

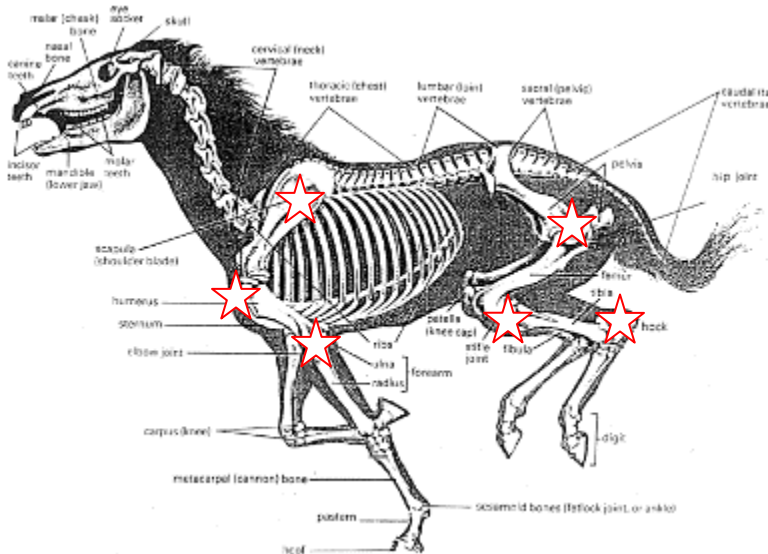
Middle California Region USPC Movement And Conformational Unsoundnesses

Movement:

What makes a good mover? Good movers are born (inherited traits and good conformation) and made (training).

The Gait makers:

- The limbs' range of motion
- Coordination of the legs
- Stride length
- Agility
- Foot flight (the path the foot follows in the air)
- Tempo – the stride rate
- Scope (largeness of movement, as in the ability to jump wide without a speedy approach)



The stars indicate the average placement of the skeletal pivot points that fix limb leversages.

Placement of the skeletal pivot points fixes the limb leversages, thereby determining the range of motion and the length of stride. For example in the shoulder: when the star is near the withers the front leg swings in a longer arc giving a longer stride suitable for covering ground and the makings of a good mover; when the star is lower the stride will be shorter- the movement quicker suitable for agility sports, polo cutting horse. Skeletal angles and length of bones also affect the gait.

The skeletal muscles move the bones; various muscle groups each have their role to play, and the entire muscular system works together in a coordinated effort, in a "circle of muscles". Placement of the muscles points of attachment influences the horse's range of motion. In the hind leg the rump muscles attach to the top of the femur about 2 ½ inches above the hip joint – where the leg pivots as the horse pushes forward. A contraction that shortens the controlling muscle just 1 inch makes the foot move

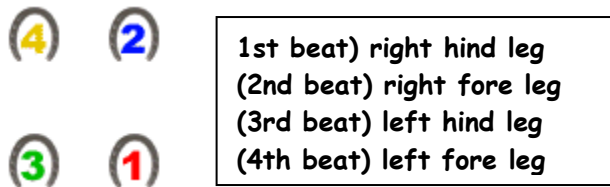
about 20 inches. If the bone above the hip were just ½ inch longer, the foot's range of motion would be cut by 3 ½ inches for the same 1 inch muscle contraction imparting 20% more power but slower movement. Conversely the shortening of the bone results in a shorter muscle decreasing the power but increasing the speed of movement of the hind leg. Because the limb controlling muscles are located so high in the body, tiny differences in muscle attachment can produce dramatic differences in the foot's range and motion.

Muscle strength influences foot flight.

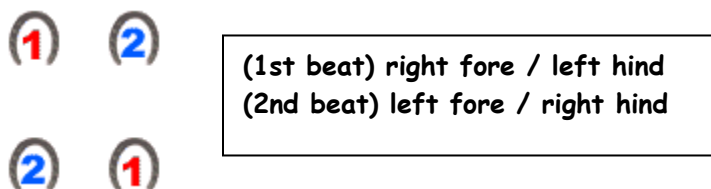
The percentage of fast-twitch versus slow-twitch muscle fibers is genetically determined. The more fast-twitch fibers the horse has, the more suited to sports that require bursts of speed and agility. The more slow-twitch fibers the horse has, the more suited to sports that require endurance.

The horse's nervous system initiates the gait, maintains the gait and recruits the muscle fibers and muscle groups which ultimately determine the degree of coordination and quickness each horse exhibits in his movements. Inheritance determines much of the nervous system's effects and training improves the response. The horse is "wired" to pace or trot. Foot flight and tempo are also related to the horse's nervous system's response.

The Natural Gaits:



Walk: The walk is a four-beat gait that averages about 4 mph. When walking, a horse's legs follow this sequence: left hind leg, left front leg, right hind leg, right front leg, in a regular 1-2-3-4 beat. At the walk, the horse will always have one foot raised and the other three feet on the ground, save for a brief moment when weight is being transferred from one foot to another. A horse moves its head and neck in a slight up and down motion that helps maintain balance.



Trot: The trot is a two-beat gait that averages about 8 mph, or roughly the speed a human can run. A very slow trot is sometimes referred to as a jog. An extremely fast trot has no special name, but in harness racing, the trot of a Standardbred is faster than the gallop of the average non-racehorse. In this gait, the horse moves its legs in unison in diagonal pairs. From the standpoint of the balance of the horse, this is a very stable gait, and the horse need not make major balancing motions with its head and neck. The trot is the working gait for a horse. Despite what one sees in movies, horses can only canter and gallop for short periods at a time, after which they need time to rest and recover. Horses in good condition can maintain a working trot for hours.

2 3

1 2

The Right-Lead Canter:
(1st beat) left hind leg
(2nd beat) right hind / left fore
(3rd beat) right fore leg

Canter: The canter is a controlled, three-beat gait that usually is a bit faster than the average trot, but slower than the gallop. Listening to a horse canter, one can usually hear the three beats as though a drum had been struck three times in succession. Then there is a rest, and immediately afterwards the three-beat occurs again. The faster the horse is moving, the longer the suspension time between the three beats. In the canter, one of the horse's rear legs – the right rear leg, for example – propels the horse forward. During this beat, the horse is supported only on that single leg while the remaining three legs are moving forward. On the next beat the horse catches itself on the left rear and right front legs while the other hind leg is still momentarily on the ground. On the third beat, the horse catches itself on the left front leg while the diagonal pair is momentarily still in contact with the ground. The more extended foreleg is matched by a slightly more extended hind leg on the same side. This is referred to as a "lead".

3 4

1 2

The Right-Lead Gallop:
(1st beat) left hind leg
(2nd beat) right hind leg
(3rd beat) left fore leg
(4th beat) right fore leg

Gallop: The gallop is very much like the canter, except that it is faster, more ground-covering, and the three-beat canter changes to a four-beat gait. It is the fastest gait of the horse, averaging about 25 to 30 miles per hour, and in the wild is used when the animal needed to flee from predators or simply cover short distances quickly. Like a canter, the horse will strike off with its non-leading hind foot; but the second stage of the canter becomes, in the gallop, the second and third stages because the inside hind foot hits the ground a split second before the outside front foot. Then both gaits end with the striking off of the leading leg, followed by a moment of suspension when all four feet are off the ground. A careful listener or observer can tell an extended canter from a gallop by the presence of the fourth beat.

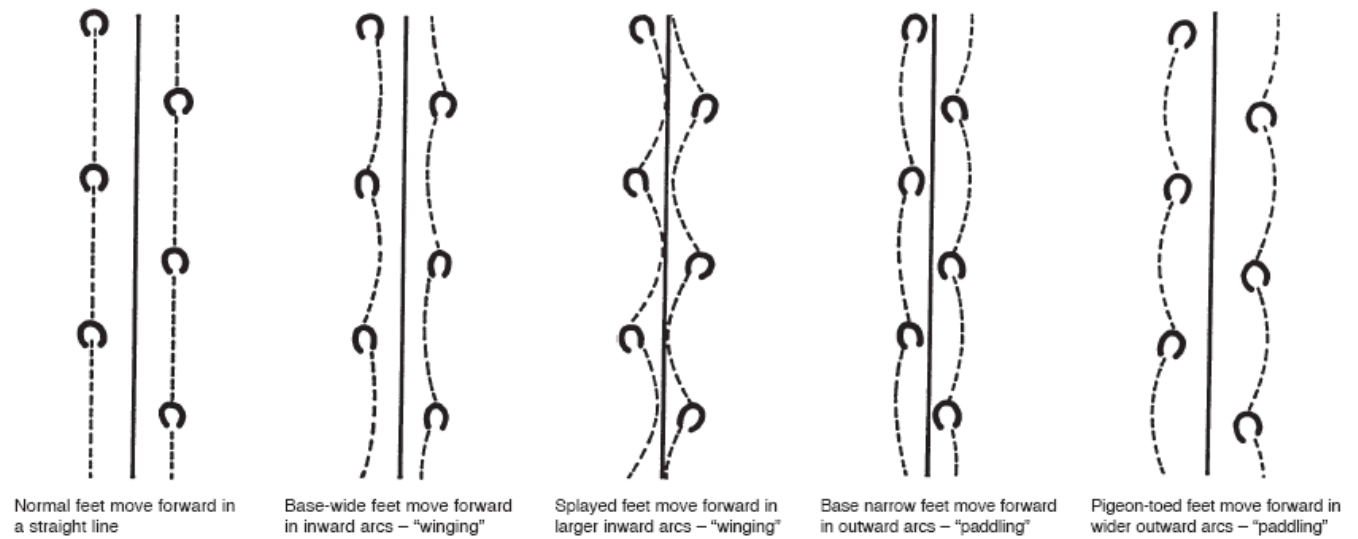


Figure 5. Path of Feet as Seen from Above

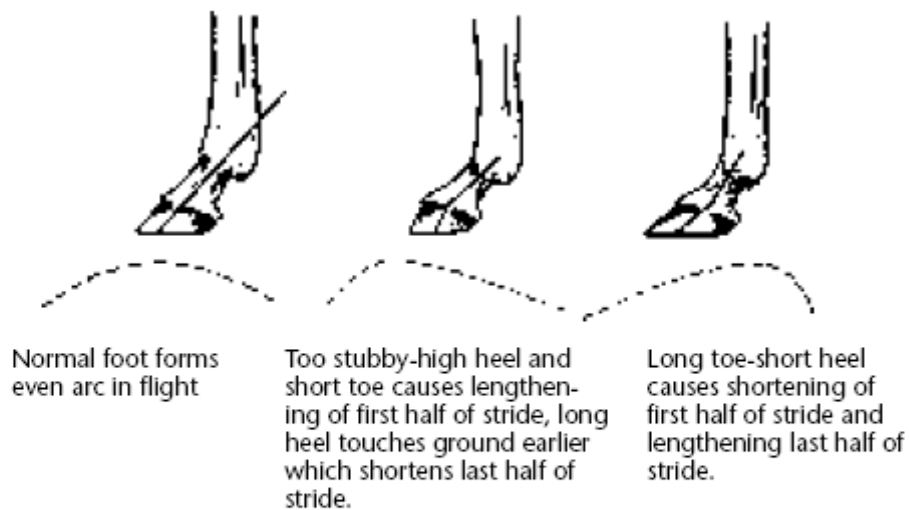
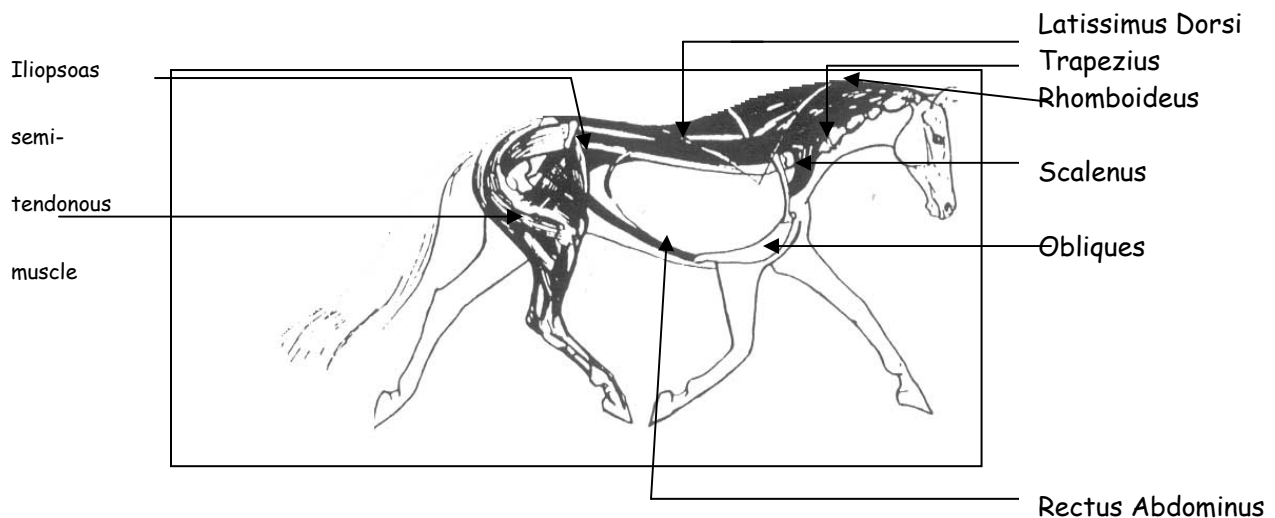


Figure 3b. This illustrates how the length and slope of the hoof affects way of going.

The Circle of Muscles:

Horses effectively have a circle of muscles running from the poll along the back, over the quarters and down to the hocks. The lumbo-sacral joint is the center point of this system. (It is completed by the abdominal muscles, which run from the floor of the pelvis, deep in the groin, to the breastbone and the bottom edge of the ribs.) The major muscles in the system - the iliopsoas in the pelvis, and the external and internal oblique and the rectus abdominis muscles of the abdomen - complete the ring. A horse with a deep groin, almost as deep as his girth, has more muscle mass in the abdomen and can bascule and engage the hindquarters more easily and carry the rider more effectively. All desirable movements of the horse - *impulsion, collection, engagement, lightness, and stride length* - originate in these ring muscles. The "ring of muscles is the unifying principle of riding. All horses no matter what they are bred for, function from this ring. The well conformed horse is the one who is so structured and so fitted that his ring of muscles is able to function most powerfully.

A problem with any of these muscles within this circle effectively breaks the circle and impaired function or action results. The trapezius muscle which forms part of the circle sits directly above the muscles of the shoulder - a problem in the trapezius thus eventually affects these muscles of movement, thereby visibly shortening the horse's stride. The longissimus dorsi is the connecting musculature between the powerful hind quarters and the horse's front end. Soreness or restriction here will tend to make the horses back hollow and dramatically reduce the degree of engagement of the hind quarters. The circle of muscles support the horse's long, heavy gut and aid in breathing; in movement, they act as powerful pelvis flexors, bringing the hindquarters under the horse and raising his back. They are aided by the psoas muscles, which run from the underside of the spine to the pelvis and to each thighbone. Horses that move well have strong, well-developed abdominal and psoas muscles; in those that move hollow, these muscles are unfit and flabby, the equine version of a "beer belly."






MOVEMENT	DEFINITION	PREDISPOSING CONFORMATION
Brushing	Light contact of any form between 2 legs where no injury occurs but only hairs may be worn away	Base narrow
Cross firing/ Cross Canter	Defective leg action occurring in pacers when the hoof of the hind-leg hits the fore-leg on the opposite side of the body. E.g.: LR contacts RF	
Daisy Cutter	The feet are barely lifted high enough to clear the ground	
Drags Toes	Horse drags toes, usually the rear limbs (wear marks on the front face of the rear toes)	Bone Spavin: caused by cow hocks, post leggedness, sickle hocks, bowed hocks
Forging	Toe of the hind foot slaps the toe or the shoe of the forefoot on the same side creating a metallic clicking	Short back with long legs; fatigue; long toes; young unbalanced horse
Gaiting/Gaitedness	Running walk, fox trot, amble and rack: the legs on the same side of the body move as lateral pairs instead of diagonal pairs (as in the trot)	Breed Characteristic Horse's often have: long backs and loins which tend to hollow with elevated heads and shoulders. Comfortable ride.
High Action, High Motion in front	Horse's knees lifted high into the air (snapped)	Heritable (Saddlebreds) or trained with weight, etc. Long toes Shoulder arm bone angle < 90°
High motion behind	Snaps hocks and stifles upward	Sickle hocks, cow hocks, bowed legs
Interfering	Hoof swings inward to strike the opposite leg below the knee or the hock	Toed out or Base narrow
Lame	Sore or Off Uneven hoof beats can be heard on hard ground	Horse tries not to step on sore leg; takes shorter stride with sore leg; front: head up when steps on sore leg, down when steps on good leg; hind: hip carried higher on lame side and head down when sore leg touches ground and head up when good leg touches the ground; Sore joints horse will travel stiffly and avoid bending joint
Not tracking up	Does not step under himself with rear legs	Pain in one or both hind limbs, the back or loins; pain in one or both of the front limbs that restricts the shoulder swing and necessarily shortens the horse's rear leg stride. Difficulty flexing at the lumbosacral joint

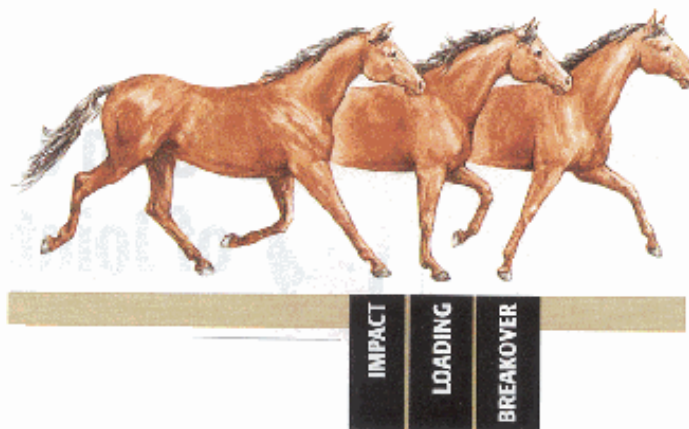
Overreaching	Toe of the rear foot strikes the toe of the front hoof usually at the bulb of the heel	Short back with long legs; fatigue; long toes; young unbalanced horse; Overly long stride or asynchronous movement between the rear and front legs
Overstepping	The rear foot is placed forward beyond the imprint of the forefoot	Long stride length and covers more ground; laid back sloping shoulder and long arm bone with high withers; low stifle/long hip
Paddling	The hoof in flight “paddles” outward to the side; foot breaks over to the outside of the toe at each step	Toed in Base Narrow
Plaiting/Rope Walking	Hoof travels on and inward arc as horse moves forward, the horse then sets the foot down directly in line with the opposite front leg	Base Narrow; Toed out (predisposes to tripping and stumbling)
Pony Gaited/Short strided	Short choppy steps	Steep upright shoulders coupled with short arm bone (humerus); upright pasterns; mutton withers; pain in the forelimb usually the feet; navicular syndrome
Scalping	At fast trotting speeds the toes of the horse’s front foot “scalps” the front of the coronary band, pastern or canon region on the hind leg on the same side	
Scope	Degree of freedom, range of motion of limbs while in motion	Good conformation especially of the shoulder angle > 90°
Sound	Good normal movement; free from pain or disability	Good conformation
Speedy Cutting	Any type of interference from any limb to any other limb while the horse is moving at speed	
Stargazer	Head and neck carried high in an extended position	Ewe neck, poor back and abdominal muscle development (may be caused by bad riding)
Straight and true	When viewed from the front or the rear each hoof travels straight without deviating inward or outward	Good balanced conformation
Stringhalt	Exaggerated and involuntary flexion of one or both rear legs toward the belly as the horse moves off at the walk, backs up or turns	Injury to nerve or tendon supplying the hock; ingestion of certain toxic plants (<i>Singletary Pea, Caley Pea, Sweet pea, Cat’s ears</i>)
Stumbling	Horse does not pick up front feet high enough to clear the ground	Foot soreness making the horse less eager to pick up or put down foot; navicular disease or syndrome; poor shoeing, stone bruises, corns, long toes. Poor balance, arthritis

Symmetrical	Both front and hind legs move evenly with the same arc, height and length of stride	Good balanced conformation
Uncoordinated/ Proprioceptive Defect	Uncoordinated movement may be associated with pain or neurological disease	Wobbler's syndrome (associated with necks slender at the top of the throatlatch), EPM, any infectious disease that affects the nervous system e.g.: rabies, EEE,
Winging	Hoof flight swings inward tendency to cause interference; foot breaks over at the inside of the toe at each step	Toed out Base Wide

Conformation as it relates to Specific Horse Occupations:

Horse Occupation	Desired Movement	Desirable Conformation
Western performance horse 	Sprinting Athletes; "weight lifters"; maximal power in short period of time; lighten forehand and collect frame for sudden changes of direction while retaining flexibility and suppleness	Fast-twitch muscle fibers (quarter horses have ~ 90%); fast nervous system response (inherited); Good bone, strong joints and tendons; moderately short neck to lighten forehand; moderately low withers so cat like movement doesn't cause saddle to jam into the horse's spine; low knees and hocks (short canons (ideal 9 inches), long forearms, long femurs, moderately long gaskins (the best have distance from ground to point of hock 22-23 inches); all joints large and strong especially the hocks; hocks relatively straight without excessive angulations; short and broad loins; hind hooves under the body but no sickle hocks; moderately short croup; muscles strong, well developed and rounded; big chest and forearm muscles
Jumping Horse 	Need speed, agility and strength; quickly turn and bend, accelerate and decelerate; Bring his haunches underneath to slow down quickly; long ground covering stride and ability to tuck the knees	Good solid muscling of the hindquarters with the hindquarters comprising @ least 1/3 of the horse's body length; big bone and tendons; feet large and broad with a good cup (concave); well developed frog and bars of the feet; medium pasterns, short canons, large tendons running behind the lower leg; No limb crookedness; Long sloping shoulder coupled to a long arm bone ideal angle 105° (no less than 90°); loins short strong and broad but little longer than Western horse (but not

		too long); high and broad withers; the neck should carry back through the withers (not be set on too low although some hunters prefer the look); moderate neck length to aid in balancing over the jump
<p>Dressage Horse</p> 	Fluid smooth elastic movement; ability to lower the haunches and shift the weight to the back; evenness and length of stride; impulsion, drive and suspension	Good solid muscling of the hindquarters with the hindquarters comprising @ least 1/3 of the horse's body length; big bone and tendons; a little more angulation in the hocks than the jumping or reining horse is okay increasing the stride length and creating a little more "brilliance"; Strong solid hock joints (90% of unsoundnesses in the dressage horse are in the hocks); short canons, long femur and short gaskin to promote strength in rear end; a little longer back to simplify canter work and canter departs (but not too long); short strong wide loin; long sloping shoulder with long sloping arm bone; long forearm, short canons, medium pasterns, strong feet



Thoroughbreds and Appaloosa = 80-90% fast-twitch muscle fibers

Standardbreds = ~ 80% fast-twitch muscle fibers

Arabians = 70-80% fast-twitch muscle fibers

Conformation leading to Blemishes and Unsoundnesses

Contributing Conformation	Description/ Location	Causes	Blemish or Unsoundness
Base Wide	The legs(feet) are wider (farther apart) at the bottom than the chest	More stress on the inside of the foot	Ringbone, Sidebone
Base Narrow	Feet (legs) are narrower (closer together) at bottom than chest	Plaiting, Interference or stumbling, more stress on outside of foot	Ringbone, Sidebone
Toed In	Toes are pointed inwards, Deviation can be from fetlock up	Paddling, Stress on outside of foot	Ringbone, Sidebone
Toed Out	Toes pointed outwards, Can be from fetlock up	Winging, Interfering, Brushing, Stress on inside of foot	Ringbone, Sidebone
Straight Shoulder	Too straight open angle less than 90°	Less range of motion in shoulder and foreleg short stride up and down stride, less ability to fold knees when jumping	Increased concussion ringbone, sidebone
Mutton Withers	Ill defined withers	Less range of motion, shorter stride, not a scopey mover or jumper because less area for muscles of shoulder and back to attach	Difficulty fitting saddle, less athleticism
High Withers	High withers from 8 th -12 th thoracic vertebrae	Difficulty fitting saddle, prone to wither sores ** makes horse more athletic because more places for muscle to attach ****	
Short upright pasterns	Bones of fetlock usually front legs, Straighter up than 45°	Increased concussion on bones and joints of the pastern	Osselets (Concussion related arthritis of the pastern joint), sidebone, ringbone, splints, bucked shins, navicular disease, windpuffs
Long sloping pasterns	Longer and weaker	More stress on flexor tendons and pastern may even strike the ground	bowed tendon, injury to sesamoid bones, ringbone
Over At The Knee	Knee is over the plumb like from the side	Stress from back of knee down to fetlock	Tendon Strain, Stumbling
Back At The Knee (Calf Kneed)	Knee is behind the plumb line	Stress on the knee and flexor tendons	Carpitis, Inflammation of the knee joint, Carpal Chips, Fractures, Bowed Tendons, arthritis

Bench Kneed	Cannon bones are set to the outside of the knee	Stress on the inside of the knee to the fetlock	Splints, Ringbone, arthritis
Long Back	Back is long	Weak back less able to carry weight	Sore Back
Short Back	Back is short	Usually stronger	
Knock Kneed	Cannon bones are set to inside of knee	Stress on outside of knee	Inflammation of Knee joint, splints, arthritis, ringbone
Tied in below the knee	The tied-in leg shows the tendon slanting in toward the knee. The flexor tendons are too close to the cannon just below the knee.	Stress on the tendon, the knee joint tends to be too small	Tendon lameness, arthritis in the knee joints
Bow Hocked	Bow-legged horses have hocks that are too far apart	More stress on the outside of the hock and hind leg	Bone Spavin, Bog Spavin, thoroughpin
Cow Hocked	Hocks pointed in and toes pointed out in hind legs	Stress on Inside of hocks	Bone Spavin, Bog Spavin, thoroughpin
Sickle Hocked	Hind limbs bent more than normal at the hock, placing the hooves farther forward than ideal	Hock less able to extend fully more stress on the plantar ligament	Bone Spavin, Bog Spavin, thoroughpin, curby hock
Straight hocked (post legged)		Less able to flex and absorb shock, making collect gaits more difficult, stress on hock joint	Bone Spavin, Bog Spavin, thoroughpin
Straight Stifle	Straighter angle of stifle joint	Stress and inflammation	Arthritis, locked stifle
Contracted heels	Narrower at the heel	Lack of frog pressure and poor circulation	Navicular disease
Flat Soles	Soles flat and close to ground	May be caused by coffin bone rotation	Tender feet
Low Heels	Heels low to the ground may be accompanied by long toes	Poor shoeing or inherited	Navicular disease, syndrome, stress on deep digital flexor tendon, when accompanied by long toes: sesamoiditis, bowed tendons

Condition	Blemish (B) Unsoundness (U)	Definition
Osteoarthritis/ Osteoarthrosis/Degenerative Joint Disease (DJD)	U	Arthritis is a general term for joint inflammation and can affect any joint in the body; Osteoarthritis = DJD is considered synonymous with arthritis; There is progressive deterioration of the joint and irregular boney formations at the joint. E.g.: bone spavin, ringbone, etc
Developmental Orthopedic Disease (DOD)/Osteochondritis	U	Encompass all orthopaedic problems seen in the growing foal and includes: Osteochondritis dissecans; Subchondral cystic lesions; Angular limb deformities; Physitis; Flexural deformities (these may have no defined cause, or may be secondary to osteochondrosis or physitis); Cubodial bone abnormalities; Juvenile osteoarthritis Osteochondritis dissecans or osteochondrosis (OCD) = disturbance in endochondral ossification, an area of retained cartilage can be formed with a consequent defect in the bone (<i>rapid growth, nutrition, excesses or imbalances and superimposed trauma on the cartilage, Genetic predisposition</i>)
Capped Elbow (Shoe boil)	B	A swelling of the bursa on the point of the elbow of a horse usually caused by pressure of the horse's heel against the elbow when lying down
Capped Hock	B	A swelling of the bursa on the point of the hock usually caused by kicking of the stall or fence boards or hard floor with insufficient bedding
Carpitis	U	Inflammation of the knee (carpal joint) caused by stress or trauma; joint hot and swollen
Splints	B/U	Tear of the interosseous ligament that holds splint bones to canons; ligament subsequently becomes ossified forming a hard lump; horse may be lame when forming and splint "hot" but when healed and "cold" a blemish; may also be lame if large splint close to and interferes with the Suspensory ligament
Bowed Tendons	U	Stretching, swelling and tearing usually of the superficial digital flexor tendon and its sheath (but can include the DDFT, and/or the SL); usually on the front legs; as the tendon tear repairs itself it becomes thickened (the bow); High Bow = close to the knee; Low Bow = close to pastern
Bandage Bow	B	Bandage bows are caused by applying a bandage too tightly, creating an acute pressure injury to the tendons. The compression may cause the area to swell once the bandage is removed, giving a "bowed" appearance. However, the damage is usually just to the skin and not to the tendon itself.

Bucked Shins	B	Inflammation of the periosteum (single cell covering of the bone that contains the cells that make and remodel bone); Can have microfractures on the front of the canons usually front legs; Canons hot and sore and horse is lame but when heals may leave slight enlargement on front of canon)
Osselets	U	Arthritis of the fetlock joints usually found in front legs; seen as a swelling slightly above or below the center of the joint and off center of the exact front of the leg. The fetlock may have a square appearance.
Suspensory Injury	U	Sprain resulting in tearing and damage to Suspensory ligament
Contracted Heels	B/U	Are not usually considered an unsoundness but maybe part of an unsoundness such as navicular disease. Contracted heels are caused by lack of frog pressure; which worsens as the lack of such pressure continues. Seen in horses keeping their weight off the heels (navicular), poor shoeing, lack of exercise, stall confinement.
Corns	U	A bruise of the soft tissue underlying the horny sole of the foot in the angle between the bars and the wall which is seen as a reddish discoloration of the sole immediately below the affected area. A suppurating corn becomes infected and can cause an abscess.
Hoof Cracks	B/U	Range from superficial blemish to serious unsoundness. Depth if reaches sensitive laminae = U or B if superficial. Cracks = toe, heel or quarter; Sand cracks = down from coronary band – from concussion in dry hard feet especially unshod feet; Grass up from ground usually on unshod hooves that have grown too long; Surface cracks = tiny fissures that cover various parts of the hoof wall usually reflect changes in moisture of the hoof; Blow-out = horizontal crack usually from injury to coronet band or hoof wall –usually no problem
Founder	U	Damage to the hoof as a result of a case of laminitis; may become chronic with coffin bone rotation, founder rings, dropped soles, turned up toes, separation of the white line, move as though moving on eggs, may put heel down first.
Navicular Disease/ Syndrome	U	Inflammation of the navicular bone, bursa, and/or the DDFT, bone may develop irregularities (lollo-pop indentations)
Windpuff	B	Windpuffs (Windgalls) are distentions of a tendon sheath, bursa, or joint capsule on a horse's legs, usually on the fetlock.
Sesamoiditis	U	Inflammation of the sesamoid bones in the horse's fetlock
Ringbone (High/Low)	U	Arthritis with exostosis (bone growth) in the pastern (high) or coffin (low) joint; bony outgrowth which may completely ring the pastern region (hence the name "ringbone"); "high ringbone" occurring on the lower part of the large pastern bone or the upper part of the small pastern bone. "Low ringbone" occurs on the lower part of the small pastern bone or the upper part of the coffin bone.

Sidebone	B/U	Ossification of the collateral cartilages of the pedal bone. These are found on either side of the foot protruding above the level of the coronary band. The lateral cartilages support the hoof wall and provide an important role in the support and cushioning provided to the heel. The front feet are most commonly affected. Usually does not cause lameness unless the bone gets very large or broken.
Curb (hock)	B	Sprain of the plantar ligament that runs down the back of the hock; causes lameness when forming but blemish after heals.
Bone Spavin	U	Bone spavin is osteoarthritis, or the final phase of degenerative joint disease (DJD), in the lower three hock joints. It usually affects the two lowest joints of the hock (the tarsometatarsal and the distal intertarsal joints), <i>Jack spavin</i> is the term used for a large spavin that can easily be seen; Occult spavin = one that cannot be seen on the outside
Bog Spavin	B	Synovitis (inflammation of the lining of the joint capsule), A soft filling of the natural depression on the inside and front of the hock. A bog spavin is much larger than a blood spavin. In most horses bog spavin does not cause lameness. However, bog spavin can be a sign that the horse has joint disease, which is a very significant finding.
Blood Spavin	B	Spavin caused by distension of the veins A varicose vein enlargement which appears on the inside of the hock and immediately above the location of a bog spavin.
Thoroughpin	B	An abnormal swelling on either side of the hock joint; Swelling of the synovial sheath of the deep flexor tendon above the hock.
Upward fixation of the patella	U	Locking stifles or the <i>upward fixation of the patella</i> is may be a short term problem in young growing horses or a chronic problem, (straight hind legs and stifles upright). The patella is the horse's knee cap. Horses have the ability to physically lock (fixate) their leg in the extended position. This purposeful locking of the stifle allows the horse to remain upright while sleeping or resting without falling over. The problem occurs when the stifle will shift into its 'locked' mode during normal movement, or will lock normally at rest but will be difficult for the horse to 'unlock' in order to move. The severity ranges from a slight 'hitching' of the joint as the horse tries to keep it from catching, to a complete lock of the joint, so that the horse is unable to bend it whatsoever and must swing the limb out to the side by the hip in order to move and until the joint frees itself. The locked stifle is apparent when a horse moves off from a stand still and the effected hind leg jerks suddenly upward.