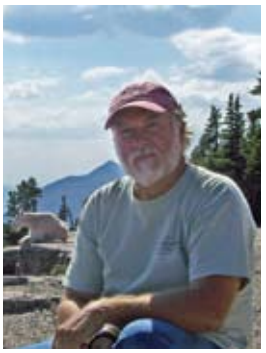

The Builders' Forum

By Dan Starck, Co-Chairman of the USEA Eventing Course Designers/Builders Committee, Member of the USEA Safety Committee, and an active professional course builder since 1985.

Portable cross-country jumps where unheard of 20 years ago. Now, I believe, more jumps are built portable than permanent. The flexibility of moving jumps around enables designers to easily change courses and fine tune distances between obstacles in complexes. However, their portability creates a new problem.

Cross-country jumps, by definition, are massive, immovable obstacles. The *USEF Rules for Eventing* states in EV140, section 3a: "The obstacles must be fixed and imposing in shape and appearance. When natural obstacles are used, they should, if necessary, be reinforced so that they remain in the same state through out the test." A cross-country jump that can move or tip not only defies the definition, but also poses a safety hazard. Last October, an amendment was added to the rules. It continues in the same section: "Portable fences must be secured to the ground in a way that the fence cannot move."

There are several techniques commonly used to accomplish this; some more effective than others. I will discuss some here and give my opinions on their usefulness. I must preface this discussion by stating that I am not an engineer. I am not certified by any licensing organization as an expert. I have completed a few college level design courses, studied basic structural engineering, been a professional course builder for 24 years, and have worked in the construction trades for over 40 years. My approach here will be common sense.

Photo courtesy of Dab Starck.

ABOVE: One way to stabilize jumps from tipping, says Starck, is to build a base that extends slightly past the back.
NEXT PAGE: Stair step fences are some of the most "tippable" types of cross-country fences.

Whenever I get in a discussion about portable jumps, I'm reminded of an incident several years ago at the Virginia Horse Trials in Lexington, Virginia. I was stationed by a portable stair step fruit stand jump. I was talking with a spectator about the jump. She asked me if it was staked. I told her, "No, it's fine. It's really quite secure. It has a big base spread. It can't go any where." The very next horse hit the top of the jump and it flipped back. Pumpkins and gourds went rolling everywhere. The horse stumbled and the rider held on. Neither fell. With the help of the jump judges and a few spectators, the jump was righted and the fruit back in place before the next horse arrived. Everything was fine except for my very red face. I learned a lot in those few seconds.

The stair step shape and bench shape are especially prone to tip over because the top

of the jump is at the back. As the horse pushes the top of the jump back, the front lifts up. The force of a horse hitting the top is resisted only by the weight of the front. One way to make this type of jump more stable is to build it with a base that extends past the back. That principle can be applied to the design of other jumps as well, as long as the base doesn't extend so far as to interfere with the arch of the jumping horse.

What can we do to secure a jump like this? We need to either stop the back from tipping back or the front from rising up. While this shape is the most sensitive, the principles apply to securing any portable. Posts set behind the jump would stop it from tipping back. Some type of anchors attached to the front would resist the upward force there. Depending on the situation, one solution may be easier or better than another.

Posts (set behind) are the most effective method of securing portable jumps, but that might not be your preferred solution. Setting posts might be more work and may not be the most attractive. If the jump has a flat back where posts would look good and the soil is easy to dig, that would be your best option. Half round posts are a good choice in this situation. They are less visually obtrusive and can be easily attached to the jump with a timber lock or two.

I have seen jumps set with just stakes set at the back or toward the back of the ends. While this will keep a jump from scooting, it will do nothing to resist tipping. The stakes set in this manner would simply act like a hinge; the jump rotating head over heels. That could potentially be worse than nothing at all. Where a non-staked jump might scoot back when hit, if it's only staked at the bottom of the back (or sides near the back), that force would be transferred into tipping motion, causing the jump to roll. Use stakes at or near the back of the jump only in combination with stakes at or near the front; never alone.

Anchoring the front is usually done with some type of stake. Different staking systems will offer varying resistance to the forces exerted here. Remember that in the case of a jump that can tip, the force we need to resist is an upward force at the front. So one factor limiting a stake's effectiveness is it's resistance to pulling out of the ground. Imagine a hammer pulling a nail. This is a similar action, with the back of the jump being the hammer handle and the stake being the nail. The better the stake holds the ground, the more force it will take to pull it out. If you have a light or sandy soil, it will pull out much easier than in a heavy or clay soil. Also, if the stake is driven at an angle, it will be harder to pull than if straight.

There are a few different types of stakes commonly used; each having their own advantages and disadvantages. Probably the most commonly used stake is the simple wooden peg. It is usually a 2x4 cut to a point on one end. The advantages of wooden stakes are that they are very inexpensive, and they can be driven into the ground until they won't go any further then cut off at an appropriate length. Wood stakes often split while driving or attaching to the jump and would need to be re-set. I have also found that wood stakes are often difficult to pull back out after a competition, sometimes leaving a broken stub to be dug out.


Photo courtesy of Dab Starck.

The type of stake I use most often is the steel concrete form stake. They are made for concrete workers to set forms and are available at contractor supply houses and some big box lumber yards. It looks like a giant nail about ¾ inch in diameter with holes toward the head end. There is also a flat version available approximately ¼ inch thick by two inches wide. They come in various lengths, 24 inches being the most used. The disadvantage in using form stakes is the cost. Last summer they were about $3.50 each. That can add up when you're doing a whole course. The real advantage is how easy they are to use and that they can be used over and over again. They are easy to hammer into the ground and usually come back out fairly easily. They can be driven into the ground at an angle easier than wooden stakes. The labor savings and their durability make them quite affordable in the long run.

Potentially, the weakest link in either the wooden or steel staking systems is the connection to the jump. It doesn't matter how well a stake holds in the ground if the connection to the jump fails. A couple of nails or screws will usually be okay in basic situations, like flat ground or stable shapes, but sensitive situations may need more. A greater degree of holding strength can be achieved by adding more or heavier connectors. A timber-lock or lag bolt or

more nails or screws in a wood stake add more strength. Adding a pipe strap to the steel stake also increases the holding strength.

Another anchoring system worth mentioning has recently become available. Eric Bull (ETBjump.com) is making a stake modeled after one used by the British Military. Last fall, at the annual course builders' seminar at Burghley Horse Trials, he observed a graphic demonstration of portable jump staking. A cable was hooked between the top of a jump and a winch with a scale measuring the force of pull. Builders were invited to stake the jump using their preferred techniques. The force needed to move the jump was measured for each. The jump consistently moved at forces less than those measured in horse/jump collisions. Then the "new" anchors (actually "Spirafix Anchors") were set. When the winch was engaged, the rail threatened to break while the anchors held fast. Eric has taken the basic design and adapted it for a better connection to jumps and is having them fabricated here in the States to keep costs down. He says they go in and come out of the ground very easily. The cost is a bit high, around $45 per jump. But this looks like the way to go in more sensitive situations. I can imagine situations where nothing else would be adequate.

There are some situations that are more sensitive than others. A massive Advanced table with an eight foot base spread on flat ground will not demand the same degree of attention that a bench on a mound will. The shape of the fence and the slope of the ground will affect the "move-ability" or "tip-ability." The basic principle is to imagine what would happen if the jump is hit hard, then do what ever it takes to stop that from happening. First, look at the slope of the ground. If the jump is on a down-hill slope or the ground falls away after the jump, it will move more easily and more attention is needed in staking. The next thing to consider is the shape of the jump. How easy will it tip? A jump with a base that extends beyond its impact point is more stable than one where the top is at the back of the jump. For example, a bench with back-to-back seats is much more stable than a simple bench with a flat back. The most sensitive shapes are benches, stair steps, fruit stands, verticals, and palisades. The more stable shapes include rolltops, cabins, tables, and coops. The bottom line is that all portables must not move. But you must be especially careful with more "tip-able" shapes and ones that can travel down hill.

Hopefully, I have not made you more confused. It is very difficult to put hard rules to staking portable jumps. There are some portable jumps that would never move, but just when you think you know it all, you'll find out you're not so smart after all. I was so sure about that jump in Virginia! The new rule about staking may seem extreme, but it forces us to be prudent. Just stake them all and be especially careful with those light, tippy ones on slopes.

Always feel free to send me comments or questions at *jumpbuilder@earthlink.net*. Until next time, always do your best, happy building, and keep your chain sharp.

Frangible Fence Correction

The "Where's Waldo Award" is awarded this month to Tremaine Cooper. He was the first person to call me and point out that the photo accompanying my article, "Explaining the Frangible Rule", shows an improper installation. The rail in the photo is roped wrong. In the photo, it is roped tight and straight back to the post. Roped this way, the rail would not be able to drop freely when the pin broke. In fact, it may prevent the pin from breaking at all. The proper way to rope a frangible fence is to attach the rope eight inches below the pin. That way as the pin breaks, the rope goes slack, allowing the rail to fall freely. As the rail drops 16 inches, the rope again holds the rail close to the post, keeping it from rolling away.

The photo was chosen by the editorial staff from their catalog of stock photos. We really don't know where it was taken. I assume that officials at the site saw the problem with this installation and corrected it before it was jumped. The point is that we all need to keep a sharp eye on things. How many of you noticed it? I didn't when I first got the magazine. I was concentrating on the article and only glanced at the photo. But that's just the point. We assume because it's out there, everything is fine. Be careful. Pay attention. And do it right.

ABOVE: This photo illustrates a correctly installed frangible pin.

BELOW: This pin was not installed correctly.

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Back in the Stone Age, when I first started building jumps, there wasn't anything known as a "portable cross-country jump". We had built some jumps partly in the shop during bad weather, or that could, technically, be moved, but never intentionally to be portable. I distinctly remember around 1992, Pete Costello telling Jon Wells and I about a course he built (Galway, I think) where all the jumps had to be portable because it was in the infield of a track. The course had to be removed and restored after each competition. We thought it was an amazing concept. We soon began building portables when we realized we could avoid the major hassles of adjusting the distances between permanent jumps when the striding didn't work out the way the designer pictured. Of course, now, the advantages of portable jumps are well known and there are probably more jumps built portable than permanent.

When we started building portables, our approach to construction was the same as with permanent jumps: we hung wood on posts. Or more specifically, we built the jumps by setting posts on skids and then attaching skin boards to the posts. The idea of building on a foundation made up of two skids was good. It provided a good level base and made the jump easy to be dragged around. But the idea of using posts as the structure proved problematic. We started off building ramps, tables, benches; basically boxes of differing shapes. We were framing these jumps with 4x6's, 4x4's, 6x6's, like they were posts set in the ground. The first problem was that the space between the "posts" was too much. If we used stock lumber for the skin it would be too weak to hold up to a horse kick and would warp. To alleviate these problems, the structural members should be no more than two feet apart. Using heavy timbers this close together works fine, but is an incredible waste of material and money. Even a 2x4 is very strong in compression (up and down, as a post) and 2x6's, 8's, etc. are strong enough (when sized correctly) to be used horizontally (as "beams"). We

figured out that we could build this kind of jump that was superior, more durable, cheaper, and from material readily available at any lumber yard. I'll illustrate the system that we developed here. Use your imagination and you may be able to improve on it even more.

One limitation to this system is that it is really only appropriate for jumps that are enclosed box-like shapes. But that includes a huge variety of jumps: tables, ramps, coops, roll-tops, benches, cabins, steps, etc. OK, so where do we start?

I usually start with a sketch on graph paper. This way I can work out the angles or curves, the dimensions, the general look. I can make a material list from this plan, as well. My next step is to make a full scale drawing of the cross section of the jump on a piece of plywood (or the shop floor). At this step I can fine tune the exact dimensions, angles, curves, whatever. This also provides a pattern for making frames. The frames will be like ribs supporting the skin of the jump. I like to use polyurethane glue (like gorilla glue) when assembling frame pieces. A glued joint is infinitely stronger than one that relies totally on mechanical fasteners alone (nails, screws). I'm lucky enough to own an air nailer. It makes frame assembly really easy and fast.

I build this type of portable on a base made of two 4x6's or 6x6's used as skids (like a sled). They are cut on an angle on the bottoms of the ends to facilitate sliding. I also glue and bolt 4x6's across the skids near the ends to provide a strong member where the jump can be pulled from. Timber-locks are an easy way to bolt these cross members. If the ends of the jump will be open, or if you will provide a hole in closed ends to grab the cross member with a chain, move on to the next step. If the ends will be closed, it's a good idea to bolt pairs of short pieces of chain to the cross members to provide something to grab for dragging.

I toe-nail the frames to the base with nails (air gun, again, incredibly handy); usually two nails from each side into each skid. The spacing of the frames depends on the strength of the skin material. For deck boards, I recommend a maximum spacing of 16 inches; for 2x4's or 2x6's, etc. 24 inches max. The skin boards should be attached being careful to keep the frames vertical and square. They can be nailed, but deck screws are a better fastener in this case.

This is just the basic idea of this technique. There are many, many possible variations. Good planning is the secret to a successful design. Think of the jump in cross section. It simply becomes a series of frames in this shape lined up and covered with a skin of material strong enough to resist the forces of a horse hoof. This cross section shape can be anything from a box to a bench shape to a curve (roll top) to a series of curves. We have also used variations of this technique to build tapered jumps and snaking curves.

PREVIOUS PAGE AND BELOW: A roll top is born! The great thing about this design, says Starck, is it's more durable and cheaper than other types of fences, and can be made from materials readily available at any lumber yard. **RIGHT:** The end result is an exciting and well-built roll top that will surely catch the competitor's eye.

Finally, here are a few tips:

• Use treated lumber. Some of the new treated lumber brands look untreated, lacking that green color. At any rate, you want these things to last so always use treated lumber in your jump construction. If you want to use a more decorative wood where it shows, use a rot resistant species like cedar, locust, or white oak. Stick with pressure treated wood for all the interior structural members.

• Set the end frames a few inches short of your skin board length. An overhang usually looks better and hides slight out of squareness.

• Set the end frames first. Pull a string from end to end at the widest point and set the other frames to the string. That way even if the base isn't exactly straight, the jump face will be and the skin boards will land on all the frames evenly.

• Add vertical diagonal bracing where necessary. A couple of braces each way near the center resist racking forces.

• Before you start to attach the skin boards, temporarily attach a board across the tops of the frames holding each frame plumb and spaced correctly.

• Set one end of all the skin boards even to each other. Then trim a straight line off the wild end. Boards are seldom the same length.

• Think about leaving a narrow board at the top that can be easily removed. Maybe attach it with screws so it could be taken off and the space stuffed with brush.

• Build the jump a couple of inches below max. height. Ground is never level and if a jump is built at max height and is slightly up hill from the take off point, it will measure illegally high. It is easy to raise a portable jump if it is too low. A few blocks of wood set under the skids can bring it easily to the right height. Of course, always stake portables appropriately. See last month's column for staking tips.

This isn't the only way to build. Some jump designs lend themselves better to heavy timber construction. The point is, this is an efficient way to build many designs. I see way too many jumps out there built with unnecessarily large timbers, wasting material and money. And I see way, way too many jumps built with structure spaced too far apart. 2x6's supported on four foot centers is just wrong. And I've seen much worse. But don't get me started.

Until next time, always do your best, have fun, and keep your chain sharp.

Check out a video on cross-country design in the next issue of **EventingUSA 2.0**.