



May 15, 2013, 12:00pm – 2:00pm
URS Corporation Office, One Montgomery St., Suite 900
San Francisco, CA

Topic	Presenter	Time	Desired Outcome
1. CHAIR'S REPORT	S. Heminger, BATA		Information
2. SAN FRANCISCO-OAKLAND BAY BRIDGE UPDATES a. Status Update on Anchor Rods* 1) What caused the 2008 bolts to fail? 2) What retrofit strategy should we use for 2008 bolts? 3) Should the remaining bolts on the east pier be replaced? 4) What should be done about other similar bolts? b. Draft Bolt Report	PMT A. Fremier, BATA	1.5 hr 30 min	Information Information
4. OTHER BUSINESS			

Next TBPOC Meeting: June 6, 2013, 1:00pm – 4:00pm
1120 N Street, Sacramento, CA

BACKGROUND ON E2-T1 AND SAS A354BD ANCHOR RODS

Draft 5/11/13


DOCUMENT(S)	DISCUSSION
SAS Design Criteria	Specifically ties design to Caltrans Bridge Design Specifications dated 1995. Use of A354BD rods is noted in design criteria. Per TY Lin/Moffatt & Nichol, design calculations required use of high strength steel anchor rods and bolts at certain locations. Due to involvement of federal funding, Buy America and sole source restrictions precluded use of proprietary rods unless it could be established that there was no alternative. This led to decision to specify A354BD rods, which were generally available and could be competitively bid.
Bridge Design Specifications ASTM Specifications	1995 Caltrans Bridge Design Specifications (BDS) do not restrict use of or galvanization of A354BD. Restriction on standard use of galvanized A354BD rods first appears in 2000 BDS. ASTM specifications for A354BD from 2002-2004 period do not restrict galvanization. The specifications do caution that hydrogen stress cracking "may occur" on hot dip galvanized A354BD rods. The 2002-2004 specifications refer to A153 for galvanization process (current specification refers to A2329). Other than the reference to A153, ASTM specifications for A354BD from 2002-2004 period are generally consistent with current ASTM specifications
E2-T1 Special Provisions	E2-T1 first advertised with specifications dated January 21, 2003 (this contract was advertised twice). Specifications call for use of A354BD rods with mechanical galvanization. Information at this point regarding use of A354BDs with galvanization is verbal and still being researched. Desire for long life span led to decision for corrosion protection. The fact that mechanical galvanization was specified indicates that potential for hydrogen embrittlement was being considered, but documentation of such analysis has not been identified.
SAS Special Provisions	SAS first advertised with specifications dated February 3, 2003 (this contract was also advertised twice). Similar to E2-T1, specifications call for use of A354BD rods with mechanical galvanization.
E2-T1 Bidder Inquiries	Bidder inquiry number 7 was submitted between 1/21/03 and 4/3/03, stating that the required A354BD rods were too large to mechanically galvanize and asked how galvanization could be applied.

Misc Correspondence	<p>Several e-mails and memos dated between March 2003 and April 2003 discuss bolting specifications for SAS and bidder inquiry on E2-T1. Correspondence regarding E2-T1 indicates awareness of use of hot-dip galvanization of A354BD rods for the Richmond-San Rafael Bridge (RSRB) retrofit project. The RSRB retrofit was designed by a consultant, Ben Gerwick (the named principal of the firm was a member of the East Span Seismic Retrofit Peer Review Panel in the late 1990s, early 2000s). RSRB was originally specified with mechanical galvanization of A354BD rods, similar to E2-T1 and SAS, but this was modified during construction of the RSRB retrofit to hot dip galvanization by contract change order. The correspondence indicates that the RSRB did specifically consider and address hydrogen embrittlement in the change order by requiring blasting instead of pickling, followed by a standard tensile test. This approach was adopted for use in E2-T1.</p>
E2-T1 Addendum 3	<p>Addendum 3 to the first advertisement of the E2-T1 contract was Issued on April 4, 2003. The addendum called for hot dip galvanization of A354BD rods with blasting instead of pickling and testing per ASTM A143 (note: ASTM A143 states that testing is subject to “dimensional limitations”).</p>
SAS Addendum 8	<p>An analogous addendum was issued on June 6, 2003, for the first advertisement of the SAS contract.</p>
E2-T1 Special Provisions	<p>E2-T1 was not awarded when first advertised, and was re-advertised a second time on October 17, 2003. The readvertised contract called for hot dip galvanization of A354BD rods with blasting instead of pickling and testing per ASTM A143 (note: ASTM A143 states that testing is subject to “dimensional limitations”).</p>
SAS Special Provisions	<p>SAS was not awarded when first advertised, and was re-advertised a second time on August 1, 2005. The readvertised contract called for hot dip galvanization of A354BD rods with blasting instead of pickling and testing per ASTM A143 (note: ASTM A143 states that testing is subject to “dimensional limitations”).</p>

Location	Replace Before Opening	Replace After Opening	Reduce Tension	Monitor
E2	1. Lower shear key bolts	2. Lower shear key / bearing bolts 3. Upper shear key bolts 4. Upper bearing bolts		5. Bearing assembly bolts (bushings) 6. Bearing assembly bolts (rings)
Anchorage			7. Main cable anchor bolts	
Top of Tower			8. Saddle tie rods 9. Saddle segment splices	10. Saddle to grillage anchor bolts 11. Outrigger boom
Bottom of Tower			12. Anchor bolts 3" 13. Anchor bolts 4"	
East Cable				14. East saddle anchor bolts 15. East saddle tie rods
W2				17. Bike path anchor bolts

Handwritten: Add. #3
A 354 bolt galvanizing

Rob Reis
04/03/2003 07:31 AM

To: <jrucker@tylin.com>
cc: "Duxbury, James" <jduxbury@tylin.com>, Robert_Kobal@dot.ca.gov,
"Rob Reis \E-mail)" <rob_reis@dot.ca.gov>, "Steve Margaris
\E-mail)" <steve_margaris@dot.ca.gov>
Subject: Re: DRAFT E2/T1 Addendum No. 3 Request 

Jim,

This looks good.

Rob.

"Jim Rucker" <jrucker@tylin.com>



"Jim Rucker"
<jrucker@tylin.com>
04/02/2003 04:56 PM
Please respond to
jrucker

To: "Duxbury, James" <jduxbury@tylin.com>
cc: "Steve Margaris \E-mail)" <steve_margaris@dot.ca.gov>, "Rob Reis
\E-mail)" <rob_reis@dot.ca.gov>, <Robert_Kobal@dot.ca.gov>
Subject: DRAFT E2/T1 Addendum No. 3 Request

James,
Please review.

Steve, Rob, and Robert,
FYI/Comment as necessary. I took the 4 hour window between blast cleaning
and hot-dip galvanizing from the Richmond-San Rafael example.

Thanks,
Jim Rucker, P.E.
T.Y. Lin International
619.692.1920 voice
619.692.0634 fax

Tracking #: 0E9A76444D99DB42B5192E255721D0DD2B6A0DEA



- E2-T1 Add 3 Request(V2).doc

3/27/03 mtg minutes from Alan Chow / Metric bolts
Pier 7

Allan Chow
03/27/2003 02:44 PM

To: Jess Avila/HQ/Caltrans/CAGov@DOT
cc: Rob Reis/HQ/Caltrans/CAGov@DOT, Steve
Margaris/HQ/Caltrans/CAGov@DOT
Subject: Re: A354 & A490 bolt corrosion protection (SFOBB) [E]

Jess:

There had been several bolts issues discussed during the meeting:

(1) T.Y.Lin found three manufacturers (including BBC, Nucor) in U.S. for metric bolts.

(2) Proposed metric bolt test specifications (**Steel Committee need to review the specifications by 4/4/03, Steve Margaris will bring you the package**)

The concept is to use Skidmore to determine snug tight condition (which dependent on the splice plates thickness) and specify the amount of turn of nuts beyond snug tight.

Some states & AASHTO allow turn of the nut method. Some research was done in University of Texas. Canadian are using the method. RCSC adaptation of this method is in the work. All these info should be in the package. Any question regarding this package, please contact Marwan Nader @ T.Y.Lin directly @ 415-291-3700.

(3) TC bolts will not be used due to addition paint application - *Not manufactured in metric*

(4) A490 corrosion protection - Construction concerns about the inorganic zinc may peel off inside the nut and cause jamming. Jim present Dacromet product which requires Degreasing, Blast to white metal, Spray on application of Zinc coat, then bake at 615 degree F for 15 min. Akashi Bridge in Japan use this product. Construction concerns the time required to approve the new product. (The process seems to be IC fastener process which is recommended by FHWA.) The other option is use organic zinc, but California's high standard of VOC requirement prohibit application of this coating. If the bolts are manufactured out of state which has lower VOC std., that is O.K. Organic Zinc performs better, no need to blast clean, thinner film, less nut jamming problem. At this point, Construction suggest to specify black A490 bolt and will consider a change order later on.

(5) A354 BD grade bolt corrosion protection - Due to the size of these bolts, the cleaning process will be blasting to SP10 condition, then hot dip. Rob has concerns with strain age embrittlement and suggested to test the final product with ASTM A143 "Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement". T.Y.Lin & Construction agree. Also, Construction will investigate the change order in Richmond-San Rafael to determine the applicability of this method.

(6) Bolt sampling & testing - METS distributed the suggested sampling & testing spec. The decision is QC report need to be furnish before release. Release tag is required before shipment.

bolt

Allan

Jess Avila

Relocate Staircase Handrail <u>Pylon S1 and S2</u> Internal Diaphragms Pylon S2 Elev. 89.00 Diaph. Handrail Pylon S2 Access Platform Handrail <u>Fort Point Arch</u> Outer Rib Deck Truss Bracing <u>Temporary Structure Support</u> Columns Rolled shapes, plates, bars Structural tubing bracing Steel pipe Tubing Sleeve <u>Traveler Rails</u> (including mounting brackets)	ASTM Designation: A 53, Grade B ASTM Designation: A 572 Grade 50 ASTM Designation: A 53, Grade B ASTM Designation: A 53, Grade B ASTM Designation: A 709 T Zone 2 Grade 50 ASTM Designation: A 572 Grade 50 ASTM Designation: A 709 T Zone 2 Grade 50 ASTM Designation: A 500 Gr B (fy=46ksi) ASTM Designation: A 53, Grade B ASTM Designation: A 513 Type 5 ASTM Designation: A 709 Grade 50
High strength low alloy columbium vanadium steel	ASTM Designation: A 709 WT Zone 2 Grade 50 or ASTM Designation: A 709 T Zone 2 Grade 50
High strength low alloy structural steel	ASTM Designation: A 709 WT Zone 2 Grade 50 or ASTM Designation: A 709 T Zone 2 Grade 50
Steel fasteners for general applications: Bolts and studs which include threaded rods and nonheaded anchor bolts Nuts Washers	ASTM Designation: A 307 or AASHTO Designation: M 314, Grade 36 or 55 ASTM Designation: A 563 including Appendix X1 ^(b,c) ASTM Designation: F 844
High strength steel fasteners: Bolts for structural steel joints Temporary Structure Support Lock Bolts All other steel joints Bolts and studs which include threaded rods and nonheaded anchor bolts, for general applications Unless otherwise noted	ASTM Designation: A 325X ASTM Designation: A 325N ASTM Designation: A 325X ASTM Designation: A 449 (Fu=120 ksi)
South Approach Viaduct HS Threaded Rod Anchor Bolts Temporary Structure Support HS Threaded Rod Anchor Bolts <u>Fort Point Arch</u> Deck Truss Top Chord	ASTM Designation: A 354 Grade BD ASTM Designation: A 354 Grade BD ASTM Designation: A 722 Type 2 (Fpu=150ksi)

Steel pipe (Hydrostatic testing will not apply)	ASTM Designation: A 53, Type E or S, Grade B; A 106, Grade B; or A 139, Grade B
(a) Grades that may be substituted for the equivalent ASTM Designation: A 709 steel, at the Contractor's option, subject to conformance with all chemical and mechanical properties of the specified A 709 steel.	
(b) Nuts made and marked in accordance with the requirements of ASTM Designation: A 194/A 194M, Grade 2H are an acceptable substitution for heavy hex nuts complying with ASTM Designation: A 563, Grade DH. This substitution is permitted, provided that the zinc coating, overtapping, lubrication, rotational capacity requirements and testing of the substituted nuts meet the same requirements as specified for the A 563 nuts, including all supplementary requirements. Proof load testing and stresses required for ASTM A 194 zinc-coated nuts shall be the same as required for ASTM A 194 plain uncoated nuts.	
(c) All zinc-coated nuts that will be tightened beyond snug or wrench tight shall be furnished with a dry lubricant conforming to Supplementary Requirement S2 in ASTM Designation: A 563.	

Except as otherwise shown on the Plans, high strength fastener assemblies, high strength steel bars, nuts, washers, and couplers shall be galvanized in accordance with Section 75-1.05 "Galvanizing," of Standard Specification. All ASTM A325 bolts shall be mechanically galvanized.

High strength threaded rods and couplers for anchor bolt assemblies shall be manufactured from steel conforming to AISI Grade 1040 or 4140, quenched and tempered steel. Each high-strength threaded coupler shall be tested for hardness by the Contractor. Each high-strength threaded coupler shall be permanently marked with the manufacturer's identification and "DH".

High strength threaded rod anchor bolts and couplers on the South Viaduct tower/bent columns and Temporary Structure Support columns shall not be galvanized.

Hot dip galvanizing of high strength threaded rods and steel bars with an ultimate tensile strength of 150 ksi shall be cleaned and prepared by abrasive blast cleaning. Acid pickling or other process that will result in hydrogen embrittlement shall not be used.

An approved thread locking system, consisting of a cleaner, primer and anaerobic adhesive, shall be applied where shown on the plans. Lubricants and foreign materials shall be removed from the threaded areas of both parts using the cleaner and small wire brush. The primer shall be applied to cover the threaded areas of both parts. The anaerobic adhesive shall be applied to fill the male threads in the area of the final position of the nut. The nut shall be installed at the location or to the torque shown on the plans, and an additional fillet of anaerobic adhesive shall be applied completely around the exposed junctions of the nut and male part.

The second paragraph in Section 55-2.01, "Description," of the Standard Specifications is deleted.

The first paragraph in Section 55-2.02, "Structural Steel," of the Standard Specifications is hereby deleted and replaced with the following:

55-2.02 Structural Steel. Unless otherwise specified or shown on the Plans, all structural steel plates and shapes shall conform to ASTM Designation as specified in this section "Steel Structures"

Check Testing. Structural steel shall conform to the specified ASTM Designations and the check testing requirements of this section.



TOLL BRIDGE PROGRAM OVERSIGHT COMMITTEE

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION

TBPOC MEETING MINUTES

May 15, 2013, 12:00 PM – 2:00 PM

URS Corporation Office, One Montgomery St., Suite 900
San Francisco, CA

Attendees: TBPOC Members: Steve Heminger (Chair), Andre Boutros, and Malcolm Dougherty
PMT Members: Tony Anziano, Andrew Fremier, and Stephen Maller
Participants: Ade Akinsanya, Bill Casey, Michele DiFrancia, Andrew Gordon, Ted Hall, Beatriz Lacson, Richard Land, Peter Lee, Steve Margaris, Brian Maroney, Dina Noel, Jim Rucker, Bijan Sartipi, and Ken Terpstra
Guests: TY Lin/M&N: Sajid Abbas, James Duxbury, Dennis Jang, Marwan Nader, Jim Rucker; ABF: Brian Petersen; AVS/METS: Mazen Wahbeh

Convened: 12:09 PM

Items		Action
1.	CHAIR'S REPORT <ul style="list-style-type: none">None given.	
3.	SAN FRANCISCO-OAKLAND BAY BRIDGE UPDATES <ul style="list-style-type: none">a. Status Update on Anchor Rods<ul style="list-style-type: none">1. What caused the 2008 bolts to fail?2. What retrofit strategy should we use for 2008 bolts?3. Should the remaining bolts on the east pier be replaced?4. What should be done about other similar bolts?The Chair noted that while he has received a lot of materials on this matter, he still does not have the minutes of the earliest design meetings from the late 1990s/ early 2000s.1. <u>What caused the 2008 bolts to fail?</u> The Chair referred to T. Anziano's document (Background on E2-T1 and SAS A354BD Anchor Rods) and commented that he was struck by the	<ul style="list-style-type: none">S. Margaris and J. Rucker to provide all pertinent meeting minutes to the TBPOC.

(Continued)

Items	Action
<p>disparity between the 1995 Caltrans Bridge Design Specifications (BDS), which do not restrict galvanization of A354BD rods, and the 2000 BDS which do.</p> <ul style="list-style-type: none"> ➤ Per M. Nader, the 1998 design was tied to the 1995 BDS. As a matter of consistency of code, galvanized A354 BD rods were used. He referred to binders of calculations, demands, etc., and described the process of bolt selection, the challenges involved, and concluded that it was testing that failed – not the bolts. ➤ J. Rucker presented a brief timeline of events from January 1999 to date. ○ Discussion items included: ASTM standards, sole sourcing, group decision to galvanize the A354 BDs, choice between one galvanizing process and another (mechanical galvanization vs. hot dip galvanization), blasting vs. pickling, comparison with Richmond-San Rafael Bridge, corrosion protection. ○ A. Fremier handed out a page from the Golden Gate Bridge contract which showed the use of A354 BD anchor bolts, both mechanically galvanized and not galvanized, on different parts of the bridge. ○ S. Margaris handed out copies of a memo from J. Rucker on Draft-E2/T1 Addendum No. 3 Request (A354 bolt galvanizing), and minutes of 3/27/2013 meeting on A354 & A490 bolt corrosion protection (SFOBB), from A. Chow. ○ <u>2. What retrofit strategy should we use for 2008 bolts?</u> In response to the Chair's question as to when sufficient knowledge might be acquired to come up with a schedule regarding Labor Day bridge opening, B. Petersen gave an update of current activities, and indicated that ABF could not commit to a date until the saddle 	<ul style="list-style-type: none"> ● ABF to give the TBPOC a schedule update at the end of May.

(Continued)

Items	Action
<p>fabrication is locked down.</p> <ul style="list-style-type: none"> ○ <u>3. Should the remaining bolts on the east pier be replaced?</u> ○ <u>4. What should be done about other similar bolts?</u> <p>The Chair referred to his e-mail to the TBPOC and PMT, dated May 13, 2013, on Bolt Workshop #3, which had his comments on the above questions. In response to the Chair's query as to whether any additional testing data from the lab on the downstairs bolts have been received, M. Wahbeh distributed a handout showing updated testing results for 2008 A354 Gr. BD Anchor Rods (96 Rods) and 2010 A354 Gr. BD Anchor Rods (192), Charpy Sample SEM Fracture Comparison, and E2 Shear Key Hardness Readings – 192 Rods (Fabricated in 2010). He referred to pages 3-5 which showed the mechanical testing results for all four full-size sample rods (2010), and pointed to the comparison between the 2008 and 2010 charpy fracture surface samples on page 6.</p> <ul style="list-style-type: none"> ○ Discussion items included: testing of upstairs bolts; range of tests; expanding testing resources; surface hardness test on other bolts; test on tower foundation anchor bolts; availability of a comprehensive testing plan. ○ M. Nader indicated that by the end of July when testing will be completed, more data will be available and more work can be done. ○ The Chair expressed frustration in not having more information. He assured the team that if additional resources and direction are needed, the TBPOC will provide them. ○ The Chair referred to the chart, attached to his 5/13/2013 e-mail, which he drafted to sort out the bolts. He described each column (Location, 	<ul style="list-style-type: none"> ● B. Maroney to provide a testing plan in a week's time. ● Move #7 (Main cable anchor bolts) on the chart from the Reduce Tension column to the Monitor column.

(Continued)


Items	Action
<p>Replace Before Opening, Replace After Opening, Reduce Tension, and Monitor), and remarked about making some decisions about these prior to the Townsend test, or wait until July.</p> <ul style="list-style-type: none">○ B. Casey handed out, for TBPOC information, a spreadsheet on E2 Shear Key S1/S2 and Anchor Rod CCO Tracking Status, as of 5/15/2013, with rough order of magnitude figures for field work and fabrication, excluding testing activity.<ul style="list-style-type: none">➤ The spreadsheet was developed to track the expenditure of the TBPOC-approved amounts of \$4.3 M and \$1 M for all E2 shear key anchor bolt activity and the wet test of 2010 bolts, respectively.• The Chair acknowledged the amount of work and strain that people are under, and expressed the Committee's appreciation for all the work being done under pressure and criticism. He noted that every passing day makes Labor Day opening harder to achieve; that we do want to complete this job, but we need to do it well and do it right. He thanked the teams for their efforts, and indicated that the group will meet again at the end of the month. <p>b. Draft Bolt Report</p> <ul style="list-style-type: none">• Not discussed.	
<p>6. OTHER BUSINESS</p> <ul style="list-style-type: none">• N/A	

Adjourned: 1:38 PM

(Continued)

TBPOC MEETING MINUTES
May 15, 2013, 12:00 PM – 2:00 PM

APPROVED BY:



STEVE HEMINGER, TBPOC Chair
Executive Director, Bay Area Toll Authority

6/6/13
Date



ANDRE BOUTROS,
Executive Director, California Transportation Commission

6/6/2013
Date



MALCOLM DOUGHERTY
Director, California Department of Transportation

6/6/2013
Date