



**BAY AREA TOLL AUTHORITY**  
 JOSEPH P. BORT METROCENTER  
 101 EIGHTH STREET, OAKLAND, CA 94607-4700  
 TEL 510.817.5700  
 TTY/TDD 510.817.5769  
 FAX 510.817.5848  
 EMAIL [info@mtc.ca.gov](mailto:info@mtc.ca.gov)  
 WEB [www.mtc.ca.gov](http://www.mtc.ca.gov)

**BAY AREA TOLL AUTHORITY (BATA) MEETING**  
 9:30 a.m. Wednesday, March 27, 2013  
 Joseph P. Bort MetroCenter  
 Lawrence D. Dahms Auditorium  
 101 8<sup>th</sup> Street, 1<sup>st</sup> Floor  
 Oakland, CA 94607

**AMY REIN WORTH, CHAIR**  
 Cities of Contra Costa County

**DAVE CORTESE, VICE CHAIR**  
 Santa Clara County

**ALICIA C. AGUIRRE**  
 Cities of San Mateo County

**TOM AZUMBRADO**  
 U.S. Department of Housing  
 and Urban Development

**TOM BATES**  
 Cities of Alameda County

**DAVID CAMPOS**  
 City and County of San Francisco

**BILL DODD**  
 Napa County and Cities

**DORENE M. GIACOPINI**  
 U.S. Department of Transportation

**FEDERAL D. GLOVER**  
 Contra Costa County

**SCOTT HAGGERTY**  
 Alameda County

**ANNE W. HALSTED**  
 San Francisco Bay Conservation  
 and Development Commission

**STEVE KINSEY**  
 Marin County and Cities

**SAM LICCARDO**  
 San Jose Mayor's Appointee

**MARK LUCE**  
 Association of Bay Area Governments

**JAKE MACKENZIE**  
 Sonoma County and Cities

**JOE PIRZYNSKI**  
 Cities of Santa Clara County

**JEAN QUAN**  
 Oakland Mayor's Appointee

**BIJAN SARTIPI**  
 State Business, Transportation  
 and Housing Agency

**JAMES P. SPERING**  
 Solano County and Cities

**ADRIENNE J. TISSIER**  
 San Mateo County

**SCOTT WIENER**  
 San Francisco Mayor's Appointee

**STEVE HEMINGER**  
 Executive Director

**ANDREW B. FREMER**  
 Deputy Executive Director

*The Bay Area Toll Authority (BATA) considers matters related to the Toll Bridge Accounts, Toll Bridge Seismic Retrofit Program and the Regional Measure 1 (RM 1) Bridge Improvement Program.*

This meeting is scheduled to be audiocast live on MTC's Web site: [www.mtc.ca.gov](http://www.mtc.ca.gov)

## **AGENDA**

### **ACTION RECOMMENDED\*\*** Confirm Quorum

#### 1. Roll Call

#### 2. Pledge of Allegiance

#### 3. Compensation Announcement (Committee Secretary)

Information

#### 4. Chair's Report – Rein Worth

Information

**BATA Resolution No. 107, In Memoriam Resolution of Appreciation for Bimla Rhinehart**

#### 5. Consent:

Authority Approval

- a) Minutes – February 27, 2013 meeting.\*
- b) Draft Minutes – March 6, 2013 BATA Oversight meeting.\*

#### 6. BATA Resolution No. 70, Revised – Bay Area Infrastructure Financing Authority (BAIFA)\* (Andrew Fremier).

Authority Approval

*The Authority will be asked to approve BATA Resolution No. 70, Revised, which amends the existing BAIFA board membership in preparation for BAIFA's assumption of responsibility for development, operation and financing of the Regional Express Lane Network.*

#### 7. Public Comment / Other Business / Adjournment / Next Meeting:

Information

Wednesday, April 24, 2013 at 9:30 a.m.  
 Joseph P. Bort MetroCenter  
 Lawrence D. Dahms Auditorium  
 101 8<sup>th</sup> Street, 1<sup>st</sup> Floor, Oakland, California.

- \* Attachment sent to Authority members, key staff and others as appropriate. Copies will be available at the meeting.
- \*\* All items on the agenda are subject to action and/or change by the Authority. Actions recommended by staff are subject to change by the Authority.
- + Non-voting Member.
- ++ Item will be distributed at the meeting.

**Quorum:** A quorum of this Authority shall be a majority of its regular voting members (10).

**Public Comment:** The public is encouraged to comment on agenda items at committee meetings by completing a request-to-speak card (available from staff) and passing it to the committee secretary. Public comment may be limited by any of the procedures set forth in Section 3.09 of MTC's Procedures Manual (Resolution No. 1058, Revised) if, in the chair's judgment, it is necessary to maintain the orderly flow of business.

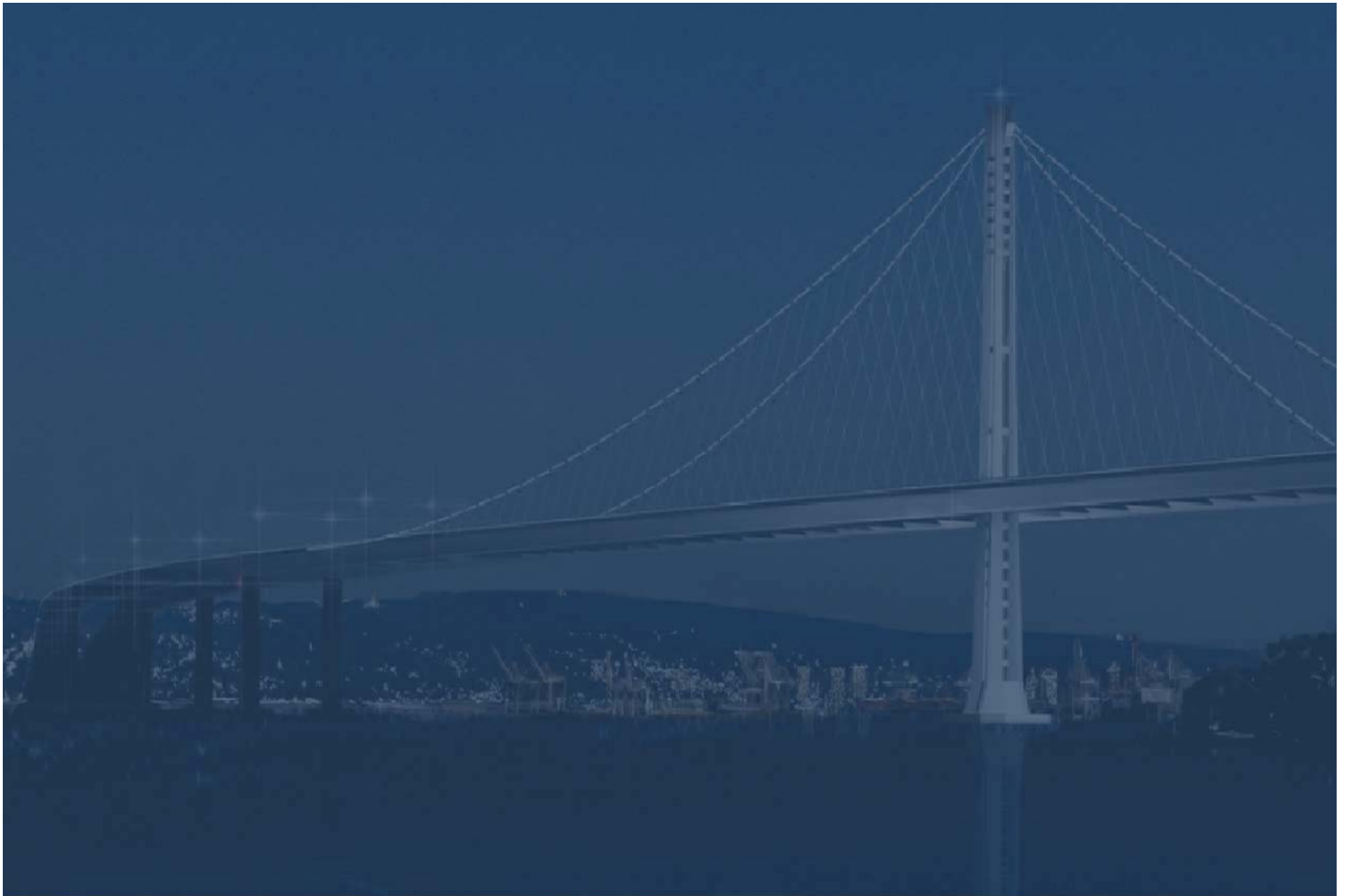
**Meeting Conduct:** If this meeting is willfully interrupted or disrupted by one or more persons rendering orderly conduct of the meeting unfeasible, the Chair may order the removal of individuals who are willfully disrupting the meeting. Such individuals may be arrested. If order cannot be restored by such removal, the members of the committee may direct that the meeting room be cleared (except for representatives of the press or other news media not participating in the disturbance), and the session may continue.

**Record of Meeting:** BATA meetings are recorded. Copies of recordings are available at nominal charge, or recordings may be listened to at MTC offices by appointment. Audiocasts are maintained on MTC's Web site for public review for at least one year.

**Accessibility and Title VI:** MTC provides services/accommodations upon request to persons with disabilities and individuals who are limited-English proficient who wish to address Commission matters. For accommodations or translations assistance, please call 510.817.5757 or 510.817.5769 for TDD/TTY. We require three working days' notice to accommodate your request.

**可及性和法令第六章:** MTC 根據要求向希望來委員會討論有關事宜的殘疾人士及英語有限者提供服務/方便。需要便利設施或翻譯協助者，請致電 510.817.5757 或 510.817.5769 TDD / TTY。我們要求您在三個工作日前告知，以滿足您的要求。

**Acceso y el Título VI:** La MTC puede proveer asistencia/facilitar la comunicación a las personas discapacitadas y los individuos con conocimiento limitado del inglés quienes quieran dirigirse a la Autoridad. Para solicitar asistencia, por favor llame al número 510.817.5757 o al 510.817.5769 para TDD/TTY. Requerimos que solicite asistencia con tres días hábiles de anticipación para poderle proveer asistencia.



THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION



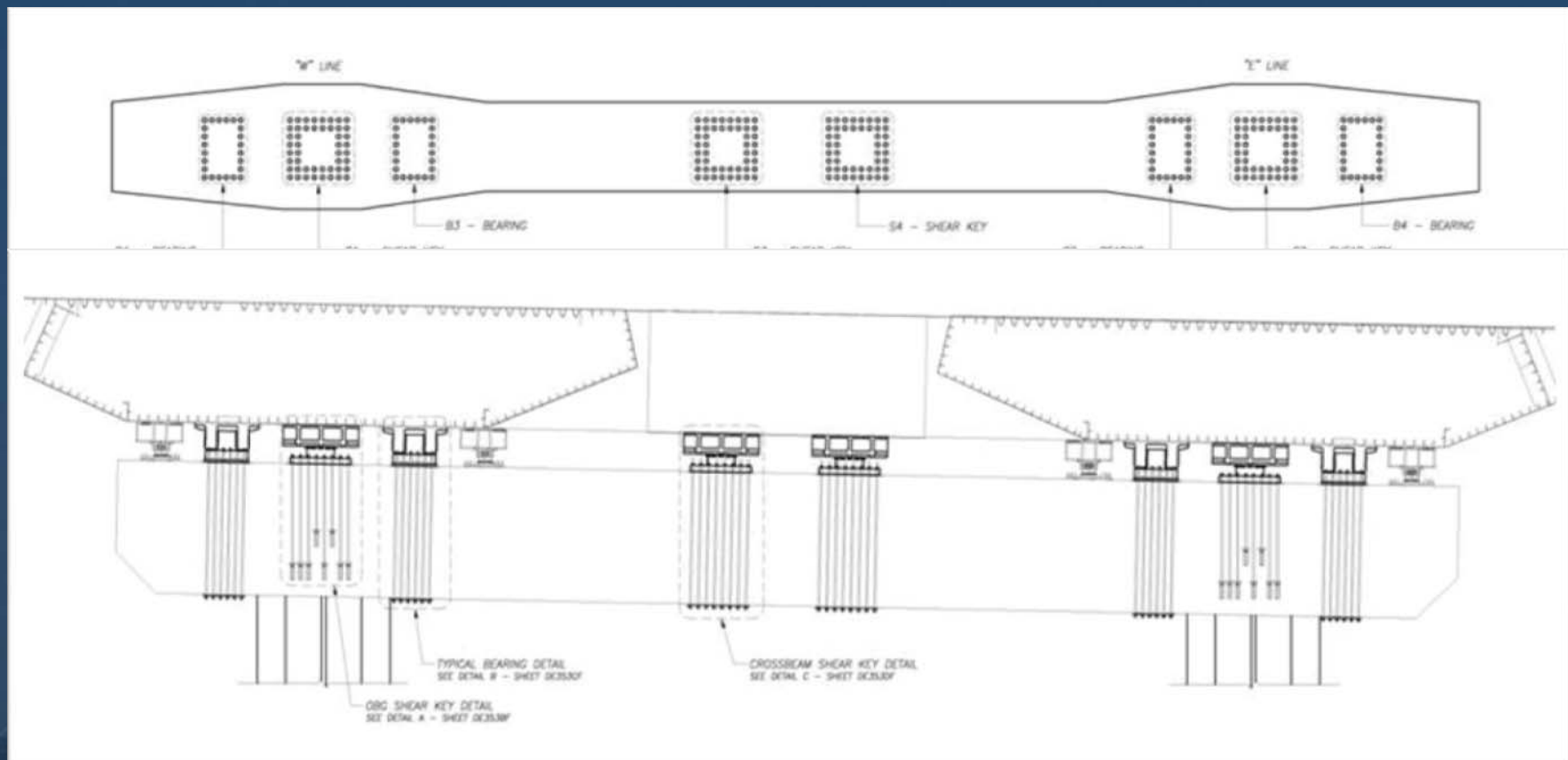
THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION



THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION



**Bearings and shear keys are secured to E2 by 3 inch diameter anchor rods, ranging from 9 feet to 24 feet in length**

**Each bearing has 24 anchor rods and each shear key has 48 anchor rods for a total of 288 anchor rods**



THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION





THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION





THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION





THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

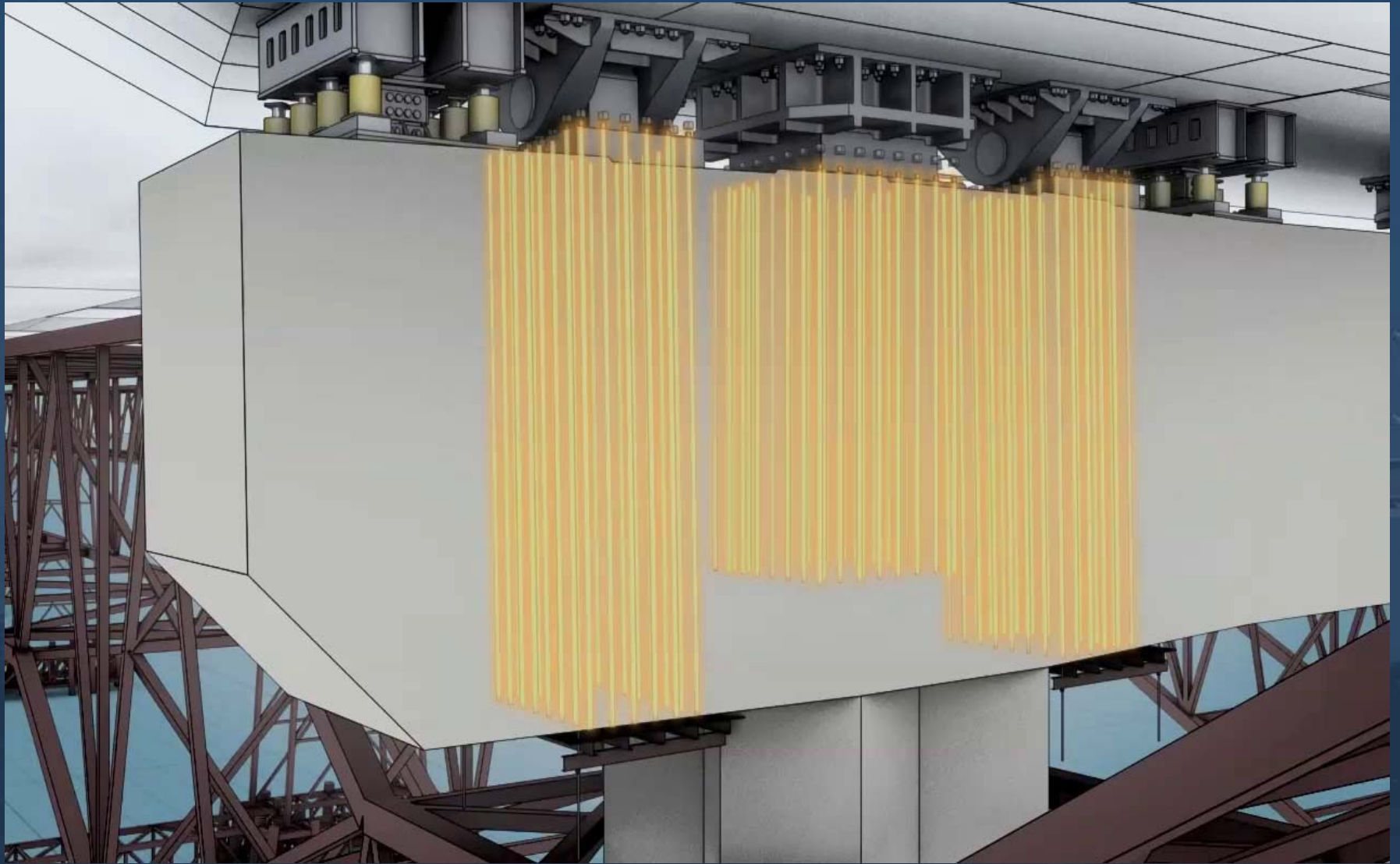
CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION





THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

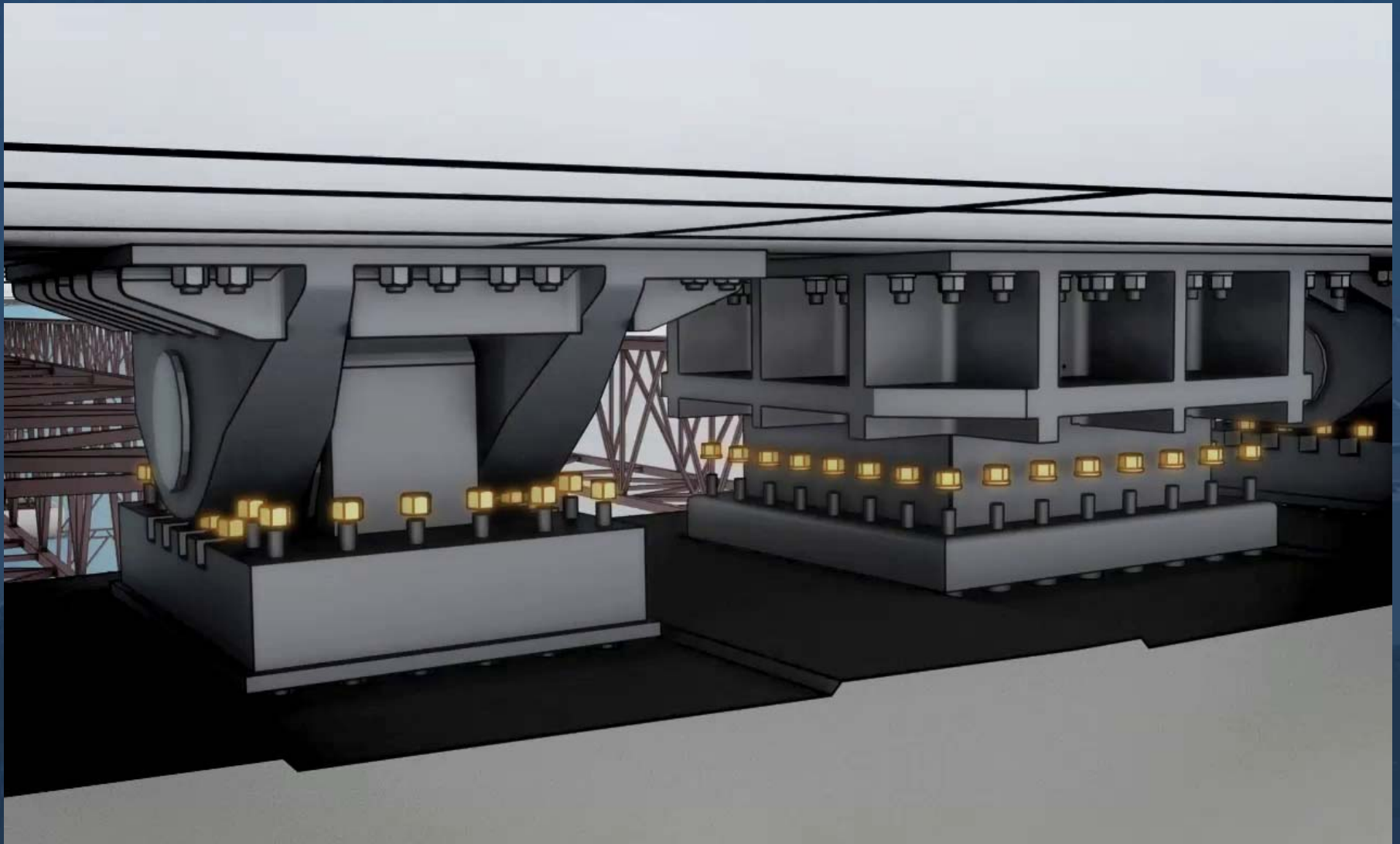
CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION



THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

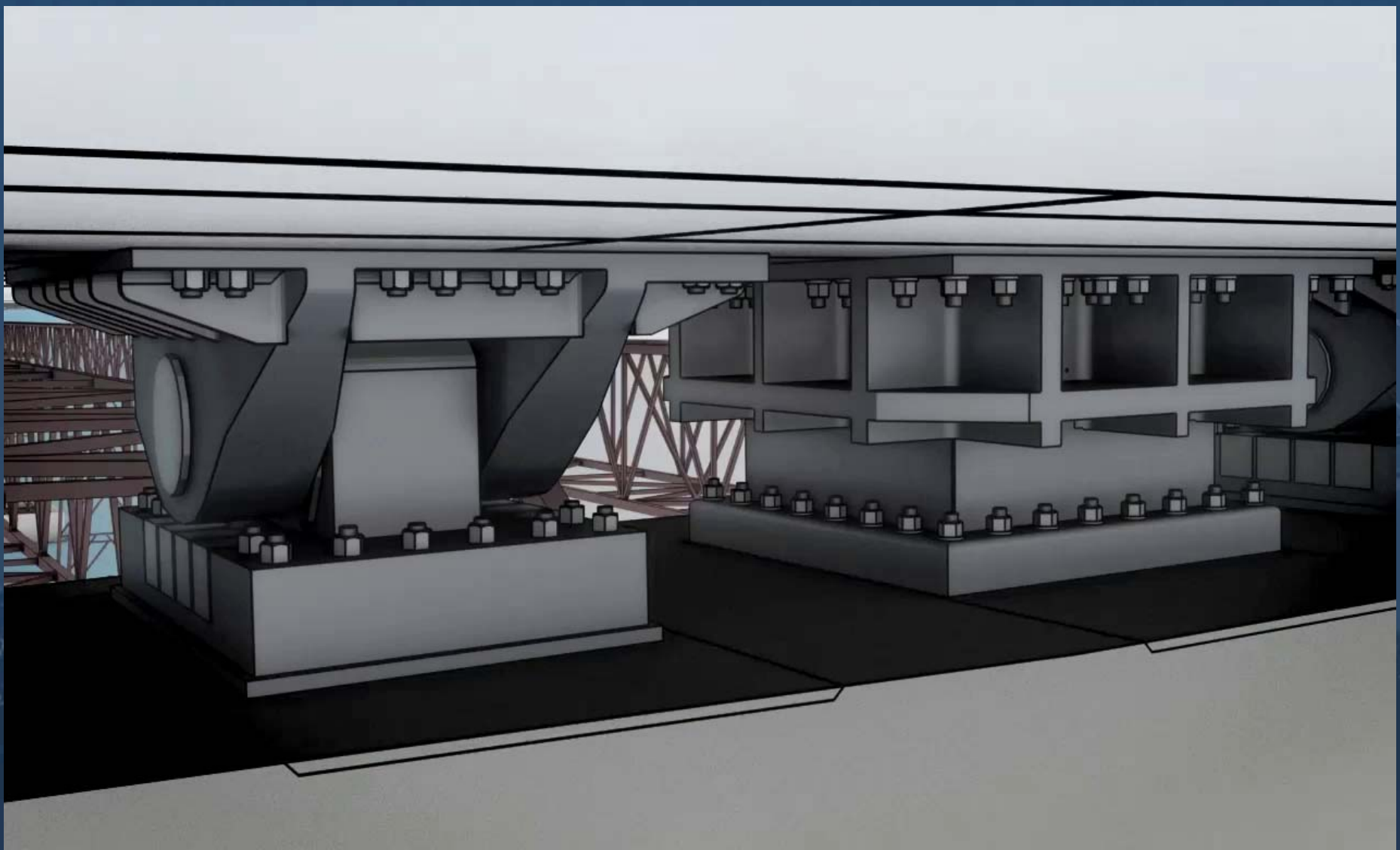
CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION





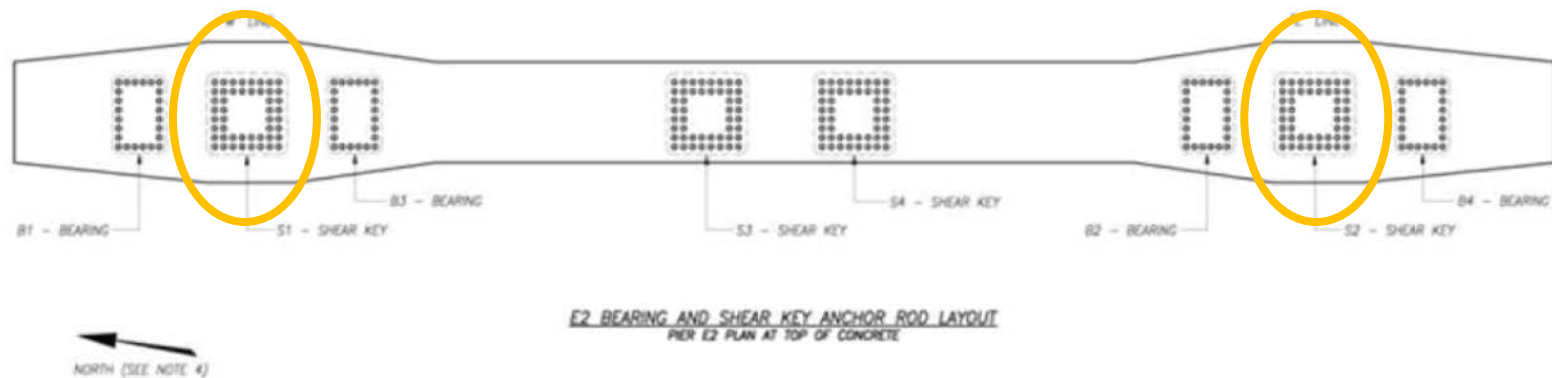
THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION



THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION



**A number of S1 and S2 shear key anchor rods at pier E2 have broken after tensioning.**

**Rods were tensioned in between March 1 and March 5.**

**Broken rods were discovered between March 8 and March 15.**

**Remaining rods have been untensioned pending resolution of problem.**



THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

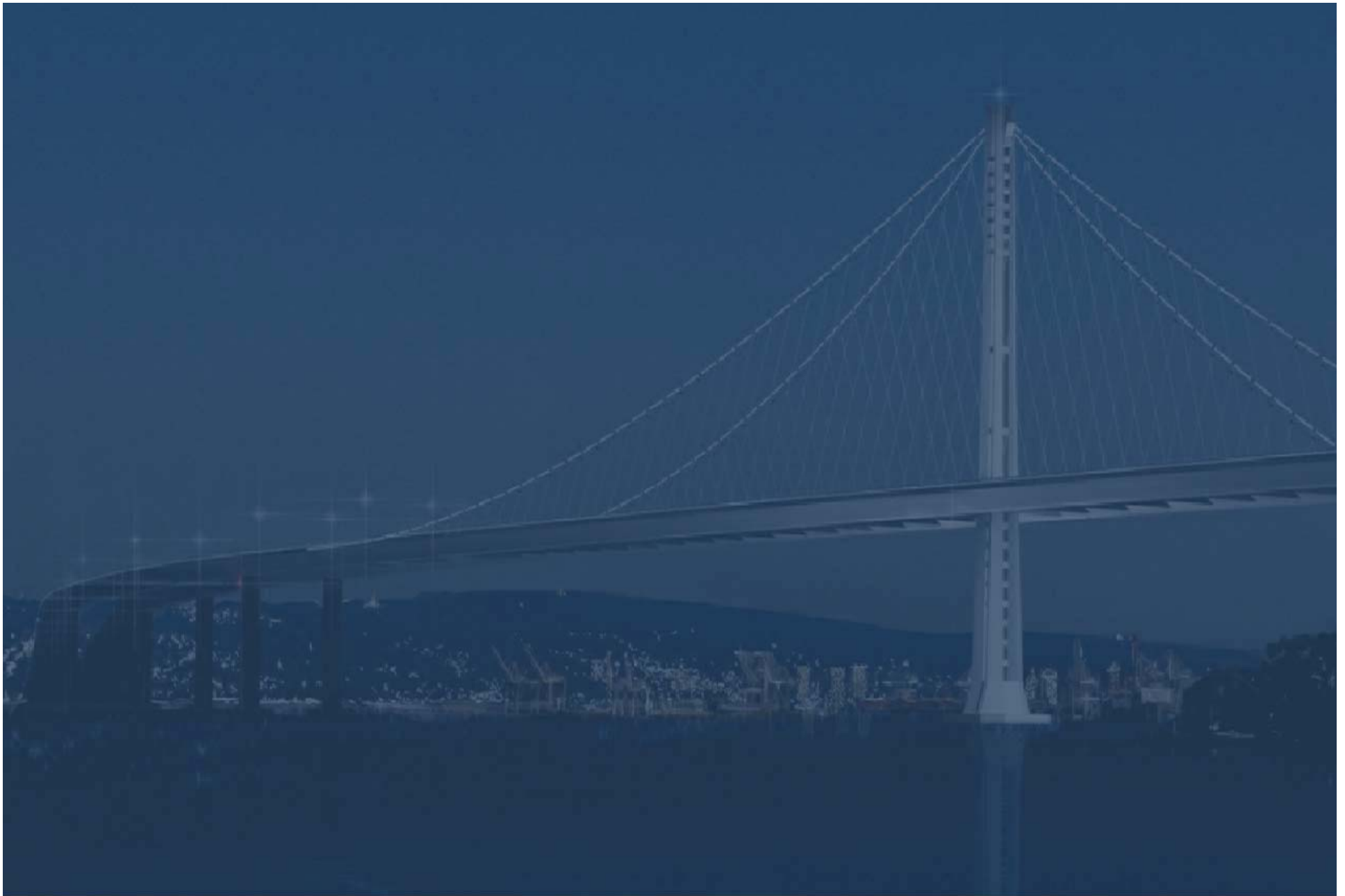
CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION





THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION



THE SAN FRANCISCO-OAKLAND  
**BAY BRIDGE**  
SEISMIC SAFETY PROJECT

CALTRANS BAY AREA TOLL AUTHORITY CALIFORNIA TRANSPORTATION COMMISSION

CHAIR AMY REIN WORTH: First of all, under the Chair's Report, we have one item listed, but, in addition, in lieu of the urgency of the recent information regarding the issues surrounding the Bay Bridge construction, I would like to now proceed with the presentation from our staff and Caltrans, with regard to the construction issues that have been raised, and also invite the commissioners, if you have any questions during the course of this presentation, to feel free to ask them. So with that, I'd like to turn the meeting over to our Executive Director, Steve Heminger.

STEVE HEMINGER: Thank you, Madam Chair. Good morning, Commissioners, and as I think you may have read in your morning newspaper, we've got some busted bolts on the new Bay Bridge. They are located... and I think you can see it on the diagram on the screens... at the East Pier of the self-anchored suspension bridge. The West Pier you can see on the far left on the island, and the East Pier is the first set of piers to the east of the tower, and they are located at that point and function to tie the roadway decks into the pier. And the Toll Bridge Program Oversight Committee, which I chair, has been dealing with this issue for several days now, since the bolts were discovered, and we decided it made sense to provide this board a briefing about it today, which is why we've asked Tony Anziano, the Program Manager for Caltrans, to be here. Tony's sitting there in the middle, and his two amigos are with him—Stephen Maller to his left, from the California Transportation Commission, and Andy Framier from our agency on the right, and these three gentlemen function as the project management team for the project and are familiar with all the details on this and many other issues that we have gone through.

And before turning it over to Tony I will just say that we have surmounted far greater engineering challenges than this one in getting this bridge constructed, and I have no doubt that we will get through this one, as well. And I'll ask Tony to make the briefing, and then we will be happy to take any questions that any of you might have.

TONY ANZIANO: Steve, thank you. Chair Worth, Commissioners, my name is Tony Anziano. I am the Toll Bridge Program Manager with the



State of California Department of Transportation. I appreciate the opportunity to be here this morning.

I'm going to run you through a very high level PowerPoint, kind of describing the issue that we're facing. I think Steve's point is very well taken. This is one in a list that we faced over, you know, the last decade, basically, so I think the team is very optimistic about where we're headed with this, but in any event this is certainly something that merits a briefing.

On the slide that you're looking at there, it does show the E2 Pier, the easternmost pier of the main span of the bridge. And one thing I wanted to draw your attention to on this slide, you'll see that the pier consists of the underwater foundation portion. There are two columns that rise up from the water, and those are very relevant to the discussion so please keep those in mind, and then there is a large concrete cap beam that connects the two columns just immediately underneath the deck of the main span of the bridge. Next slide.

These are a couple of plan sheets showing you basically both an elevation and a plan view of the E2 cap beam that... large concrete beam that connects the two columns, and what you see on the very top is a view looking down on the top of that cap beam, and you see some rectangles with dots. Those are locations where certain structural elements are located. These are elements that we refer to as shear keys and bearings. And if we move from basically left to right in that top diagram, what you see is a bearing, which is a single row of dots followed by a shear key—you've got a double row of dots—another bearing, moving over to the middle you've got two more shear keys, then a bearing, then a shear key, then a bearing.

The diagram on the bottom shows you how these elements are basically connected to the concrete portion of the structure at this location. Basically, they're very large steel rods that tie these elements into the E2 pier cap, and these are big elements. I mean, these range from... as you see up there, they range from up to 24 feet in length, they're three inches in diameter, and in some cases they go entirely through that concrete cap, and in some cases they're embedded in the cap. And, in particular, you see the shear keys that

are located directly over those columns that I drew your attention to in the prior slide. These rods are actually embedded in the concrete. They cannot go through because they rest directly on top of the columns. We've got a few more pictures that will show you that. The remainder of these rods go entirely through this cap of the column, and that's important in terms of what we ultimately may wind up doing with this. It's important to understand that those we do have full access to, and if we need to replace them we can. The rods that are in the middle portion there, the access is very limited. Basically, you've got about five feet between the top of the E2 concrete cap, and the bottom of the bridge deck that you do see in the bottom portion of the graphic, you see the deck sections, and there's actually a crossbeam connecting the two in the middle at this location, as well. But basically this gives you the plan view. Let's move on to the next and start looking at some actual pictures that will give you, I think, a much better idea of the lay of the land out there.

This is a picture taken roughly late 2011, and it's showing you the actual beginning of the installation of some of the physical elements out there. What you see sitting out there to both the left and the right of that image are actually... it's a set of temporary shear keys that are installed, and the reason we have to use temporary shear keys is that prior to load transfer the structure rests in a slightly different position than it does in its ultimate configuration after load transfer, and these temporary elements deal with both shear and bearing until we actually get load transferred. And then you can sort of see, as you move to the middle there, the actual representation of what you saw in the plan sheets, so you see the little rectangles and little holes down there, and those holes are the locations where these large steel rods are installed to basically clamp the permanent bearings and shear keys into place. Next slide.

Here's a close-up image showing you how those rods are actually preinstalled, and if you see the ironworker there, who is right on top of one of the holes, you see actually one of the steel rods resting on the inside of that hole, and you see a wire attached to that rod. The wire is actually connected to a little threaded fastener that threads into the middle of the rod, because the way these things are installed, since these rods are preinstalled

before the large structural elements are put on top of them, they have to be pulled up into place once the large bearings and shear keys are put down. And the way they do it they basically have these wires pre-attached that they can use to lift the rods into their final position, and then a nut is put on top so that the rods are clamped into place. Next slide.

Now you see the actual bearings and shear keys being put into position. Again, this is the actual lay of the land. This is back from, again, late 2011. Next slide.

And here you see a picture of one of the initial crossbeams being installed directly over the E2 bent cap, and then the deck sections follow this, as well. But this shows you very clearly why these elements had to be preinstalled before the actual bridge goes on top of it. You have, in effect, a little bit of a sandwich at this location. Next slide.

This is another diagram showing you the rods. This is an image, a little x-ray image showing you through the concrete cap where these rods are located. And, again, this pretty clearly shows you the access issue that we do have in trying to address the issue we presently have. The rods that go all the way through on either side of the central portion are clamping the bearings into place, and then we have one shear key in the middle, again resting directly over the column that has these long rods actually embedded into the concrete resting on top of the column. They don't go through, so that presents a bit of a challenge when we try and figure out what to do with the issue we're currently facing. Next slide.

Again, just a rendering showing you basically the one bearing and one shear key fully installed. The deck is on top. The concrete, E2 cap is on the bottom, and the nuts are actually being placed onto the anchor rods in this image. Next slide.

And then sort of the final configuration with the nuts attached on rods that are clamping these into place, both on the column and additionally into the deck, as well. Next slide.

Now, these were not physically tensioned, tightened, if you will, until fairly recently. Again, as I mentioned earlier, you want to get past load transfer, so you have the final configuration of the bridge before you start clamping all of these elements into place. So we began tensioning or tightening the nuts on these rods roughly around... it was, oh, late first week of this month/early the second week of the month. And the first locations where we began doing this tensioning were at what we call shear keys 1 and 2. They're circled in this diagram. Again, these are the elements that are directly over the columns. And within a week we started seeing evidence that these rods were breaking in place. And we have roughly about 96 rods at these two locations, or a total of 288 rods throughout this area, so 96... or at these two locations, 96 are the ones that provide a slightly larger access challenge in terms of figuring out what we're going to be doing. But the balance we have full access to, which does make ultimately a solution a little bit easier if we do wind up needing a solution. And roughly we've got about a third of the rods at this point at these two locations that are indicating that they have broken. Next slide.

This is a very simple image that demonstrates to you how we identify that these things are broken. If you see the nut in sort of the background of this image, you will see that it is tightened up flush against the top of the shear key, where the nut that's directly in the foreground of this image is actually lifted up above the area that it's supposed to be flush against, and this is a pretty clear indication that a rod has broken. You know, these are tightening with significant amounts of force, so when these rods do snap they pop up, basically, and this is exactly what you see out in the field. This was what was observed by our inspectors, which gave a very clear indication that we do have an issue that we have to deal with.

So at this point in time we're still in the process of assessing the situation. We've actually done a fair amount of actually laboratory and materials testing. We've taken some of these rods out. They're not easy to get out. Again, it relates to the access issue. They actually have to be extracted as far as you can pull them out, and then you have to cut a piece off, extract a little bit further, cut a piece off, because, again, keep in mind the shortest rod is about nine feet in length and we're only working with about five feet of



clearance in this area. So you can't just pull one out or put one back in at this particular location. In any event, we've extracted three of them. We've sent them out for metallurgical testing, and at this point in time it does look like we do have a materials issue. It really relates to the presence of hydrogen in these rods. Hydrogen is not something you want to have present in steel. It does present a problem. You do everything you can in the process of fabricating steel to make sure it doesn't occur, but sometimes it does. And in this case it appears that it did, and it does cause the type of fracturing that we're seeing on these rod. So we think we know what we have, but, again, I think we want... because of the significance of this structure, we want to make sure we have a very clear and compelling answer to anybody who asks, 'What happened here?' But, again, I think we've got a pretty high level of confidence that we do know.

We do know that of the 288 rods we do have access to the vast majority of them, so if it comes down to deciding that we did need to replace all of them, we can do that. We're still in the process of evaluating whether or not we need to do that. We will have a very thorough evaluation process, and as we always do with this project, we will make sure that we have a number of eyes and brains looking right behind us to make sure we're on the right track. This will be presented to our peer review panel, and we do hope to have some conclusions on this in the very near future. At this point in time, we do not see a schedule impact with respect to our planned seismic safety opening. We've got a very strong team that's already on this.

But the biggest challenge is right at the two shear keys that are located over the columns, because, again, we can't replace those rods, and we do have some at this point that are broken. So we do need an alternate design solution to basically hold the shear keys in place in the fashion that we want them held in place during the large event. And do keep in mind that's the function of these. These things don't hold the bridge up, but they do manage the move under the bridge in a large seismic event, so they are important elements and we want to make sure that the shear keys are operating properly in a large earthquake, so we do need a design a solution that keeps these clamped in place under large earthquake loads, as we need to have them be. There are already a couple of conceptual solutions that are being

discussed by our design team; they are working on this very quickly. And, again, I think our view at this point is we're not seeing the scheduled impact, but the one thing to keep in mind, the most important thing, as always is the case with this project, safety is number one, so we are going to make sure that we do have a proper and safe solution implemented at these locations before we declare this bridge seismically safe.

So, again, I think I would just emphasize we're still in the evaluation process. We're moving forward as quickly as possible, and I think we'll have some fairly clear-cut answers pretty quickly at this point, I would say within a matter of weeks at this point.

So I think with that I'd be happy to answer any questions that you have.

CHAIR REIN WORTH: Thank you. Yes, Commissioner Aguirre?

COMMISSIONER ALICIA AGUIRRE: You mentioned that you had access to the majority of them. How many of them do you not have access to and what would be the consequences?

ANZIANO: We do not have access to 96 of the rods, or a total of 288 rods. Again, the consequence of not having access to those 96 rods means we would need to find an alternate design solution to keep these two shear keys, or a total of four shear keys... two of the shear keys are the ones where we have limited access. We need to find an alternate design solution to maintain the clamping force on these two during a large event. And, again, as I indicated, we already have a couple of concepts on the table that will achieve that goal.

COMMISSIONER AGUIRRE: Thank you.

CHAIR REIN WORTH: Thank you. Any other questions? Yes, Commissioner Haggerty?

COMMISSIONER SCOTT HAGGERTY: Thank you. So you're pulling these rods out; you're cutting them up. You now have to fill it back up and

that's what you're saying is the alternate design. I mean, can you give us some kind of idea of what you're thinking?

ANZIANO: I can give you a very broad brush of some of the concepts that are being discussed. Basically, we've removed three of the broken rods for evaluation in laboratories, again, putting them under the electron microscope. The remaining rods have not been taken out. Some of them are broken, some of them are not broken, and some of them will provide some degree of clamping force and perhaps will perform as intended. But we won't have the full capacity from these rods since we have lost some number of them, so that means most likely putting some sort of an exterior collar around the base of the shear key... and I don't know, Peter, if you can go back a couple of slides to something showing one of the shear keys. Right here. The shear key is on the right in this image, and you can see at the bottom part, the phalange of this, if you come up with some sort of an exterior collar that fits around that, that you then tie into the cap of E2 through alternate mechanisms, that could be the mechanism that allows us to hold this down in a major event the way we want it to. So it's probably some use of the rods that we still have out there, either that are not broken, and we would probably even use some of the rods that are broken as dowels, if you will, very simply. We would just grout up the hole completely and make sure that they're providing at least some structural capacity at that location in a major event, combined with a collar that is probably one of the more favored options at this point.

COMMISSIONER HAGGERTY: So I heard what you said about the hydrogen and the manufacturing process and all that. My concern is, once we've put a load on that bridge, meaning we start putting cars and trucks on it, do you anticipate this problem getting worse?

ANZIANO: No.

COMMISSIONER HAGGERTY: So you anticipate being able to identify all cracked bolts prior to opening the bridge.

ANZIANO: Yes.

COMMISSIONER HAGGERTY: And then is there a monitoring process going forward?

ANZIANO: There will be a monitoring process on this bridge, not only for these components but for everything. We'll have a very thorough maintenance plan actually in place for this structure before this bridge is open, and it will include points that need to be evaluated on a regular basis for a number of different reasons.

COMMISSIONER HAGGERTY: Okay, and then I did notice that on the bolt of the sheared one it had a... I think it was an F1... I don't know if that's considered a location or a manufacturing identification. And have you noticed... do you have identifications on all the bolts that refer back to when they were manufactured, you know, what batch they were and that kind of thing?

ANZIANO: We've got exhausted records on all of this. And that's part of the process we're going through right now in our evaluation, is making sure we've put all the documentation together, because, again, we want to be able to say with the highest degree that's certainly possible this is what we believe.

COMMISSIONER HAGGERTY: So then you can't say today whether or not these bolts, the ones that are cracking, have all came out of the same batch.

ANZIANO: They did not all come out of the same batch, if you will, but they all did come through the same general process. That we do know.

COMMISSIONER HAGGERTY: All right. Thank you.

COMMISSIONER REIN WORTH: Commissioner Cortese?

COMMISSIONER DAVE CORTESE: Just appreciate you indicating that you're moving as quickly as possible, or words along those lines. You



calculated just on the remove and replace, just setting aside the new engineering solutions for the ones that you can't get out, but just a basis remove and replace based on the process you describe for those that you can completely remove, what kind of FTE or worker hours... I don't want to call them man-hours... but what are we looking at, and how does that extrapolate out? I mean, what is as soon as possible? Is this the kind of process that's so labor-intensive it's going to, you know, take weeks or what? I can't imagine you could put too many people on, you know, each individual... each individual rod, given, you know, the economics of diminishing returns, trying to crowd too many people around a single workplace. So I'm just curious as to... I don't want to micromanage, I just want to know how's your calculation look at this point in terms of timing?

ANZIANO: You know, I would say that it's really premature until we figure out what the ultimate solution is to start putting those kinds of numbers on it. You know, the one thing I know I can say is that one thing we have seen with this particular contractor is, you know, they move remarkably quickly on issues. Things that we've even looked at and have thought would take, you know, several months, wind up taking a matter of weeks because they're so good at what they do. But I would fully expect this is a process that's going to involve months.

COMMISSIONER CORTESE: Thank you.

COMMISSIONER REIN WORTH: Okay, great. Commissioner Campos, and then Commissioner Mackenzie.

COMMISSIONER DAVID CAMPOS: Thank you, Madam Chair, and I apologize that I missed this piece of the presentation, but as I understand it a key issue here is that there was impurity in the steel. And one question that I have is was there a system in place to verify the purity of steel before we actually put it up?

ANZIANO: We always do have a very rigorous inspection process that we utilize when we're dealing with any supplies or fabricated components. That process begins with actually going out and inspecting the facility to see what

kind of equipment they have, what kind of workers they have in place, sometimes certifications required for the workers, and then, in addition, we will typically do random sampling and routine inspections of these facilities while elements like these are being made. We don't do 100 %, nobody does 100 %, but we do have a fairly rigorous process in place. Now, hydrogen is one of those things that works its way in in ways that you don't always typically see, and that's why hydrogen is an issue when you're dealing with steel. So even with the most rigorous inspection practices, hydrogen somehow basically sneaks its way in and then manifests itself in situations like this. But bottom line, we do have an extremely thorough field inspection practice dealing with components like this that are being made offsite.

COMMISSIONER CAMPOS: So I guess I'm trying to understand exactly what that means. So is there an industry standard that you follow to make sure that hydrogen is not present?

ANZIANO: There are various industry standards that we do follow with respect to fabrication of items like this. I mean, the short answer is yes.

COMMISSIONER CAMPOS: I guess, since you do have a rigorous system in place, is it that hydrogen is just impossible to detect it, and no matter what you have in place, or is it... what happened here? Is there something... was there something that was missed or...?

ANZIANO: Again, we're still in the process of evaluation. I really want us to be able to say that this is what we've identified as the likely culprit before we get into that. But, again, we do have an extremely rigorous field inspection practice, which is one of the reasons, I think, we're already at where we're at in terms of having an idea of what went on.

HEMINGER: Commissioner, if I could, and speaking as, again, Chairman of the Oversight Committee... and my colleagues are Malcolm Dougherty, who is the Caltrans Director, and Andre Boutros, who's the new Director of the California Transportation Commission... I think it is fair to say that if the prevailing theory proves out to be true, that this is a question... I think

the term they use is 'hydrogen embrittlement...' if that's what this is, and given the significant number of failures of these bolts, I think there clearly was a quality control failure. And as Tony indicated, there's no one who checks 100% , although, with some of the welds that we had on the decks, we eventually got to that, because we were doing custom fabrication. It's not typical that you get to that level of inspection on a manufactured product, which is what we have here. And so to the extent we have to go back and remanufacture, I can probably assure you that we'll be doing more checking than we did the first time through. So that is one of the issues that our oversight committee will be examining, whether we had adequate passes through the batches, because what we've seen so far, at least, is out of the roughly 100 of these bolts that have been installed, we've had a failure rate of a third, and that's very, very high. So I think your question is certainly relevant, and it's one that we want to pursue to its conclusion in our role as overseeing the project.

COMMISSIONER CAMPOS: I appreciate that, Steve. I think that's really the heart of my question. You know, was there a quality control issue here? And, quite frankly, if there was a quality control issue here, is there any other area in the construction where that could be a possibility? And, you know, I think that's...

HEMINGER: Well, and, again, Commissioner, I do want to assure you that for the majority of this self-anchored suspension span, the very large pieces of steel, there was, as I said earlier, in many instances, close to 100% inspection, because they are so critical not just to the seismic performance, but to carrying the load that it's got to carry every day. Typically, manufactured items, which come out of a more standardized process, don't rise to that level of inspection, but what we've seen here is that that perhaps wasn't enough of a level of inspection to catch the failure rate that occurred.

COMMISSIONER CAMPOS: Thank you.

COMMISSIONER REIN WORTH: Commissioner Mackenzie?



COMMISSIONER JAKE MACKENZIE: Thank you, Madam Chair. I'm just going to continue along the line of my colleague here, Commissioner Campos. Hydrogen embrittlement, as you have described... has been described, is that something that is a common occurrence or a known occurrence in the manufacture of these types of bolts?

ANZIANO: I think it's fair to say it is on appearance, yes.

COMMISSIONER MACKENZIE: Okay, and I guess... so in the quality control work that was done, as all of these rods were being manufactured, do you have samples that you have kept since the original testing? In other words, you were doing QC work in these before they were delivered to the bridge, would be my understanding. Is that correct?

HEMINGER: Let me start by saying the way that it works is quality control is the responsibility of the manufacturer. We do quality assurance, which is yet another layer over and above quality control, so you always have multiple levels of quality inspection. With respect to your specific question, I don't know if we have actual material samples. I'd have to check on that and get back to you. We do have, believe me, extensive records documenting all of the processes and all the tests that were performed, and probably the most fundamental test you get to at the end of the process is you take a sampling of rods like this, for example, and you stress them to see if they meet the standards that you're requiring in terms of strength, and we definitely have records of that.

COMMISSIONER MACKENZIE: So I have some familiarity with QA/QC work, more in the area of pesticides and that area, but, nonetheless, you would be doing that to some level of statistical significance in terms of the number of samples that they were required to take, and the number of samples that you and the assurance side of the thing were required to take. So, yeah, I think that would be interesting to get an answer on that.

Secondly, on this... to go to the West Pier do they use the same types of anchoring bolts on the West Pier, or is this very specifically a set of bolts that was only manufactured for the East Pier?

ANZIANO: These were very specifically manufactured for the East Pier. There are high-strength rods installed over on the West Pier—different manufacturer, different point in time when those remain.

COMMISSIONER MACKENZIE: Okay.

COMMISSIONER REIN WORTH: Okay. Thank you. Commissioner Tissier?

COMMISSIONER ADRIENNE TISSIER: Yes, just a quick question. You had mentioned you don't know the exact solution just yet, but your anticipation is once you do it could take a month or two to fix the problem, so to speak, and if I'm looking at the calendar we're talking five months until the opening that we've anticipated. Are we that far ahead in the process on the bridge that we can afford to lose the two months and still be able to be one on Labor Day?

HEMINGER: It's not a zero sum game. In other words, we can be working on this while other work is occurring. So we can continue down the path of what essentially is punch list activity at this point, final installation of the machine electrical systems. That work will proceed—it's not a zero sum game—while this solution is being pursued and implemented. Time is absolutely tight, but, again, at this point we are not seeing an impact to the schedule, but everybody should acknowledge there is risk.

COMMISSIONER REIN WORTH: Thank you. Commissioner Sperring?

COMMISSIONER JAMES SPERING: Steve, who has the financial responsibility for this? I mean, obviously we're talking about engineering, you know, the delay. Ultimately, where is that going to fall?

HEMINGER: Commissioner, good question. Right now, we're trying to find the solution, and so we're working very cooperatively with the contractor in doing so. There will be time to sort out who is responsible for the cost that will be incurred here, and so I don't want to say a lot about that

now because I think that time hasn't arrived yet. I will say that these items are a manufactured item that the contractor procured, and the responsibility, the first responsibility, as Tony indicated, for quality control, was with the manufacturer, secondly, with the contractor, and then ultimately with the owner, which is Caltrans. So I think that will be the nature of the discussion we have. And, again, solution first, but we are certainly mindful of the fact that we need to assign responsibility, as well, for any additional cost.

COMMISSIONER REIN WORTH: Okay, thank you. Commissioner Quan, then Commissioner Wiener?

COMMISSIONER JEAN QUAN: So I'm still coming up to speed on bridges, but I do understand in bridges we often replace and check bolts over time, that's a part of bridge maintenance. Do you think this will affect our maintenance schedule in the future, and, again, is that going to be additional cost to the Authority? You may not know now, but I think that, again, when we're looking at the total cost of the span and the long-term financial issues that's something that the Authority needs to know.

ANZIANO: I think the short answer to that is no, because, again, once we decide what has happened here and what the solution is, the goal is you implement a solution that is proper, which means you're not putting something in that you feel that you have to watch into the future. You put a solution in that you believe is effective and is giving you what you actually need. So, no, I don't believe once the solution is implemented that we're going to have to be going out and checking these things over and above what you would normally check. And you're absolutely correct, as part of your normal maintenance practice you would be looking at elements like this over time to make sure they're performing as required.

COMMISSIONER QUAN: Again, I've gotten most of my information from the media before this report today. My understanding is that we can't see or inspect all of the bolts, or are we now going to make sure that we inspect all of the bolts, that there's some in locations that are hard to see?



ANZIANO: Some of the rods are in locations where you don't have access to replace them. Those are the two that are located in the two shear keys directly over the columns. But, again, the solution that will be developed is not going to be a solution that is dependent upon having to inspect these rods for future issues. It will be a solution that is independent of that.

COMMISSIONER QUAN: Okay, thank you.

HEMINGER: You know, Commissioner, I would like to add, on this maintenance question, which obviously is a key one, two points, perhaps. One of them is that at least the pattern that seems to have developed with the failures is that they occur relatively quickly after the tensioning happens. Now, we can't know for certain that that means that a failure won't happen 10- or 15 years from now, but that seems to be the pattern. But I think, secondly, it is the case that there are all sorts of things on this bridge that the engineers and the maintenance folks are already focused on, because they know it's something you really need to pay attention to. And I think it's entirely likely that as a result of this issue, and if there are a lot of the bolts that we end up using, because they appear fine, that these are going to get a little extra special attention, and I think that's only reasonable.

COMMISSIONER QUAN: I think it's a unique construction and design, it's beautiful, and I think everybody's going to be watching to see if this design works. So it just seems that, given the issues and the problems, that probably a little more inspection, especially the first year or two, is going to be required. I'm hoping that you're right, that we're going to be able to fix this in time for the Labor Day weekend, but I would rather make sure that it's safe.

ANZIANO: Absolutely.

HEMINGER: I will say, though, Commissioner, that we certainly have a unique design, you're absolutely right about that, but these anchor bolts are not unique at all. They are a very common element of all kinds of bridge construction. So maybe that's a bit of the irony here, is that a fairly

mundane detail in a very unique design is what's going to cause us trouble up to the finish line.

COMMISSIONER REIN WORTH: Commissioner Wiener and then Commissioner Bates.

COMMISSIONER SCOTT WIENER: Hi, Scott Wiener from San Francisco. So I know you said earlier that it's too late to actually replace these with different structures, and that we'll have to do some sort of workaround to shore them up to make sure that they're stable in an earthquake. Did I understand that?

ANZIANO: Generally correct. We cannot replace the rods, the rods that have actually broken, because we don't have access, the capability of doing that. And, yes, we will, at those two locations where access is limited, basically we will have to supplement the system that is out there to provide the connection that those rods were originally intended to provide.

COMMISSIONER WIENER: And with a workaround or alternative system, how confident are you that the bridge will perform during a seismic event at the same level in terms of resilience as it would have had these not been defectively manufactured?

ANZIANO: Any solution that's developed will have to give us a very high level of confidence that this system will perform as designed. That will be the result of a solution.

COMMISSIONER WIENER: So in terms of earthquake resilience, it's your belief that what we end up with will be the same level of resilience as we would have had without the manufacturing defect?

ANZIANO: Absolutely.

COMMISSIONER WIENER: Okay. And then how common is it for these kinds of bolts to have... or rods... I'm sorry, they're bolts or rods?

ANZIANO: They're threaded rods, they have threaded at both ends and you put nuts in them.

COMMISSIONER WIENER: How common is it for this kind of rod in bridges throughout the country or the world, to have this kind of problem with hydrogen? Is this common, rare?

ANZIANO: I wouldn't say that it is common, but I think, as discussed earlier, this is a known issue, so it's certainly not a surprise to see it.

COMMISSIONER WIENER: Have we... in terms of... who's the manufacturer of the rods?

ANZIANO: We're still in the process, since there have been multiple batches, of going through the records to figure out who all has touched on these. It's not just one manufacturer per se, but there are a number of different companies involved in the supply chain here.

COMMISSIONER WIENER: And do we... does Caltrans track manufacturers who provide defective product like this for future... does that play into future bidding processes or scoring, because, I mean, this is a... even though I'm glad to hear that we're going to be able to work around it and not delay the opening and produce a bridge that will be seismically just as strong, but this is a major issue just in terms of, you know, having something so fundamental as the safety as the bridge to have been defectively manufactured, and it would seem to me that a vendor who does that, that should be noted. So I'm just wondering how that... when a manufacturer delivers a defective product, how that plays into future bids and other projects?

ANZIANO: There is a process, both at the state and federal level, that can address issues like that. You know, personally, at this point in time I don't believe we are seeing anything that would rise to that level. No, we're not happy that we put some of these rods into place that are breaking. That's not a good thing. On the other hand... and I think this kind of goes back to your question about whether or not this is common... it's not something I'm

seeing that would rise to the level at this point where you would really want to engage that kind of action. You would probably work affirmatively with the people involved in the supply chain to make sure that they've taken steps to make sure it won't happen in the future. But, again, I don't think it would rise to the level where you're saying this is such a huge problem, you would actually not want these folks involved in the future.

COMMISSIONER WIENER: Right. I mean, debarment, or whatever it would be called, is a pretty extreme thing, but, you know, if five years from now this same firm is bidding for it to put rods in for another bridge that Caltrans is working on, would that be something that's known in terms of at least considering competing bids? It just seems... like this is a... it's a significant... it appears on initial first glance to be a significant failure in the manufacturing process.

ANZIANO: Under the Public Contract Act the answer is no, that would not be a factor taken under consideration.

COMMISSIONER WIENER: Okay, that's troubling. And then I guess another question is... I mean presumably I know the responsibility will be worked-out in terms of increased costs to deliver the bridge, but is there a possibility of future increased cost down the road? I know this was touched on earlier in terms of maintenance or whatever, but we really don't know if five or 10 years down the road there could be increased costs, as well?

ANZIANO: Again, I think we touched on this question. The answer is, with the solution that we would be implementing we would be basically saying this is performing as intended. So, again, I think, as Steve indicated, you're always going to be looking very closely at certain portions of this structure as part of your regular maintenance plan, but we would not be implementing a solution that would be something that rose to the level of concern where we felt we were having to incur significant additional costs by having to monitor certain elements.

COMMISSIONER WIENER: Thank you.



COMMISSIONER REIN WORTH: Commissioner Bates?

COMMISSIONER TOM BATES: Thank you, Madam Chair. I have a question that maybe it's been stated, but obviously this indicated that we have problems on the piers that are directly to the east of the tower. What about the other piers? Have they all been inspected and do we have to... in other words, I see a whole series of other piers as we head east on the bridge.

ANZIANO: Basically, as you move to the east on the skyway you're dealing with very different issues, very different systems, and different manufacturers and suppliers. So to the extent this has been identified as a very specific materials issue, the answer would be no, this is not something we would anticipate moving to the east.

COMMISSIONER BATES: So the other piers have been thoroughly inspected to ensure that we don't have another problem on those other piers?

ANZIANO: Yes.

COMMISSIONER BATES: And then I know this is hard to say, but once we find a solution is it your opinion that the bridge would be... it would be safe for the purpose that it was built for, to withstand an earthquake?

ANZIANO: That not only would have to be my opinion, that would have to be the opinion of many, many people because this bridge is not going to open if it is not safe. When it opens it will be safe and there will be many, many people involved in looking at this particular solution, including the design staff, including the Oversight Committee, including our peer review panel, and I would assume a number of other folks who would have significant interest in this issue. Bottom line, this bridge will open and it will be safe.

COMMISSIONER BATES: That would be the irony, if we build a new bridge, then it turns out it can't be opened for some reasons. No, but I'm convinced that we will move forward in those efforts, and we can... I just want the public to understand that we are not going to do something that's

going to put the bridge and future bridge at risk of having a problem. Thank you.

COMMISSIONER REIN WORTH: Thank you. Commissioner Azumbrado?

COMMISSIONER TOM AZUMBRADO: So your belief is that it's just a tensioning of the rods that caused the failure, and there's no unintended design loads being transferred?

ANZIANO: Correct.

COMMISSIONER AZUMBRADO: Okay, thank you.

COMMISSIONER REIN WORTH: Okay. Any other questions...?

COMMISSIONER AZUMBRADO: So maybe that led to my next question, was... what I was going to ask you is... well, first of all, this isn't the general area in which the false work was... fell down, correct:? That's further down the bridge, is that correct?

ANZIANO: Correct.

COMMISSIONER AZUMBRADO: So there was no damage from that. So did this popping happen as a result of removing the false work below it?

ANZIANO: No.

COMMISSIONER AZUMBRADO: So that had nothing to do with it.

ANZIANO: Correct.

COMMISSIONER AZUMBRADO: Okay.

COMMISSIONER REIN WORTH: Thank you. I just had two questions, and then return it to staff for any wrap-up comments, Steve, that you'd like

to make. In talking originally, obviously you're looking at this point very carefully to understand what the exact cause was for the failure of these bolts, at what point in time it occurred. And so my sense is what you're saying is that the preliminary idea of a collar would essentially... it would almost... it would serve in the same function of connecting and keeping these two pieces of the bridge together, in light of the fact that there are a number of rods that cannot be replaced. Can you talk just a little bit more from the seismic standpoint about how this collar solution would work to act, I gather, in the same way that these rods were intended to work?

ANZIANO: Okay, we'll give it a shot. Again, the shear keys are intended to basically control the motion of the structure during a major event, side-to-side, longitudinally, and also you can have uplift forces that occur during an earthquake, as well. And if these shear keys disengage, if they actually uplift off the top of the E2 concrete cap beam, they then can't manage either of those longitudinal or transfers loads as they are supposed to do. That's why you want to keep it attached, clamped down at that location. So if your initial clamping system, which is the rods and nuts that are in there right now is not functioning the way that you need it to, you need to come up with an external collar that does that same thing. That collar would have to be attached to the cap beam in the same fashion, in effect, as the original rod system was intended to, so that it holds down sufficiently so that you don't get uplift, it performs as intended in a major earthquake. I don't know if that... does that answer your question?

COMMISSIONER REIN WORTH: Yeah, thank you. Okay, yes, Commissioner Campos?

COMMISSIONER CAMPOS: I just had a quick question, thank you. Thank you, again, for the presentation. Following up on Commissioner Wiener's question, would this specific manufacturer, before we entered into a contract with the manufacturer, did we verify whether or not there had been this kind of problem with the steel that they had manufactured for other...?

ANZIANO: We... just to be clear, we enter into a contract with the prime contractor. The prime contractor enters into a number of sub and supply contracts with a number of different companies and vendors. This is basically an issue with one of the suppliers. Now, even with that said, as part of our quality assurance process, which is over and above its standard quality control process, we actually go out and we look at the facilities that make parts like this, and, again, we go out and we inspect these facilities, we look at them to make sure they have the necessary material, machinery, people to properly produce these items, and then there is quality control and quality assurance testing that occurs during the process.

COMMISSIONER CAMPOS: I appreciate that, but my question is can you confirm with us that before... that someone checked whether or not this manufacturer had similar problems before there was a contract entered into with this manufacturer?

ANZIANO: You know, I can't speak to whether or not the contractors, our prime contractors, have a process for doing that. Obviously, reputation is significant, and, obviously, if there's a reputation for a particular supplier to have some problems, a prime contractor's not going to have much motivation to enter into a contract with them. But absent some department proceedings, you would not see that, no.

COMMISSIONER CAMPOS: I think that's a problem. I think that given that, you know, it was acknowledged earlier that this is not an uncommon thing to happen with steel, I would hope that before we contract, whether it's directly or indirectly through a prime contractor or someone else that we actually do verify whether or not a manufacturer has had issues in terms of the quality of their product. And I personally think that we would all benefit from a more detailed description of what your quality control actually looks like. I think that going through that process would be very useful for us.

HEMINGER: Commissioner, we make sure that happens. And Madam Chair, you know, we've tried to answer many of the questions today, but there are some of your questions, just given where we are in the process of investigation, that we can't answer yet. And so I think one obvious follow-



up here is that we give you some additional briefings on some of the questions that we couldn't give you full answers to today, and I think this is clearly one of them. We do operate at some arm's length from the suppliers and subcontractors, but as you saw in Shanghai that was a supplier, essentially, a very large one, but that was a supplier, and we got very involved in the fabrication there because of the importance of it. And I can assure you that before we go back to the folks who made these bolts, we're going to do a lot more than we did the first time to make sure that the bolts we get again, if that's what we have to do, are up to snuff.

COMMISSIONER REIN WORTH: Okay. Are there any other questions? Yes, Commissioner Azumbrado?

COMMISSIONER AZUMBRADO: So it's not the failure of the bolts, it's the failure of the rods, or the bolts are an issue, also?

ANZIANO: You know, the term I'm using is rods because, again, a bolt is the more traditional thing we're used to using at home. It's, you know, maybe got a hexagonal head at the top, a threaded end at the other end, you put a nut on it. I mean, this is in effect very similar to a bolt. It's just a rod with two threaded ends that you put nuts on both ends, that's the only distinction.

COMMISSIONER REIN WORTH: Well, thank you very much. I appreciate the chance to have this meeting today, and a public meeting so that the public can hear this discussion. I think it's very important. There's a tremendous amount of interest in the bridge, and we want to be able to reassure the public that the bridge that is being constructed and open will be safe, so I think it's really important that we have these briefings. And it sounds like, given the schedule that you've indicated, we will be... you'll be coming back very shortly, as you move through this process, giving us updates.

I guess the other thing that I would just like to add, I think when there was a discussion about the concrete last year, I think you took a lot of effort to take time to explain the technical information about concrete, about inspection,

so that the public could understand—you presented a video, there was some things online. And given the public interest and concern about this particular situation, I think I would encourage Caltrans to do the same thing again, to explain what the issues are, and as you come forward with solutions, to present those both to the Commission, as well as the public, so that the public can understand exactly what the solutions are and that you, in fact, are, you know, designing and producing a bridge that will be safe, and we have confidence that you will. So we thank you for coming, and, again, we look forward to having you come back. And, again, appreciate the commissioners and the questions that you've raised, and being able to ask those. So thank you.

HEMINGER: Thank you, Madam Chair, Commissioners.