

SAFE-T-PUNCH EVALUATION

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Synopsis

This report discusses the evaluation of SAFE-T-PUNCH, a commercial product which enables trapped people in a bus to easily shatter and remove the rear windows, or emergency exit. Findings from data collected show that the product can easily be operated by adults as well as children.

Sinopsis

Hierdie verslag bespreek die evaluasie van SAFE-T-PUNCH, 'n kommersiële produk wat vasgekeerde mense in 'n bus in staat stel om die agter ruite, of nood uitgang maklik te breek en te verwyder. Bevindings toon dat die produk ewe maklik deur volwasse persone as kinders gebruik kan word.

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SAFE-T-PUNCH EVALUATION

HS MeIntjes

1. INTRODUCTION

Although all buses and passenger carrying vehicles have well marked emergency exits, the practicality of these exits is somewhat dubious. For a man, the method of removal of the glass window might not be a problem. For a child, a woman, or an injured person kicking out the window might prove to be more of a problem, especially after the window rubbers have been extensively exposed to sunlight.

Exclusive Inventors have developed a product which has the potential to overcome this problem. This is a punch, permanently attached to the window, to break the glass. The claims that Exclusive Inventors made were to be evaluated by the CSIR and recommendations were required.

2. DESCRIPTION OF DEVICE

SAFE-T-PUNCH is a small device that is permanently attached to the rear window/s or emergency exit/s of a vehicle. It consists of a red spring loaded handle in a black shell, made of Nylon 6. Attached to the handle is a steel tip. A safety pin is attached to the device. After removing the safety pin, a blow is delivered to the handle. By either delivering a single blow, or a number of softer blows, the steel tip chisels through the outer layer of the glass. Once through, the glass shatters by itself. **It should be noted however that this device is only to be used on Armourplated, or hardened glass, and not on Shatterprufe glass.** An instruction sticker is also attached to the glass for the convenience of the user.

3. METHOD OF EVALUATION

Two almost similar punches were to be evaluated, the first with a hardened steel point and the second with a tungsten tip. This was for comparative purposes only. The latter was then to be evaluated in real life situations, i.e. in a taxi and in a bus. The forces for breaking the glass were measured.

The sticker was evaluated by school children to see if they could understand the instructions, and the impact force delivered by children were measured. This was compared to the actual breaking force of the glass, when broken with the SAFE-T-PUNCH. The children were aged between 12 and

13 and this was decided as the cutoff as it was felt that younger children might find it difficult to get to the punch, as well as find it difficult to read during a panic situation.

The device was also evaluated for tampering.

In total, ten pieces of glass were broken in a preliminary study as well as two taxi windows and two bus windows in the final study.

4. RESULTS

Twenty children were asked to evaluate the sticker, of which 17 understood the instructions. All adults understood the sticker. The three children that did not get the device to operate had problems with the safety pin, in that they only partially removed the pin before delivering the blow to shatter the glass. The forces measured when delivering a single blow (average of three) to a load cell did not differ substantially (see TABLE 1).

As previously mentioned there were two punch types to be evaluated. In ten impacts (five each), no noticeable difference could be found between the two types (TABLE 1).

The devices were then mounted to the rear windows of two taxis. Both a normal window, as well as a heated version were evaluated. The forces for shattering the glass were not noticeably different when compared to breaking bus windows, although the first glass was shattered with a single blow, and the second with three softer blows.

DESCRIPTION	DESCRIPTION OF IMPACT	AVERAGE FORCE Newton (LOWEST)	AVERAGE FORCE Newton (HIGHEST)
School children		84.37	88.29
Tungsten tip	Single blow	86.33	92.21
	Multiple blows	35.32	89.27
Hardened tip	Single blow	89.27	92.21
	Multiple blows	44.15	89.76
Taxi window	Single blow		63.77
	Multiple blows	35.32	
Bus window	Single blow		113.80
	Multiple blows	37.28	

TABLE 1 : Impact forces delivered

Finally, the devices were mounted onto the rear windows of a bus. At first, two devices were forcibly removed (for tampering), and in both cases the metal ring attaching the punch to the window separated from the punch. A force was applied to a unit without removing the safety pin and the unit did operate successfully afterwards. After this the windows were shattered, the first with a single blow, and the second with two softer blows.

5. DISCUSSION OF RESULTS

The biggest influence on the force needed to break the glass is the thickness of the hardened layer on the glass. On some samples, the glass shattered easier than on others. In general, it was found that the force needed to break the glass was lower when multiple blows were used rather than single impacts. Although not specifically evaluated for submerged conditions, it is felt that the device will work under water as the water pressure against the glass will minimise deflection of the glass created during impact.

Even though the forces measured with children were not always enough to break the glass in one blow, it is felt that the force applied might be higher in panic situations. When multiple blows were delivered, the glass would have shattered.

The method of attachment is excellent (metal to glass). The fact that the units could be broken from the glass with sufficient force (in cases of vandalism) showed that although some units might be stolen, the device is useless as the metal ring necessary for attaching the unit to the window is left behind. The design also does not permit for the unit to be modified to reattach to another window, and the specific glue does not bond to the Nylon 6, of which the device is made of. The fact that the relatively inexpensive SAFE-T-PUNCH can, with sufficient force be removed without breaking the expensive glass is felt to be an advantage.

It is interesting to notice that in a two month period, of the 600 units that had been mounted to the Johannesburg City Council buses, none had been reported damaged or removed, and although the safety pins on some had been removed, no windows had been broken.

6. RECOMMENDATIONS

The recommendation made that the sticker be changed, i.e. that a 1 (one) and 2 (two) (see Appendix A) be placed on the sticker to show sequence of operation, has made understandability much easier. Letter size should also be as big as possible.

It is further recommended that the length of the safety pin be looked at, as the children that had problems with the device pulled the pin, but did not remove it totally. The wording could also be changed to "REMOVE PIN BY PULLING". Although the CSIR felt that the safety pin should be made of a material that would shear under sufficient force and be permanently fixed to the punch, Exclusive Inventors stated that it was important to be able to check operation during the life of the

product. The shearing force might then also have been too high.

Although the product was not evaluated by the CSIR for Ultra Violet ray damage, Nylon 6 is prone to damage by these rays. Exclusive Inventors has however stated that the carbon black portion of the device has some UV protection and the glue cuts off UV. If the device is placed against the top edge of the glass, the instruction sticker will also shield the rest of the device from the sun.

7. CONCLUSIONS

From the evaluation, it is apparent that the product "SAFE-T-PUNCH" does what it is supposed to do; provide an easy way to removing the emergency exit. The general design is simple and effective, and could lead to substantial saving of lives in an accident situation.

8. ACKNOWLEDGEMENTS

The author would like to thank the Pretoria City Council for making available a bus for evaluation purposes.

9. APPENDIX A

EMERGENCY EXIT		NOOD UITGANG
1 PULL THE PIN OUT ----- TREK DIE PEN UIT ----- KHIPHA INSIMBI ----- NTSHA TSHEPE	P U L L	2 STRIKE THE RED KNOB ----- SLAAN DIE ROOI KNOP ----- SHAYA IKINOBO ELIBOVU ----- OTLA KONOPO E KGUBEDU
DO NOT TAMPER		FOR YOUR SAFETY