2021 INNOVATION CHAMPIONS CONTEST

Chip Seal Bucket Spreader

COUNTY: Traill County Highway Department

DESIGNERS: Corey Ackerman, Jay Showers

ADDRESS: 319 2d Ave SW, Hillsboro, ND 58045

CONTACT: Corwyn Martin, Jay Showers, Corey Ackerman

E-MAIL: corwynm@nd.gov; kshowers@nd.gov

TELEPHONE: (701)636-4341, (701)430-9320, (701)367-9628

PROBLEM STATEMENT: Using the large self-propelled chip spreader plow when traveling to smaller chip seal projects was slow and cumbersome. The top speed of the chip spreader is 17 mph. Since it has no suspension system driving the spreader is physically exhausting for the driver. With no canopy the driver is sometimes exposed to the sun's heat for hours.

At times the truck with the chipping stones would bump the chip spreader when back up. This would cause the driver in the spreader to jerk and hang on. With the chip spreader, two people are needed when filling it with chipping stones.

SOLUTION: Designed and fabricated the chip seal bucket spreader that attaches to a skid steer. The chip seal bucket spreader was fabricated so it is no longer necessary to bring the self-propelled chip spreader across the county that can be done with the chip seal bucket spreader. The chip seal bucket spreader is ideal for smaller projects when patching roads, bridges and culverts.

The skid steer with the chip seal bucket spreader is hauled to the work site using a pickup and trailer that can travel at 55 mph. Once unloaded, it is driven up to the back of the truck hauling chipping stones. The truck box is lifted and dumps chipping stones into the chip seal bucket spreader. The skid steer is driven to the crack, the bucket is hydraulically opened, about ¼ inch so chipping stones trickle over the oil treated area. The dividers in the bucket are support the fully loaded bucket. On the back end of each divider, a ½ of circle is cut out. The dividers and ½ circle cut out serve to allow the chipping stones to fluidly flow and spread more uniformly. The skid-steer can be used for compaction when necessary, or sometimes a rubber-tired roller is used. After the oil and chipping stone have solidified, a sweeper is used to broom off excess chips.

EQUIPMENT, MATERIALS, AND LABOR:

Equipment used:
Welder

Materials:
Salvage material:
(8) 4-inch long pipe with 1-inch hole
(2) 1-inch x 2-1/2-inch x 3-inch flat steel
(2) ½-inch x 2-inch x 3-inch flat steel

New material:
(1) 4-feet x 8-feet x 3/16-inch flat steel
(1) Hydraulic cylinder
(1) 1-inch x 8-foot round shaft
(1) 8-foot cutting edge
(1) 3/16-inch x 3-inch x 8-foot long flat steel
(1) Blank skid steel plate bucket attachment
(2) 4-inch x 6-inch x 8-foot angle iron

Total Labor Hours:
2 people
2 hours for design
20 hours to build
Total – 22 hours, 2 people

COST SUMMARY:

4-feet x 8-feet x 3/16-inch flat steel	$ 422.00
Hydraulic cylinder	$ 70.00
1-inch x 8-foot round shaft	$ 45.00
8-foot cutting edge	$ 136.48
3/16-inch x 3-inch x 8-foot long flat steel	$ 35.00
Skid steer plate attachment	$ 375.00
4-inch x 6-inch x 8-foot angle iron	$ 50.00
Total Cost:	$1,133.48 plus labor

SAVINGS AND BENEFITS:

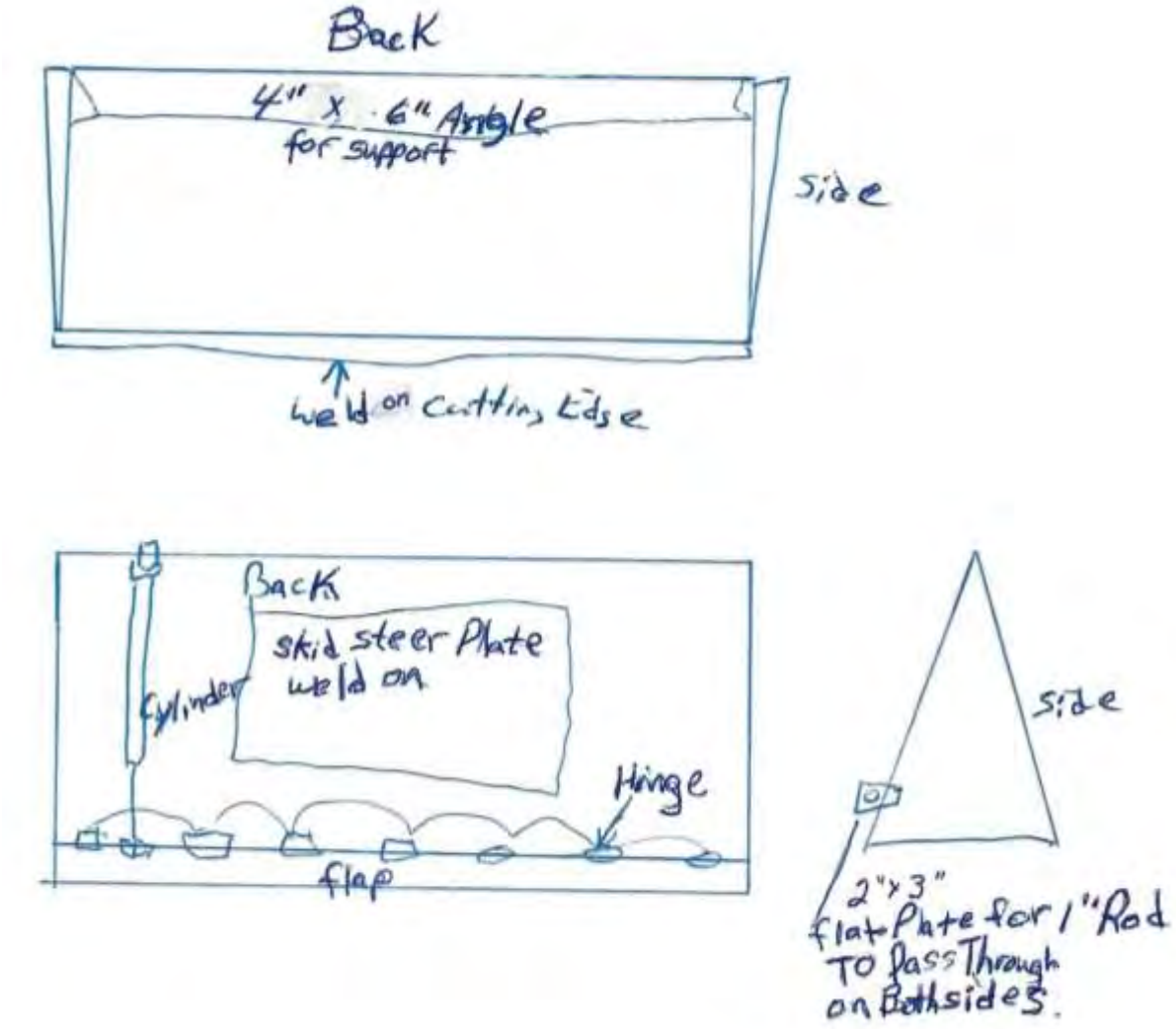
Using the skid steer with the bucket chip spreader is more cost effective in both manpower and time and as a result revenue. Travel time to the work sites is reduced because vehicles are able to travel at 55 mph versus 17 mph. Laying 2 to 3 layers of chip seal for binding is completed quickly and efficiently. More chip seal projects can be completed in a day. Fewer road crew, 3 versus 4, are needed to complete the chip seal projects. Backing up the truck hauling the chipping rock is not necessary which makes this part of the operation even safer.

ANNUAL OPERATING COSTS:

Before using the innovation – It was necessary to drive the self-propelled chip spreader to all chip seal projects. It can only travel at 17 mph, so it would take longer to get to a worksite, especially if it was across the county. Two people are needed to operate the self-propelled chip spreader. It was also necessary for the truck hauling chipping stones to back up to the spreader. Sometimes the truck would bump the spreader causing the driver on the spreader to jerk.

After using the innovation – Traveling to smaller projects with the chip seal bucket spreader is done at 55 mph. Less time is needed to travel to the worksites. More chip seal projects can be completed in a day. Only one person is needed to run the skid steer with the chip seal bucket spreader. Use of time and manpower is more efficient and effective.

SCHEMATIC:


Back
4" x 6" Angle
for support
side
weld on cutting Edge
Back
skid steer Plate
weld on
cylinder
Hinge
flap
side
2"x3"
flat Plate for 1" Rod
TO pass Through
on Both sides.

Chip seal bucket spreader

Front view, 3 feet deep, 8 feet wide
Cutting edge welded bottom of bucket front

Quarter-inch opening in back – 3”x8’ flap door on hinges
Divider and ½ circle notch on back end of divider allow easy and uniform flow of chipping stones

Backside of bucket

2x3” plates with 1” hole welded on each end of bucket, for 1” round shaft
Hinges for flap door

Blank skid-steer attachment plate
Brackets to pin hydraulic cylinder

Hydraulic cylinder

Cylinder attached to bracket, opens flap on bucket to release gravel

3” flap door opens ¼ inch

Chip seal bucket spreader on skid steer

Video: https://www.youtube.com/watch?v=G1q-M0kkkGA