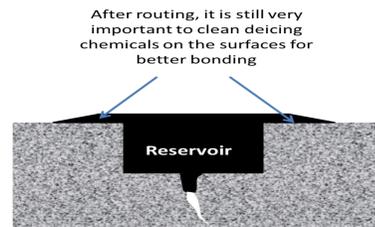


Cleaning Device to Remove Debris and Chemicals for Crack/Joint Sealing

Introduction & Problems

- Over fifty percent of the US interstate system is classified in fair or poor condition.
- Loss of adhesion causes most crack sealing failures
- Traditional air blasting is less effective in cold weather climates due to de-icing chemicals.
- FHWA recommends abrasive crack cleaning methods such as water blasting or wire brushing
- The pavement surface is often ignored during crack preparation
- Labor costs of current crack cleaning/sealing processes are extremely high.



Elevation view of routed crack after sealing



Crack Sealing Process

After routing, it is still very important to clean deicing chemicals on the surfaces for better bonding

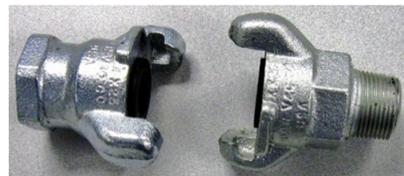
Innovative Versatile Crack Cleaning Device

Design Concept:

Brushing

Pneumatic power = Routing + air blasting

Cutting



Simple Chicago fitting connection with existing air compressor



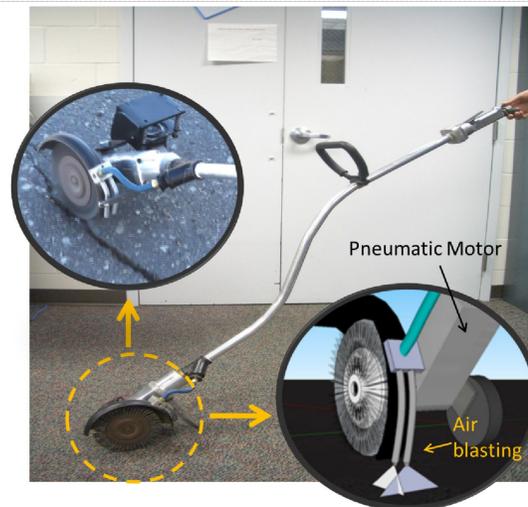
Wire brush: Cleaning cracks



Router: Excavate cracks



Masonry blade: Pothole repair



Conventional Preparation Method vs. Proposed Preparation Method

	Non-Routing	Comments		Routing	Comments
Traditional	Air blasting -> sealing	Does not effectively remove de-icing chemicals and vegetation	Traditional	Routing -> air blowing -> sealing	Not effective for wide cracks. Also, routing cannot clean top surfaces of cracks which promotes better bonding between surface and sealant material.
Proposed device	Wire brushing & air blasting -> sealing	Remove de-icing chemicals and vegetation + air blasting = one process	Proposed device	Routing -> wire brushing & air blasting -> sealing	A brush effectively prepare top surface of cracks while air blasting cleans inside and outside of the routed crack simultaneously.

Conventional and Proposed Preparation Method Overview

Crack Size for Sealing

- Crafco Inc. defines cracks $\geq 1/8"$ (about 3mm) generally require sealing.
- Materials and Procedures for Sealing and Filling Cracks in Asphalt-Surfaced Pavements (FHWA-RD-99-147)² recommends crack sealing for 5 to 19 mm width of cracks.
- Unified Facilities Criteria (UFC) provides guidelines for crack preparation based on crack size as follows:



Graphical representations of typical crack sizes (from UFC 3-270-02)

Innovative Versatile Crack Cleaning Device



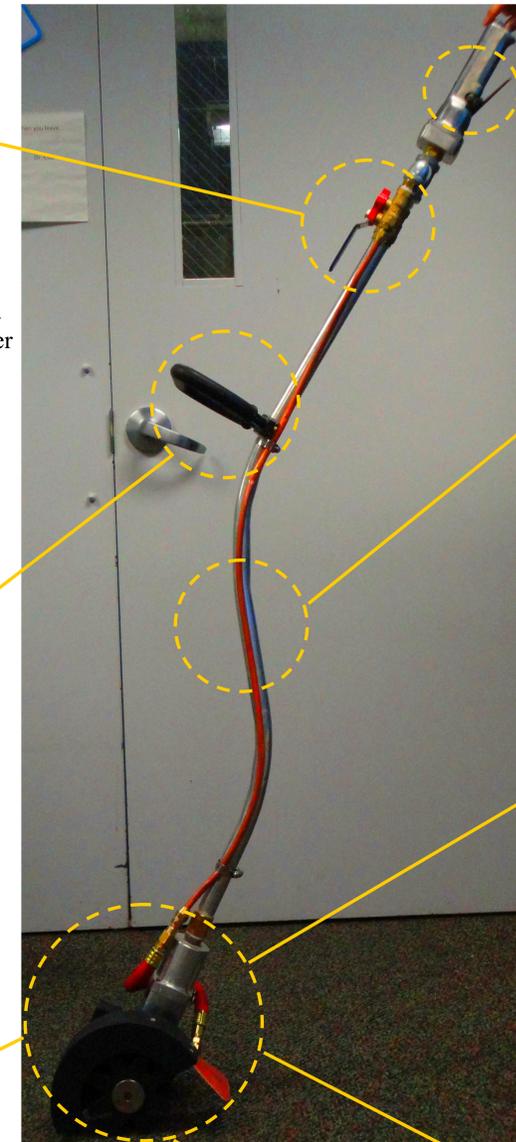
Air Flow Splitting Design
One for running motor, the other for air blasting to clean debris



Air Amount Control Switch
A convenient trigger mechanism



Handle
Designed for the hand not pulling the trigger



S-shaped Shaft Design
More comfortable to use for a prolonged period of time compared to the straight one because the s-shape of the shaft allows the operator to stand more erect while pushing down on the device



Wire Brush
Cleaning Cracks



Router
Excavate cracks



Masonry Blade
Pothole Repair



Replaceable Brush Design
A low cost alternative to simply and effectively prepare pavement cracks and joints for sealing or filling



Guiding Wheel with Height Adjustable Assembly
Give the operator a choice in the setting the minimum crack depth



Pneumatic Motor, Angle-adjustable air nozzle, and Debris Guard
The increased debris guard was suggested not only for the safety and protection of the operator, but also for passing vehicles and pedestrians. The adjustable nozzle trajectory using a funnel was suggested to blow out debris away from the crack to the side of the roadway no matter what the direction the device is moving.

Contact

Yong Cho, Ph.D.
Associate Professor
Durham School of Architecture Engineering & Construction
University of Nebraska - Lincoln

Mailing Address: 1110 S. 67th ST
PKI Room 104C
Omaha, NE 68182
Tel: (402) 554-3277, Fax: (402) 554-3850
Email: ycho2@unl.edu