

*FHWA LTAP/TTAP*  
BUILD A BETTER MOUSETRAP  
NATIONAL COMPETITION  
National Entry Booklet 2011

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*Images from the 2011 Build a Better Mousetrap: National Competition*

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### **ADDENDUM, ADDITIONAL STATE MOUSETRAP BOOKLETS/ENTRIES:**

Connecticut Creative Solutions Guide

New Hampshire Build a Better Mousetrap Competition

Ohio LTAP Center Build a Better Mousetrap Competition Entry Booklet 2011

## What is the National Entry Booklet 2011?

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The National Entry Booklet is a compilation of all the entries from the FHWA LTAP/TTAP 2011 Build a Better Mousetrap National Competition, representing LTAP/TTAP Centers from around the country. The purpose of the competition is to collect and disseminate real world examples of Best Practices, Tips from the Field, and assist in the Transfer of Technology. The Build a Better Mousetrap National Competition is a fantastic way for innovative ideas to be exchanged with others that may benefit from different concepts and perspectives. It is also a great way for local and county transportation workers and other LTAP/TTAP clients to get some well earned recognition for their hard work.

## What is the FHWA LTAP/TTAP Program?

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For over 25 years, 58 Centers that comprise the Federal Highway Administration's Local & Tribal Technical Assistance Programs (LTAP/TTAP) have provided information and training to local governments and agencies responsible for over three million miles of roads and over 300,000 bridges in the United States. The LTAP/TTAP Clearinghouse acts as a central source of information for LTAP/TTAP centers and other industry stakeholders. The LTAP/TTAP centers enable local counties, parishes, townships, cities and towns to improve their roads and bridges by supplying them with a variety of training programs, an information clearinghouse, new and existing technology updates, personalized technical assistance and newsletters. Through these core services, LTAP/TTAP centers provide access to training and information that may not have otherwise been accessible. Centers are able to provide local road departments with workforce development services; resources to enhance safety and security; solutions to environmental, congestion, capacity and other issues; technical publications; and training videos and materials.

The mission of LTAP/TTAP is to foster a safe, efficient, and environmentally sound surface transportation system by improving skills and increasing knowledge of the transportation workforce and decision makers.

If you would like additional information about the FHWA LTAP/TTAP Program, or the Build a Better Mousetrap National Competition please visit [www.ltap.org](http://www.ltap.org) or contact Susan Monahan at the FHWA LTAP/TTAP Clearinghouse at [smonahan@artba.org](mailto:smonahan@artba.org) or (202) 289-4434.

## 1st Place Winner Cutting Edge Lift: North Dakota

### CONTACT:

Dunn County, North Dakota  
Randy Keller, designer  
711 1ST Avenue S.W.  
Halliday, ND 58636  
701.938.4485

### PROBLEM STATEMENT:

The changing of cutting edges on a piece of equipment has been a hardship to employees because of their size and weight. An eight foot cutting edge can weigh up to 110 pounds. Cutting edges are normally stacked in piles and must be lifted and moved to a piece of equipment to be mounted. It requires two people and they are still prone to injury. Back and foot injuries are very common.

### SOLUTION:

Randy built a cutting edge lift as shown in the photo to transport a cutting edge from a stack to the piece of equipment to be mounted. This cutting edge lift is unique because it has multiple adjustments. The adjustments include being able to raise the lift arm by a means of a ratchet from ground level to a height of six feet. The cutting edge can be secured to the lift arm by two screw clamps on each end of the arm. The angle of the lift arm can be angled so a single person can remove an old cutting edge and mount a new cutting edge on a piece of equipment without getting on the ground or under the equipment. The cutting edge lift can be used to mount cutting edges on motor graders, front end loaders, and snowplow truck wings and plows. On a motor grader the moldboard can be angled so the old cutting edge can be removed and a new one mounted from a standing position. Randy has built two lifts to date.



### COST:

The cost of the material to build the cutting edge lift was approximately \$200. That included the purchase of a ratchet, three caster wheels, and various sizes of steel square tubing. The cost of labor was 10 hours @ \$30 an hour for a cost of \$300. All the labor was done in the shop during slack periods of time in the winter when there was no snow removal required. Total cost of material and labor was approximately \$500.

### SAFETY:

Cutting edge removal and replacement on equipment is very labor intense and employees are prone to injury. The weight of cutting edges and positions it requires operators to place themselves into to get the job done is hazardous. Back, foot, knee and hand injuries are very common in this work activity. The design of this cutting edge lift requires minimal manual lifting. It has multiple adjustments which limit the amount of lifting and the need for an operator to get under a piece of equipment which is dangerous. Other cutting edge lifts designs are built from modified jacks having limited height capabilities and still require two operators to do the job safely. Randy's designed cutting edge lift eliminates hazards from manual lifting and getting into awkward working positions.

## 2nd Place Winner

### Highway Division Plow Blade Rack: New Hampshire

#### CONTACT:

Town of Merrimack, NH  
Bruce Moreau, Foreman  
80 Turkey Hill Rd.  
Merrimack, NH 03054  
603.423.8551

#### PROBLEM STATEMENT:

Plow blades were being stored in the highway garage on blocks of wood or pallets on the floor. Employees had to bend down very low to pick up the blades. Some of our blades weighed in at 160 pounds a piece and were very cumbersome to carry. With the variety of blades we need to inventory, we used up a lot of scarce floor space, which resulted in trip hazards as employees usually had to step over the blade stock for the one they needed. We recognized that we had a bad fall or a back injury waiting to happen.

#### SOLUTION:

We wanted to raise the blades higher off the ground so they were more easily accessible in a limited space and organize them by application and size. We wanted the heaviest blades as high up off the floor as possible to minimize bending. We could utilize the area under the rack for our lighter three and four foot blades.

#### LABOR AND EQUIPMENT:

Material consisted of 100 feet of 3 1/2 inch channel steel and 50 feet of 2 inch angle iron. We used in-house saws and welding tools to cut it up and put the materials together. In-house personnel did all the labor as time allowed in between snow used: and ice activities. The completed rack takes up approximately 9.5 feet X 5.5 feet of garage floor space (5.5 feet tall).

#### COST:

At current prices the steel order would come to around \$410.

#### SAVINGS/BENEFITS TO THE COMMUNITY:

Our biggest concern was the prevention of back, hand, and foot injuries as well as tripping hazards as we tried to get a blade from the back of the pile. The savings from the lack of injuries come under the category of cost avoidance from worker's comp insurance rates and claims. Another benefit is that since blade changes by operators are a common occurrence in the wintertime, this also helps avoid a lost time injury by a driver that would further result in a plow or spreader route not being covered. We gained more floor space as well. We have seen no downside to having this rack.

#### NOTE:

Fortunately we recognized the need for a plow rack many years ago and did something about it. Unfortunately, I don't have any 'before' pictures that would have shown the risk potential.



## 3rd Place Winner

### Concrete Cylinder Cure Boxes, and Carriers: Nebraska

#### CONTACT:

NDOR District 6  
Josh Willard, Highway Project  
1321 N Jeffers  
PO Box 1108  
North Platte, NE 69103-1108  
308.530.3325

#### PROBLEM STATEMENT:

Needed a place to securely keep concrete test cylinders on the jobsite where chain of evidence could be maintained.

#### SOLUTION:

Create a storage box that one field inspector could manage physically and would provide a safe and secure place for concrete cylinders to cure and be accounted for.

#### COST:

Preformed box = \$18  
Expanded Polystyrene (foam board) all sizes = \$5  
Construction Adhesive = <\$1  
Hardware (nuts, bolts, etc.) <\$3

The cost was around \$25 - 30 per box to build. We bought the Styrofoam in 4x8 sheets. 8 boxes were built with the foam and we still have some left-over, the same for the construction adhesive a single tube of adhesive was enough for several boxes. We figured the cost was very comparable to building a box entirely out of raw materials (plywood etc.) but the amount of labor needed to build a box from scratch was 10 times as much. Once the templates were made a box could be assembled in about 2 hours utilizing 2 people. (\$12/hr avg per person) The insert trays cost about \$5 each in raw materials (handle and hardware). After a template of these was made a single person could build one in about 15 minutes making the labor cost very minimal. Low cost solution to improve the quality control inspection procedures on publically financed concrete transportation construction projects.



## Extended Temporary Sign Post: Colorado

### CONTACT:

CDOT Colorado Springs  
Lawrence Wilke  
1480 Quail Lake Loop  
Colorado Springs, CO 80906

### PROBLEM STATEMENT:

Many 2-lane roadways have little or no shoulder along areas with metal post guard rail. Temporary sign placement becomes an issue for the following reasons:  
a. The signs and stands encroach into the lane of traffic, causing larger vehicles to cross the center line, into oncoming traffic. b. The signs obstruct the visibility of the motoring public on the narrow winding highways.

### SOLUTION:

To make a safer environment for the motoring public and maintenance personnel; a device was made that allows for temporary signs to be placed behind a metal post guard rail. This device keeps the driving lane unobstructed and improves driver visibility. The main device was constructed from scrap highway maintenance material. In addition to the device a delineator post and sign clamp are needed; both are available through the supply room.

### LABOR, EQUIPMENT, MATERIALS USED:

Employee time to fabricate a device takes about 1 hour. The material needed is:

- 24" of steel guard rail post (scrap)
- 3" of angle iron (scrap fence brace)
- 3" of square tube (scrap from the county sign post)
- a small amount of cutting and welding material.

The cost to fabricate 1 device is basically 1 labor hour.

### COST:

The mounting device is made using scrap material.

1 each - 24" length of damaged, steel guard rail post.	\$ 0.00,	1 each - 4" length of damaged, 2" square tube sign post.	\$ 0.00
1 each - delineator post 7" (storeroom)	\$ 5.08		
1 each - jaw clamp for cloth signs (storeroom)	\$16.00		
(2 each required for metal signs)			
1hr of labor	\$20.00		
Cutting and welding supplies	\$ 5.00		
Total Cost:	\$46.08		

### SAVINGS/BENEFITS TO THE COMMUNITY:

Patrol has used this device several times, and it has been used with both cloth and metal signs without any problems. It makes for a safer environment for the motoring public and roadway maintenance personnel. A flag could also be added to the sign to attract additional attention.



Roadwork sign with typical installation



Roadwork sign with proposed device

## Gantry: Connecticut

### CONTACT:

Andy Kennedy, Supervisor of Fleet Operations  
Chris Lodice, Welder  
Frank Piselli, Equipment Mechanic  
City of Bridgeport, Municipal Garage  
475 Asylum St.  
Bridgeport, CT 06610  
203.576.3916

### PROBLEM STATEMENT:

We needed a safer and more efficient way to remove and install heavy salt spreaders from truck beds. Our shop space and overhead lifting capabilities are limited.

### SOLUTION:

It works by means of quick connecting to a wheel loader forks. The Gantry has a telescoping boom and is constructed with 4-5 chain lifting points. The Gantry can lift 2,020lbs with the boom fully extended.

How does it perform? It performed great and is the most efficient safe way we have been able to lift the large heavy spreaders. During this past winter we had a couple of spreaders break down in the middle of a storm. We were able to remove, repair and reinstall the salt spreaders in a short period of time.

### COST:

\$1,500

### SAVINGS/BENEFITS TO THE COMMUNITY:

The benefits are: cost effective to build in-house, created a safer work environment and prevented damage to heavy spreader like equipment from lifting improperly. We now remove and install then repair the spreaders anywhere in the shop or outside. This has freed up shop space, reduced down time and reduced labor costs. We also found many more uses than it was originally intended for.

Some of the solution was inspired by other sources. One being the construction industry the way they lift and transport equipment. Our main inspiration was necessity we needed to be able to lift, move around and repair the spreaders safely and efficiently.



## Mini Paver: Minnesota

### CONTACT:

City of Cottage Grove  
Jennifer Levitt  
7516 80th Street South  
Cottage Grove, MN 55016  
651.458.2890

### PROBLEM STATEMENT:

Longitudinal cracks develop along curb lines and centerline streams, forcing crews to hand-patch certain areas in order to preserve the integrity of the bituminous surface. This presents a number of problems. Hand-patching does not stay in place through the freeze/thaw cycle, nor does it uniformly seal the joints. The drive quality of the road is also reduced by hand-patching.

### SOLUTION:

Use the Mini Paver to repair roadway instead of hand-patching. The Mini Paver was tested under four different applications including skin-patching along the concrete curb line, overlay application along curb line, centerline or crown area paving, and gravel shouldering. Using the Mini Paver more than doubles the amount of patching that can be completed in a day. There will be a uniform, neat patch, and roads will remain in better condition longer, increasing the life expectancy of the road. The Mini Paver has two different screed plates for paving operations, one is a flat plate along the bottom and the other has a 3/8" crown in the center for paving roadway crowns. Both screed plates can be adjusted manually during the paving operation. The paver can be mounted on the right side or center of a skid steer, depending on the application. The Mini Paver can also be used to install Class 5 for shouldering material. The Mini Paver is convenient to utilize on trails, where large equipment cannot be used.

### COST:

The initial cost of labor to build and test the equipment was 200 hours equaling \$8,000. Testing of the Mini Paver was done under 4 different applications; Test#1 Skin patching along the concrete curb line- curb line skin patching was applied utilizing the Mini Paver. Monitoring took place over a one year period. Test#2 Overlay application along curb line. Test#3: Centerline or crown area paving. Test#4: Gravel shouldering. Breakdown of cost available upon request, Total costs \$2,000

### SAVINGS/BENEFITS TO THE COMMUNITY:

Utilization of the Mini Paver will more than double the amount of patching that can be completed in a day. There will be reduced back injuries/workers compensation claims. There will be a uniform and neat patch. Money will be saved, and roads will remain in better condition longer. This will help increase the life expectancy of a road. The City of Cottage Grove continues to use the Mini Paver extensively for paving applications. This project could lead to implementation at city, county, and state levels because of possible savings in time and labor cost.

## Monthly Road Inventory Sheet: Ohio

### **CONTACT:**

Madison Township, Hancock County  
Jeff Rettig, Trustee  
13081 County Road 24  
Arlington, OH 45814  
419.365.5693

### **PROBLEM STATEMENT:**

Improve procedure(s) for maintaining road sign inventory and monthly road inspections.

### **SOLUTION:**

Redesign inspection sheets to eliminate completely handwritten reports. Provide visual records of sign placement(s).

### **LABOR, EQUIPMENT, & MATERIALS USED:**

1. Using a digital camera, I took pictures of all Madison Township road signs and noted their locations. Computer generated pictures and printed copies.
2. Established for each township road a master sign inventory sheet. Identified and entered every sign with . Code # on master road sheet. (Used newly acquired Ohio Manual of Uniform Traffic Control Devices.)
3. Prepared a computer generated monthly inspection sheet with all township roads listed. Also noted are roads co-shared with other townships, the county and the state.
4. All master road sign inventory sheets and monthly inspections sheets were inserted in a hard bound folder. Folder is kept in the township office and is available to all trustees to make monthly notations. Inspection sheets for last year are retained and filed. New blank monthly sheets are placed in folder.

### **MATERIALS:**

One hard bound folder. Paper sheets for individual road and attached pictures of all signs, etc. Access to digital camera and computer to generate pictures. Completed in three cold, snowy, working days after pictures were taken. (Includes time spent reading New Sign Manual, coffee breaks, sitting at computer and desk.)

### **COST:**

No major cost involved. Used personal digital camera for all pictures. All copies done on township paper and copier. Sign manual is supplied by the State.

### **SAVINGS and BENEFITS:**

The biggest savings is the time saved in handwriting the monthly inspection sheets. All road information is contained in the master folder. Trustees monitor township roads weekly. The prepared monthly sheets are completed easily. It's all about safety for the community. I am sending copies of our Madison Township Sheets as examples. Also these pictures served us well when an accident damaged several of our signs (pictures attached). We had a picture and documented sign placement for the insurance company. We anticipate using these pictures for many years.

## Electric Infrared Seamless Pot Hole Repair: Utah

### CONTACT:

Larry Griffin, President  
Heatwurx  
136 Heber Avenue, Suite 304  
Park City, UT 84068  
435.647.0519

### PROBLEM STATEMENT:

Patching potholes is a temporary solution for most cities and towns. Within a short period of time pot holes tend to reflect up and need repair frequently. Edges of the potholes crack during winter and wet weather allowing the repaired are to return within a few months. In addition, the repair of relatively small areas may require major rehabilitation to fairly large areas in order to be cost effective. Rural damage is even a larger problem. If the repair area is dozens or hundreds of miles from fresh asphalt plants, the cost to repair this damage may be so prohibitive as to cause transportation departments to wait for the damage to risk create vehicle damage before repairing.

### SOLUTION:

The self-contained Heatwurx infrared heater and asphalt processor. The surface can be heated to a depth of 6 inches, RAP added with a rejuvenator, and mixed with an asphalt processor attachment to a skid steer bucket. The repair will often outlast the surrounding road surface if properly rejuvenated. The Heatwurx solution can recycle, in place, the existing and damaged asphalt to a state similar to, if not superior to, new asphalt and seamlessly integrate the repaired roadway into the surrounding viable material. In addition, because this solution can be applied directly to fairly small (30 sq. ft.) areas independently, this process can repair only what is damaged and leave intact roadway that can still be used for long periods.

### MATERIALS:

The solution uses the HWX-30 heater to bring the treated area to a pliable 300 degree Fahrenheit and the HWX-AP 40 to till and screed the area. Both Heatwurx machines are operated by and/or set into place by a standard skid steer with capacity to lift at least 3500 pounds. Because the solution is primarily automated and machine driven, the labor factor can be reduced to as few as two skilled operators: one to drive and operate the skid steer with both Heatwurx attachments and one on the ground to integrate rejuvenating oil, direct the skid steer operator, manage RAP and excess asphalt on the ground and to operate the roller. In addition to the machinery, RAP and Heatwurx Rehab rejuvenating oil mix are required materials for nearly all jobs.

### COST:

The equipment (HWX-30 and HWX-AP 40) have a single unit price of approximately \$35,000 (discounts may apply for volume orders) for both machines, not including the skid steer or the 45 KW generator necessary to operate the heater. On a contract basis, the repair work can vary based upon location and season, but has been often quoted at \$5-10 per square foot depending upon the aggregate area being repaired through a single contract and other pricing variables such as time constraints and/or hours (e.g. night only) of operations.

### SAVINGS and BENEFITS:

This process has demonstrated cost savings of 30-60% over traditional methods while achieving better overall results. In addition, this process recycles existing asphalt creating a benefit to the community due to its "green" aspects. By rehabilitating and recycling what is already in place, Heatwurx is also able to reduce the impact to the local community by reducing the impact of road closures and/or allowing traffic to pass sooner than full roadway replacement.



If you would like additional information about the FHWA LTAP/TTAP Program, or the Build a Better Mousetrap National Competition please visit [www.ltap.org](http://www.ltap.org) or contact Susan Monahan at the FHWA LTAP/TTAP Clearinghouse at [smonahan@artba.org](mailto:smonahan@artba.org) or (202) 289-4434.

