

**APPENDIX A**  
**Standard Specifications for Plow Blades with Carbide Inserts (Trapezoid Shape)**  
Prepared by Clear Roads

1. PLOW BLADE

- a. Plow blades shall be 3/4" by 6" by 48" and shall be hot rolled AISI 1020 quality steel.
- b. Lengths other than 48" may be specified in 12" increments.
- c. Hole punching shall be 11/16" square and countersunk to receive 5/8" bolts.
- d. Location and spacing of hole punches shall be as shown on the attached Figure 1A.
- e. Tolerance of bolt hole location shall be 1/32".
- f. A 3/8" groove for the carbide inserts shall be milled in the center of the blade edge.

2. CARBIDE BLADE INSERTS

- a. Inserts shall be made of the following materials:
  - i. 87-88% tungsten carbide
  - ii. 11-~~12.5~~12.5% cobalt
  - iii. 1% maximum for all other elements
- b. Inserts shall be 25-degree trapezoidal with the following nominal dimensions (Figure 2A):
  - i. Length: 1" ± 0.005"
  - ii. Thickness: 0.365" ± 0.005"
  - iii. Height: 0.635" ± 0.005" (measured on long side)
  - iv. Nose radius: 1/16"
- c. Inserts shall have the following properties:
  - i. Hardness: ~~88-0-90-587.5-89.0~~ HRA per ASTM B294-92
  - ii. Density: ~~14.4-14.5~~14.1-14.6 g/cc per ASTM 311-08
  - iii. Porosity: ~~A04=0.06%, B02=0.02%, C04=0.06%~~A06, B02, C00 per ASTM B276-05e1
  - iii-iv. Transverse Rupture Strength: Minimum 350,000 PSI
- d. All surfaces (internal and external) shall be free of cracks and laminations.

3. BRAZING

- a. Carbide inserts shall be spaced in the milled groove with .010" between the inserts for the entire length of each blade section.
- b. The inserts shall be brazed on all sides.
- c. Brazing shall leave no voids or shims.
- d. Brazes shall use quality materials, best methods and qualified/certified technicians.
- e. There shall be no gaps or spacing between adjacent inserts after brazing.

4. TESTING PROCEDURES

- a. The vendor shall perform ASTM testing on a representative sample of each lot of carbide material that is used in the production of carbide inserts. All ASTM carbide test procedures listed above shall be conducted.
- b. Prior to delivery, the vendor shall provide the Department with all ASTM carbide test results and a statement of Acceptable Quality Level (AQL) inspection data, including acceptance and rejection findings. At its discretion, the Department will review the provided information and either accept or reject the carbide material. Accepted carbide material may move forward in the procurement process. Rejected carbide material shall result in rejection of the full lot of carbide from which the test samples were derived and cancelation of the procurement. If the vendor desires to continue with the procurement, they must submit test results and AQL findings from a different lot of carbide material.

**APPENDIX B**  
**Standard Specifications for Plow Blades with Carbide Inserts (Bullnose Shape)**

Prepared by Clear Roads

1. PLOW BLADE

- a. Plow blades shall be 3/4" by 6" by 48" and shall be hot rolled AISI 1020 quality steel.
- b. Lengths other than 48" may be specified in 12" increments.
- c. Hole punching shall be 11/16" square and countersunk to receive 5/8" bolts.
- d. Location and spacing of hole punches shall be as shown on the attached Figure 1B.
- e. Tolerance of bolt hole location shall be 1/32".
- f. A 3/8" groove for the carbide inserts shall be milled in the center of the blade edge.

2. CARBIDE BLADE INSERTS

- a. Inserts shall be made of the following materials:
  - i. 87-88% tungsten carbide
  - ii. 11-~~12~~12.5% cobalt
  - iii. 1% maximum for all other elements
- b. Inserts shall be bullnose shape with the following nominal dimensions (Figure 2B):
  - i. Length: 1" ± 0.005"
  - ii. Thickness: 0.365" ± 0.005"
  - iii. Height: 0.750" ± 0.005" (total height, including bullnose radius)
  - iv. Nose radius: 3/16"
- c. Inserts shall have the following properties:
  - i. Hardness: ~~87.5-89.0~~ 88.0-90.5 HRA per ASTM B294-92
  - ii. Density: ~~14.1-14.6~~ 14.4-14.5 g/cc per ASTM 311-08
  - iii. Porosity: ~~A06, B02, C00~~A04 = 0.06%, ~~B02 = 0.02%, C04 = 0.06%~~ per ASTM B276-05e1
- d. All surfaces (internal and external) shall be free of cracks and laminations.

3. BRAZING

- a. Carbide inserts shall be spaced in the milled groove with .010" between the inserts for the entire length of each blade section.
- b. The inserts shall be brazed on all sides.
- c. Brazing shall leave no voids or shims.
- d. Brazes shall use quality materials, best methods and qualified/certified technicians.
- e. There shall be no gaps or spacing between adjacent inserts after brazing.

4. TESTING PROCEDURES

- a. The vendor shall perform ASTM testing on a representative sample of each lot of carbide material that is used in the production of carbide inserts. All ASTM carbide test procedures listed above shall be conducted.
- b. Prior to delivery, the vendor shall provide the Department with all ASTM carbide test results and a statement of Acceptable Quality Level (AQL) inspection data, including acceptance and rejection findings. At its discretion, the Department will review the provided information and either accept or reject the carbide material. Accepted carbide material may move forward in the procurement process. Rejected carbide material shall result in rejection of the full lot of carbide from which the test samples were derived and cancelation of the procurement. If the vendor desires to continue with the procurement, they must submit test results and AQL findings from a different lot of carbide material.