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Evaluation of Rollup Sign Holder

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Supplemental Notes

Abstract
The rollup sign holder consists primarily of an L-shaped hollow steel tube with a 2-inch square cross-section. One end of the tube is designed to fit into a standard 2-inch trailer hitch sleeve on the rear of a light-duty maintenance vehicle and the other end has hardware necessary for supporting a conventional 4-foot rollup sign. The Marquette County Highway Department (WI) agreed to retrofit five vehicles with 2-inch sleeves and use the signs for two weeks of retrieving and replacing shoulder material at various locations in the county on two-lane roads. Opinions of the device were elicited from a focus group interview of all 5 vehicle drivers and their supervisor. It was found that the rollup sign holder serves a need for a warning sign close to a vehicle during moving operations. There is a perception that such signs improve safety.

Evaluation of Rollup Sign Holder

1. TECHNOLOGY

The rollup sign holder is a product of Lang Products International, Inc. (1870 E. 50th St., Inver Grove Heights, MN 55077). The rollup sign holder consists primarily of an L-shaped hollow steel tube with a 2-inch square cross-section, as shown in Figure 1. One end of the tube is designed to fit into a standard 2-inch trailer hitch sleeve on the rear of a light-duty maintenance vehicle and the other end has hardware necessary for supporting a conventional 4-foot rollup sign. Two configurations were tested. One configuration had a sign-support bracket with pins (Figures 1 and 2) and the other configuration held the sign with a clamp (Figure 3). The holder does not come with any signs. The holder fits only one type of trailer hitch.

Figure 1. Rollup Sign and Holder with Pin Bracket on Rear of a Grader

Figure 2. Pin Mount on Rollup Sign Holder

Figure 3. Clamp Mount on Rollup Sign Holder

2. STUDY SITE:

It was very difficult to find suitable study sites because large maintenance vehicles with unused 2-inch sleeves are rare in Wisconsin. Furthermore, there was a desire to test the signs on moving operations where the maintenance vehicles are seriously disturbing the normal flow of traffic on a state trunk highway. It was felt that a standard work zone would not demonstrate the potential of the rollup sign holder, as there are many stationary devices that already serve this need. Consequently, there was a single test of the holder in Marquette County, Wisconsin. The Marquette County Highway Department agreed to retrofit five vehicles with 2-inch sleeves and use the signs for two weeks of moving operation. The moving operation consisted of retrieving and replacing shoulder material at various locations in the county on two-lane roads.

The Marquette County Highway Department self-assesses itself as being highly committed to worker safety and to innovation in their adoption of safety devices and techniques. Thus, the county's staff is particularly qualified to perform the test.

3. DATA COLLECTION:

The test was conducted principally during the last two weeks of May 2002. The shoulder retrieving operation required five vehicles: two graders, a broom and two dump trucks. The lead grader retrieved the material, the second grader placed the material and the broom cleaned the road surface. The two trucks followed the broom and were present only as shadow vehicles to protect the graders and broom from motorists. The maintenance vehicles encroached about halfway into the travel lane in a single direction. The lead grader and the lead truck were both fitted with rollup signs reading "SHOULDER WORK". The second truck pulled an arrow board.

The trucks were also fitted with numerous flashing yellow lights. The graders had only a single yellow light. The operation was conducted during daylight hours.

Marquette County fabricated its own 2-inch sleeves. The sleeves were either bolted or welded to the vehicles off-center, nearer to the left side of the vehicle. Thus, the sign would be positioned close to the line of sight of motorists without blocking the maintenance vehicle driver's view to the rear. The sleeve on a grader can be seen in Figure 1. Figure 4 shows the location of the sign on a truck.

Figure 4. Rollup Sign and Holder on Rear of a Truck

The maintenance vehicle drivers were told of the purpose of the test and were asked to remember any pertinent details or unusual occurrences.

4. DATA ANALYSIS

A focus group interview of all 5 vehicle drivers and their supervisor was conducted at the offices of the Marquette County Highway Department. A consensus was quickly reached about the answers to all questions.

5. RESULTS

Using the textbook air resistance formula, the maximum wind load on a rollup sign is 17 lbs at 20 mph and 67 lb at 40 mph.

The following observations about the rollup sign holders were made by the focus group.

Vehicle Preparation. The need to add a sleeve to each vehicle was not considered to be an impediment. For each vehicle about 1 hour of fabricator time was needed, and the material cost was $10.

Training. The holders had much in common with other sign supports used by the county, so training time was not significant.

Installation and Removal: The time to install the holder at the beginning of the job or to remove the holder at the end of a job was less than 5 minutes each. The signs could easily be installed or removed by one worker. Often, it was most convenient to leave the holder on the vehicle at the end of a day so it would be in place for the next day's work. The holder with the pins was easiest to use.

Speed of Vehicle with the Signs. Vehicles could be operated up to 20 mph (the maximum speed of a grader) with the signs in place. Since all vehicles were driven to the job site in a convoy, the signs could be installed prior to leaving the yard. The sign legend for the job was appropriate for moving between the yard and the job site.

Unanticipated Problems. Strong winds caused an angle iron holding the sleeve on one truck to deform. The holder or the sign were not damaged in this incident. The county recognized the need for a stronger angle iron for future operations. There is a need for a way to stow the holder when not installed on the rear of the vehicle. The sign on the grader became dusty and required cleaning, although it never became illegible. The signs block motorists' view of some of the yellow warning lights on the trucks.

Stability of the Signs. Except as indicated previously, there were no serious vibrations, oscillations or deflections of the signs or holders.

Versitility. Marquette County uses rollup signs exclusively and has a wide variety of signs available. The signs would be useful for any moving operation. However, it would not be possible to spill from a dump truck with the signs in place. There were not any good places for mounting the sign on the dump truck that would allow tilting the box.

Personal Assessments. Drivers felt safer with the signs on their vehicles but were skeptical that motorists paid sufficient attention to any warning sign.

Recommendations. Marquette County would recommend that other counties in Wisconsin adopt the holder. The sign and holder is inexpensive compared with the perceived safety advantages. The product helps fill the space between the job site and the required stationary signs that can be as much as 3 miles away. Marquette County plans to continue to use the holders.

6. CONCLUSIONS

The rollup sign holder serves a need for a warning sign close to a vehicle during moving operations. There is a perception that such signs improve safety.

The need for a 2-inch sleeve on the vehicle is an obstacle for adopting this device.

7. RECOMMENDATIONS

The rollup sign holder affords an additional margin of safety beyond the stationary signs required for moving operations and should be adopted wherever practical.

Mounting hardware should be designed to handle loads on the sign caused by winds of up to 40 mph (about 67 lb).

When a sleeve is added to a vehicle, it should be mounted off-center to the left, so that it provides the greatest visibility to motorists without interfering with the driver's ability to see to the rear.

Either the manufacturer or customer should fabricate a device for stowing a holder on a vehicle when the holder in not being used.