DUAL CARBIDE TIPPED UNDERBODY SNOW PLOW BLADES MGS-01-02D

1.0 DESCRIPTION. This specification covers dual tipped carbide underbody snowplow blades.

2.0 MATERIALS.

2.1 Steel. The blades shall be fabricated from flat hot rolled carbon steel meeting the requirements of either ASTM 576-90b or ASTM 575-89 with the range of Grades SAE 1020 or equal.

2.2 Tungsten Carbide Inserts. The inserts shall be a high shock WC Grade of tungsten carbide.

2.2.1 The inserts shall meet Virgin Tungsten Carbide quality specifications and shall meet the following requirements.

2.2.1.1 Face Insert Characteristics:

Specification	**Requirement**
Cobalt Content, percent	19.0 – 21.0
Density, g/cm^3 (ASTM B 311)	13.25 - 13.65
Hardness (ASTM B 294, Rockwell A Scale)	83.5 - 85.0
Transverse Rupture Strength, psi, min.	330,000

2.2.1.2 Center Insert Characteristics:

Specification	**Requirement**
Cobalt Content, percent	10.5 - 12.5
Density, g/cm^3 (ASTM B 311)	14.1 - 14.6
Hardness (ASTM B 294, Rockwell A Scale)	87.5 - 89.0
Transverse Rupture Strength, psi, min.	350,000

2.2.2 The insert shall be rectangular and trapezoid design with the following dimensions for each:

2.2.2.1 Face Insert Dimensions:

Specification	**Requirement**
Height, inch	0.745 $\pm$ 0.005
Width, inch	0.310 $\pm$ 0.010
Length, inch, nominal	2

2.2.2.2 Center Insert Dimensions:

Specification	**Requirement**
Height, inch, long side	0.635 $\pm$ 0.005
Width, inch	0.365 $\pm$ 0.010
Length , inch, nominal	1
Bottom Angle	25 degrees with a nose radius of 1/16-inch minimum.

2.3 Finished Blades.

2.3.1 Insert Placement. The groove for the carbide inserts shall be milled on the blade edge. The tungsten carbide inserts shall be positioned in the milled area with approximately 0.010-inch space between the inserts the entire length of each cutting edge section. Each of the inserts shall be one-inch nominal length for the center inserts and two-inch nominal length for the face inserts. It may be necessary for some of the inserts to be different than the nominal lengths to make up for the spacing between the inserts. The number of one-inch inserts shall be no less than one or more that three from the number required for one insert per inch of blade length. The number of two-inch inserts shall be no less than one or more than two from the number required for one insert per two inches of blade length.

2.3.2 Brazing. The inserts shall be brazed on all contact surfaces consistent with sound brazing practice with no evidence of voids or use of shims. Brazing shall be of such strength and quality as required to prevent movement or loss of the inserts during use.

2.3.3 Physical Requirements. All blades shall be straight and free from flaws and injurious defects, and shall have workmanlike finish.

2.3.3.1 The finished blade sections shall be free of warpage and longitudinal deviation shall not exceed 1/8 inch in a four-foot or five-foot long blade section or 3/32 inch in a three-foot long blade section. The edge that rests upon the pavement shall be straight and true. The longitudinal warp and the alignment of this edge shall be measured by extending a straight edge from one end of the blade to the other and measuring from the straight edge to the blade at the mid-point of length.

2.3.3.2 The difference between the highest and lowest tip point shall not exceed 1/32 inch on any given blade assembly.

2.3.3.3 Punching shall be 11/16 inch square holes with 1 5/32 inch diameter countersink 3/8 inch deep to receive either 5/8 inch or 3/4 inch diameter plow bolts as required. Location of holes shall be in accordance with AASHTO standards for “heavy-duty” punching. Details, location, and spacing of the holes shall be as shown on the attached drawing for a standard state highway three-, four- or five-foot blade.

2.3.3.4 Moldboards are punched with holes 1/8 inch larger than the blade bolts. Accordingly, blade punching will be of such accuracy, both for the spacing between holes and for the spacing between the end hole and the end of the blade, that the blades will fit the moldboards, thus making the blade sections interchangeable.

2.3.4 The paint used to coat the blades shall be dry prior to shipment and shall not smear or track during handling.

3.0 CERTIFICATION AND ACCEPTANCE.

3.1 Prior to approval and use of any material delivered, the manufacturer shall submit to the State Project Operations Engineer, P.O. Box 270, Jefferson City, Missouri 65102, a certification in triplicate certifying the grade of steel used in fabricating the blade and certifying that the blades supplied conform to all requirements and specifications.

3.1.1 The “Certification Statement” form shown in Section 5.0 is to be used when certifying. The certification shall include or have attached specific results of test performed on the tungsten

carbide inserts for cobalt content, density, hardness and transverse rupture strength and showing the standard test designation of the test specified for each of these properties. The certification shall show the purchase order number, destination, quantity of material represented at each destination and shipping date.

3.2 Acceptance of the blades and carbide tip inserts shall be based on the manufacturer's certification and upon the results of such tests as may be performed on samples of the material. When samples are taken, one complete blade of each length shall be taken to represent the shipment. A shipment will be considered as all blades represented on one certification and shipped on one date, regardless of various destinations. The carbide tip inserts shall be sampled from the blades selected for testing.

3.2.1 If a blade fails to meet any of the specified requirements, two additional blades will be selected for retest from the same quantity represented by that certification. Both of these retest samples must meet all requirements or the entire quantity will be rejected.

3.2.2 If the carbide tip inserts fail to meet any of the specified requirements, two additional samples will be selected either from the original blade sampled or from other blades contained in the same quantity represented by that certification. Both of these retest samples must meet all requirements or the entire quantity will be rejected.

3.2.3 If the blades are rejected, no payment will be made and the cost of blades destroyed during sampling and testing shall be borne by the supplier.

4.0 TEST METHOD MODOT T21 DETERMINATION OF COBALT IN TUNGSTEN CARBIDE INSERTS.

4.1 Scope.

4.1.1 This method describes a procedure for determining the percent of Cobalt in Tungsten Carbide Inserts used in Snowplow Blades, using a Inductively Coupled Plasma Optical Emmission Spectrophotometer (ICP-OES). The specification may be accessed at

http://epg.modot.mo.gov/index.php?title=106.7.21_TM-21%2C_Determination_of_Cobalt_in_Tungsten_Carbide_Inserts

5.0 CERTIFICATION STATEMENT.

CERTIFICATION STATEMENT
DUAL CARBIDE TIPPED UNDERBODY SNOWPLOW BLADES

State Project Operations Engineer
P. O. Box 270
Jefferson City, MO 65102

Dear Sir:
We hereby certify that the dual carbide tipped underbody snowplow blades described below comply with all requirements of Specification MGS-01-02D and in accordance with bid request No. _____.

The following blades manufactured by _____are covered by this certification.

Purchase Order No.	Destination	Quantity & Size	Shipping Date

Following are results of tests performed on these blades:

Grade of Steel in the Blade: _____

Cobalt Content in Carbide Tip: _____ Test Method: _____

Density of Carbide Tip: _____ Test Method: _____

Hardness of Carbide Tip: _____ Test Method: _____

Transverse Rupture Strength:_____ Test Method: _____

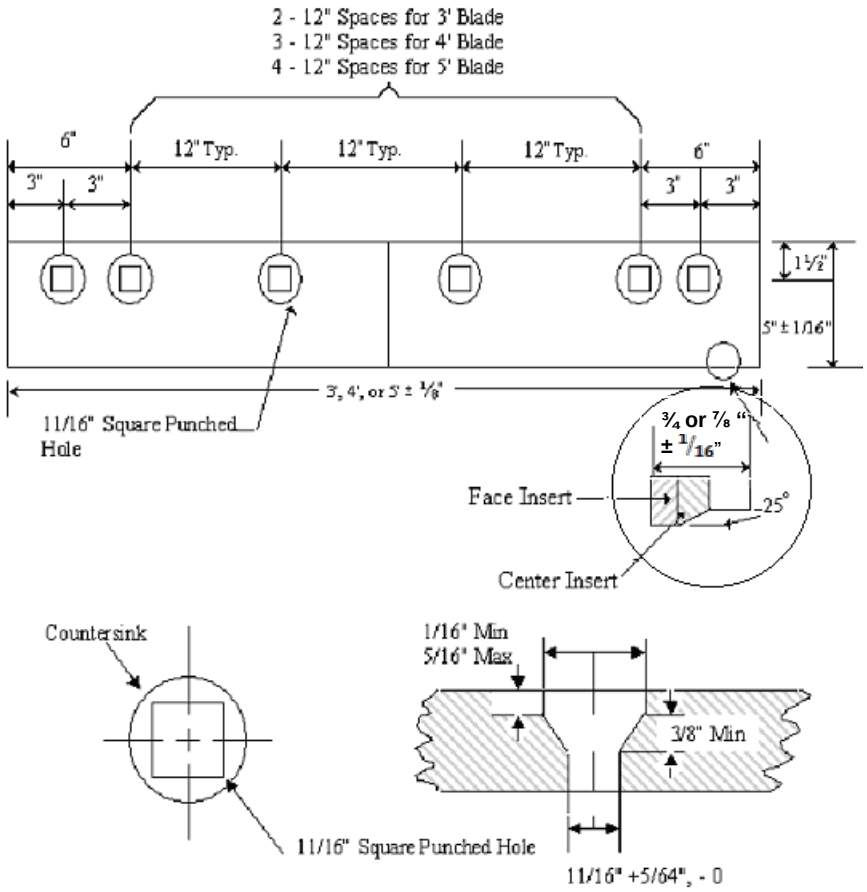
Certified By: _____

Title: _____

Date: _____

Results of tests may be shown on attachments rather than on this form, if preferred.

This form is to be completed, signed, and submitted in triplicate for each shipment, at the same time as blades are shipped. A shipment is defined as all blades represented on one certification and shipped on one date, regardless of various destinations.



NOTE: This drawing not to scale.

Plan of Dual Carbide Tipped Snowplow Blades