CASE STUDY

RESULTS OF BROADHEAD TESTS ON CAPE BUFFALO

ZAMBIA
JUNE, 2022

By: Rob Neilson

ABF CASE STUDY: **CAPE BUFFALO (Syncerus caffer caffer)**
LOCATION: **ZAMBIA**
DATE: **JUNE 2022**
RE: **RESULTS OF BROADHEAD TESTS ON CAPE BUFFALO**

Comments:
The Ashby Bowhunting Foundation (herein sometimes referred to as "ABF") is a non-profit organization whose goal is to provide the bowhunter with the information to achieve highest possible success rate and reduce the wound/non-recovery of game to the lowest level possible. Through this continuing research, we seek to find the most lethal arrow setups, considering all possible hits under realistic hunting conditions, and make the results of this testing available to the global bowhunting community free of any cost. ABF consists of 100% volunteers that do this for the betterment of bowhunting worldwide and no salaries are paid by ABF. **ABF accepts no funding, direct or otherwise, from the archery industry, thus keeping the Foundation's testing truly independent of industry influence, marketing hype, or promotional hunters.**

As with last year's test, ABF looked at structural integrity, mechanical advantage ("MA") including edge bevel MA, broadhead silhouette, tip design, positives, negatives, questions arising for further testing, and pre-shot and post-shot sharpness. All test shots were taken at 20 yards, 90 degrees broadside. Three of each head were shot, and the test medium was the southern Cape Buffalo (Syncerus caffer). The Cape Buffalo is ideal due to their flat, overlapping rib structure that all but ensures a bone hit on all arrows shot unless intentionally shot into soft tissue only. **Also, the ribs on a mature buffalo average just over 2 cm thick, equivalent in thickness to larger bones in mid-sized game.** Testing was done by Rob Neilson w/ABF and Strang Middleton w/Strang Middleton Safaris. Photography and Videography by Garrick Cormack w/Worldwide Hunting Productions.

While on this hunt, a prime example that things happen in the field occurred. As we made our final stalk, the Cape Buffalo was partially obscured in the tall grass, and while focusing on the magic triangle for shot placement to put him down quickly, the shot was pulled a bit and hit squarely into the humerus/scapula knuckle. This is approximately 5" of solid bone on a mature Cape Buffalo. The arrow system was 1135 grains total all in weight with an original Tuffhead up front with a calculated 32% FOC measurement and shot from an 82# Hoyt compound bow. This arrow system buried into approximately 5" of bone, fracturing the joint, allowing us to get on him again quickly to put additional arrows into him to finish the job. No doubt had this been a lesser arrow system, it would not have penetrated, we would have been in a worse situation, charged and had to resort to the 470 Nitro Express as a bailout. A picture of this head is included and the damage to the adapter occurred post-shot. After splitting the bone and crippling the Cape Buffalo, the

edge was still sharp enough to cleanly cut paper. This broadhead is a great example of structural integrity post-shot as you will ever get.

Based on feedback from 2021, improvements to the 2022 Case Study include pre/post-shot photos of the heads, charts for each head pre/post sharpness, along with a penetration chart for each head. A penetration test with the same head, but different FOC balance points of 15%, 26% and 32% was completed as well. ABF has implemented a grading system based on guidelines for the 12 penetration enhancing factors to give each broadhead a final average grade, with the breakdown attached as **Exhibit A** to this Case Study. For testing, ABF grades the arrows based on 10 of the 12 factors, removing Factors 6 & 12. ABF's hunting database will include Factors 6 & 12. This way all heads are graded equally across the board.

Factor 1 is **Structural Integrity.** A failure here is an automatic failure of the entire arrow system, with the only exception being damage to the nock after launch or damage to any component(s) not directly attributable to arrow impact with the tissues.

Factor 2 is **Perfect Flight.** This must be achieved as it is the enabler to maximize all other factors.

Factor 3 is the arrows **Forward of Center.** Simply this is the gravitational balance point and is tested herein.
Factor 4 is **Broadhead Mechanical Advantage.** While the blades MA can easily be calculated, different ferrule designs cannot. Therefore, the ferrule gets reviewed under Broadhead/Arrow Silhouette.
Factor 5 is the **Shaft Diameter to Ferule Diameter Ratio.** This is commonly overlooked by many bowhunters and manufacturers.
Factor 6 is the **Arrow Mass.** ABF has a recommended weight chart by animal category as a go-by.
Factor 7 is the **Broadhead Edge Finish**. ABF measures both pre-shot and post-shot sharpness. Only two manufacturers passed the post-shot sharpness based on the Bess Scale in this test.
Factor 8 is the **Shaft Profile**. Four profiles are tapered, parallel to tapered, parallel, barrel.
Factor 9 is the **Broadhead/Arrow Silhouette**. ABF looks for smooth transitions from the tip of the broadhead to the nock.
Factor 10 is the **Edge Bevel**. Single bevel, double bevel, along with the degrees of the sharpening angle.
Factor 11 is the **Tip Design**, such as tanto, needle, round, chisel, others.
Factor 12 is the **Arrow Mass** at or above the heavy bone threshold.
If you wish to read more about each individual factor, please read over the twelve penetration enhancing factors on our website that can be located online here: https://www.ashbybowhunting.org/reports, or you can read a series of Articles that are currently in progress with Dallas Safari Club in their Camp Talk Series.

All ethical bowhunters strive for accuracy and to make a perfect shot, but bad shots do happen, and the animals have a vote in where they will be when that arrow arrives. Accuracy is a given and requires dedicated practice to consistently achieve no matter your choice of equipment.

ABF volunteers hunt with highly efficient arrow systems we sometimes refer to as “Plan B” arrows that will work for most what-if scenarios when things don’t go according to Plan A, such as unexpected animal reaction to the sound of the bow loosing an arrow, turning what was going to be perfect shot placement prior to that movement into a marginal hit, i.e., heavy shoulder bone, too far back, even up the nostril and pass through out the butt. Those scenarios require that arrow to overcome additional resistance to penetrate to reach the vitals for a clean kill. Unfortunately, ABF has seen people going to the field with the mentality of a Plan B arrow will work regardless of accuracy; they do not practice, they are not familiar with their equipment, they are not familiar with the anatomy of the target animal, and all of that falls into the unethical category. If anyone is going to the field with that mentality, we hope this can serve as a reminder that the animals we pursue deserve better.

ABF has seen many commonly mistake accuracy of an arrow with trajectory due to industry marketing. Accuracy and trajectory are two completely different things. Acceptable trajectory of an arrow varies from bowhunter to bowhunter and is strictly a personal preference. For example, the hunters in Papua New Guinea use 2000+ grain arrows very accurately on open plains with long shots, and their survival depends on it! Trajectory should not be an excuse for any bowhunter for their lack of accuracy and learning proper bowhunting skills.

In 2021, we purchased most of the heads directly from the manufacturers. In 2022, we purchased most of the heads indirectly through commercial outlets, to make sure we acquired what the consumer would acquire. With this change we did notice a substantial difference in pre-shot sharpness from some 2021 heads to 2022 heads that required from 2-6x more force to cut from the same spool of Bess medium, suggesting that some manufacturers might have given special attention to the broadheads they knew were going into the testing. To ensure the accuracy of our findings we confirmed the calibration of our BESS Scale. Additionally, if a reading was skewed or extraordinarily off, it was tested again on the pre or post sharpness BESS test medium for confirmation. With these results from 2021 to 2022, all heads to be tested in the future will be purchased incognito so no one knows what is being tested.

All information is captured in ABF's database consisting of over 250 data points per shot. The outcome of this data gathered is the direction we follow, not marketing hype. Due to the time and expense involved with gathering this information, this data is reviewed only by qualified third party research groups. This information will not be released to manufacturers for extrapolating only select pieces of information to put themselves in a better light at the expense of the animals we hunt. If someone or another organization wishes to do their own testing of this nature, we will gladly advise them how to proceed and avoid errors and pitfalls we have already encountered.

THE BOWS USED AND ARROWS UTILIZED ARE AS FOLLOWS:

- 82# Hoyt Faktor 34” axle to axle compound bow, 29” DL: 300+ grain heads were used with arrow weights from 1100 to 1180 gr, depending on the head weight.
- 71# Hoyt Axius Ultra 34” axle to axle compound bow with a 29” DL. 100-225 Grain heads were used with arrow weights from 610-735 gr, depending on the head weight.
- Custom Adapters and Ethics Components were utilized on all test shafts. All factory aluminum inserts were eliminated due to common structural failures. A few Ethics inserts utilized on the 610-735 grain arrows bent on impact in combination with broadhead failures. No Ethics adapters/components failed when the broadhead structural integrity was not compromised. **Note the extreme importance of broadhead structural integrity and how it effects other components of the arrow system. While Structural Integrity is the first Penetration Enhancing Factor, this emphasizes a failure in this category results in the entire arrow system receiving a failing grade.**
- All test arrows were bare shafted to ensure perfect flight. There were no structural integrity issues with any of the shafts in the testing except for the Easton FMJ 5MM which exploded on impact. The various arrow information is as follows:
    - Sirius Apollo 150 spine shaft, AAE 4 vane w/wrap, Bohning A-nocks, Ethics components, original 300 grain Tuffhead w/200 gr screw-in adapter, 26% FOC, 1150 grains. ID/OD were in spec. No manufacturing QA/QC issues noted.
    - GrizzlyStik 170 spine shafts, A&A 3 fletch, Easton X-nocks, Custom 300 gr stainless steel 300 grain adapters w/original 300 grain Tuffheads, Custom stainless steel 100 grain collar, completely bonded one piece arrow system, 32% FOC, 1135 grains. **Note the custom adapters and collars were used as the Ethics Components built for this shaft were in spec as advertised at a .312”, but the OD on the shaft was at .3155” that would have required sanding to fit the Ethics components, ID on the shaft was in spec. Arrow manufacturer QA/QC issues noted.**
    - Black Eagle 150 Spine shafts, 3 Blazer Vanes, Bohning A-nocks, Ethics components, 300 through 375 grain screw-in heads utilized on arrows weighted from 1100-1175 grains, FOC ranged from 24-25% depending on head weight. No manufacturer QA/QC issues noted.
    - Easton Full Metal Jacket Dangerous Game 250 spine shafts, 3 True Flight 3” feathers, hidden brass inserts, full length weight tubes, 300 grain Tuffhead w/100 grain adapter, 1180 grains, FOC 15%. No manufacturer QA/QC issues noted.
    - Easton Full Metal Jacket 5MM 300 Spine shaft, 3 Blazer Vanes, aluminum hidden insert, 100 grain VIP Combat Veteran, 470 grains, FOC of 11%. Broke on soft tissue impact.

  - Black Eagle Carnivore 250 spine shafts, with a FOC of 25%. No manufacturer QA/QC issues noted.
- All impact velocities at twenty yards were confirmed with the use of our Labradar.

BROADHEADS TESTED:

(610-735 Grains Total Weight w/Arrow from 71# Bow)

- 100 Grain Feradyne Rage X-treme 2.3"+ 2 Blade
- *100 Grain Sevr Titanium 1.5"
- **100 Grain VIP Combat Veteran
- Ozcut Hurricane 150 Grain 3 Blade Single Bevel
- Valkyrie Blood Eagle 200 Grain 3 Blade
- Dirtnap DRT 200 Grain Single Bevel 175 Grain w/Bleeders
- Strickland Helix 200 Grain 2 Blade
- GrizzlyStik Maasai 200 Grain 2 Blade
- Tuffhead Evo 200 2 Blade
- Blitz 225 Grain 2 Blade Double Bevel
- Iron Will Single Bevel 200 w/Bleeders
- Ace Super Express 175 Grain Double Bevel
- Grizzly 200 Grain Single Bevel
- VPA 200 Grain Single Bevel

(1100-1180 Grains Total Weight w/Arrow from 82# Bow)

- Original Tuffhead 300 Grain Single Bevel with 100 gr adapters
- Original Tuffhead 300 Grain Single Bevel, custom adapters, smooth
- Original Tuffhead 300 Grain Single Bevel, custom adapters, serrations
- GrizzlyStik Ashby 315 Forged Head
- GrizzlyStik Alaskan 315 Forged Head
- Tuffhead Evo 300 Grain 3 Blade
- Tuffhead Evo 300 Grain 2 Blade Single Bevel
- DEAD X BIG GAME 3 "BG3" 300 Grain Single Bevel
- Edgetac 375 Grain 2 blade Single Bevel
- VPA 300 Grain Single Bevel

*Also tested at 900 grains.
**Also tested at 470 grains for a one factor arrow – perfect flight.

PICTURE OF PRE-SHOT ARROWS/HEADS ASSEMBLED – READY FOR TESTING.

A special THANK YOU to Strang Middleton for helping with this testing, which could not have been possible without him. Also, a THANK YOU to Garrick Cormack with Worldwide Hunting Productions for the photography and videography to document the testing.

Help Support our Research: A reminder Ashby Bowhunting Foundation is a 501(c)(3) non-profit organization and as with all testing, the Foundation accepts no funding from the archery industry, keeping all testing truly independent of industry influence. All Board Members and Ambassadors are unsalaried volunteers. Your donations make our continuing independent research possible.

TESTING NERVES

STRANG AND ROB WITH CAPE BUFFALO #1 AND #2

A. TEST SYNOPSIS FOR 300-375 GRAIN HEADS, 1100-1180 GRAINS TOTAL ARROW WEIGHT. All launched from Hoyt 82# compound bow:

1. Original Tuffhead 300 grain heads and FOC TEST Summary. Three of each arrow (12 shots) at 15%, 26% and 32% FOC. All shots were made with the 82# Hoyt. Impact Velocity 201-196 fps depending on shaft, Impact Momentum 1.01-1.02 slug ft/sec depending on shaft.

The Original Tuffhead is made of 420 HC stainless steel and tempered to a 52 HRC, ceramic coated with a 30-degree single bevel edge. Pre-shot sharpness was an average of 179 grams of pressure, with a post-shot sharpness average of 287 grams of pressure on heads that stayed in the animal, with an average post-shot sharpness of 372 grams of pressure for all 12 heads, including those that passed through and buried into the dirt. The MA of this head is the highest of any tested at 3:1.

Original Tuffhead 300 with smooth edges on 9 and custom interruptors by Troy Fowler on 3 heads. (See photo for Interruptor notches.)
Arrow: (3) FMJ Dangerous Game, 1180 grains, 15% FOC, smooth stropped
Arrow: (3) Sirius 150 Spine, 1150 grains, 26% FOC, smooth stropped
Arrow: (3) GrizzlyStik 170 Spine, 1135 grains, 32% FOC**,** smooth stropped
Arrow: (3) GrizzlyStik 170 Spine, 1135 grains, 32% FOC, interruptor edges


INTERRUPTOR NOTCHES

FOC: The arrows were built for testing on hippopotamus, but due to unavailability of permits prior to arrival in Zambia, the testing was done on Cape Buffalo. All rib-only hits with the 32% and 26% FOC arrows passed through, so those penetration data points were lost. Two 32% FOC arrows impacted ribs on entry and stopped on the opposite scapula. The 15% FOC arrows were rib hits and penetrated 15”, 16.5” and 20”, not penetrating to the offside ribs.

“Interruptor” notches were added to some heads to determine if there was any difference in penetration from the ‘interrupted’ edge and the smooth stropped edge. Note the previous comment regarding the build for hippopotamus and pass throughs on Cape Buffalo, so those potential data points were lost.

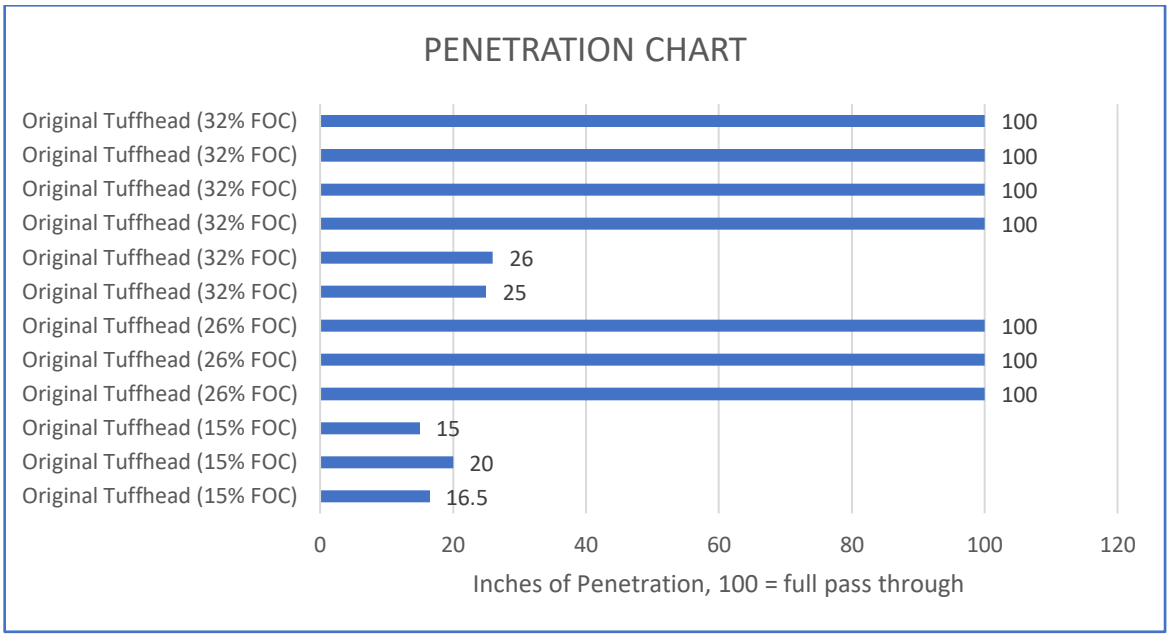
ABF Comments: The original 300 grain Tuffhead was used in the 2021 testing and performed flawlessly, so this head was used for hunting and testing this year. There were no structural integrity issues with any of the Original Tuffheads from hunting or testing. The penetration of the heads was consistent with variances in FOC. **Note the 15% FOC arrows, while heavier in weight, only exhibited penetration of 15”, 16.5” and 20” not making it to the offside ribs in comparison to the slightly lighter, but considerably higher FOC arrows that made complete pass-throughs with equivalent rib shot placement. None of the heads exhibited any damage, no tip damage, no chatter, no rolling, all retaining an excellent edge post-shot, including the broadhead from the hunt that penetrated and broke the massively heavy ball joint of the buffalo’s humerus bone; some five inches of solid bone.**

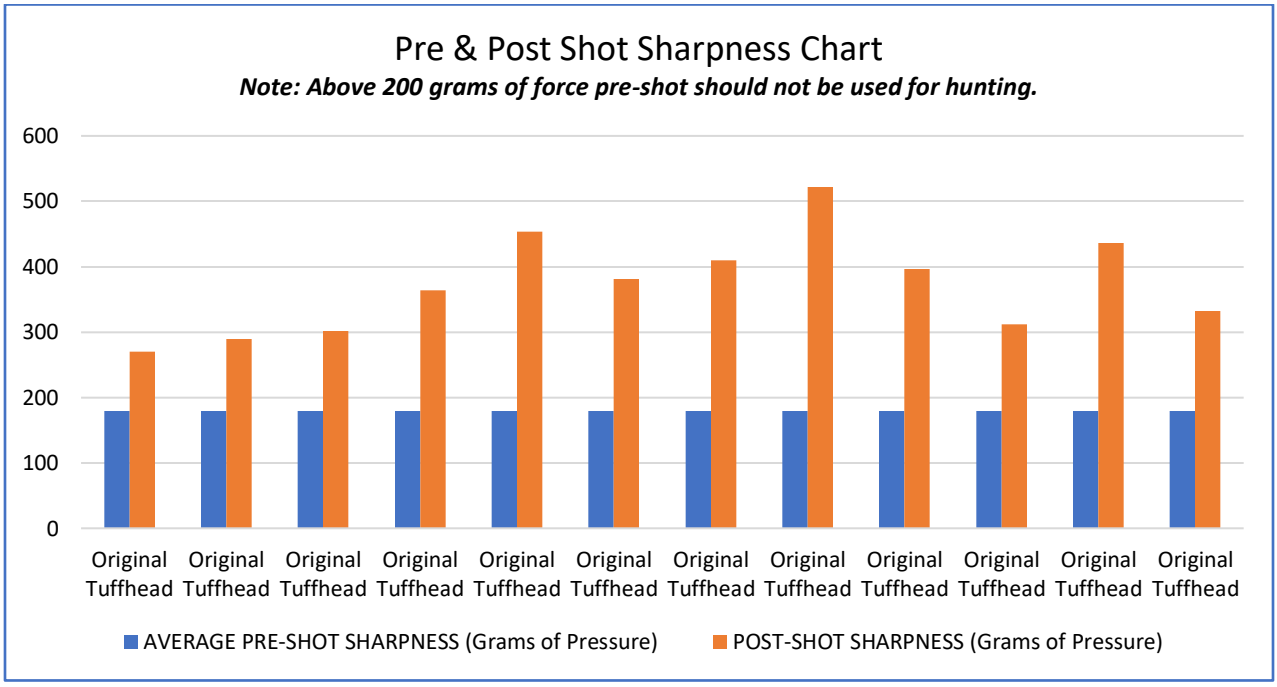
Questions arising out of this testing for further research: More tests with same head and varying FOC balance points for additional penetration data. Re-test the interruptor vs smooth stropped broadheads with lighter draw weight bows and lighter arrow setups to evaluate if any penetration differences are noted.

Based on the history of this head in hunting situations, and in two case studies, **the original 300 Grain Tuffhead emerged from this testing as the clear stand-alone leader and is the Benchmark 300 grain head which others will be compared. Based on this testing, this head receives an overall score of A. Great job, Tuffhead!**

ORIGINAL TUFFHEAD PRE-SHOT:

ORIGINAL TUFFHEAD POST-SHOT:





RATING BASED ON 12 FACTORS		
BROADHEAD: ORIGINAL TUFFHEAD		
Factor	**Description**	**Grade**
1	Structural Integrity	A
2	Perfect Flight	A
3	Forward of Center	A&B*
4	Broadhead Mechanical Advantage	A
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	C
8	Shaft Profile	A&C*
9	Broadhead/Arrow Silhouette	A
10	Type of Edge Bevel	B
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	ORIGINAL TUFFHEAD Overall Grade Rating	**A**

*Multiple grades are different shafts for Forward of Center and Shaft Profile

2. GrizzlyStik Ashby 315 grain head on a Black Eagle 150 spine shaft, 1115 grains total weight. All shots were made with the 82# Hoyt. Impact Velocity 202 fps, Impact Momentum 1 slug ft/sec.

This head is made of 440C stainless steel tempered to a 55 HRC with a 25-degree single bevel edge. All three GrizzlyStik Ashby heads passed the overall structural integrity portion of this testing, but unlike last year these exhibited tip and edge damage. These heads penetrated from 8.5-9.5" into the heavier bone spinal process, with none making it through the offside of the Cape Buffalo. Pre-shot sharpness was an average of 189 grams of pressure while the post-shot sharpness on the blades averaged 957 grams of pressure. The front of the blades tipped/chipped and the blade edges had considerable chatter. The MA of this head is 2.3:1.

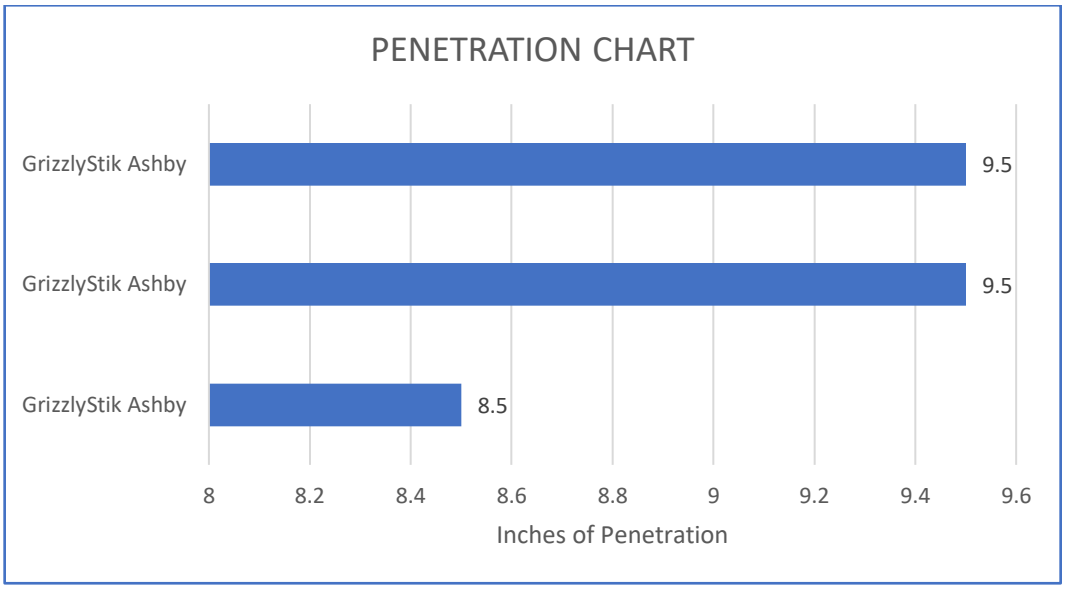
ABF Comments: ***A reminder the Ashby Bowhunting Foundation (ABF) does not manufacture, produce, or sell any archery equipment. While GrizzlyStik named this head after Dr. Ashby as he provided input in the initial design which was not fully incorporated, neither Dr. Ashby nor the ABF receives any compensation from the sale of those heads. Dr. Ashby and ABF are completely independent of anyone in the archery industry. For the record, the closest thing to the "Ashby Specifications" broadhead is the Original 300 Grain Tuffhead designed by Joe Furlong, tested herein.***

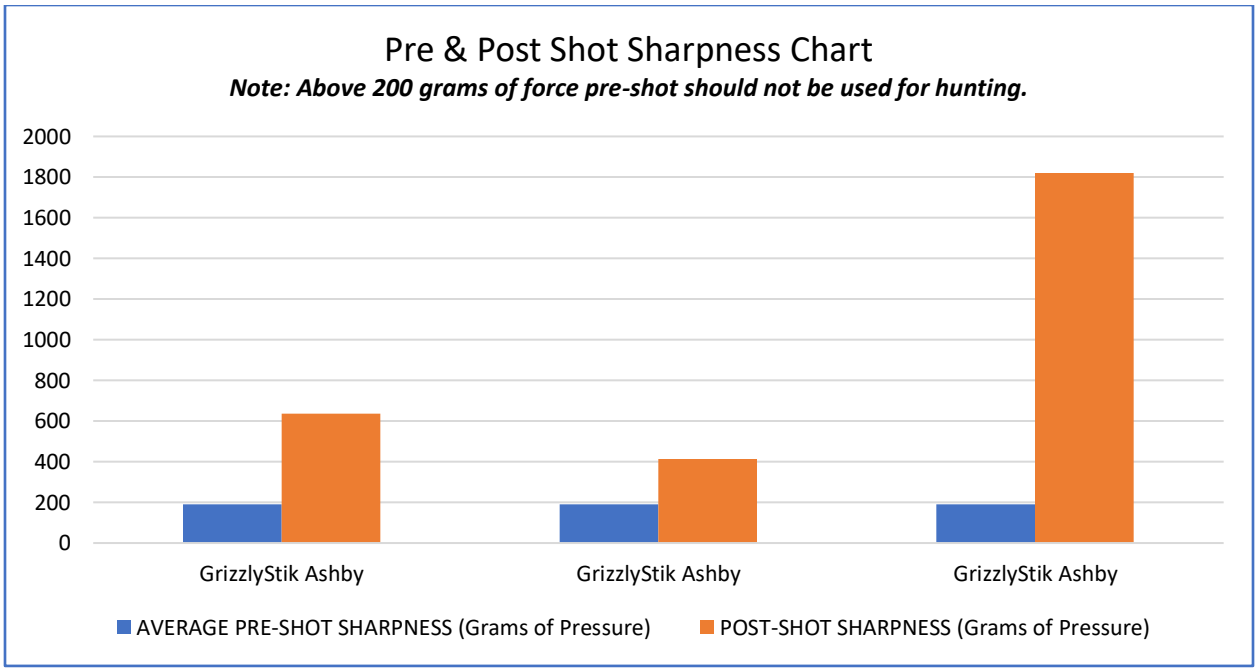
ABF has seen the GrizzlyStik Ashby heads perform well over the years, but the manufacturer has not made any improvements to this head since introduction. As referenced in the 2021 Case Study, the ferrule stops too short and should fade closer to the tip for additional lateral support as we have seen this to be a consistent area of weakness and many times complete failure. We prefer the entire broadhead to remain structurally intact, but minor chipping is preferred over tip bends. We noted the sharpness of the same brand of heads tested in 2021 required approximately 4x less pressure to cut the BESS medium pre-shot. The 2022 pre-shot sharpness was 189 grams of pressure, while the post-shot sharpness average of 957 grams of pressure is unacceptable for an advertised premium head. We have noticed a forty-five (45) grain variance in the advertised weight of these heads ranging from 280 to 325 grains, bringing to light the lack of Quality Assurance/Quality Control. ABF recommends improving the known weaknesses, improving the forging process or steel so they possibly can be resharpened for multiple shots, and addressing the weight inconsistencies that should not have made it through any QA/QC Department.

Questions arising out of this testing for further research: ABF will be on the lookout if GrizzlyStik makes any improvements that would require re-testing. **Based on this testing, overall this head receives a score of C.**

GrizzlyStik Ashby Pre-Shot

GrizzlyStik Ashby Post-Shot





RATING BASED ON 12 FACTORS		
BROADHEAD: GRIZZLYSTIK ASHBY		
Factor	**Description**	**Grade**
1	Structural Integrity	C
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	B
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	A
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	GRIZZLYSTIK ASHBY Overall Grade Rating	**C**

3. TUFFHEAD EVO 300 grain (Version 1) 2 blade head on a Black Eagle 150 spine shaft, 1100 grains total weight. All shots were made with the 82# Hoyt. Impact Velocity 203 fps, Impact Momentum 0.99 slug/ft sec.

This head is made of S7 Tool Steel and has a 20-degree single bevel. Two heads passed the overall structural integrity portion of this testing, but one exhibited a skip angle resulting in a bent tip with limited penetration. Of the two heads that remained structurally sound, one penetrated 9" into the spinal process and the other entered through the ribs penetrating into the thoracic cavity. The head that bent exhibited a serious skip angle and did not penetrate beyond the ribs. Pre-shot sharpness was an average of 153 grams of pressure while the post-shot sharpness on the blades averaged 290 grams of pressure. The MA of this head is 2.0:1.

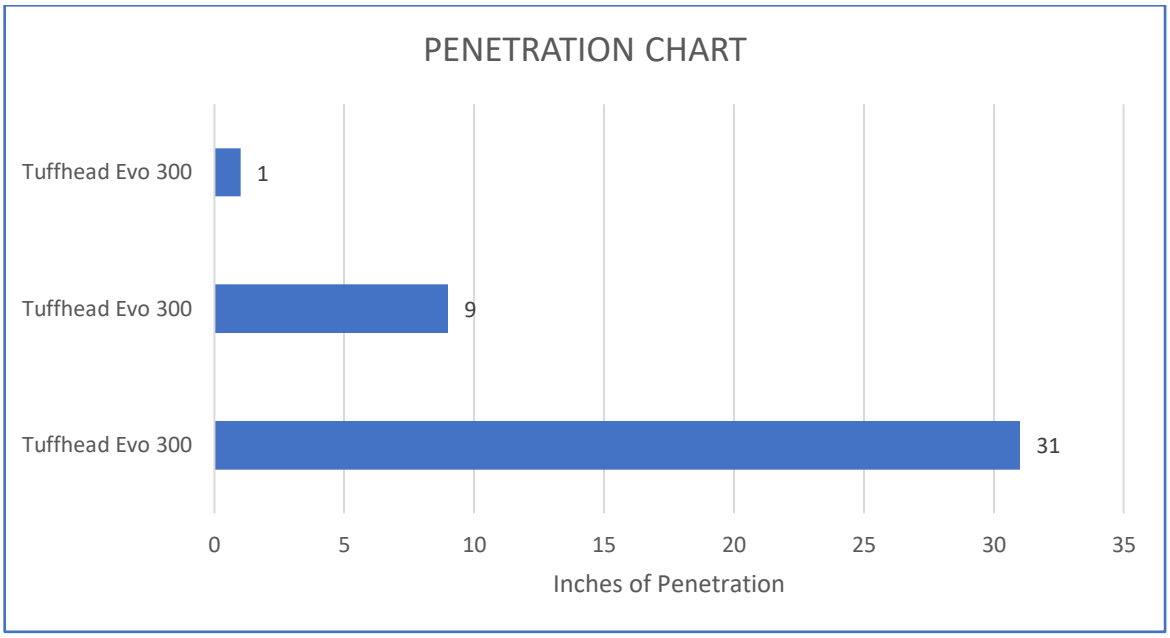
ABF Comments: ***Note the heads tested were Version 1.*** ABF tested this head in 2021 and returned it for another round in 2022. We like the one-piece design of this head but would prefer to see the ferrule fade a little more toward the tip for additional lateral support. If this did not have the structural failure with the tip bend, this head would have scored well. While everyone prefers the entire head, including the tips, to remain structurally intact, minor chipping is preferred over tip bends like exhibited here. We tested the Rockwell hardness for the bent head at 47-48 compared to the ones that did not bend being in spec at the 55-57 Rockwell hardness. ABF spoke with Sirius and they were aware of the problem, attempted to catch all heads, but have since improved the heat treating process for consistency. **From a structural integrity standpoint, it is important to note the penetration differences from the Original Tuffhead with no tip issues, the GrizzlyStik Ashby with chipping on the tip, and this head with the tip bend.**

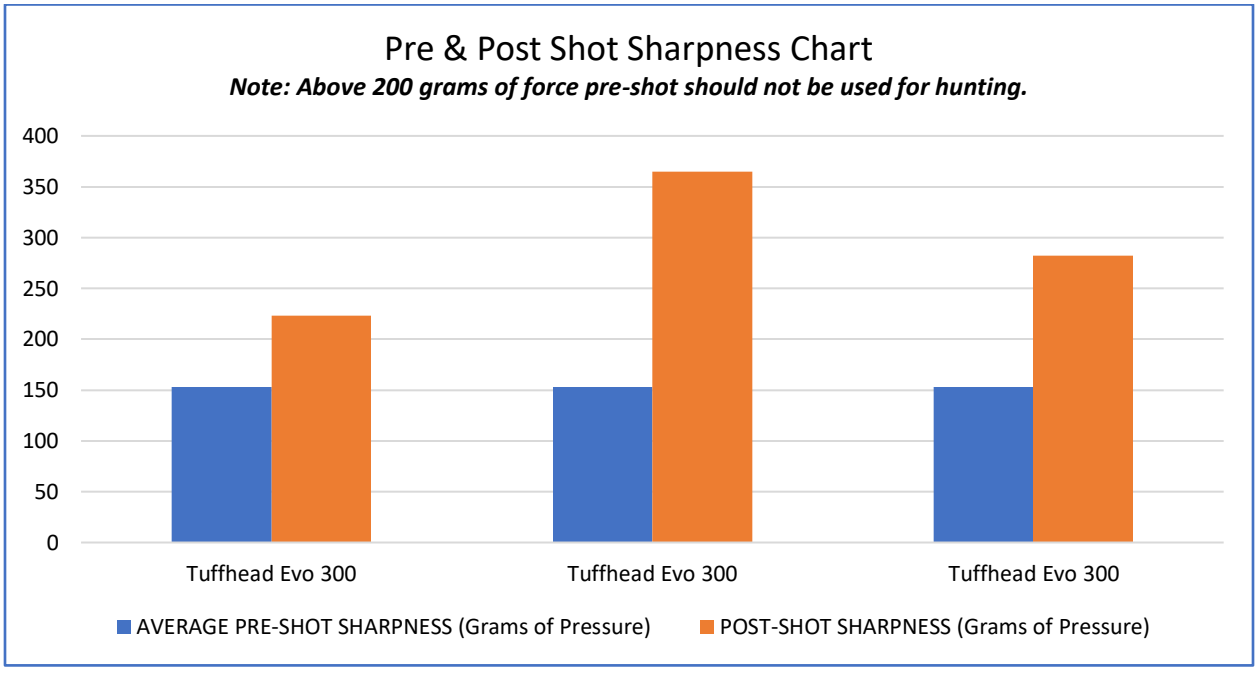
Questions arising out of this testing for further research: The new Version 2 Evo 300 grain, with the improvements Sirius has mentioned to us will be tested, which could eliminate the tip bend exhibited in this testing.

Based on this testing with a tip bend considered a structural failure, overall Version 1 of this head receives a grade rating of F.

TUFFHEAD EVO 300 PRE-SHOT

TUFFHEAD EVO 300 POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: TUFFHEAD EVO 300 2 BLADE		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	B
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	D
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	A
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	TUFFHEAD EVO 300 Overall Grade Rating	**F**

4. GRIZZLYSTIK ALASKAN 315 GRAIN 2 blade head on a Black Eagle 150 spine shaft, 1115 grains total weight. All shots were made with the 82# Hoyt. Impact Velocity 202 fps, Impact Momentum 1.00 slug/ft sec.

This head is made of 440C stainless steel tempered to a 55 HRC with a 25-degree single bevel edge. Two heads passed the overall structural integrity portion of this testing, but one exhibited a broken post resulting in limited penetration of 15". Of the heads that retained their structural integrity, one head penetrated 26", while one penetrated 16". Pre-shot sharpness was an average of 193 grams of pressure while the post-shot sharpness on the blades averaged 1109 grams of pressure. The MA of this head is 1.7:1.

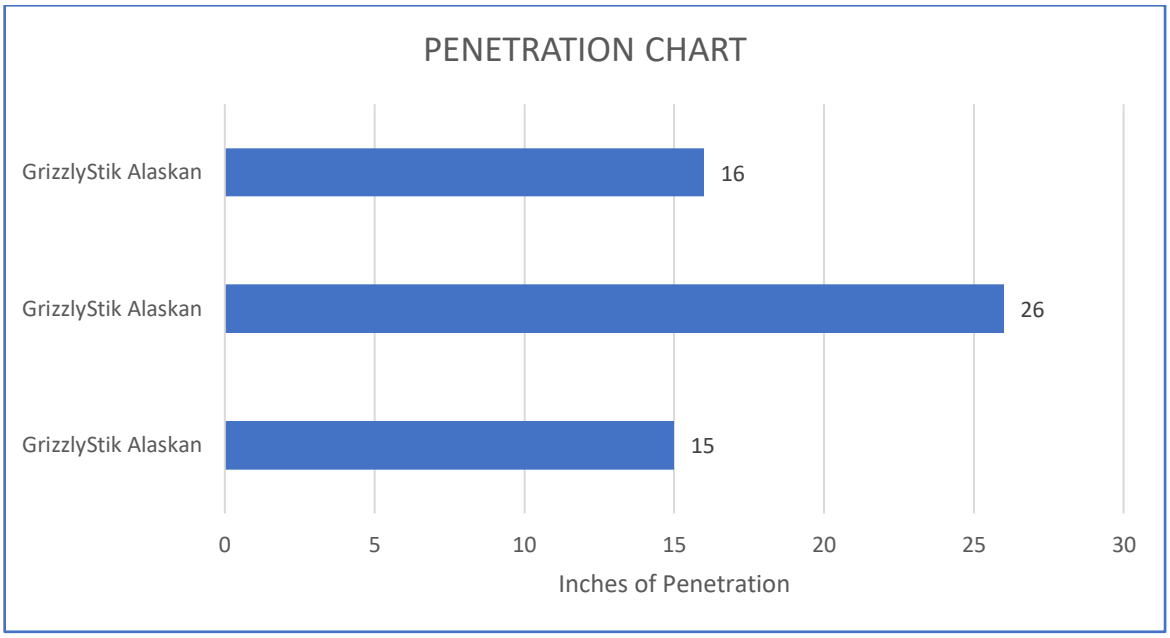
ABF Comments: Geometrically this head looks like it would be a strong head. ABF used this head in 2021 for hunting purposes and while the head killed, two of the three heads used exhibited structural failures in the form of broken posts. The 2021 hunt results relegated the head to testing only for this study. For our 2022 study, one out of three posts broke, so they continue to have structural integrity issues with a fifty percent failure rate of heads used over two years. ABF noted the sharpness of these same brand heads tested in 2021 required approximately 6x less pressure to cut the BESS medium pre-shot. The 2022 pre-shot sharpness was 193 grams of pressure, while the post-shot sharpness average of 1109 grams of pressure is unacceptable for an advertised premium head. As with the GrizzlyStik Ashby head, we have noticed a thirty (30) grain variance in the advertised weight of these heads ranging from 295 to 325 grains, once again bringing to light the lack of Quality Assurance/Quality Control. The forging process and/or steel needs to be improved so they possibly may remain in one piece and be resharpened for multiple shots. The weight inconsistencies that should not have made it through any QA/QC Department need to be addressed. Since this is promoted as a "Dangerous Game" head, ABF recommends that GrizzlyStik do the ethical thing for bowhunting and recall/remove these heads from the market until the noted deficiencies are corrected.

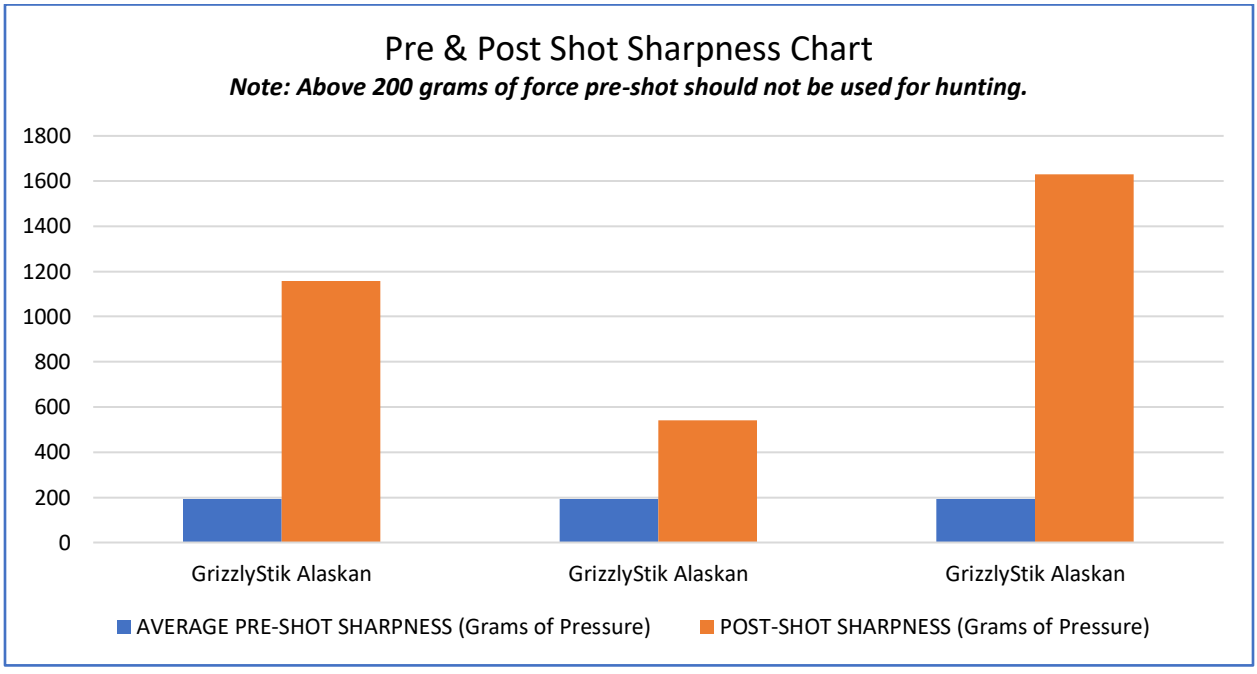
Questions arising out of this testing for further research: Failed, no further research necessary on this head in its current state.

Based on this testing with the structural failure, overall this head receives a grade rating of F.

Alaskan Pre-Shot

Alaskan Post_Shot





RATING BASED ON 12 FACTORS		
BROADHEAD: GRIZZLYSTIK ALASKAN		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	B
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	B
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	GRIZZLYSTIK ALASKAN Overall Grade Rating	**F**

5. TUFFHEAD EVO 300 grain 3 blade head on a Black Eagle 150 spine shaft, 1100 grains total weight. All shots were made with the 82# Hoyt. Impact Velocity 203 fps, Impact Momentum 0.99 slug/ft sec.

This head is made of S7 Tool Steel with a 1" cutting diameter. All heads passed the overall structural integrity portion of this testing with two heads penetrating 10" and 11" with heavy bone hits and the third penetrating 26" on a ribs-only impact. Pre-shot sharpness was an average of 263 grams of pressure while the post-shot sharpness on the blades averaged 521 grams of pressure. The MA of this three-blade head is 1.6:1.

ABF Comments: We like the one-piece design of this head. Structurally it held up very well with no tip damage, no blade chipping or rolling of the blades. We would prefer to see a smoother ferrule to eliminate the slight lip as you transition from the base of the ferrule to the shaft and would like to see sub-200 grams of pressure on the sharpness scale out of the packaging. With a Mechanical Advantage of 1.6:1, it is about as good as you will get in a three blade and exceeds many of the popular two blades. Overall, a very solid choice for anyone that prefers a 3-blade head with higher quality steel.

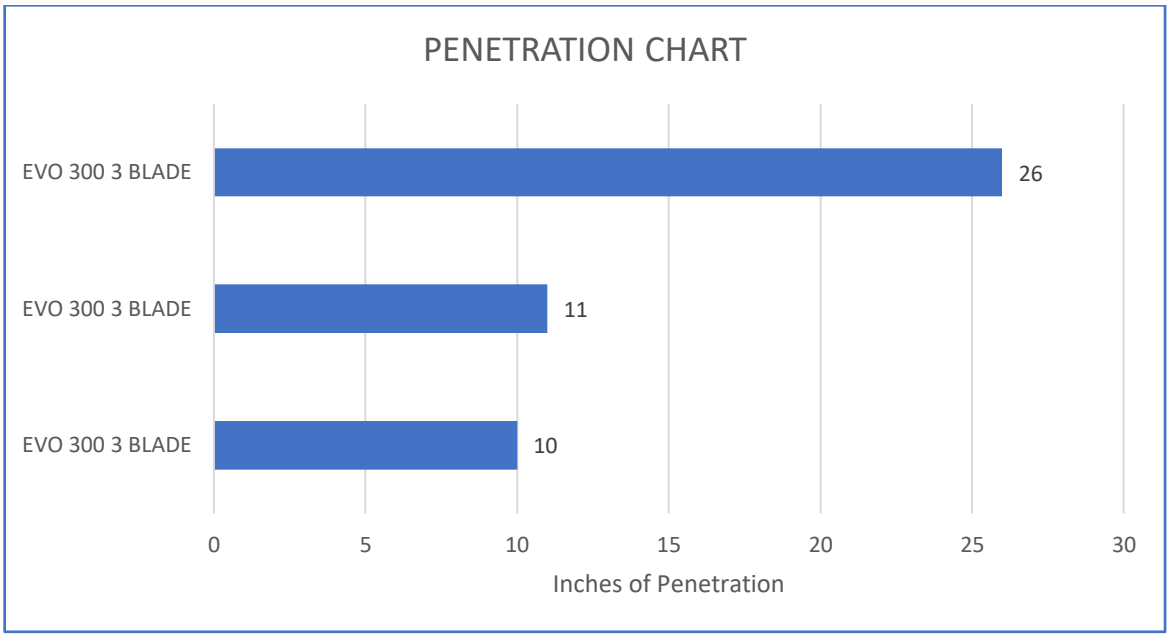
Questions arising out of this testing for further research: ABF will be on the lookout if Tuffhead makes any improvements that would require re-testing.

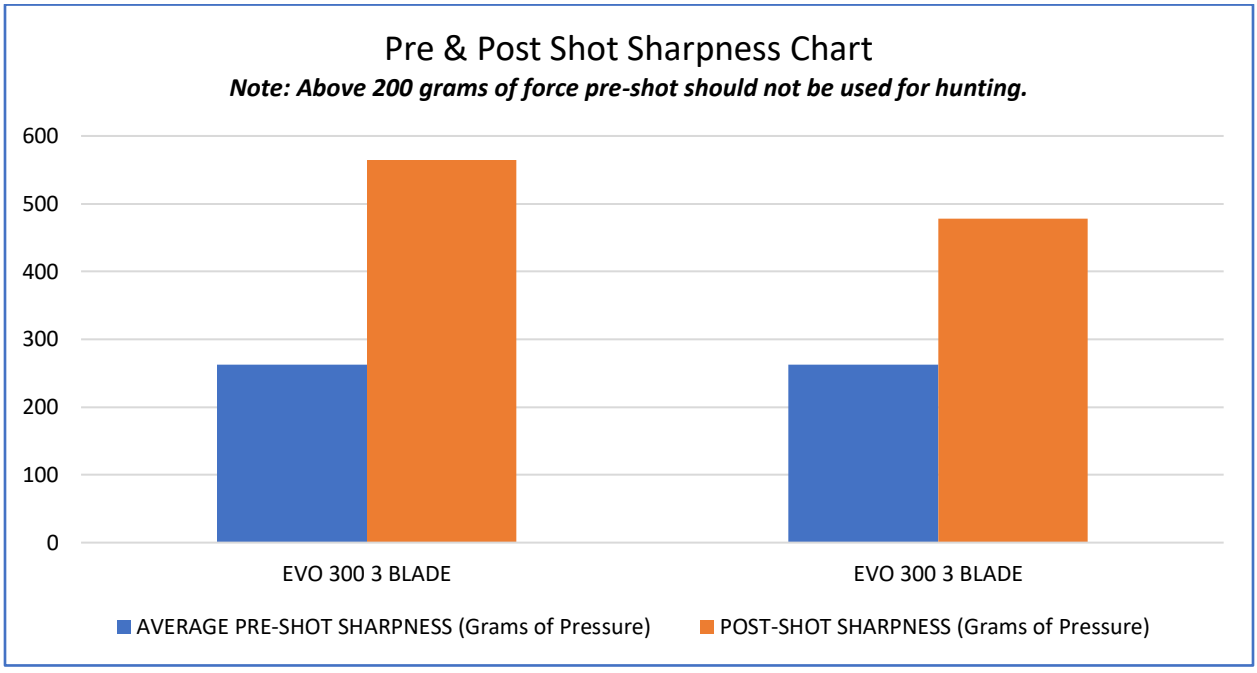
Based on this testing, overall this head receives a grade rating of B.

Evo 300 3 Blade Pre-Shot

Evo 300 3 Blade Post-shot

One head lost in field.





RATING BASED ON 12 FACTORS		
BROADHEAD: TUFFHEAD EVO 3 BLADE		
Factor	**Description**	**Grade**
1	Structural Integrity	A
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	D
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	A
10	Type of Edge Bevel	C
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	TUFFHEAD EVO 3 BLADE Overall Grade Rating	**B**

6. DEAD X BIG GAME 3 “BG3” – 300 grain three-blade head on a Black Eagle 150 spine shaft, 1100 grains total weight. All shots were made with the 82# Hoyt. Impact Velocity 203 fps, Impact Momentum 0.99 slug/ft sec.

The tip and ferrule are carbon steel with three individual blades with a 37-degree single bevel and an aluminum sleeve to hold the blades in place. The head has a 1.8” cutting diameter and is seven different components all held in place by screwing tightly into the insert. No heads passed the structural integrity portion of this testing as they all came apart on impact. The penetration achieved on rib hits only were 13”, 2” and 5.5”. While one head penetrated 13”, the blades were stripped from the ferrule, so lethality is highly suspect. Pre-shot sharpness was an average of 331 grams of pressure while the post-shot sharpness on the blades averaged 576 grams of pressure. The MA of this three-blade head is 0.4:1.

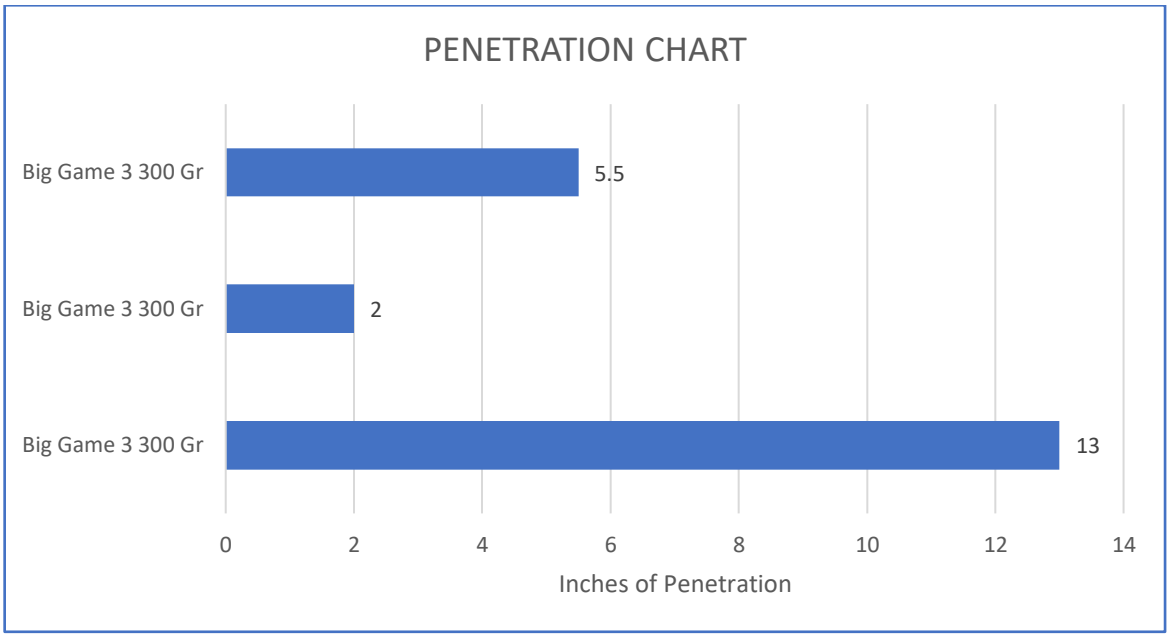
ABF Comments: This head is advertised as a “Big Game” head, and “NOT SURVIVABLE”. This is a heavier head, and none survived the impact into the ribs of a Cape Buffalo, so a bit of truth in their advertising when you read closely. This head with a punch through design essentially looks like a Muzzy that spent way too much time at Krispy Kreme, falling into more of the bludgeon category than a broadhead. With short blades and a wide cut, the head has a horrendous MA of 0.4:1. While the blades held what edge they had well, they separated from the aluminum sleeve that is intended to hold them in place. **A key takeaway with this highly inefficient head is just because you add weight and single bevel blades, that does not equate to penetration. Compare this penetration to other efficient 300 grain heads in this test, both two and three blade heads, and lighter set ups in this test with more efficient broadheads.**

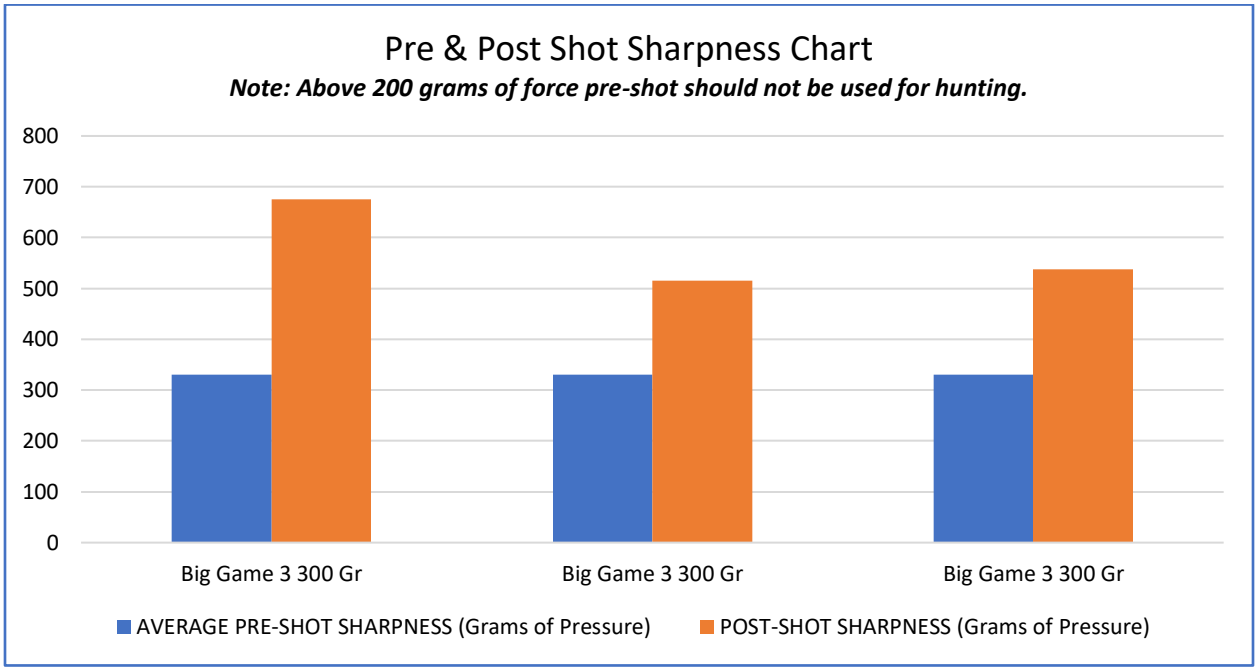
Questions arising out of this testing for further research: Failed, no further research necessary on this head in its current state.

Based on this testing with the structural failures, overall this head receives a grade rating of F.

Big Game 3 Pre-Shot

Big Game 3 Post-Shot





RATING BASED ON 12 FACTORS		
BROADHEAD: BIG GAME 3		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	F
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	F
10	Type of Edge Bevel	C
11	Tip Design	D
12	Weight Above Heavy Bone Threshold	n/a
	BIG GAME 3 Overall Grade Rating	**F**

7. Edgetac 2 blade – 375 grain two-blade head on a Black Eagle 150 spine shaft, 1175 grains total weight. All shots were made with the 82# Hoyt. Impact Velocity 196 fps, Impact Momentum 1.02 slug/ft sec.

This head is machined from one piece of steel with a 1.5” cutting diameter. Two heads passed the structural integrity portion of this testing while one failed by twisting off the post. The penetration achieved on rib hits were 22.5” and 23”, with no penetration on the post break. Pre-shot sharpness was an average of 215 grams of pressure while the post-shot sharpness on the blades averaged 463 grams of pressure. The MA of this head is 1.16:1.

ABF Comments: This head has thick .15” blades with a 1.5” wide cutting diameter. The two that held together structurally had consistent penetration and exhibited slight tip damage. The heads were sharp and retained their edges with no damage. Due to the shorter blades and wide cut, the MA falls to 1.16:1. While we would prefer a higher MA, ABF has spoken to Edgetac and they have already improved the tempering process of their heads and working on additional improvements.

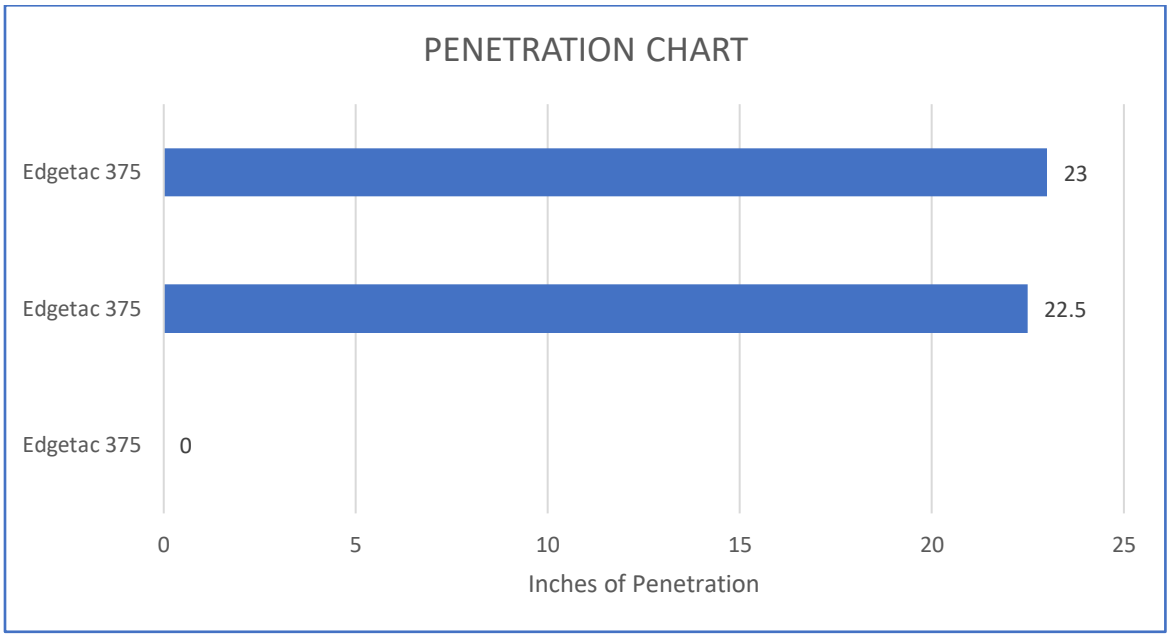
Questions arising out of this testing for further research: We will look at the next series of heads with the improvements they have mentioned to us for testing in the future.

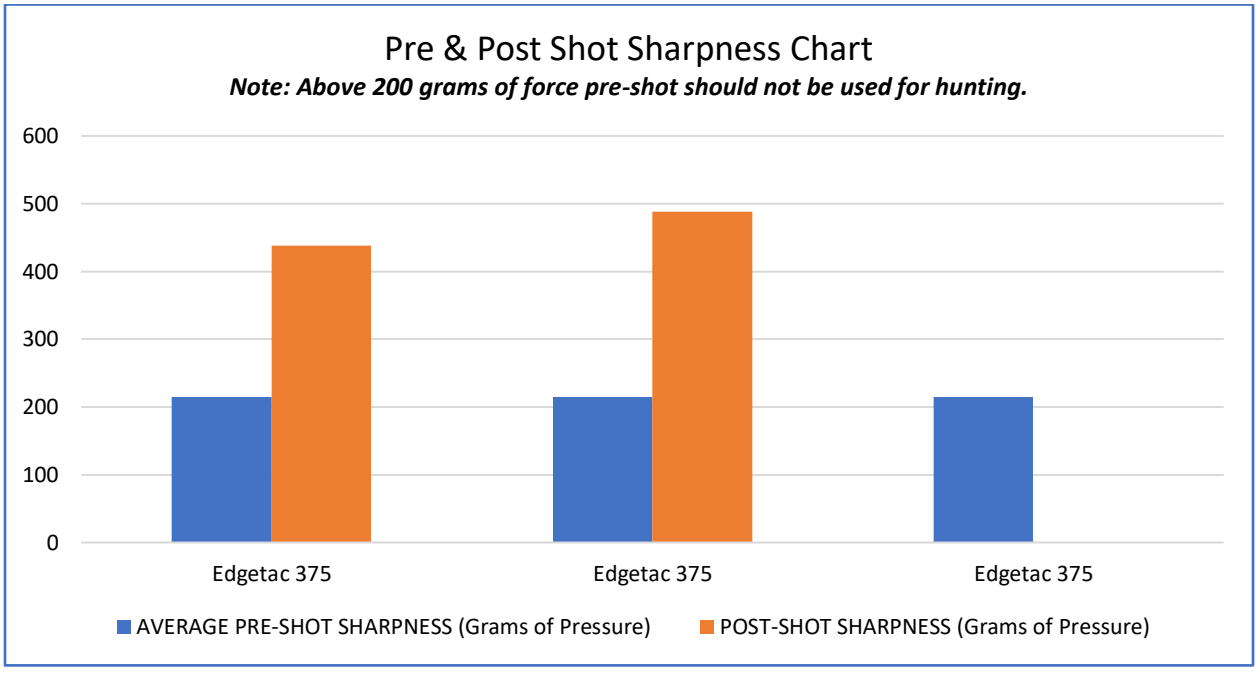
Based on this testing with the structural failure, overall this head receives a grade rating of F.

EDGETAC PRE-SHOT

EDGETAC POST-SHOT

One head lost in field.





RATING BASED ON 12 FACTORS		
BROADHEAD: EDGETAC 375		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	D
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	B
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	EDGETAC 375 Overall Grade Rating	**F**

8. VPA 300 grain single bevel two blade head on a Black Eagle 150 spine shaft, 1100 grains total weight. All shots were made with the 82# Hoyt. Impact Velocity 203 fps, Impact Momentum 0.99 slug/ft sec.

This head is one piece carbon tool steel with a 1.125” cutting diameter heat treated up to 54 Rockwell with 35-degree bevels. All three heads passed the structural integrity portion of the testing. The penetration achieved on rib hits were 17.5”, 26” and 23.5”. Pre-shot sharpness was an average of 316 grams of pressure while the post-shot sharpness on the blades averaged 801 grams of pressure. The MA of this head is 1.9:1.

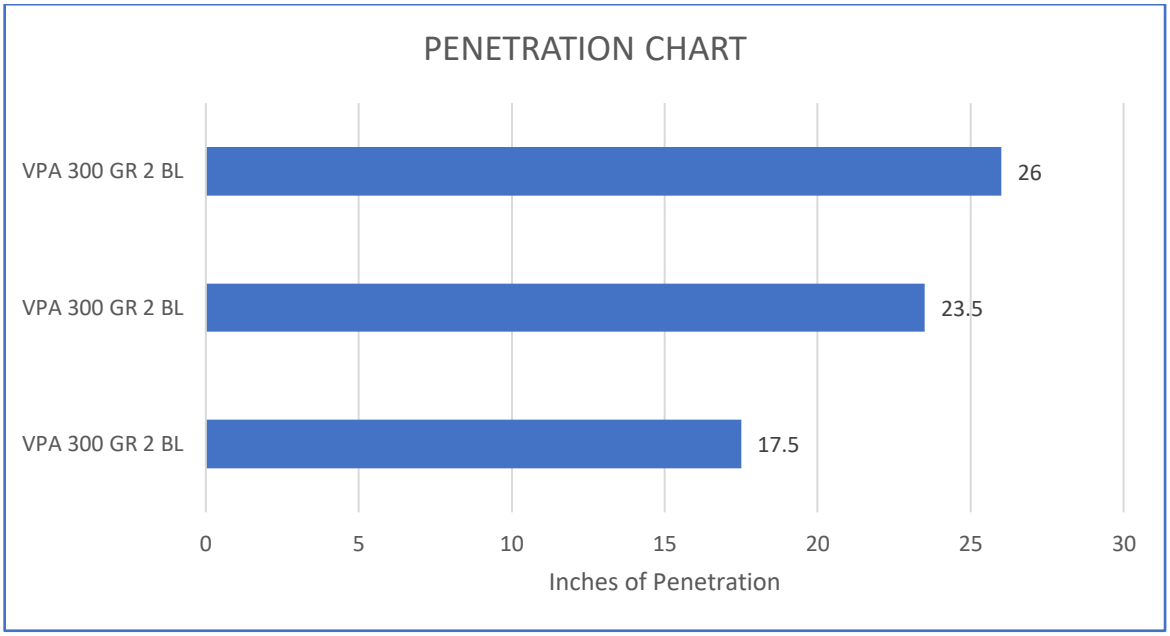
ABF Comments: We like the one-piece solid design of this head for structural integrity with the ferrule fading out near the tip for lateral support. Unknown to ABF until the broadheads arrived, these heads come with a burr edge and initially had a pre-shot sharpness of over 700 grams of pressure. After contacting VPA and confirmed they ship them that way for bowhunters to sharpen, we touched up the heads before testing. While the bevels are 35 degrees for additional durability, two heads exhibited slight tip rolling with the chisel tip, with the most tip roll being the least penetration and no tip roll being the best penetration. Other than the tips, the edges did not exhibit any edge chattering or rolling. The octagonal shape ferrule created the slightest forward-facing lip as it transitioned to the collars on the shaft. The head’s MA is a respectable 1.9:1. While exhibiting many good qualities, we would recommend these heads be sharpened to sub 200 grams of pressure on the sharpness scale prior to shipping, as many bowhunters do not know how to sharpen a head. We would also recommend a round and slightly larger ferrule to give a smooth transition/step down to collars/shaft to prevent any drag. **A takeaway from this testing is the decreased penetration with the slight tip rolls.**

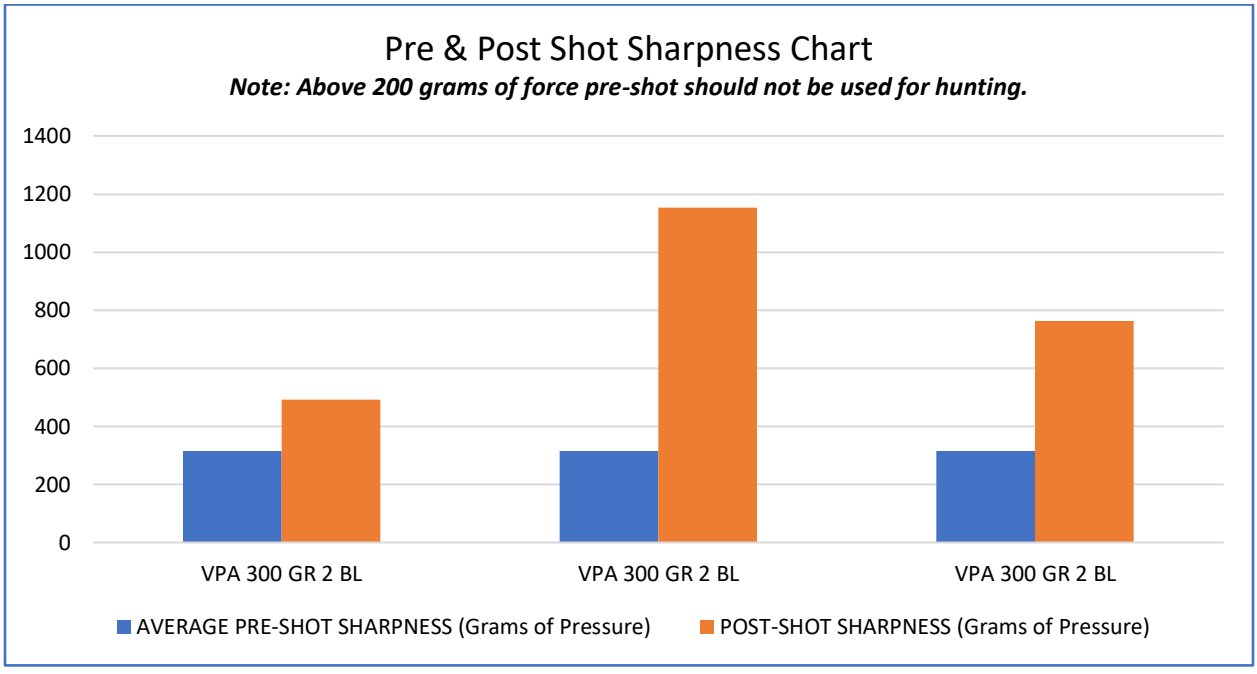
Questions arising out of this testing for further research: We will watch for any improvements and would also like to test the skip angle with the chisel tip on these heads.

Based on this testing, overall this head receives a grade rating of C.

VPA 300 GRAIN PRE-SHOT

VPA 300 GRAIN POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: VPA 300 2 BLADE SB		
Factor	**Description**	**Grade**
1	Structural Integrity	C
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	C
5	Shaft Diameter to Ferrule Diameter	F
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	C
10	Type of Edge Bevel	B
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	VPA 300 2 Blade SB Overall Grade Rating	**C**

300+ Grain Head Synopsis/Take-Aways:
Complete Structural Integrity: Note the penetration differences from heads that maintained complete structural integrity (Original Tuffhead) vs tip chipping (GrizzlyStik Ashby) vs rolled edges (Tuffhead EVO 300 2 blade).

Based on the frequency of structural failures with screw-in posts ABF **strongly recommends** the use of a direct bonding system of broadhead-to-shaft attachment utilizing 24 hour curing epoxy on all arrows to be used on heavy/dangerous game.

A key component of Structural Integrity is the ability of the blade to maintain its sharpness throughout the time it is traveling through the animal. While some heads didn't pass the Pre-Shot Sharpness rating, the only head in this weight range to pass Post-Sharpness ratings based off the Bess Scale for Factor #7 was Tuffhead. **All manufacturers need to take note of their failures in this critical category and fix it. Note the differences in the post-shot sharpness to penetration.**

FOUR OUT OF EIGHT HEADS IN THIS WEIGHT CATEGORY FAILED THIS TEST.

Mechanical Advantage: Compare the best rated Mechanical Advantage of the Original Tuffhead at 3:1 to any other as it is the only head that consistently passed through the Buffalo in this testing. The worst Mechanical Advantage being the Big Game 300 shows that even if you add weight and a single bevel, an inefficient design is still inefficient and does not equate to penetration.

FOC: Note the Original Tuffhead set up on a slightly heavier arrow with 15% FOC achieved from 15-20" of penetration, while the same head set up on slightly lighter arrows, but FOC ranged from 26% to 32%, were complete pass throughs on equivalent hits.

Tip design: The Tuffhead EVO 300 2 blade and VPA 300 2 blade are similar except in tip design, ferrule and bevel edge. The Evo has a tanto tip and a round ferrule vs the VPA chisel tip with an octagonal shaped ferrule. A less noticeable difference is the higher mechanical advantage on the bevel edge on the Tuffhead at 20 degrees over the VPA at 35 degrees. Note the improvement in penetration with the Tuffhead Evo 2 blade on equivalent rib hits.

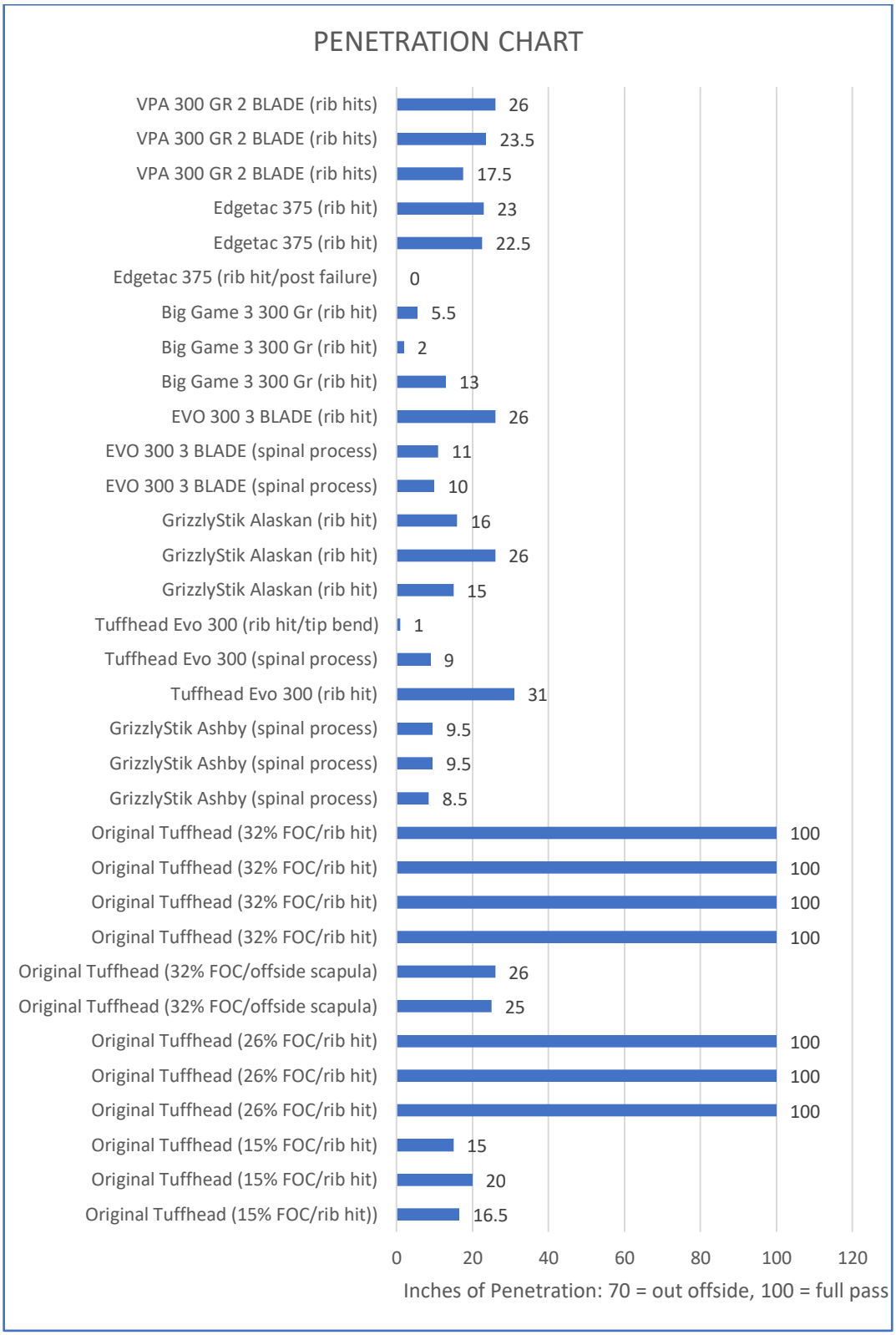
Tip Bends: Note the glaring detrimental effect even tiny tip bends have on outcome penetration like with the VPA 300. Major tip bends like what was seen with the Tuffhead EVO 300 2 blade can prevent penetration altogether while also increasing the chance of structural failure in other sections of the arrow system.

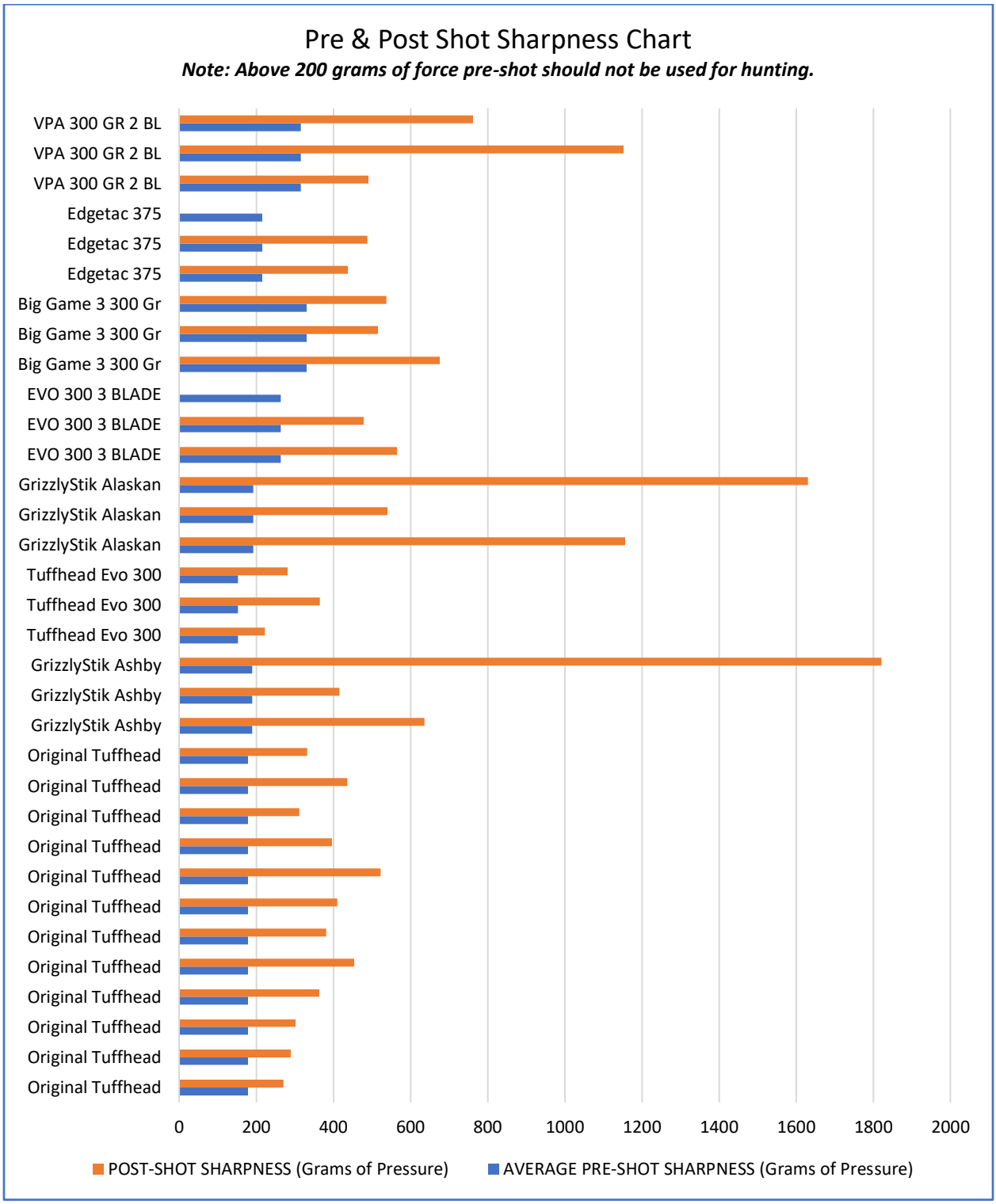
ABF greatly appreciates Tuffhead, Shartac and VPA discussing their heads with us and their willingness to continue improving their heads to strive for perfection for their clients that utilize their equipment and for the betterment of archery hunting. All manufacturers

should take note of these manufacturers constantly improving their manufacturing process.

Dead X Big Game 3 300 Grain head is an example of how simply adding weight, will not overcome an inefficient design.

Other heads in this weight category were reviewed and eliminated prior to this testing for various reasons, i.e., poor designs, lack of sharpness, lack of smooth transitions, history of failing on lesser game, etc. Heads that exhibited poor performance on previous tests with no improvements will not be re-tested until improvements are made. The animals we hunt deserve the best we can put forward to kill them quickly and cleanly, filling one tag per shot.





TEST SYNOPSIS FOR 100-225 GRAIN HEADS, 610-735 GRAINS TOTAL ARROW WEIGHT. All launched from Hoyt 71# compound bow:

1. 100 Grain Feradyne Rage X-treme 2.3"+ 2 Blade, Black Eagle 250 spine shaft, 610 grains total weight. All shots made with the 71# Hoyt. Impact velocity 250 fps, Impact Momentum 0.67 slug/ft sec.

All three Rage heads had structural integrity failures in this testing, with leading edge blades and ferrules bent, along with the main blades either missing or bent. Due to design inefficiencies and low-quality material, these heads only penetrated from 0.5" to 2.5", none making it through the onside ribs of the Cape Buffalo. Pre-shot sharpness was an average of 331 grams of pressure while the post-shot sharpness on the blades averaged 1434 grams of pressure. The MA of this head is 1.3:1

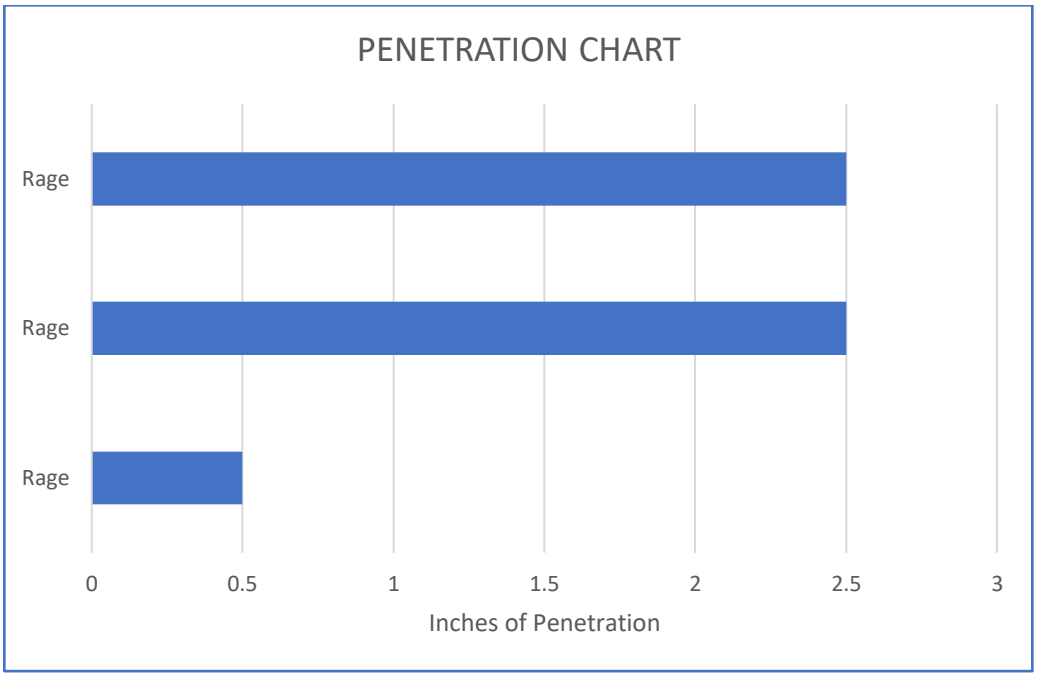
ABF Comments: We know there are approximately twenty Rage variations on the market but used what a local bowshop recommended. We have seen Rage heads be devastating on medium sized game *when* they work, and we have seen the mental devastation on the hunter when they do not work, with the result being a wounded and lost animal. We have seen this popular head fail on medium size game with perfectly placed shots, so the test results were not a surprise to ABF. We put these heads in the test as many believe if you are accurate and hit your spot, that is all you need. Anyone that has hunted any length of time knows this to be false. With the structural failures, horrible penetration results and cheap material, we do not see any pros to mention about this head and recommend the manufacturer to either improve the quality of the product or do the ethical thing for hunting and take them off the market.

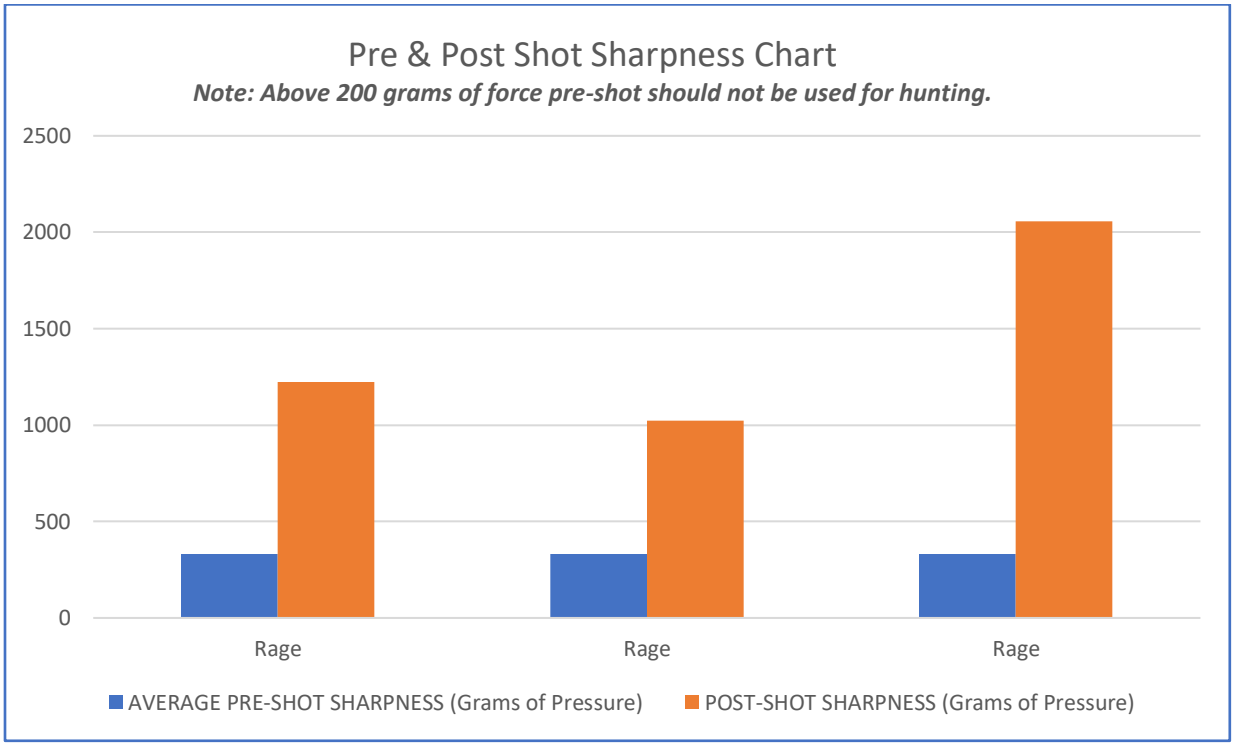
Questions arising out of this testing for further research: Failed, no further research on this head necessary. Other variations of Rage heads may get tested stateside.

Overall, with structural failures along with failures in other factors, this head receives a score of F.

RAGE PRE-SHOT

RAGE POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: RAGE EXTREME 2.3”		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	F
5	Shaft Diameter to Ferrule Diameter	C
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	D
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	RAGE EXTREME 2.3 Overall Grade Rating	**F**

2. 100 Grain VIP Combat Veteran hybrid 2" and 1.25" 4 Blade, Black Eagle 250 spine shaft, 610 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 250 fps, Impact Momentum 0.67 slug/ft sec.

Two out of three heads had structural integrity failures in this testing. One head was a rib impact and two were soft tissue only hits. The one that did not have a structural failure was shot into the small intestines. The one bone impact exhibited a skip angle and penetrated 5.5", while the soft tissue only hits did better with 15.5" and 23". Pre-shot sharpness was an average of 365 grams of pressure while the post-shot sharpness on the blades averaged 678 grams of pressure. The MA of this head is 0.4:1

2a. **100 Grain VIP Combat Veteran hybrid 2" and 1.25" 4 Blade, Full Metal Jacket 340 spine shaft, 470 grain total weight, Impact velocity 272 fps, Impact Momentum 0.56 slug/ft sec.**

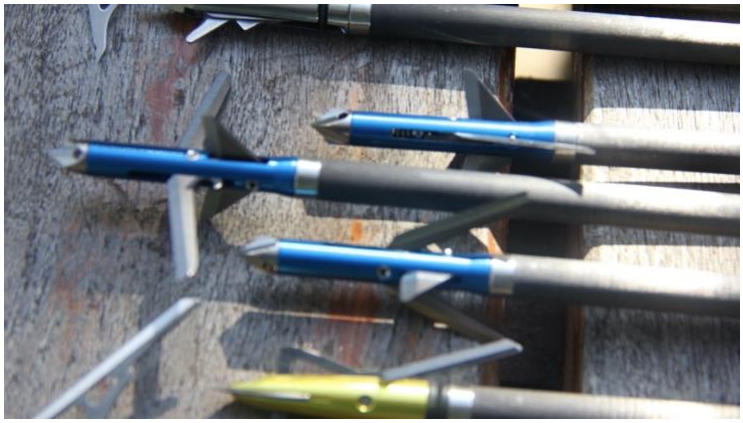
This 1 factor arrow (perfect flight) was put into the testing and intentionally shot into the soft tissue area where no bone impact would be possible on the Cape Buffalo. The result was the broadhead penetrated under the skin and the arrow snapped and bounced off the Cape Buffalo. The arrow and broadhead were a complete failure.

ABF Comments: With structural failures on two out of three heads at 610 grains, and a complete arrow and broadhead failure at 470 grains impacting only soft tissue, we do not see any pros to mention about this head or the full metal jacket shaft. ABF's recommendation is to either improve the quality of the product(s) or do the ethical thing for hunting and take them off the market. We added this 470-grain set up into this test as we have seen these lighter set ups penetrate well into paper, gel, block targets and other similar mediums without any damage to the heads/arrows. Many people mistakenly construe and attempt to correlate penetration into those artificial mediums as an indicator of equal and consistent penetration that will occur in an animal, which is inaccurate. Many incorrectly state trajectory and accuracy are one in the same to push a particular product for sales. Accuracy is a given regardless of what you hunt, while trajectory is a personal preference as all bowhunters are not equal. All the accuracy in the world will not do you any good if your arrow can't penetrate the animal. **While this head failed at both arrow weights tested, a key takeaway is the difference in penetration with the only difference being 140 grains of weight with a structurally stronger arrow shaft, showing all components of the complete arrow system are critical.**

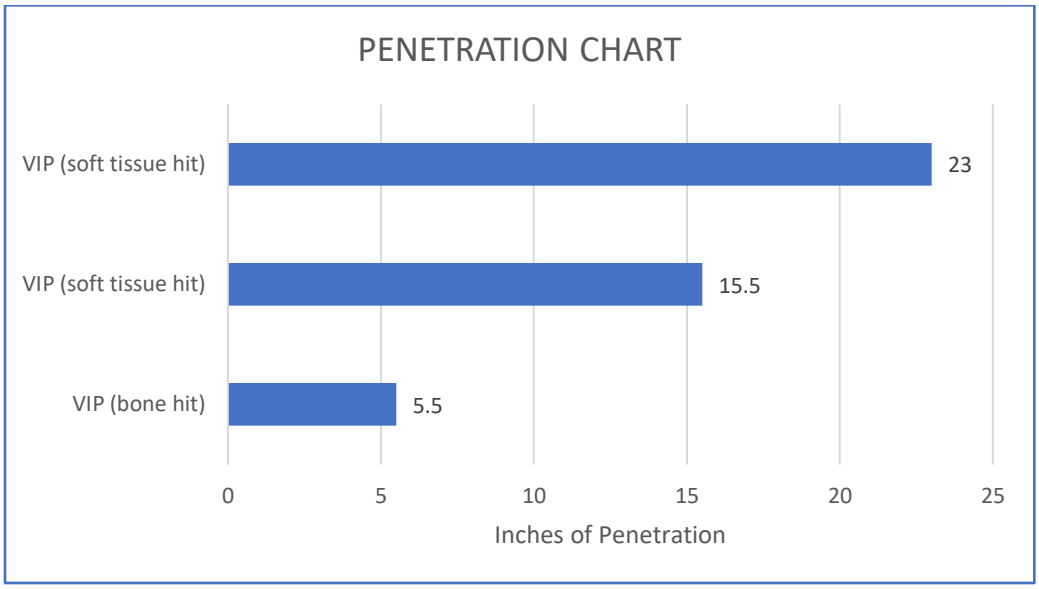
Questions arising out of this testing for further research: Failed, no further research on this head necessary. Other variations of VIP heads may get tested stateside.

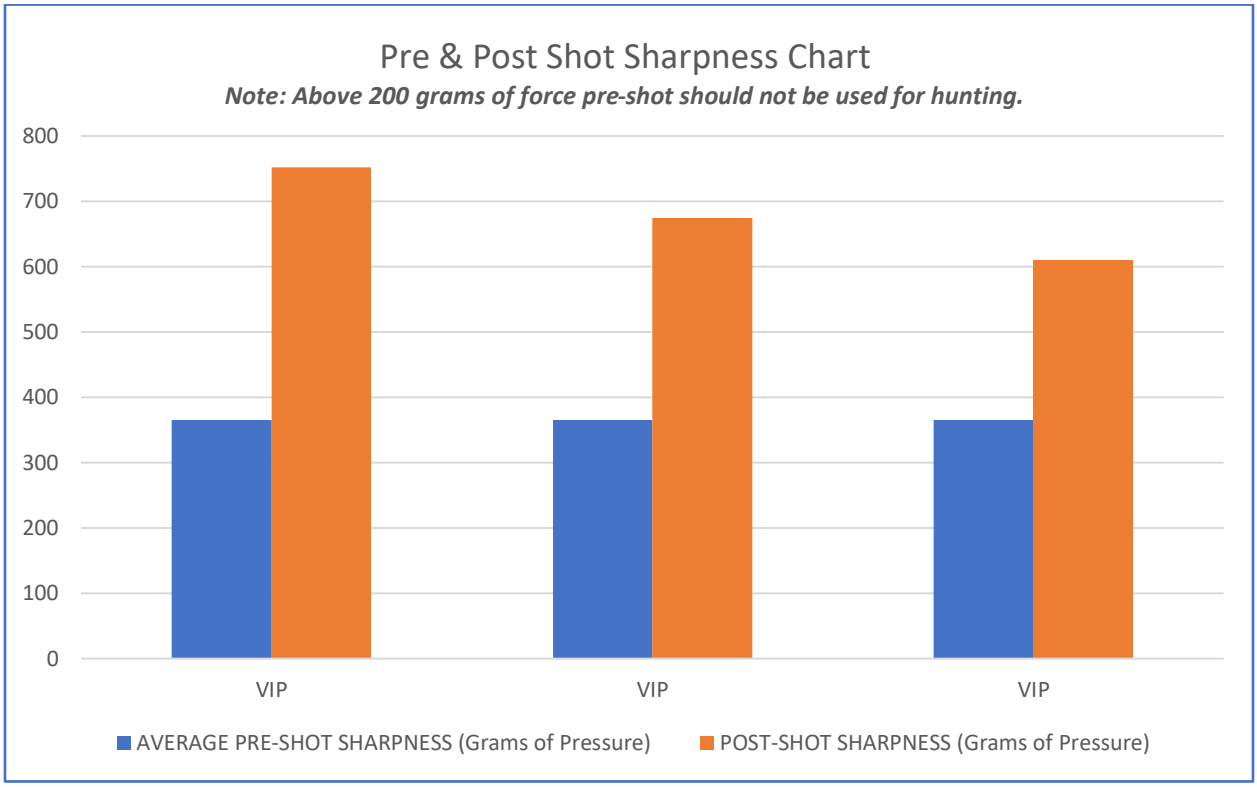
Overall, with structural failures along with failures in other factors, this head receives a score of F.

VIP PRE-SHOT



VIP POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: VIP COMBAT VETERAN HYBRID		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	F
5	Shaft Diameter to Ferrule Diameter	C
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	D
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	VIP COMBAT VETERAN Overall Grade Rating	**F**

3. 100 Grain Sevr Titanium 1.5" 2 Blade, Black Eagle 250 spine shaft, 610 grains total weight. All shots made with the 71# Hoyt. Impact velocity 250 fps, Impact Momentum 0.67 slug ft/sec.

3.a. Second round on Black Eagle 150 spine shafts 900 grains total weight. All shots made with the 82# Hoyt. Impact Velocity 220 fps, Impact Momentum 0.87 slug/ft sec.

All three Sevr Titanium heads survived the structural integrity portion of this testing. At 610 grains two were shot into soft tissue achieving 18.5" and 19.5" of penetration, with one rib impact achieving 7" of penetration. There was no skip angle exhibited on the arrows tested or any redirection. This head is the first mechanical head not to fail the structural integrity portion of this test, so we decided to conduct an impromptu test with a heavier arrow. At 900 grains and all rib impacts, penetration achieved was 16", 20", and 17". Pre-shot sharpness was an average of 433 grams of pressure while the post-shot sharpness on the blades averaged 671grams of pressure. The MA of this head is 1.25:1.

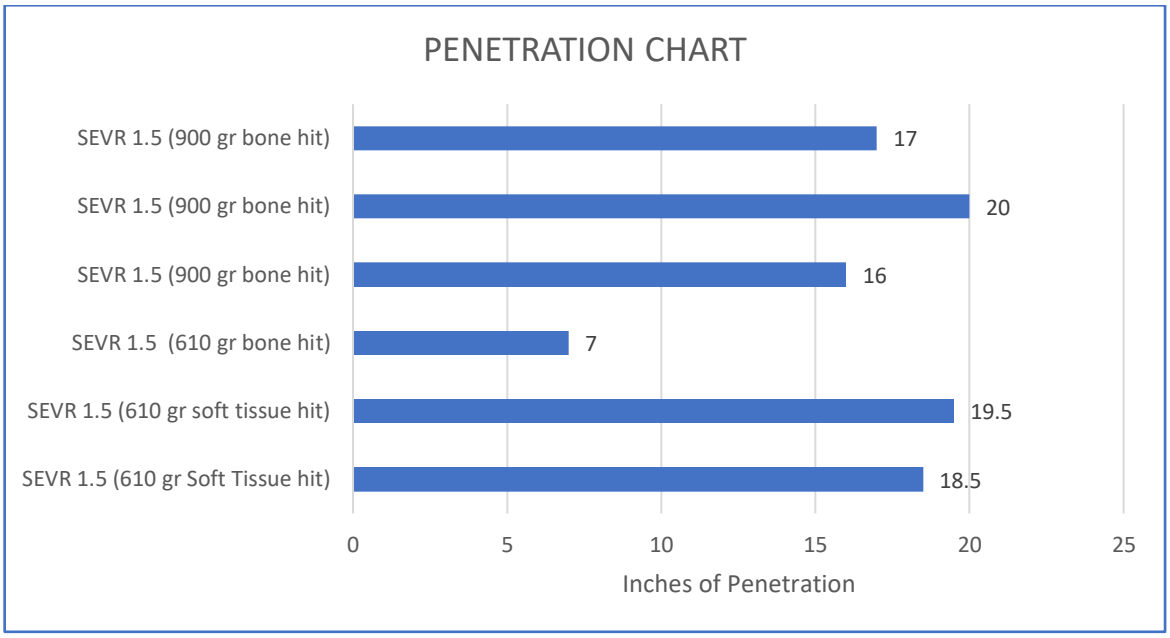
ABF Comments: Congratulations to Sevr for achieving the milestone as the first mechanical not to be a total failure in our testing. Note the post sharpness is after two shots with each head into the Cape Buffalo using two different arrow weights. While it is difficult to achieve the sharpness we desire with Titanium, the blades retained what edge they had exceptionally well. Pros to this head were surviving the structural integrity portion of the test. We would like to see an improvement in the sharpness, if possible with Titanium, and also see a heavier head made, i.e., 200 grains for improvements in overall FOC. **As this was the first mechanical to not structurally fail, the Sevr was the surprise of the testing, and would clearly be chosen over many in this test. While we do not recommend mechanical heads, if pre-shot blade sharpness can be increased to the minimum acceptable level for hunting we may have one to point to for those that feel the need to shoot a mechanical.**

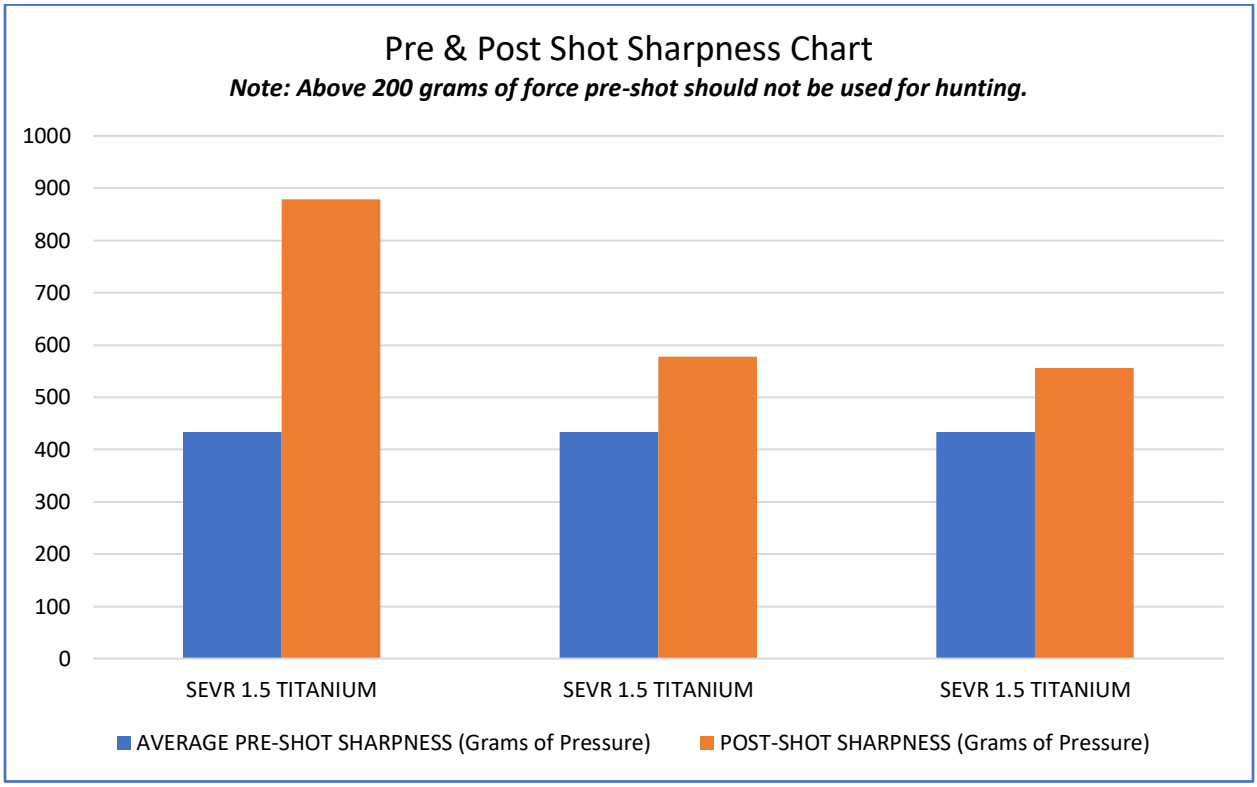
Questions arising out of this testing for further research: We would like to test this head further for skip angles, along with other variations of Sevr broadheads stateside.

Overall, with structural integrity intact, and passing in other areas, this head receives a score of C after six shots – the only head shot twice with different overall weights.

SEVR PRE-SHOT

SEVR POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: SEVR TITANIUM		
Factor	**Description**	**Grade**
1	Structural Integrity	C
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	F
5	Shaft Diameter to Ferrule Diameter	C
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	C
10	Type of Edge Bevel	C
11	Tip Design	D
12	Weight Above Heavy Bone Threshold	n/a
	SEVR TITANIUM Overall Grade Rating (6 shots)	**C**

4. 150 Grain 1.125” 3 blade Ozcut Hurricane single bevel, Black Eagle 250 spine shaft, 660 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 240 fps, Impact Momentum 0.70 slug ft/sec.

All three heads had structural integrity failures in this testing. Two heads were bone hits and one soft tissue hit only. The two shots into ribs achieved 1” and 3.5” of penetration, with the one soft tissue impact achieving 25” of penetration. While advertised as “pre sharpened ready to hunt”, the pre-shot sharpness was an average of 1572 grams of pressure while the post-shot sharpness on the blades maxed the scale out at 3030 grams of pressure and had not cut the medium. The MA of this head is 0.6:1

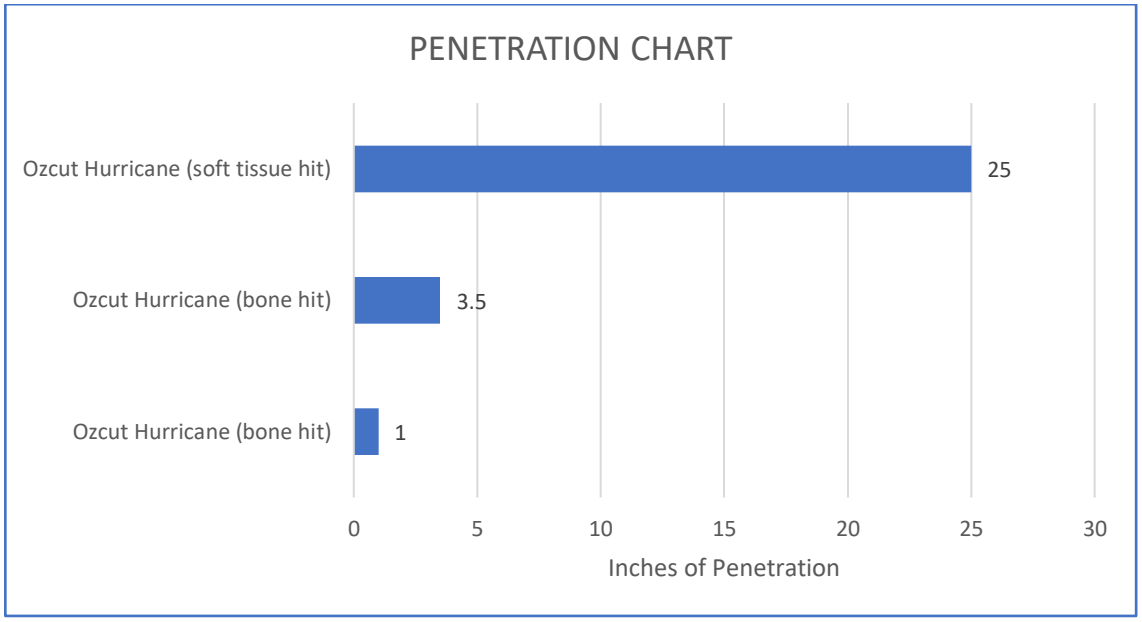
ABF Comments: With butterknife sharpness pre-shot ratings out of the box it is clear the manufacturer’s claim of “pre-sharpened ready to hunt” is false. The post-shot sharpness maxing out the scale and still not cutting the medium is a first. With a horrible MA of 0.6:1, the brittleness of the material and the resulting catastrophic failures of this product we do not see any pros to mention about this head and recommend to either improve the quality of the product or do the ethical thing for hunting and take them off the market.

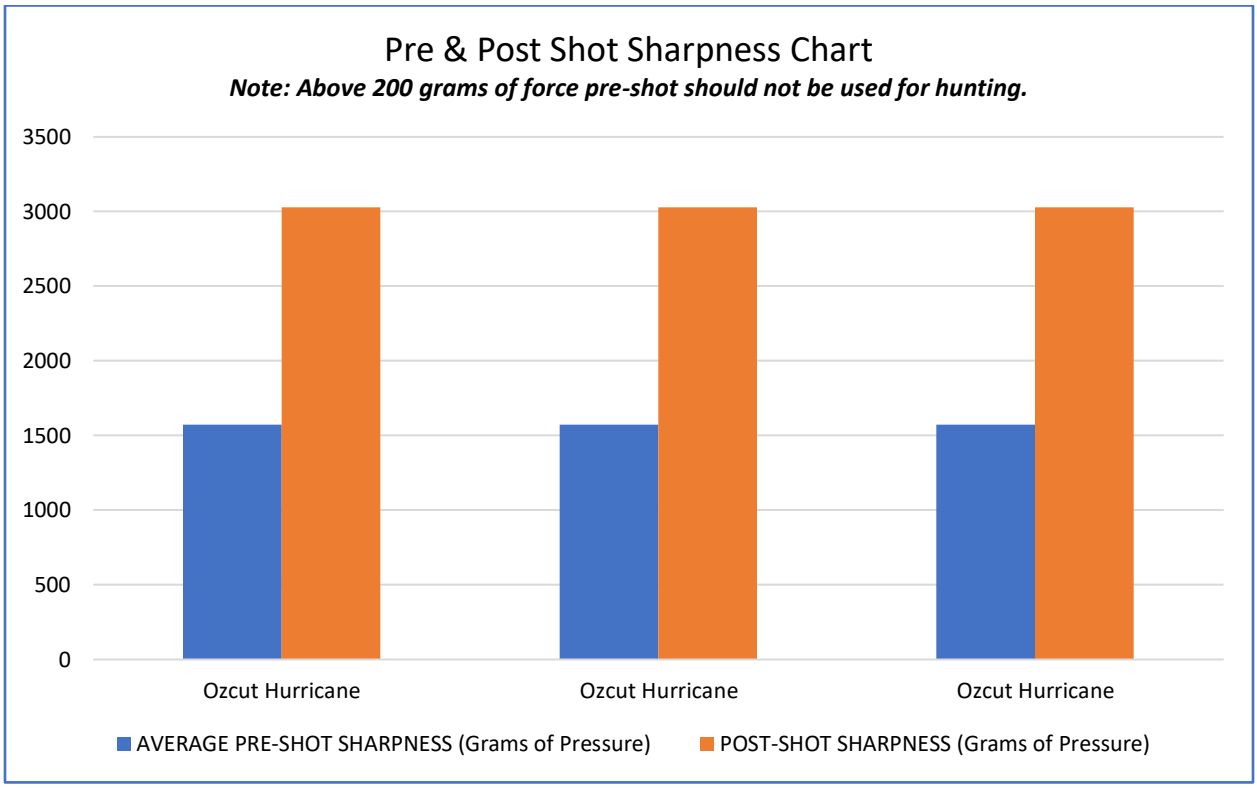
Questions arising out of this testing for further research: Failed, no further research on this head necessary.

Overall, with structural failures along with failures in other factors, this head receives a score of F.

Ozcut Pre-Shot

Ozcut Post-Shot





RATING BASED ON 12 FACTORS		
BROADHEAD: OZCUT HURRICANE		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	F
5	Shaft Diameter to Ferrule Diameter	C
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	C
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	OZCUT HURRICANE Overall Grade Rating	**F**

5. 200 Grain Strickland Helix 2 blade single bevel, Black Eagle 250 spine shaft, 710 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 235 fps, Impact Momentum 0.74 slug/ft sec.

Two out of three heads survived structurally while one head exhibited a structural failure with an approximately ten-degree blade bend in front of the ferrule where the blade profile narrows. The head with a bent blade also exhibited a skip angle on impact. All three heads impacted rib with the two structurally sound heads achieving 21.5" and 22" of penetration. The head with a bent blade which exhibited the skip angle only penetrated 11". The broadhead comes with a burr and the pre-shot sharpness was an average of 572 grams of pressure while the post-shot sharpness on the blades averaged 781 grams of pressure. The MA of this head is 2.2:1.

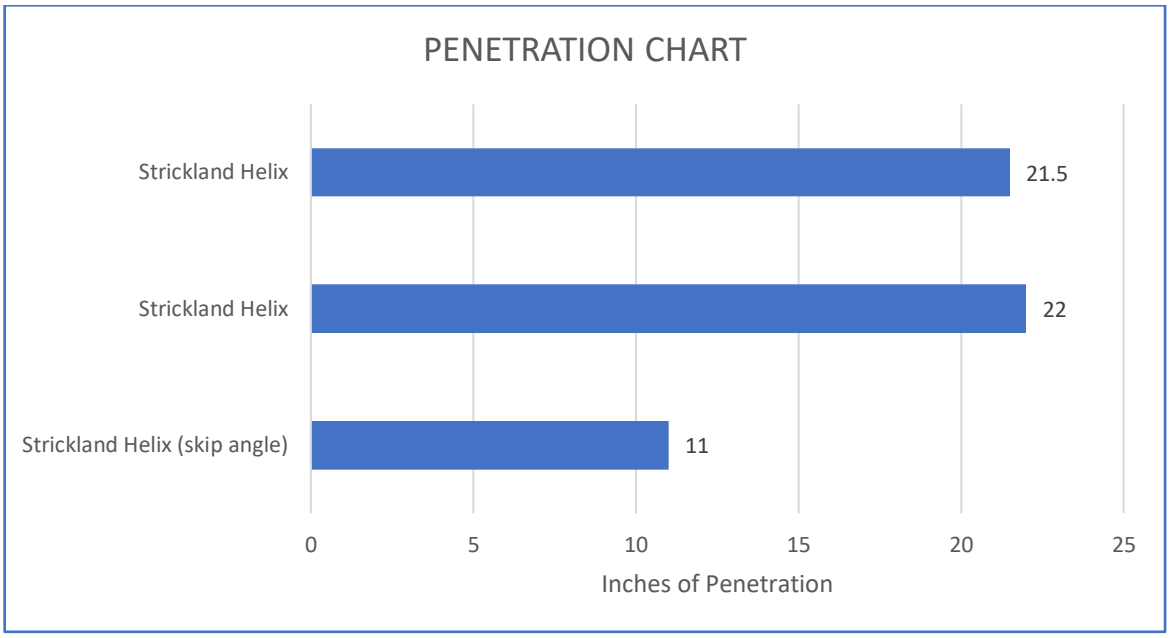
ABF Comments: While this head almost passed the structural integrity portion of the testing, we have also seen this design fail on mid-size game due to a geometrically weaker design than a straight blade. We have seen the single screw holding the blade in place be an area of weakness on bone impacts, but they held up in this test. The manufacturer claims it is ready to hunt, so we did not sharpen the head pre-testing. A few improvements would be an increased ferrule length fading out toward the tip for more lateral support with a second screw, and an overall wider blade profile, making it more of a straight blade without the abrupt angle, eliminating the longer, narrower profile that bent, along with improving the sharpness of the head to sub 200 grams of pressure out of the box. **Note the redirection with a slight bend resulted in a 50% reduction in penetration from the two heads that did not bend.**

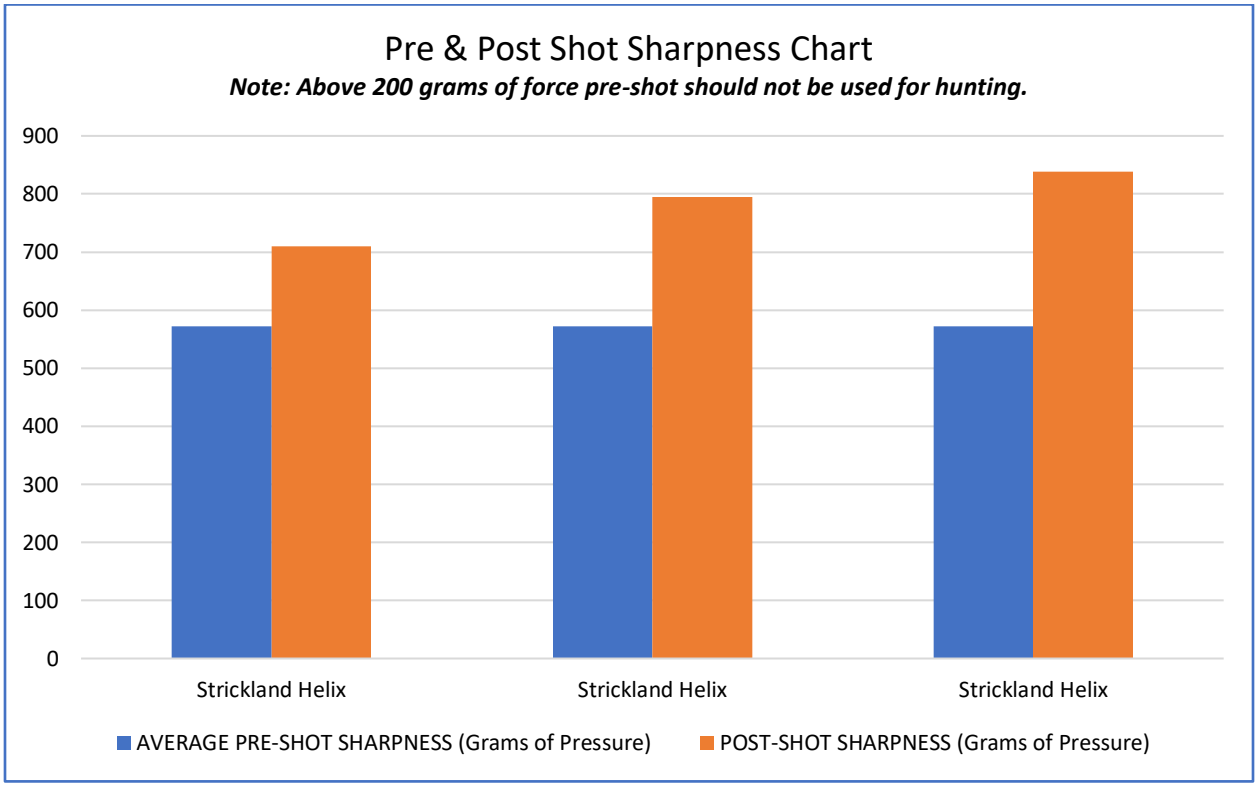
Questions arising out of this testing for further research: We will watch for any improvements to this head that would require re-testing.

Overall, with tip bend considered a structural failure, the head receives a score of F.

Helix Pre-Shot

Helix Post-Shot





RATING BASED ON 12 FACTORS		
BROADHEAD: STRICKLAND HELIX		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	B
5	Shaft Diameter to Ferrule Diameter	C
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	C
10	Type of Edge Bevel	B
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	Helix Overall Grade Rating	**F**

6. 200 Grain Grizzly Kodiak Single Bevel, Black Eagle 250 spine shaft, 710 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 235 fps, Impact Momentum 0.74 slug ft/sec.

All three heads survived the structural integrity portion of this test. All three heads were rib hits and achieved 21.5, 13.5" and 18.5" of penetration. Pre-shot sharpness was an average of 335 grams of pressure while the post-shot sharpness on the blades averaged 918 grams of pressure. The MA of this head is 2.4:1.

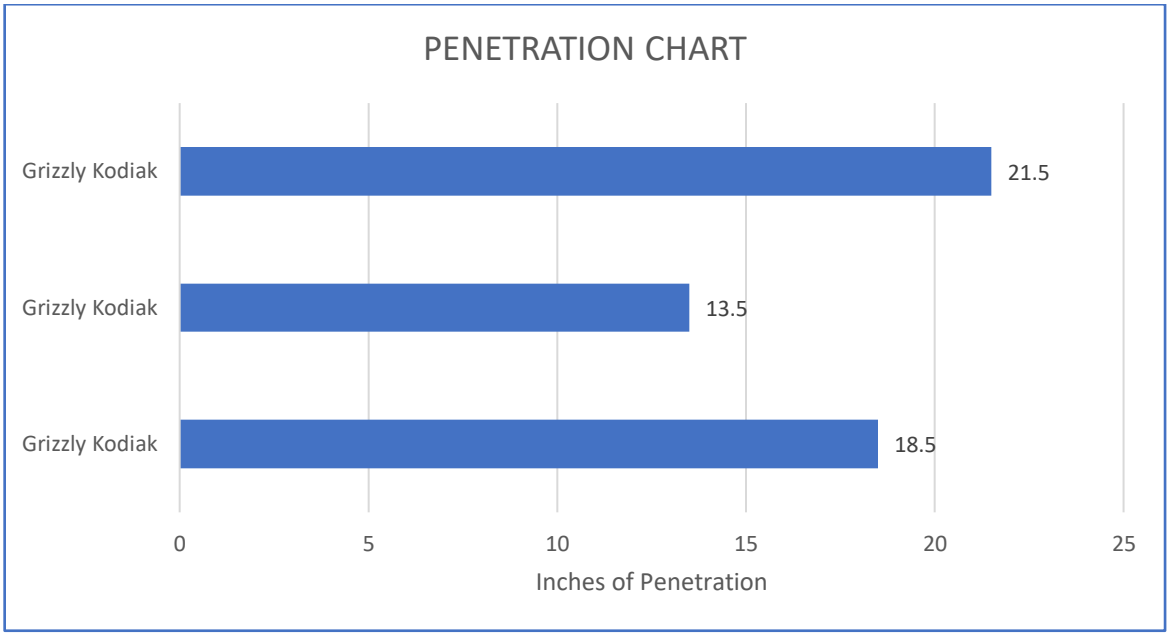
ABF Comments: The Grizzly was in Doc's original studies and is still going strong. A few improvements we would like to see would be an increased ferrule length fading out toward the tip for more lateral support and improving the sharpness of the head to sub 200 grams of pressure out of the box. There was only very minor chipping in some areas along the blade edges post impact. Overall, a solid choice for a 200-grain single bevel. Ferr-L-Tite was used to attach the broadhead to the adapters, but the glue did not hold. For all big game hunting arrows, and especially those for heavy and/or dangerous game, it is best to use a slow-cure epoxy.

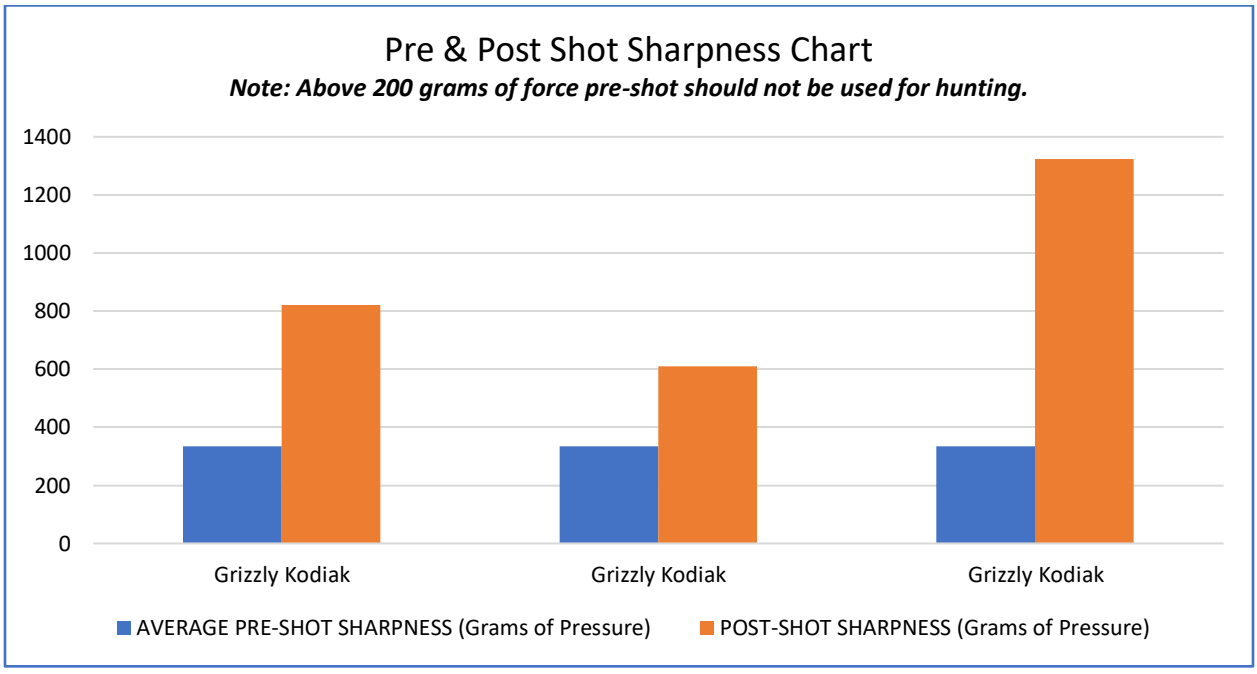
Questions arising out of this testing for further research: We will watch for any improvements to this head that would require re-testing.

Overall, the head receives a score of B.

Grizzly Pre-Shot

Grizzly Post-Shot (Ferr-L-Tite did not hold)





RATING BASED ON 12 FACTORS		
BROADHEAD: GRIZZLY KODIAK		
Factor	**Description**	**Grade**
1	Structural Integrity	A
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	B
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	A
10	Type of Edge Bevel	A
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	Grizzly Kodiak Overall Grade Rating	**B**

7. 200 Grain GrizzlyStik Maasai, Black Eagle 250 spine shaft, 710 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 235 fps, Impact Momentum 0.74 slug/ft sec.

The blade is .069” thick and made of 440C Stainless Steel with an aluminum ferrule. All three heads survived the structural integrity portion of this test with rib hits. Two achieved 24.5” and 26” of penetration with one penetrating 70”, exiting the offside. Pre-shot sharpness was an average of 179 grams of pressure while the post-shot sharpness on the blades averaged 628 grams of pressure. The MA of this head is 1.5:1.

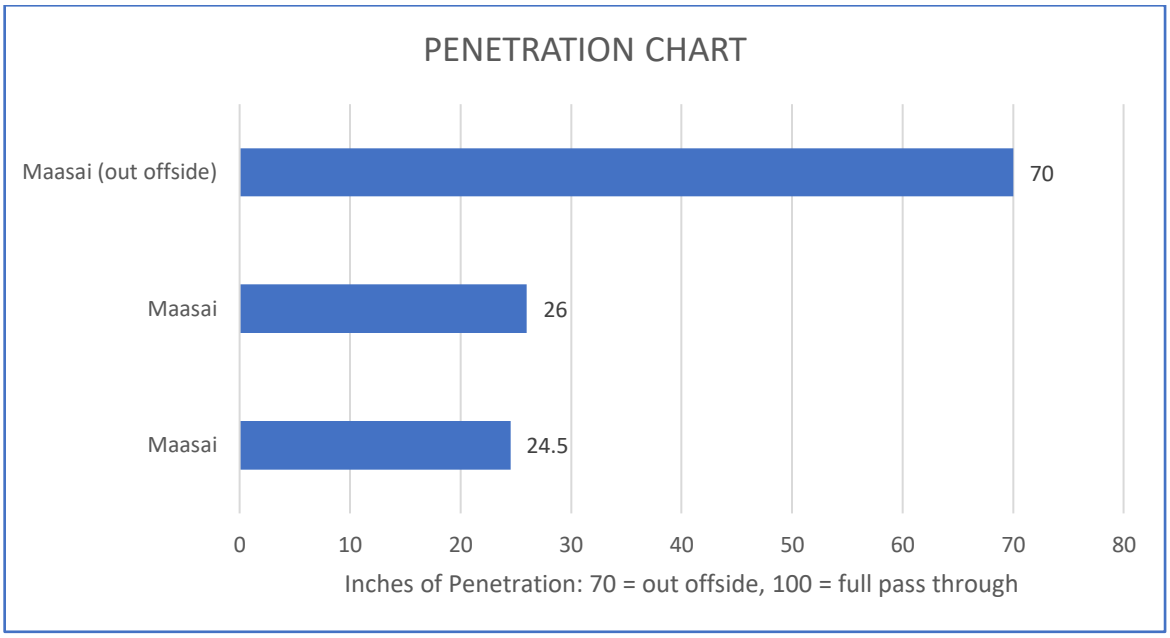
ABF Comments: The Maasai is the best head GrizzlyStik makes that we have tested. Many in ABF have used this head for years as the convex shape adds strength over a straight blade (all else equal) with the simple modification such as a micro-back bevel to help reduce chatter and help improve the life of the head. All three heads in this test had good penetration. As with other GrizzlyStik products, ABF noted the sharpness of these same brand heads tested in 2021 required approximately 2x less pressure to cut the BESS medium pre-shot. The 2022 pre-shot sharpness was 179 grams of pressure, while the post-shot sharpness average of 628 grams of pressure is unacceptable for an advertised premium head. An improvement to this head that has been previously mentioned would be adding a micro-back bevel to help reduce chatter. While the overall sharpness and finish has diminished over previous versions tested, the Maasai is still an overall solid choice for a 200-grain single bevel. We would recommend that GrizzlyStik look at its manufacturing process as the overall finish and sharpness is not what we have come to expect in a premium head.

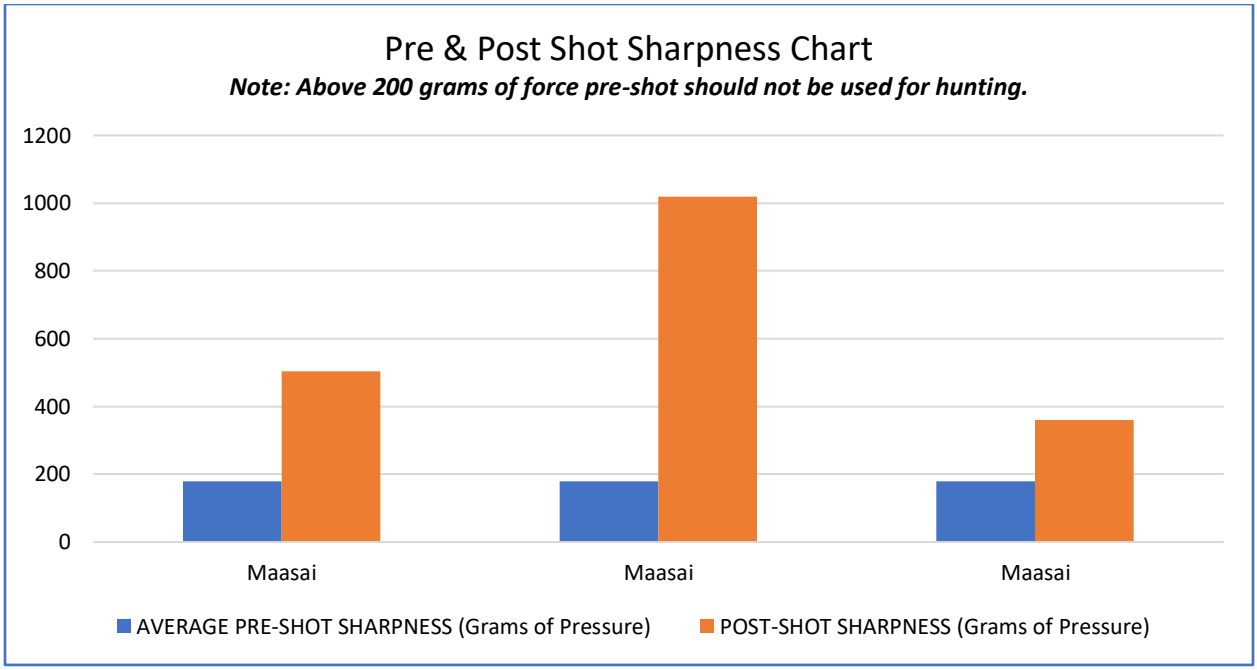
Questions arising out of this testing for further research: No questions and we will watch for any improvements to this head that would require re-testing.

Overall, the head receives a score of B.

Maasai Pre-Shot

Maasai Post-Shot





RATING BASED ON 12 FACTORS		
BROADHEAD: MAASAI		
Factor	**Description**	**Grade**
1	Structural Integrity	C
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	D
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	B
10	Type of Edge Bevel	D
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	Maasai Overall Grade Rating	**B**

8. 200 Grain Tuffhead Evo 2 blade (Version 1), Black Eagle 250 spine shaft, 710 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 235 fps, Impact Momentum 0.74 slug/ft sec.

This head is made of S7 Tool Steel and has a 20-degree single bevel. All three heads survived the structural integrity portion of this test. All three heads were rib hits on impact and achieved penetrations of 70", hanging out the opposite side, 22", stopping on the offside scapula, and a full pass through. Pre-shot sharpness was an average of 134 grams of pressure while the post-shot sharpness on the blades averaged 345 grams of pressure. The MA of this head is 1.2:1.

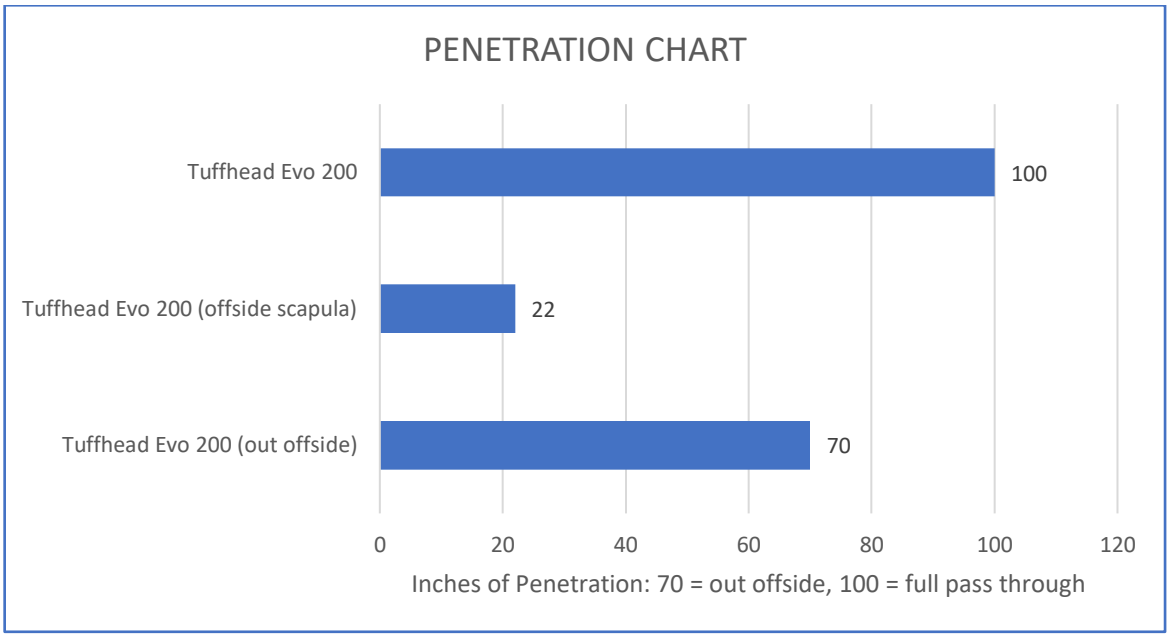
ABF Comments: ***Note the heads tested were Version 1.*** ABF tested this head in 2021 and returned it for another round in 2022. We like the one-piece design of this head. All three heads had good penetration, there was no structural damage, no chattering, no edge damage, and overall a solid product.

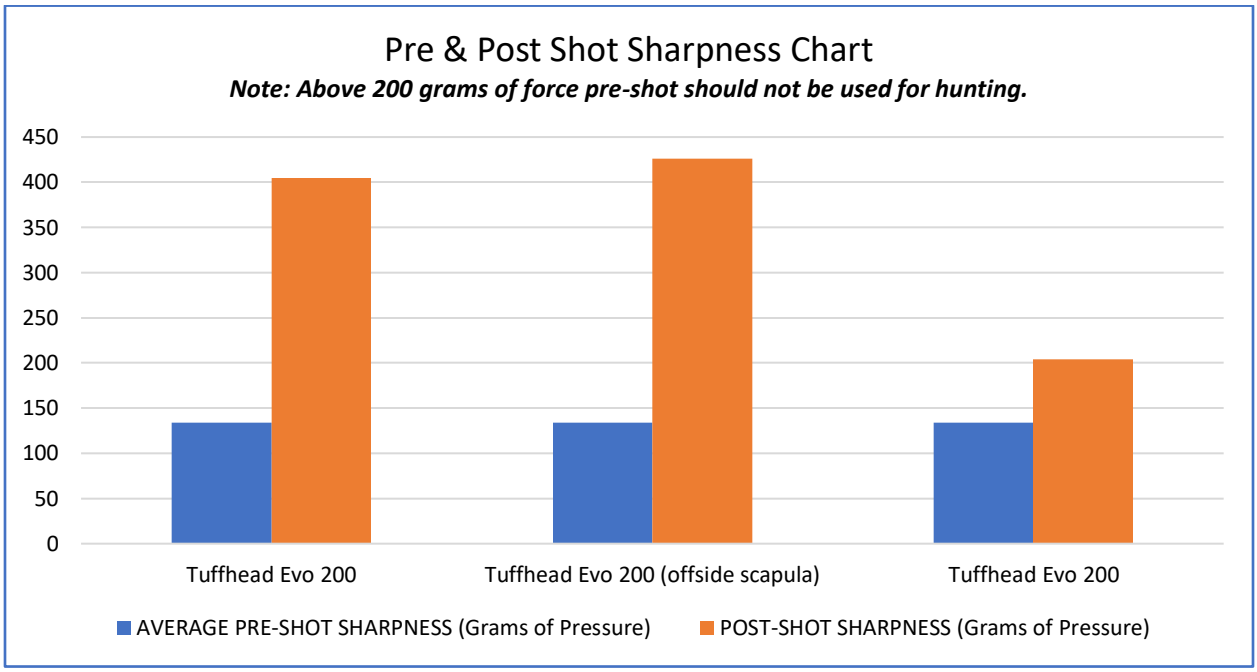
Questions arising out of this testing for further research: No questions and we will have to test Version 2 with the improvements there.

Overall, the head receives a score of B.

TUFFHEAD EVO 200 PRE-SHOT

TUFFHEAD EVO 200 POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: TUFFHEAD EVO 200		
Factor	**Description**	**Grade**
1	Structural Integrity	A
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	D
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	D
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	B
10	Type of Edge Bevel	A
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	Tuffhead Evo 200 Overall Grade Rating	**B**

9. 225 Grain Blitz 2 blade Double Bevel, Black Eagle 250 spine shaft, 710 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 231 fps, Impact Momentum 0.75 slug ft/sec.

This head is made of 440B Stainless Steel with a 58 HRC, and a 35-degree cut-on-contact convex edge. All three heads survived the structural integrity portion of this test. Two were rib hits and one impacted, but did not penetrate the scapula, limiting the penetration. The rib hits penetrated 24" and 25" while the scapula hit penetrated 5". The broadhead came into the test with the sharpest rating of all heads with a pre-shot sharpness average of 131 grams of pressure and retained that sharpness well, with an average of 332 grams of pressure. The MA of this head is 1.7:1.

ABF Comments: We like the one-piece design of this head. The two rib impacts showed good penetration, while the third shot's penetration was halted by the scapula. There was no structural damage on any of the impacts; no chattering, no tip or edge damage and, overall, a solid product. The pre and post sharpness was excellent, the ferrule fades nicely to the tip of the head for support. Overall, a very solid performance from this head.

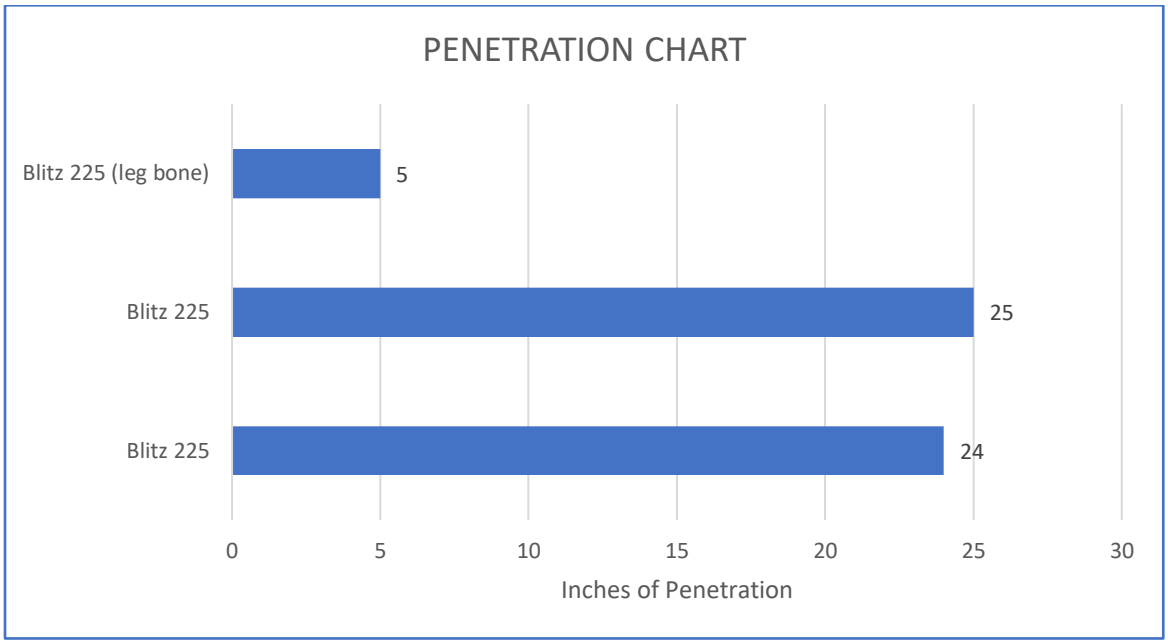
Questions arising out of this testing for further research: No questions and we will run more tests with this head with the heavier direct bond adapters.

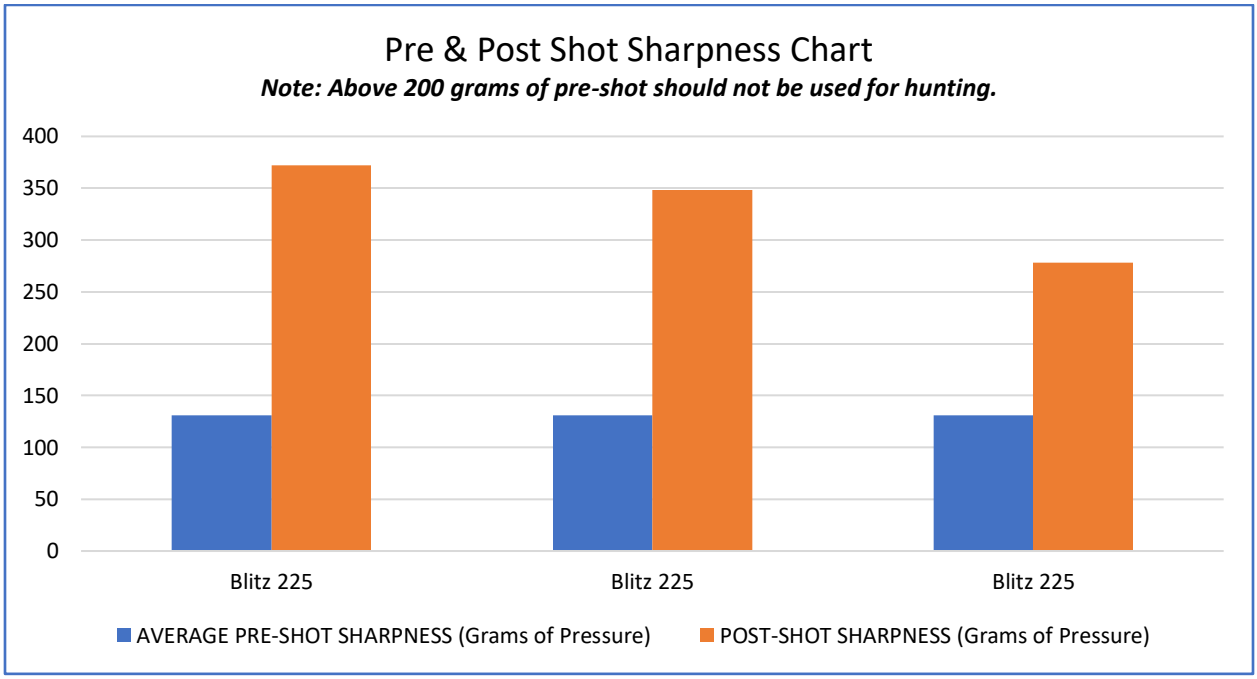
Overall, the head receives a score of B.

BLITZ PRE-SHOT

BLITZ POST-SHOT

Note: One head lost in field. Ferr-L-Tite did not hold.





RATING BASED ON 12 FACTORS		
BROADHEAD: BLITZ 225		
Factor	**Description**	**Grade**
1	Structural Integrity	A
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	C
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	D
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	B
10	Type of Edge Bevel	C
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	Blitz 225 Overall Grade Rating	**B**

10. 175 Grain DRT Single Bevel w/Bleeders, Black Eagle 250 spine shaft, 685 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 238 fps, Impact Momentum 0.72 slug ft/sec.

The blade is made of 420J2 Stainless Steel with a 58 HRC, with a .051" thick main blade having a 25-degree bevel and with a 5/8" double bevel bleeder blade. Two heads survived the structural integrity portion of this test exhibiting minor damage with hits into the rearward ribs with penetration of 27.5" while one forward, heavier rib, hit failed the structural integrity portion, exhibiting a bent ferrule and blade in front, achieving 19" of penetration. The heavier rib hit sheered its bleeder blade, but that is the preferred design for bleeder blades. Pre-shot sharpness was an average of 301 grams of pressure while the post-shot sharpness of the blades averaged 539 grams of pressure. The MA of this head with the bleeders averaged is 0.95:1.

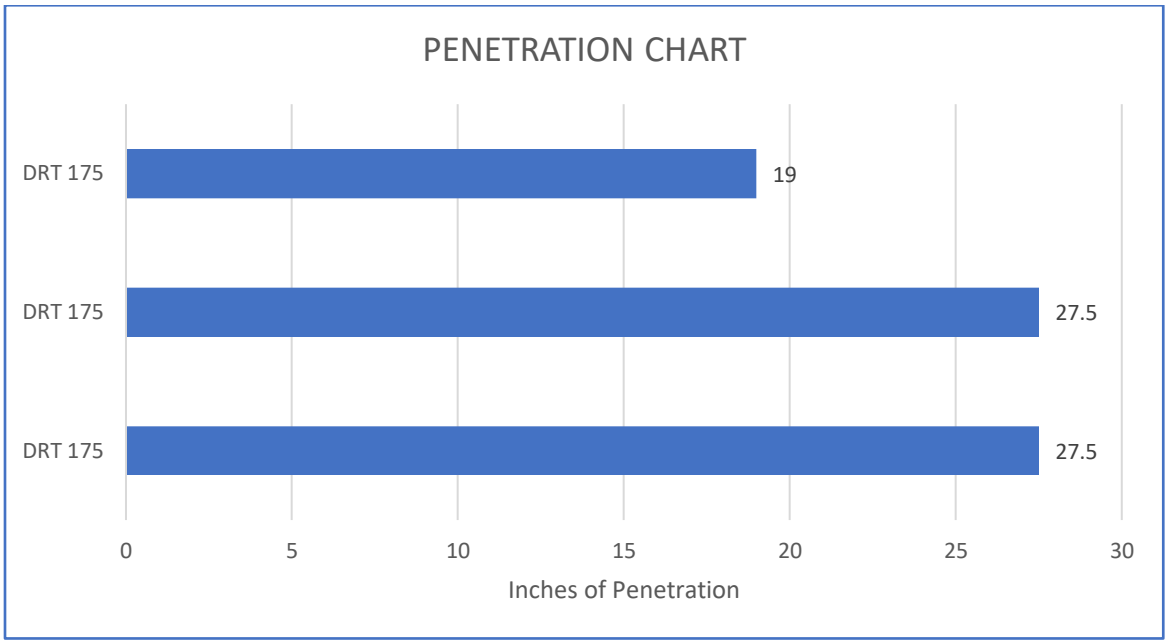
ABF Comments: Two heads had good penetration, other than the bent blade, which is a structural failure, there was some slight rolling and chipping to the edge. The micro back bevel on this head likely helped in the edge retention. The ferrule has some lumps and bumps, and the modular weight system creates a forward-facing lip. The blade is held in place with one screw which we have seen to be a weak point on bone impacts, but the two that were not structural failures held the blade true to center with no wobbling when placed on the spin tester. Overall, while failing this test, not a bad showing from a less expensive head in the group. We would like to see D.R.T. remedy the noted ferrule problems and sharpen these heads to a sub 200 grams of pressure out of the box.

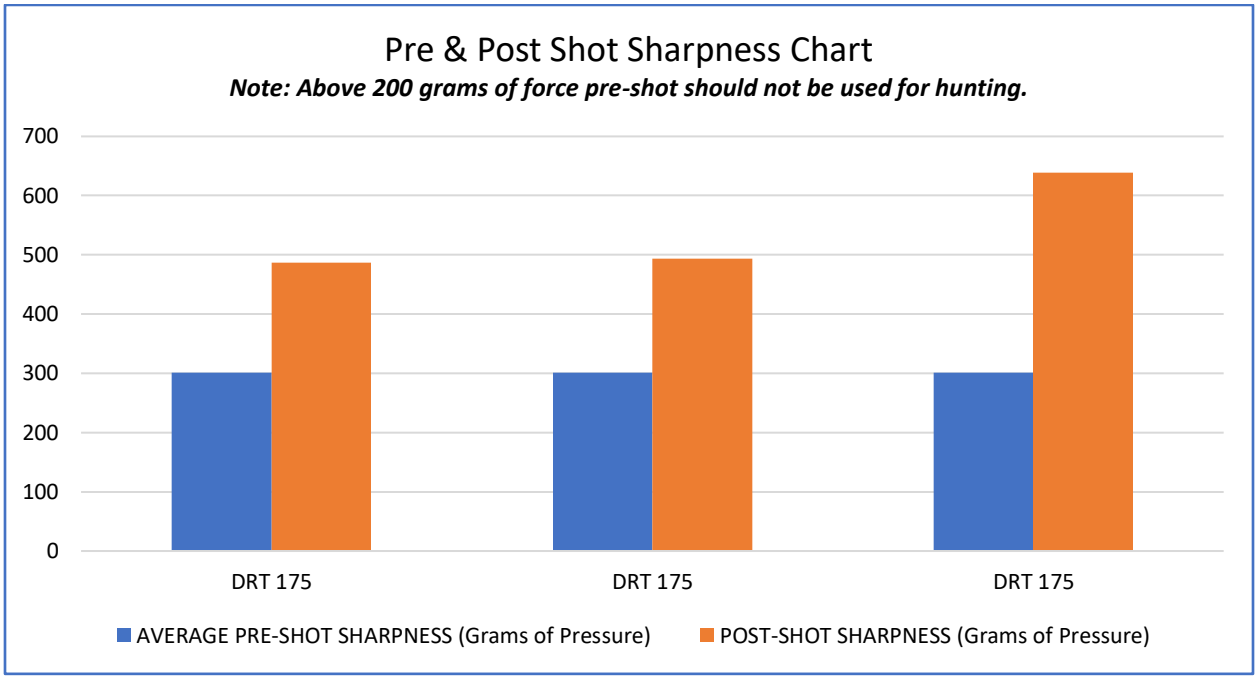
Questions arising out of this testing for further research: No questions and we will monitor this head for any improvements which would require re-testing.

Overall, the head receives a score of F.

DRT PRE-SHOT

DRT POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: DRT 175		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	F
5	Shaft Diameter to Ferrule Diameter	C
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	F
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	DRT 175 Overall Grade Rating	**F**

11. Ace Super Express 175 Grain Double Bevel, Black Eagle 250 spine shaft, 710 grains total weight. All shots made with the 71# Hoyt. Impact Velocity 238 fps, Impact Momentum 0.72 slug ft/sec.

The blade is made of carbon steel, is spot welded, copper brazed and heat treated with a triple laminated tip. The heads did not survive the structural integrity portion of this test. Two penetrated well on soft tissue hits but had severe blade bends, and the third that impacted a rib blew apart and did not achieve any penetration. The broadheads arrived dull and were sharpened to a pre-shot sharpness average of 243 grams of pressure while the post-shot sharpness on the blades averaged 925 grams of pressure. The MA of this head is 1.8:1.

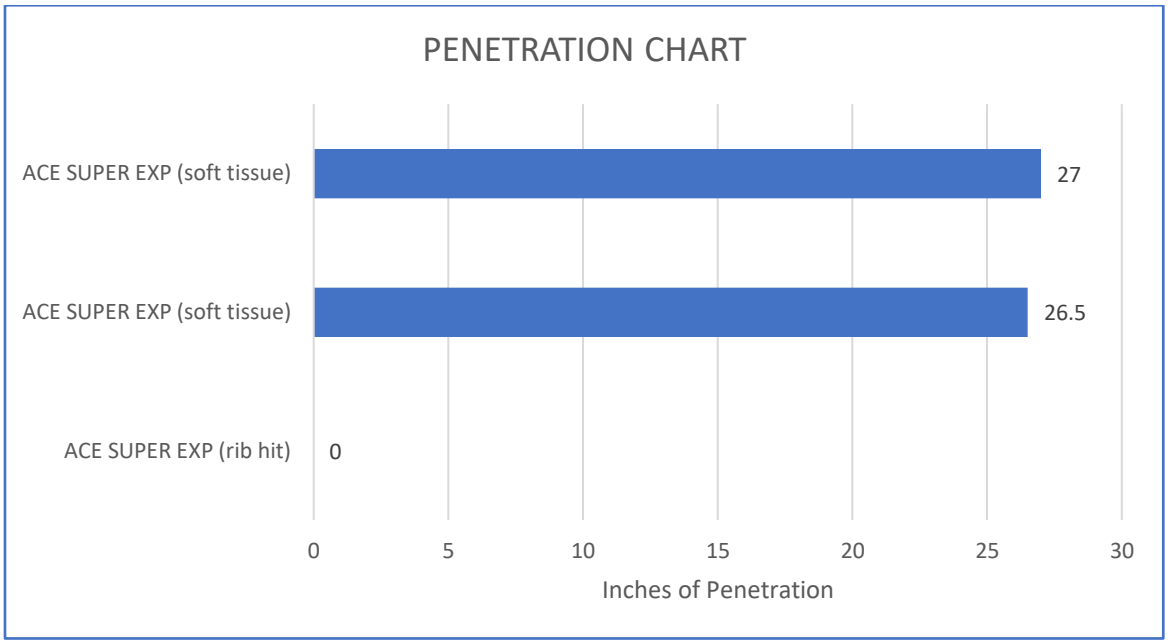
ABF Comments: All three heads had structural damage with rolled and bent edges and tips that blew off. The ferrule has a few more lumps and bumps than we prefer but it is a spot welded and copper brazed head. This head has been around a long time and was in some original testing, which had the same results.

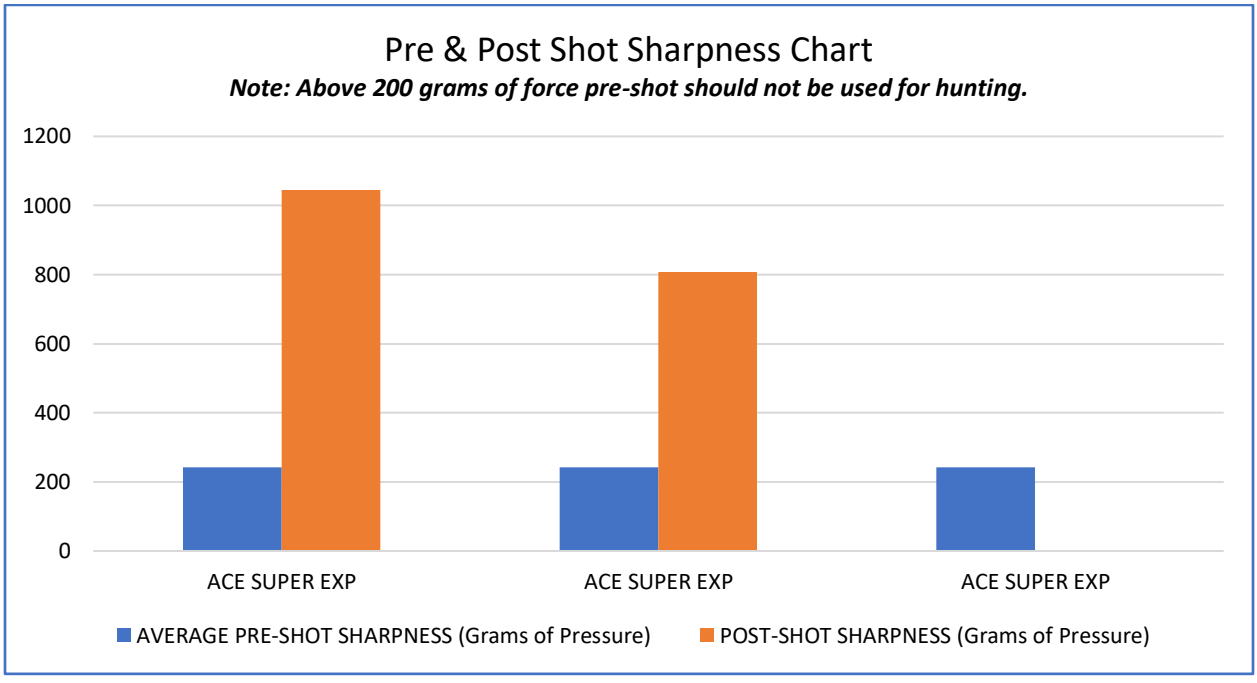
Questions arising out of this testing for further research: No questions as this head failed.

Overall, the head receives a score of F.

ACE SUPER EXPRESS 175 PRE-SHOT

ACE SUPER EXPRESS 175 POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: ACE SUPER EXPRESS 175		
Factor	**Description**	**Grade**
1	Structural Integrity	F
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	C
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	C
10	Type of Edge Bevel	F
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	Ace Super Express 175 Overall Grade Rating	**F**

12. VPA 200 grain single bevel two blade head on a Black Eagle 150 spine shaft, 710 grains total weight. All shots were made with the 71# Hoyt. Impact Velocity 235 fps, Impact Momentum 0.74 slug ft/sec.

This head is one-piece premium grade tool steel with a 1.125” cutting diameter heat treated up to 58 Rockwell with a 35-degree single bevel. All three heads passed the structural integrity portion of the testing. The penetration achieved on rib hits was 24” and 27”, while one intentionally shot into soft tissue passed through. Pre-shot sharpness was an average of 309 grams of pressure while the post-shot sharpness on the blades averaged 656 grams of pressure. The MA of this head is 1.2:1.

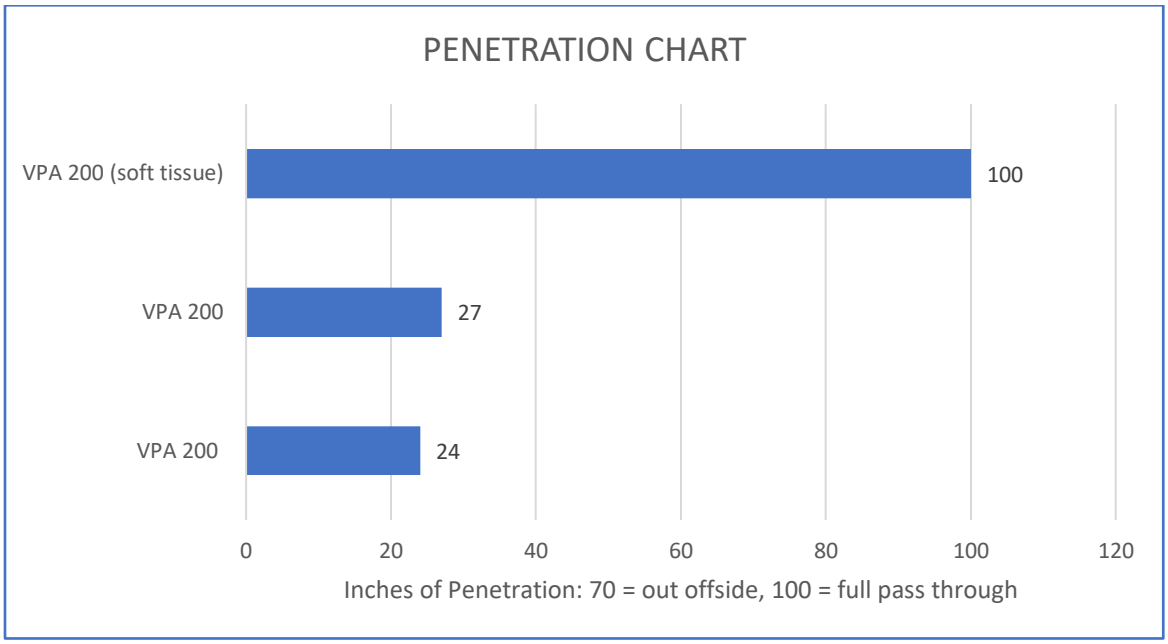
ABF Comments: We like the one-piece solid design of this head for structural integrity with the ferrule fading out near the tip for lateral support. Unknown to ABF until the broadheads arrived, these heads come with a burr edge and initially had a pre-shot sharpness of over 700 grams of pressure. After contacting VPA and confirmed they ship them that way for bowhunters to sharpen, we touched up the heads before testing. While the bevels are 35 degrees for additional durability, one head exhibited the slightest tip damage on the chisel tip. Other than the one with slight tip damage, the edges did not exhibit any edge chattering or rolling. Unlike the collars on the shafts that were used on the 300-grain version of this head that created a slight forward-facing lip, the shafts used with the 200 had a slight step down as you transitioned to the shaft. The heads MA is 1.2:1. While exhibiting many good qualities, we would recommend these heads be sharpened to sub 200 grams of pressure on the sharpness scale prior to shipping, as many bowhunters do not know how to sharpen a head. We would also recommend a round and slightly larger ferrule for a smooth transition and caution bowhunters to watch that octagonal shaped ferrule, so you do not create a forward-facing lip to impede penetration when screwed into the insert. **A takeaway from this testing is comparing the VPA’s two rib hits to those of the Tuffhead Evo, with the differences of a 20-degree bevel and tanto tip, which achieved substantially more penetration than the VPA’s 35-degree single bevel and chisel tip. Note that the arrow set ups and arrow weights tested with these two broadheads are identical.**

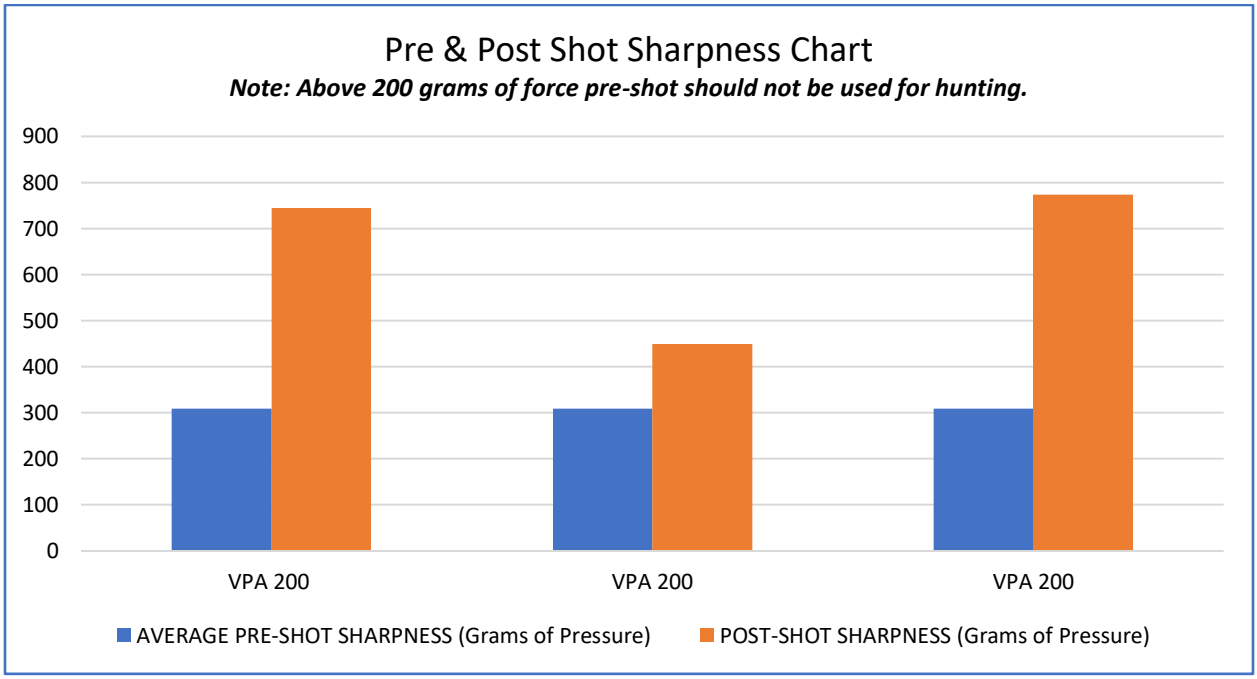
Questions arising out of this testing for further research: We will watch for any improvements and would also like to test the skip angle with the chisel tip on these heads.

Overall, the head receives a score of C.

VPA 200 GRAIN SINGLE BEVEL PRE-SHOT

VPA 200 GRAIN SINGLE BEVEL POST-SHOT





RATING BASED ON 12 FACTORS		
BROADHEAD: VPA SINGLE BEVEL 200		
Factor	**Description**	**Grade**
1	Structural Integrity	C
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	D
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	B
10	Type of Edge Bevel	B
11	Tip Design	F
12	Weight Above Heavy Bone Threshold	n/a
	VPA Single Bevel 200 Grade Rating	**C**

13. Valkyrie Blood Eagle 200 grain head on a Black Eagle 150 spine shaft, 710 grains total weight. All shots were made with the 71# Hoyt. Impact Velocity 235 fps, Impact Momentum 0.74 slug ft/sec.

This head is a cut on contact one-piece high carbon tool steel head heat treated to 58-61 Rockwell. All three heads passed the structural integrity portion of the testing. The penetration achieved on a rib hit was 20.5”, while heavier bone impact was 8” and 9.5”. Pre-shot sharpness was an average of 297 grams of pressure while the post-shot sharpness on the blades averaged 584 grams of pressure. The MA of this head is 1.6:1.

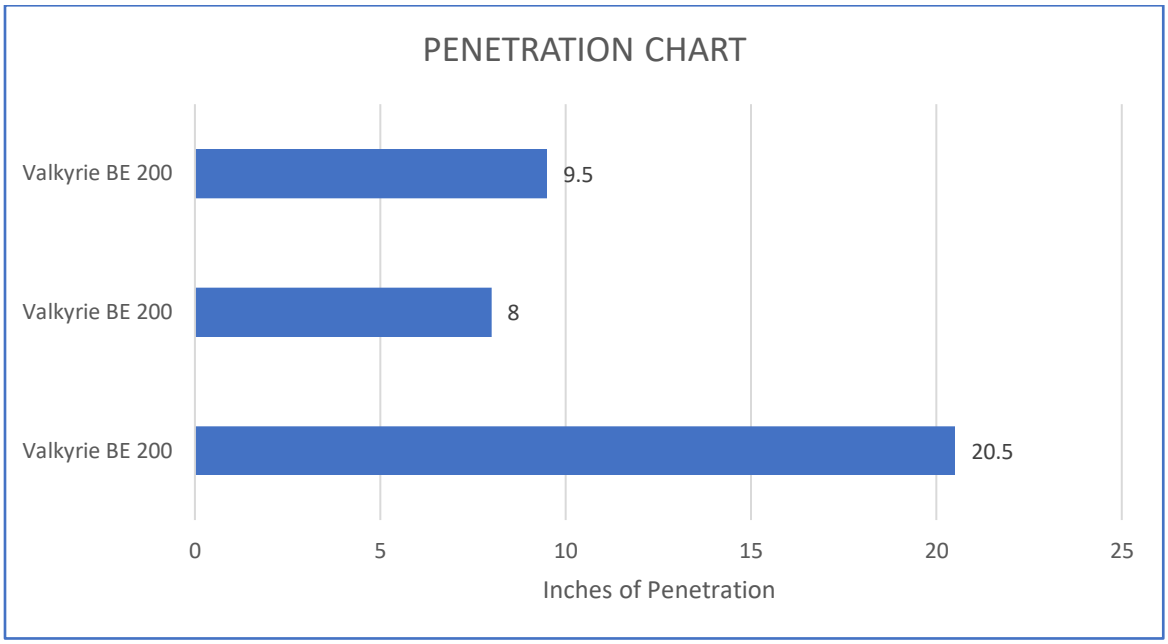
ABF Comments: We like the one-piece solid design of this head for structural integrity with the ferrule fading out near the tip for lateral support. The concave shape is a weakness in two blade heads, but this shape did not exhibit any weakness in the testing, all spinning true post-shot. Post-shot one tip had the slightest discernible flattening of the tip, while the edges did not exhibit any edge chattering, rolling or damage, holding their edges very well. The heads MA is a respectable 1.6:1, which is about as good as you will get with a three blade and exceeds many of the popular two blades. While this head exhibits many good qualities, we would recommend these heads be sharpened to sub 200 grams of pressure on the sharpness scale prior to shipping. While we did not have the issue in this testing, we would prefer a round ferrule for a smooth transition to the collars, while cautioning bowhunters to watch that octagonal shaped ferrule so you do not create a forward-facing lip with some larger collars that would impede penetration. Overall, a very solid choice for anyone that prefers a 3-blade head with higher quality steel.

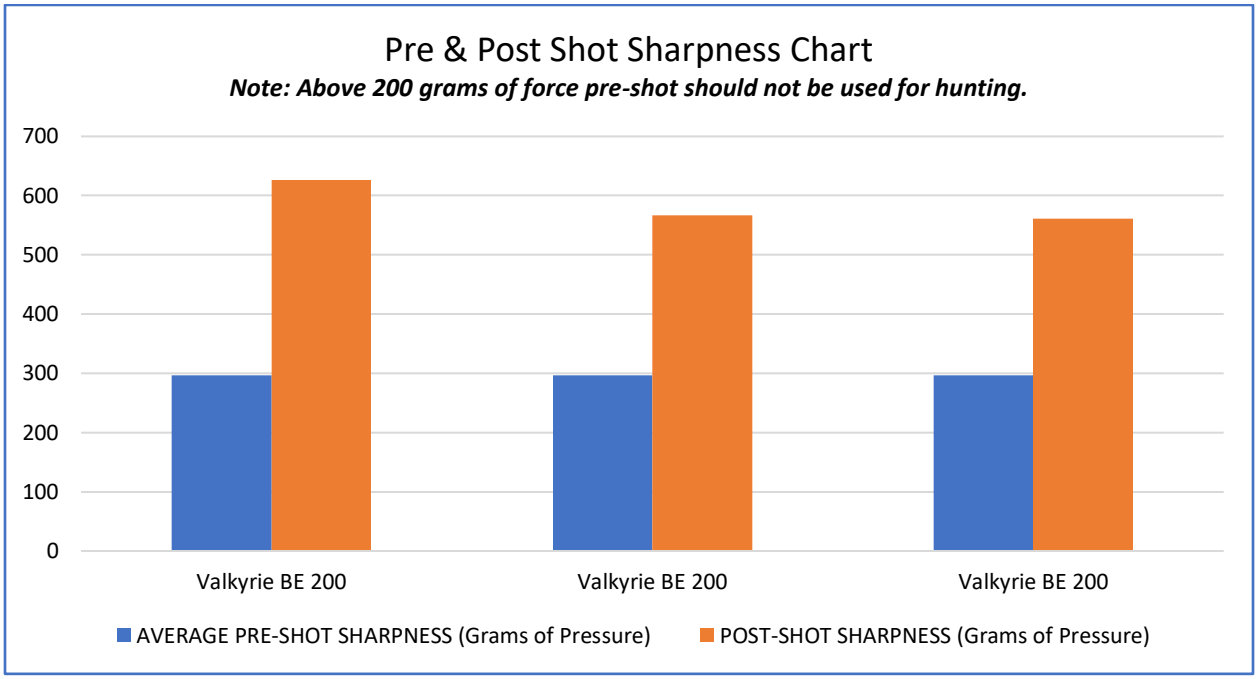
Questions arising out of this testing for further research: We will watch for any improvements and would also like to test the skip angle with this head.

Overall, the head receives a score of B.

Valkyrie Blood Eagle Pre-Shot

Valkyrie Blood Eagle Post-Shot





RATING BASED ON 12 FACTORS		
BROADHEAD: VALKYRIE BLOOD EAGLE 200		
Factor	**Description**	**Grade**
1	Structural Integrity	A
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	D
5	Shaft Diameter to Ferrule Diameter	A
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	A
10	Type of Edge Bevel	C
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	Valkyrie Blood Eagle 200 Overall Grade Rating	**B**

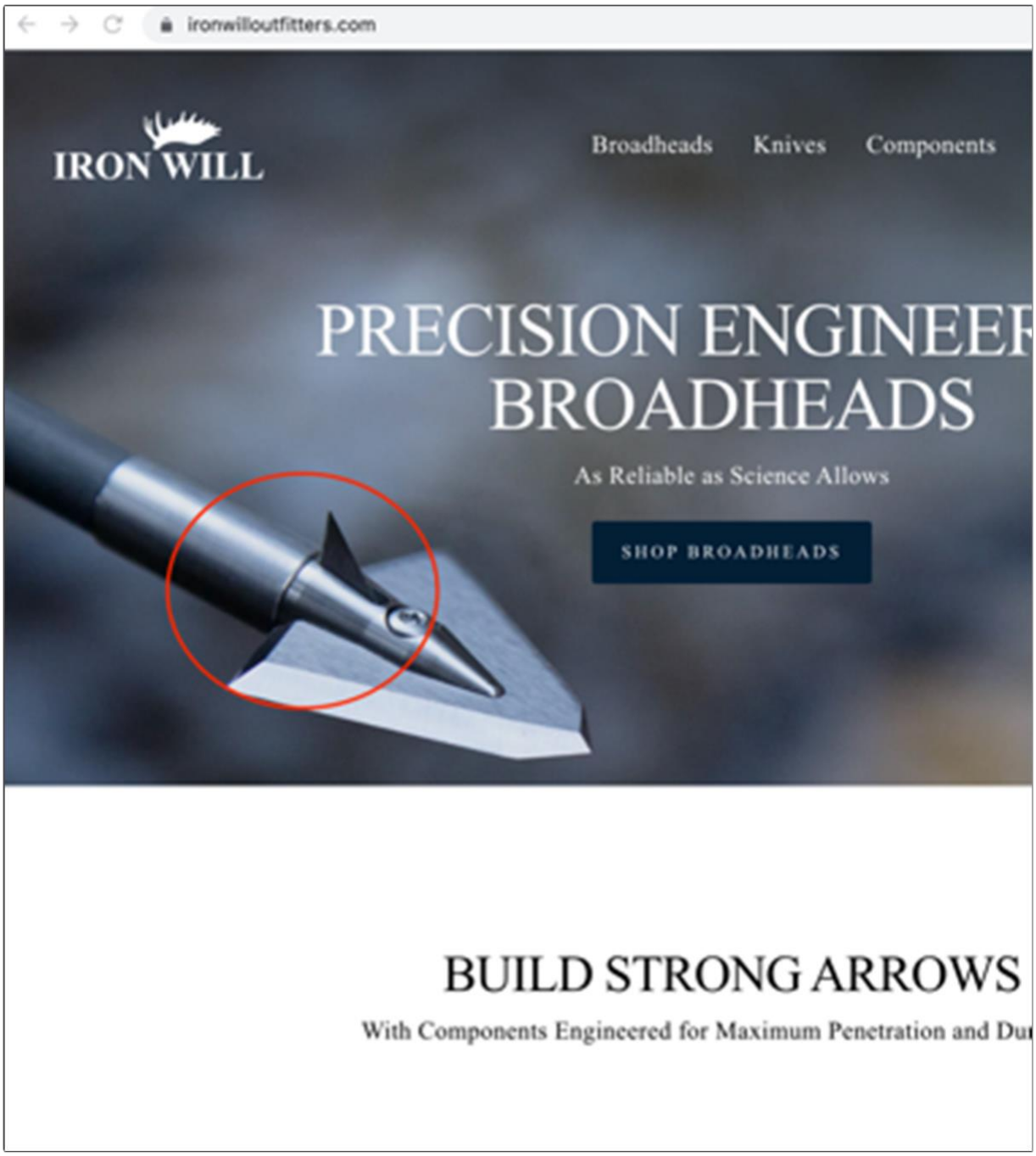
14. Iron Will Single Bevel 200 grain head on a Black Eagle 150 spine shaft, 710 grains total weight. All shots were made with the 71# Hoyt. Impact Velocity 235 fps, Impact Momentum 0.74 slug ft/sec.

This head is a cut on contact single bevel .062" A2 tool steel blade with a matching single bevel bleeder blade tempered to 60 HRC . All three heads passed the structural integrity portion of the testing. All were rib hits with penetration of 23.5" 16.5" and 26.5". Pre-shot sharpness was an average of 161 grams of pressure while the post-shot sharpness on the blades averaged 506 grams of pressure. The MA of this head with the bleeder averaged 0.8:1.

ABF Comments: We purchased these heads in 2021 but did not test them until 2022. While the blade is made of a higher quality steel, post-shot one head had very minimal chatter while the other two did not exhibit any chatter, rolling or damage. The heads MA with the bleeder averaged in is 0.8:1. As noted in last year's testing, this head comes with a standard component diameter ferrule of 5/16", which is smaller diameter than many commonly used shafts and will create a forward-facing lip with many collars and induce additional drag (see photo from Iron Will webpage for example). This was tested with an insert of the same diameter, so we did not have that issue. Also, we have been informed Iron Will has improved the ferrule design to a larger diameter, which could remedy most forward-facing lips when used on larger diameter shafts. Post-shot we noticed that two of the three blades were slightly off center when placed on the arrow spinner. We have seen this in previous testing, and it is likely attributable to having only one screw holding the blade in place. While this head exhibits many good qualities, the heads with larger diameter ferrules will need to be tested.

Questions arising out of this testing for further research: Re-test with the larger diameter ferrule.

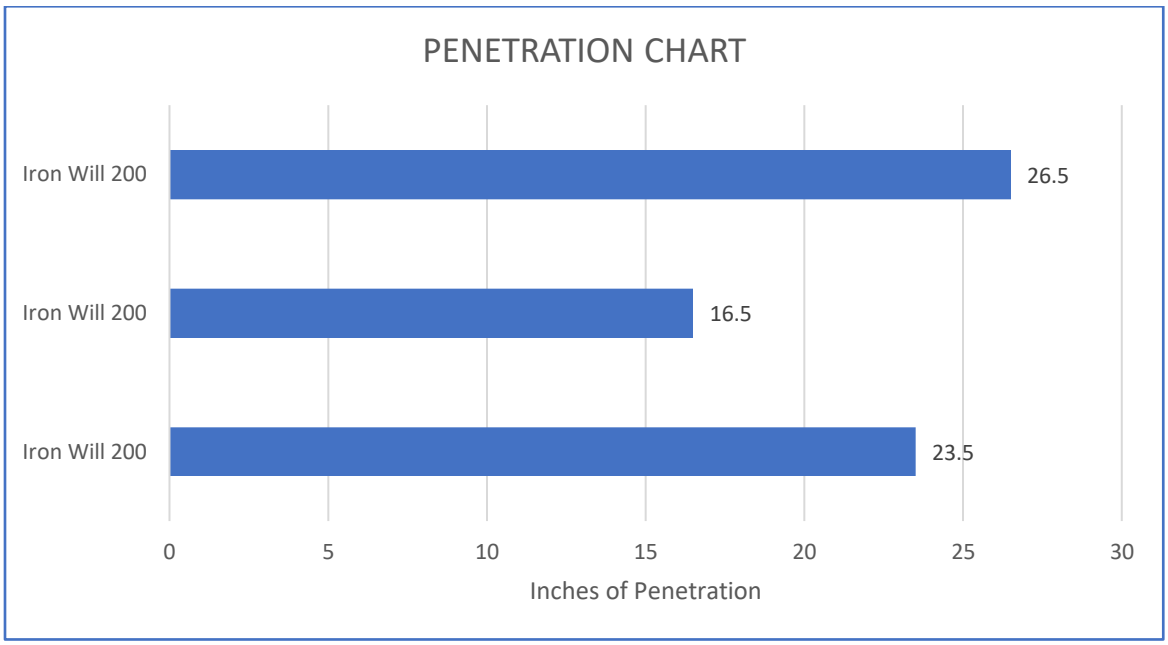
Overall, the head receives a score of C.

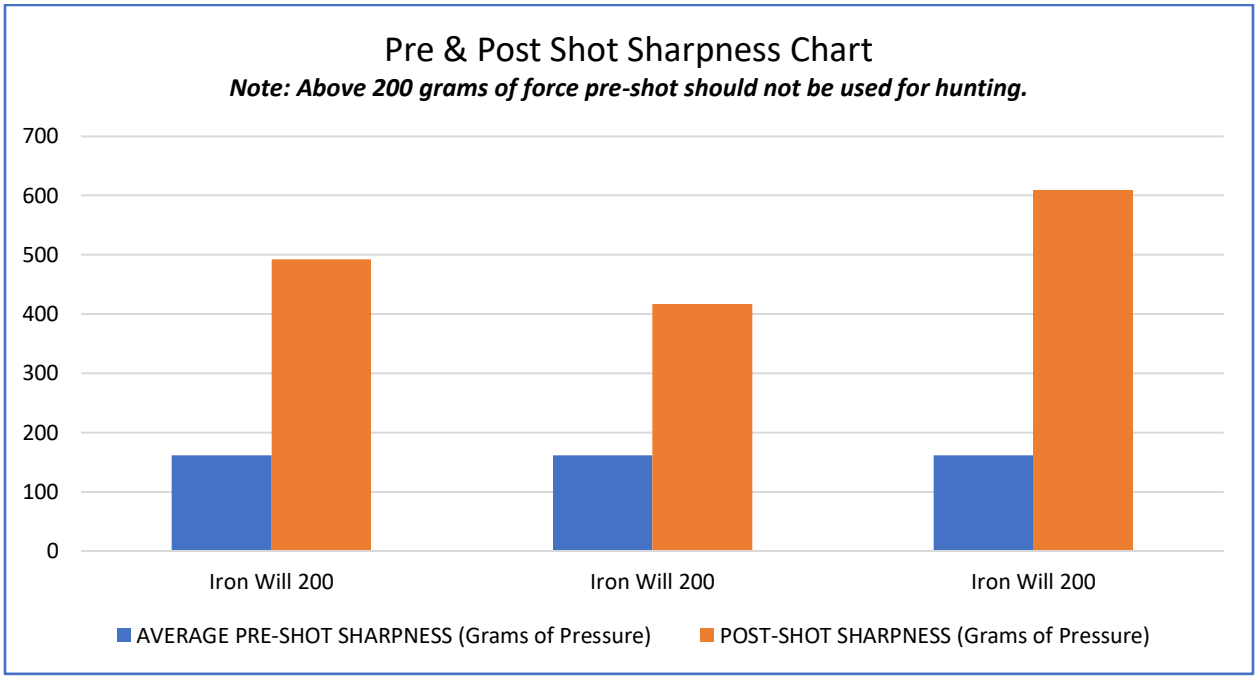


SCREENSHOT OF IRON WILL OUTFITTERS WEBSITE
WITH EXAMPLE OF FORWARD-FACING LIP CIRCLED IN RED

Iron Will Pre-Shot

Iron Will Post-Shot





RATING BASED ON 12 FACTORS		
BROADHEAD: IRON WILL 200 SINGLE BEVEL		
Factor	**Description**	**Grade**
1	Structural Integrity	A
2	Perfect Flight	A
3	Forward of Center	A
4	Broadhead Mechanical Advantage	F
5	Shaft Diameter to Ferrule Diameter	C
6	Arrow Mass	n/a
7	Broadhead Edge Finish	F
8	Shaft Profile	C
9	Broadhead/Arrow Silhouette	C
10	Type of Edge Bevel	D
11	Tip Design	A
12	Weight Above Heavy Bone Threshold	n/a
	Iron Will 200 Single Bevel Overall Grade Rating	**C**

100-225 Grain Head Synopsis/Take-Aways:
Complete Structural Integrity: As with the 300 grain heads tested, note the penetration differences from heads that maintained complete structural integrity with the only pass through in this category with rib hits being the Evo 200 2 blade. The GrizzlyStik Maasai, also made it through the offside, but was not complete pass through on rib hits. The surprise of this test was the Sevr, the first mechanical to not structurally fail in our testing which earns them the surprise of the testing and would clearly be chosen over many in this test.

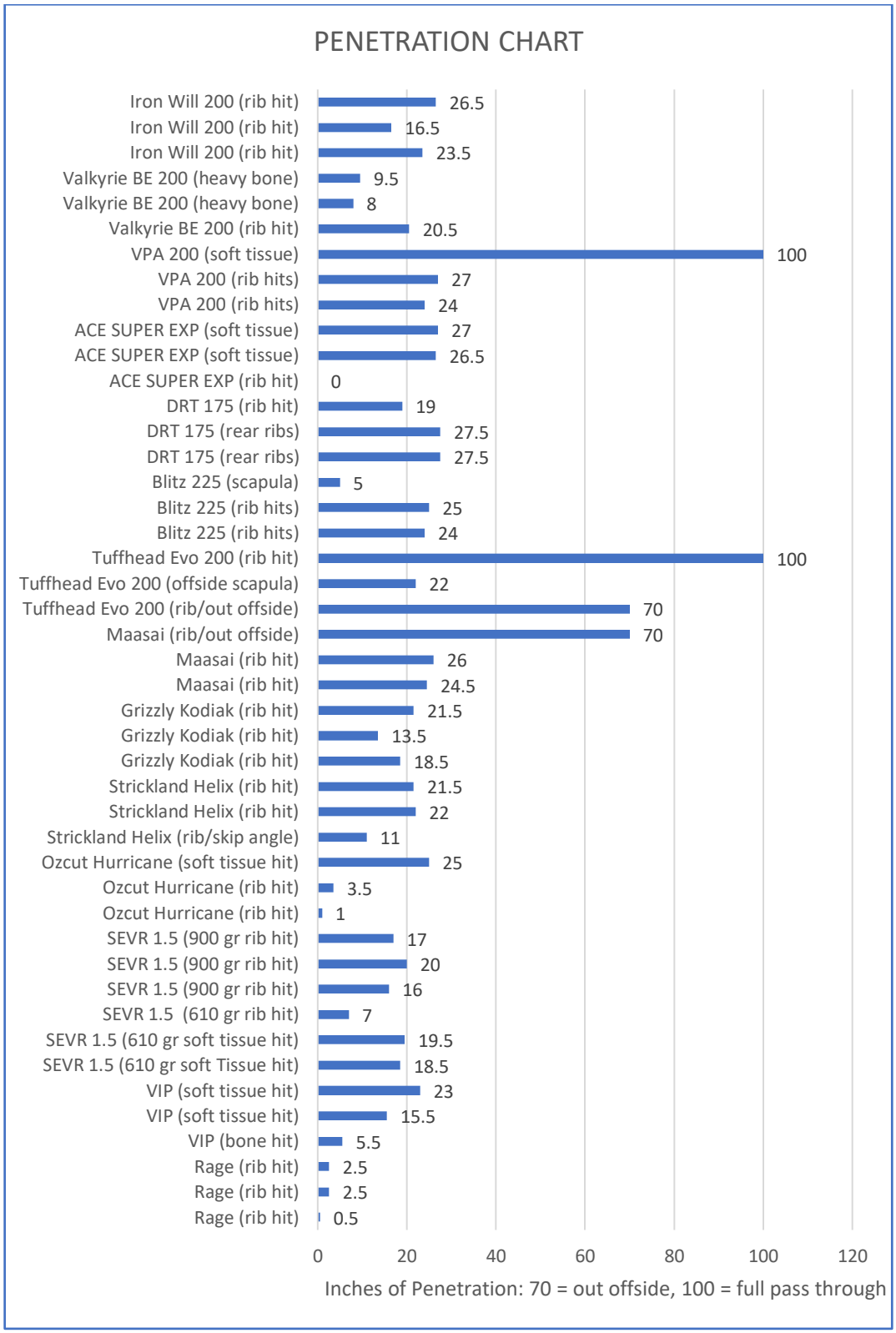
A key component of Structural Integrity is the ability of the blade to maintain its sharpness throughout the time it is flying through the animal. While some heads didn't pass the Pre-Shot Sharpness rating, the only heads in this weight category to pass Post-Sharpness ratings based off the Bess Scale for Factor #7 were Tuffhead and Blitz. **All manufacturers need to take note of their failures in this critical category and fix it.**

SIX OUT OF FOURTEEN HEADS IN THIS WEIGHT CATEGORY FAILED THE STRUCTURAL INTEGRITY TEST. It is important to note we had replaced all aluminum inserts with Ethics stainless steel components. We did have some failures in the inserts but only when we had a broadhead failure. It is important to note there were no insert failures when the broadheads remained structurally sound.

Mechanical Advantage and Tip Design: This weight range of heads falls off on MA from the 300 grain category heads due to being overall shorter. Note the difference in the Tuffhead EVO 200 2 blade and VPA 200 2 blade being similar except in tip design, ferrule and bevel edge. The Evo has a tanto tip and a round ferrule vs the VPA chisel tip with an octagonal shaped ferrule. A less noticeable difference is the higher mechanical advantage on the bevel edge on the Tuffhead at 20 degrees over the VPA at 35 degrees. Note the improvement in penetration with the Tuffhead Evo 2 blade on equivalent rib hits.

Tip Bends: The Strickland Helix had a 50% reduction in penetration with a slight tip bend attempting to redirect the direction of the shaft. Minor tip bends have a glaring detrimental effect on outcome penetration, and major tip bends, like the Rage, devastate arrow penetration.

Other heads in this weight category were reviewed and eliminated prior to this testing for various reasons, i.e., poor designs, lack of sharpness, lack of smooth transitions, history of failing on lesser game, etc. Heads that exhibited poor performance on previous tests with no improvements won't be re-tested. The animals we hunt deserve the best we can put forward to kill them quickly and cleanly, filling one tag per shot.



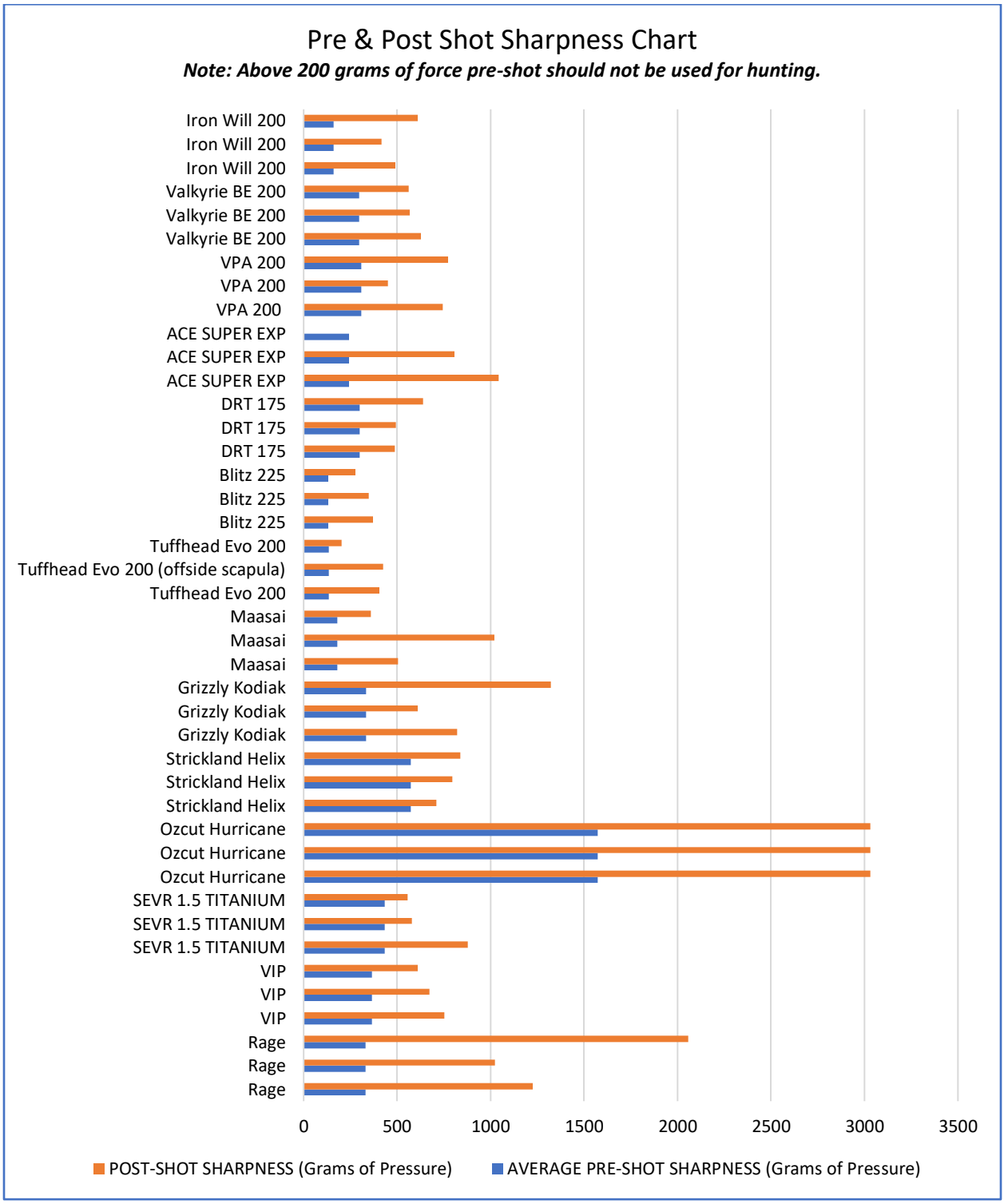


EXHIBIT "A"

Arrow Rating Guidelines Based on the 12 Factors

1. **Structural integrity**:
Total integrity is an **A**
Minor damage that has only a slight effect, such as a broadhead edge that shows minor chipping, or a tip that cleanly breaks (rather than bending) is a **C**.
Any major failure in the arrow system is an **F**.
** Receiving an **F** in structural integrity is an **automatic overall score of F** for that particular arrow system **with the only exceptions being damage to the nock AFTER LAUNCH or damage to any component(s) NOT DIRECTLY ATTRIBUTABLE to arrow impact with the tissues**.

2. **Perfect Arrow Flight** for the full flight distance to the animal, except where imperfect flight is due to interference from intervening objects.
For setups we test this should always be an **A**.
Less than perfect flight for the full flight distance to the animal is an F.

3. **Arrow's Forward of Center (FOC)** balance point:
Above 30% is **A+**.
Above 24% to 30% is **A**.
Above 19% to 24% is **A-**.
Above 15% to 19% is **B**.
Above 12% to 15% **C**.
Above 10% to 12% is **D**.
Equal to and Below 10% is **F**.

4. **Broadhead Mechanical Advantage**:
Above 2.6 is **A**.
Above 2.0 to 2.6 is a **B**
Above 1.5 to 2.0 is a **C**
Above 1.0 up to 1.5 is a **D**
Equal to and below 1.0 is an **F**

5. **Shaft-Diameter to Ferule Diameter Ratio**:
Shaft at least 5% smaller than broadhead's ferrule is **A**
Shaft diameter smaller than broadhead's ferrule by less than 5% **B**
Shaft diameter equal to broadhead's ferrule diameter is **C**
Shaft diameter greater than broadhead's ferrule diameter is **F**

6**. Arrow Mass**:
See recommended arrow weight chart for that class animal to obtain score.

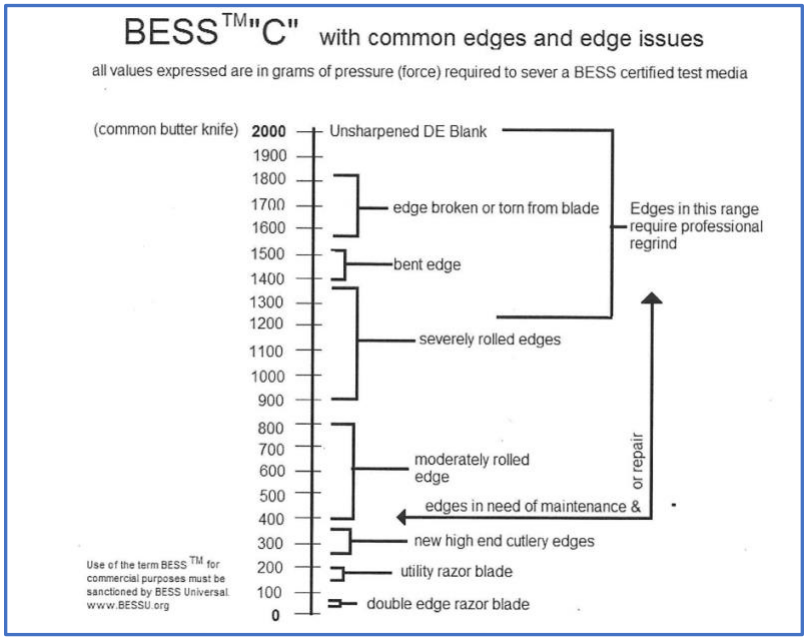
ARROW WEIGHT CHART														
GAME CATEGORY	350-400 Gr	400-450 Gr	450-500 Gr	500-550 Gr	550-600 Gr	600-650 Gr	650-700 Gr	700-750 Gr	750-800 Gr	800-850 Gr	850-900 Gr	900-950 Gr	950-1000 Gr	1000-1050+ Gr
Small Game & Varmints (Coyote, Turkey, Varmints)	D	C	B	A	A+	A+	A+	A+	A+	A+	A+	A+	A+	A+
Medium Game Thin-Skinned (Whitetail, Antelope, Mulies, Black Bear, Chupacabra)	F	D	C	B	A	A	A+	A+	A+	A+	A+	A+	A+	A+
Large Game (Elk, Moose, Brown Bear, Bison, African Plains)	F	F	D	C	C	B	A	A+	A+	A+	A+	A+	A+	A+
Larger Thick-Skinned Game (Cape Buffalo, Asiatic Buffalo)	F	F	F	F	F	F	D	C	B	A	A+	A+	A+	A+
Largest Thick-Skinned Game (Elephant, Hippo)	F	F	F	F	F	F	F	F	F	F	D	C	B	A

ARROW WEIGHT CHART LEGEND:	
THIS CHART TAKES INTO ACCOUNT THE USE OF AS MANY PENETRATION ENHANCING FACTORS AS POSSIBLE FOR THAT SPECIFIC WEIGHT CATEGORY.	
A TO A+	RECOMMENDED AND PREFERRED WEIGHT RANGES PER CATEGORY
B	ACCEPTABLE
C	FUNCTIONAL, BUT SHOULD BE IMPROVED FOR OPTIMAL PERFORMANCE
D	BARELY PASSING
F	FAIL. DO NOT USE. TOO LIGHT FOR ETHICAL HUNTING
ABF RECOMMENDS USING THE HEAVIEST ARROW POSSIBLE WITH A TRAJECTORY YOU FIND ACCEPTABLE.	

7. **Broadhead Edge Finish**: Based on a Honed and Stropped edge unless advertised by manufacturer as "Ready to Hunt" or similar statements, in which case the 'out of package' sharpness is used. Sharpness of each broadhead is rated both before testing and after testing. Scores based on standardized BESS rating scale.

PRE & POST SHARPNESS BASED ON BESS CHART	
Pre-Shot Sharpness	**Post-Shot Retained Sharpness**
Up to 80 is A+	**Up to 80 is A+**
Above 80 to 160 is A	**Above 80 to 160 is A**
Above 160 to 240 is B	**Above 160 to 240 is B**
Above 240 to 320 is C	**Above 240 to 320 is C**
Above 320 to 400 is D	**Above 320 to 400 is D**
Above 400 is F	**Above 400 is F**
Note: Bess Chart sub 400 grams of pressure to sever Bess Certified Media utilized to derive grading scale.	

BESS CHART:



SHARPNESS TESTER:

Pre and post sharpness measurements were done with each broadhead to confirm consistency. The sharpness tester measures in grams of pressure (force) to cut through its test media. See BESS chart for reference on where these heads fall pre and post sharpness. For a quick conversion, 1 gram equals 15.4324 grains.

8. **Shaft profile**:
Constant tapered shaft is **A**
Parallel to tapered shaft is **B**
Parallel shaft is **C**
Barreled Shaft is **D**

9. **Broadhead/Arrow Silhouette:**
Broadhead has smooth surfaces with no 'lumps or bumps' **and there is a long, high MA ferrule taper into blade** is **A**
Broadhead has smooth surfaces with no 'lumps or bumps' and there is a **smooth but short ferrule taper into blade** is **B**
Broadhead has surface with **minor 'lumps or bumps'** and there is a smooth ferrule taper into blade is **C**
Broadhead has surface with **substantial 'lumps or bumps' or an abrupt ferrule taper into blade** is **D**
Broadhead has surface with **both abrupt '**lumps or bumps' **and** an abrupt ferrule taper into blade is **F**

10. **Type of Edge Bevel**:
Single-Bevel Broadheads with a **25 degree or less sharpening angle** which retains undamaged appearance after testing is **A**
Single-Bevel Broadheads with greater than **25 degrees up to 35 degree sharpening angle** which remains undamaged in testing is **B**
Double-Beveled Broadheads and Single-Bevel Broadheads with a **total sharpening angle greater than 35 degrees** which remains undamaged in testing is **C**
Edge bevel that suffers **minor chipping damage** in testing is **D**
Edge bevel that shows either **significant chipping, rolled edges or other significant damage or distortion** in testing is **F**

11. **Tip Design**: Ratings based on outcomes in Tip Type Testing outcome penetration.
Cut on contact Tanto tip or needle tip that remains undamaged in testing is **A**
Cut on contact Round, arched, or chisel tip that remains undamaged in testing is **B**
Other cut-on-contact tip designs that remains undamaged in testing is **C**
Other tip designs that remain undamaged in testing is **D**
Any tip design showing damage in testing is **F**
**** Any broadhead showing a high frequency of bone skips is an automatic F. It should be annotated that the failure was because of the high frequency of bone skip.**

12. **Arrow-Mass above Heavy Bone Threshold**:
650 grains and above is **A**
Below 650 grains is **F**

END OF EXHIBIT "A"

