

# Chapter 2: Review of Shop Drawings

## Table of Contents

Chapter 2: Review of Shop Drawings.....	1
Table of Contents .....	1
2-1    Introduction .....	3
2-2    General Information .....	3
2-3    Design Calculations .....	4
2-4    Shop Drawing Review.....	5
2-4.01    Initial Review .....	5
2-4.02    Review .....	7
2-4.03    Engineering Analysis.....	9
2-4.04    Sample Engineering Analysis Report.....	10
2-5    Review Duration.....	13
2-6    Shop Drawing Authorization and Rejection.....	13
2-6.01    Shop Drawing Authorization.....	13
2-6.02    Shop Drawing Rejection.....	16
2-7    Cal/OSHA Requirements .....	16
2-8    Revisions to Shop Drawings .....	16
2-8.01    Revisions to Rejected Shop Drawings .....	16
2-8.02    Revisions to Authorized Shop Drawings .....	17
2-9    Chronological Record of Shop Drawing Review .....	17
2-9.01    Introduction .....	17
2-9.02    Example of Chronological Record of Falsework Review.....	18
2-10    Transmittal to the Contractor .....	20
2-10.01    Authorized Submittals .....	20
2-10.02    Rejected Submittals .....	21
2-10.03    Sample Transmittal Letters.....	21
2-11    Submittal Guidelines .....	25

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2-11.01	Introduction .....	25
2-11.02	Submittals Where Railroad is Not Involved .....	25
2-11.03	Submittals When Railroad is Involved .....	25
2-11.04	File Naming Convention .....	27
2-12	Responsibilities .....	28
2-12.01	Structure Representative.....	28
2-12.02	Assistant Structure Representative .....	29
2-12.03	SC Falsework Engineer.....	29
2-13	Field Review of Falsework .....	29
2-13.01	Introduction .....	29
2-13.02	Structure Representative & Assistant Structure Representative .....	30
2-13.03	Bridge Construction Engineer .....	30
2-13.04	Area Construction Manager .....	30
2-13.05	SC Oversight Engineer.....	30
2-14	Review of Lighting Plan .....	31
2-15	Review of Adjustment Plan .....	31

## 2-1 Introduction

This chapter covers Structure Construction (SC) practice with respect to the shop drawing review process. Subsequent chapters cover specific review guidelines, procedures, and explanations to ensure uniform and impartial contract administration.

Review and authorization of the Contractor's shop drawings are delegated to the Structure Representative in responsible charge of structure work at the project site. While any qualified member of the project staff may perform the actual engineering analysis, the Structure Representative is expected to give personal attention to the review while it is in progress and to give concurrence before the shop drawings are authorized.

The findings from the engineering analysis will be documented in an engineering analysis report.

## 2-2 General Information

The contract requirement for submission of shop drawings should be discussed at the preconstruction meeting, with emphasis on the need for a complete submittal before the review period begins. (See [Section 2-4](#), *Shop Drawing Review*, for information that must be shown in the submittal). With the exception of foundation pads and piles, falsework construction may not begin until the shop drawings are authorized.

When a manufactured product or assembly will be used, the [Contract Specifications](#), Section 48-2.01C(1), *Temporary Structures – Falsework – General – Submittals – General*, require the Contractor to furnish catalog data or other descriptive literature showing the manufacturer's recommended safe load carrying capacity, conditions of use, and other information affecting the ability of the product or device to carry the design load. However, such supplemental design information needs to be furnished only if it is requested by the Engineer. The Contractor should be informed promptly in any case where required technical data is not furnished when the drawings are submitted for review.

On most contracts the Engineer will be allowed 20 calendar days to review the shop drawings. For complicated structures, the contract special provisions may establish a longer review period. For falsework near or in railroad right-of-way, the review time is established by the requirements of the railroad company involved. These requirements can usually be found in the *Information Handout* in the bid package.

The drawings may be submitted in increments, and the increments will be reviewed and authorized, provided they are well-defined units of the work, such as individual bridges or portions of bridges that are independent of other portions.

If shop drawings for different units of the work (two or more individual bridges, for example) are submitted at the same time, or if an additional set is submitted for review before review of a previously submitted set has been completed, the Contractor must designate the order or sequence in which the sets are to be reviewed. The time allowed for the review of any set in the sequence is not less than the contract time allowed for review of that set, plus 15 calendar days for each additional set. A set consists of 40 or fewer sheets. See also *Contract Specifications*, Section 5-1.23B(2), *Control of Work – Submittals – Shop Drawings*.

When shop drawings are returned for correction, they are to be accompanied by an engineering analysis report giving the reason the shop drawings are not acceptable. The report should list the specific deficiencies found, but elaboration is unnecessary. Do not suggest any corrective measures.

## 2-3 Design Calculations

The *Contract Specifications*, Section 48-2.01C(2), *Shop Drawings*, require the Contractor to furnish design calculations supporting the design on the shop drawings. The design calculations must demonstrate the adequacy of the falsework system and show the stresses and deflections in load carrying members. It is not the intent of the specifications to require the Contractor to calculate the stress in, and the deflection of, each and every member in the system.

The design calculations furnished by the Contractor should not be used during the independent review of the falsework submittal. Any design or construction details which may be shown in the form of sketches on calculation sheets must be shown on the shop drawings as well; otherwise the drawings are not complete. Shop drawings are not to be authorized in any case where it is necessary to refer to calculation sheets for information needed to complete the review and engineering analysis, or where information shown only on the calculation sheets will be needed for construction.

In most cases it is unnecessary to refer to the Contractor's calculations during the engineering analysis. However, in the event a member is overstressed or is otherwise inadequate in some respect, reference to the calculations may reveal the reason for the design deficiency.

## 2-4 Shop Drawing Review

### 2-4.01 Initial Review

Immediately upon receipt of the first submittal of any set of shop drawings, the Structure Representative or a civil engineer registered in the State of California will perform an initial review of the documents received. The purpose of the initial review is to ascertain whether the shop drawings and any required supporting data have been submitted.

The goal is to complete the initial review within 2 working days following receipt of a given set of shop drawings. The purpose is to assure a timely notice to the Contractor in the event the shop drawings are not complete or required supporting data is missing. Since the only purpose of the initial review is to discover omissions that would prevent completion of a subsequent engineering analysis, neither calculations nor an evaluation of design details is required; thus, completion within 2 working days is a realistic time frame.

Determining whether a particular submittal has sufficient information to perform an independent engineering analysis involves a certain degree of subjectivity, and the Engineer will be expected to exercise judgment and common sense when making this determination. The basic requisite is that the shop drawings contain enough information to enable the Engineer to verify that the design meets contract requirements. This is accomplished by making an independent engineering analysis. Therefore, if there is not enough information or detail to make an engineering analysis, the shop drawing submittal must be rejected.

Regardless of other considerations, for administrative purposes, the shop drawing submittal must include all the information listed below. If any of the information is omitted, the submittal must be rejected and returned to the Contractor for correction and resubmission:

1. Size of all load carrying members, including soffit joists, and all transverse and longitudinal bracing, including connections
2. Members supporting sloping exterior girders, deck overhangs, and any attached construction walkways
3. Design controlling dimensions, including beam length and spacing; post location and spacing; overall height of bents; vertical distance between connectors in diagonal bracing; and similar dimensions that are critical to the design.
4. Location and method by which the falsework will be adjusted to final grade
5. Unless a concrete placing schedule is shown on the contract plans, the shop drawings must include a superstructure placing diagram showing the proposed concrete placing sequence and/or the direction of pour, whichever one is

- applicable, and the location of all construction joints. (For relatively simple structures, this requirement may be satisfied by a note on the shop drawings.)
6. All openings through the falsework (e.g., traffic, railroad, and pedestrian). Horizontal and vertical clearances must be clearly shown.
  7. Location of temporary railing
  8. If the falsework will incorporate a proprietary shoring system, the trade name and rating
  9. Maximum horizontal distance the piles may be pulled into place under the caps
  10. Maximum deviation of piles from vertical
  11. Assumed soil bearing values for pads or footings
  12. Grade (E-value), species, and type of any structural composite lumber, including manufacturer's tabulated working stress values for the lumber
  13. Welding standard for any welded members
  14. If the height of the falsework at any location, measured from the ground line to the bridge soffit, exceeds 14 feet, or if any falsework span exceeds 16 feet, or if openings are provided for vehicular, pedestrian, or railroad traffic; each sheet of the shop drawings must be sealed and signed by a civil engineer registered in the State of California. This includes contractor's standard plans and standard details.
  15. The shop drawings must be accompanied by the Contractor's design calculations, and any other supplemental data required by the falsework design that is needed for an engineering analysis.

The *Contract Specifications* require the Contractor to submit design data for any manufactured assembly to be used in the falsework, but only if requested by the Engineer. To assure a complete design submittal and thus avoid any unnecessary delay in the review process when a manufactured product or device will be used, the specification requirement should be discussed with the Contractor at the preconstruction meeting. The Contractor should be informed that if proprietary products of any kind are to be used, the required technical data must accompany the shop drawings when they are first submitted for review.

When reviewing shop drawings pursuant to instructions in this section, submission of complete shop drawings along with all required supporting data is a specific contract requirement that controls the start of the review period. However, while the time period for review of shop drawings does not begin until a complete submittal is received, it is often possible to review portions of the design, which do not depend on the missing information. It is SC practice to expedite the authorization process by reviewing as

much of the design as is possible while waiting for the resubmission of shop drawings that have been returned for completion following the initial review.

The initial review may reveal omissions, which are not of such serious consequence as to delay the engineering analysis, but if not corrected will delay authorization. For example, the omission of items such as the erection and removal plan; pad and/or pile design information; the lighting plan, if one is required; and similar information that will eventually be required prior to authorization should be brought to the Contractor's attention at the earliest convenient time.

## **2-4.02 Review**

Appendix B, *Falsework Reminder List*, includes a comprehensive listing of items that should be considered and/or investigated during the review of the shop drawings. Prior to the authorization of any shop drawings, the reminder list should be reviewed to verify that no requirement has been overlooked. [Section 2-14, Review of Lighting Plan](#), provides information on the review of lighting plans at falsework openings.

### **2-4.02A Review Procedure when Railroad Company is not Involved**

The Structure Representative or a civil engineer registered in the State of California must review the shop drawings for adequacy and compliance with all contract requirements and all requirements in this manual. An engineering analysis must be performed, see [Section 2-4.03, Engineering Analysis](#).

### **2-4.02B Review Procedure when Railroad Company is Involved**

This procedure includes structures adjacent to or over railroad facilities and structures that in any way may impact the railroad or its property.

To ensure that SC is fully informed of all matters relating to falsework over a railroad facility, correspondence to and discussions with the railroad company must be handled by the [SC Falsework Engineer](#). Neither SC field personnel nor contractor personnel are authorized to communicate directly with the railroad. An exception must be approved by the SC Deputy Division Chief.

In most cases, only the shop drawings for the structure span over the railroad tracks will require review and approval by the railroad company. However, when the structure is high enough for adjacent falsework to fall on railroad property or equipment will be used in erecting the falsework, e.g. cranes, which can fall on railroad property, the shop drawings for those adjacent spans must be submitted as well.

Authorization of the shop drawings is contingent upon the shop drawings being satisfactory to the railroad company involved and requires their approval.

The shop drawings must be reviewed for adequacy and compliance with contract requirements in the same manner as all other shop drawings including the engineering analysis (see Section 2-4.03, *Engineering Analysis*). The shop drawings must also be reviewed for compliance with the railroad requirements in the *Information Handout*. The *Contract Specifications*, Section 5-1.20C, *Railroad Relations*, refers to the *Information Handout* for railroad requirements. The Railroad Falsework Check list must also be completed. The check list can be found on the Temporary Structure Technical Team ([Team A](#)) website on the SC intranet.

The “Right-Of-Entry” and “Service Contract” must be fully executed between Caltrans and railroad authorities. Verify that they are not expired because normally they expire after three years. This verification must be done before sending the railroad submittal to the SC Falsework Engineer.

Restricted temporary horizontal and vertical clearances at the railroad tracks require Public Utilities Commission (PUC) approval. Caltrans Right-of-Way requests the approval from the PUC during project development. The Structure Representative should make certain PUC approval has been granted before the shop drawings are authorized.

The following information must be on the first sheet of the shop drawings. This information can usually be found in the *Information Handout*:

1. DOT #
2. RR Milepost
3. Subdivision
4. Closest City
5. Longitude
6. Latitude.

See also *Falsework Manual*, Section 4-12.06F, *Shop Drawings Over or Adjacent to Railroad*, for additional information.

When the engineering analysis has been completed and the Structure Representative is satisfied that all contract requirements and railroad requirements have been met, the Structure Representative must submit PDFs of the following by email to the SC Falsework Engineer:

1. Shop drawings (reviewed, but not authorized)
2. Review calculations
3. Contractor’s calculations



4. Manufacturer's catalog data for manufactured assemblies
5. Railroad Falsework Check list
6. General Plan of the contract plans.

The Railroad Relations section in the *Information Handout* must be reviewed before the shop drawings are sent to the SC Falsework Engineer to ensure that all applicable requirements have been met.

The email must state that the shop drawings have been reviewed, an engineering analysis has been completed, and the submittal is satisfactory.

The SC Falsework Engineer will review the submittal and subsequently forward the submittal to the railroad for approval.

When the SC Falsework Engineer is informed by the railroad company that the shop drawings are satisfactory, the Structure Representative will be notified by email including the railroad approval.

The railroad approval may include conditions. These conditions must be addressed before authorizing the shop drawings.

Upon notification and after any applicable railroad approval conditions have been satisfied, the Structure Representative may authorize the drawings as described in [Section 2-6.01](#), *Shop Drawing Authorization*.

It is emphasized that shop drawings for structures over railroad facilities are not to be authorized until the SC Falsework Engineer has notified the Structure Representative that the design is acceptable and has been approved by the railroad company.

### **2-4.03 Engineering Analysis**

When the Contractor submits shop drawings, which are required to be stamped and signed by a civil engineer registered in the State of California, it is SC practice to perform an independent engineering analysis.

Upon completion of the engineering analysis of the shop drawings, the Structure Representative or the civil engineer registered in the State of California performing the engineering analysis will present the findings in an engineering analysis report. This includes sealing and signing the report in accordance with the *Streets and Highways Code*, Section 137.6, and the Professional Engineers Act (Business and Professions Code), Section 6735. See Section 1-10, *State Statutes*.

This report is to be completed for rejected and authorized shop drawings. The report should contain a brief chronological record of the pertinent dates relating to the submission, review, rejection, and authorization, including the number of review days. This does not replace the chronological record in [Section 2-9](#), *Chronological Record of Shop Drawing Review*. The Structure Representative must transmit the report to the Contractor, see [Section 2-10](#), *Transmittal to the Contractor*. An example of the report is shown in [Section 2-4.04](#), *Sample Engineering Analysis Report*.

When the shop drawings cannot be authorized, complete the engineering analysis report and list the reason(s) the shop drawings are not acceptable. Elaboration is unnecessary. Do not suggest any corrective measures. Prior to sending the report to the Contractor, contact the falsework design engineer by phone or in person to discuss the reason(s) for rejecting the submittal. Document this discussion in the chronological record and the daily report.

When the shop drawings are authorized, complete the engineering analysis report. The report must include the following paragraphs:

1. “The *(insert type of review completed, i.e., falsework, trenching and shoring, column guying)* shop drawings for *(identify specific location)* of the *(Bridge name, Br. No.)*, are found acceptable based upon an independent engineering analysis and are authorized to the extent provided in the *Standard Specifications*, Section 5-1.23, *Submittals*.”
2. “Your attention is directed to your responsibilities pursuant to *Standard Specifications*, Sections 5-1.23, *Submittals*, 7-1.04, *Public Safety*, and *(insert appropriate Standard Specification reference, i.e., Standard Specifications, Section 48, Temporary Structures)*, and to applicable requirements of the *Construction Safety Orders*.”
3. “You are reminded that *(insert type of temporary structure, i.e. falsework, shoring, etc.)* construction must conform to the authorized shop drawings, that the materials used must be of the quality necessary to sustain the stresses required by the design, and that workmanship must be of such quality that the *(insert type of temporary structure, i.e. falsework, shoring, etc.)* will support the loads imposed without excessive settlement or joint take-up beyond that shown on the authorized *(insert type of temporary structure, i.e. falsework, shoring, etc.)* shop drawings.”

The sample engineering analysis report in Section 2-4.04, *Sample Engineering Analysis Report*, can be used as a template.

## 2-4.04 Sample Engineering Analysis Report

(see next page)

## Engineering Analysis Report

*Insert Date*

### Project Information

Contract Number

Dist-Co-Rte-PM

Bridge name

Br. No.

**Type of structure reviewed:** *(insert falsework, trenching and shoring, column guying)*

### Chronology:

Plans were received: *(date)*

Plans rejected: *(date)*

Revision No. 1 received: *(date)*

Revision No. 1 rejected: *(date)*

Revision No. n received: *(date)*

Revision No. n rejected: *(date)*

Review completed: *(date)*

Elapsed review time: *(days)*

### Introduction:

This report presents the results of an independent engineering analysis for the *(insert type of review completed, i.e., falsework, trenching and shoring, column guying)* at *(identify specific location i.e., Frame 1, stage 1 etc.)*

### Discussion:

Rejection – *This portion of the report would describe specific deficiencies found with the shop drawings that would be cause for rejection i.e. The following members have been found to be overstressed:*

W36x240 stringer in span FW5-6 is overstressed in bending

Post in bent FW5 overstressed in compression

*For clarity, redline clouds may be made on the temporary structure drawings and then described here.*

Authorization – No exceptions were found.

**Conclusion:**Rejection:

The *(insert type of review completed, i.e. falsework, trenching and shoring, column guying)* shop drawings for *(identify specific location)* of the *(bridge name, Br. No.)*, are rejected based upon an independent engineering analysis. The deficiencies are listed above.

Authorization (the paragraphs below must be included):

"The *(insert type of review completed, i.e., falsework, trenching and shoring, column guying)* shop drawings for *(identify specific location)* of the *(bridge name, Br. No.)*, are found acceptable based upon an independent engineering analysis and are authorized to the extent provided in the *Standard Specifications, Section 5-1.23, Submittals.*"

"Your attention is directed to your responsibilities pursuant to *Standard Specifications, Sections 5-1.23, Submittals, 7-1.04, Public Safety, and (insert appropriate Standard Specification reference, i.e., Standard Specifications, Section 48, Temporary Structures)*, and to applicable requirements of the *Construction Safety Orders.*"

"You are reminded that *(insert type of temporary structure, i.e. falsework, shoring, etc.)* construction must conform to the authorized shop drawings, that the materials used must be of the quality necessary to sustain the stresses required by the design, and that workmanship must be of such quality that the *(insert type of temporary structure, i.e. falsework, shoring, etc.)* will support the loads imposed without excessive settlement or joint take-up beyond that shown on the authorized *(insert type of temporary structure, i.e. falsework, shoring, etc.)* shop drawings."

If you have any questions regarding this report, please contact the Structure Representative at (XXX) XXX-XXXX.

*(Signature)* \_\_\_\_\_

LOREN N, BRIDGE, P.E.  
Structure Representative  
Structure Construction



## 2-5 Review Duration

As previously noted, the time allowed by the contract for the shop drawing review is 20 calendar days, or more for complicated structures or when railroad approval is required (see [Section 2-2](#), *General Information*).

Regardless of the time allowed, the review period begins when the shop drawings and required supporting information have been received from the Contractor and ends when the shop drawings are authorized or rejected. The Engineer is not responsible for time taken by the Contractor to make necessary revisions or corrections to the shop drawings.

Revised submittals receive the same number of review days as the original submittal. Although the review time for a resubmittal is the same as the original, it is SC practice to make an effort to review the resubmitted shop drawings in less than the specified time if the revisions are minor. As a guide, a resubmittal will be viewed as a minor revision when it does not require another engineering analysis to verify system adequacy.

The actual duration of the review can be critical from an administrative standpoint, since the contract provides for additional time and compensation to offset any time lost due to delays attributable to the failure to complete the shop drawing review within the time allowed. In the event the Contractor is delayed, the additional time and compensation due are determined in accordance with the delay provisions of the contract.

## 2-6 Shop Drawing Authorization and Rejection

### 2-6.01 Shop Drawing Authorization

Prior to the authorization of any shop drawings, the shop drawings must be reviewed, and an engineering analysis done according to [Section 2-4](#), *Shop Drawing Review*, to verify that no requirement has been overlooked.

The shop drawings must be authorized by placing the authorization stamp on each sheet, see Figure 2-1, *Authorization Stamp*. The stamp must be signed and dated by the Structure Representative or the reviewer.

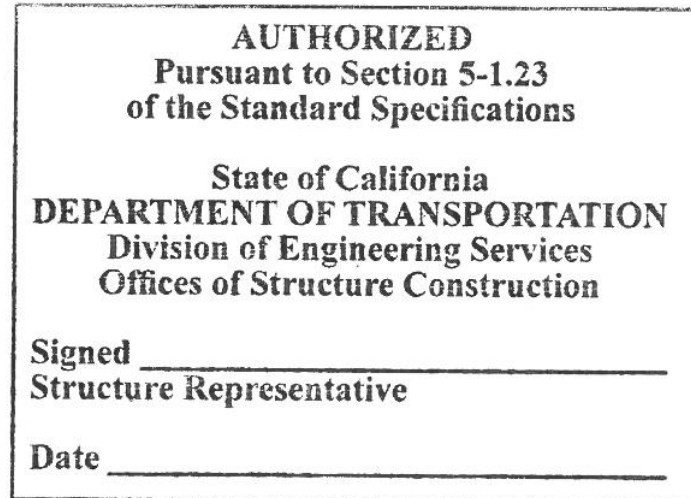


Figure 2-1. Authorization Stamp

Shop drawings may be authorized using an electronic authorization stamp, see Figure 2-2, *Electronic Authorization Stamp*. The stamp must be signed by the Structure Representative or the reviewer. The signature may be electronic. The procedure to create and use an electronic signature is available on the [SC Intranet](#) website, under the *Downloads* tab (select “Digital Stamps” followed by “Users Guide for the Digital As-Built Stamp”).

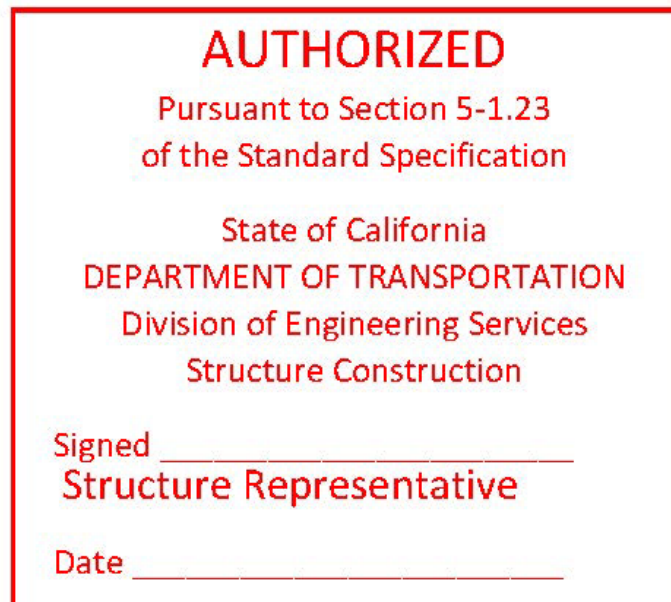


Figure 2-2. Electronic Authorization Stamp

### 2-6.01A Authorization when Railroad Company is not Involved

The shop drawings may be authorized when:

- The Structure Representative or a civil engineer registered in the State of California has completed the shop drawing review and engineering analysis.
- The Structure Representative is satisfied that the design meets all contract requirements.

See Section 2-4, *Shop Drawing Review*; Section 2-4.02A, *Review Procedure when Railroad Company is not Involved*; and Section 2-4.03, *Engineering Analysis*.

The Structure Representative must stamp each sheet as described in Section 2-6.01, *Shop Drawing Authorization*.

### 2-6.01B Authorization when Railroad Company is Involved

This authorization includes structures adjacent to or over railroad facilities and structures that in any way may impact the railroad or its property, see Section 2-4.02B, *Review Procedure when Railroad Company is Involved*.

It is emphasized that authorization of shop drawings is contingent upon the shop drawings being satisfactory to the railroad company involved. They are not to be authorized until the SC Falsework Engineer has notified the Structure Representative that the design is acceptable and has been approved by the railroad company.

The shop drawings may be authorized when:

1. The Structure Representative or a civil engineer registered in the State of California has completed the shop drawing review and engineering analysis.
2. The Structure Representative is satisfied that the design meets all contract requirements.
3. The Structure Representative has been notified of the railroad approval by the Falsework Engineer.
4. The Structure Representative has addressed any conditions in the railroad approval.

See Section 2-4.02B, *Review Procedure when Railroad Company is Involved*, and Section 2-4.03, *Engineering Analysis*.

The Structure Representative or the reviewer must stamp each sheet as described in Section 2-6.01, *Shop Drawing Authorization*.

## 2-6.02 Shop Drawing Rejection

When the shop drawings cannot be authorized, stamp the date on each sheet of the shop drawings when the review stopped. See *Contract Specifications*, Section 5-1.23B(2), *Shop Drawings*.

Describe the deficiencies in the engineering analysis report, see Section 2-4.03, *Engineering Analysis*. For clarity, redline clouds may be used on the shop drawings.

## 2-7 Cal/OSHA Requirements

The Cal/OSHA Regulations (found in Chapter 3.2 of Title 8 of the California Code of Regulations), Subchapter 2, [Article 2](#), *Permits – Excavations, Trenches, Construction and Demolition and the Underground Use of Diesel Engines in Work in Mines and Tunnels*, requires the Contractor to obtain a permit for the “Erection and placement of scaffolding, vertical shoring, or falsework intended to be more than 36 feet high when completed.” This requirement will apply to all falsework, which exceeds 36 feet, measured from the lowest point of surrounding grade or ground level to the bridge soffit.

Obtaining the permit required pursuant to Article 2 is the Contractor's responsibility. Upon application, a permit will be issued for a specific project; however, as a business practice many bridge contractors obtain an annual permit to cover all their work. Annual permits are valid for the period from January 1 to December 31.

Although the Structure Representative has neither the authority nor the duty to enforce the article mentioned above, as a matter of practice, when a permit is required, the fact that the Contractor has a valid permit should be verified before the shop drawings are authorized. The date of verification should be noted in the daily report and the chronological record, see Section 2-9, *Chronological Record of Shop Drawing Review*.

## 2-8 Revisions to Shop Drawings

### 2-8.01 Revisions to Rejected Shop Drawings

The *Contract Specifications*, Section 5-1.23B(1), *Control of Work – Action Submittals – General*, allow the same number of days for a revised submittal as for the original submittal. See [Section 2-5](#), *Review Duration*, for additional information.

The Contractor must show the revision number on the revised shop drawings and uniquely number each revised detail, and describe and date the revisions in a legend, see *Contract Specifications*, Section 5-1.23B(2), *Shop Drawings*.



## 2-8.02 Revisions to Authorized Shop Drawings

The specifications contemplate the possibility of the Contractor submitting a revised design after the original design has been reviewed and authorized. The revised design is to be submitted as a new submittal per *Contract Specifications*, Section 5-1.23B(2), *Shop Drawings*, and will be reviewed pursuant to applicable specification requirements and the review practice and procedures discussed in this chapter.

## 2-9 Chronological Record of Shop Drawing Review

### 2-9.01 Introduction

A chronological record, or log, showing all pertinent dates relating to the submission, review, and authorization of shop drawings is required for each structure in the contract.

Normally, the first entry will be the date the shop drawings are first received. If, however, topics having significance with respect to the design are discussed prior to the first submittal, the discussion should be noted, and the log started.

This log will include, but not limited to:

1. The date the shop drawings were first received.
2. The date(s) the Contractor is notified of required revisions, including the reason(s) the review could not continue and/or why the shop drawings had to be returned.
3. The date(s) revised shop drawings were received.
4. The date(s) and subject matter covered in conversations, letters, and emails, relating to the review.
5. The date the shop drawings were sent to the SC Falsework Engineer for railroad approval and when railroad approval was received.
6. The date of authorization; the date the authorized shop drawings were forwarded to SC HQ.

When entries are properly made, the time taken for the Engineer's review should be readily apparent. Other functional units will use this information to establish review times, especially for complex bridges and those involving other agencies, such as the railroad.

Make a notation in the log of the date that falsework for a given structure becomes the controlling operation on the project, and the date on which it is no longer controlling.

Be specific as to the activity that is controlling, such as preparation of drawings by the Contractor, review by the State or railroad company, erection, etc. In some situations, particularly where a Critical Path Method (CPM) analysis has not been made, it may be difficult to ascertain whether falsework is, or is not, on the critical path. If the actual controlling operation is not evident but it appears that the falsework review (or construction) may affect other aspects of the project, the Structure Representative should note this fact in the log.

Entries in a chronological record are not in lieu of similar information shown in construction daily reports. The diary entry should give detailed information, whereas the chronological record should list only the dates, identification of subject, and the people involved. The level of details will depend on the complexity of the project. An example of a chronological record is shown in Section 2-9.02, *Example of Chronological Record of Falsework Review*.

## **2-9.02 Example of Chronological Record of Falsework Review**

Chronological Record of Falsework Review

*Insert Date*

### **Project Information**

Contract Number  
Dist-Co-Rte-PM  
Bridge name  
Br. No.

**Type of structure reviewed:** *(insert falsework, trenching and shoring, column guying)*

Chronological Record:

Event No.	Date	Comments and/or References
1	4-01-2017	Contractor submitted shop drawings and calculations for frames 1 & 2. (See attached copy of transmittal letter dated 4-01-2017).
2	4-04-2017	Discussed FW submittal with contractor's engineer. Submittal incomplete, need pedestrian protection details, catalog data, etc. (See SR daily report).
3	4-08-2017	Received additional FW data. (See copy of transmittal letter dated 4-08-2017) <b>Falsework review period begins for frames 1 &amp; 2.</b>
4	4-10-2017	Contractor set pads for spans 1 & 2 in frame 1. (See ASR daily report).
5	4-12-2017	Contractor revised beam sizes in FW spans 1-4 & 1-5. (See attached copy of transmittal letter dated 4-12-2017). This is revision 1.
6	4-18-2017	Frame 1 (incl. Rev. 1) and frame 2 (except span 7 over RR) approved. (See attached copy of analysis report to contractor).
7	4-18-2017	Frame 1 (incl. Rev. 1) drawings with contractor's and SR calculations and analysis report transmitted to SC HQ. Frame 2 drawings with contractor's and SR calculations and RR check list sent to SC Falsework Engineer for review and transmittal to RR. (See attached email to SC Falsework Engineer).
8	4-22-2017	Contractor revised lateral connections at FW bents 1-6, 1-7 & 1-8. (See attached copy of transmittal letter). This is Revision 2.
9	4-23-2017	Rev. 2 approved and sent to SC HQ. (See attached copy of analysis report to contractor).
10	5-07-2017	Contractor requested status of RR review. (See SR daily report).
11	5-17-2017	RR approved span 7. Advised contractor. (See SR daily report). Received confirming email from SC Falsework Engineer regarding RR approval. Sent analysis report approving span 7 to contractor. (See attached copy of RR approval, email from SC Falsework Engineer, and analysis report).

## 2-10 Transmittal to the Contractor

### 2-10.01 Authorized Submittals

Write and sign a transmittal letter to the Contractor per your office or district protocol. The transmittal letter should refer to the engineering analysis report for findings and decision. Attach the following to the transmittal letter:

- The authorized shop drawings with the SC authorization stamp and the Structure Representative's or reviewers' signature and date, see Section 2-6.01, *Shop Drawing Authorization*
- The engineering analysis report with the professional engineer's stamp, signature, and date, see Section 2-4.03, *Engineering Analysis*.

Send the transmittal letter and the attachments to the Contractor.

For falsework submittals where the shop plans are not required to be stamped by a civil engineer registered in the State of California (see *Contract Specifications*, Section 48-2.01C(2), *Shop Drawings*), the engineering analysis report is not required (see Section 2-4.03, *Engineering Analysis*), the authorization is stated in the transmittal letter and the letter must include the following paragraphs:

1. "The (*insert type of review completed, i.e., falsework, trenching and shoring, column guying*) shop drawings for (*identify specific location*) of the (*Bridge name, Br. No.*) have been reviewed and are authorized to the extent provided in *Standard Specifications*, Section 5-1.23, *Submittals*."
2. "Your attention is directed to your responsibilities pursuant to *Standard Specifications*, Sections 5-1.23, *Submittals*, 7-1.04, *Public Safety*, and (*insert appropriate Standard Specification reference, i.e., Standard Specifications*, Section 48, *Temporary Structures*), and to applicable requirements of the *Construction Safety Orders*."
3. "You are reminded that (*insert type of temporary structure, i.e. falsework, shoring, etc.*) construction must conform to the authorized shop drawings, that the materials used must be of the quality necessary to sustain the stresses required by the design, and that workmanship must be of such quality that the (*insert type of temporary structure, i.e. falsework, shoring, etc.*) will support the loads imposed without excessive settlement or joint take-up beyond that shown on the authorized (*insert type of temporary structure, i.e. falsework, shoring, etc.*) shop drawings."

The transmittal letter is not an engineering document and therefore should not be stamped with a professional engineer's stamp.

For sample transmittal letter, See Section 2-10.03, *Sample Transmittal Letters*.

## 2-10.02 Rejected Submittals

Write and sign a transmittal letter to the Contractor per your office or district protocol. The transmittal letter should refer to the engineering analysis report for findings and decision. Attach the following to the transmittal letter:

- The rejected shop drawings with the date the review stopped stamped on each sheet, see Section 2-6.02, *Shop Drawing Rejection*
- The engineering analysis report with the professional engineer's stamp, signature, and date, see Section 2-4.03, *Engineering Analysis*

Send the transmittal letter and the attachments to the Contractor.

For falsework submittals where the shop plans are not required to be stamped by a civil engineer registered in the State of California (see *Contract Specifications*, Section 48-2.01C(2), *Shop Drawings*), the engineering analysis report is not required (see Section 2-4.03, *Engineering Analysis*).

In this case, state the rejection in the transmittal letter and list the reason(s) the shop drawings are not acceptable. Elaboration is unnecessary. Do not suggest any corrective measures. Prior to sending the transmittal letter to the Contractor, contact the falsework design engineer by phone or in person to discuss the reason(s) for rejecting the submittal. Document this discussion in the chronological record (see Section 2-9, *Chronological Record of Shop Drawing Review*) and the daily report.

The transmittal letter is not an engineering document and therefore should not be stamped with a professional engineer's stamp.

For sample transmittal letter, See Section 2-10.03, *Sample Transmittal Letters*.

## 2-10.03 Sample Transmittal Letters

(see next page)



SEPTEMBER 2023

## Transmittal Letter – With Engineering Analysis Report – Authorized and Rejected

STATE OF CALIFORNIA-----CALIFORNIA STATE TRANSPORTATION AGENCY

Gavin Newsome, Governor

### DEPARTMENT OF TRANSPORTATION



<Your Office Address>  
<Your Office Phone>

Date: <Date>

File: <Project Name>  
<Co/Rte./Pm>  
<Job EA>

<Contractor Name>  
<Contractor Address>

Dear <Responsible Person>,

The falsework shop drawings for Camarillo Overhead and Separation (Widen), Bridge No. 52- 16, as revised December 1, 2017, have been reviewed. Your attention is directed to the attached Engineering Analysis Report.

Sincerely,

Resident Engineer

Attachments:

*(Authorized or rejected)* falsework shop drawings  
Engineering Analysis Report

## Transmittal Letter – Without Engineering Analysis Report - Authorized

STATE OF CALIFORNIA-----CALIFORNIA STATE TRANSPORTATION AGENCY

Gavin Newsome, Governor

### DEPARTMENT OF TRANSPORTATION



&lt;Your Office Address&gt;

&lt;Your Office Phone&gt;

Date: &lt;Date&gt;

File: &lt;Project Name&gt;

&lt;Co/Rte./Pm&gt;

&lt;Job EA&gt;

&lt;Contractor Name&gt;

&lt;Contractor Address&gt;

Dear: &lt;Responsible Person&gt;,

The falsework shop drawings Camarillo Overhead and Separation (Widen), Bridge No. 52-0016, as received on December 1, 2017, have been reviewed and are authorized to the extent provided in *Standard Specifications*, Section 5-1.23, *Submittals*.

Your attention is directed to your responsibilities pursuant to *Standard Specifications*, Sections 5-1.23, *Submittals*, 7-1.04, *Public Safety*, and 48, *Temporary Structures*, and to applicable requirements of the Construction Safety Orders.

You are reminded that falsework construction must conform to the authorized shop drawings, that the materials used must be of the quality necessary to sustain the stresses required by the design, and that workmanship must be of such quality that the falsework will support the loads imposed without excessive settlement or joint take-up beyond that shown on the authorized falsework shop drawings.

Sincerely,

Resident Engineer

Attachments:

Authorized falsework shop drawings

## Transmittal Letter – Without Engineering Analysis Report - Rejected

STATE OF CALIFORNIA-----CALIFORNIA STATE TRANSPORTATION AGENCY

Gavin Newsome, Governor

**DEPARTMENT OF TRANSPORTATION**

&lt;Your Office Address&gt;

&lt;Your Office Phone&gt;



Date: &lt;Date&gt;

File: &lt;Project Name&gt;

&lt;Co/Rte./Pm&gt;

&lt;Job EA&gt;

&lt;Contractor Name&gt;

&lt;Contractor Address&gt;

Dear &lt;Responsible Person&gt;,

The falsework shop drawings Camarillo Overhead and Separation (Widen), Bridge No. 52-0016, as received on December 1, 2017, have been reviewed and are rejected. The deficiencies are listed below:

The following members have been found to be overstressed:

W14x120 stringer in span 1 is overstressed in bending

Post in bent FW2 overstressed in compression

If you have any questions regarding this report, please contact the Structure Representative at (XXX) XXX-XXXX.

Sincerely,

Resident Engineer

Attachments:

Rejected falsework shop drawings



## 2-11 Submittal Guidelines

### 2-11.01 Introduction

This section is intended as a brief guideline showing where to send shop drawing submittals, how to name files, and how to label email subject lines.

### 2-11.02 Submittals Where Railroad is Not Involved

Of the documents listed below, retain one copy in the job file and send one copy to SC HQ for retention in VISION and emergency response:

1. Authorized shop drawings
2. Engineering analysis report
3. Reviewer's engineering analysis calculations
4. Contractor's calculations
5. Manufacturer's catalog data for manufactured assemblies.

Follow these guidelines for files and emails when sending to Sacramento:

1. Scan each document to PDF
2. Name each file as shown in Section 2-11.04, *File Naming Convention*
3. Send by email to: [SC Office Associates@dot.ca.gov](mailto:SC Office Associates@dot.ca.gov)
4. Send copy of email to SC Falsework Engineer
5. In the email subject line enter:
  - a. Contract # - Bridge Name (Bridge No.) - Submittal Type.

### 2-11.03 Submittals When Railroad is Involved

To obtain approval from the railroad send the following documents to the SC Falsework Engineer:

1. Shop drawings (reviewed, but not authorized)
2. Reviewer's calculations
3. Contractor's calculations
4. Manufacturer's catalog data for manufactured assemblies
5. Railroad falsework check list
6. General Plan of the contract plans.

Follow these guidelines for files and emails when sending to Sacramento:

1. The following information must be on the first sheet of the shop drawings:
  - a. DOT #
  - b. RR Milepost
  - c. Subdivision
  - d. Closest City
  - e. Longitude
  - f. Latitude.
2. Scan each document to PDF.
3. Name each file as shown in Section 2-11.04, *File Naming Convention*.
4. In the email subject line enter:
  - a. Contract # - Bridge Name (Bridge No.) - Submittal Type.

After the railroad has approved the submittal and the Structure Representative has authorized the shop drawings, retain one copy of the following documents in the job file and send one copy to SC HQ for retention in VISION and emergency response:

1. Authorized shop drawings
2. Engineering analysis report
3. Engineering analysis calculations
4. Contractor's calculations
5. Manufacturer's catalog data for manufactured assemblies
6. Railroad approval
7. Railroad falsework check list.

Follow these guidelines for files and emails when sending to Sacramento:

1. Scan each document to PDF.
2. Name each file as shown in Section 2-11.04, *File Naming Convention*.
3. Send by email to: [SC Office Associates@dot.ca.gov](mailto:SCOfficeAssociates@dot.ca.gov).
4. Send copy of email to: SC Falsework Engineer.
5. In the email subject line enter:
  - a. Contract # - Bridge Name (Bridge No.) - Submittal Type.

## 2-11.04 File Naming Convention

Name each scanned PDF as shown for ease of archiving and retrieval in VISION. The short-abbreviated naming convention is chosen for easy searching in VISION. Due to the large number of files stored in VISION, it is important that all file names are consistent throughout the state.

The naming conventions were developed to also cover other submittal types.

The abbreviations shown below cover most submittals. There may be cases where a proper abbreviation is not listed below. In this case consult the SC Falsework Engineer about the proper abbreviation to use.

Naming convention:

- Contract # / Bridge # / Stage, Frame, etc. / Submittal Type / Component
- Note: slash “ / ” indicates space

Abbreviations for **Stage, Frame, Span, or Location:**

Fr = Frame

Sp = Span

St = Stage

A# = Abutment and number

B# = Bent and number

Abbreviations for **Submittal Type:**

FW = Falsework

Demo = Bridge Removal

Guy = Column/wall Rebar Guying Plan

Pile = Pile Installation (e.g. CIDH piles)

Scaff = Scaffold

SH = Shoring and Excavation

Trest = Trestle

TS = Temporary Support

Abbreviations for **Component:**

AR = Engineering Analysis Report (*Includes Transmittal Letter*)

AP =	Adjustment Plan
Cat =	Manufacturer's catalogue, data sheet
CCalc =	Contractor's Calculations
LP =	Lighting Plan
SCalc =	SR Calculations
SD =	Shop Drawings (plans)
PP =	Placement Plan (e.g. pile placement plan written procedure)
PSD =	Permanent steel deck forms
RP =	Removal Plan (written procedure). Sometimes the removal plan is written on the shop drawings. In this case use SD
RR =	Railroad approval
TL =	Transmittal Letter with authorization ( <i>Only needed when AR is not required</i> )

Example of file names:

04-120004 34-0120L Fr1 FW AR.pdf

04-120004 34-0120L Fr1 FW SD.pdf

04-120004 34-0120L Fr1 FW CCalc.pdf

04-120004 34-0120L Fr1 FW SCalc.pdf

04-120004 34-0120L Fr1 FW Cat.pdf

## 2-12 Responsibilities

This section is intended as a brief guideline showing the responsibility of the person involved in the shop drawing review.

### 2-12.01 Structure Representative

The Structure Representative has the following responsibilities pertaining to falsework submittals:

1. Performs or oversees review of the independent engineering analysis.
2. Confirms that the submittal complies with contract requirements and railroad requirements where railroad is involved in the project.
3. Corresponds with contractor (rejects/authorizes).
4. Keeps track of review times.

5. Prepares seals and signs engineering analysis report.
6. Confirms that shop drawings, materials incorporated, and construction methods meet contract requirements and the best general practices represented in the *Falsework Manual*.

## 2-12.02 Assistant Structure Representative

The Assistant Structure Representative has the following responsibilities pertaining to falsework submittals, if requested by the Structure Representative:

- Performs review and independent engineering analysis.
- Keeps track of review times.
- Prepares seals and signs engineering analysis report.

## 2-12.03 SC Falsework Engineer

The SC Falsework Engineer has the following responsibilities pertaining to falsework submittals:

1. Performs a cursory review of all shop drawings and calculations for falsework adjacent to or over railroads and forwards the shop drawings and calculations to the railroad for their review and acceptance.
2. Spot checks shop drawings and calculations. The shop drawings to be spot checked are selected at random with the objective of ascertaining compliance with current falsework directives and practices.
3. Acts as consultant to the Structure Representative and field engineers and provides guidance with complicated falsework problems and resolves questions involving policy and practice.
4. Acts as the temporary structure liaison between the project and the railroad.

# 2-13 Field Review of Falsework

## 2-13.01 Introduction

Falsework erected by contractors during construction of state highway bridges and related structures needs to remain safe, stable, and serviceable throughout its' design life. Failure of falsework can be catastrophic. SC practice is to incorporate all contract requirements, experience, and best general practice to prevent falsework failures. SC staff will have the following responsibilities as a minimum to ensure a safely constructed system.

## 2-13.02 Structure Representative & Assistant Structure Representative

Responsibilities of the Structure Representative and the Assistant Structure Representative:

1. Verify that falsework is constructed as per the authorized shop drawings.
2. Verify that all pertinent load tests are performed and properly documented.
3. Verify that the falsework construction meets all Cal/OSHA applicable safety orders.
4. Verify that the falsework is inspected and certified by the contractor's falsework designer or their authorized representative pursuant to the requirements in *Construction Safety Orders, Article 1717*, the *Contract Specifications, Section 48-2.01C(2), Shop Drawings*, and the contract Special Provisions.
5. Verify that jacking and displacement monitoring systems are authorized and in place prior to jacking.
6. Work closely with the contractor's falsework foreman to coordinate all aspects of erecting, grading, and removing the falsework safely.
7. Verify that the Temporary-Structure Engineer is onsite as required by the *Contract Specifications Section 48-1.01D(2), Temporary Structures – General – Quality Assurance – Temporary-Structure Engineer*
8. Verify that temporary-structure inspection reports are being submitted as required; review reports.

## 2-13.03 Bridge Construction Engineer

Responsibility of the Bridge Construction Engineer:

- Perform a field review of falsework installations, together with the Structure Representative, before concrete is placed. Refer to the authorized shop drawings during this review.

## 2-13.04 Area Construction Manager

Responsibility of the Area Construction Manager:

- Periodically perform a field review of falsework installations with Bridge Construction Engineers in their areas. Refer to the authorized shop drawings during this review.

## 2-13.05 SC Oversight Engineer

Responsibility of the SC oversight engineer:

- Perform a field review of falsework installations, together with local agency Structure Representative, before concrete is placed, see [BCM C-14](#), *SC Administration of Projects by Other Implementing Agencies*. Refer to the authorized shop drawings during this review.

## 2-14 Review of Lighting Plan

*Contract Specifications*, Section 48-2.01D(2)(b), *Quality Control – Falsework Lighting*, Section 48-2.02C, *Temporary Structures – Materials – Falsework Lighting*, and Section 48-2.03E, *Temporary Structures – Construction – Falsework Lighting*, state the requirements for pavement and portal lighting at traffic openings. Any project specific requirements will be shown on the contract plans and/or included in the special provisions.

The *Contract Specifications*, Section 48-2.01C(1), *Falsework Submittals – General*, require the Contractor to submit a lighting plan before starting construction of falsework containing openings for vehicular traffic, pedestrians, or railroad. The lighting plan must be authorized by the Engineer before falsework construction at the traffic opening commences. The lighting plan is not part of the falsework shop drawing submittal covered by *Contract Specifications*, Section 48-2.01 C(2), *Falsework Submittals – Shop Drawings*. It is a separate action submittal, which is reviewed and authorized pursuant to *Contract Specifications*, Section 5-1.23B, *Action Submittals*. However, if the lighting plan is shown on the shop drawings, authorization of the shop drawings will constitute authorization of the lighting plan as well.

The lighting plan should be reviewed from the viewpoint of public traffic, and for employee safety during routine maintenance work as well. The *Contract Specifications*, Section 48-2.03E(1), *Temporary Structures – Construction – Falsework Lighting – General*, do not permit closing of traffic lanes for routine maintenance of the lighting system on any roadway having a posted speed limit above 25 mph.

## 2-15 Review of Adjustment Plan

*Contract Specifications*, Section 48-1.01C(3), *Adjustment Plan Shop Drawings*, requires the Contractor to submit an adjustment plan if the falsework needs to be adjusted more than 1/2-inch. The adjustment plan and calculations must be sealed and signed by a civil engineer registered in the State of California.

The adjustment plan may be designed and submitted as part of the falsework shop drawing submittal or designed and submitted as a separate action submittal, which is reviewed and authorized pursuant to *Contract Specifications*, Section 5-1.23B, *Action Submittals*. If the adjustment plan is part of the falsework shop drawing submittal,

authorization of the shop drawings will constitute authorization of the adjustment plan as well.

The adjustment plan must be authorized by the Engineer prior to any adjustment of the falsework. The review of the adjustment plan must be in accordance with the review process for shop drawings in this chapter.