



Memorandum

To: Mr. Gary Goff – Caltrans Structures Local Assistance File: 58-0242B
Cc: Mr. Jason Wise – Mendocino County DOT
From: Eric Fredrickson, Mark Thomas & Company, Inc. *E.D.F.*
Date: August 25, 2015
RE: **BRIDGE RETROFIT STRATEGY MEETING COMMENTS**
(GARCIA RIVER BRIDGE AT EUREKA HILL ROAD – Br. No. 10C0034)

Background

An updated Seismic Retrofit Strategy Report dated June 11, 2015 was prepared for the Garcia River Bridge at Eureka Hill Road. The report was submitted to Caltrans Structures Local Assistance (SLA) for review and concurrence with the Office of Earthquake Engineering (OEE). Mark Thomas and Company (MTCO) received eight comments on July 10, 2015. These comments and their responses are attached to this memo. A meeting with SLA and OEE was held on August 19th to discuss the comments and decide on a course of action.

Retrofit Strategy

During the meeting, OEE raised concerns due to costs associated with some of the retrofit measures outlined in the Seismic Retrofit Strategy Report. The retrofit measures at issue are the addition of new piling at the pier footings and the new large diameter cast-in-drilled-hole piling at the abutments. The additional piling was added to the strategy report to mitigate liquefaction and lateral spreading concerns. Additional analysis is needed to determine if the additional piling is required. The retrofitted structure will be designed to meet the "No Collapse" performance standard per Memo to Designers 20-4; not the seismic requirements for new structures.

MTCO will proceed with the Seismic Retrofit Strategy Report recommendations except for the addition of piling at the piers and abutments. If during final design the additional piling is needed to prevent collapse in a design seismic event, the calculations will be submitted to SLA and OEE for review and approval prior to implementing the use of piling.

Conclusion

The retrofit strategy will be implemented except for the use of additional piling. If warranted and upon approval; additional piling may be added during final design.

Eureka Hill Rd. at Garcia River	
Br. No. 10C-0034	
COMMENT	RESPONSE
1) The Seismic Analysis section mentions that lateral spreading has not been considered; therefore a strategy can not be approved with incomplete submittal. The pinning effects of existing piles need to be included in the lateral spreading analysis.	Lateral Spreading will be checked per MtD 20-15 and "Guidelines" (dated October 2013). Consideration for the pinning effects of the existing piles will be added to the lateral spreading and slope stability analysis.
2) The Seismic Analysis section mentions that the columns are considered fixed at the base and the retrofit strategy shows a proposed foundation fixity retrofit. This practice is not acceptable and typically leads to unwarranted retrofit.	As discussed the additional piles at the piers will be removed from the base retrofit. Existing condition provides column fixity.
3) In examining the bridge Earthquake Resistant system, OEE notes that the bridge can be classified as short bridge with relatively good foundation piles except for a pile cap that warrants strengthening given the hazard demand.	Agreed. Additional mat of reinforcement will be added to pile cap. Pile analysis will be updated to evaluated existing pile capacity.
4) In addition to vulnerability mentioned in (3), the columns lack confinement and a casing retrofit is warranted.	Agreed.
5) The designer may demonstrate the need for additional abutment strengthening/footing to diaphragm pipe keys to engage a full height passive resistance of back wall and engage the capacity of Abutment in transverse direction.	Abutment has no transverse shear keys. Pipe keys to be installed to engage soil passive resistance. Slope stability analysis will be updated to see if existing embankment will remain in place to provide resistance.
6) The use of any additional piles need to be demonstrated taking into account the retrofit considerations given in (3-4) and optional retrofit consideration mentioned in (5).	Agreed.
7) For existing bridge, all seismic related hazards (ground shaking, fault rupture, liquefaction and lateral spreading) are treated separately.	MtD 20-15 says to combine liquefaction and lateral spreading. MtD 20-8 says to combine EQ and fault rupture. Per discussion with OEE these load combinations in the memos apply to new bridges and are not for retrofit.
8) Per Md 20-4, a collapse scenario needs to be demonstrated for a retrofit or additional retrofit measures are acceptable.	Calculations will be prepared for agreed upon base retrofit including: Column casings, abutment pipe keys with infill diaphragm, and pier top mat pile cap reinforcement/thickening. Collapse scenario will be analyzed.
RETROFIT STRATEGY	
Column casing	Base Retrofit
Abutment pipe keys	Base Retrofit
Abutment shafts	Need to demonstrate need based on updated lateral spreading analysis
Footing retrofit	Base Retrofit
Additional bent piles	Need to demonstrate need based on updated lateral spreading analysis