

RESULTS SUMMARY

Researchers developed standard procurement specifications for carbide plow blades, providing agencies with an effective tool to acquire high-quality, long-lasting blades that consistently perform well on the road.

PROJECT DETAILS

Project Title: Standard Specifications for Plow Blades with Carbide Inserts

Project Number: CR17-02

Project Cost: \$53,787

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SPECIFICATIONS TO STANDARDIZE PLOW BLADES WITH CARBIDE INSERTS

Many state DOTs use snowplow blades enhanced with carbide inserts—made of a long-wearing alloy of tungsten and carbon—to greatly increase the blades' service life. Over a winter season, an agency may use multiple sets of plow blades per truck, at a considerable cost to the agency.

Need for Research

While many agencies use specifications for purchasing carbide inserts, these specifications vary considerably in their parameters and requirements. Having common specifications for the overall plow blade, as well as the carbide insert characteristics, helps standardize the product and allows agencies to more easily obtain the best possible products.

Objectives and Methodology

The goal of this project was to develop standard specifications that could be used by agencies across the country for procuring carbide plow blades. Having a common standard for all 36 Clear Roads members and other interested agencies would simplify and streamline the procurement process for both agencies and vendors.

Researchers for this project built on [previous Clear Roads research](#) that developed standardized test procedures to predict carbide insert performance. First, they conducted a literature review to identify common specifications and relevant research on the use of plow blades with carbide inserts.

Researchers then surveyed state agencies to collect existing specifications and best practices and to learn about agencies' experiences with carbide inserts. They also conducted an industry survey and industry interviews and visited a manufacturing plant to learn how specifications influence the manufacturing process and to identify factors that affect carbide insert quality.



A state highway agency can go through thousands of plow blades over a winter season. Standardizing specifications to provide a consistent product should help ensure the blades' quality and lead to cost savings. (Photo courtesy of Massachusetts DOT)

The research team's metallurgist also analyzed properties of carbide inserts to identify those that should be considered in the development of specifications.

Results

Very little investigation had been conducted previously on carbide insert specifications, though several studies have dealt more generally with plow blades. The previous Clear Roads project developing laboratory methods for testing the quality of carbide inserts was the most relevant study; its findings were incorporated into this project.

Through the survey of agencies, the research team collected specifications from 34 organizations, primarily Clear Roads states. Researchers found wide variability among respondents' specifications for such values as material grade, insert composition and insert size, and in some cases the specifications were not clearly defined or left room for interpretation.

The survey of manufacturers and the plant visit provided researchers with additional data and context on carbide inserts. Manufacturers consider quality to be paramount, and they expressed concerns that many DOT contracts were awarded on a low-bid basis with no guarantee of quality. Carbide composition is the key to ensuring performance

and longevity, and basic tests for density, hardness and porosity can help ensure good quality.

Synthesizing all this information and previous relevant findings, researchers developed standard specifications for plow blades with trapezoidal or bullnose carbide inserts. The specifications include insert geometry, dimensions, and metallurgical, mechanical and physical properties, and are intended to be used industry-wide for plow blade fabrication and acceptance.

The new insert specifications provide thorough guidance for independent lab testing and inspection of carbide inserts. Common, inexpensive lab tests for density, hardness and porosity can be performed quickly, and good test results in these categories correlate well with properties associated with performance and longevity. Researchers also provided procedures for inspecting batches of inserts for acceptable quality level.

The final project deliverables include computer-aided design (CAD) drawings, standard specifications for blades with inserts, and testing and inspection protocols that include ranges of acceptable results.

Benefits and Further Research

The research report and the accompanying specifications will expand agencies' understanding of the characteristics of quality carbide inserts and have the potential to improve the procurement process for both agencies and vendors. Through independent lab testing and quality assurance, agencies can have more confidence in the quality of the inserts they are purchasing. If used widely, the specifications could result in better quality, quicker delivery times and lower costs for carbide plow blades.

The specifications are available on the [Clear Roads website](#).

"If most agencies adopt this standard for procuring carbide inserts, vendors will have a common specification to work from. This will allow them to have more finished products available, reducing costs and delivery times."

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