

STATE PERSPECTIVE ON CERTIFICATION OF TESTING LABS

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I'd like to start out with a Calvin and Hobbes comic strip that has a tenuous connection to the subject at hand and deals with the general subject of crash test research. As you may recall, Calvin and Hobbes go on wild daredevil rides in their little red wagon in the summer and on their sled in the winter. This, of course, is Hobbes happily welcoming Calvin home from school with a 100 km/h tackle.

In the first panel Calvin's dad is fixing the little red wagon and Calvin says, "You know Dad, it disturbs me that this wagon has no seat belts and wouldn't survive a 30 mph impact with a stationary object." Dad says, "Um...Why do you bring this up?" with a worried look on his face. Calvin replies evasively, "Oh, no reason." Now the wagon is fixed and Calvin and Hobbes are about to take a ride. Calvin says, "Want to help me test the theory of relativity?" Hobbes says, "Sure." Hobbes gives the wagon a big push as Calvin steers and Calvin says, "The idea is that the faster we go, the slower time goes." Hobbes says, "Gotcha. It's 10:23." Now they are accelerating down a steep hill and Calvin asks again, "What time is it now?" Hobbes says, "10:24. Go faster." In the next panel they are streaking down hill and Calvin asks again, "We're going pretty fast! What time is it?" Hobbes replies, "10:25. Time still hasn't stopped." Now they've just catapulted over a cliff and Calvin, Hobbes and the little red wagon are all flying separately through blue sky at mach 1. Calvin repeats, "Has time stopped now?" Hobbes pants, "No, just my heart." In the final panel they are cracked up in a little crater at the bottom of the cliff and Calvin grumbles, "Well, it looks like Einstein's a fraud, wouldn't you say?" And Hobbes picks up his watch which is totally smashed and gleefully replies, "No, he's right! My watch isn't going at all anymore!"

CRASH TESTS FOR BACKYARD INVENTIONS

Well, I can remember a few CALTRANS crash tests that weren't much more successful than that. I wouldn't want to tell you about those, but I would like to tell you about some tests by others we witnessed several years ago that bear on the subject at hand.

About 15 years ago we met with a backyard inventor who ran a beauty salon with his wife and who had devised a rubber tire and sand crash cushion. He was

hoping to sell this to local agencies to shield power poles and other fixed objects and hoped to get CALTRANS approval to improve his sales pitch. We explained that he would need to conduct crash tests and that the process was long and expensive.

He did not appear to be a good listener and managed to set up a test in the Bay Area where he was able to get a street closed off for a day and I believe hired a university professor to hook up a couple of accelerometers. One of my staff went over to observe the process and came back with this report. Our inventor used another vehicle to push the crash vehicle up to speed. The test vehicle missed the crash cushion completely, hit a power pole down the street, totaled the test car and we never heard from him again.

A few years later we had a couple of amateur inventors who normally worked mounting school buses on truck frames and they had designed a truck mounted attenuator (TMA) that used plastic foam blocks for energy absorption. As usual we explained the process needed to qualify their device. At one point we requested a drawing of the TMA and eventually we received a crude one page sketch that was about junior high drafting class level. We then recommended that they find a licensed engineer who could draw up the plans for them.

In the meantime, they had found an auto racetrack in the Bay Area where they could conduct their test and had hired a stunt driver to do a live driver test of their TMA. The test speed was supposed to be 45 mph but the driver only got up to about 40 mph so we told them that was not a satisfactory test.

Being persistent they scheduled another test, hired the same driver again, but told him that he wouldn't be paid unless his speed was 45 mph or more. Well, on the day of the test the driver packed foam blocks all around the front of his body and tied his helmet to the seat so it wouldn't snap forward. He proceeded to drive into the TMA at 60 mph. Fortunately I wasn't there and fortunately the driver was uninjured as far as I know but he must have had a sore body the next day. The two inventors didn't have enough resources and talent to follow through with their design and they soon faded from the scene.

Although these stories are amusing because the inventors were so inept, I don't mean to belittle inventors. I realize that sometimes the most

revolutionary new concepts come out of someone's garage. I believe some of the first water tube cushions were tested at low speed in someone's driveway. And being a public agency we must entertain anyone with an idea and explain the rules to them and give due consideration to their proposals. Originally I planned to tell these stories to illustrate why certification is needed. As I've thought about it, though, I tend to think this kind of amateur test group is self eliminating.

Well, let me tell one more story before I describe our approval process and draw some conclusions. Twenty years ago we used to witness some bare bones crash tests that were performed by a colorful but innovative engineer contracting with a company developing safety products. In particular I recall that in a few of his proof tests he used his son as the crash car driver. Right after the crash he would tell his son to back up the car and drive off while the cameras rolled to show how little damage was done to the car. In the meantime I was scrambling to get some measurements of barrier deflections and car position before he drove the car off. In those days my measurements were usually much more thorough than those of the crash tester.

He used another car to push his crash vehicles up to speed and then backed off at the last minute with his pusher car, hoping the crash car would hit the barrier. Some of his first developmental tests were with old junkers so he could, as he said, "get a feel for conditions" which I thought was a pretty amusing concept for crash testing.

Back in those days it was difficult to get decent measurements, photos, movies, drawings and so on from that company but we did have the advantage of being invited to most of the tests so that we could check out the testing process in person. Eventually the colorful crash tester went on to other inventor challenges and the company he was testing for made other arrangements.

Over the years the tests on their products became much more rigorous and the documentation came pretty close to the ideal requested in NCHRP 230. However, in the meantime for whatever reasons, we were no longer invited to their tests. Consequently, we must pretty much accept on faith that the documents they present to us were generated properly. I believe all their submittals are vouched for by a licensed engineer not working for the company who has unknown qualifications.

THE CALTRANS APPROVAL PROCESS

Next I'd like to describe our CALTRANS method of evaluating new roadside safety products submitted to us for approval. We require a written report of the required crash tests--the report to include the sections

specified in *NCHRP Report 230* (now *NCHRP Report 350*). They must also submit copies of their 16 mm movies, engineering drawings of the device, material specifications of critical materials in the device, sometimes a brief summary of their quality control program, and a copy of the FHWA approval if they have one. If available, we review accident experience from other states.

For the past year we have had a new products evaluation committee specifically for roadside safety features at CALTRANS with representatives from traffic, structures, maintenance, construction, the lab, and one district traffic engineer. Various committee members review the submittal as appropriate and the committee makes a recommendation to the chief of our division of traffic operations who has the final approval for most types of products.

Except for the committee we have been using the same approval process for many years. It has always been a struggle to get all the documents we wanted from manufacturers but cooperation and quality of documents seem to have improved in recent years. We do believe that a fairly rigorous review is worthwhile to 1) protect the safety of motorists in our large state and 2) to protect ourselves from tort liability suits as much as possible.

SHOULD TEST AGENCIES BE CERTIFIED?

As you know we have less than a dozen agencies in the U.S. doing crash testing on a regular basis. Most of them have been in business for several years and generally speaking they all seem to be competent and capable of doing reasonably good work. Considering only these companies, certification doesn't seem overly necessary. I'm not sure we would gain that much with the possible exception of checking out instrumentation equipment and instrumentation data processing procedures where it would be nice to insure that we had uniformity around the country. On the other hand, it might be nice to have some kind of certification procedure available for new crash test companies or for teams assembled for a short time only to conduct a small number of tests.

I conducted a last-minute mini-survey of a few other state DOT engineers. I'd like to give you the flavor of their thinking.

Brett Gilbert of Ohio said they approve products by looking at all available data, library sources, and discussing the product with FHWA, other states etc. He thought certification might help their comfort level and self certification could shift some liability to manufacturers. He thought the problems of certification could be worked out.

Ron Canner of Minnesota said their approval process is similar to Ohio's. They call Charlie McDevitt if in doubt. Ron doesn't *perceive* a problem. A rigid certification process could discourage new companies, hence, competition. Nevertheless, Minnesota is going to more certification. They trust vendors but periodically verify vendor claims. He might support test agencies *voluntarily* requesting outside certification.

Jimmy Lynch, the North Carolina State Traffic Engineer, said their specification requires the vendor to certify conformance to *NCHRP Report 230*. He believes in crash testing, says devices they use are working and thinks if the system isn't broke, don't fix it.

Duane Hofsteder of Oregon described a product approval method similar to Ohio and Minnesota--they review all available information and then decide. He seemed to support certification to get uniformity provided it didn't get bogged down in excessive red tape.

Jim Bryden of New York sends his greetings. Jim believes all data presented by vendors should be viewed with a little suspicion and checked for authenticity, but he leaned away from requiring certification of test agencies. At most, he might go for a mid-level process to check instrumentation only. He believes a licensed P.E. employed by the manufacturer should certify test results. Independent observers at crash tests wouldn't prevent manipulation of test devices to get successful tests. Certification, if used, should be contracted out to someone like Jack Carney, who doesn't have his own crash test facility but is very knowledgeable, rather than certification by FHWA or AASHTO.

Bill Crozier, my boss, who has just been working on uniform CALTRANS standards for qualifying new products, gave this example. He says that AISC certifies bridge shops to fabricate bridge girders for a rather large fee with follow-up inspections for a lesser fee. CALTRANS supports this process but doesn't require it and we send our own inspectors to the bridge shop anyway. Hence, certification may help the little states, but a state with more resources may want more assurance that the products they buy meet specifications and standards. Nevertheless, Bill says our director and upper management support more self certification of highway products.

Considering all of the above, my state-oriented recommendation (based on very minimal input from a handful of states plus my own opinions) would be that we start out with a simple and limited process whereby all crash test entities, both permanent and temporary, be *invited* to obtain certification of their instrumentation equipment and instrumentation data processing procedures from a team contracted by FHWA available upon request in, say, one month or less from date of

request. Results of the certification review should be available within, say, two weeks or less. Help in establishing certification procedures could be obtained from a task force of TRB A2A04 committee members. This would help gain uniformity in the validity and accuracy of instrumentation data, would pick up inadvertent mistakes, but would not necessarily prevent manipulation of test results. Crash test agencies should self certify their products; their certification should be signed by a licensed engineer. Ideally, their proof tests should be witnessed by a qualified engineer from a state DOT and/or FHWA so there is an independent observer present. State DOT's would, of course, have the option of requiring the submittal of test reports, films, drawings etc. Hence, small states and local agencies would have a minimum level of protection from bad tests and larger states would have the option of doing more thorough reviews if they believed that was necessary or useful.

ERRANT DRIVERS AND CRASH TESTERS A PHILOSOPHICAL COMMENT

In closing, I'd like to get back to the book of Calvin with a little more philosophical comment on the whole subject of errant drivers and crash testers. In the first panel Calvin and Hobbes are at the top of the hill with a small sled and Calvin says, "Boy, is this hill big. We'll have a good long ride down!" Hobbes cautions, "Provided we improve our steering." As they start down the hill Calvin says, "Hobbes, do you think human nature is good or evil?" Hobbes nervously says, "Look out for those trees." The hill gets steeper and the sled is partly airborne as Calvin asks, "I mean, do you think people are basically good, with a few bad tendencies, or basically bad with a few good tendencies?" Hobbes shouts, "There's a rock up ahead! Look out!"

Unconcerned, Calvin drones on, "Or, as a third possibility, do you think people are just crazy and who knows why they do anything?" Hobbes is frantic, "Not so close to the ledge!" By now they are going 100 km/h and Calvin looks over his shoulder and repeats, "Well? What do you think? Are people good, bad or crazy?" Hobbes has his paws over his eyes and shrieks, "Aughh! I can't look!" There is a loud "wump!" And the front of the sled is impaled in the trunk of a large tree. In the last panel we see Calvin and Hobbes in a huge drift of snow buried up to their eyeballs and Calvin says, "You know, its very rude of you to keep changing the subject after every sentence." And Hobbes sighs, "Good, bad, crazy...I choose crazy."