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MAILBOXES AND MOUNTING SYSTEMS

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COLORADO DEPARTMENT OF TRANSPORTATION

RESEARCH BRANCH

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16. Abstract

Background: During the winter months mailboxes along rural highways are often damaged by the plow blast as snowplows remove heavy, wet, packed snow and ice from the highway. Because the damage is done by CDOT maintenance operations, CDOT is responsible for repairing or replacing the damaged boxes. Mailboxes and mounting systems that are resistant to damage caused by plow blasts are available. This report evaluates the durability of mailboxes and energy absorbing mounting systems.

Several mailboxes and mounting systems were installed along US-34 west of Wiggins during the fall of 2002. The condition of the boxes and mounting systems was evaluated following the winter snow season to determine which ones withstood the pounding from the plow blasts with the least damage.

Implementation: Plastic mailboxes and one of the metal self centering mounting systems performed well and are recommended for use in rural areas where snowplowing operations are known to cause damage to mailboxes.

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EXECUTIVE SUMMARY

On rural highways mailboxes are often placed close to the edge of the pavement, where the mail carrier and homeowner can reach them from inside a vehicle. These mailboxes and their support systems are subjected to severe forces generated by flying snow and ice thrown by plows passing by at high speed. The impact of the snow and ice can bend the mounting posts and flatten the mailboxes. Swing-away mailbox mounting systems let the box be pushed aside by the plow blast. The swinging action reduces the amount of force that is applied to the mailbox and helps to protect it from damage.

It is important that a swing-away system be designed to return completely to its original position every time it is moved so users can easily reach it from inside a vehicle. The all metal swing-away systems protected their boxes and held adjustment performing well through the winter. The wood and metal swing-away systems protected their boxes but were unable to maintain adjustment to function properly; after several impacts, they failed to return reliably to the original position.

All wood mounting systems perform satisfactorily in locations where snow and ice thrown by passing plows is less likely to hit the mailbox and its mounting system. These mounts provide no energy absorption – they are better suited to use with plastic mailboxes that withstand the impact from plow blasts better than metal boxes.

Plastic mailboxes are better able to withstand repeated impacts of flying snow and ice and retain their usefulness than are metal boxes. Plastic mailboxes are recommended for use on both fixed and swing-away mounting systems in locations where they are likely to be hit repeatedly by snow and ice thrown by passing snowplows. If a metal mailbox is necessary, it is recommended that it be positioned as far from the shoulder of the highway as possible, such as on a driveway or extended shoulder pull-off.

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BACKGROUND

On rural highways mailboxes are placed close to the edge of the pavement, where the mail carrier can reach them from a vehicle. They have been mounted on a wide variety of interesting, artistic, and sometimes bizarre bases ranging from welded chain to stone columns to an antique miniature bulldozer. Safety regulations have eliminated that form of creativity in most instances because a mailbox mounted near a highway is considered a hazard and is required by law to be designed to do as little damage as possible to a vehicle that hits it. The mounting post must be a break-away design with a base that will not cause a small vehicle to roll over. The top of the mount must be designed so it won't separate from the post and become a missile that could penetrate the windshield of a vehicle during an accident.

Figure 1. Mailboxes mounted near high-speed highways are susceptible to damage from the blast of snowplow during the winter.

A mailbox located next to a rural high-speed highway is in a harsh environment. During the winter, when snowplow clear the highway, the heavy, wet snow and ice in the blast from their blades can do considerable damage to the mailboxes, often bending them to the point that they become unusable (**Figure 1)**.

EVALUATION

In the fall of 2002, along a section of US-34 west of I-76, CDOT Region 4 maintenance workers replaced several damaged mailboxes and posts with new boxes and new mounting systems. Some of the old metal boxes were replaced with plastic ones from Rubbermaid® to see if the plastic would hold up better to the heavy snow blast thrown by passing snowplow. The new boxes were installed using four different post and/or mounting system designs:

- The Friend Innovations system - an all-metal swing-away system.
- The Roadside Safety Devices system - a metal arm with a pivot that bolts to a wood post.
- A fixed all-wood mount with a cantilevered arm.

- A straight metal break-away post system.

OBJECTIVES

The attempt to protect the traveling public and to prolong the life of rural mailboxes has led to widely varying mailbox mounting systems for use along high-speed rural highways. The old familiar round-topped metal box has also evolved into plastic designs that can withstand impact from heavy, wet snow thrown by plows passing at high speed.

The Friend Innovations system – A three-piece all-metal post system allows the mailbox to swing to the side when hit by the snow thrown by a passing plow. The swinging action of the mount absorbs most of the impact from thrown snow, slush and ice. The geometry of the design uses gravity to swing the box back to its original position. The metal box in the picture (**Figure 2**) has survived through the winter with no damage.

Figure 2. The box and top section of the mount swing to the side and up.

A box is bolted to the top piece of the system which is bent about one-third of the way along its length at a 45º angle. The short arm of the top piece then slips over the top of the middle pipe but is not fixed to it. This allows the top section to pivot when the box is hit. The middle section, which is bent at a 45º angle near its center, is tightly clamped at the bottom to a straight 24" long vertical base pipe. The base pipe is in turn bolted to a section of U-post that is driven so its top is 4" above ground level. The U-post is set back 46" from the edge of the pavement.

Costs for the Friend Innovations system in the fall of 2002 were: Mailbox support: $36.00 + $16.32 shipping = $52.32/each. Each Friend Innovations system takes about 1.5 hours to assemble and install. This is the most expensive of the systems evaluated here.

Figure 3. The Roadside Safety Devices mounting system does not reliably return to the centered position.

The Roadside Safety Devices system – Mailboxes mount to a long metal arm that attaches to a pivot bolted to a 4" x 4" wood post. This system is designed to allow the box and arm to swing away from the plow blast. The assembly should then re-center itself after the plow has passed. As the picture shows, the mailboxes were not damaged during the winter. However the system does not return the box to the centered position reliably. Both of these boxes would be difficult for the mail carrier to reach.

Close examination of the two-piece pivot mounts on the two boxes in **Figure 3** showed two

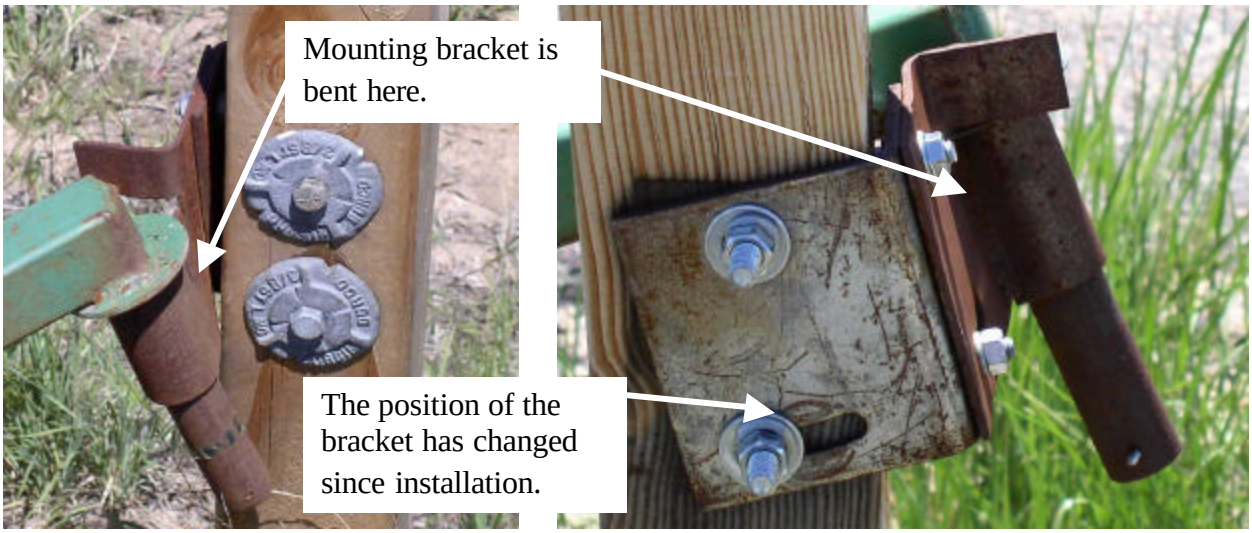

Figure 4. Close-up pictures of the two mounts in Figure 3. Both brackets are bent. The bracket in the right picture has gone out of adjustment at the bolts facing the camera.

problems with the system. The first is due to the fact that on both mounts in **Figures 3 and 4** there is some bending in the mounting bracket piece that holds the pivot sleeve. The bracket on the left post is bent so the pivot sleeve tilts to the left as viewed from the highway; the bracket on

the right is bent at the same point but so the pivot tilts to the right viewed from the highway. The bent bracket changes the angle of the pivot sleeve which changes the normal position of the pivot arm and the mailbox.

The second problem is with the adjustments to locate the normal position of the arm and box. Initial position adjustment of the system is done by setting the relative angles of the two-piece mounting brackets that bolt to the wood post. The adjustments, made by two pairs of bolts, set the initial positioning of the pivot sleeve so the arm returns to the centered position after it is pushed to the side. In the picture on the right of **Figure 4,** marks made on the bracket by the pair of bolts facing the camera show the initial position of the bracket and that the position has changed. Natural expansion and contraction of the wood post, due to changes in its moisture level as the weather changes, will make it nearly impossible to keep these two bolts tight enough to hold this adjustment. This system has the longest arm of the mountings evaluated. That long arm provides considerable leverage against the two adjustments held only by friction between the mount pieces and the wood post.

The long arm on the Roadside Safety Devices system allows the mount base to be 56" back from the front of the box – the largest setback of the mounts evaluated here.

In the fall of 2002, the Roadside Safety Devices system cost $28.10 ea – $20.00 for the system plus $8.10 each for shipping. Assembly and installation time for this system is 1.5 hours.

Wooden Mailbox Support system – An all-wood mount design with a 4" x 4" post and a cantilevered wood arm sets the post 4' back from the front of the box. This is an inexpensive, easily constructed mailbox mount. However, it is a rigid system; it doesn't absorb any of the energy from the plow blast. While there is no evidence of damage to the plastic box in **Figure 5**, the photo at the right shows that the force of the plow blasts over the winter has twisted the post in its hole, causing the mailbox to be turned slightly away from the highway.

This system, with a cost of $28.38 for the materials, and assembly and installation time of 2

Figure 5. The plastic box is good condition, but the twisted post shows the effects of being hit by the snow thrown by passing plows.

hours, is nearly as expensive as the Friends Innovations system. Because it is a rigid mount with no mechanism to absorb any of the energy from a snowplow blast, it is best suited for use with a plastic box rather than a metal one. The blast force applied through the long cantilevered top support arm will continue to twist the base post in the ground, loosening and weakening the system.

Figure 6. Damaged metal boxes on rigid post mounts. The post on the left is set at the edge of the pavement, while the two on the right are set about 8' from the edge of the shoulder with a small gravel turn-out to allow close access to the boxes.

Figure 6 shows new metal boxes mounted on straight rigid posts. The post in the picture on the left is at the edge of the pavement. The box was replaced

last fall but, as the picture shows, did not stand up well to the winter. The two boxes in the right picture are set about eight feet from the edge of the pavement with a small gravel turn-out to allow mail carrier and homeowner access to them. The near box, while not as severely damaged as the one in the left picture, is slightly bent. Possibly the extra distance from the highway provided a measure of additional protection for these two boxes – the small one almost certainly provided some protection for the large one behind it.

Plastic boxes, like the one in **Figure 5**, seem to be a better choice for rigid mounting systems. The box appears to be better able to withstand the pounding from the snowplow blasts. The fact that the plastic boxes are wider than the metal ones and have a slightly lower profile may help them resist the force of the blast better.

Cost differences between the plastic and metal boxes are negligible: The plastic mailboxes, from Rubbermaid®, cost $35 for a large one and $10 for a medium one; metal mailboxes cost $30 for a large one and $9 for a medium one.

CONCLUSIONS AND RECOMMENDATIONS

When they are positioned close to the highway, mailboxes and their support systems are subjected to severe forces generated by flying snow and ice thrown by plows passing by at high speed. Heavy, wet, snow and ice can bend the mounting posts and flatten the mailboxes. A swing-away mounting system that lets the box be pushed aside by the plow blast can reduce the amount of force that is applied to the mailbox and protect it from damage. However, it is important that a swing-away system be designed to return completely to its original position every time it is moved so users can easily reach it from inside a vehicle.

A wooden post in contact with the soil will expand and contract as its moisture content changes. For this reason, it is important that a mounting system that contains both metal and wood parts be designed so the adjustments of the system cannot be affected by dimensional changes in the wood parts. No amount of tightening will prevent bolts that clamp slotted adjustable metal parts to wood parts from loosening when the moisture content of the wood part drops and the wood shrinks.

A cantilevered wood post system is esthetically pleasing; however, it does not provide any energy absorption to protect the box and is susceptible to twisting caused by the force of plow blasts acting on the box at the end of the long arm. This type of mount would be best used in locations slightly removed from the highway so it is not likely to be hit by heavy snowplow blasts.

Plastic mailboxes were able to withstand the battering better than the metal ones installed for this evaluation – especially on rigid mountings. Costs are very similar between metal and plastic boxes, so the added durability of the plastic boxes makes them more cost-effective in any location where the box is likely to be hit by plow blasts – even on the "self centering" systems, but especially on all types of rigid mounts. If specific needs require the use of a metal mailbox for some reason, it should be located somewhere away from the highway, such as on a driveway or a wide turn-out, if possible.