The Natural Angle
A PUBLICATION OF PRACTICAL IDEAS AND SOLUTIONS FOR FARRIERS
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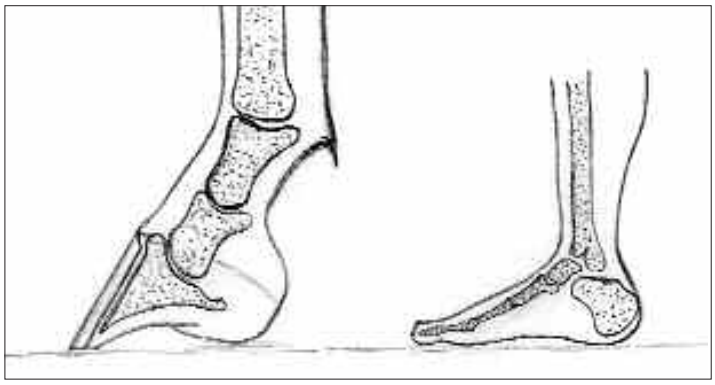
BY **MITCH TAYLOR**



This sketch illustrates the differences of bone contact to the ground between the horse and human foot. Notice the horse's coffin bone is suspended while bones of the human foot have more direct ground contact.

A Working Knowledge of Anatomy is Important to Everyday Shoeing Concerns

In order to gain a better understanding of how to approach a variety of situations in foot care, a working knowledge of the parts of the foot and leg and how they relate or 'communicate' with each other is necessary.

In nature, the general rule is that form follows function. Therefore, if you understand how a particular structure or system works, it is much easier to remember its parts. The names and types of bones in horse limbs are almost exactly the same as ours. So, if you know anything of your own anatomy, it's much easier to remember horse anatomy. For example, both the human and the horse have a scapula, humerus, radius, ulna, carpal bones, metacarpal bones and three bones called phalanges that make up our digits. However, the functions of our arms and those of the horse's forelimb are completely different making the arrangement and lengths of bone, and number of digits more suited to the needs of each animal.

One of the main differences between our feet and horses' feet is that our feet are much bigger in proportion to our body weight than the horse. Our feet don't deal with anywhere near the concussion that a horse does. If you look at the form of our feet, the bones are in almost direct contact with the ground, protected only by skin (sometimes callused) and small fibro-fat pads, which allow for easy bruising of the underlying bones when barefooted. Conversely, if we consider the horse's foot, its form is designed to withstand tremendous forces. Basically, the bones of the horse's foot (the coffin and navicular bones) are protected from direct contact with the ground by being suspended within the hoof capsule via the laminar bed.

The horse is unique in that it is able to travel great distances at moderate speeds and relatively short distances at high rates of speed. Few other animals have specialized their locomotor systems to incorporate both of these characteristics. By design, the feet and legs of horses must be able not only to bear the animal's full weight but dissipate enormous amounts of shock generated as the foot hits the ground at high rates of speed in order to maintain soundness. In addition to weight bearing and shock absorption, the foot must provide some natural traction and serve as a venous blood pump to clear the blood from the foot on its way back up the leg.

Let's look at it another way. When the average size horse (1000 lbs.) is breezing along at 30 mph the concussion that each foot and leg must deal with per stride is approximately 10,000 lbs. How does the very porous 2 1/2-ounce coffin bone handle this violent impact with the ground without fracturing?

Because the foot is the first thing to receive the impact of the ground at speed it is the first line of defense in dissipating that energy. In order to accomplish this, the foot must be both strong and elastic. Much like an engineer will combine the strengths of steel and concrete to build a foundation that not only can handle incredible weight, but also will have some ability to yield to changing conditions, the horse has developed a

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Anatomy

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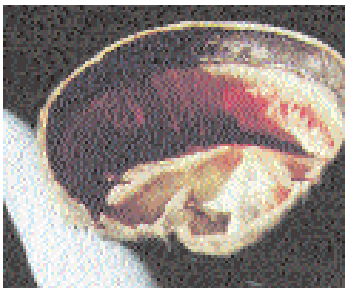
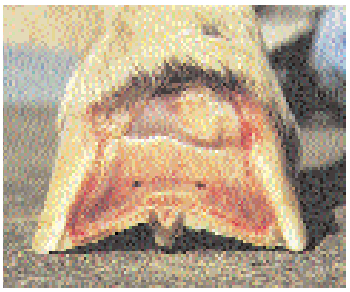
highly specialized form in its leg and foot that utilizes several different types of "materials" or tissues that when combined together are stronger than any of them alone. The design of the foot utilizes bone because it is best suited to resist compression. The coffin bone being porous would at first glance seem very fragile. But, when this bone is engorged with blood it is as strong as very dense bone and can have some elasticity if needed during the peak loading times of the stride. The navicular bone is situated adjacent to and just to the rear of the coffin bone within the hoof capsule. Two strong ligaments, the suspensory ligament of the navicular bone and the impar or distal navicular ligament hold it in place. It makes up about 1/3 of the floor of the coffin joint. The short pastern bone rests on the coffin bone and the navicular bone. Because the navicular bone is a separate entity and held in place by 'elastic' ligaments, the rear 1/3 of the coffin joint can 'hinge' or move to dissipate some energy as the pastern drops.

The hoof capsule can be described as those insensitive, protective, weight bearing structures of the foot consisting of the hoof wall, white line, sole, frog, bars and bulbs. The hoof wall takes the general shape of a cone with the top cut off. Foundations are strongest when the base is wider than the top. The function of the wall is to bear weight. It is a constant weight bearing structure, i.e., it will bear weight on hard ground or soft, bare footed or shod. Weight is transferred from the wall through the laminar bed to the bony column of the leg. The wall is designed to temporarily distort under a load. Most of the distortion of the normal foot is measured in the heel area as the heels expand.

The sole is an intermittent weight bearing structure i.e.; it bears weight depending on the situation. Obviously, if the foot is not shod and is on soft terrain the sole will contact the ground and bear weight. Only after the wall has taken a considerable amount of the load first though. A healthy dense sole is designed to handle this. If, however, the foot is shod and on hard ground it may not contact the ground at all. But because the sole is the protective foundation of the bottom of the coffin bone, it will take some weight from above. The sole is concave. It is concave because the bottom of the coffin bone from which it grows from is concave. This concave form is no accident. It functions like a leaf spring from a car, which flattens when loaded (due to the weight of the horse from above and the outward distortion of the wall) and returns to its original shape when unloaded. When soles are over pared one not only exposes the underlying sensitive sole to bruising and potential changes of the coffin bone but also, weaken this natural 'dome' and the ability of the sole to rebound back to its original shape. This results in flatter soles. Flatter soles result in less upright walls that are not as strong.





Top left: A freshly removed hoof capsule. The soundness of any foot and the regeneration of healthy horn depends on these structures being strong and elastic. **Top center:** A cross-section of the hoof showing how bony column is suspended above the ground. Notice how the hoof wall and white line are bearing weight. Also notice the dome shape of the sole. **Top right:** A cross section of rear third of hoof. The bone is replaced with the digital cushion in this area. The shape of frog and commisure allows for expansion as the foot bears weight.

The white line joins the sole to the wall. It can be likened to the rubber caulking between two cement pads at a pool. It is an elastic bond between the sole and wall that allows for some movement. The white line does not run from the ground to the coronary band but is only as thick as the insensitive sole. The white line begins at the junction of the sensitive laminae and sensitive sole. It is a constant weight bearing structure.

The normal healthy frog will take up about 1/3 of the bottom surface of the hoof. It is an intermittently weight bearing structure. It has a triangular shape with the base of the triangle being even with the buttress of the heels of the foot. The frog is an important component of the natural traction capabilities of the foot. The triangular form furrows into soft ground, much the same as a plowshare does, helping the foot stop. The soft fleshy feel of the frog helps the foot to grip hard ground as the horse turns and sets up to breakover. The frog originates from its sensitive counterpart, the sensitive frog, and is connected to the hoof capsule by way of the commisure. When viewing the foot from behind the frog has the shape of a W. This form facilitates the expansion and contraction of the heel area under the strain of a load without sacrificing strength.

The bars are sometimes a forgotten structure of the foot. They are formed as the wall folds in on itself at the buttress of the heel. Commonly over pared, they are crucial for hoof strength. Think of the bars as internal struts of the capsule. Much like the cross members on the legs of a fold up table help it to be more stable, the bars help increase the foot's stability

Up to this point we have only really talked about the insensitive hoof capsule and its bones. It is important to remember the inner sensitive structures as well. These structures comprise vasculature, fibrous cushions, interlocking laminae and cartilage. The health of these underlying tissues is dependent on the structural integrity of the hoof capsule and its ability to hold up under less than desirable conditions. Therefore, as stewards of the feet we must know anatomy, respect the horn that constitutes the hoof capsule and employ sound farrier principals to promote healthy growth of the foot. ■

Mitch Taylor *is the owner and director of the Kentucky Horseshoeing School in Mt. Eden, Kentucky. His program focuses on the anatomy and biomechanics of the equine limb as well as the fundamentals of horseshoeing and forging. For information on the program call 502-738-5257.*

Working to Certification Standards - Value Added

BY **BOBBY MENKER**

THE AFA BOOKLET "Guidelines for Evaluating Farrier Competitions and Certifications" is a useful tool in preparation for certification testing. However, its value doesn't end there. Understanding and applying these principles to your everyday shoeing can greatly improve your overall farrier skills - and your income.

The guidelines for foot preparation look for a flat, solid and level hoof wall, of uniform thickness with no excessive rasping or paring of the sole, frog or bars. Following these guidelines preserves the strength and integrity of the hoof. The hoof, pastern and shoulder angle should be the same to maintain the horse's natural structural balance.

The determination of proper hoof balance can be one of the most subjective areas of certification. However, the guidelines: the horse stands in the middle of the hoof, the coronary band is level and the foot lands flat on the ground in motion- provide for a hoof properly balanced for most circumstances.

When addressing shoe quality, the guidelines are looking for a shoe that is level and flat in all aspects, so as not to compromise the balanced hoof wall achieved with proper hoof prep. It should be forged to relieve sole pressure with the nail holes properly located (between the toe and quarters) to allow for hoof expansion. The proper fit of the nails is important to prevent shoe slippage. The smooth finish of the shoe lessens the chance of injury to horse or handler, while the tool control you develop to attain this finish greatly contributes to your overall shoeing efficiency.

The guidelines for shoe fit are looking for a shoe that does

Checking for balance, foot should be in center of limb. View down leg from behind is one check point.

Top: Notice sole and frog prep - be careful not to over pare frog or sole. Clean up any ragged edges of frog and leave smooth surface to sole. **Bottom:** Shoe is fit to perimeter of foot. Nails are not behind widest point.

not put pressure on the sole and allows for proper support and expansion of the hoof. While expansion and heel length are subjective, the "thickness of a dime" guidelines results in a correct shoe fit for many horses. Most testers will be quick to tell you that this fit guideline is not always what works best in the field, but it is important to minimize the subjectivity of the testing process. Correct nailing looks for nails 1/3 of the way up the wall with uniform, square and properly aligned clinches, for maximum strength and security.

The hoof should be finished smooth with no rasp marks or sharp edges. This serves several purposes; it lessens the chance of self-injury to the horse, maintains the protective integrity of the hoof, and provides a more visually pleasing, professional finish to the shoeing. Your owners soon notice the

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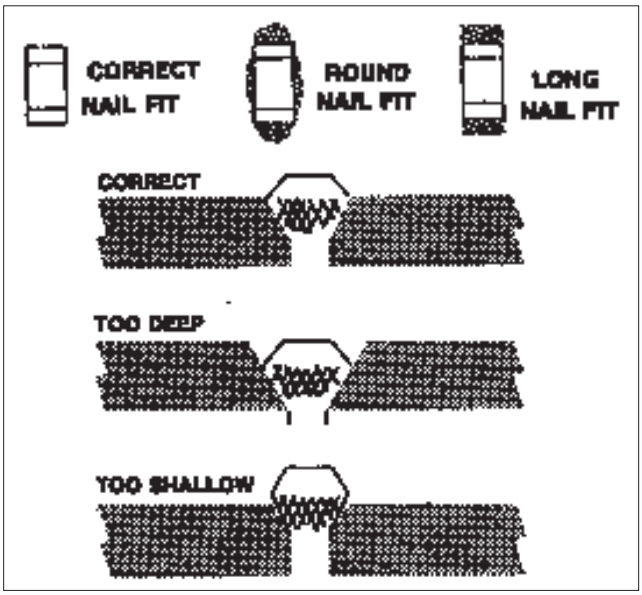
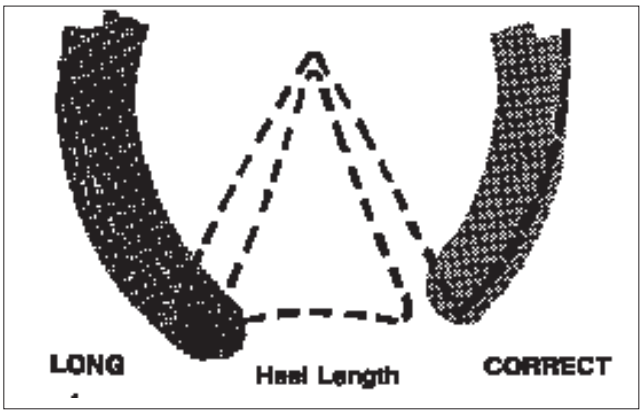
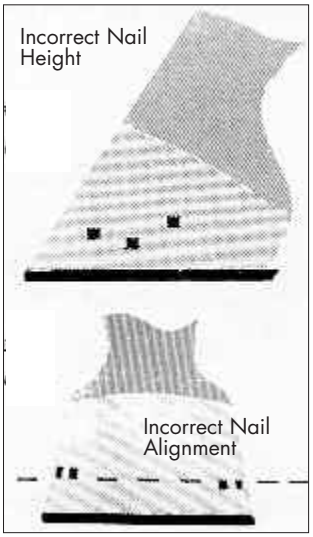
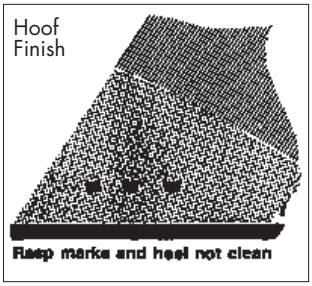




Top: Nail fit is checked for keg shoes and hand made shoes. Don't assume nail fit is automatic in keg shoes. Your choice of shoes for certified level can impact on this scoring point. **Above:** Heel length should be dime's width from end of hoof. **Bottom left:** Nail placement should be as even as possible- 1/3 up the wall and in a good line. **Bottom right:** Finish is critical and points can be some of the easiest if you make sure not to leave rasp marks or unclean areas. A finish file and a sanding block are very useful tools.





Sketches courtesy *Guidelines for Evaluating Farrier Competitions and Certifications.*

Standards

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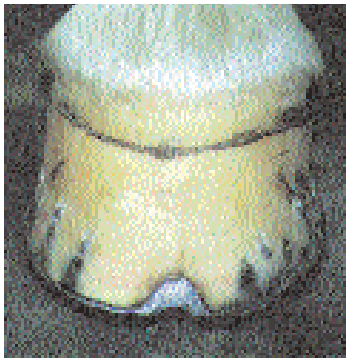
results of this effort to provide a better finish. In fact, this may be all that they see.

As the name indicates, the AFA booklet provides guidelines for evaluating shoeing in testing and competition settings. Some guidelines are correct for all situations; others are more subjective. But there have to be standards established for testing and competitions. The important point here is to know that application of many of these guidelines in your everyday shoeing will serve you well. By understanding and gaining proficiency in these basic standards; ideal for many horses, under many circumstances; you will build a strong foundation and base of support for your practice. This foundation will prove invaluable as you branch into more specialized circumstances. ■

__Bobby Menker__ of Findlay, Ohio has been shoeing since 1979. He is an active member of the Mid-Eastern Farriers Association and American Farrier's Association. Bobby has been consistently involved in efforts to bring more educational opportunities to farriers. He has recently been named a tester for the AFA Certification program and has done a number of certification clinics.

Below left: Finished job from side- notice expansion, nail line, clinches and finish. **Below right:** For journeyman test, clips should be set flush in foot. Again, spend adequate time getting clean finish to outer wall.



New Products

SX-7 Rim Shoe
Kerckhaert and FPD continue to work with you to develop shoes that meet your needs. The latest addition is the SX-7 Rim shoe, a light traction shoe ideal for the horse that needs that extra bit of grip to reach maximum performance levels. This new shoe has the same front and hind pattern and punching that has made the SX-7 one of the most popular Kerckhaert shoes. You'll find this to be an excellent choice for your barrel and roping horses, light hunters and trail horses where terrain allows for a lighter shoe. The SX-7 Rim shoe is now available in sizes 00, 0 and 1.

farrierproducts™ SX-7 Egg Bar Shoes
The SX-7 clipped front egg bar shoes are now available at your farrierproducts™ dealer. The shoes are creased and clipped and come in sizes 000 through 2. ■