

FHWA LTAP/TTAP Build a Better Mousetrap National Competition

National Entry Booklet 2010



Images from the 2010 Build a Better Mousetrap: National Competition



Table of Contents

What is the National Entry Booklet 2010? 1

What is the FHWA LTAP/TTAP Program? 1

2010 Competition Winners 2

 1st Place: North Dakota LTAP..... 2

 Large Tire Trailer Transport2

 2nd Place: Nebraska LTAP..... 4

 Object Marker Spring-loaded Post Holder.....4

 3rd Place: Colorado LTAP..... 6

 Electric Utility *Safety Cone* Zone Program.....6

Honorable Mention: Connecticut LTAP 10

 Multi-use Water Truck..... 10

Honorable Mention: Ohio LTAP 12

 Bridge Building Process – Time and Safety Improvements 12

Additional Entries..... 14

 Connecticut LTAP..... 14

 Modified Salt Chute..... 14

 Traffic Control Vehicle 16

 Context Sensitive Salt Shed..... 18

 Ohio LTAP 20

 Concrete Box Carrier..... 20

 Debris Rake 22

 Fire Hydrant Preventive Maintenance 23

 Sign Truck/Work Zone Set-up Truck 25

 Enclosed Rain Barrel Valve Nut Wrench 27

Salt Mixing to Achieve Optimum Results	29
Under Body Pressure Washer Adapter	31
Complete Salt Conveyor System.....	32
Crack Sealing De-tack Truck System.....	34
Cone and Barricade Trailer.....	36
Bern Installer and Grader	38
Work Zone Set Up Truck	39
Leaf Blower Hitch Assembly	40
Scooter Parking Program.....	41
Curb Cleaner.....	42
Life-cycle Extension Calculator	43
Jointbond Longitudinal Joint Stabilizer	45
Nebraska LTAP.....	46
Retractable Truck Bed Extension	46

What is the National Entry Booklet 2010?

The National Entry Booklet is a compilation of all the entries from the FHWA LTAP/TTAP 2010 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?

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 or contact Susan Monahan at the FHWA LTAP/TTAP Clearinghouse at smonahan@artba.org or (202) 289-4434.

1st Place Winner in the 2010 Build a Better Mousetrap National Competition

LARGE TIRE TRAILER TRANSPORT

Towner County, North Dakota

Contact:

Larry Halvorson
Road Foreman
RR 1, 850 9TH St.
Cando, ND 58324-6458
(701) 968-4366

Problem Statement:

With motor graders and front end loaders located throughout the county, it is necessary to do tire repair on sight, hauling tires in for repair. Manually handling these tires is very difficult and can be unsafe for the individual if not handled properly.

Discussion of Solution:

Larry and his staff built a small trailer as shown in the photo to transport the large tires to and from the work site as necessary. The trailer has a two (2") inch axle with 16 inch wheels. The trailer carriage is five (5) feet long, two (2) feet wide and thirty nine (39) inches high, using 1 1/2 inch square steel tubing. The trailer bed is pinned at the front to the trailer hitch for easy tilting in the back. The tail gate is hinged and can then be dropped to the ground level, making it very easy to roll the tire into the cage. The top of the tailgate has a chain attached to partially raise the tailgate when the tire is placed thereon. When the trailer is tilted down in front the tire rolls ahead and the tailgate can be closed. There is a winch located on the trailer hitch to assist in pulling the trailer carriage into place and the pin reinserted. The procedure is reversed for unloading the tire.

With this design they are able to transport the tire on the roadway within the posted speed limit to the repair shop. This is working out very well and three trailers will be built to serve the road maintenance shops in the county.



**Cost:**

New material was purchased for this at a cost of approximately \$600.00. All labor was done in the shop by the operators, working on this during slack periods of time in the winter when there was no snow removal required. The 16" wheels were purchased so as to have more availability of used tires.

Safety:

Handling these large tires is very difficult. It required two individuals to load them into a truck (pickup), and with the heavy lifting required, a possibility existed for injury. With the trailer, very little lifting is required, and therefore less possibility for injury. One individual can handle the removal, loading, unloading and replacement of the tire.

2nd Place Winner in the 2010 Build a Better Mousetrap National Competition

OBJECT MARKER SPRING-LOADED POST HOLDER

Buffalo County, Nebraska

Contact:

Mike Mitchell
9730 Antelope Ave
Kearney, NE 68847

Problem Statement:

Inability to keep object markers (OM-3) up at bridge sites.

Discussion of Solution:

By use of this object marker spring-loaded post holder our problem has basically been eliminated. We have tested this for about a year now and it has worked great.

Labor, Equipment, & Materials Used:

Labor: 45 min. per unit

Equipment: welder, drill press & band saw

Materials: 2" sign post anchor; 1 3/4" slide in sign post; (1) adjustable spring; (1) 1 1/2" flat bar for pivot; misc. bolts.

Cost:

\$32.00 per unit

Savings & Benefits:

Fuel and labor has been the greatest savings by not having to go back to the same bridges week after week. In this area farm equipment is always getting bigger and the ability for them to safely cross the bridges without having to weave around our markers is a benefit for everyone.





3rd Place Winner in the 2010 Build a Better Mousetrap National Competition

ELECTRIC UTILITY SAFETY CONE ZONE PROGRAM

San Luis Valley, Colorado

Contact:

Jim Clare
San Luis Valley Rural Electric Coop
San Luis Valley, CO

Problem Statement:

Performing various tasks near or around electric utilities is dangerous and can lead to serious injury or death when contact is made with a power line. A program was established to help with the identification and protection of the public and workers in the area of accidental contact with overhead electric utilities and underground electric utilities.

Discussion of Solution:

After a fatal contact accident at a jobsite while conducting a paving operation, *Electric Safety Cone Zone* was developed to help with the prevention of accidental contact of electric utility lines. There are 3 important parts to the program that make this possible and workable. The first is to communicate the availability of this resource to the people that are or may become involved with a power line contact. Second, is the implementation of the program once it has been communicated to those in the area at risk. Third, is the equipment used which is simple to acquire and set-up such as the 28" traffic cones and reflective sleeves.

When overhead electric lines or underground electric lines cross the path of any operation or the lines run parallel within 15 feet of the operation, the Cone Zone is put into operation for the safety of workers and public. Once the Cone Zone is put into effect, all workers in the area should pay special attention while working in the immediate area of the electric utility hazards.

Once the equipment is in place, it should help detour contacts with the three hazard alert items used to warn of hazards. Those are the *Signal Word Panel*, *Message Panel*, and the *Safety Symbol Panel*. These are a part of the warning sleeve that fits over the cone. Not only does the hazard alert item help but also the reflective lime green colored sleeve catches your attention, day and night.

The program can also be expanded to let the utility do an on-site "Job Safety Analysis" of the work area and communicate with the people who would be working in the area. This would help to give a clear view of the program and the dangers that could



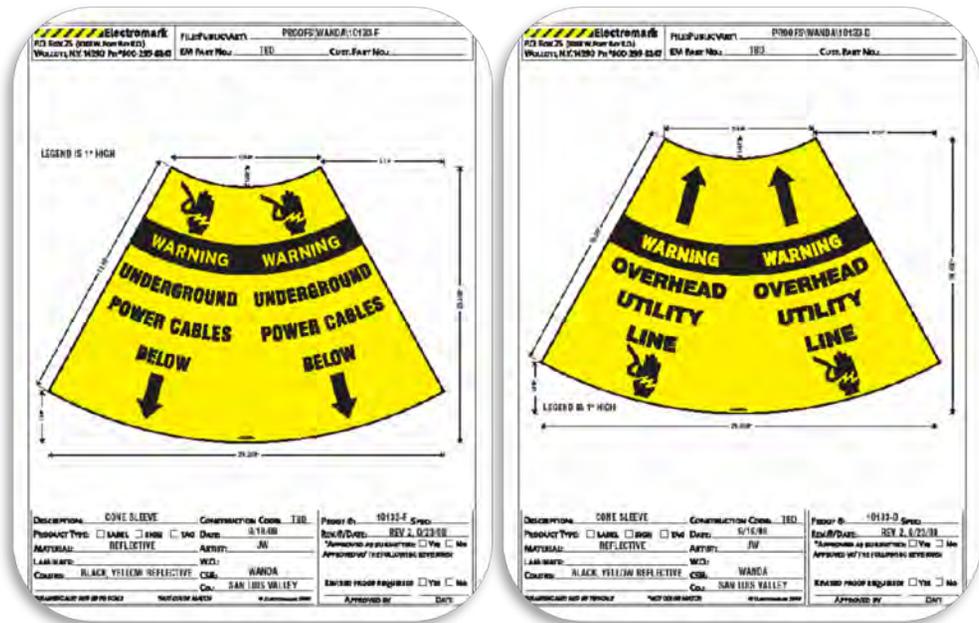
happen from an accidental contact. The program is also set up to not just warn of overhead utilities, but to give attention to an area that has underground utilities.

Labor, Equipment, & Materials Used:

28" tall traffic cones are used that are covered with a reflective and lime-green color sleeve developed specifically for this project which are about \$30 each. The wording **WARNING OVERHEAD UTILITIES** or **WARNING UNDERGROUND POWER CABLES** with an arrow on the signage pointing to the hazard area is used.

Items of the program that make it functional are listed below:

- A letter explaining the program is sent out to local contractors, various farm agencies and the County Road and Bridge contacts from participating utilities.
- Any serviceman or electric utility employee has the authority to implement the program if they see an area of concern during their travels throughout the utility's service area.
- Any construction, farm/ranch, maintenance or contracting firm has the option to request the safety cone zone program from any utility using the system in the area.
- Once an area is identified, do an onsite safety review (Job Safety Analysis) of hazards and concerns with the entity doing work in the area of the safety cone zone if requested. Ask how hazards will be managed with the work crew prior to work commencing.
- State laws prohibiting work within a certain distance of overhead electric lines should be obeyed. The Utility Notification Center in your state should be called before any work is started around underground utilities.
- The program restricts the raising of dump beds or any type of construction or farm equipment while in the Cone Zone area which would be 10 feet either side of the most extreme part of the overhead utility facility in relation to the road. Underground utilities would require the working approach distance as stated by the Utility Notification Center.
- Employees or personnel shall not have any physical contact (from equipment to ground) with any equipment while it is moving under an overhead line or digging in the immediate area of underground utilities.
- Night time operations are marked the same as daytime operation markings. Additional markers, lights and spotters are suggested.
- Inform working entity that in case of broken line to stay clear and contact utility immediately as line may or may not become energized.
- A standard to initiate the program would be if an electric utility crosses over or under the area of work or runs within 15 ft parallel to the work area.
- If an object or piece of equipment of high profile must be moved under an overhead line make sure a spotter has been appointed and if the safe distance of less than 10 feet will be reached the utility should be at the site to direct the operation in a safe manner. Also the utility could apply protective cover-up if considered necessary for the location.



- Notify entity working in the area if equipment does come in contact with over head line or underground cable, the operator is to stay on the equipment and that workers in the area are to stay clear of the equipment that has come in contact with the electric line until the electric utility has arrived.
- Inform the entity if the operator must clear the equipment because of fire or other emergency; make sure they understand to jump clear of the equipment with both feet together. Make sure to never contact the equipment and ground at the same time. Once off of the equipment, hop away keeping both feet together and hand and arms close to one's side.
- Inform the entity if equipment is operational and can be moved without doing further damage to the line, poles or underground wire, do so. Do not step off of the equipment as long as it is in contact with the electric line until the utility arrives.

Savings & Benefits:

With thousands of contacts each year, it was felt that it is good safety sense to promote prevention of accidental contacts of electric utility high voltage lines, above or below the ground. The program emphasizes safety by promoting the Do Not Exceed the 10 foot approach distance while working in the zone area. This includes but not limited to raising dump beds, loaders, forklifts farm equipment, backhoes, excavators, irrigation equipment or other equipment/hazards in the zone area. It is hoped that this useful safety resource can be promoted state wide as an option for utility hazard recognition to prevent accidental contact with high voltage lines. *Cone Zone* is very visual with the cones and sleeves and can be verbal when promoted with an onsite visit to help workers understand the dangers of electricity. **All of this can save lives.**



Honorable Mention in the 2010 Build a Better Mousetrap National Competition

MULTI-USE WATER TRUCK

Bloomfield, Connecticut

Contact:

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Bloomfield Public Works
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Bloomfield, CT. 06002
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(860) 243-1480

Problem Statement:

We wanted to build a water truck with a cab controlled, pressurized spray delivery boom. It evolved into a multi use truck to service many needs for portable water for our dept.

Discussion of Solution:

We mounted and inter-connected two 500 gallon aluminum tanks on a truck chassis, incorporating a hydrant fill connection. It has a mounted portable pump for water distribution with a mounted hose reel with assorted nozzles. We also mounted a hot water pressure washer, and tool box for additional hoses. The back of the vehicle has a spray boom for street application, with its own cab controlled electric pump. All of the accessories are permanently plumbed, but have ball valves or fittings for service or repair. As the operator of this vehicle also cleans out offset basins and corner, two flat shovels and a street broom were mounted as well. We also added additional surplus safety lighting including an arrow stick with an ample supply of safety cones for hazards found and securing parking areas for sweeping operations.

Cost

\$950.00

Savings & Benefits:

We wanted a vehicle capable of performing multiple tasks efficiently and realized we would have to build one to meet those needs. We utilized an older truck and military surplus tanks (state surplus) and a portable hot water pressure washer (state surplus), previously not being utilized.





Honorable Mention in the 2010 Build a Better Mousetrap National Competition

BRIDGE BUILDING PROCESS – TIME AND SAFETY IMPROVEMENTS

Tuscarawas County, Ohio

Contact:

Joseph S. Bachman, County Engineer
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New Philadelphia, OH 44663
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engineer@co.tuscarawas.oh.us

Problem Statement:

For many years we have constructed bridges completely with county forces, including pre-casting our own concrete beams for bridges up to 31' in length, building new abutments for longer concrete beams that were purchased, and bidding them furnished and set. The issues we wanted to address were the reduction of road closing/construction time from six weeks and the improvement of safety conditions by reducing the time working below grade building forms and tying steel.

Discussion of Solution:

Starting with engineering-standard abutment wall cage design, we were able to order our rebar for each abutment so that it was bent and shipped in kit form. We designed cage-tying jigs and had them fabricated by an outside vendor. We also purchased a lifting beam to load and set cages and forms. This allowed us to pre-assemble abutment wall cages in the off season along with our precast bridge beams. This also saved significant time and exposure spent below grade tying steel and setting form panels individually. Form panels were shop-assembled and lowered into place along with the pre-fabricated wall cages. Numerous other labor-saving and safety-related equipment and items were purchased and are outlined under costs.

Labor, Equipment, & Materials Used:

- Cage-tying jigs fabricated externally
- A purchased rebar-tying gun to reduce time
- A purchased, pre-engineered lifting beam to handle cages and form panels
- Bridges, jigs, and wall braces engineered in-house



- Racks for form trailer fabricated in-house
- Form supply cabinet fabricated in-house

Cost:

- Fabrication of cage-tying jig: \$1800.00
- Lifting beam – pre-engineered manufactured unit: \$15,500.00
- Rebar tie gun: \$2200.00
- Form trailer – 6 ton: \$4600.00
- Form supply cabinet: \$500.00
- Steel form braces: \$1900.00
- Used stretch trailer (for transportation of cages and forms): \$8500.00
- Form walk planks: \$1520.00

Savings & Benefits:

- Reduced inconvenience to the traveling public as road closures were reduced from six to four weeks
- Reduced labor costs by utilizing a three-person crew and spending fewer hours on site
- Created additional off-season work for bridge crew
- Allowed for efficient and productive work for county forces, saved profit costs of using outside contractors, and saved taxpayer dollars
- Improved safety by reducing work below grade by 90%
- With time saved, we are now able to build additional bridges during the construction season (an average of eight per year)



Additional Entries

Connecticut LTAP

MODIFIED SALT CHUTE

Connecticut Department of Transportation

Contact:

James F. Wilson
Training Coordinator
Connecticut Department of Transportation
Bureau of Highway Maintenance, District 2
(860) 823-322

Problem Statement:

The modified materials chute is a conceptual model that was created and field tested to determine the feasibility of improving the Department's effectiveness to apply snow and ice control materials to the State's roadways during winter storm conditions. Over-scattering of snow and ice control materials is a contributing factor leading to the ineffectiveness for deicing materials to work at maximum capabilities.

Discussion of Solution:

By bypassing the truck's salt spinner, this chute allows for maximum flow of a material onto the middle of the roadway, increasing the effectiveness of the material and allowing the brine solution to work more efficiently. Tests show greatly reduced scatter and experience has shown a reduction in the amount of material used.

Cost:

The cost to research and create the modified materials chute will be minimal to the Department. The chutes were made from recycled street signs that were designed to conform to the various designs of our 9-ton dump trucks.

The Department uses three basic styles to accommodate the different types of vehicles in our fleet. The only cost incurred would be the labor to manufacture the modified chute. The testing chutes were created with a few basic hand tools and work bench, our production chutes will be produced by a metal brake to department specifications.



Savings & Benefits:

In addition to the benefit of greater control over the placement of snow and ice control materials, operators reported that they noticed they used less snow and ice control materials during various types of storms. It appears that the increased concentration and the placement of snow and ice control materials reduced the time needed to create a salt brine solution. In some cases it extended the time between reapplication of the snow and ice control materials. Some operators decreased their application rate in response to the results of the modified materials chute effectiveness.



TRAFFIC CONTROL VEHICLE

Bloomfield, Connecticut

Peter Joseph
 General Foreman
 Bloomfield, Public Works Department
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 Bloomfield, CT 06002
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 pjoseph@bloomfieldct.org

Problem Statement:

The Bloomfield Public Works Department has always stressed the safety of its employees. Following training, one employee found it challenging to properly apply Work Zone Safety to his work environment. With consultation and assistance from CONN-OSHA, and some additional training with the crew chiefs, it was determined the best way to integrate work zone safety was to make it part of the job, and as easy as possible.

Discussion of Solution:

Much Traffic control was stored in the building in various locations, or on various trucks, and shuttled around on an as needed basis. A step van surplus to our needs was very slightly modified with some additional exterior lighting, a step platform and grab handles, and some interior lighting for night use.

Cost:

Exterior lighting and lettering cost maybe \$600.00. The van and all the contents were already here, in various locations and it took 2 to 3 workdays in the shop for the step and up-fitting.

Savings & Benefits:

Each traffic control device stores in the van, so it is simple to deploy and the truck itself is usable as a barrier to traffic. While a single function vehicle, it is usable as is by Public Works, Police, the Fire Departments, etcetera, so all town traffic control events are serviced by one unit.





CONTEXT SENSITIVE SALT SHED

East Haddam, Connecticut

Contact:

Frederick G. Thumm, P.E.
Director of Public Works
Town of East Haddam, Public Works Dept.
P.O. Box K
East Haddam, CT 06423
(860) 873-5023
pwdirector@easthaddam.org

Problem Statement:

East Haddam has an area of 56 sq. mi. and 119 miles of road to maintain. Remote storage for sand/salt at a second site is necessary; but budget constraints would not allow a pre-engineered conventional salt shed building.

Discussion of Solution:

Pre-cast 6'x6'x3' concrete blocks were available at no cost from a bridge job recently completed in Town. Town forces did the site preparation and layout. Sixty blocks were moved to the site and set in place by the Town. The Town issued a performance-based "design-build" scope for a carpentry contractor to create a structure in compliance with performance standards identified by the Town's Director of Public Works. There was no architect or engineering firm employed. Contract administration and quality assurance was performed in house by the Town's Public Works Director and Road Foreman. The Town's Building Official provided plan review through the permitting process.

Cost:

Estimate \$29,000 for all carpentry work and material. This does not include the value of the Town's labor or donated concrete blocks. We believe this represents a cost savings of more than \$60,000 compared to a conventional dome or gambrel topped structure for this use.

Savings & Benefits:

The benefit is an effective covered storage building that will safeguard the environment, reduce over-the road truck time to refill during storm events and do so in an aesthetically pleasing, economical way.





Ohio LTAP

CONCRETE BOX CARRIER

Clinton County Highway Department

Contact:

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 David Krazl, Engineering Technician
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 Wilmington, OH 45177
 (937) 382-2303
 cchdsuperintendent@yahoo.com
 dkrazl@clintoncountyengineer.org

Problem Statement:

Our county government agency is unique in the fact that it is one agency amongst a few small, local transportation agencies that actually makes its own pre-cast, concrete, three-sided box culverts. The problem was moving the recently-poured pre-cast concrete structure out of the culvert shop and into the yard safely. The boxes weigh anywhere from six tons to ten tons depending on their sizes; this made using the forklift difficult (if not dangerous) to move over a long distance to the yard. The main concerns were upsetting the forklift, point-loading of the box onto the forks, and the box sliding off the forks en route to the yard.

Discussion of Solution:

One idea was to back a flatbed semi-trailer into the culvert shop and load the boxes. However, this process was cumbersome and time-consuming. Another problem was the difficulty of maneuvering around obstructions within the narrow confines of the culvert shop.

The solution was to design a carrier to transport the boxes safely to the yard without damaging the culvert boxes and, more importantly, to eliminate any possible injury to the workers. We also needed to build a carrier that could withstand the weight of the boxes. The carrier needed to be narrow and maneuverable enough to fit in the culvert shop and around any obstructions.

The box culvert is lifted from the curing station and set safely onto the box carrier using the stationary crane. The carrier is then pulled out into the yard using a forklift. The box is then lifted off the carrier using the same forklift and set onto the surface safely. Additionally, with the pull of a few pins, the carrier can be adjusted to accommodate the different-sized box culverts that are pre-casted during any given season. The tires are solid-filled; this eliminates any punctures. Another attribute is that the





carrier is light enough to be moved around by one person guiding with the tongue, yet still strong enough to haul a 10-ton box culvert.

Labor, Equipment, & Materials Used:

We were fortunate that very little expense for materials was needed for the fabrication of the carrier. The basic running gear came from a donated, dated "C" container hauler from a local air freight shipping company. The steel rails and tubes that the box culverts sit on were from some material from a steel bridge that was replaced. Fabrication of the carrier was done by two of our skilled mechanics. Hours of labor, including modifications and painting, were just under twenty.

Cost:

Original "C" container running gear: Free

Additional steel for modifications: Free

Misc. Parts (hardware, welding rods, paint): \$100.00

Savings & Benefits:

The most important benefit of the carrier is that it minimizes the risk of injury to our workers who are transporting the heavy concrete boxes, which is of immeasurable value. Secondly, the carrier reduces possible damage to equipment and to the concrete boxes. Third, by speeding up the process of moving boxes to the yard because of the maneuverability of the carrier, we recognize a cost savings.



DEBRIS RAKE

Pulaski Township, Ohio

Contact:

Ray Boucher
06646 SR-127
Bryan, OH 43506
(419) 636-2472

Problem Statement:

Many Pulaski Township farmers use the No-Till farming method which leaves bean stubble, corn stalks, dead weeds, etc. on the land. When we get flooding rains, the debris is carried to the ditches and catch basins, causing overflow to the roads and plugged basins and drains.

Discussion of Solution:

The debris from No-Till farming needed to be cleaned up to keep water flowing and the catch basins clear, and using the front loader bucket to scrape was destroying the ditch banks. The idea I came up with was to put a rake on the backhoe in order to pull debris from the ditch without destroying banks and catch basins. This rake causes little damage. The debris is then pulled onto the roadway, picked up with a loader, taken to the Township building's mulch pile, and recycled with leaves and grass clippings.

Labor, Equipment, & Materials Used:

Two hours in-house labor
Welder
Torch
Miscellaneous flat iron

Cost:

Misc. flat iron: \$25.00
Three-point rake: \$500.00

Savings & Benefits:

We spend little time repairing damaged ditch banks, and the flood waters recede quicker due to the clear basins; this means less time is spent monitoring flooded roads and citizens with flooded properties. An added benefit is that the township citizens use the mulch in their gardens and flower beds.

FIRE HYDRANT PREVENTIVE MAINTENANCE

Dublin, Ohio

Contact:

Harold Dellenbach
Gary Browning
6555 Shier-Rings Road
Dublin, OH 43016
(614) 410-4750
HDellenbach@dublin.oh.us
GBrowning@dublin.oh.us

Problem Statement:

Sometimes fire hydrants are very hard to open, resulting in broken stems and couplings. This is an annual problem (sometimes twice a year) that occurs when our local Fire Department flushes all hydrants. Repairs and parts can become very expensive very fast, and O.O.S. hydrants are unsafe.

Discussion of Solution:

Our Water Department employees figured out a way to prevent this damage and lengthen the life of the hydrant's internal parts. On the American Darling #73-2 they removed the pipe plug part #73-5-3. They then installed an appropriate-sized grease zerk fitting in the opening. Next, the operating nut was filled with food-grade grease through the grease fitting. The Fire Department could then easily open the hydrant during emergencies as well as not break the stem or coupling parts. This will also aid in future maintenance as an employee can add a few squirts of grease during summer painting schedules.

Labor, Equipment, & Materials Used:

Labor is minimal and takes less than fifteen minutes per hydrant. Simple hand tools and food-grade grease complete the task.

Cost:

Food-grade grease: \$11.00 per tube / \$0.85 per hydrant
Grease fitting: \$0.81 per hydrant
Fifteen min. of labor: \$6.00



Savings & Benefits

The benefits are fewer broken hydrants and a lower overall cost for maintenance (maintenance cost is \$7.66 vs. \$187.00 for a broken hydrant). In the event of a fire, the hydrant will operate appropriately.



SIGN TRUCK / WORK ZONE SET-UP TRUCK

Bowling Green, Ohio

Contact:

Brandt Corral, Public Works Sign Shop
 Brian Craft, Public Works Director
 304 N. Church Street
 Bowling Green, OH 43402
 (419) 354-6227
 bcorral@bgohio.com
 bcraft@bgohio.com

Problem Statement:

We needed to replace a badly deteriorated bed of a sign truck with one that would be sufficient in design so as to be able to carry all needed supplies on a daily basis, including signs for an emergency if needed. At the same time, we needed to maintain a safe work area and have a highly visible truck that allowed for the largest possible work area.

Discussion of Solution:

We have now actually built three sign trucks in-house for Bowling Green Public Works. This design utilizes a 1999 International Chassis already in use. The chassis has a short wheel base that allows it to maneuver into tight areas. The truck has an Atlas 60.1 crane with two knuckles with a 27' reach from the base. At the end of the extension boom is a Fairmont hydraulic hammer capable of 1800 BPM. The hammer has been modified and is hard-attached to allow for precise control from the ground using the controls of the truck and operated by a single operator. At the end of the boom is a large hook used to attach a chain for pulling posts, lifting concrete basins, and even for pulling small equipment stuck off the road (i.e., a mower).

The bed has four tool boxes, two being Diamond plate; the first is a 24" square torch box with a torch set and shovels, while the second is a storage box that holds tow straps, two portable sign stands, two roll-up STOP signs, and two roll-up ROAD CLOSED signs, along with other tools. The third and main box was custom-made ten years ago, again in-house, and was designed to hold up to fifty signs of different sizes without scratching the face of the signs. It also has a storage area for bent or very large signs and custom-built tool boxes that fit into the sign storage areas. The fourth box is a hand tool box that fits into a cut-out on the floor so that all hand tools can be reached from the ground or the bed of the truck. At the rear of the truck is a recycled, aluminum ambulance bumper/step that extends the width of the truck, with each side having two additional steps for access into



the bed of the truck (the bottom step is attached using recycled rubber). This way, if the steps hit anything they will bend up out of the way. At bed height are stainless steel hand rails on each side that were made from a recycled swimming pool ladder. The bed has two steel posts mounted to it that hold cones and keep them neatly stored on the bed. Built into the rear of the bed is a storage area for carrying posts up to 12' in length.



Even with all this equipment, a very large area for two people to work at the same time or for storing work zone signs/a hundred or more cones still remains. Also, on the end of the truck is a directional arrow used when setting up work zones or during other unexpected jobs, accidents, or emergencies. The truck is fitted with an overhead strobe light along with strobes at each corner of the truck, and the bed was updated with all new LED lights.

Labor, Equipment, & Materials Used:

All labor was done in-house by our mechanics/fabricators. The steel for the bed was purchased through local suppliers and was used to build the bed from scratch.

Cost:

The total cost of supplies was less than \$2000 which includes all steel, lights,

paint, and wood for the decking.

Savings & Benefits:

The city has the benefit of knowing that a traffic sign can be replaced in a matter of minutes when the sign truck pulls onto the scene of an accident, and that time is not wasted in trying to find supplies. Also, only one truck is needed to perform several duties and can go from one kind of job to a completely different task without wasting time, fuel, or man hours. In addition, city employees built the truck which saved thousands of dollars in taxpayer money.



ENCLOSED RAIN BARREL VALVE NUT WRENCH

Sheffield Lake, Ohio

Contact:

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Sheffield Lake, OH 44054
(440) 935-1432
williamlgardner@yahoo.com

Problem Statement:

The City bought food-grade, one-piece 60-gallon barrels for residents to use as converted two-valve rain barrels. This program improves water quality, conserves and reduces treated water, and controls erosion run-off. Over fifty rain barrels have been installed in the City.

Discussion of Solution:

Due to fixed lids on the barrels and the desire to reduce the mosquito population, we needed a tool to be placed inside the barrel that included a valve nut that could be screwed on to the two shut-off valves that were uniquely placed in the barrel. No human hand could reach the locations.

Labor, Equipment, & Materials Used:

John McCallie, our City mechanic, used the following materials to weld washers on to rebar, cut to the valve nut size. Duct tape was used to hold the washer to the tool. The material used was two pieces of rebar (24 inches and 48 inches), two one-inch flat washers notched by torching or grinding to washer size, and a piece of duct tape. The welding and cutting took fifteen minutes with one tool having a seven degree off-set angle and the other one at 45 degrees to the rebar. The total time needed to manufacture these two tools was fifteen minutes.

Cost:

Project materials: \$4.10

Labor, including fringe benefits: \$10.00

Savings & Benefits:

The Street Department is responsible for sheet run-off and street flooding. These project tools allowed homes to collect rain water and delay run-off as well as reduce water needed for their gardens and rain gardens. These barrels have reduced road repairs by reducing street water puddling. Removing sealed barrel tops is not practical, and by buying one-piece barrels the City saved \$23.00 per barrel. These tools can be adapted with different washers to provide nut holders for tight and enclosed applications.



SALT MIXING TO ACHIEVE OPTIMUM RESULTS

Ottawa County, Ohio

Contact:

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Problem Statement:

Salt prices almost doubled, and the salt availability was cut by 25%. Our budget was already stretched to the point where it was about to be broken, and we needed a way to provide safe roadways during the winter months with less salt. Even if we were able to afford our allotted amount of salt, we may not have been able to get the amount we needed to provide the safest roads possible.

Discussion of Solution:

We determined that the best way to control costs would be to mix the salt with a fine limestone at a 50/50 ratio, and then add a deicing liquid to it. One of the fears was whether or not we could do it efficiently and effectively with just a loader and a spray hose. We were afraid that there would be instances where the mix would have areas that would be nothing more than limestone, thus not giving us any deicing properties at all. We discussed using a rotary blender to achieve a mix that was even throughout. After getting prices on new rotary stainless steel blenders, we determined that we could not afford one. We then called a local concrete company to see if they had any old, used concrete mixing trucks they wanted to sell, since they were in essence the same as a rotary blender. We found and purchased a concrete mixer and set out to find a conveyor to load the mixer. We talked to the local quarry which had a conveyor deemed useless; we bought it for scrap price. We brought the conveyor back to the shop and replaced the worn-out parts and the belt. We then made a loading hopper to direct the material onto the conveyor. Once all the parts were put together, we placed the conveyor and hopper by the salt barn and had an electrical contractor run the wiring to power the conveyor. Once all the pieces were in working order, we started mixing at a 50/50 ratio and adding a deicing liquid.

Labor, Equipment, & Materials Used:

The mix consists of nine tons of rock salt, nine tons of Ohio #9 limestone, and 200 gallons of deicing liquid. We can currently mix at a rate of approximately 36 tons per hour. We use the concrete mixer and a loader to charge the mixer. One person is in the mixer, and one is in the loader at all times during the operation.





Cost:

Considering the FEMA rates for the loader and the concrete mixer truck, labor rates for two people, and the actual cost of the materials, we made a salt stone mix that was \$60.49 per ton. During this winter season, salt prices are \$73.82 per ton. The difference is \$13.33 per ton, and at that rate we would break even on the project if 2,152 tons of mix were used. Our total salt usage for the prior year was 4,313 tons. Total cost to set up the mixing process was \$28,686.41, which included the mixer, conveyor, load hopper, and electrical wiring.

Savings & Benefits:

There are many benefits to the mix. The loads do not freeze in the trucks, there is instant traction with the limestone, the salt works faster, and the liquid has a longer residual effect than plain salt. If it were not for the mixing, there would have to be a lot less liquid in the mix due to leeching. When the loads are not frozen in the trucks, the trucks are on the road and not having to try to get clumps of salt out of the spreading systems. The cost for the '07-'08 winter season for ice control materials

was \$160,660.00, and the cost in the '08-'09 season was \$159,050.00. However, the numbers alone do not show the savings as salt actually increased by \$36.57 per ton between the two periods. The mixing operation provided the same level of service to the public at the same cost even though salt prices almost doubled. The plow drivers also noted a definite benefit when they first started using the mix.



UNDER BODY PRESSURE WASHER ADAPTER

Atwater Township, Ohio

Contact:

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Problem Statement:

Salt builds up and corrodes the chassis of trucks. Washing under trucks thoroughly is hard with a normal pressure washer.

Discussion of Solution:

We needed to build a simple tool to clean under trucks. The tool must be easy to use and incorporate our existing pressure washer.

Labor, Equipment, & Materials Used:

It took less than an hour to build, and all that was purchased was a 50" lance extension, a street elbow, and a quick disconnect.

Cost:

50" lance extension: \$23.00
1/4" NPT street elbow: \$4.00
Quick disconnect: \$10.00

Savings & Benefits:

This saves time and helps do a better job of washing equipment. Trucks and equipment should now last longer and need fewer repairs from salt corrosion. No one washes underneath like we do.



COMPLETE SALT CONVEYOR SYSTEM

Butler County, Ohio

Contact:

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 Hamilton, OH 45011
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 bresslers@bceo.org

Problem Statement:

We needed to come up with a way to stack salt into our dome quickly so we didn't hold up the drivers bringing the salt to us. Drivers are paid by the load delivered and will haul to other agencies first if they can get more loads off. Whatever we came up with needed to be efficient and inexpensive.

Discussion of Solution:

We knew we most likely needed some type of belt elevator, either one with its own power source or one powered by existing equipment. We didn't want to spend a lot of money for the conveyor and hopper. We looked at similar systems used statewide, which cost \$40,000 to \$80,000, and decided to purchase an agricultural belt elevator powered by the PTO from our mowing tractor. The hydraulics from the tractor also powered the conveyor system, which needed to be raised or lowered. The next concern was the issue of getting the salt from the delivery truck onto the elevator quickly. We decided to use a retired V-box which we mounted on a running gear from an agricultural wagon. The V-box conveyor is powered by the hydraulics from the same mowing tractor used to power the conveyor. The tractor is also used to move both pieces of equipment into place. With the hopper we were able to have the delivery trucks simply dump the salt next to the hopper where we would then load the hopper.

Labor, Equipment, & Materials Used:

We used a welder, torch, and grinder. Miscellaneous steel, hardware and paint, an agricultural conveyor, a v-box, used running gear, and a hydraulic motor were also used. We also used one week of in-house labor.

Cost:

Agricultural Conveyor: \$14,000

V-Box: \$1,000

Used Running Gear: \$800

Hydraulic Motor: \$250

Miscellaneous Steel & Hardware: \$400



Paint: \$100
Labor: \$3560
Equipment: \$100
Total Cost: \$20,210

Savings & Benefits:

Like most agencies, we needed to find a way to keep the salt deliveries coming in and a safe way to stack salt in the dome. This all needed to be done in the most efficient and least expensive way possible. We were able to do this for the above-mentioned cost, when it could have cost us upwards of \$80,000 for a commercial salt conveyor. The benefits we have noticed are that the drivers who bring salt to us like the fact that they can pull in the yard, dump, and leave quickly. The loader operator does not have to stack salt in the dome, which takes time and is unsafe. Most of all, we can stack the dome full, using every square foot of the dome's capacity.



CRACK SEALING DE-TACK TRUCK SYSTEM

Dublin, Ohio

Contact:

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Problem Statement:

We purchased a new Crafcro Supershot Melter to begin in-house crack sealing. However, we had no efficient way of spraying de-tack solution on the fresh sealant to prevent the public from tracking it on to their vehicles. Sand was not an option due to EPA concerns along with additional sweeping costs for clean-up. Flooding the road with a de-tack solution seemed like a waste of money as well. Our only current option was a hand-help pump sprayer or backpack sprayer.

Discussion of Solution:

With the constraints upon me and the necessity of keeping the roadway open at all times, I began to draft a plan to retro-fit our chase truck to apply de-tack. The configurations included using the existing plow mount to provide a kind of quick coupling device that could easily be changed from crack sealing to snow and ice purposes. The tank and pump being mounted to the steel skid also allowed for quick mounting and dismounting procedures. The steel skid is bolted in with hardened bolts to provide load securement.

Labor, Equipment, & Materials Used:

All items used were either scrap materials or items already acquired: 4-cycle water pump, 150 gallon poly tank, retractable hose reel, garden hose, steel stock, and fittings. Labor included only two employees to set up.

Cost (Estimated):

Pump \$350
Hose Reel \$100
Hose/fittings \$50
Tank \$150
Steel Skid/Extra Steel \$350
\$ 1000 +/-

Savings & Benefits:

Now, the truck and operations are very efficient. We have eliminated the need to burden the City of Dublin with budgeting for another specialty vehicle. Employees are not burdened by carrying a hand sprayer all day and filling it every half hour to an hour. This set-up could also easily benefit other applications. When de-tack is not in use, the system could be used for spraying other materials (salt brine, etc.) onto aprons and walkways in the winter or watering plants in the summer. An additional reel and hose could be added to the steel skid with a Y-valve in order to spray from the rear when plowing is needed. Special thanks go to mechanic Scott Herd for his help in making this possible.



CONE AND BARRICADE TRAILER

New Albany, Ohio

Contact:

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Problem Statement:

Every time cones and/or barricades were needed for an emergency road closure, parade, or special event, equipment had to be loaded into the bed of a truck or onto a trailer after it was unloaded from storage. Response to an emergency could take upwards of 1 ½ hours. Expensive equipment was being damaged due to its movement from one place to another, it sliding around in the bed of vehicles, and it being stored outside in the sun.

Discussion of Solution:

The New Albany Service Department designed a 20' trailer with a 4' rail to store barricades and cones. The rail has five openings for access. Each opening has two chains across it to prevent equipment from falling out. Type III barricades were placed upright in the front of the trailer. Cones were stacked in the middle of the trailer.

Two problems came to light while using the trailer. One was the difficulty of unloading and loading the barricades. Our staff fabricated and mounted a rack to the front rail to hold the barricades off the floor. A bar was mounted to the floor to prevent the "feet" from sliding.

Another issue we ran into was trying to keep the stacks of cones upright. During transportation, stacks of cones would move around and fall over onto other stacks. The staff designed a cone-shaped base to mount to the floor. For the most part, this has held up very well. Staff also mounted strobe lights for increased visibility on three sides and hooked them into the parking lights.

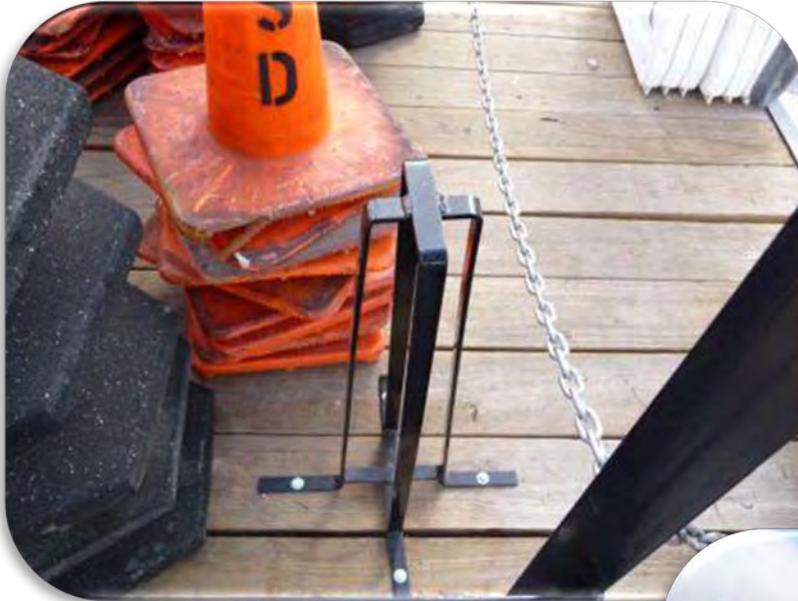
Labor, Equipment, & Materials Used/Cost:

Trailer: \$2555.00
 Miscellaneous Materials: \$650
 Labor: \$1200



Savings & Benefits:

The largest benefit is increased efficiency. Currently, when a call comes to respond, staff simply must hook any truck with a hitch to the loaded trailer and go. It is backed into the garage and easily accessible. There is also a reduction in lost time since crews are not loading and unloading equipment to make room for the cones and barricades. Another cost benefit is less damaged equipment since everything is secured. The life expectancy of the equipment is greater, requiring less frequent replacements. In the past, set-up and tear-down for parades required three to four trucks and two trailers. Currently, we use two trucks and one trailer to complete the same tasks.



BERM INSTALLER AND GRADER

Newark, Ohio

Contact:

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Morehead@newarkohio.net

Problem Statement:

We were looking for a better way to install gravel berms on newly paved streets. The previous method was to distribute the gravel by hand or with a motor grader. These methods were time-consuming and did not do a neat job.

Discussion of Solution:

The idea was to add an improvement to the belt-driven gravel spreader (the white unit shown.) The spreader is hydraulic-driven and can distribute material from either end. We took this unit and built a frame (painted orange) that would hook to the back of a large dump truck, similar to a "Buckeye Box". When the dump bed is raised, the steel wheels under the unit would run on the pavement. An operator would have an area on the back on which to ride and operate the entire unit. The side shoe on the left side of the unit can be set from 12" to 24" wide to fill berms of varying widths. The operator can also adjust the depth of the berm by lifting or lowering the shoe.

Labor, Equipment, & Materials Used:

A Street Department mechanic and employees built the additional framework using 2" and 3" square box tubing, deck screen, sheet metal, and angle iron. The two steel roller wheels came from a local junkyard. The hookup used is from an old snow plow truck that was going to be sold.

Cost:

The cost of the steel materials was approximately \$400. Several hours of planning, cutting, and welding were not documented.

Savings & Benefits:

This unit allows the Street Department to berm the newly-paved streets at a much faster rate. There is very little hand work needed. The work is much neater, less material is wasted, and the berm is more uniform in width and depth. The berming is completed in about half the time, which allows the City to do work with its employees as opposed to hiring an outside contractor.

WORK ZONE SET UP TRUCK

Newark, Ohio

Contact:

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(740) 670-7725
Morehead@newarkohio.net

Problem Statement:

Our Street Department maintains several miles of four-lane State Route 16. This maintenance often requires closing one lane for patching, storm sewer cleaning, sweeping, etc. We needed a vehicle that would have all traffic signs and cones in a handy location and be easy to deploy and collect afterwards.

Discussion of Solution:

We used a Ford F-250 pickup truck that had a rusted-out bed. We removed the bed and built a flat bed with compartments for all of the traffic control items. The truck now carries 100 cones and sixteen different signs. Six-inch plastic pipe holds 3' x 3' plastic signs, and the sign brackets are also carried onboard. The rear deck allows the cones to be set or picked up, and the seat can be mounted on either side of the rear deck. The bed has a walkway up the middle so that workers can reach the cones or signs from the inside or outside of the bed.

The seat described above has been equipped with a seat belt for safety purposes.

Labor, Equipment, & Materials Used:

A Street Department mechanic and employees cut out the two-inch square tubing, 1 ½" angle iron, and sheet steel and welded the unit together. Six-inch plastic sewer pipe was mounted to hold collapsible signs. The seat is from an old asphalt paver that was sold.

Cost:

The pickup truck is a 1995 model, retired from everyday use. The cost of the steel material is approximately \$1000, and the cost of the pipe is approximately \$100. Labor cost was not documented.

Savings & Benefits:

The small truck is more versatile and efficient than a large truck. It also eliminates the need for a separate trailer to haul these items. The traffic control items are deployed and collected faster, keeping traffic disruptions to a minimum on this State Route. It can also be deployed quickly in emergency situations.

LEAF BLOWER HITCH ASSEMBLY

Chagrin Falls, Ohio

Contact:

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Problem Statement:

Several of our village parks, along with a large cemetery, contain many mature deciduous trees. Leaf removal from these areas is necessary throughout the fall season. Previously, both push blowers along with backpack blowers were used to remove the leaves. This resulted in much equipment wear, fuel cost, and additional man hours. Some years we were unable to remove all the leaves before snowfall, resulting in damage to turf areas.

Discussion of Solution:

We designed a hitch assembly to hook up to and pull our existing push blowers behind our riding lawn mowers. The hitch assembly is bolted onto the existing framework of the push blowers. This new assembly allowed for a more efficient and effective leaf removal. The blower can be disconnected simply by removing one pin in order to operate it manually.

Labor, Equipment, & Materials Used:

Band saw, grinder, welder, and drill press
Approximately 4 man-hours
4' 1 ½ x 1 ½ x ¼ square stock
6" 2 x 2 x ¼ square stock
8" ½ x 1 ½ flat stock
12" ½ x 1 ½ flat stock

Cost:

Materials: \$63.00
Labor: \$92.00

Savings & Benefits:

The cemetery crew is now free to clear leaves from other village properties. This mower/blower system results in greater leaf removal ability. The new system also saves time, fuel, equipment wear and tear, and overtime costs. Another benefit is that this system is physically less demanding on personnel.

SCOOTER PARKING PROGRAM

Columbus, Ohio

Contact:

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Problem Statement:

The number of moped, motor-scooter, and motorcycle users is growing as a result of increased fuel and parking costs as well as the desire to cut carbon emissions. The use of these vehicle types should be promoted in order to enhance mobility options for the motoring public.

Discussion of Solution:

The City of Columbus initiated a program, commonly known as Scooter Parking, in 2008 to provide parking for two-wheeled motorized vehicles – motorcycles, motor scooters, and mopeds – in the central business district and two adjoining historic districts. These fuel-efficient vehicle types have become increasingly popular in Columbus and other metropolitan cities. The first phase of this program created 23 parking locations which were free to all riders. The second phase of the program began in 2009 and required riders to purchase annual permits to park in these locations.

Labor, Equipment, & Materials Used:

City forces erected signs and installed pavement markings to designate the Scooter Permit parking areas. The areas are permit areas from 8:00 AM until 5:00 PM, Monday through Saturday and are free to riders at other times. The city fabricated signs and printed permits to be sold to riders.

Cost:

The cost of providing signage and pavement markings for these areas has totaled \$27,500. The City expects that over time, the annual permit fees generated will pay for all costs associated with establishing and maintaining the program.

Savings & Benefits:

The Scooter Parking Program has provided safe and convenient parking for scooter users visiting, working, shopping, or living in the urban core. Riders can now park within steps of their destinations in many cases. 27 locations have been created to date that provide 302 parking spaces. The City has sold 147 annual permits for \$50 each as of November 2009, which is considered a bargain when the least expensive automobile parking permit is \$50 per *month*.

CURB CLEANER

Walbridge, Ohio

Contact:

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Walbridge, OH 43465
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walbridgesteve@aol.com

Problem Statement:

Residents complained about parking issues when large amounts of snow were plowed against the curb. Parking a car and opening the door in the permitted areas became impossible. In an effort to get around this problem, residents would park further into the street, making travel difficult and hazardous.

Discussion of Solution:

Different techniques for snow removal had been experimented with, all of which being costly and requiring a shut-down of at least one lane of traffic during snow removal. The idea was to modify a loader bucket that would remove enough snow from the curb area to allow cars to park and doors to open. The piece of equipment could be operated without disruption of traffic or lane closures.

Labor, Equipment, & Materials Used:

Labor included one employee for eight hours with normal shop tools and a welder, one scraper blade from our scrap pile, miscellaneous scrap steel, and one piece of rubber belting. We also used a handful of miscellaneous bolts.

Cost:

Materials: \$0
Labor: \$160

Savings & Benefits:

The use of this single piece of equipment eliminates multiple pieces of equipment. Therefore, it cuts labor expenses and prevents lane closures. This equipment creates a safe and fully functional parking area that allows our residents to park and open doors without damage to their cars and prevents them from having to climb over mountains of snow. This also allows residents to park within designated areas and not partially in the traffic lanes.

LIFE-CYCLE EXTENSION CALCULATOR

Westlake, Ohio

Contact:

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24144 Detroit Road
Westlake, OH 44145
(440) 892-1895
cdurante@pavetechinc.com

Problem Statement:

Asphalt pavement deteriorates due to asphalt binder dryout, water absorption, etc. When a pavement preservative tool is selected, the various elements of deterioration can be delayed by using the right treatment on the right pavement at the right time. In turn, the pavement's life cycle is extended and annual cost to own the pavement is reduced.

Discussion of Solution:

This "calculator" is intended to help the pavement management professional compute how the use of preservation tools can extend a road system's life in years, and thereby reduce the overall annual cost to manage their system. The first five field's values are selected by the user. The third, fourth, and fifth fields default to our Reclamite product. However, these fields are changeable by the user to any preservation tool desired, like chip seal, slurry seal, etc. The "calculator" also indicates how to pay for preservation by diverting a small amount of paving dollars to preservation and calculates the additional lane miles possible. Next, the "calculator" allows a review of the effect of a second round of preservation. Keep in mind that no commas or decimal points should be used on entries.

Following computation of life-cycle extension in years and reduction in life-cycle cost, the "calculator" offers another benefit. The "Green Effect" of extending the time between resurfacing also reduces CO₂ or greenhouse gas emissions. Therefore preservation allows the calculation of the pounds of CO₂ abated by less frequent operation of production plant, trucking, and pavement lay down operations.

Labor, Equipment, & Materials Used:

Not applicable, as the life-cycle extension calculator was designed and produced by industry and made available to the public works professionals at no cost.

Cost:

Free to public works professionals at www.pavetechinc.com or on a CD from Pavement Technology, Inc.

Savings & Benefits:

When pavement preservation is employed, the annual dollars to maintain roads decline. In turn, public agencies are able to do more with their dwindling budgets. The "Green Effect" or CO2 reduction achieved by employing preservation can have a positive effect on the environment.

JOINTBOND LONGITUDINAL JOINT STABILIZER

Westlake, Ohio

Contact:

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D & D Emulsions, Inc.
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Westlake, OH 44145
(440) 892-1895
cdurante@pavetechinc.com

Problem Statement:

The longitudinal construction joint in an asphalt pavement is the weak point in the structure. This is due to reduced compaction approximately one foot on each side of the new joint. This is the most significant problem in need of a solution according to the FHWA.

Discussion of Solution:

To mediate this joint deficiency, we developed JOINTBOND, which is composed of maltene oils identical to those found in asphalt binder together with an SBR polymer. JOINTBOND is a cationic emulsion that is spray-applied in a two-foot wide strip over the longitudinal joint at controlled rates of 0.06 to 0.15 gallons per square yard at ambient temperature. The emulsion is absorbed into the pavement and fluxes with the in-place asphalt binder, adjusting its viscosity and creating an in-depth seal.

Labor, Equipment, & Materials Used:

The labor involved in application consists of a traffic control crew of two to four men and an operator of the spray-applicating equipment. The applicator is usually an asphalt distributor truck. The JOINTBOND material is applied at a variable rate of 120 to 150 gallons per mile of joint, depending on porosity of a given pavement.

Cost:

JOINTBOND, contractor-applied, has a cost complete in place of about \$3500 per mile. The material cost should average about \$1000 per mile in general.

Savings & Benefits:

Tests performed by the Tennessee Department of Transportation indicated no surface distress in the treated areas after three and five year observations. To date, about 200 miles of joint have been preserved with JOINTBOND, with an anticipated life extension of three to six years beyond the normal time for needed resurfacing.

Nebraska LTAP

RETRACTABLE TRUCK BED EXTENSION

Scotts Bluff, Nebraska

Problem Statement:

With limited truck bed length, delivering material to a job site was always a challenge. Delivering corrugated metal pipes which can be damaged with too much unsupported length being transported was also an issue. A longer bed could have been a solution but a short bed in many instances is more manageable on a day to day basis.

Discussion of Solution:

Truck with an extendable flat bed

Using existing flat bed, Scotts Bluff County built a retractable truck bed extension that will allow an additional four feet of support for over length materials. When dumping materials the extension allows the material to be supported closer to the ground. The extension can then be slid back into the bed frame when not needed. Since the extension was built in the frame, the bed height was not altered.

LABOR, EQUIPMENT, AND MATERIALS USED:

The extension was built in the County shop by Scotts Bluff County employees and took about fifty man hours to fabricate. Much of the material used was on hand.

The extension will provide an extra four feet of support for over length materials. The rails that ride inside the existing frame are ½" x 4 ½" x 10' cold rolled steel. The rails are held in place in the frame as shown in the photos with 3/16" in the middle of the frame and ½" gussets at the rear end of the frame. The tubes in the center are 1 ½" o.d. square and 2" o.d. square mild steel. The function of the tubes is to help with the alignment and to provide a way to secure the extension in the open or closed position with the use of a 5/16" lynch pin. The end support was made of 3" x 6" x 6' heavy tubing. The end support sits on top of the rails to align with the bed of the truck. The end support has the ends closed with 3/16" steel and is attached to the rails with 3/16" gussets. A 1" diameter tube was welded between the rails to keep the rails from twisting in the open position.

Savings & Benefits:

- Two bed lengths on one truck.
- When in use the extension will add four feet of additional bed length.
- Since the extension was built in the frame, the bed height was not altered.