MDZ SHIELD
TESTING REPORT
August 28, 2015

Mr. Mark Barron
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523 West 6th St. Suite 1102
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Re:
Phase I and II testing and evaluation of MDZ Shield

Abstract

This investigator was retained by PTS to participate in the evaluation and testing of Minimize Danger Zone Shield (MDZ Shield). MDZ Shield is developed by PTS to eliminate or minimized the high risks involving school children, other pedestrians and cyclists from fatal and severe injuries as the result of accidental tripping/falling and getting run over by the right dual wheels of school buses. Danger zone is defined as an area within ten feet radius of a school bus, where children and others are at the highest risk for being hit by passing vehicles or buses. MDZ Shield was designed to push and deflect people out of the path of the right rear wheels of school buses. PTS had already developed a similar device, which is now installed on city transit buses and coaches (S-1 GARD). The purpose of this investigator’s participation was to provide technical support in testing, recommend improvements, and render an opinion with respect to the effectiveness and feasibility of the MDZ Shield.

MDZ Shield Construction for Phase I Testing

MDZ Shield deflector for phase I was made from two injected molded BASF Polyurethane plates bolted to each other (upper plate ~ 6.25-inched wide, lower plate ~ 4-inches wide). The polyurethane deflector as tested was roughly 10.5 inches high, 22 inches wide covering over the right rear dual wheels. The deflector covered about 12 inches of space on the right side profile and in front of the wheels. The deflector had a varying thickness of 0.5 to over 1 inch. A receiver mounting plate was permanently
affixed into the deflector plate during the injection molding (see attached photos for details).

Testing

Phase I and II of the testing and evaluations were performed on 7/17/2015 and 7/23/2015, at A-Z Bus Sales, 1900 S Riverside Ave., Colton, CA 9232. A-Z also provided the buses and drivers for both phases of the testing. A 50th percentile female dummy, a manikin, and live human subjects (hired stunts) were used to test and evaluate the effectiveness of MDZ Shield. The subjects were placed under the bus and in front of MDZ Shield in various configurations to represent conditions where a child or pedestrian would accidently trip and/or fall under and onto the path of a moving bus RR dual wheels. The MDZ Shield receiver mounting plate was glued to the side panels of the testing buses (to prevent cosmetic damage to the exterior of the bus; production versions will be bolted to the side panels). The deflector plate in the installed position was measured from 3 to 4 inches from the ground level in both phases of the testing (~3 inches outer edge, ~4 inches inner edge). The following describe the results of the observations and visual evaluation of MDZ Shield in phases I and II of the testing.

Phase I Evaluation and Results

- The prototype MDZ Shield used in phase I was attached to the bus in a cantilevered configuration. The deflector plate was attached and supported only by the receiver mounting plate to the bus’s right side panels (see attached photos). The unsupported inner end of the deflector plate showed some flexing and rotation around the supported vertical axes (receiver plate area). Despite the flexing, the MDZ Shield’s deflector plate proved to be stiff and still capable of moving and deflecting subjects out of the path of the moving RR dual wheels. The deflector effectively pushed the subjects that were placed in various configurations out and to the side of the bus. All the tests were done with the subjects’ bodies partially placed or inserted on the right side of the vehicle’s undercarriage. Some of the tests with the 50th percentile female dummy showed
the possibility of extremities (hands and feet) being dragged under the protector plate with the bus moving (although a child or pedestrian extremities, most likely, would not be placed motionless on the ground, like the subject test dummy). In any event, the test runs showed low risks and possibility of injuries from a child or pedestrian hands/feet getting caught under the protector plate and dragging. PTS informed this investigator that the MDZ Shield will be slightly modified for the phase II testing by supporting the inner end of the deflector plate to an undercarriage structural component.

**Phase II Evaluation and Results**

PTS added an aluminum brace to the inner end of the deflector plate and attached it to the bus’s undercarriage. Therefore the deflector plate was secured at both ends for the phase II testing. A manikin and live human subjects were used and placed under the bus and in front of the MDZ Shield deflector in different positions and configurations for the testing. The deflector plate showed insignificant amounts of deflection in any directions. The deflector was stiff and effective in sweeping the manikin and human subjects out and to the side of the bus’s right rear wheel path. This investigator personally tested the integrity of the deflector plate in four separate test runs. The deflector plate pushed this investigator out and to the side of the bus in each of the four test runs.

**CONCLUSION**

MDZ Shield proved to be an effective and practical device in significantly reducing risks of fatal and serious injuries to children and pedestrians from accidentally tripping and falling under the right rear wheels of buses during loading and unloading. The simple but effective design of MDZ Shield provide for easy mounting to right side and undercarriage of buses made by different manufacturers (can also be easily adapted to various bus body and undercarriage configurations). MDZ Shield was not tested for durability and potential damage as the result of striking roadway obstacles, potholes, etc. However, it can be concluded that the economic impacts from repairs and
replacements of MDZ Shield should be very minimal, considering the advantages in preventing fatal and serious injuries. Repairs, replacements, and other pertinent data and information can be obtained from the transit buses experience and service exposures that have already been equipped with a similar S-1 GARD deflector shield.

Respectfully submitted,

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Attachments:

- Eighteen photographs of testing and evaluation MDZ Shield
- Three drawings of MDZ Shield mounting configuration to a bus body
Photo 1

Test bus with a 50th percentile female dummy laid in front of the RR wheels equipped with MDZ Shield
Photo 2

Test bus with a 50th percentile female dummy laid in front of the RR wheels equipped with MDZ Shield
Photo 3

50\textsuperscript{th} percentile female dummy being pushed to the side of the bus by MDZ Shield
Photo 4

50th percentile female dummy being tested in a different position
Photo 5

50th percentile female dummy being tested in a different position
Photo 6

50th percentile female dummy being tested in a different position
Photo 7

A human subject (stunt) testing MDZ Shield effectiveness
Photo 8

A human subject (stunt) testing MDZ Shield effectiveness
Photo 9

A human subject (stunt) testing MDZ Shield effectiveness
Photo 10

A manikin used in testing MDZ Shield effectiveness
Photo 11

A manikin used in testing MDZ Shield effectiveness
Photo 12

Manikin being deflected by MDZ Shield
Photo 13

Manikin placed further away from MDZ Shield
Photo 14

Human subject (stunt) used in testing MDZ Shield effectiveness
Photo 15

Human subject (stunt) being deflected and rotated around MDZ Shield
Photo 16

Human subject (stunt) placed in front of MDZ Shield (different position)
Photo 17

Human subject (stunt) being deflected and rotated around MDZ Shield
Photo 18

4.5-inch high wooden pallet was swept aside by MDZ Shield (did not drag when placed in front of the shield)
Figure 1

An MDZ Shield 3D drawing showing mounting configuration
Figure 2

MDZ Shield receiver plate mounting location to the bus body
Figure 3

MDZ Shield receiver plate mounting location to the bus body