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Summary Timeline of Decision to Follow National Standards For Bolts Set by American Society for Testing and Materials

November 2002: Original bridge-specific construction specifications called for A 354 BD steel fasteners with no particular corrosion protection specification. It also called for a number of mechanically galvanized A 490 fasteners.

Jan. 10, 2003: Caltrans Structure Steel Technical Committee (“Steel Committee”) chair Lian Duan wrote a letter to Ade Akinsanya, office chief for the San Francisco-Oakland Bay Bridge East Span Seismic Safety Project (“SFOBB-ESSSP”) noting, under the heading “Constructability,” that “the use of Type 3 A490 bolts is not appropriate in marine environment.” Under the heading “Technical Specifications,” it noted “mechanical galvanizing of A490 bolts is not recommended by RCSC.” The letter considered another type of corrosion protection, but concluded “painting of A490 bolts will not provide adequate corrosion resistance.” The Steel Committee letter suggested: “Consider alternative materials.” The same Jan. 10, 2003, Steel Committee letter also called for adding corrosion protection to the specifications: “Provide corrosion resistance specifications for A354 BD fasteners.”

Feb. 28, 2003: Marwan Nader, of TY LIN International, and Moffatt & Nichol, a joint venture, wrote a Response to Comments from Steel Committee. He wrote that the A490 fasteners “are inside the cap beam and encased in concrete.”

Regarding the Steel Committee’s observation about corrosion protection for A354 BDs, Nader asked for potential alternatives if mechanical galvanization was not permitted: “This issue was discussed in a construction meeting on 2/25/03” and that both “Caltrans and the (joint venture) are looking into this.” He wrote that if mechanical galvanizing was not permitted, “it will be removed from the specs and only inorganic zinc coating will be specified.” He noted that the joint venture was considering the use of “Dacromet (zinc/aluminum/chromium coating)” as a possible alternative.

March 13, 2003: Dyson Corporation, the bolt manufacturer, sent a fax to James Duxbury at TY Lin, which included a contract change order from Caltrans to Tutor Saliba/Koch/Tidewater, contractor on the Richmond/San Rafael Bridge project, dealing with galvanizing of “high strength rod assemblies.” The change order had allowed such rods on the Richmond/San Rafael Bridge, but required that they “... shall be galvanized in accordance with Section 75-1.05 of the Standard Specifications ...” It also said “dry blast cleaning” could be used “in lieu of ... cleaning in pickling solution.”

March 18, 2003: Marwan Nader of TY Lin wrote a memo to Caltrans, noting that, based on the 2/25/03 construction team meeting, unspecified recommendations have been made “for corrosion protection of A354BD.”

March 18, 2003: Jim Rucker, of TY Lin, sent an email to Caltrans engineers saying mechanical galvanizing of the bolts wouldn’t work “because the bars are too long and too heavy. A revised galvanization procedure is required.” He then noted that “Caltrans approved a procedure for galvanizing ASTM Grade BD bars for the Richmond/San Rafael Bridge” and that “Dyson Corporation has followed this procedure for thousands of bars ...” Rucker asked whether

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that procedure could be used as an alternative.

March 27, 2003: Allan Chow of Caltrans wrote an email that served as minutes of a meeting to Jess Avila, Rob Reis and Steve Margaris of Caltrans. He discussed the challenges of using Dacromet for A490 corrosion protection, and noted that “Akashi Bridge in Japan use[d] this product. (The process seems to be IC fastener process which is recommended by FHWA.)” He noted, however, that “Construction [has] concerns [with] the time required to approve the new product.” “The other option is use organic zinc,” he wrote, but suggested California emission laws may have precluded it. “If the bolts are manufactured out of state which has lower VOC [standard], that is O.K.” In the March 27 email, Chow offered more reasons to reject Dacromet. “Organic zinc performs better, no need to blast clean, thinner film, less nut jamming problem,” he wrote. “At this point, Construction suggests to specify black A490 bolt and will consider a change order later on.”

In the same email, Chow also wrote about discussion of the A354 connectors: “Due to the size of these bolts, the cleaning process will be blasting ... then hot dip.” He also noted that “Rob has concerns with strain age embrittlement” and suggested testing the product according to ASTM A143 “Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.”

That same day, James Druxbury of TY Lin sent an email to Robert Kobal at Caltrans that included the same change order dealing with dry blasting and galvanizing on the Richmond-San Rafael Bridge in the past.

April 1, 2003: Robert Kobal from Caltrans, sent an email to James Duxbury at TY Lin, cc-ing Rob Reis, Gary Pursell. “Just got a fax from the Richmond project” he wrote, and noted that his point of contact on that bridge “says had no problems that he knows of, but was uncertain about any strain aging possibilities.” He references both ASTM 123 and ASTM 143 protocols and suggests taking extra steps for precaution: “How about the added phrase ‘The contractor shall also provide certified test reports showing that the rods and nuts conform to the specifications of ASTM Designation A143.’”

April 2, 2003: Andrew Grower, of Caltrans, sent an email to Robert Kobal and others saying he was “looking into testing and fabrication requirements” from the use of hot-dip galvanized rods on the Richmond-San Rafael Bridge: “The rods are blasted vice being ‘pickled’ in an effort to reduce/avoid hydrogen embrittlement.” And, he wrote, “tensile tests are performed after galvanizing to ensure the minimum strength required has been maintained. Tensile specimens are verified for strength achieved and for required elongation per A722. This ensures adequate ductility.”

April 3, 2003: Robert Kobal of Caltrans writes to other Caltrans engineers that it “looks like this change does the trick for galvanizing HS rods.”

The next day, Addendum No. 3 to the bridge contract specified that the A 354BD fasteners would be treated for corrosion protection with the dry-blast, hot-dip method.

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May 22, 2003, TY Lin requested Addendum No. 8, which, among other things, specified the dry-blast method of avoiding pickling and declared that the rods be galvanized within four hours of their dry-blast cleaning.

June 6, 2003, Caltrans issued Addendum No. 8 with those provisions.

