

# PHYSICAL CHARACTERISTICS OF SELECTED POLYMER TIPPED RIFLE BULLETS

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**KEY WORDS:** Polymer tipped bullets, component, reload

## ABSTRACT

**Polymer tipped bullets are available for reloading and in factory assembled cartridges. Fragments of these tips recovered from game carcasses may be used to infer manufacturer and, in some cases, bullet caliber.**

### THE BULLETS

Nosler, Inc., of Bend, OR, Hornady Manufacturing Co. of Grand Island, NE, and Jensen Bullets of Blackfoot, ID are three commercial manufacturers of polymer tipped bullets in the United States. Nosler BallisticTip® bullets are sold for reloading and are also available in Federal and Winchester factory loaded cartridges. Although Federal and Winchester are the only domestic manufacturers with whom Nosler has contractual agreements, Nosler Ballistic Tips® are also loaded by over the counter commercial buyers such as A-Square Ammunition and Dakota Arms.<sup>1</sup> V-Max™ bullets are factory loaded in Hornady's own VX™ line and in Remington varmint cartridges. V-Max™ bullets are also sold separately for reloading. Polymer tipped A-Max™ reloading match and hunting bullets are manufactured by Hornady. Jensen J-26 bullets are sold almost exclusively to reloaders although Jensen will custom reload for clients who request this service.

Nosler's Ballistic Tip® (Figure 1) copper/zinc alloy jacketed, boat tailed bullets are color coded for caliber. The calibers in

this line include 22 (orange), 6mm (purple), 25 (blue), 6.5mm (brown), 270 (yellow), 7mm (red), 30 (green), and 338 (maroon). A 35 (buckskin) caliber polymer tip bullet is expected to join the Ballistic Tip® line in the Spring of 1997. These bullets are sold in a variety of grain weights for use in varmint and hunting loads. The full Ballistic Tip® line is available for reloading. Federal Cartridge Co. loads select caliber/grain weight Ballistic Tips® in their Premium hunting cartridges and starting in the Spring of 1997, Winchester will feature Nosler Ballistic Tips® in Winchester Supreme® rifle ammunition. Winchester's Nosler tips will be uniformly silver/gray in color regardless of caliber and grain weight. The contractual agreement between Nosler and Winchester precludes Nosler from selling silver/gray tipped component bullets, making Winchester factory loaded ammunition the only authorized source for these bullets.<sup>1,2</sup>



**PHOTO 1: Longitudinal sections of three 7mm polymer-tipped rifle bullets. Left: Hornady 162 grains; Middle: Nosler 150 grains; Right: Jensen 140 grains.**

Nosler polymer tips consist of a head and a two stage shaft (Figure 2). The head is smooth and conical. The shaft stages are an upper bulbous portion and a lower straight to slightly curved portion. The lower portion features three narrow, equidistant

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ridges that run parallel to the long axis of the shaft. The base of the shaft has a slight lateral taper and a flat, solid bottom. The head and the shaft are roughly proportional to each other in length. Nosler polymer tips are fabricated in #1, #2, and #3 sized, 32 slot molds. The #1 size classification consists solely of .100 inch maximum diameter and .300 inch minimum length tips for 22 caliber, 55 grain bullets. Number 2 size tips are .120 inch maximum diameter with a minimum length of .350 inch and are used in 22 caliber/40 grain, 22/50, 6mm/55, 6mm/70, 6mm/95, and 25/115 bullets. Number 3 tips are .375 inch minimum length with a maximum width of .150 inch and are found in all other caliber/grain weight bullets.<sup>1,3</sup> (Note: width and length measurements given in

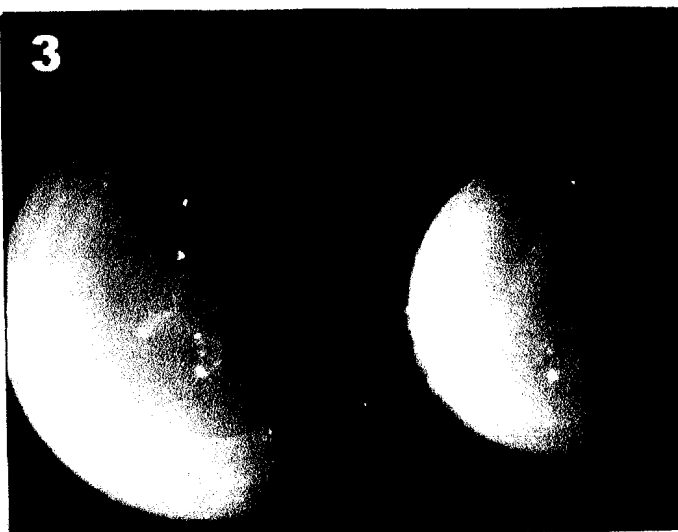


**PHOTO 2:** Nosler 7mm polymer tip. Original magnification X10.

this and subsequent paragraphs are reasonably accurate within the measured subsets. Actual measurements may vary slightly.)

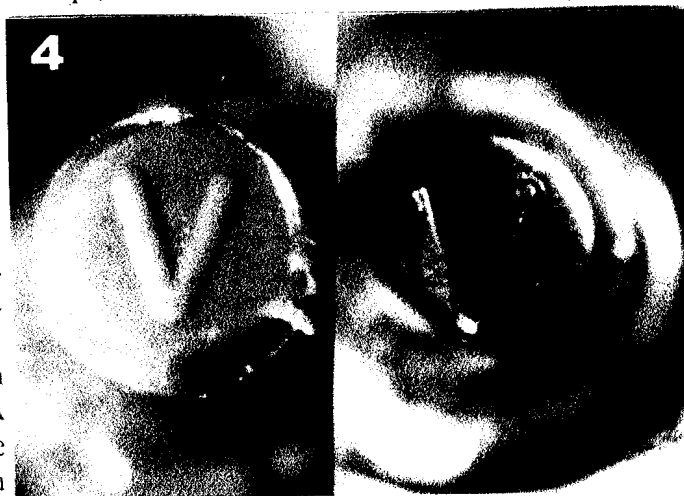
With the exception of 22/55 tip molds, each Nosler mold slot contains a consecutive letter from A to Z or a sequential number from one to six. The alpha-numeric character appears as a raised feature on the base of the tip's shaft (Figure 3). Base characters do not appear on 22/55 tips due to size limitations.<sup>1</sup> We have observed that an impression of the base character may be present in whole or in part on the surface of the lead core that is directly below the shaft (Figure 4).

Hornady sells V-Max<sup>TM</sup> polymer tipped component bullets, VX Varmint Express<sup>TM</sup> ammunition loaded with V-Max<sup>TM</sup> bullets, and A-Max<sup>TM</sup> polymer tipped match component bullets (Figure 1). Prior to 1997, copper/zinc alloy jacketed V-Max<sup>TM</sup> bullets were only



**PHOTO 3:** Hornady (left) and Nosler (right) 7mm polymer tip bases showing raised mold characters. Original magnification X20.

available in 22 caliber 40 and 50 grain boat tails, and 55 and 60 grain flats. The Varmint Express<sup>TM</sup> line, which was sold under Frontier and Hornady head stamps, was limited to .222 REM, .223 REM, .22-250,



**PHOTO 4:** Nosler polymer tip base mold character and the impression of this character in the underlying lead core of a .308 bullet. Original magnification X20.

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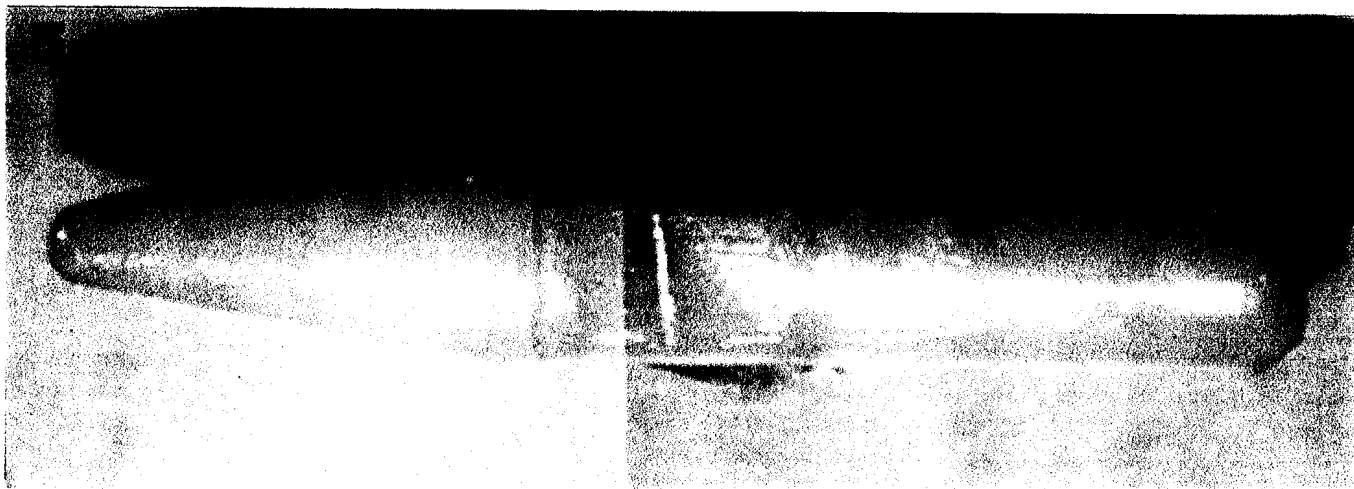
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stamps, was limited to .222 REM, .223 REM, .22-250, and .220 SWIFT. The first of Hornady's A-Max™ polymer tipped bullet line, which was introduced in 1996, consisted of 162 grain 7mm copper/zinc alloy jacketed boat tails. Hornady significantly expanded its polymer tipped bullet lines in 1997. New V-Max™ bullets include 17, 6mm, 25, 243, 6.5mm, 270, 7mm, and 30 calibers. The new A-Max™ bullets for 1997 are 22, 6mm, 6.5mm, and 30 calibers.<sup>4</sup> Also new for 1997 are Remington Arms Premium® varmint cartridges in .222 REM, .223 REM, .22-250, and .220 SWIFT that are loaded with 50 grain, .224 Hornady V-Max™ bullets. In keeping with the Remington corporate colors, the tip on this Hornady bullet is green.<sup>5</sup>

Hornady's polymer tips consist of a smooth, conical head and a long, one stage shaft (Figure 5). The shaft is without significant sculpturing. The base of the shaft displays a slight lateral taper and a flat

display base characters.<sup>6</sup> The 22 caliber V-Max™ tips we examined averaged .380 inch in length with a maximum diameter of .110 inch, were red in color, and did not display base characters. The 7mm A-Max™ tips we examined had a maximum diameter of .155 inch by approximately .655 inch long, were red in color, and displayed numerical base characters.

Jensen Bullets manufactures boat tailed, polymer tipped component bullets (Figure 1). The Jensen J26 bullet line features copper jackets and is sold in a wide variety of calibers and grain weights from an 80 grain .243 to a 400 grain .458. The J26 polymer tips are white. The tip consists of a conical head and a one stage shaft (Figure 6). The shaft is straight to slightly angular. The shaft does not appear to display fine sculpturing but rough, irregular cutting marks may be present. The base of the shaft terminates with a knob. The shaft and the tip are approximately proportional. Fine concentric lines are readily observable on the tip's head with minimal magnification.



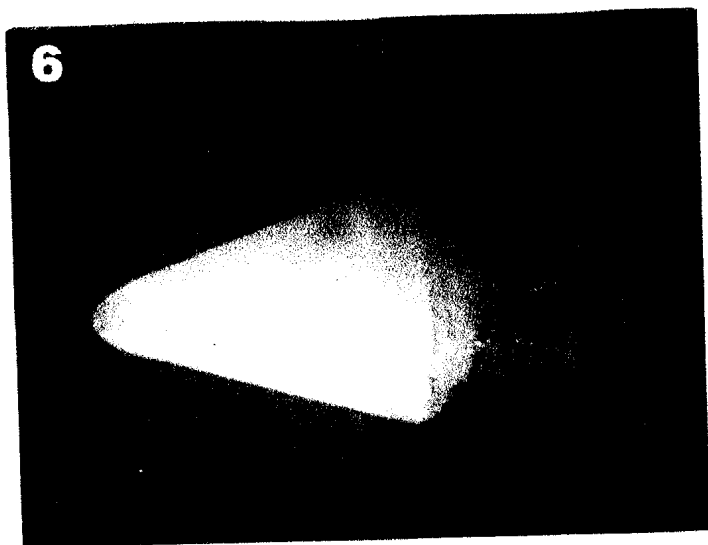
**PHOTO 5: Hornady 7mm polymer tip. Original magnification X10.**

solid bottom. The length ratio of the head to the shaft is roughly 40/60. According to Hornady, their polymer tips are molded in two sizes (small and large) and, with the exception noted above, are red in color. The large tips are used in 7mm, and 30 calibers. Small tips are used in the 17, 22, 6mm, 243, 25, 6.5mm and 270 calibers. The large tips display base character numbers from 1 to 48. The number appears as a raised character on the bottom of the shaft (Figure 3). An impression of this number has not been observed on the proximal core of unfired bullets. Small tips do not

According to the manufacturer, these tips are individually lathed and their general configuration varies slightly from lot to lot because of the lathing process. The tips will also vary considerably depending on caliber, ogive, and magazine requirements.<sup>7</sup> The Jensen 7mm and 30 caliber bullets, grain weights 140 and 180 respectively, that we purchased contained tips that were approximately .340 inches in length with a maximum diameter of .160 inch.

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**PHOTO 6: Jensen 7mm polymer tip. Original magnification X10.**

The production of polymer tipped bullets is not limited to Nosler, Hornady, and Jensen. Small scale, caliber specialized, and/or limited distribution commercial operations and private enthusiasts also contribute to this category of ammunition. For example, *Lyman 47th Reloading Handbook*<sup>8</sup> contains a black and white photograph of "338 cal. Cascade Custom bullets" whole, sectioned, and expanded. This small company, which apparently was in business for only about one year, produced .338 boat tailed, semi-partitioned "Poly Tip" reloading bullets. Cascade's conical shaped polymer tips were color coded white, blue, orange, and black for grain weight.<sup>9</sup> Northern Precision<sup>TM</sup> of Carthage, NY manufactures .358, .375, .416, .429, .44 and .458 "Pollyball Tip"/"Poly-Ball" and "Polly Tip" reloading bullets and has been in business since 1989. These mail order bullets are hand fabricated using Corbin dies and Corbin plastic balls. They are available bonded (color coded using white, yellow and green balls) and non-bonded (color coded using clear balls). Ball sizes range from .185 to 3/8 inch diameter and are applied based on ogive and tip diameter variations.<sup>10</sup>

### CASE APPLICATION

In late February, 1996, the partial remains of a deer were submitted to the National Fish & Wildlife

Forensic Laboratory by the Wisconsin Dept. of Natural Resources for cause of death determination. The submitting officers believed that their suspect had illegally killed the deer with a firearm during bow season. Radiographic examination of the remains revealed the presence of very small, irregular, radio-dense, metallic particles in freshly hemorrhagic muscle tissue. An x-ray transparent, 4 milligram, approximately 2.5 millimeter X 2 millimeter piece of green colored plastic (Figure 7) was found with the metallic particles during necropsy. The metallic and plastic pieces were submitted to the Firearms Unit of the Laboratory for analysis. X-ray fluorescence spectroscopy of the metallics revealed the presence of lead in all but one particle. The other particle was composed of copper and zinc. Microscopic examination (Figure 8) of the green plastic piece revealed that it was physically consistent with having originated from a .308 Nosler Ballistic Tip® bullet. In January, 1997, the suspect plead guilty three days prior to jury trial.

### ACKNOWLEDGMENTS

We thank Wisconsin Dept. of Natural Resources officers Steven Daye and Randall Stark for submitting the evidence, and Senior Veterinary Medical Examiner Dr. Richard K. Stroud for collecting the tiny piece of green plastic that precipitated this study. We thank Gail Root of Nosler Inc., Doug Derner of Hornady Manufacturing Co., Warren Jensen of Jensen Bullets, and William Noody of Northern Precision for providing technical information on their products, and Mr. Root and Matt Smith of Nosler, Inc., for donating bullet reference standards for this project. We also thank firearms examiner Mike Scanlan of the Oregon State Police Crime Laboratory (Medford) for the longitudinal bullet sections seen in Figure 1.

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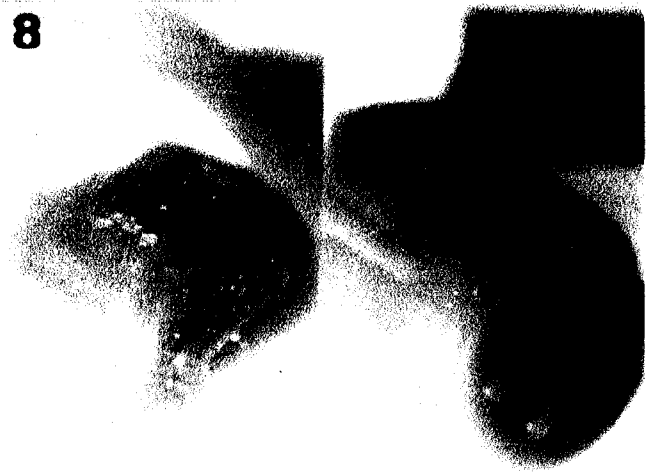
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**7**



**PHOTO 7:** Green plastic piece removed from the wound track of a Wisconsin deer .

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**PHOTO 8:** Microscopic comparison of the green plastic piece to the base of a .308 Nosler polymer tip. Original magnification X20.

