

Introduction

Caltrans – Temporary Structures

- Jim Nicholls – Falsework Engineer
 - Provide technical support for temporary structures to field staff
 - Develop guidelines and standards
 - Railroad liaison for temporary structures

Teams

Caltrans – Temporary Structure Technical Team (TSTT)

- Sponsor: Bryan Bet
- Chair: Jim Nicholls
- Members:
 - 6 Senior Bridge Engineers
 - 3 Structure Representatives
- Meets monthly
- Goals:
 - Develop guidelines and standards
 - Discuss questions from the field

Teams

Caltrans / Industry – Falsework Advisory Team (FWAT)

- Typically Meets twice a year (January and August)
 - Hybrid meetings
 - Next meeting will be in August (San Diego)
- Members attending January 2024 meeting (Sacramento)
 - 9 from Caltrans
 - 16 from Industry
- Goals:
 - Discuss guidelines and standards
 - How to improve falsework and falsework specifications
 - Eliminate falsework failures

FWAT Topics Discussed

Topics from January Meeting

1. Specification changes
2. Manual revisions
3. Temporary barriers
 - Required clear width Spec 12-3.20C
 - Cal F-23 temporary barrier standard plans drafted
 - K-rail sunset December 31, 2026
4. Boussinesq formula
5. Wet friction factor
6. Deadmen factor of safety
7. Sloping pads
8. Railroad requirements
 - Railroad checklist

FWAT Topics Discussed Continued

Previous Meeting Topics

1. Wind loads on temporary structures (not FW or Temp support)
2. Analysis and load transfer through existing structures for temporary support designs
3. Alternate materials for jacking redundant systems
4. Need for 150% increase of post loads at traffic openings
5. EOR onsite for critical operations
6. Factor of safety for PT strand cable bracing
7. Guying rebar assemblies
8. Redistribution of loads due to prestressing
9. Connections at traffic openings

Specifications Changes

52-1.01C(2) *Shop Drawings*

Temporary support of rebar assemblies

Current language:

- **52-1.01C(2) Shop Drawings**

If a portion of an assemblage of bar reinforcing steel exceeds 20 feet in height and is not encased in concrete, submit shop drawings and design calculations for a temporary support system.

- ASCE Rebar Construction and Safety manual recommends maximum 20 foot unsupported length
- Revision will limit unsupported length to 20 feet

Specifications Changes

7-1.02K(6)(e) Scaffolds

- *Revised so language is clear what is required*

Spec 12-3.20C Temporary Barrier Systems

- *Continued revisions as barrier test data is received*
- *Cross-bolt temporary barrier most recent addition*
- *Cal F-23 temporary barrier should be added soon (draft Std Plans complete)*

48-3 Temporary Supports

- *Caltrans Bridge Design Alert (BDA) and Bridge Design Memo 17.3 require 10% of DL minimum lateral load*
- *Specification will be revised to be consistent with the above*

Specifications Changes

48-1.01D *Quality Assurance*

- Proposed revisions to remove temporary structure engineer (TSE) from providing onsite superintendence by requiring the TSE to notify the contractor and Caltrans when unanticipated issues occur
- Requirement to stop the work will be the responsibility of the contractor
- A qualified representative may be assigned to perform the required temporary structure activities by the contractor

60-2.02A(4)(c) Quality Control

- Proposed revision so language of this section is similar to what is being proposed above in section 48-1.01D

Falsework Manual Changes (Revision 5 Published)

Section 4-8 *Prestressing Forces*

- *Previous version implied that the load from prestressing should be added to falsework loads including concrete*

An example of dead load redistribution due to longitudinal prestressing is stage construction of continuous bridges with hinges. For these bridges, prestressing will reduce the dead load on the falsework near the center of the suspended span and increase the load on the falsework at the hinge. The forces involved in the dead load redistribution are of considerable magnitude, since up to 3/8 of the total suspended span dead load may be transferred to the falsework at the hinge, assuming the span acts as a fixed-pinned beam. The load due to dead load transfer is shown in the contract drawings and includes the secondary prestress forces. In addition, the dead load of the falsework, calculated in the usual manner, along with the falsework live loads over the deck surface, assuming a fixed-pin beam configuration, will need to be added to the hinge loads provided on the contract plans. ~~must be added to the dead load calculated in the usual manner to obtain the total dead load for the falsework design at the hinge support.~~

Falsework Manual Changes (Revision 5 Published)

Chapter 5 Revisions

Section 5-5.04 *Cable Connector Design*

The installation of cable connectors must conform to the manufacturer's requirements. Only forged clips must be used as connectors. Forged clips are marked *forged* to permit positive identification, and have the appearance of galvanized metal. Malleable clips shall not be used as connectors. Malleable cable clips appear smooth and shiny. Clips should be labeled with manufacturer's markings and size so installation of the clips can be verified with the manufacturer's instructions in accordance with Contract Specifications, Section 48-2.02B(3)(d) *Manufactured Assemblies*.

Falsework Manual Changes (Draft Revision 6)

Chapter 5 Draft Revisions

- Section 5-5.06 *Factor of Safety*

Therefore, a factor of safety, **FS = 3**, based on the minimum breaking force, **MBF**, is required when determining the allowable design capacity of the cable units.

A factor of safety, **FS=2**, based on yield strength, is acceptable for prestressing strand when used in a falsework bracing systems.

Chapter 8 Draft Revisions

- Section 8-2.01 *Introduction*

Individual posts may be supported by individual pads, which may be square or rectangular. A row of several posts may be supported by a continuous pad. Falsework pads may consist of a single member or of several members set side by side. Pads are typically set on level ground. When pads are set on ground slopes greater than 10% sliding effects should be investigated. Normally, for continuous pads, a lower cap beam is used to distribute load from the posts to the corbels.

Additional Temporary Structure Guidelines

Structure Removal Manual

- Published July 2023

Temporary Structure Manual

- Addresses temporary structures that are not falsework or shoring
- 8 of 9 chapters have been drafted and are being reviewed

Questions?

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