

Caltrans Balsi Beam Crash Test & In-Service Issues

(with comparison to Mobile Barriers MBT-1)

Mobile Barriers Calls for the Retirement and Replacement of Caltrans Balsi Beam

Caltrans Balsi Beam has a number of serious testing and in-service issues. The remaining units should be taken off the road. The Balsi Beam does not meet national crashworthy standards under the old NCHRP 350 and was never tested to the new, higher, MASH standards ([the “new state of practice” since 2011 – See FHWA-MASH](#)). The Balsi Beam is a patented and proprietary device of the California Department of Transportation (Caltrans). It is limited to use where the potential for impact not exceed 43 mph (70km/h). Only a few Balsi were ever made, and as of 2014-2015, most were out of service or unused. Only two remained in service with limited use. **Mobile Barriers MBT-1** was separately developed and has dominated all sales and rentals since introduced in 2008. It is MASH tested and speed appropriate for use on the interstate system. It has received numerous accolades and awards. It is larger, it is better tested, it has more capabilities, and it costs less. It is the better tool. www.mobilebarriers.com

Balsi Testing & In-Service Issues

- **Not independently tested.** The Balsi was only ever internally tested by staff of the person who takes professional credit developing the Balsi (Mr. Larry Orcutt/then head of Caltrans Research, to whom the testing staff reported). FHWA guidance of 2012 notes that devices be tested, and the results certified, by a test facility that is independent from the developer. [See 2012 FHWA Memo, Attachment A, pg 3](#)
 - *Mobile Barriers MBT-1 was independently tested.*
- **Internal report written up years after the fact.** Although the Balsi was purportedly tested in 2003, no report was prepared until 2008/2009, or released until 2010 (after introduction of Mobile Barriers MBT-1).
- **Report not submitted to or accepted by FHWA.** The Balsi crash report and supporting data was not submitted to or reviewed by FHWA. There is no FHWA acceptance/eligibility letter. Anyone using the barrier would need to self certify and/or assume risk of using the same (as Caltrans apparently has).
 - *Mobile Barriers MBT-1 was submitted to the FHWA and is accepted/federal aid eligible for use on the NHS. [See 2012 FHWA Memo re Submittal Process.](#)*
- **Lower Speed & Weight of Crash Vehicle:** The speed and weight of the pickup used in the Balsi test was significantly less than required under current standards for use on our interstate system and in other locations where the potential for impact exceeds 43 mph. Under current standards (TL-3/MASH), the pickup should weigh around 2270 kg (5000 lbs) and impact at or about 100 km/h (62 mph). The pickup used in the Balsi test weighed only around 1800 kg (4000 lbs) and impacted at 70 km/h (43 mph). The pickup test is the critical test of the strength and ability of a barrier to contain a vehicle on impact (ie. keep it out of the work zone). Reducing speed and weight exponentially reduces the severity of impact. Impact Severity equals $0.5M(V\sin\theta)^2$ where M is mass of the crash vehicle, V is speed and θ is angle.
 - *Mobile Barriers MBT-1 was tested to TL-3/MASH as requested/recommended by the FHWA’s Office of Safety. The pickup weighed 2329 kg (5134 lbs) and impacted at 102 km/h (63 mph).*
- **Lower Severity of Impact:** The Balsi was only tested at impact severity levels of 19 and 66 kJ (only 13 and 44% of the impact severity to which FHWA’s Office of Safety requested/recommended Mobile Barriers MBT-1 test). Minimal levels for speed appropriate use over 43 mph was around 130 kJ at the time of testing, and is now around 150 kJ under TL-3/MASH standards.
 - *Mobile Barriers MBT-1 tested at 150 kJ and some, in actual use, have sustained multiple hits and even turned and redirected semi-trucks... and remain in service.*
- **Not speed appropriate for interstate use.** The Balsi is limited to use in locations where the potential for impacts not exceed 43 mph (70 km/h) (TL-2/350) per Caltrans internal crash report on the Balsi.
 - *Mobile Barriers MBT-1 is speed appropriate for use on the NHS and FHWA accepted/eligible for TL-3 use under both the old 350 and new MASH standards.*

- Excessive Tearing.** FHWA guidance in 2012 specified that even if all other test evaluation criteria are met, “excessive tearing/shredding to the vehicle exterior” may alone be basis for failure. [See 2012 FHWA Memo, Attachment A, pg 8.](#) Both vehicles in the Balsi tests had extreme tearing/shredding, and at only 43 mph. Beam joints snagged and tore the front quarter panels off both vehicles, and the outer skin off the car to the rear of the passenger door. Separate accounts contradict the report and indicate the Balsi itself was disabled following the impact. The Balsi used in the test was later taken out of service and replaced.

- The high smooth walls of Mobile Barriers MBT-1 exhibited no snagging or tearing and cleanly turned the crash vehicle. The front quarter panel merely flattened, and no windows broke. The MBT-1 in the crash test was fully functional and is still in service.*

- Old/Non-Compliant Test Vehicles.** National standards (then and now) call for vehicles not more than 6 years old, reflective of current traffic. The Balsi was tested with older vehicles ('89 & '94), with side windows removed. Lower centers of mass and thicker steel in older vehicles raise issues as they would tend to reduce override and tearing (which nevertheless was bad).

- Mobile Barriers MBT-1 was tested with newer model vehicle as per applicable standards..*

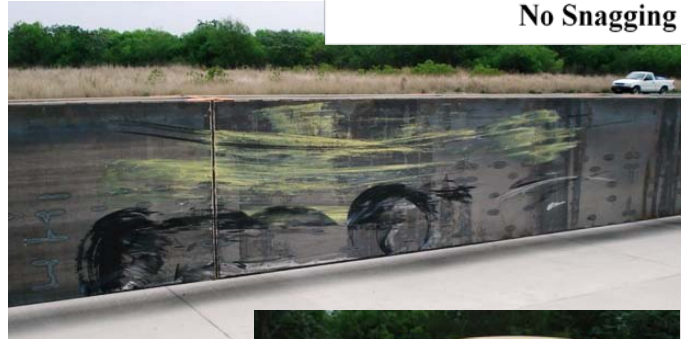
- Inadequate Beam/Wall Height.** The Balsi beams are only 24” high when positioned one to each side. As such they would engage only 4” of bumper on modern pickups and the later would likely jump the beam into the work area. The beams are still only 36” high when both are rotated to one side. That is only about hip high and leaves much of a person’s upper body exposed. It also would not fully brace a modern pickup. The modern heavier pickup required under current TL-3/MASH standards, has a higher center of mass may lean or swing the over the beams. The beams would not even engage the frame of a larger truck. Highly mobile barriers such as the Balsi are intended to be used in tight proximity to workers and traffic. There is no room for override.

- MASH testing of Mobile Barriers MBT-1 highlighted the need and value of full 5’ walls. Almost all of the height of the walls were used to control and redirect the pickup at the much higher MASH test levels representative of those that may be encountered on an interstate. In two instances where semi-trucks hit MBT-1, the primary engagement was over 36” up the walls. The semi’s would not have even engaged the Balsi beams. The 5’ height of MBT-1’s walls have proven critical in its handling of errant vehicles. See MBT-1 [Crash Photos](#) and [Crash Video](#).*

Balsi
 TL-2/350 - 43 mph
 Impact Severity: 66 kJ (pickup)
 19 kJ (car)
Snagging



MBT-1
 TL-3/MASH - 63 mph
 Impact Severity: 150 kJ
No Snagging





Balsi out of service.
Mobile Barriers MBT-1
being deployed
in California.

- **In-Service Issues.** The Balsi has a lot of moving parts. The rotating beams require on-site setup on arrival and departure to deploy jack stands, stabilize the unit, and rotate the arms. Jack stands required to stabilize the unit preclude use for mobile operations. Loads cannot be carried on the decks as the unit becomes unbalanced and tends to bind and lock up. To rotate the beams, the ends must be precisely aligned. The jointed beams rotate on a single center pivot and any misalignment or play in the joints can cause the unit to bind and lock up. There are a complex array of chains and hydraulics throughout the Balsi that must all work properly for the unit to function. As a former Caltrans State Equipment Manager noted, it is difficult and expensive to build and maintain. Units have locked up and/or otherwise been disabled when arms did not align, expand/contract or rotate properly, or the hydraulic jacks needed to stabilize the unit fail. Bolt sheer and other issues have been reported. When along the road, such mechanical failure can create a hazard for motorists, that may not be easily removed. Examples of Balsi lockup have been witnessed by third parties on at least two separate occasions. Both visiting parties have acquired Mobile Barriers MBT-1 instead.
 - *Mobile Barriers MBT-1 has virtually no moving parts. There is no on site setup. Simply pull in place and work. The MBT-1 can be used for moving operations as well as short work operations. With it, meaningful work can be performed between rush hours, and lanes quickly reopened to minimize public disruption and return the roadway to normal traffic flows.*
- **Obsolete/Limited Use.** Only a few Balsi were ever made. They were limited to 43 mph (70 km/h). As of the two year period 2014-2015, all but 2 were out of service or not being used. The remaining two were used on a limited (or “very limited”) basis. The Balsi has not been used outside California.
 - *Mobile Barriers MBT-1 is commercially available and has been internationally deployed. It has dominated all sales and rentals since its introduction in 2008. All, including the original barrier used for crash testing, remain in service. It has received numerous accolades and awards. For additional articles, videos, pictures and other information, see www.mobilebarriers.com.*
 - *For the developmental progression of highly mobile barriers and a comparison of Mobile Barriers MBT-1 to the Balsi, see [Progression](#) and [Comparison](#). Read also what users in CA say about Mobile Barriers MBT-1, see [Full Lane Cut](#) and [Outside Sacramento](#).*

Caltrans is aware of the Balsi limitations and issues. Nevertheless, persons within Caltrans have continued to “market the Balsi Beam through many FHWA publications” in an effort to an effort to “help gain credibility within California that this technology is unique, for the purpose of obtaining resources to purchase additional units.” [Overcoming Roadblocks Facing the Implementation of Innovation, Lawrence H. Orcutt \(primary author\) \(2009\) \(pg 16\).](#)

The Balsi is not unique. The “marketing” has regrettably been used to detract from serious issues and to suppress real innovation - Mobile Barriers MBT-1 – which really can help improve safety and mobility for the benefit of workers, commerce and the traveling public.

Mobile Barriers MBT-1 is better and less expensive. The remaining Balsi units should be retired and replaced with Mobile Barriers MBT-1. As noted in a study sponsored by Caltrans, the entire cost of a barrier can be offset many times over in less than one year, with an expected yearly average benefit of \$1.9 million per year. ([See UC Davis/AHMCT Report 2008, pg 59, attached to the cost benefit analysis here linked](#))

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