

## DISCUSSION

### THE LOMA PRIETA, CALIFORNIA, EARTHQUAKE OF OCTOBER 17, 1989: REPORT OF THE NZNSEE RECONNAISSANCE TEAM

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#### J H GATES<sup>1</sup>:

I read with great interest the article by the New Zealand Reconnaissance Team. The Team should be congratulated on a job well done. I have read several summary reports and this one is not only one of the best, it presents the material in a very interesting manner. I think the engineering community is very fortunate that your Team was in the Bay Area at the time of the earthquake. Many times as we investigate an event of this magnitude, we are so close to the scene that we often miss some of the more subtle aspects and lessons that result. Your Team, with their independent view have given us that good overall view. Of course, when gathering such a large amount of data, certain inaccuracies are bound to show up and it is in a spirit of completeness and not of criticism that I offer the following corrections to the factual material relating to bridges which was gathered by your team.

#### EDITORIAL (p111)

The Cypress section of I880 was NOT officially in line for retro-fit - only single column structures were actually being put into projects. All remaining bridges (including Cypress) would have been included in the next retrofit phase. Similar bridges in San Francisco had just been identified (but not yet put into a project) and I am positive that Cypress, once identified would have been assigned a high priority.

When the BARTD crossing was designed, their designs were subjected to intensive review - including seismic. I am sure that if the Bay Bridge had been involved, it's seismic response would have received close scrutiny.

#### 8.2 BRIDGES - GENERAL PERFORMANCE (p52)

California bridges built after about 1973 performed very well. The major damage occurred to earlier designs which were built

before modern standards. The single significant damage to a modern bridge was to an outrigger which can be attributed to a lack of adequate detailing of the knee joint.

#### 8.3 I-280 EXTENSION (p52)

This portion of the China Basin facility (I280 extension) was constructed BEFORE 1971 and therefore contained several non-ductile details. The poor performance of knee joints can be attributed primarily to details and improved details have already been developed. Additional testing is being planned to validate these details.

#### 8.5 I-880 CYPRESS (p52)

Refer to my discussion (above) on retrofit scheduling of Cypress.

#### 8.7 MOCOCO RAMP (p58)

The abutment of this structure is located on very soft material and has experienced problems with lateral spread movements for several years. The earthquake just emphasised this problem.

#### 8.8 STRUVE SLOUGH (p58)

Investigations by Caltrans and others have determined that the bridge superstructure itself was not significantly excited by the earthquake. It appears that the very soft slough soils moved a great deal but the piles broke off before transmitting any significant load to the superstructure. No evidence of hinge banging or abutment movement was found.

#### 8.9 MADRONE DRIVE OVERHEAD (p59)

The only bridge in the Bay area which has been retrofit with lead/rubber isolation bearings is the Sierra Point bridge south of San Francisco. The Madrone Drive Undercrossing on Route 17 (Br.No. 37-59) is a three span T-beam with simply supported end spans built in 1937. The girders are supported on 6 inch high rocker bearings at the abutments. Excessive abutment settlements at the bridge necessitated that the bridge be jacked and shimmed in 1943.

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Seismic retrofit of this bridge in 1983 consisted of the addition of cable restrainers at the intermediate hinges plus the addition of concrete catcher blocks and transverse keys at the abutments to provide lateral restraint and support in the event of rocker bearing failure.

#### 8.14 CONCLUSION (p64)

Phase II retrofit contracts are currently underway - initial contracts are located primarily in the Los Angeles basin and the San Francisco Bay area. I do not know where the press got the information on costs to retrofit Cypress, as it was never identified or estimated. I think that there was some confusion on the part of the press with some of the approach structures to the Bay Bridge (located on Route 880) which had been identified and estimated as requiring retrofit. (Refer also to my earlier comments on Cypress).

Again, my congratulations to your Team on a job well done. It is my hope that copies of the Reconnaissance Team Report will be given wide distribution here in the U.S..