Caltrans / Industry Falsework Advisory Team

Meeting Agenda – August 15, 2019 (Thursday)

Location: 4050 Taylor Street, San Diego, CA

Time	Topic	Speaker
10:00 – 10:10	Welcome and introductions	Jim Nicholls / All
10:10- 10:20	Falsework Safety **Minutes:** ○ Discussed recent incidents ○ CT exploring requiring incident reports for falsework ○ CT is willing to pay for safety ○ Agency meeting 4 years ago to discuss preventing falsework collapses resulted in CT taking the following steps to prevent FW collapse ▪ Additional training ▪ Update FW manual ▪ Develop Bridge removal Manual ▪ Develop Temporary Structures Manual ○ North region will provide training for new hires ○ New Standard Specification will be released in April 2020 with changes affecting temporary structures ○ Draft FW Manual currently being reviewed by ACM's ○ CT agreed to send the draft FW manual to Industry as soon as possible so it can be reviewed prior to the next FWAT meeting in January	Steve Harvey
10:20 – 10:35	150% Post Loads at Traffic Openings • 150% load increase at traffic openings will be retained in revised falsework manual as additional factor of safety • Increase based on load cell testing done in the 70's • AREMA applies the 150% load increase • Increase will be applied only to the post and not the other members in the system **Minutes:** ○ Information above was presented with no comments	Jim Nicholls

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10:35 – 10:50	50% Reduction for Cross Bracing • Current falsework manual leads the reader to believe it is a buckling issue in the brace, but that is not the case • Original analysis done in 1985 using STRUDL • Results from 1985 confirmed using modern software • Modeling confirms the load in the compression member can as much as 2 times the tension member • As vertical loads on post approaches 0, the loads on braces converge and become equal • Higher load in compression member effects the connections as well • Revised manual clarifies the issue **Minutes:** ○ Team agreed the tension side connections would govern since the load typically is applied in both directions ○ All agreed that buckling would limit the compression side except in rare cases ○ Applying the reduction to the member only was discussed and team did not see a need to change the existing method and to keep the existing simple procedure ○ The comment was made that the modeling the bracing procedure in the FW manual is based on is not reality ○ The difficulty of doing more in-depth analysis including buckling was discussed ○ The team agreed that for falsework, the existing procedure is adequate, and the manual should be changed to provide clarification based on the analysis method ○ It was noted a more complex analysis method is not warranted since the load used for design of bracing is an assumed load	Jim Nicholls
10:50 – 11:05	Trestle Design • Caltrans review required when public safety is a concern • Review is independent similar to falsework • Railroad review required when their operations can be affected • Loading is not defined and at the discretion of the designer • Minimum lateral loading not defined • Caltrans developing guidelines for field staff for review and authorization of trestles **Minutes:** ○ Comment was made by industry that actual equipment loads will control and miscellaneous loads will not matter ○ Comment made 100 psf minimum load already exists	Jim Nicholls

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	Minutes continued: ○ Question was asked by CT should a minimum dead load be required or should load be unique to each trestle design? ○ Equipment loads can be define but other loads such as material storage vary ○ Comment by industry that 10% is a company policy but using 5% as the minimum is reasonable ○ Industry commented when applying equipment loads the calculated torque should be used not the maximum specified torque ○ Industry comment when determining loads AASHTO should be referenced ○ Comment made that requirements should not be too specific and if minimum is specified, then tendency will be to always design to the minimum	
11:05 – 11:15	Break	All
11:15 – 11:30	Post Clips (Jenco Clip) Capacity • Previously discussed at last FWAT • Only manufactured clip is the Dayton C-90 beam Clip (see attachment 1) • Dayton does not have any test data available for the C-90 clip • Clips used to resist the required loading at traffic openings per SS 48-2.02B(4) • Caltrans tested the clips using FS=2 ○ Dayton C-90 w/ 4-20d nails at corners ○ Allowable load = 3315 lb • Clips manufactured by contractor require load testing if used to resist loads SS 48-2.02B(4) using FS=3 **Minutes:** ○ Method used to test the clips was discussed and how the clips reacted when the load was applied ○ Comment made that no clip will stop an SUV from jumping the K-rail ○ Discussed how the clips performed well after recent collision from the SUV jumping the K-rail recently ○ Discussed how assumptions need to be made to calculate the capacity of the clips which required a load test ○ Question was raised by industry if contractor manufactures clips that match the dimensions of the Dayton C-90 can the CT load test results be used. The answer by CT was yes. ○ Jim commented that there are other clip configurations being used that do not have any test data and will need to be tested	Jim Nicholls

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11:30– 11:45	75% Factor for Bolts in Wood Members • NDS tables does not apply adjustment for large main member • Testing mentioned in existing manual has not been confirmed • AREMA uses 75% factor (AREMA 28.6.3.1) • Revised falsework manual will reference NDS only **Minutes:** ○ Discussed items above and team agreed no need to include the 75% reduction after NDS is adopted into the FW manual	Jim Nicholls

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11:45 – 12:00	Railroad Submittal Requirements
	• Required information on first sheet of plans and calcs per railroad guidelines:
	  ○ DOT number
	  ○ Railroad Milepost
	  ○ Railroad subdivision
	  ○ Closest city
	  ○ Longitude
	  ○ Latitude
	• http://safetydata.fra.dot.gov/officeofsafety/publicsite/crossing/xingqryxing.aspx
	• What needs to be submitted to the railroad
	  ○ Anything that can affect RR operations
	  ○ Work inside RR right-of -way
	  ○ Work that can fall into the RR right-of -way (25' of centerline of track)
	  ○ Restriction of stream channel upstream
	  ○ Construction schedule
	• Need to be included in items above
	  ○ Pick plans include soil bearing values at outriggers and tracks
	  ○ Dimensions vertically from top of rail and horizontally from centerline of track
	  ○ Location of RR right-of-way
	  ○ Utilities
	• Review RR guidelines
	• Separate files for plans, calcs, Mfgr information, etc
	• Maximum file size 20MB
	• Design values per AREMA (steel, wood)
	• SCRRA guidelines are different than other RR's
	
	Minutes:
	○ Discussed RR requirements above
	○ Question was raised why CT does not include the DOT # and other information in the contract plans. The information is removed after the RR approves the plans.
	○ CT will look into retaining the RR information in the plans
	○ RR has been asking for construction schedule recently, so they can determine milestones for inspection, especially UPRR
	○ Comment was made by industry that providing specific equipment for pick plans is difficult and multiple cranes may need to be included in the pick plan
	○ Discussed requirements for stamping pick plans when critical pick (75% cap)
		Jim Nicholls

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12:00 - 12:35	Lunch	All
12:35 – 12:50	Double Caps • Discussed in last FWAT meeting and Caltrans was looking for options to the double cap system (see attachment 2) • Double cap systems are suspect in falsework failures • Existing falsework manual requires external restraint of the top flange of the top cap. • Reference to double caps was removed from the revised falsework manual and 2:1 height to width ratio remains **Minutes:** ○ Discussed items above with no comments from team	Jim Nicholls
12:50 – 1:05	Simplified Pad Formula • SYM formula changed to include variable F_b values per NDS • See Attachment 3 • Non-Uniform post spacing formula already had bending stress input and was not changed • Alternate methods return the same results **Minutes:** ○ Question by industry if it will be mandatory to use the SYM formula and CT answered no ○ Discussed method for determining adequacy of pad design when designer and checker calculations don't agree ○ Discussed alternate methods for designing pads and how they return similar results to SYM ○ Splices of pads were discussed ○ Discussed new figures added to FW manual to better define splice requirements	Jim Nicholls

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1:05 – 1:35	Falsework Manual Revisions
	• Spec scheduled for publication in April 2020
	• Notable changes:
	  ○ Falsework Memos incorporated into the chapters
	  ○ Numbering of chapters has changed
	  ○ Figures updated
	• Chapter 1 *Introduction*
	  ○ Updated
	  ○ References NDS
	• Chapter 2 *Review of Shop Drawings*
	  ○ Revised review and authorization of falsework submittals
	  ○ Sent to attendees of August FWAT
	• Chapter 3 *Loads*
	  ○ Loads chapter addresses loads only and was separated from design considerations
	  ○ No significant changes from previous
	• Chapter 4 *Design Considerations*
	  ○ Items from other chapters moved here
	  ○ 900 psi allowable stress for perp to grain retained
	• Chapter 5 *Analysis*
	  ○ NDS for timber
	  ○ Blocking per NDS
	  ○ Web yielding, and web crippling analyzed
	  ○ 1000 per inch 1/8-inch weld retained for approximating only (D1.1 required for welds)
	  ○ FS=3 for cables
	• Chapter 6 *Stability*
	  ○ 2:1 height to width ratio only
	• Chapter 7 *Manufactured Assemblies*
	  ○ Load test procedure
	  ○ Authorized wood sand jack section 7-3.01A
	• Chapter 8 *Foundations*
	  ○ NDS incorporated into pad design formulas
	  ○ SYM formula revised for F'_b per NDS
	• Chapter 9 *Inspection*
	  ○ Updated and reorganized
	• Appendix “A” *Wood Characteristics*
	  ○ No changes
	• Appendix “B” *Falsework Reminder List*
	  ○ Updated
	• Appendix “C” *Falsework Memos*
	  ○ Remains for future Memos
	• Appendix “D” *Example Problems*
	  ○ Existing updated and problems added
		Jim Nicholls /Hogni Setberg

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	Minutes (FW manual): ○ Manual currently under ACM review and is schedule for publication in April 2020 ○ Standard Specifications including the requirement for NDS is schedule to be published around the same time as FW manual, April 2020 ○ Discussed why the 900 psi compressive stress perpendicular to the grain was retained in the manual. The 900 psi allowable stress has been proven to work so there was no need to eliminate it ○ Discussed welding requirements and the specification to use D1.1 ○ Discussed the factor of safety for cables being changed to 3 for all cables. ○ Industry questioned if the connection efficiency will still be applied. The CT response was yes, the only difference in the new manual is FS=3 will be used in place of 2. ○ CT will research if the FS=3 can be applied to the cable only ○ The use of the factor of safety of 3 for contractor manufactured assemblies was discussed. ○ Question by industry why load testing is required when the calculation can determine the capacity. The response from CT was loading testing is only required for items that the failure mode is difficult to predict, and assumptions need to be made. ○ Statement was made the FS=3 for contractor manufactured assemblies has been around since 1988 ○ Question from industry about previous testing of assemblies done in accredited labs being acceptable. The response from CT was most likely but would depend on the test data and the how the assembly is constructed	

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1:35 – 1:50	Longitudinal Stability • Current manual transfers load to span ahead see (Attachment 4) • Load transfer to previous stabile bent for ½ span only • Load path to resist loads for multiple solutions **Minutes:** ○ Team agreed there are multiple solutions associated with longitudinal stability as long as the load path is correct ○ Discussed the stiffness of the resisting members might need to be considered ○ It was pointed out that the CT check would probably follow the FW manual and may differ from other solutions ○ Team agreed the FW manual needs to clarify that multiple solutions are possible according to which load path is used	Open Discussion
1:50 – 2:00	Round Table **Minutes:** ○ Industry questioned why a PE is required to be onsite during bridge removal operations. It was stated that for small companies being onsite during removal operations is not practicable and a E.I.T. could do the job. ○ Industry commented that requiring a more robust work plan would be a better option than requiring a PE to be onsite ○ Discussed new Standard Specification requiring PE for certain operations associated with falsework and the assigned representative will need to be a PE as well ○ Industry stated the PE would have no authority to stop the work and does not accomplish anything by being onsite ○ Discussed options for stopping work if needed ○ CT commented the PE guarantees experience and being onsite has the ability to recognize situations that might not have been anticipated during the development of the plan ○ Industry stated that with a good work plan that is being followed there is no need for the PE onsite	Open Discussion
2:00	Adjourn	

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Action Items:

Items from Meeting on 1/24/19

1. CT to research origin of 150% loading at traffic openings
2. Draft falsework manual chapter 2 send to team attendees
3. Ct to develop simplified pad design and share with team
4. Post clips to be load tested and calculation reviewed

Today's Action Items

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

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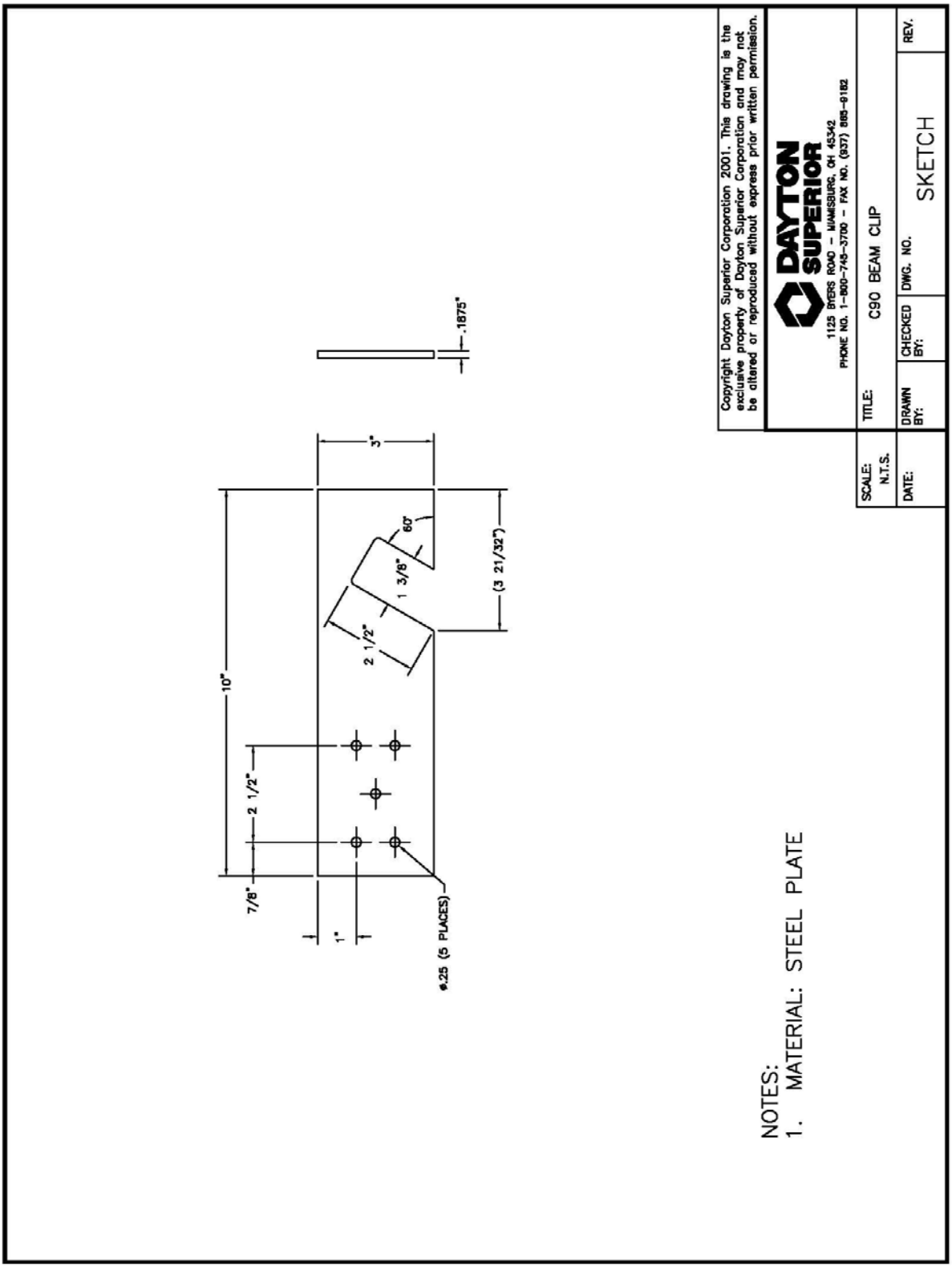
Attachment 1



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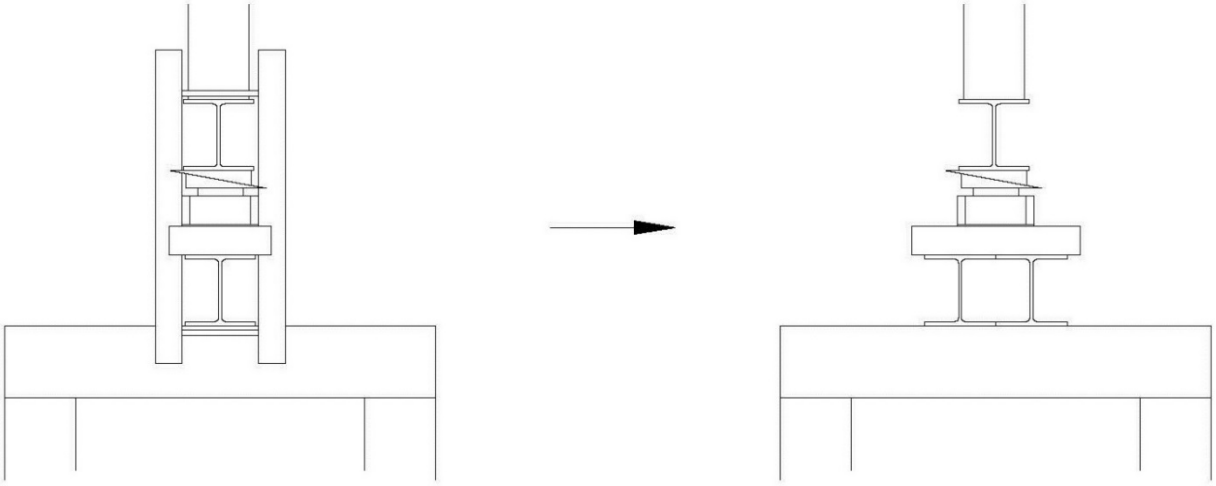
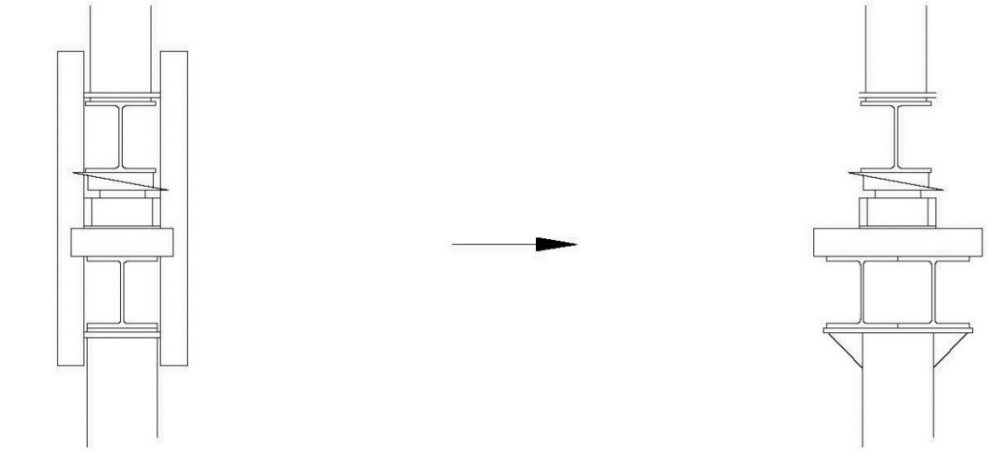
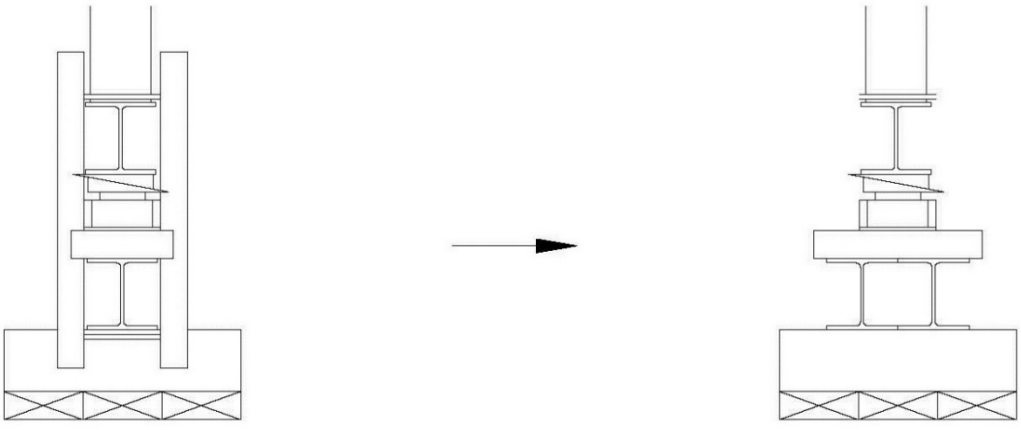
Attachment 2







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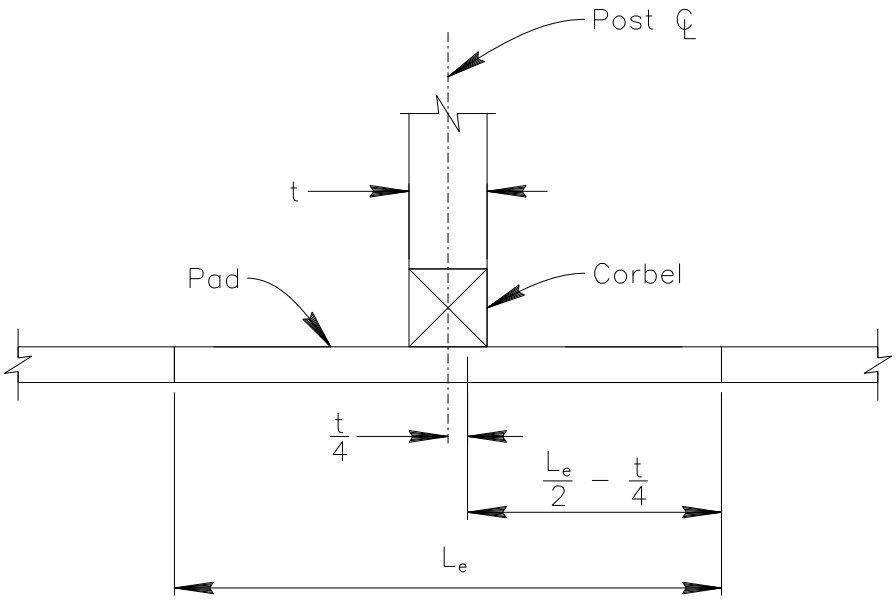
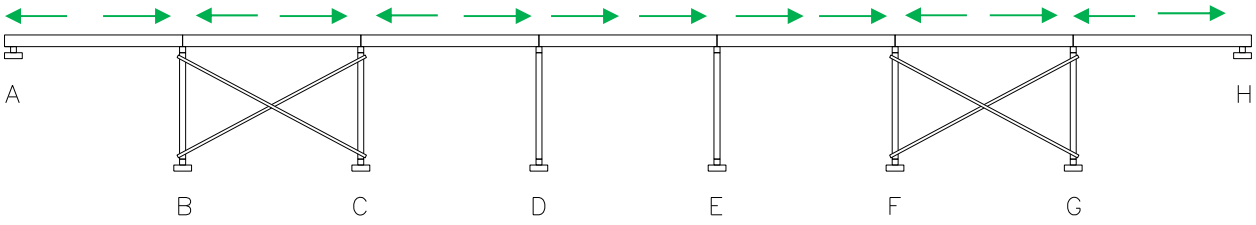
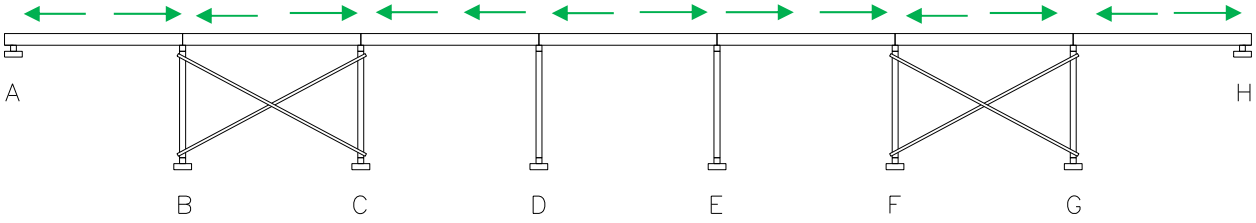
Attachment 3



Attachment 4



FW Manual



Alternative

CALTRANS/INDUSTRY FALSEWORK ADVISORY TEAM MEETING

Thursday, January 24, 2019

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