 49	6	6
Ring and Ball Softening Point (min,°C)	AASHTO T 53	57	57

[a]Use 35 ml of 0.8% sodium dioctyl sulfosuccinate solution.
[b]Must comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.
[c]Distillation is the defining test if there is a conflict with evaporation.
[d]Elastic recovery is the defining test if there is a conflict with torsional recovery.
[e]Distillation temperature of 350 °F.

94-1.02G Bonded Wearing Course Asphaltic Emulsions

Bonded wearing course asphaltic emulsion must comply with the requirements shown in the following table:

Bonded Wearing Course Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59[c]	20–100
Storage stability test, 1 day (max, %)		1
Sieve test (max, %)		0.05
Particle charge[a]		Positive
Residue from distillation or evaporation test (min, %)[b]		63
Tests on residue:		
Penetration, 25 °C (dmm)	AASHTO T 49	70–150
Torsional recovery (min, %)[d]	California Test 332	40

[a]Must comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.
[b]Distillation is the defining test if there is a conflict with evaporation.
[c]Distillation temperature of 350 °F.
[d]Measure the entire arc of recovery at 25 °C.

94-1.02H Rapid-Setting Polymer-Modified Rejuvenating Asphaltic Emulsions

Rapid-setting polymer-modified rejuvenating asphaltic emulsion must comply with the requirements shown in the following table:

Rapid-Setting Polymer-Modified Rejuvenating Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement Grade PMRE
Saybolt Furol viscosity, at 50 °C (Saybolt Furol seconds)	AASHTO T 59[d]	50–350
Storage stability test, 1 day (max, %)		1
Sieve (max, %)		0.30
Oil distillate (max, %)		0.5
Particle charge[a]		Positive
Demulsibility (min, %)[b]		40
Residue from distillation or evaporation test (min, %)[c]		65
pH	ASTM E70	2.0–5.0
Tests on residue:		
Viscosity, at 60 °C (max, Pa-s)	AASHTO T 202[e, f]	5000
Penetration, 4 °C (dmm)	AASHTO T 49	40–70
Elastic recovery, 25 °C (min, %)	AASHTO T 301[g]	60

[a]Must comply with a pH requirement of 6.7 maximum under ASTM E70 if the particle charge test result is inconclusive.
[b]If the product is to be diluted, demulsibility is waived.
[c]Distillation is the defining test if there is a conflict with evaporation.
[d]Distillation temperature of 350 °F.
[e]If it is suspected that a sample may contain solid material, strain the melted sample into the container through a No. 50 (300-µm) sieve conforming to Specification E 11.
[f]Use an AI- 200 glass capillary tube to run the test. If the viscosity is 4000 or above, use an AI 400 instead.
[g]Elastic recovery, hour glass sides, pull to 20 cm, hold 5 minutes then cut, let sit 1 hour.

Rejuvenating agent for rapid-setting polymer-modified rejuvenating asphaltic emulsion must comply with the requirements shown in the following table:

Rejuvenating Agent Requirements

Quality characteristic	Test method	Requirement
Tests on rejuvenating agent:		
Viscosity, at 60 °C (cSt)	AASHTO T 201	50–175
Flash point (min, °C)	AASHTO T 48	193
Saturate (max, % by weight)	ASTM D2007	30
Asphaltenes (max)	ASTM D2007	1.0
Tests on rejuvenating agent Rolling Thin-Film Oven Test residue:		
Weight change (max, %)	AASHTO T 240	6.5
Viscosity ratio (max)[a]		3

[a]Rolling Thin-Film Oven Test (RTFOT) viscosity divided by the original viscosity.

94-1.02I Quick-Setting Asphaltic Emulsions

Quick-setting asphaltic emulsion must comply with the requirements shown in the following table:

Quick-Setting Asphaltic Emulsion Requirements

Quality characteristic	Test method	Requirement			
		Anionic		Cationic	
		Grade QS-1	Grade QS-1h	Grade CQS-1	Grade CQS-1h
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59	15–90			
Storage stability test, 1 day (max, %)		1			
Particle charge[a]		--		Positive	
Sieve test (max, %)		0.30			
Residue from distillation or evaporation test (min, %)[b]		57			
Tests on residue:					
Penetration, 25 °C (dmm)	AASHTO T 49	100–200	40–90	100–200	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400	400	400	400
Solubility in trichloroethylene (min, %)	AASHTO T 44	97.5	97.5	97.5	97.5

[a]If the result of the particle charge test is inconclusive; the asphaltic emulsion must be tested for pH under ASTM E70. Grade QS-1h asphaltic emulsion must have a minimum pH of 7.3. Grade CQS-1h asphaltic emulsion must have a maximum pH of 6.7.
[b]Distillation is the defining test if there is a conflict with evaporation.

94-1.02J Quick-Setting Polymer-Modified Cationic Asphaltic Emulsions

Quick-setting polymer-modified cationic asphaltic emulsion must comply with the requirements shown in the following table:

Quick-Setting Polymer-Modified Cationic Asphaltic Emulsions

Quality characteristic	Test method	Requirement Grade PMCQS-1h
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59[d]	15–90
Storage stability test, 1 day (max, %)		1
Sieve test (max, %)		0.30
Particle charge[a]		Positive
Residue from distillation or evaporation test (min, %)[b]		60
Tests on residue:		
Penetration, 25 °C (dmm)	AASHTO T 49	40–90
Ductility, 25 °C (min, mm)	AASHTO T 51	400
Torsional recovery (min, %)[c]	California Test 332	18
or		
Elastic recovery, 25 °C (min, %)[c]	AASHTO T 301	60

[a]If the result of the particle charge test is inconclusive; the asphaltic emulsion must be tested for pH under ASTM E70.
[b]Distillation is the defining test if there is a conflict with evaporation.
[c]Elastic recovery is the defining test if there is a conflict with torsional recovery.
[d]Distillation temperature of 350 °F.

94-1.02K Micro Surfacing Emulsions

Micro surfacing emulsion must comply with the requirements shown in the following table:

Micro Surfacing Emulsion Requirements

Quality characteristic	Test method	Requirement Grade MSE
Saybolt Furol viscosity, at 25 °C (Saybolt Furol seconds)	AASHTO T 59[c]	15–90
Storage stability test, 1 day (max, %)		1
Sieve test (max, %)		0.30
Particle charge[a]		Positive
Residue from distillation or evaporation test (min, %)[b]		62
Tests on residue:		
Penetration, 25 °C (dmm)	AASHTO T 49	40–90
Softening point (min, °C)	AASHTO T 53	57
Torsional recovery (min, %)[d]	California Test 332	20
or		
Elastic recovery, 25 °C (min, %)[d]	AASHTO T 301	65

[a]If the result of the particle charge test is inconclusive; the asphaltic emulsion must be tested for pH under ASTM E70.
[b]Distillation is the defining test if there is a conflict with evaporation.
[c]Distillation temperature of 350 °F.
[d]Elastic recovery is the defining test if there is a conflict with torsional recovery.

94-1.03 CONSTRUCTION

Not Used

94-1.04 PAYMENT

The quantity of asphaltic emulsion is the weight determined before the addition of any water.

The weight of asphaltic emulsion is determined from volumetric measurements if:

1. Partial loads are used
2. Scale is not available within 20 miles
3. Asphaltic emulsion is delivered in:
   3.1. Trucks with each tank calibrated and accompanied by its measuring stick and calibration card
   3.2. Trucks equipped with a vehicle tank meter and a calibrated thermometer that determines the asphalt temperature at delivery

For volumetric measurements, the measured volume of asphaltic emulsion is reduced to the volume the material would occupy at 60 degrees F. One ton of asphaltic emulsion at 60 degrees F equals 240 gal. One gallon of asphaltic emulsion at 60 degrees F equals 8.33 lb.

Convert volume to weight using the factors shown in the following table:

Conversion Table

t	M	t	M	t	M	t	M
60	1.00000	83	0.99425	106	0.98850	129	0.98275
61	0.99975	84	0.99400	107	0.98825	130	0.98250
62	0.99950	85	0.99375	108	0.98800	131	0.98225
63	0.99925	86	0.99350	109	0.98775	132	0.98200
64	0.99900	87	0.99325	110	0.98750	133	0.98175
65	0.99875	88	0.99300	111	0.98725	134	0.98150
66	0.99850	89	0.99275	112	0.98700	135	0.98125
67	0.99825	90	0.99250	113	0.98675	136	0.98100
68	0.99800	91	0.99225	114	0.98650	137	0.98075
69	0.99775	92	0.99200	115	0.98625	138	0.98050
70	0.99750	93	0.99175	116	0.98600	139	0.98025
71	0.99725	94	0.99150	117	0.98575	140	0.98000
72	0.99700	95	0.99125	118	0.98550	141	0.97975
73	0.99675	96	0.99100	119	0.98525	142	0.97950
74	0.99650	97	0.99075	120	0.98500	143	0.97925
75	0.99625	98	0.99050	121	0.98475	144	0.97900
76	0.99600	99	0.99025	122	0.98450	145	0.97875
77	0.99575	100	0.99000	123	0.98425	146	0.97850
78	0.99550	101	0.98975	124	0.98400	147	0.97825
79	0.99525	102	0.98950	125	0.98375	148	0.97800
80	0.99500	103	0.98925	126	0.98350	149	0.97775
81	0.99475	104	0.98900	127	0.98325	150	0.97750
82	0.99450	105	0.98875	128	0.98300	151	0.97725

t = observed temperature in degrees F
M = multiplier for reducing volumes to the basis of 60 °F

^^

95 EPOXY

04-17-20

Replace section 95-1.02E with:

04-17-20

95-1.02E Epoxy Adhesive for Pavement Markers

Epoxy adhesive for bonding pavement markers to concrete and HMA must comply with ASTM C881/C881M, Type IV, Grade 3, Class B or C except the gel time for epoxy adhesive may be less than 30 minutes.

Use Class B whenever the surface temperature is from 40 to 60 degrees F. Use Class C whenever the surface temperature is above 60 degrees F.

Replace section 95-1.02F with:

04-17-20

95-1.02F Reserved

04-17-20

Delete the 2nd paragraph of section 95-1.02G.

Replace section 95-1.02H with:

04-17-20

95-1.02H Epoxy Resin Adhesive for Pressure Injection Grouting of Concrete Pavement

Epoxy resin pressure injected into concrete must comply with ASTM C881/C881M, Type IV, Grade 1 except the epoxy must have a minimum bond strength of 3000 psi at 14 days.

^^

96 GEOSYNTHETICS

04-17-20

Replace the row for *Apparent opening size* in the table in the 2nd paragraph of section 96-1.02B with:

04-17-20

Apparent opening size, average roll value (max, µm(US Sieve))	ASTM D4751	425(40)	250(60)	212(70)

Replace the row for *Apparent opening size* in the table in the 1st paragraph of section 96-1.02E with:

04-17-20

Apparent opening size, average roll value (max, µm(US Sieve))	ASTM D4751	600(30)	300(50)

Replace the row for *Apparent opening size* in the table in the 1st paragraph of section 96-1.02F with:

04-17-20

Apparent opening size, average roll value (max, µm(US Sieve))	ASTM D4751	425(40)

Replace the row for *Apparent opening size* in the table in the 1st paragraph of section 96-1.02G with:

04-17-20

Apparent opening size, average roll value (max, µm(US Sieve))	ASTM D4751	600(30)	300(50)

Replace the row for *Apparent opening size* in the table in the 1st paragraph of section 96-1.02H with:

04-17-20

Apparent opening size, average roll value (max, µm(US Sieve))	ASTM D4751	600(30)	300(50)

Replace the row for *Apparent opening size* in the table in the 3rd paragraph of section 96-1.02I with:

04-17-20

Apparent opening size (min and max, µm(US Sieve))	ASTM D4751	150(100)–212(70)	150(100)–212(70)

Replace the row for *Apparent opening size* in the table in the 2nd paragraph of section 96-1.02O with:

04-17-20

Apparent opening size (max, µm(US Sieve))	ASTM D4751	300(50)	300(50)	600(30)	300(50)	300(50)

Replace the 3rd table in the 3rd paragraph of section 96-1.02R with:

10-19-18

Cushion Fabric

Quality characteristic	Test method	Requirement					
		Class 10	Class 12	Class 16	Class 24	Class 32	Class 60
Mass per unit area (oz/sq yd)	ASTM D5261	10	12	16	24	32	60
Grab tensile break strength (min, lb)	ASTM D4632	230	300	370	450	500	630
Grab tensile break elongation (min, %)	ASTM D4632	50					
Puncture strength (min, lb)	ASTM D6241	700	800	900	1100	1700	2400
Trapezoidal tear strength (min, lb)	ASTM D4533	95	115	145	200	215	290
UV resistance (min, %)	ASTM D7238	70					