



U.S. Department
of Transportation

**Federal Highway
Administration**

DEC 20 2002

400 Seventh St., S.W.
Washington, D.C. 20590

Refer to: HSA-10/B-110

Mr. Rich Peter, Chief
Roadside Safety Technology Branch
Materials Engineering and Testing Services
5900 Folsom Boulevard
Sacramento, California 95819-4612

Dear Mr. Peter:

In late September, you sent me one copy of a California Department of Transportation test report dated September 2002 entitled "Crash Testing of Various Textured Barriers" and one set of videotapes showing each of the tests you conducted. Based on the results of these tests, you developed general guidelines for the architectural treatment of single-slope barriers and requested formal acceptance of these guidelines.

All of the textured designs were formed over and parallel to California's Type 60 concrete barrier, which has a constant slope approximately 9 degrees from vertical. Seven different textured designs were tested. Four of these tests met all appropriate Report 350 evaluation criteria at test level 3 and three were considered unsuccessful. A summary (and reference photograph) of each tested design follows:

- Deep Cobblestone design (Enclosure 1) – not acceptable, due to excessive occupant compartment intrusion (2000P vehicle)
- Fluted Rib at 45 degrees (Enclosure 2) – not acceptable, due to rollover (820C vehicle)
- Mission Arch (Enclosure 3) – acceptable performance when tested with 820C vehicle. 2000P test waived
- Deep Cobblestone Reveal (Enclosure 4) – acceptable performance with 2000P vehicle. 820C test waived
- Drystack (Enclosure 5) – acceptable performance with 2000P vehicle. 820C test waived
- Fractured Granite (Enclosure 6) – acceptable performance with 2000P vehicle. 820C test waived
- Shallow Cobblestone (Enclosure 7) – deemed not acceptable due to 2000P vehicle driveshaft separation in crash. Report 350 evaluation criteria were met, however



Based on analysis of all test results, you proposed the following general texture guidelines for use on single-slope concrete barriers in California:

1. Sandblast textures with a maximum relief of 9.5 mm.
2. Images or geometric patterns inset into the face of the barrier 25 mm or less and having 45-degree or flatter chamfered or beveled edges to minimize vehicular sheet metal or wheel snagging.
3. Textures or patterns of any shape and length inset into the face of the barrier up the 13-mm deep and 25-mm in width.
4. Any pattern or texture with gradual undulations that have a maximum relief of 20 mm over a distance of 300 mm.
5. Gaps, slots, grooves or joints of any depth with a maximum width of 20 mm and a maximum surface differential across these features of 5 mm or less.
6. Any pattern or texture with a maximum relief of 64 mm, if such pattern begins 610 mm or higher above the base of the barrier and all leading edges are rounded or sloped to minimize any vehicle snagging potential. No part of this pattern or texture should protrude above the plane of the lower, untextured portion of the barrier.

Based on my staff's review of the information you submitted, I agree that the above guidelines for concrete barrier texturing are acceptable and will not adversely affect the NCHRP Report 350 test level of the barrier to which a texture or pattern is applied. I also agree that any texture or pattern meeting these guidelines can be applied to all crashworthy single slope or vertical wall designs. It is clear from the crash test results that textured barriers can result in more vehicular body damage in a crash due to increased friction even if their crash performance remains within acceptable limits. Although the barriers you tested were 1220-mm and 1422-mm tall, review of the crash and post-crash vehicle trajectories indicate that these guidelines may also be applied to vertical walls as low as 685 mm and to any single-sloped barrier at the standard 813-mm height or higher. These treatments may prove acceptable on New Jersey and F-shape concrete barriers if the treatment is applied only to the upper sloped face of the barriers, but some crash testing would be advisable to verify good performance with these shapes. I understand that anyone wishing detailed design drawings for any of the tested patterns may contact you by telephone at (916) 227-7257 or via e-mail at rich_peter@dot.ca.gov.

Finally, I wish to commend you on this very timely research. Today, more state and municipal transportation agencies are seeking aesthetic traffic barriers that are also crashworthy for use in historic and environmentally sensitive areas. The above

guidelines provide a means for satisfying both goals without additional crash testing and increased project delays and costs.

Sincerely yours,

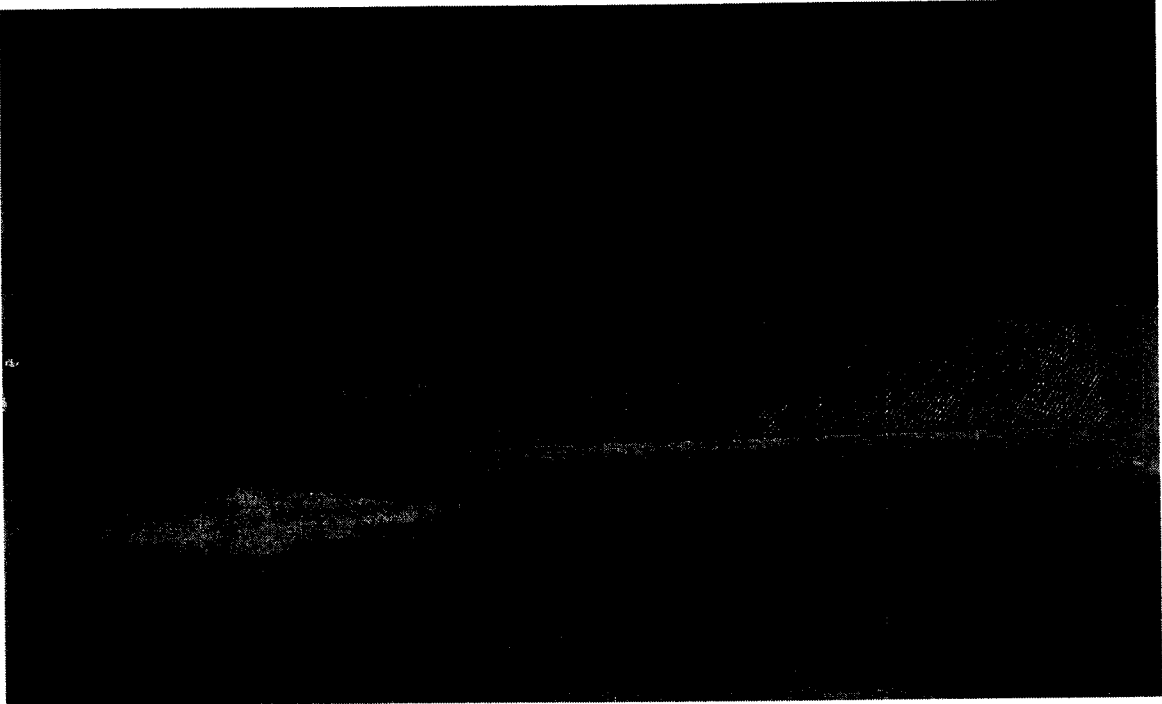
Harry W. Taylor

Harry W. Taylor
Acting Director, Office of Safety Design

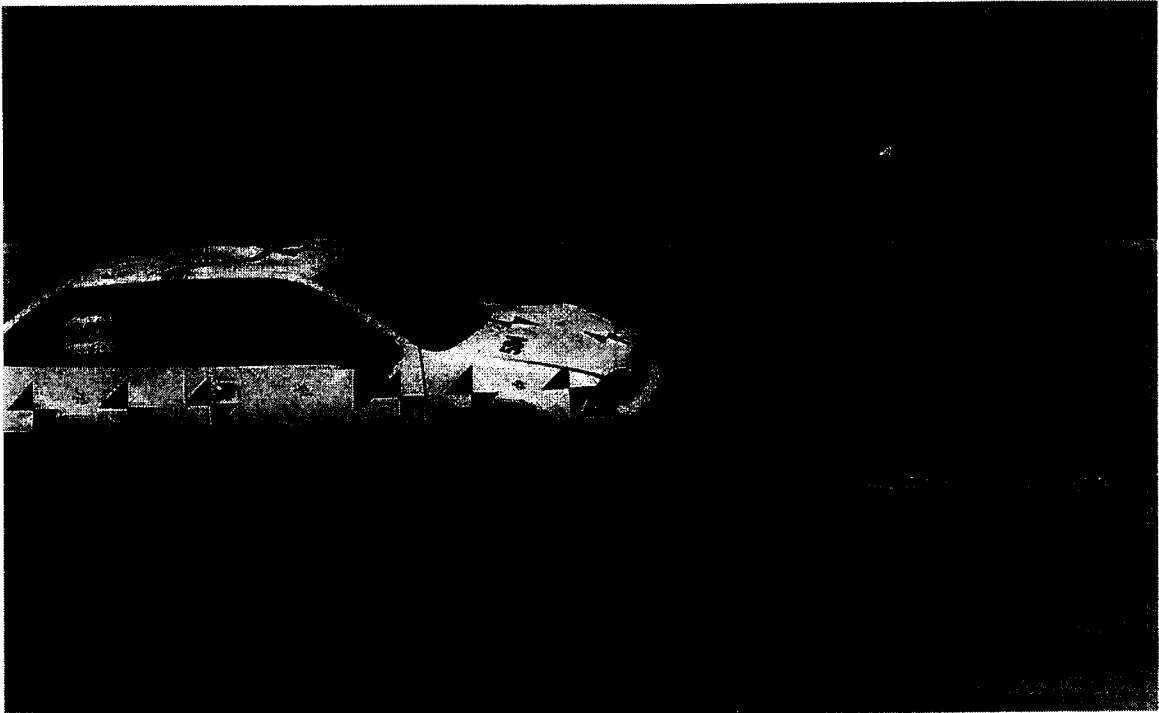
7 Enclosures



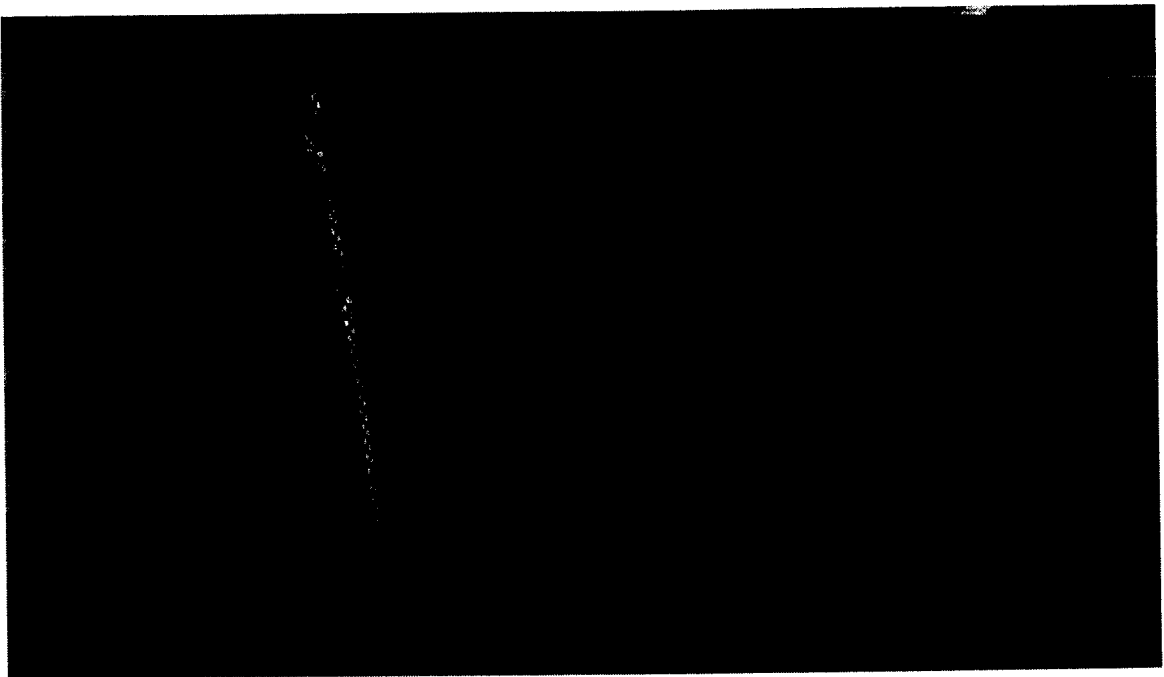
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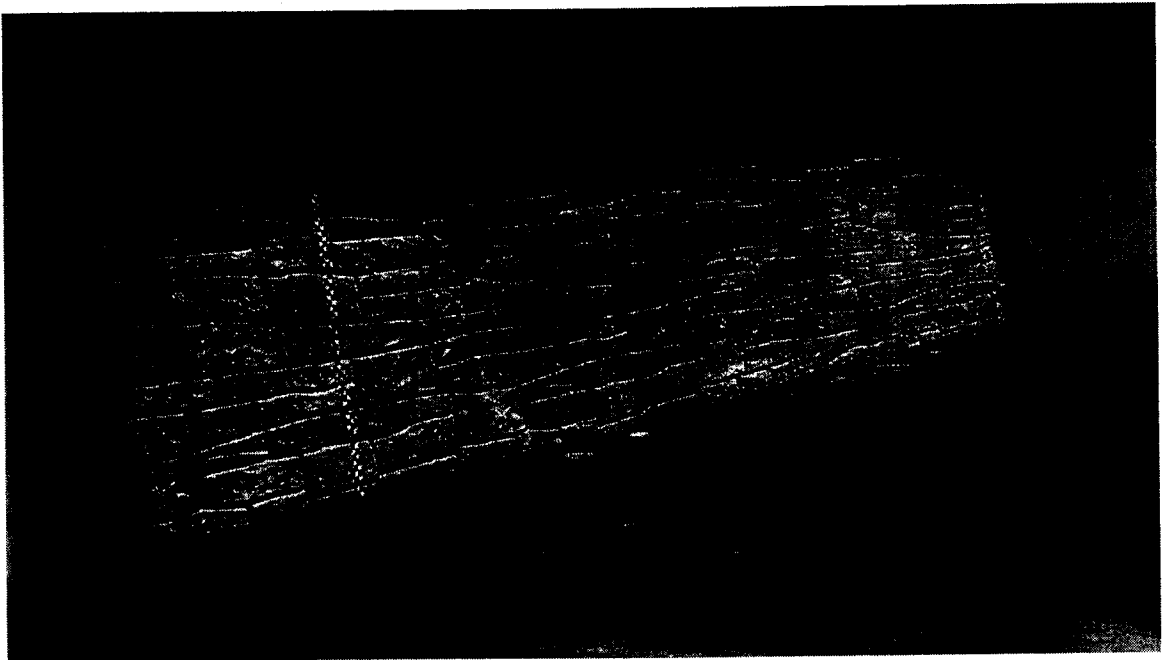
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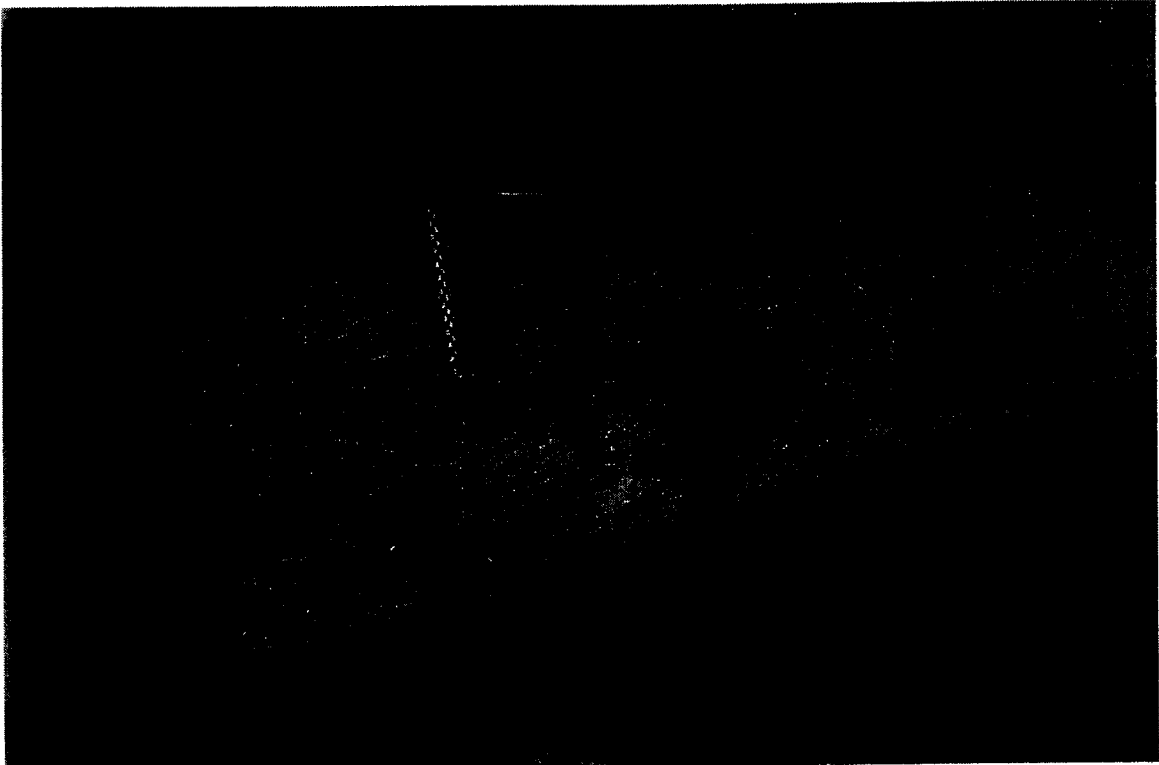
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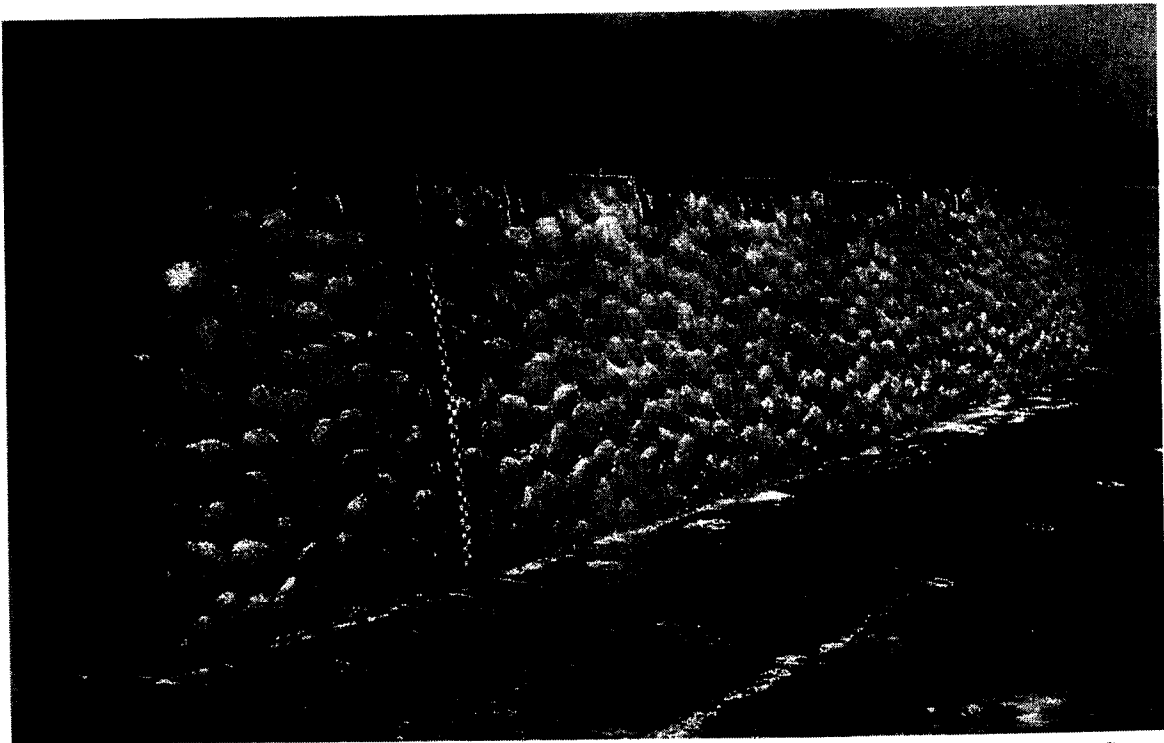
ENCLOSURE 4



ENCLOSURE 5



ENCLOSURE 6



ENCLOSURE 7