

TRUCK & TRAILER *Specialties, Inc.*

**Cutting Edge Options for
Winter Operations**

2013 www.ttspec.com

The “Good Old Days”



1st Truck I Ever Spec'd Out



First One Butch Spec'd Out



Pre-Underbody Scraper



What sort of cutting edge is best?

- Is there a **one-size-fits-all** solution? Or,
- Does the optimal solution indicate **each agency might need a different cutting edge option?**
- **In examining cutting-edge performance**, two factors are obviously significant: **1.** The longevity of the cutting edge (how many miles or how many hours can it be used before it must be replaced) and **2.** The ability of a given cutting edge to remove snow from the road (how much snow or ice is left behind). These two factors in turn raise other issues. For example, the condition of the roads that the cutting edge will be used on is clearly of importance. If roads have significant ruts, then cutting edges need a heightened ability to conform to the road surface. If roads are particularly rough, then cutting edges must be very resistant to shock loading. If roads use any sort of raised pavement markings, then the cutting edges must not destroy these markings.

Third factor to Consider

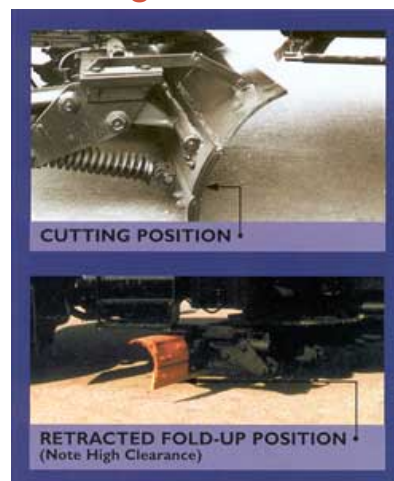
- Plow type & design should be a factor in choosing cutting edge:
- Front plow: rigid or trip
- Underbody scraper: mop (trailing edge) of folding moldboard.
- Wing; junior or patrol

Michigan: The underbody scraper state

Mop Style



Folding Moldboard



Underbody Scraper Blades

- Underbody scraper blades are commonly used in the state of Michigan by various agencies engaged in snow & ice removal from roadways. These blades are also used for grading of gravel roads. Essentially, there are two basic designs of underbody scraper blades: A. **trailing edge type**, commonly referred to as "mop style" and B. **folding moldboard type**, commonly referred to as "vertical style". Both designs have a place and both have advantages and disadvantages.

Trailing Edge Type (Mop)

- Mop style with one piece 1" thick moldboard is very rugged and if ordered with heavy duty compression springs, does good job of grading gravel roads as well as snow and ice removal. It has few moving parts so, by design, should require fewer repairs, until, of course, the operator hits an obstacle (like manhole cover). You cannot blame the scraper for that. Disadvantage is: the moldboard is one piece and hinged at one end, which means it raises and lowers in a circular motion (an arch, if you will) causing the "attack angle" between cutting edge and road surface to vary as cutting edge wears. This design of scraper requires use of curved cutting edges for maximum cutting edge life span and aggressiveness. Traditionally, these blades have been poor choice for tungsten inserted cutting edge as these were never available in curved design. But this has changed, you can now purchase curved cutting edges with tungsten inserts. The other criticism of this style underbody scraper is slowness in raising and lowering due to longer stroke of lift cylinders. Is that really an issue, I don't know but could be in certain situations.

Folding Moldboard (Jack knife)

- **Vertical style blade? Has two piece hinged moldboard and raises vertically, allowing attack angle to stay constant providing the most aggressive attack angle possible which makes it very efficient at snow & ice removal (even hard pack) and excellent candidate for straight carbide inserted cutting edges. This design can provide exceptionally long cutting edge life. It is capable of discharging snow long distances, which can be good (expressway) or can be very bad (towns). It is quick to respond for raising and lowering, lift cylinders have very short stroke. But it does have drawbacks, many moving parts and two hinge points. Not as heavily built as mop style. Too aggressive for grading roads. So you now understand your two choices. Match them to the right application and you will be very satisfied with the performance of either.**

Common Steel Alloys for Cutting Edges

- Non-heat treated: High Carbon
- Heat Treated: Through Hardened & Special Hardened
- Surface Hardened: flame or case hardened

Selection Criteria

- Wear Resistance
- Breakage Resistance
- There is a trade-off between toughness (resistance to impact) and wear resistance. Steel alloys with extreme hardness levels tend to be brittle and break easily when subject to impact. The other extreme are steel alloys that can absorb severe impact which tend to provide poor wear resistance.

Non-Heat Treated (Carbon Steel)

- These blades derive their wear resistance from high carbon content. High levels of carbon are very resistant to wear, which increases longevity in abrasive conditions.
- However, non-heated blades are subject to impact breakage and can crack or break when subject to even moderate impact.

Heat Treated- Through Hardened

- Derives its wear resistance from its hardness level. The increase hardness level causes it to be very impact resistant. However, its wear resistance is equivalent to that provided by non heat-treated steel given the composition of the alloy. High carbon steel become brittle when subject to heat treat process so these blades are made from boron steels. You lose the wear characteristics of carbon but gain the strength characteristics from the hardening process. It is a superior choice to non-hardened (carbon steel) blades.

Surface Hardened- Flame Hardened

- Hybrid between non-heat treated, high carbon steel and a heat-treated, through hardened steel blade. Is still a carbon steel, although not as high as non-heat treated blade, providing the desirable wear characteristics. The surface hardened blades undergo a heat-treat process which is different in intensity and duration than the through hardened. The combined carbon content and different heat treat process provide superior wear life over the other two choices. Surface hardening is designed to leave the center of blade (core) ductile which allows blade to flex under moderate conditions.

So what does this mean to you?

- Surface hardened cutting edge is recommended for snow removal operations and routine gravel road maintenance for overall best performance.
- Through Hardened/heat treated cutting edge is recommended for new road construction, quarry or mining applications.

Another Consideration

- Esco offers X-TRA EDGE Special Hardened Steel Alloy cutting edge offering up to 40% less throw-away material and increased wear.

There is a third choice:

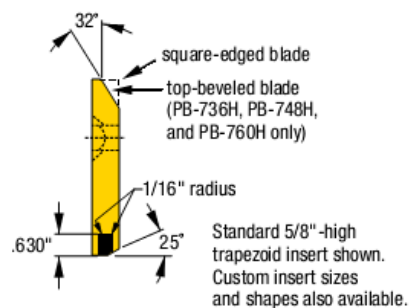
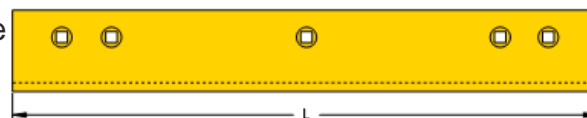
- Carbide

Tungsten Carbide-Edged Snowplow Blades and Accessories

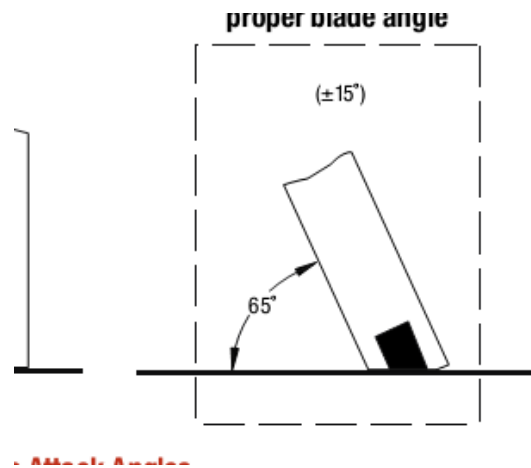
- Equipped with genuine Kennametal tungsten carbide inserts.
- Unparalleled hardness and fracture/wear resistance.
- Our brazing expertise ensures that inserts stay firmly in place — dramatically lowering your replacement part inventory and overall operating costs.

Exceptional Life on FMB Scraper

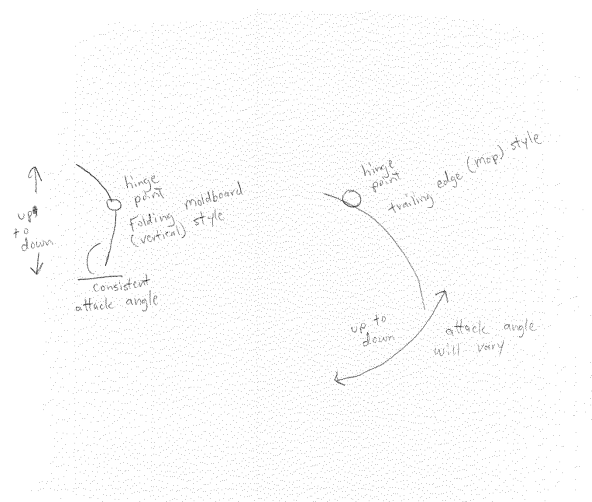
- Carbide



Proper Angle for Best Performance



Geometry of Designs



Underbody Design

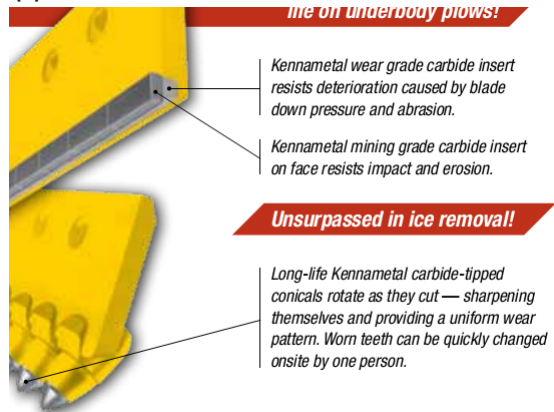
- Attack angle is critical to longevity good performance on tungsten carbide-edged blades lending itself well to mounting on folding moldboard scraper.
- Esco (Pacal) does offer a tungsten carbide-edged curved cutting edge which should solve potential attack angle issues on trailing edge blades.

Lots of choices



Rotating Carbide Bits

- Many applications



Uses

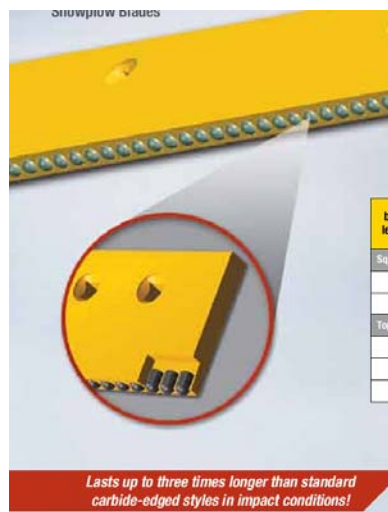
- Cuts road instead of scraping
- Asphalt planing and oil road reclamation
- Hard calcium chloride roads
- Reduce dust
- Brings larger gravel particles to top of road surface
- Lasts as long as 5 to 15 sets of standard grader blades

Maintenance

- Bits will freeze in pockets: need to be kept oiled with light oil
- Will need to be removed from pockets and cleaned occasionally depending on material being cut
- Check bit wear daily
- Maintain proper attack angle

Isolated Carbon Edge Blade

- I.C.E:
- Hard Pack



ICE Application

- I.C.E.

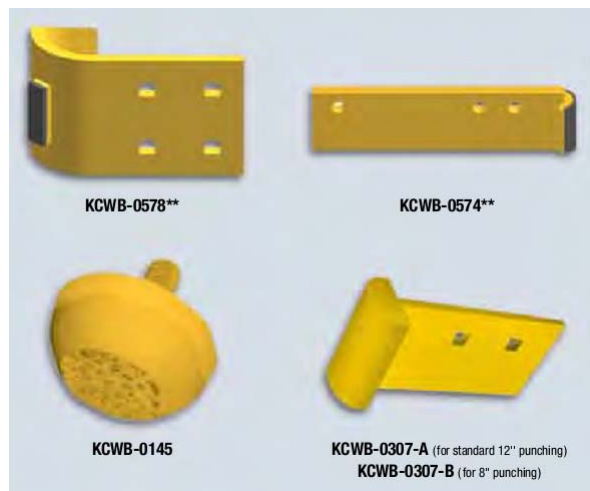
Kennametal I.C.E. Series™ • Isolated Carbide-Edged Blades

Specifically engineered to last exceptionally long in even the most challenging road conditions.

- Especially effective in applications involving imbedded lane markers and rumble strips — greatly reducing blade breakage.
- Ideal for high-speed plowing over roads with excessive joints, cracks, or uneven surfaces.
- Ultra-durable, dome-shaped carbide inserts are securely mounted and strategically isolated from one another to provide optimum fracture resistance throughout the entire blade length.
- Available in 3' and 4' (7/8"-thick; 5"-high) sections that can be easily installed and rotated on the plow for balanced wear throughout a season.

Curb Guards

- Examples

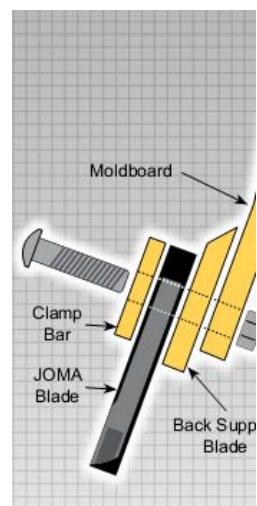
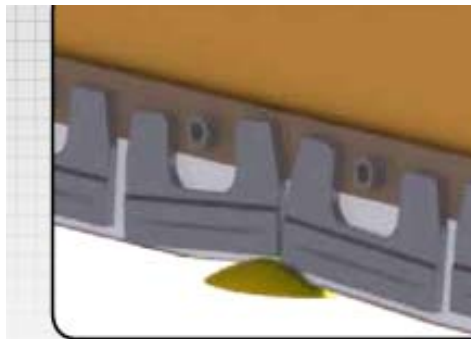


Olofsfors Sharp Edge (Sweden)



Joma 6000 Blade System

- Tungsten Impregnated Rubber



Replace Fastener System Everytime

To significantly reduce blade chatter and bolt failure, we highly recommend Grade 8, Number 3 head plow bolts with self-locking nuts for mounting our blades.

Stover Prevailing Torque Lock Nut



Description of Stover Lock Nut

- An all-metal one-piece hex nut which derives its prevailing torque characteristics from controlled distortion of its top threads from their normal helical form to a more elliptical shape

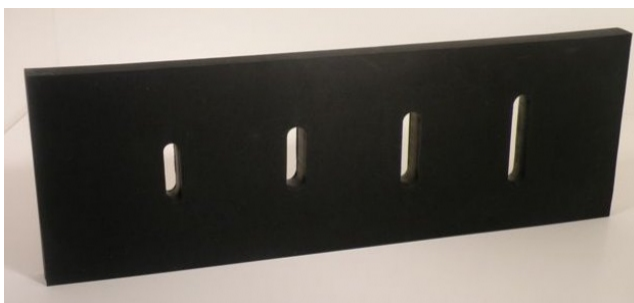
What does it cost to replace cutting edge?

- Employee time: 1 or 2 hours? What is your labor rate? Is it encumbered?
- Equipment downtime: not available for use (during snowstorm potentially)
- New bolts and nuts: Grade 8 with Stover prevailing torque lock nut. No lock washers. Cost?

Wing Plow Cutting Edge Options

- **Rubber**
- **Reverse Curve**
- **Recycled Tire**

Rubber Cutting Edge



Rubber Cutting Edge Mounting

- Rubber cutting edge requires face plate.
- Can use worn out cutting edge or flat stock 4" wide.
- I have seen guys sandwich rubber between new steel cutting edge and moldboard. Doing this will eliminate squeegee affect of rubber cutting edge. However, it does create a larger "footprint" on road surface reducing "down pressure"> Example: 5/8" X 9' cutting edge provides approximately 67.5 square inches of area in contact with road surface. If wing plow weighs 1,000# divide by 67.5" and you have 14.81 pounds per square inch exerted on road surface. Add rubber cutting edge= 2-5/8" x 9' =283 square inches divided by 1,000# = 3.53" per square inch.

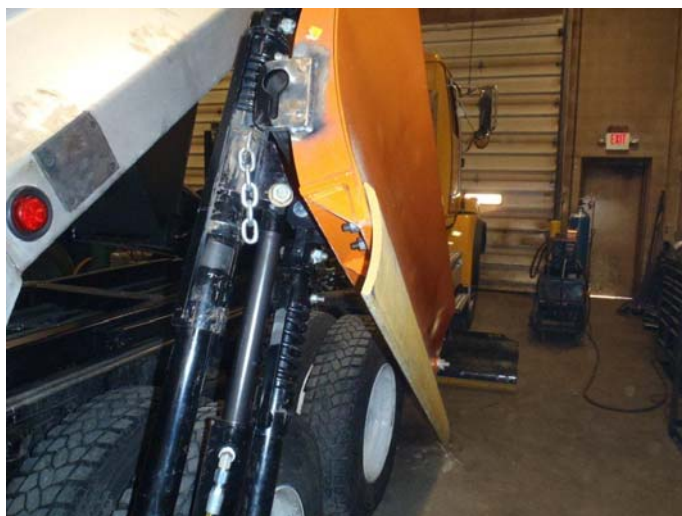
Reverse Curve with reverse curve shoes



Reverse Curve Cutting Edges

- Less aggressive
- Less shoulder gravel thrown into ditch
- Never, ever, ever back up with wing down when using reverse cutting edge as severe wing damage will result.
- Requires curved wing plow shoes.

Reverse Curve; no shoes



Recycled Tire



Have a safe winter! Hope it is “bearable”!



Resources

- www.ttspec.com This presentation is available under **Education** heading.
- <http://fleetgod-snowice.blogspot.com/> My Blog dealing primarily with fleet and snow & ice issues
- mlester@ttspec.com My work email address.