



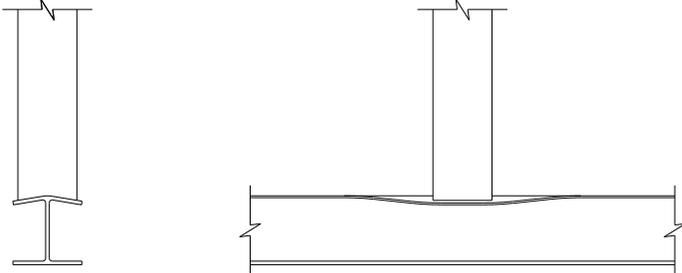
Caltrans / Industry Falsework Advisory Team

Meeting Agenda – February 11, 2020 (Tuesday)

Location: 3390 Lanatt Street, Sacramento, CA

Time	Topic	Speaker
10:00 – 10:10	Welcome and introductions	Jim Nicholls / All
10:10-10:25	<p>Draft Falsework Manual</p> <ul style="list-style-type: none"> • Draft sent to FWAT members after last meeting in August • Additional changes have been made since last FWAT meeting • Additional comments and questions? <p>Meeting Minutes:</p> <ul style="list-style-type: none"> • Question was raised by industry, does the Falsework Manual follow the guideline in the AASHTO Construction Handbook for Temporary Works. <ul style="list-style-type: none"> ○ CT responded that the AASHTO manual is an independent document and in the past shared much of the same information as the falsework Manual. The two manuals contain similar information but are independent of each other. 	All
10:25 – 10:40	<p>Wood Beam Stiffeners</p> <ul style="list-style-type: none"> • UNR report documents design procedure through experimental and analytical studies • Full capacity of blocking may not be effective • UNR procedure added to the falsework manual in section 5-4.11 (see attachment 1) • Some designers already using this procedure • Experimental results suggest effectiveness of blocking is difficult to quantify for web buckling <p>Meeting Minutes:</p> <ul style="list-style-type: none"> • The information in Attachment 1 was presented • Some from industry are aware of the UNR report and already use the findings • I was noted that the additional calculations are easily added to a spreadsheet to be checked with other calculations • Question was raised if UNR report would be referenced in revised falsework manual <ul style="list-style-type: none"> ○ CT replied it would not be referenced in the manual because the additional information in the report may lead to confusion on what variables to use 	Jim Nicholls

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<p>10:40 – 10:55</p>	<p>Flange Bending</p> <ul style="list-style-type: none"> • UNR report documents design procedure through experimental and analytical studies • Flange bending should be checked, for timber to steel connections, at locations of concentrated loads and supports. Figure 5-15 Localized Flange Bending illustrates the behavior of the flange when it bends over the web. The flange capacity is determined by: $\frac{R_n}{\Omega} = \beta_1 t_f^2 F_{yf}$ <p>where</p> <ul style="list-style-type: none"> R_n = Flange capacity (lb) $\beta_1 = 11$ t_f = Flange thickness (in) F_{yf} = Minimum specified yield stress of the flange (psi) $\Omega = 1.67$ (Factor of Safety) <div style="text-align: center; margin: 10px 0;">  </div> <p>Meeting Minutes:</p> <ul style="list-style-type: none"> • The information above was presented • Discussed the β_1 variable • It was noted the value of $\beta_1 = 6.25$ in the AISC <ul style="list-style-type: none"> ○ It was explained 6.25 corresponds to a line load such as a knife plate across the flange and the UNR report used larger values for use with posts of 11.5 inch width • Team members familiar with the UNR report noted higher values of β_1 could be used for common falsework cap sizes and the value of 11 was conservative • The team agreed to add the table of β_1 variables corresponding to the different common cap sizes to the manual so the calculation would not be overly conservative • The question of how double post would affect the calculations was discussed since the report was based on a single post. <ul style="list-style-type: none"> ○ The team discussed the options and concluded it would be conservative to double the capacity for two post to keep the calculation simple. • A note will be added addressing double post configurations in the Falsework Manual 	<p>Jim Nicholls</p>
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10:55 – 11:10	<p>Lateral Web Buckling</p> <ul style="list-style-type: none">• UNR report documents design procedure through experimental and analytical studies• Buckling of unbraced, unstiffened beams, where the flange is loaded with a post load has potential to displace sideways through buckling of the web and is synonymous with column buckling. The dimensions of the assumed column are as follows:• Column height equal to the clear distance between the beam flanges• Column depth equal to the web thickness• Column width equal to the tributary width of the associated post, which is typically the post spacing for interior post• Analyze using elastic buckling formula found in the AISC Manual with an effective length factor equal to 1.7. <p>Meeting Minutes:</p> <ul style="list-style-type: none">• The information above has been added to the Falsework Manual• Discussed the UNR report findings that wood post provided some rotational restraint which resulted in the value of 1.7 which is between 1.0 and 2.0• Steel post provide additional restraint so 1.7 was conservatively used• The comment was made that some industry members check web buckling in their spreadsheet but it never critical• CT commented it was added to the manual to bring attention to it for unusual cases such as heavily loaded deep beams	
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11:15 – 11:35	<p>Revisions to Standard Specifications Section 48</p> <ul style="list-style-type: none">• Section 48-1.01 General<ul style="list-style-type: none">○ Definitions○ Temporary structure inspection report prepared daily during jacking and adjustment○ Adjustment plan shop drawing (Adj > ½")○ Temporary Structure Engineer certify FW during adjustment, prior to pour, and materials○ Option to assign duties to PE with experience• Section 48-2 Falsework<ul style="list-style-type: none">○ NDS○ Welding to D1.1○ Forming winch openings• Section 48-3 Temporary Supports<ul style="list-style-type: none">○ Addresses all temporary supports○ Jacking references moved to 48-5○ Minimum horizontal load 5% supported load• Section 48-5 Jacking<ul style="list-style-type: none">○ Addresses jacking○ Temp support references moved to 48-3 <p>Meeting Minutes:</p> <ul style="list-style-type: none">• Discussed the reorganization of section 48 and how section 48-1 was expanded• Discussed the requirement for a temporary structure inspection report• Discussed licensed engineer to be present during falsework adjustment<ul style="list-style-type: none">○ Industry commented this requirement serves no purpose○ The comment was made there are not enough field engineers to cover this work○ The question was raised if this has been discussed previously. CT responded it was discussed in previous FWAT meetings possibly two years back○ Industry commented experienced superintendent is more qualified than less experienced engineer to oversee this work○ CT responded the PE requirement will provide enhanced experience during this critical time. Due to recent failures CT management required additional safety procedures be implemented to reduce failures○ Comment was made that planning prior to start of process is more important and provides better results○ Question was raised if this was for only falsework over traffic. CT responded the Spec addresses all falsework	Jim Nicholls
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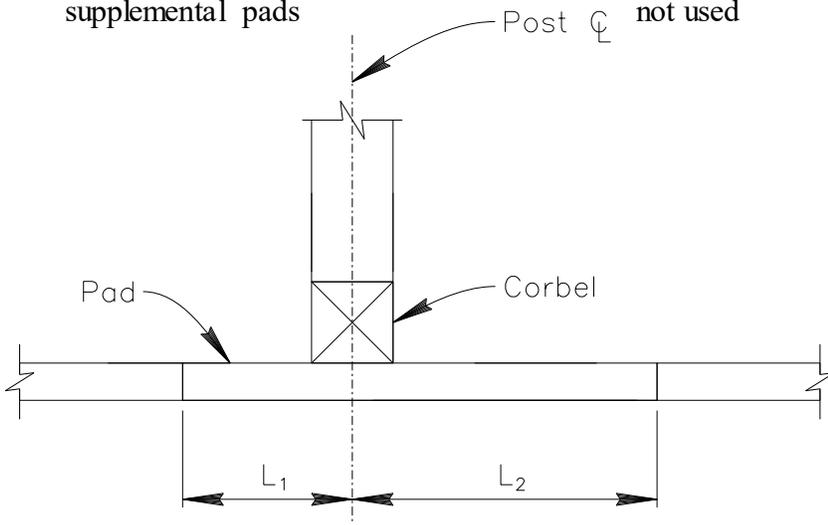
	<p>Minutes Continued:</p> <ul style="list-style-type: none">○ CT will research if PE requirement can be limited to falsework over traffic only○ Comment made the falsework designer should pick who they think is qualified to oversee and certify the falsework construction● Discussed changes to section 48-2<ul style="list-style-type: none">○ Most changes to 48-2 were previously discussed in recent FWAT meetings● Discussed changes to section 48-3<ul style="list-style-type: none">○ 48-3 will address temporary supports and jacking will be moved to 48-5○ Minimum lateral load of 5% of the supported load was added to section 48-3● Discussed changes to section 48-5<ul style="list-style-type: none">○ 48-5 will address jacking and reference 48-3 for supports● Discussed staking of K-rail, 4 stakes required , adjacent to falsework● Specification change has been submitted clarifying the number of stakes required adjacent to falsework● Old specification requiring K-rail to 150 feet in advance and 60 feet past K-rail was inadvertently removed from the Spec and CT is currently working on adding back in.	
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<p>11:35– 12:00</p>	<p>Requirements for Pedestrian Access Routes</p> <ul style="list-style-type: none"> • Standard Specification section 12-4.04 <i>Temporary Pedestrian Access Routes</i> requires access route through falsework to comply with section 16-2.02 <i>Temporary Pedestrian Facilities</i> • Form CEM-2311 completed by contractor after construction complete • Form CEM-2312 weekly report • California Manual on Uniform Traffic Control (MUTCD, Part 6, Chapter 6D) per 16-2.02A(1) • MUTCD requires geometry and alignment per ADA • Path replicate existing as nearly as practical • Construction <ul style="list-style-type: none"> ○ Surface material ○ Handrails ○ Detectable warnings ○ Width and Height (see Attachment 2) ○ Cover design load <p>Meeting Minutes:</p> <ul style="list-style-type: none"> • Discussed requirements of Standard Specifications Sections 12-4 and 16-2 • Question of why the temporary facility needs to be ADA compliant when the existing facility is not compliant <ul style="list-style-type: none"> ○ The MUTCD, Part 6, Chapter 6D requires temporary facilities be ADA compliant ○ There is most likely a legal reason for requiring the temporary facility to compliant • Question why Spec requires walkway surface to HMA, wood or concrete. <ul style="list-style-type: none"> ○ The walking surface is required to be firm and stable to be ADA compliant. The definition of firm and stable to meet ADA requirements does not allow compacted dirt or base because those materials can be disturbed especially during weather events 	<p>Jim Nicholls</p>
<p>12:00 - 12:20</p>	<p>Lunch</p>	<p>All</p>

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<p>12:20 – 12:40</p>	<p>Simplified Pad Formula</p> <ul style="list-style-type: none"> • SYM formula changed to include variable F_b values per NDS • Design method using ASYM formula is complex • Comparison between using only SYM formula and ASYM formula resulted in relatively small differences at higher loads. Increased differences occurred at lower loading conditions • Significant differences occurred when ratio of short to long side is greater than 2:1 • Bearing pressures are assumed to be uniform which is less likely the larger the ratio becomes • Using the SYM only the footing is assumed to cantilever out each side optimizing the bending stress or to the midpoint of the post • Alternatively using tributary area and then checking the stresses in the pad • Splices at midpoint or outside effective length if supplemental pads  <p>Meeting Minutes:</p> <ul style="list-style-type: none"> • Team agreed most do not use the complicated method used in the Falsework Manual • CT proposed eliminating the ASYM formula and using only the SYM formula • CT presented the comparison of pad design using the ASYM formula vs using only the SYM formula • Team discussed the different methods each member uses to design pads and agreed the results will be similar • CT will revise method in manual to use only SYM formula • At the request of Industry CT will note in manual that other method such as tributary area is acceptable 	<p>Jim Nicholls</p>
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12:40 – 12:55	<p>Guying Design</p> <ul style="list-style-type: none">• Falsework Manual typically used due to lack of any other guidelines• Future Temporary Structures Manual will address in the future• BCM currently being drafted will address until manual is published <p>Meeting Minutes:</p> <ul style="list-style-type: none">• Discussed how revisions to the Falsework Manual will affect design of guying systems• CT is working on Bridge Construction Memo (BCM) that will address Standard Specification, Section 52-1 that will address guying of rebar cages• Industry commented that ASCE is currently working on guidelines for determining guying loads and will send information to CT• ASCE meeting in L.A. is scheduled to address guying in one of the workshops• Comment by team member that UNR might be doing some research on guying	Jim Nicholls
12:55 – 1:00	<p>Round Table</p> <p>Meeting Minutes:</p> <ul style="list-style-type: none">• Discussed job specific situation when bents are on an alignment with a large skew and how the special location adjacent to traffic should be applied<ul style="list-style-type: none">○ From the description given it appeared traffic restraints would be required to meet the requirements of the Specs○ Discussed limiting distance for adjacent to traffic requirements determined by the x/h ratio○ 15 feet was suggested as a limiting distance○ This topic has been discussed in previous FWAT meetings and CT will research and bring to next meeting• Question from industry will the 150% post load increase adjacent to traffic remain in the manual.<ul style="list-style-type: none">○ Comment made NDS will reduce allowable post loads so increase might not be needed○ CT responded the 150% will remain• Question about location of deck openings from wheel lines associated with removing falsework<ul style="list-style-type: none">○ Wheel lines are 3 feet in from edge of 12-foot lane	Open Discussion



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1:00 – 2:00	<p>Safe Span Presentation</p> <ul style="list-style-type: none">• Presented by Mike Moffo• New products <p>Meeting Minutes:</p> <ul style="list-style-type: none">• Product information was presented to the team• Discussed cost of the different systems either to own or rent per square foot• Discussed the availability of the products• Question raise about system factor of safety<ul style="list-style-type: none">○ FS=4 for system and 6 for cables• Discussed options for attaching to existing structures	Mike Moffo
2:00	Adjourn	



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Action Items:

Items from Meeting on 8/15/19

1. Switch location of liaison meeting and FWAT so out of phase as far as northern and southern CA
2. Send draft falsework manual to FWAT
3. CT to look into retaining RR information on contract plans

Today's Action Items

1. CT will research limiting distance determined by x/h ratio for falsework adjacent traffic and topic added to future FWAT meetings
2. Information associated with guying systems developed by ASCE will be shared with team members and discussed in future FWAT meeting
3. Table and notes associated with flange bending calculations will be added to the Falsework Manual per today's discussion
4. Note will be added in Falsework Manual that other design methods for pads exist and are acceptable



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Attachment 1

5-4.11 Timber Blocking

Timber blocking can be used to increase capacity for web yielding, web crippling, and flange bending. Timber blocking must not be used for web lateral buckling. The full capacity of the blocking is not effective for increasing web. The effective capacity is given in the following formula:

$$P_b = \gamma F_{c||}' A_b$$

$\gamma = 0.5$ for wood post

$\gamma = 0.3$ for steel post

where P_b = Capacity of timber blocking (lb)

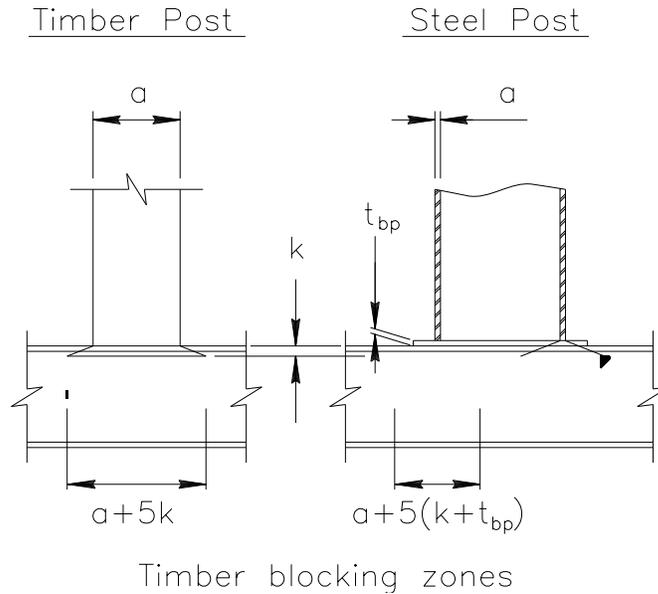
γ = Blocking effectiveness factor

$F_{c||}'$ = Nominal allowable stress for block after adjustment factors are applied (psi)

A_b = Combined cross sectional area of blocking on both sides (in²)

Location of blocking is limited to the locations shown in Figure 5-16 *Timber Blocking*.

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Attachment 2

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

Structure identification			
	Number	Width (feet)	Height (feet)
Vehicle openings			
Pedestrian openings	1	6	10
	Location	Spacing ^a (feet)	
Falsework pavement lighting			

NOTE:

R = Right side of traffic L

= Left side of traffic

C = Centered overhead

^aSpacing is the maximum distance from center to center between fixtures.