

"Roadway Widening by County Forces/Equipment to Improve Safety"

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Problem Statement: Clay County has several sections of aging paved roads that need improvement, but the existing width of traveled way and shoulder are not adequate to place new overlay without leaving a dangerous drop-off at the edge of the pavement. The funds are not available to let contracts for reconstruction to improve the cross section.

Finding a Solution: We determined that we would have to find a way to improve safety by widening the shoulder before adding new surfacing. This is difficult work to contract, so Clay County began to develop a method of widening by designing some special equipment for the job. This process began as an experiment to see what was possible with our own forces, equipment and some ingenuity. We have now used our own staff and equipment to do over 25 miles of shoulder-widening since 1993. We have continued to modify the equipment and the process, but the work has been successful from the start. It has enabled us to widen the roadway by up to six feet and place asphalt overlay with surface widths of up to 26 ft. and still maintain a minimal shoulder outside of the pavement.

This exceeds the current SDDOT Secondary Road Plan which requires a minimum of only 22. ft of width on the traveled way for the functional classification of most of our county highways. The county commission is pleased with this solution to improve safety in an affordable way.

Labor, Equipment, Materials Used: There are two primary pieces of equipment used. The first is an old moldboard extension modified and bolted to the frog of the moldboard on a standard motorgrader. This is a shop-built device fabricated in Clay County's shop that is used to undercut and move the existing vegetation and base/subgrade out onto the foreslope. This forms a bench approximately 8 inches deep and 36 inches wide with solid footing on which to add new base material. The material is cast out to help extend the foreslope.

The second device is a shop-built shouldering machine to fill the undercut area with select fill material and to add material to the foreslope if needed. This shouldering machine is a real key to making the project move quickly and efficiently. Highway department employees originally fabricated this machine in Clay County's shop in 1993. The basic component is a short conveyor salvaged from an old rock crusher. Other components such as a hydraulic pump, small engine and wheels were salvaged from an obsolete snow plow, a sander and other items. The machine performed well from the beginning, but modifications have been made to improve performance. (See accompanying photos)

It is towed to the job site with a pickup truck. On the job, it simply attaches to dump trucks utilizing a standard chip spreader hitch. The trucks tow the machine as it conveys material from the dump bed to the edge of the pavement and drops and spreads it in the undercut. This completely eliminates the costly and slow job of calculating a spread rate and dropping material on the roadway and casting it into the undercut with a motorgrader. A hydraulic cylinder raises a jack stand to hold the front of the machine up until the next truck arrives. Commercially manufactured shouldering machines are available, but Clay County's machine was fabricated at a fraction of the cost and it performs very well.

Cost: The initial cost of both of these devices was only a few hundred dollars which was mostly labor in our shop. The material was essentially of no value since it all came from salvage items. We have made improvements over the years, but still have just under \$2500 invested in both devices.

Savings/Benefits: We will illustrate savings by giving figures from our most recent widening project followed by asphalt recycling and hot-mixed asphalt paving. The engineer's estimate on this 6.9 mile project was three million dollars for reconstructing and paving – not including R-O-W acquisition or utility relocation. We are just finishing that project as this is submitted at a cost of one million dollars. The benefits are being able to put a 26 ft. pavement on the surface (replacing a 22 ft. pavement) without sacrificing safety. Without this process, the project would have been delayed for years since it was not affordable otherwise.

Photos of Devices and Process



Example of the problem we are trying to avoid – the severe shoulder drop-off when overlay is placed on a narrow roadway.



The shop-built device mounted on grader moldboard used to make the undercut.



The undercut being made. A grader with a cutting wheel is used prior to this operation to make a straight cut at the edge of the old pavement.



The finished undercut just prior to being filled with new base aggregate.



Our shop-built shouldering machine being used to place new base aggregate in the undercut. It is also used to convey soil from dump trucks out to the road shoulder to help build up the foreslope and has even been used to place hot-mixed asphalt on the shoulder.



New hot-mixed asphalt pavement placed after widening. The old pavement below was recycled in-place and mixed with the new shoulder aggregate to make a strong base out to the shoulder line.



Compaction follows the shouldering operation and the road is now ready to be overlaid with HMA or recycled prior to overlay.



Example of successful widening project done in 2001. Note there is no longitudinal crack which often appears after widening just above the edge of the original pavement. There is also a minimal aggregate shoulder evident outside of the pavement providing the safety we want.